CONSTRUCTION MONITORING REPORT

APRIL 2022 TO November 2022

Sydney Metro City & Southwest

Package 5 & 6

Customer: Sydney Metro

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Document Version History

Version No.	Date	Document Status	Brief Description of Change(s) from Previous Version
Rev A	14/11/2022	For review	Issued for comment
Rev B	22/11/2022	For review	In response to comments received by Sydney Metro & DPE ER.

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Compliance Matrix

Condition	Requirement	Compliance
MCoA C14	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	This Construction Monitoring Report

Introduction

This Construction Monitoring Report has been prepared in accordance with Condition C14 of Critical State Significant Infrastructure Planning Approval 8256. It contains the results of Noise and Vibration Monitoring Program and the Water Quality Monitoring Programs, conducted as part of the station upgrades and Metro Services Building (MSB) construction at:

- Dulwich Hill (Package 5)
- Hurlstone Park (Package 6)
- Campsie (Package 5)
- Belmore (Package 6)
- Wiley Park (Package 6)
- Punchbowl (Package 5)

This report details the results of the noise, vibration and surface water monitoring conducted for a period of six (6) months of construction of Package 5 and Package 6 of the Sydney Metro Southwest Project. Construction of these packages commenced on 21 April 2021 and this report details the results of the monitoring undertaken from 7 April 2022 to 7 November 2022. Monitoring results for the first six months (approximately) of the project have been covered in a separate Construction Monitoring Report[1].

Submission Requirements

In accordance with condition the Ministers Conditions of Approval (MCoA) C14, Construction Monitoring Report will be submitted to the following agencies for information:

- Inner West Council;
- City of Canterbury Bankstown; and
- DPE.

The Independent Environmental Representative for DPE will review the report prior to submission.

Surface Water Monitoring

The project sites are located within the rail corridor on the T3 Bankstown line between Dulwich Hill and Punchbowl, New South Wales (NSW). The project sites form part of the overall Cooks River catchment with water from the area discharging into the Cooks River via local stormwater drainage or overland flow. The catchment area is highly urbanised with mixed residential, commercial and industrial properties.

[1] Please refer to documents SMCSWSW5-DEW-WEC-EM-REP-001258 (Package 5) and SMCSWSW6-DEW-WEC-EM-REP-001153 (Package 6).

The closest Project worksite to an existing watercourse is the Wiley Park Station services building, which is located approximately 100m from an unnamed concrete-lined channel, which forms the upper reaches of Coxs Creek and is identified as a first-order stream within the Cooks River Catchment. Water quality is measured on an ongoing basis for the wider Cooks River catchment by the NSW Department of Planning & Environment (DPE) as part of the Beachwatch programme. The monitoring point is at Kyeemagh Baths at the mouth of the Cooks River in Port Botany. Water quality within the Cooks River catchment is influenced by stormwater, fertilisers, industrial discharges and sewage contamination. Objectives for water quality management during construction are:

- Minimise pollution of surface water through appropriate erosion and sediment control;
- Maintain existing water quality of surrounding surface watercourses.

The water quality monitoring program, in accordance with Table 13 of the SWMP, is to be undertaken quarterly in response to wet weather events (four wet weather events - >20mm of rain per 24 hours - per year), and also including dry weather sampling. Additional surface water monitoring is undertaken during construction to monitor the effectiveness of measures for managing soil and water impacts implemented. It must be conducted for the duration of construction or unless otherwise agreed to by Downer, Sydney Metro and the Independent Environmental Representative for DPE. Details of the Water Quality Monitoring Program and the mitigation measures to reduce the impact of the construction activities are contained within the Soil and Water Management Plans listed below:

- Southwest Metro – Dulwich Hill, Campsie and Punchbowl Station Upgrades Soil and Water Management Plan. This document can be accessed via the Downer Sydney Metro Environment Documents website.

https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Dulwich_Hill_Campsie_and_Punchbowl_SWMP_Rev07.1.pdf

- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Soil and Water Management Plan. This document can be accessed on the Downer Sydney Metro Environment Documents website:

https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Hurlstone_Park__Belmore_and_Wiley_Park_SWMP_Rev07.1.pdf

RESULTS - SURFACE WATER MONITORING

In accordance with Table 21.4 of the EIS, Vol. 1B, the water quality trigger values relevant for the project are the following:

Indicator	Criteria (lowland rivers)
Total phosphorus	50 ug/L
Total nitrogen	500 ug/L
Chlorophyll-a	5 ug/L
Turbidity	6-50 NTU
Salinity (electrical conductivity)	125-2,200 uS/cm
Dissolved oxygen (per cent saturation)	85-110 %
pH	6.5-8.5

A summary of the Surface Water Monitoring Results is contained within the table below. The complete Surface Water Monitoring Reports are contained within Appendixes 1-4. Bold red text indicates initial criteria exceedances.

Parameter	24/05/2022			04/07/2022				21/07/2022				25/08/2022		
	WP1 (upstream)	WP2 (downstream)	WP2-DP1[1] (downstream)	WP1 (upstream)	WP2 (downstream)	WP2-DP1[2] (downstream)	WP2-DP2[2] (downstream)	WP1 (upstream)	WP2 (downstream)	WP2-DP1[2] (downstream)	WP2-DP2[2] (downstream)	WP1 (upstream)	WP2 (downstream)	WP2-DP1[3] (downstream)
Monitoring Event	Wet weather event (mid-construction)			Wet weather event (mid-construction)				Wet weather event (additional pH investigation)				Dry weather event (additional pH investigation)		
Water Depth (m)	0.20	0.25	0.25	0.45	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.25	0.25	0.35
pH	6.82	9.02	10.49	6.87	6.92	10.81	7.29	7.71	7.93	9.76	8.48	7.16	9.02	10.71
Electrical Conductivity (µS/cm)	590.0	556.4	502.36	296.3	330.5	400.6	375.5	61.0	108.2	84.1	90.6	805.0	861.0	773.0
Dissolved Oxygen (mg/L)	8.10	8.05	6.22	22.98	8.95	7.63	10.61	7.52	7.13	6.28	6.42	13.50	10.32	4.06
Dissolved Oxygen (%)	85.3	83.2	64.4	73.6	71.3	61.8	67.7	221.8	86.4	73.6	102.6	124.1	101.0	40.8
SHE[1] Redox Potential (mV)	281.7	256.4	175.6	303.7	314	236.6	197.8	422.4	373.5	358.8	370.2	295.2	252.4	230.1
Total Suspended Solids (TSS) (mg/L)	<5	<5	23	11	9	42	26	Not Tested	Not Tested	Not Tested	Not Tested	<5	<5	<5
Turbidity (NTU)	14.0	16.0	18.0	9.4	11.0	14.0	22.0	Not Tested	Not Tested	Not Tested	Not Tested	3.9	3.8	1.2
Total phosphorus (mg/L)	0.16	0.14	0.04	0.06	0.06	0.04	0.14	Not Tested	Not Tested	Not Tested	Not Tested	0.31	0.35	0.11
Total nitrogen (mg/L)	2.5	1.8	3.1	0.48	0.57	3.1	1.68	Not Tested	Not Tested	Not Tested	Not Tested	2.1	1.2	4.6
Chlorophyll-a (mg/L)	< 0.01	< 0.01	< 0.01	0.036	< 0.002	< 0.002	< 0.002	Not Tested	Not Tested	Not Tested	Not Tested	< 0.002	< 0.002	< 0.002
Condition	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity
Oil and Grease (mg/L)	<10	<10	<10	<10	<10	<10	<10	Not Tested	Not Tested	Not Tested	Not Tested	<10	19	13

Note to Table:

[1] Inspected two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) and sampled one (1) additional nominated downstream discharge point (WP2-DP1) on 24 May 2022. No sampling work was undertaken at the downstream discharge point – WP2-DP2 due to lack of flow contribution.

[2] Inspected and sampled two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) on 4 July 2022.

[3] Inspected two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) and sampled one (1) additional additional nominated downstream discharge point (WP2-DP1) on 25 August 2022. No sampling work was undertaken at the downstream discharge point – WP2-DP2 due to dry condition.

Figure 1: WP1 and WP2 location map. Please note that only WP1-DP1 and WP2-DP1 are Downer's discharge points.

For reference, the previous monitoring events at these locations yielded the results below[2]:

[2] Discussion of these results are included in Construction Monitoring Report 2 (November 2021 to April 2022), Package 5 - SMCSWSW5-DEW-WEC-EMREP- 001412 and Package 6 - SMCSWSW6-DEW-WEC-EMREP- 01300.

Parameter	12/11/2021		26/11/2021		09/04/2022 – 10/04/2022		23/04/2022		09/03/2022	
	WP1 (upstream)	WP2 (downstream)	WP1 (upstream)	WP2 (downstream)	WP1 (upstream)	WP2 (downstream)	WP1 (upstream)	WP2 (downstream)	WP1 (upstream)	WP2 (downstream)
Monitoring Event	Wet weather event (mid-construction)		Wet weather event (mid-construction)		Dry weather (mid-construction)		Wet weather event (mid-construction)		Wet weather event (mid-construction)	
Water Depth (m)	0.15	0.20	0.15	0.20	0.05	0.1	0.3-0.4	0.2-0.3	0.15-0.2	0.15-0.2
pH	8.10	8.42	6.07	7.34	8.59	8.78	7.50	7.62	7.78	7.85
Electrical Conductivity (µS/cm)	514	509.2	389.2	484	680	650	230	431	622	659
Dissolved Oxygen (mg/L)	6.42	5.63	9.05	9.31	7.21	5.06	4.94	6	5.38	5.34
Dissolved Oxygen (%)	68	63	98.7	101.9	92	62.2	56.7	72	58.4	58.1
SHE1 Redox Potential (mV)	70.8	80.4	183.7	196.3	240.3	196	261.5	287.6	282.3	290.4
Total Suspended Solids (TSS) (mg/L)	8.4	7.6	16	7.8	<5	<5	18	9.6	17	7.8
Turbidity (NTU)	21	19	25	17	2.9	1.2	37	28	31	22
Total phosphorus (mg/L)	0.15	0.02	0.13	0.18	0.14	0.08	0.23	0.28	0.16	0.14
Total nitrogen (mg/L)	2.7	2.8	1.6	2.4	1.7	1.6	1.64	2.6	1.9	1.8
Chlorophyll-a (mg/L)	<0.002	<0.002	<0.002	<0.0027	<2	<2	<2	<2	<0.002	<0.002
Condition	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity
Oil and Grease (mg/L)	<10	<10	<10	<10	<10	<10	<10	<10	10	<10

Wet weather event (mid-construction): 24/05/2022

The sampling event was considered as a mid-construction wet-weather event based on the rainfall data recorded by the nearby weather station:

- Canterbury Racecourse AWS station (ID: 066194): approximately 4.6 km from the site with the rainfall data recorded 20.4 (i.e. slightly above the 20 mm threshold mm over the last 24 hours prior to the field sampling.

At the time of sampling, WP2-DP2 (downstream western discharge point) was dry, not contributing to the water body and one discharge point (WP1-DP1) was observed immediately downstream / north of WP1 (upstream of work area) with low flow contribution. Refer to **Figure 1** for approximate location of WP1-DP1.

The results of the monitoring event indicated that:

- Concentrations of Chlorophyll-a were reported below the laboratory detection limit and adopted assessment criteria at all sample locations. It is noted that due to insufficient volume of the sample being available for analyse by the laboratory (Eurofins), the LOR of this analyte was raised from 2 µg/L to 10 µg/L which is above the adopted assessment criteria. This non-compliance has been communicated with the laboratory (Eurofins) and will be avoided for the future monitoring work. This non-compliance has been communicated with the laboratory (Eurofins) and will be avoided for the future monitoring work. Overall, this issue is not considered to be a significant issue based no Chlorophyll-a exceedance to the adopted assessment criteria was historically detected from previous mid- construction wet weather monitoring events with similar water quality being visually as well as analytically observed between this round of monitoring undertaken on 24 May 2022 and previous monitoring events. ;

- Concentrations of Oil and Grease were reported below laboratory detection limit at all sample locations;
- TSS concentrations were reported below the laboratory detection limit at WP1 (upstream) and WP2 (downstream) whereas reported with concentration of 23 mg/L at WP2-DP1 (downstream eastern discharge point);
- Turbidity was reported with concentration of 14 NTU at WP1 (upstream), 16 NTU at WP2 (downstream) and 18 NTU WP2-DP1 (downstream eastern discharge point), readings below adopted assessment criteria.

Results for the mid-construction quarterly wet-weather event sampled on 24 May 2022 generally were within the adopted screening criteria, with the exception of:

- **pH** measured at upstream (WP1: 6.82) was within the adopted criterion range, whereas downstream (WP2: 9.02) and downstream eastern discharge point (WP2-DP1: 10.49) were above the adopted criterion range (i.e., 6.5 – 8.5); the pH at downstream sample WP2 was slightly above the previous wet-weather event range (i.e. 7.34 to 8.42).
- **Dissolved oxygen** saturation measured at upstream point (WP1: 85.3%) was within the adopted assessment criterion, but downstream point (WP2: 83.2%) and downstream eastern discharge point (WP2-DP1: 64.4%) were below the adopted criterion range (i.e., 85% - 110%). Overall, these slight exceedances in dissolved oxygen saturation concentrations are not considered a significant issue based on:
  - The dissolved oxygen saturation measurement at WP2 was within the range of the measurements obtained from previous mid-construction wet-weather sampling events; and
  - The dissolved oxygen saturation measurement at WP2-DP1 is considerably lower than the measurements obtained from WP1 and WP2, it is not considered to have significant impacts on the downstream water quality due to the similarity of the dissolved oxygen saturation between WP1 and WP2 (2.5% in percentage difference).
- **Total phosphorous** result at upstream sample (WP1: 0.16 mg/L), downstream sample (WP2: 0.14 mg/L) and downstream eastern discharge point sample (WP2-DP1: 0.04 mg/L) were above the adopted criteria (i.e. 0.025 mg/L). However, these exceedances in total phosphorus concentration are not considered to be a significant issue based on:
  - The total phosphorus result at WP1 and WP2 were consistent the results obtained from previous mid-construction wet-weather sampling events; and
  - The total phosphorus result at WP2-DP1 was the closest to the applicable criteria compared to the results obtained from the other two monitoring locations (i.e. WP1 and WP2).
- **Total nitrogen** results at upstream sample (WP1: 2.5 mg/L), downstream sample (WP2: 1.8 mg/L) and downstream eastern discharge point sample (WP2-DP1: 3.1 mg/L) were above the adopted assessment criteria (i.e., 0.35 mg/L). Overall, these exceedances in total nitrogen concentration are not considered to be a significant issue based on that the total nitrogen result at WP1 and WP2 were within the range obtained from previous mid-construction wet-weather sampling events.

The comparison of the mid-construction wet-weather event conducted on 24 May 2022 to the six previous wet-weather sampling events showed no significant difference. Based on comparison to the adopted assessment criteria, comparison with six previous mid-construction wet-weather events, and comparison of the upstream WP1, downstream WP2 and downstream eastern discharge point WP2-DP1 results, the results reported for the 24 May 2022 sampling event are generally not considered to reflect an adverse impact to water quality due to construction activities at the subject site except for pH.

Further details of this investigation works are provided in Appendix 1 of this report.

Wet weather event (mid-construction): 04 July 2022

The sampling event was considered as a mid-construction wet-weather event based on the rainfall data recorded by the nearby weather station:

- Canterbury Racecourse AWS station (ID: 066194): approximately 4.6 km from the site with the rainfall data recorded 31.8 mm (i.e. above the 20 mm threshold) over the last 24 hours prior to the field sampling.

At the time of sampling, flow contribution was observed on discharge point (WP1-DP1) immediately downstream / north of WP1 (upstream of work area). Due to the measurements of the elevated pH at WP2-DP1, an inspection of the upstream area within the Wiley Park worksite was undertaken by Cardno (now Stantec field team) to identify any potential source(s) within the upstream area.

During the inspection held on 04/07/2022 three (3) on-site and off-site flow contributions to WP2-DP1 was noted and one (1) additional flow contribution was identified. The additional contribution source was the on-site – track drainage: track drainage system collecting stormwater within the train track area and then entered into the main water channel via WP2-DP1.

Three (3) potential upstream flow contributions to WP2-DP1 were identified during this inspection:

- Platform 1 drainage system: run-off collected within the aco drain at Platform 1 of Wiley Park Station was observed to flow in a westerly direction via the concrete lined swale as well as underground drainage system passing beneath the MSB building then entered the main water channel via WP2-DP2;
- Temporary surface water erosion and sediment control trenches: temporary surface water erosion and sediment control trenches that cut into the soil profile were observed from the north-eastern corner of the MSB building and to flow westerly and then entered the main water channel through a series of Downer EDI installed erosion and sediment controls via WP2-DP2; and
- Urban run-off drainage system: urban run-off drainage system carrying stormwater captured from the off-site area surrounding Shadforth Street was observed to join into the Platform 1 drainage system via the concrete lined swale within the Wiley Park compound. The flow was observed in a westerly direction via the concrete lined swale as well as underground drainage system passing beneath the MSB building then entered the main water channel via WP2- DP2.

The results of the monitoring event indicated that:

- Concentrations of Chlorophyll-a were reported below the laboratory detection limit (<0.002 mg/L) for each sample with the exception of WP1 detected at 0.0036 mg/L. However, this sight exceedance at is not considered as a significant issue as all the results obtained from the downstream sample points were below the laboratory detection limit (<0.002 mg/L);
- Concentrations of Oil and Grease were reported below laboratory detection limit at all sample locations;
- TSS concentrations were detected between 9 mg/L at WP2 and 22mg/L at WP2-DP2, concentrations below the adopted assessment criteria; and
- Turbidity ranged were detected concentrations below 23 NTU at all sample locations.

Results for the mid-construction quarterly wet-weather event sampled on 4 July 2022 generally showed monitored parameters were within the adopted threshold criteria, with the exception of total nitrogen, total phosphorous, pH, EC and dissolved oxygen saturation:

- **Total nitrogen** results at all upstream, downstream sample point and downstream discharge points (WP1: 0.48 mg/L, WP2: 0.57 mg/L, WP2-DP1: 3.10 mg/L and WP2-DP2: 1.68 mg/L) were above the adopted criteria (0.35 mg/L). However, these exceedances in total nitrogen concentration are not considered to be a significant based on:
  - The total nitrogen results at WP1 and WP2 were all below the historical range obtained from previous mid-construction wet-weather events, which were ranged from 1.6 to 5.0 mg/L and 1.0 to 2.8 mg/L, respectively.
  - The total nitrogen results at WP2-DP1 and WP2-DP2 are consistent with the historical range measured at WP1 and WP2 and are close to / below the historical average measured at WP1 (3.1 mg/L) and WP2 (2.5 mg/L).
- **Total phosphorus** results at all upstream, downstream sample point and downstream discharge points (WP1: 0.09 mg/L, WP2: 0.06 mg/L, WP2-DP1: 0.04 mg/L and WP2-DP2: 0.14 mg/L) were above the adopted criteria (0.025 mg/L). However, these exceedances in total phosphorus concentration are not considered to be a significant based on:
  - The total phosphorus result at WP1 was within the range of the results obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between below the laboratory detection limit to 0.23 mg/L and below the historical average measured at WP1 (0.18 mg/L).
  - The total phosphorus result at WP2 was within the range of the results obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated below the laboratory detection limit to 0.28 mg/L and below the historical average measured at WP2 (0.17 mg/L).
  - The total phosphorus result at WP2-DP1 and WP2-DP2 were within the historical range measured at WP1 and WP2. Also, they are below the historical average measured at both WP1 and WP2.
- **pH** measured at WP1, WP2 and WP2-DP2 were within the adopted criterion range, whereas downstream eastern discharge point sample (WP2-DP1: 10.81 was above the adopted criterion range (i.e. 6.5 – 8.5), which is consistent with the previous monitoring results obtained on 24 May 2022 under similar weather conditions. Further investigation to the potential source(s) of this elevated pH value to the upstream area within the Wiley Park worksite was undertaken as detailed below.
- **Electrical Conductivity** measured at all upstream, downstream and downstream discharging points (WP1: 61.0 uS/cm (21 July 2022), WP2: 108.2 us/cm WP2-DP1: 84.1 us/cm and WP2-DP2: 90.6 us/cm were below the adopted criteria range. However, it is not considered a significant based on:
  - Significant rainfall events occurred during July 2022 (total of 317.8 mm precipitation recorded by the nearest station between 1 and 21 July 2022), which results in increasing volume of fresh water within the main water channel and may in turn cause decreasing trend of EC measurements. Although EC measurement at the downstream sample point

(WP2) was still below the adopted criteria range, the measurement at WP2 was closer to the adopted criterion range than the upstream measurement at WP1.

- **Dissolved oxygen** saturation measured at all upstream, downstream sample point and downstream discharge points (WP1: 73.6% and WP2: 71.3%, WP2- DP1: 61.8% and WP2-DP2: 67.7% were below the adopted criterion range (i.e. 85% - 110%). However, these slight exceedances in dissolved oxygen saturation concentrations are not considered a significant based on:
  - The dissolved oxygen measurement at WP1 on 21 July 2022 was outside of the range of the measurements obtained from previous mid-construction wet-weather sampling events, the downstream sample point WP2 (86.4%) was measured within the adopted criteria range.
  - The dissolved oxygen saturation measurement at WP2 was within the range of the measurements obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between 43.2% and 101.9 % and closer to the adopted criteria range than the historical average measured at WP2 (69.2%).
  - The dissolved oxygen saturation measurements at WP2-DP1 and WP2-DP2 were within the historical range measured at WP1 and WP2. Also, they are close to the historical average measured at WP1 and WP2.

Seven (7) previous mid-construction wet weather sampling events were used to compare and check if there is any potential adverse impact to the water quality caused by the construction activities done around the date of this monitoring works undertaken between 20 March 2021 and 24 May 2022. Overall, conditions are similar between upstream and downstream samples collected on 4 July 2022 and previous mid-construction wet weather events except for pH values reported from WP2-DP1 relative to rest of the sampling locations.

Further details of this investigation works are provided in Appendix 2 of this report.

Additional pH Investigation (Upstream Area to WP2-DP1) – 04/07/2022 and 21/07/2022

The additional pH investigation was undertaken during wet weather conditions with a total of 6.8 mm precipitation recorded by the nearest weather station, approximately 4.6 km from the site (Canterbury Racecourse AWS station, ID: 066194), over the last 24 hours prior to the field investigation. The sampling event was considered as a mid-construction wet-weather event based on the rainfall data (i.e. above the 20 mm threshold).

Due to the elevated pH values at WP2-DP1, the additional investigation and inspection were undertaken by Cardno now Stantec field team with a Downer EDI delegate within the Wiley Park worksite area upstream of WP2-DP1 on both 04/07/2022 and 21/07/2022.

Eight (8) soil samples were collected during the additional investigation on 21/07/2022 to assess the pH status of the surficial soils within the Wiley Park worksite upstream to the WP2-DP1. The pH assessment was undertaken to all soil samples using both on-site soil pH testing kit (Manutec soil pH test kit) as well as laboratory analysis. Refer to Figure GS003 in Appendix 2 of this report for the approximate locations of the soil samples collected.

Key findings from this additional pH investigation are following:

- On-site – platform 1 drainage system:

  - Elevated pH values were consistently measured within platform drainage ranging from 9.08 to 9.40 during the additional investigation works undertaken on 04/07/2022 and 21/07/2022 indicating that there is likely upstream source(s) causing elevated pH measured.
  - No investigation work was undertaken further upstream of monitoring location PD1 to determine the potential source(s) due to the inaccessibility at the time of investigation (i.e. the area is inaccessible without a rail possession). As such, the potential source(s) for the elevated pH identified from this drainage system has been identified. Further investigation to the potential source(s) of the elevated pH is required.

- On-site – temporary surface water erosion and sediment control trenches:
  - Elevated pH values were consistently measured within this temporary surface water erosion and sediment control trenches with a clear trend that pH is increasing significantly towards west (downstream) direction and when it gets close to the area where the on-site detention tank (OSD) constructed. As part of the project design, stabilising sand with cement was used as backfill materials to this area, which is considered likely to be a source of this elevated pH identified within the surface water.
  - pH values (on-site test and laboratory analysis) undertaken from the surficial soil samples collected from this area indicates high alkalinity (ranged from 9.9 to 12 based on laboratory measurements).
- On-site – track drainage and off-site – urban run-off drainage system: no elevated pH was measured from neither track drainage nor urban run-off drainage system. Thus, these two flow contributions are not considered as potential sources of the elevated pH measured at WP2-DP1.

The elevated pH measured at the downstream discharge point WP2-DP1 was considered significant and requires further investigation of the upstream area regarding the potential source(s).

Mid-Construction Quarterly Dry-Weather Event – 25/08/2022

The sampling event was considered as a mid-construction dry-weather event based on the rainfall data recorded by the nearby weather station:

- Canterbury Racecourse AWS station (ID: 066194): approximately 4.6 km from the site with the rainfall data recorded 0 mm over the last 24 hours prior to the field sampling.

All four (4) nominated monitoring locations were inspected (WP1, WP2, WP2-DP1 and WP2-DP2) on 25/08/2022. Three (3) surface water monitoring locations (WP1, WP2 and WP2-DP1) were sampled. WP2-DP2 was not sampled due to the dry weather condition on 25/10/ 2022. Minor flow contribution at the time of sampling was observed immediately downstream / north of at WP1 (discharge point WP1-DP1). Refer to **Figure 1** for approximate location of WP1-DP1.

The results of the monitoring event indicate that:

- Concentrations of Chlorophyll-a were reported below the laboratory detection limit (<0.002 mg/L) and adopted assessment criteria at all sample locations;
- EC results measured at all locations were within the adopted assessment criteria;
- TSS were reported below the laboratory detection limit (<5 mg/L);
- Turbidity was reported with concentration below 4 NTU at all sample locations;
- Dissolved oxygen saturation measured at WP2 (101.0%) was within the adopted criterion range whereas WP1 (124.1%) and WP2-DP1 (40.8%) were outside the adopted criterion range. This is

not considered to significant as the pre-construction monitoring results showing saturations of 63% and 45.9% for WP1 and WP2 respectively, indicating that this mid-construction results are close to the adopted thresholds and the pre-construction event.

Results between upstream and downstream samples collected during the mid-construction dry-weather event were comparable, with the exception of oil and grease, total nitrogen, total phosphorous and pH:

- **Oil and Grease** results reported for the downstream sample location (WP2: 19 mg/L) and downstream discharge point (WP2-DP1: 13 mg/L) were higher than the upstream sample location (WP1: <10 mg/L). However, it is not considered significant and related to the construction activities undertaken because:
  - Similar concentration to the Oil and Grease concentration reported for the downstream sample (WP2: 29 mg/L) collected during pre-construction baseline monitoring event undertaken on 10 March 2021.
  - No visible oil sheen observed from any of the downstream monitoring locations (WP2 and WP2-DP1).
- **Total nitrogen** result at the downstream discharge point (WP2-DP1: 4.6 mg/L) was higher than the upstream sampling point (WP1: 2.1 mg/L). However, it is not considered significant and related to the construction activities undertaken because:
  - It is known that there is an off-site flow contribution to the eastern downstream discharge point (WP2- DP1) from the urban run-off drainage system at Shaforth Street, Wiley Park. It is known that high level of total nitrogen (i.e. an order of magnitude higher than the WP2-DP1 results) was previously identified from this off-site flow contribution.
  - Total nitrogen concentration within the downstream sample point WP2 (WP2: 1.2 mg/L) was lower than the upstream sample point WP1 (WP1: 2.1 mg/L).
- **Total phosphorous** results at the downstream sample point (WP2: 0.35 mg/L) was slightly higher than the upstream sampling point (WP1: 0.31 mg/L). However, it is not considered significant because:
  - Total phosphorous results at the downstream sample point was only slightly higher than the upstream sampling point.
  - Total phosphorous result at the downstream discharge point (WP2-DP1: 0.11 mg/L) was lower than both upstream and downstream monitoring locations. This downstream discharge point connects the surface water between the Wiley Park construction site and the subject unnamed water channel.
- **pH** results at downstream eastern discharge point sample (WP2-DP1: 10.71) and downstream sample point (WP2:9.02) were considerably higher than the results measured at the upstream sample location (WP1: 7.16). As such, flow from the downstream eastern discharge point (WP2-DP1) is highly likely to contribute an increasing pH to the downstream water body.

One sampling event during the pre-construction period (baseline event) was undertaken on 10 March 2021. This event has been used for comparison of mid-construction monitoring events under similar conditions (i.e. not triggering the wet-weather event criteria). It should be noted that the baseline water quality monitoring represents a single sampling event and may not be representative of the range of water quality within the channel prior to construction starting.

The elevated pH measured at the downstream discharge point WP2-DP1 and downstream sample point WP2 were considered significant and requires further investigation of the upstream area regarding the potential source(s). Further details of this investigation works are provided in Appendix 3 of this report.

Additional pH Source Investigation within the Platform 1 Drainage System at Wiley Park Station – 05/10/2022

Further investigation was recommended in to identify any potential source(s) for the elevated pH identified during the next possession (refer to Appendix 2) and assess the following:

- Conduct soil pH measurement at all areas that potentially form the catchment area to the platform drainage (including the batter on the northern face).
- Conduct inspections of all platform buildings (if accessible) and Downer's storages within the potential catchment area for any potential source (e.g. storage for cleaning products, etc.).
- Check the Platform aco drain during dry and wet weather.

Four (4) soil samples were collected for pH measurement from the surrounding areas that potentially form the catchment area to the Platform 1 drainage system. On-site and laboratory pH measurements were similar and indicate that the soil materials assessed were alkaline with pH that ranged from 8.5 to 9.6.

Investigation of the Platform 1 aco drain was undertaken to determine whether there is potential source in the aco drain that contributes to the elevated pH measured from the surface water collected from the Platform 1 drainage system. Platform 1 drainage system had insufficient for water monitoring purposes thus, tap water was applied to the aco drain with pH measured via a calibrated water quality meter. Tap water pH increased significantly after entering the aco drain, which indicates the presence of potential source(s) that contribute to this pH increase within the aco drain. On-site pH measurements aco drain water were between 7.86 and 8.64 and pH of tap water was measured at 6.33.

In addition, nine (9) samples of sediments were collected at 10m to 15m intervals from the aco drain. On-site and laboratory pH measurements were similar and indicate that the soil materials assessed were alkaline with pH that ranged from 8.5 to 9.4.

Further details of this investigation works are provided in Appendix 4 of this report.

Key findings of this were following:

- Tap water pH increased significantly after entering the aco drain, which indicates the presence of potential source(s) that contribute to this pH increase within the aco drain.
- pH measurements of the soil / sediment materials sampled from the aco drain were all alkaline, which is consistent with the soil pH measured from the surrounding soils within the areas that are considered to fall within the catchment area of the Platform 1 drainage system. Additionally, the texture and the type of soil / sediment materials within the aco drain was noted to be similar to soils located within the surrounding area.
- It is noted that the pH value measured at the downstream discharge point (i.e., Head Wall 1) was 9.78 which was the highest pH value measured from all the water pH monitoring points associated with this aco drain tap water check during the investigation. This result also indicates the likelihood of the presence of alkaline materials (e.g., alkaline soil, alkaline sediment, etc.) within the underground drainage pipe and the two drainage pits.

Based on the results of this investigation, the following conclusions were made:

- The alkaline soil / sediment identified within the Platform 1 drainage system are likely derived from erosion of surrounding exposed soils.

- These soils in the drainage system are considered likely to be the main source of the elevated pH measured from the surface water collected from the Platform 1 drainage system.

DISCUSSION - SURFACE WATER MONITORING

The monitored parameters were either within the adopted assessment screening criteria or considered insignificant for the exceedances (oil and grease, total nitrogen, total phosphorous and dissolved oxygen saturation) based on the comparison with the pre-construction baseline monitoring results. However, pH measured at the downstream discharge point WP2-DP1 and downstream sample point WP2 were outside the assessment criteria range of 6.5 to 8.5 and were considered significant that require further investigation of the upstream area regarding the potential source(s).

The following recommendations regarding the elevated pH identified at WP1-DP2 and the two upstream flow contributions (temporary surface water erosion and sediment control trenches and platform 1 drainage system) have been offered:

- Temporary surface water erosion and sediment control trenches: prior to rainfall events, it is recommended to install a non-permeable physical barrier (e.g. black plastic sheeting) in the drainage trench path surrounding the construction footprint of the OSD tank. This would prevent surface water from coming into direct contact with the stabilised sand / cement mixture used to backfill the area.

Based on the findings from the additional investigation conducted 05/10/022, the following recommendations regarding the elevated surface water pH identified at Platform 1 drainage system were provided:

- Removal of soil / sediment materials from the Platform 1 drainage system: the identified alkaline soil /sediment should be removed from the Platform 1 drainage system after construction has been completed within the Platform 1 in general accordance with the following steps:
  - Excavating of any excessive soil / sediment materials from the Platform 1 drainage system including aco drain and connecting underground drainage pipe to the extent practicable.
  - Flushing of the soil / sediment materials that remain within the Platform 1 drainage system including aco drain and connecting underground drainage pipe following the excavation work outlined in the previous bullet point.
  - Following the flushing work, the two drainage pits located near the downstream end of aco drain should be checked and any soil / sediment materials should be removed by excavation.
- Completion of a validation test: following the removal and cleaning work of the Platform 1 drainage system, a validation test is recommended to check the effectiveness of the mitigation works undertaken by applying tap water at the start / upstream of the Platform 1 drainage system and measuring pH using a calibrated water quality meter at multiple downstream locations along the aco drain and associated drainage system.

Downer conducts regular inspection of the environmental controls, including sediment and erosion controls at Wiley Park to ensure that all sediments and erosion controls were in place, well maintained and functioning correctly. These inspections are conducted by the Project Team and Environmental Team. This proactive approach ensures that environmental controls are functioning properly rather than reactively inspecting the worksite following monitoring and reporting.

Noise and vibration

The area surrounding the project sites contains a variety of land-use types and receivers, including residential, commercial, industrial and sensitive non-residential receivers. These land-uses are mixed within the identified noise catchments, although in general there are clusters of industrial and commercial areas surrounding stations, primarily residential areas between stations. The area surrounding the project sites are affected by rail noise and vibration. The majority of works will occur within the rail corridor, on the station platforms and buildings and within the Metro Services Building Areas, works will mainly occur adjacent to residential properties.

Noise and vibration monitoring must be carried out for the duration of Construction. The predominant reason for monitoring noise and vibration associated with the construction works is to ensure compliance with modelled results for noisy works and to ensure compliance with modelled results and the project's Conditions of Approval(s) and Noise and Vibration Management Plan (NVMP). Modelling undertaken prior to noisy construction activities assesses if Respite Offers (RO) and Alternate Accommodation (AA) are required to be provided to sensitive receivers that are impacted by noise from works conducted outside of standard working hours.

Other reasons to conduct noise and vibration monitoring include:

- In response to noise or vibration complaints;
- If requested by Sydney Metro, the ER, DPE or EPA;
- To augment baseline noise levels, if the noise environment at a receiver is considered to be different from the noise logger locations used for the EIS;
- To validate predicted noise levels associated with each works scenario assessed in the CNVIS, at the commencement of works and new construction activities or location;
- To confirm baseline vibration levels currently experienced at heritage-listed structures and at any vibration-sensitive equipment;
- Where vibration levels are predicted to exceed the vibration screening level, attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure, in accordance with Revised Environmental Mitigation Measure (REMM) NVC12; and
- As part of a plant noise audit.

The methodology and rationale for conducting noise and vibration monitoring is contained within the relevant Noise and Vibration Monitoring Plans, being:

- Southwest Metro – Dulwich Hill, Campsie and Punchbowl Station Upgrades Noise and Vibration Management Plan. This document can be accessed via the Downer Sydney Metro Environment Documents website,

  https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Dulwich_Hill__Campsie_and_Punchbowl_Station_NVMP_Rev07.pdf

- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Noise and Vibration Management Plan. This document can be accessed via the Downer Sydney Metro Environment Documents website,

  https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Hurlstone_Park__Belmore_and_Wiley_Park_Station_NVMP_Rev07.pdf

RESULTS – NOISE MONITORING

The table below contains a summary of the noise monitoring results. The complete reports are provided in Appendices 6, 10 and 11.

Assessment Point	Measured Plant	Predicted noise level dB(A)	Measured noise level		Above predicted noise level	Comments
			LAeq(15min)	LAmax		
03/07/22-07/07/22	TL927-1-26F01 Shutdown 3 Noise and Vibration Monitoring Report (R1) - APPENDIX 6					
51 Ewart Lane, Dulwich Hill	5.5T excavator with bucket attachment, dump truck 08/07/2022 01:00pm – 01:15pm	82 (H: Predicted LAeq, 15min for High impact activities)	59	73	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled directly opposite of this residential receiver. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 20 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10 metres. The measured works were intermittent during this measurement. Loud noise events originated to aircraft flyovers and noise due to natural sources e.g. wind.
71 Ewart Street, Dulwich Hill	Concrete saw, 5.5T excavator with bucket attachment, handheld blower, 08/07/2022 01:19pm – 01:34pm	86 (H: Predicted LAeq, 15min for High impact activities)	75* (*: 5dB(A) penalty applied for hammering works)	82	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured concrete sawing works were intermittent during this measurement. Loud noise events can be attributed to vehicle movements along Ewart Lane and concrete sawing located approximately 6m away and above the sound level meter.
12 Railway Street, Hurlstone Park	21.5T excavator with lifting hook attachment, telehandler, hand tools 08/07/2022 02:20pm – 02:35pm	71 (T: Predicted LAeq, 15min for Typical activities)	65	80	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured works were intermittent during this measurement. Loud noise events originated from freight rail passbys and telehandler movements from Railway Street into the work area.
5 Railway Street, Hurlstone Park	Agitator truck, 21.5T excavator with bucket attachment, telehandler 08/07/2022 02:58pm – 03:14pm	82 (H: Predicted LAeq, 15min for High impact activities)	64	78	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 25 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 3 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to engine noise and compressed air releases from the agitator truck.
23 Anglo Road, Campsie	08/07/2022	81	67	85	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to

	03:52pm – 04:07pm	(T: Predicted LAeq, 15min for Typical activities)				less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the measured works were located approximately 21 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 6 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to truck movements in and out of the work area.
13-15 Anglo Road, Campsie	Generator, positrack 08/07/2022 04:13pm – 04:28pm	75 (T: Predicted LAeq, 15min for Typical activities)	63	80	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The dominating construction noise source during this measurement was the generator approximately 15 metres away from the monitoring location, which was fitted with noise blankets. The positrack was barely audible during the measurement, operating approximately 95m away from the assessment point. Loud noise events can be attributed to road traffic passbys on Lillian Lane.
12 Railway Street, Hurlstone Park	Dump truck, 21.5T excavator with bucket attachment, telehandler 09/07/2022 08:54am – 09:09am	71 (T: Predicted LAeq, 15min for Typical activities)	69	95	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured works were intermittent during this measurement. Loud noise events originated from compressed air being released from the dump truck as well as intermittent loud noise during spoil management activities.
14 Railway Street, Hurlstone Park	Telehandler, 21.5T excavator with lifting hook attachment, 25T excavator with bucket attachment 09/07/2022 09:20am – 09:35am	70 (T: Predicted LAeq, 15min for Typical activities)	58	77	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. During the measurement, the 25T excavator with bucket attachment was only briefly operated. Loud noise events can be attributed to the 25T excavator fitting the bucket attachment.
2 Hopetoun Street, Hurlstone Park	14T excavator with lifting hook attachment, 8T excavator with lifting hooks attachment, hydrema 09/07/2022 09:43am – 09:58am	76 (H: Predicted LAeq, 15min for High impact activities)	55	70	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 33 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10 metres. During the measurement, it was noted that the hydrema was on a low idle and was barely audible. Loud noise events originated from dropped items in the work area.
5-9 London Street, Campsie	17T hi-rail excavator with forks, 5.5T excavator with	69 (T: Predicted LAeq, 15min for Typical activities)	60	90	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Noise from the 17.5T hi-rail excavator with forks near

	bucket attachment, hand tools 09/07/2022 11:05am – 11:20am					the platforms was shielded by the site offices. Furthermore, noise from the 5.5T excavator with bucket attachment was barely audible, operating approximately 78m away. Hand tool use was barely audible during the monitoring, occurring near the station box and further down the alignment approximately 80m away. Loud noise events originated from nearby road traffic.
1-3 Shadforth Street, Wiley Park	EWP, hand tools 09/07/2022 03:03pm – 03:18pm	82 (H: Predicted LAeq, 15min for High impact activities)	67	79	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the concourse work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 13 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 6 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to handheld sawing activities approximately 13m away.
2 Shadforth Street, Wiley Park	EWP, hand tools 09/07/2022 03:23pm – 03:38pm	84 (H: Predicted LAeq, 15min for High impact activities)	57	82	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the concourse work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 25 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 8 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to loud slams from the Authorised Traffic Controller packing equipment into their vehicle.
41 Urunga Parade, Punchbowl	EWP, 8.5T hi-rail excavator with forks, trucks 09/07/2022 03:56pm – 04:11pm	72 (H: Predicted LAeq, 15min for High impact activities)	53	71	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. During the measurement, the EWP was barely audible, operating approximately 48m away. The 8.5T hi-rail excavator with forks was shielded by site buildings.
14 Arthur Street, Punchbowl	Rattlegun 11/07/2022 12:21pm – 12:36pm	66 (H: Predicted LAeq, 15min for High impact activities)	58	84	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less audible plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Construction noise at this location was barely audible. The ambient environment was

						dominated by road traffic along The Boulevarde and Arthur Street.
279 The Boulevarde, Punchbowl	Hand tools, EWP, 100T crane 11/07/2022 12:43pm – 12:58pm	70 (H: Predicted LAeq, 15min for High impact activities)	70	93	No	The measured L_{Aeq}, 15min is consistent with the predicted noise level. Construction noise at this location was barely audible during periods of heavy traffic. The ambient noise environment was dominated by road traffic along The Boulevarde.
1-3 Shadforth Street, Wiley Park	EWP, Jackhammer, hand tools 11/07/2022 01:38pm – 01:53pm	82 (H: Predicted LAeq, 15min for High impact activities)	62* (*: 5dB(A) penalty applied for hammering works)	71	No	The measured L_{Aeq},, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the measured works were located approximately 20 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 6 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to road traffic passbys and dropped items in the work area.
2 Shadforth Street, Wiley Park	Truck, hand tools 11/07/2022 01:56pm – 02:11pm	84 (H: Predicted LAeq, 15min for High impact activities)	56	75	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the concourse work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 28 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 8 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to hand tool use such as power drills during ceiling installation of the new station buildings on the platforms.
30 Redman Parade, Belmore	Jackhammer, hand tools 11/07/2022 03:29pm – 03:44pm	74 (H: Predicted LAeq, 15min for High impact activities)	74* (*: 5dB(A) penalty applied for hammering works)	101	No	The measured L_{Aeq}, 15min is consistent with the predicted noise level. The platform works occurred approximately 58m away and below the measurement location. Loud noise events can be attributed to road traffic along Redman Parade.
1 Acacia Street, Belmore	Jackhammer, hand tools 11/07/2022 03:51pm – 04:06pm	79 (H: Predicted LAeq, 15min for High impact activities)	61* (*: 5dB(A) penalty applied for hammering works)	76	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the platform works occurred approximately 53m away and below the measurement location. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20 metres. Loud noise events can be attributed to road traffic along Tobruk Avenue and natural sources i.e. birds.
3 Wilfred Avenue, Campsie	Positrack, vacuum truck, hand tools, EWP 11/07/2022 04:55pm – 05:10pm	71 (T: Predicted LAeq, 15min for Typical activities)	61	78	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the measured works were located approximately 63 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 35 metres. The measured works

						were intermittent during this measurement. Loud noise events can be attributed to dropped items in the work area as well as road and rail passed by.
13-15 Anglo Road, Campsie	Generator, hand tools, 5.5T excavator with forks 11/07/2022 05:18pm – 05:33pm	75 (T: Predicted LAeq, 15min for Typical activities)	63	77	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The dominating construction noise source during this measurement was the generator approximately 15 metres away from the monitoring location, which was fitted with noise blankets. Operation of the 5.5T excavator with forks near the platform was barely audible and below the measurement location. Loud noise events can be attributed to road traffic along Lillian Lane.
107 Duntroon Street, Hurlstone Park	8T hi-rail crane 11/07/2022 06:22pm – 06:36pm	79 (H: Predicted LAeq, 15min for High impact activities)	56	72	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Operation of the 8T hi-rail crane near the platform during blockwork lifting was approximately 39m away and below the measurement position. Operation of this plant was barely audible and intermittent. Loud noise events can be attributed to road traffic along Duntroon Street and Floss Street.
107 Duntroon Street, Hurlstone Park	250T crane, trucks, lighting tower 12/07/2022 07:07pm – 07:24pm	79 (H: Predicted LAeq, 15min for High impact activities)	66	86	No	The measured L_{Aeq},, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this measurement. Loud noise events can be attributed to compressed air releases from truck air brakes and the crane revving up when deploying outriggers.
124 Duntroon Street, Hurlstone Park	250T crane, trucks 12/07/2022 07:29pm – 07:44pm	68 (H: Predicted LAeq, 15min for High impact activities)	61	80	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this measurement. Loud noise events can be attributed to jangling and attaching chains to the crane hook and lifted payloads.
109 Duntroon Street, Hurlstone Park	250T crane, trucks 12/07/2022 07:50pm – 08:05pm	78 (H: Predicted LAeq, 15min for High impact activities)	62	85	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this

						measurement. Loud noise events can be attributed to compressed air releases from truck air brakes, truck movements in and out of the work area and dropped items.
26 Floss Street, Hurlstone Park	250T crane, hand tools 12/07/2022 08:13pm – 08:27pm	69 (H: Predicted LAeq, 15min for High impact activities)	66	82	No	The measured $L_{Aeq,}$, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Crane activity was barely audible approximately 48m away with the ambient environment primarily influenced by idling noise from an ATC vehicle approximately 19m away. The measured works were intermittent during this measurement. Loud noise events can be attributed to road and rail passed by as well as truck movements in the work area.
126 Duntroon Street, Hurlstone Park	250T crane 12/07/2022 08:42pm – 08:57pm	66 (H: Predicted LAeq, 15min for High impact activities)	59	68	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this measurement. Loud noise events can be attributed to the crane lifting payloads from the truck bed across and into the platform.
13/08/2022	**TL927-1-30F01 WE07 Noise Monitoring Report (R 1) - APPENDIX 10**					
1-3 Shadforth Street, Wiley Park	Power hand tools and workers moving fences 13/08/2022 12:05am – 12:20am	54 (T: Predicted LAeq, 15min for Typical activities)	54	66	No	The measured L_{Aeq}, 15min is consistent with the predicted noise level. The ambient noise environment was dominated by road traffic noise on King Georges Road. The measured works were intermittent during this measurement. Loud noise events originated from item drops in the construction work area.
15 Alice Street, Wiley Park	Non-power hand tools and power hand tools 13/08/2022 12:18am – 12:33am	60 (T: Predicted LAeq, 15min for Typical activities)	52	68	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured works were intermittent during this measurement. Loud noise events originated from residents talking at the monitoring location.
106 The Boulevarde, Wiley Park	Power hand tools 13/08/2022 12:52am – 01:07am	56 (T: Predicted LAeq, 15min for Typical activities)	61	76	Yes	The measured L_{Aeq}, 15min is higher than the predicted noise level. This can be attributed to the heavy road traffic noise on King Georges Road. The measured works were intermittent during this measurement. The construction noise was barely audible from the monitoring location and measured to be 49-51 dB(A) when no road traffic noise was present. Loud noise events originated from road traffic vehicle passed by on King Georges Road.
14/09/2022	**Noise Monitoring Record Sheet – Hurlstone Park – APPENDIX 11**					
5 Railway Street, Hurlstone Park	One power trowel (power concrete float), non-powered hand tools 14/09/2022	55 (T: Predicted LAeq, 15min for Typical activities)	55.1	69.7	Yes	The measured L_{Aeq}, 15min is higher than the predicted noise level. A minor exceedance was within an acceptable measurement error. The ambient noise environment was dominated by trains noise. The measured works were intermittent during this measurement. The

						construction noise was barely audible from the monitoring location and measured to be 45.2-55 dB(A) when no train operation noise was present. Loud noise events originated from the train passed by the MSB area was 69.7dB(A).
24/09/2022-08/10/2022	**TL927-1-31F01 Shutdown 4 Noise and Vibration Monitoring Report (R 3) – APPENDIX 12**					
41 Urunga Parade, Punchbowl	Concrete pump, mobile crane and power hand tools 24/09/2022 02:23pm – 02:38pm	56 (T: Predicted LAeq, 15min for Typical activities)	52	75	No	The measured L_{Aeq}, 15min is below with the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - It was noted that the measured works were intermittent.
2 Shadforth Street, Wiley Park	Excavator with bucket attachment and power hand tools 24/09/2022 02:49pm – 03:04pm	58 (T: Predicted LAeq, 15min for Typical activities)	52	71	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 30m away. In the prediction model, the distance between the closest work area and the most affected facade is 10m. - It was noted that the measured works were intermittent.
26 Redman Parade, Belmore	Power hand tools 24/09/2022 03:21pm – 03:36pm	71 (T: Predicted LAeq, 15min for Typical activities)	58	79	No	The measured L_{Aeq},, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 80m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. - It was noted that the measured works were intermittent.
2 Acacia Street, Belmore	Hi-rail hydrema, excavator with bucket attachment and power hand tools 24/09/2022 04:08pm – 04:23pm	73 (T: Predicted LAeq, 15min for Typical activities)	51	69	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. - It was noted that the measured works were intermittent. - Noise from the hand tools on the station platform was shielded by the site offices.
13-15 Anglo Road, Campsie	Generator, hi-rail hydrema and power hand tools 24/09/2022 04:34pm – 04:49pm	78 (H: Predicted LAeq, 15min for High impact activities)	65	93	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The dominating construction noise source was the generator approximately 5m away from the measurement location. The generator was fitted with noise blankets. - The measured works (except the generator) were located approximately 60m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m.

						- Aside from the generator, the measured works were intermittent.
2 Wilfred Avenue, Campsie	Dump truck, excavator with bucket and power hand tools 24/09/2022 05:30pm – 05:45pm	71 (H: Predicted LAeq, 15min for High impact activities)	56	77	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 15m.
3 Commons Street, Hurlstone Park	Delivery truck, mobile crane and EWP 24/09/2022 06:10pm – 06:25pm	81 (T: Predicted LAeq, 15min for Typical activities)	71	85	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - It was noted that the crane and EWP was only idling during the measurement, not operating under load.
46 Floss Street, Hurlstone Park	EWP 24.09.2022 06:40pm – 06:55pm	79 (T: Predicted LAeq, 15min for Typical activities)	51	69	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. - It was noted that the measured works were intermittent. - Noise from the EWP on the station platform was shielded by the site offices.
5 Bedford Crescent, Dulwich Hill	Mobile crane and excavator with grapple attachment 24/09/2022 07:11pm – 07:26pm	78 (H: Predicted LAeq, 15min for High impact activities)	63	72	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 60m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. - It was noted that the measured works were intermittent.
94 Ewart Street, Dulwich Hill	Excavator with bucket attachment, delivery truck and mobile crane 24/09/2022 07:33pm – 07:48pm	74 (H: Predicted LAeq, 15min for High impact activities)	64	86	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. - It was noted that the measured works were intermittent.
41 Urunga Parade, Punchbowl	Mobile crane, telehandler and power hand tools	56 (T: Predicted LAeq, 15min	52	68	No	The measured L_{Aeq}, 15min is below with the predicted noise level. This can be attributed to:

	25/09/2022 12:29pm – 12:34pm	for Typical activities)				- Less plants operating during the measurement compared to the modelled plants. - It was noted that the measured works were intermittent.
2 Shadforth Street, Wiley Park	Excavator with bucket attachment, power hand tools 25/09/2022 01:05pm – 01:20pm	58 (T: Predicted LAeq, 15min for Typical activities)	58	83	No	The measured L_{Aeq}, 15min is consistent with the predicted noise level.
26 Redman Parade, Belmore	Power hand tools 25/09/2022 01:37pm – 01:52pm	71 (T: Predicted LAeq, 15min for Typical activities)	58	83	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 80m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. - It was noted that the measured works were intermittent.
2 Acacia Street, Belmore	Excavator with bucket attachment and power hand tools 25/09/2022 02:04pm – 02:19pm	73 (T: Predicted LAeq, 15min for Typical activities)	51	73	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. - It was noted that the measured works were intermittent. - Noise from the hand tools on the station platform was shielded by the site offices.
13-15 Anglo Road, Campsie	Generator, power hand tools and EWP 25/09/2022 02:31pm – 02:46pm	78 (H: Predicted LAeq, 15min for High impact activities)	62	71	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The dominating construction noise source was the generator approximately 5m away from the measurement location. The generator was fitted with noise blankets. - The measured works (except the generator) were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. - Aside from the generator the measured works were intermittent.
2 Wilfred Avenue, Campsie	Excavator with bucket attachment and dump truck 25/09/2022 02:53pm - 03:08pm	71 (H: Predicted LAeq, 15min for High impact activities)	53	76	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 60m away. In the prediction model, the distance between the closest work

						area and the most affected facade is approximately 15m. - It is noted that the measured works were intermittent.
3 Commons Street, Hurlstone Park	Power hand tools and hi-rail crane 25/09/2022 03:30pm – 03:45pm	81 (H: Predicted LAeq, 15min for High impact activities)	44	68	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. - It is noted that the measured works were intermittent.
46 Floss Street, Hurlstone Park	Power hand tools 25/09/2022 03:51pm – 04:06pm	79 (T: Predicted LAeq, 15min for Typical activities)	53	73	No	The measured L_{Aeq},, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 40m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. - It is noted that the measured works were intermittent. - Noise from the power handtools on the station platform was shielded by the site offices.
5 Bedford Crescent, Dulwich Hill	Excavator with bucket attachment, excavator with rock hammer attachment, power hand tools, mobile crane and concrete saw 25/09/2022 04:23pm – 04:37pm	78 (H: Predicted LAeq, 15min for High impact activities)	71* (*: 5dB(A) penalty applied for hammering works)	80	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - The measured works were located approximately 35m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m.
94 Ewart Street, Dulwich Hill	Telehandler and EWP 25/09/2022 04:44pm – 04:59pm	74 (H: Predicted LAeq, 15min for High impact activities)	66	89	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The dominant construction noise source was the telehandler that operated 10m from the measurement location, which ceased operation after one minute. - The measured works (except the telehandler) were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. - It is noted that the measured works were intermittent.
94 Ewart Street, Dulwich Hill	Power hand tools and delivery truck 27/09/2022	74 (H: Predicted LAeq, 15min for High	62	87	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants.

	06:22am – 06:37am	impact activities)				- The measured works were located approximately 10-50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10m. - It is noted that the measured works were intermittent.
5 Bedford Crescent, Dulwich Hill	Power hand tools and delivery truck 27/09/2022 06:49am – 07:04am	78 (H: Predicted LAeq, 15min for High impact activities)	51	52	No	The measured L_{Aeq},, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 50-70m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. - It is noted that the measured works were intermittent.
46 Floss Street, Hurlstone Park	Power handtools and delivery truck 27/09/2022 07:35am – 07:50am	79 (T: Predicted LAeq, 15min for Typical activities)	61	91	No	he measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 30m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. - It is noted that measured works were intermittent.
3A Commons Street, Hurlstone Park	Power handtools, delivery truck and mobile crane 27/09/2022 07:58am – 08:13am	81 (T: Predicted LAeq, 15min for Typical activities)	58	76	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. - It is noted that the measured works were intermittent.
2 Wilfred Avenue, Campsie	Power handtools and 2 excavators with bucket attachments 27/09/2022 08:28am – 08:43am	71 (T: Predicted LAeq, 15min for Typical activities)	56	75	No	The measured L_{Aeq},, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 15m. - It is noted that the measured works were intermittent.
13-15 Anglo Road, Campsie	Generator and power hand tools 27/09/2022	78 (H: Predicted LAeq, 15min for High	64	76	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants.

	09:00am – 09:15am	impact activities)				- The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The dominating construction noise source during the measurement was the generator approximately 5m away from the measurement location was fitted with noise blankets. - Aside from the generator, the measured works were intermittent.
2 Acacia Street, Belmore	Generator, power hand tools, delivery truck and EWP 27/09/2022 09:27am – 09:42am	73 (T: Predicted LAeq, 15min for Typical activities)	52	82	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 40m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. It was noted that the measured works were intermittent.
26 Redman Parade, Belmore	Power hand tools 27/09/2022 10:00am – 10:15am	71 (T: Predicted LAeq, 15min for Typical activities)	71 (ambient noise) Downer works inaudible	89 (ambient noise) Downer works inaudible	No	The construction works at the station platform were inaudible throughout the duration of the measurement. This measurement was heavily affected by the landscaping and residential construction taking place at 26 Redman Parade, Belmore.
2 Shadforth Street, Wiley Park	Power hand tools 27/09/2022 10:48am – 11:03am	58 (T: Predicted LAeq, 15min for Typical activities)	51	69	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 15m away. In the prediction model the distance between the closest work area and the most affected facade is approximately 10m. - It was noted that the measured works were intermittent.
41 Urunga Parade, Punchbowl	Power hand tools 27/09/2022 11:47am – 12:02pm	56 (T: Predicted LAeq, 15min for Typical activities)	66	87	Yes	The measured L_{Aeq}, 15min is higher than the predicted noise level. However, this can be attributed to a crane that was operating 10m from the front of 41 Urunga Parade which was part of the works conducted by a different Sydney Metro contractor, not Downer. All other loud noise events were due to traffic passed by and activities at nearby residential properties.
94 Ewart Street, Dulwich Hill	Mobile crane and power hand tools 27/09/2022 3:49pm – 4:04pm	74 (H: Predicted LAeq, 15min for High impact activities)	67	94	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 80-90m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. - It was noted that the measured works were intermittent.
2 Hopetoun Street, Hurlstone Park – Inside Corridor	Pilling rig, excavator with claw attachment and power hand tools	76 (T: Predicted LAeq, 15min for Typical activities)	64	84	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 15m away. In the prediction

						model, the distance between the closest work area and the most affected facade is approximately 10m. - It was noted that the measured works were intermittent.
2 Hopetoun Street, Hurlstone Park	Pilling rig, excavator with claw attachment and power hand tools 05/10/2022 08:32am – 08:47am	76 (T: Predicted LAeq, 15min for Typical activities)	61	86	No	The measured L_{Aeq},, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10m. - It was noted that the measured works were intermittent.
10 Hopetoun Street, Hurlstone Park	Mobile crane, delivery trucks and power hand tools 05/10/2022 08:06am – 08:21am	65 (T: Predicted LAeq, 15min for Typical activities)	59	78	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 40m. - It was noted that the measured works were intermittent.
5 Railway Street, Hurlstone Park	Mobile crane, delivery trucks and power hand tools 05/10/2022 10:31am – 10:46am	82 (T: Predicted LAeq, 15min for Typical activities)	59	77	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 20m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. - It was noted that the measured works were intermittent.
59 Ewart Street, Dulwich Hill	Excavator with rock hammer attachment, excavator with bucket attachment and power hand tools 08/10/2022 8:01am – 8:16am	69 (H: Predicted LAeq, 15min for High impact activities)	65* (*: 5dB(A) penalty applied for hammering works)	73	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. - It was noted that access to the most affected facade (Ewart Lane) for this receiver was prohibited due to the proximity of the works relative to the facade. As a result, the monitoring was conducted on Ewart Street.
73 Ewart Street, Dulwich Hill	Excavator with bucket attachment and power hand tools 08/10/2022 8:50am – 9:05am	74 (T: Predicted LAeq, 15min for Typical activities)	67	91	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 20m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10m. - It was noted that the measured works were intermittent.
94 Ewart Street, Dulwich Hill	650T crane, excavator with bucket attachment	74 (H: Predicted LAeq, 15min	63	83	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to:

	and power hand tools 08/10/2022 8:30am – 8:45am	for High impact activities)				- Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 80m-90mm away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. - It was noted that the measured works were intermittent.
5 Beford Crescent, Dulwich Hill	650T crane, delivery truck and power hand tools 08/10/2022 9:34am – 9:49am	78 (H: Predicted LAeq, 15min for High impact activities)	72	81	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement.
05/11/2022	**TL927-1-32F01 WE19 Noise Monitoring Report (R2) – APPENDIX 13**					
3 Bedford Crescent, Dulwich Hill	Concrete pump and Concrete agi 05/11/2022 09:03-09:18	82 (H: Predicted LAeq, 15min for High impact activities)	74	87	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - It was noted that the measured works were intermittent.
57 Ewart Stret, Dulwich Hill	Excavator, Concrete pump and Delivery trucks 05/11/2022 09:30-09:45	84 (H: Predicted LAeq, 15min for High impact activities)	65	89	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is 35m. - It was noted that the measured works were intermittent.
3A Commons Street, Hurlstone Park	Power Handtools 05/11/2022 09:58-10:13	82 (H: Predicted LAeq, 15min for High impact activities)	56	77	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. - It was noted that the measured works were intermittent.
46 Floss Street, Hurlstone Park	Delivery trucks and Power Handtools 05/11/2022	76 (H: Predicted LAeq, 15min for High	58	79	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants.

	10:19-10:34	impact activities)				- The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. - The measured works were located approximately 30m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. - It was noted that the measured works were intermittent. - Noise from on the station platform was shielded by the site offices.
13-15 Anglo Road, Campsie	Generator and Handtools 05/11/2022 11:11-11:26	80 (T: Predicted LAeq, 15min for Typical activities)	59	73	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: - Less plants operating during the measurement compared to the modelled plants. - It was noted that no construction works were audible due to the pump room noise (extraneous noise source) within 13-15 Anglo Road building. - The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver.
2 Shadforth Street, Wiley Park	Generator, Handtools, EWP and Excavator 05/11/2022 12:02-12:17	75 (T: Predicted LAeq, 15min for Typical activities)	58	72	No	The measured L_{Aeq}, 15min is lower than the predicted noise level. This can be attributed to: Less plants operating during the measurement compared to the modelled plants. - The measured works were located approximately 40m away. In the prediction model, the distance between the closest work area and the most affected facade is 15m. - It was noted that the EWP was only idling during the measurement. - It was noted that the excavator works were barely audible over the generator noise. - It was noted that the measured works were intermittent (except for the generator).

RESULTS – VIBRATION MONITORING

The sections below contain a summary of the vibration monitoring results. The complete reports are provided in Appendixes 5 – 9 and Appendix 12. The established criteria for cosmetic damage in the Sydney Metro Construction Noise and Vibration Statement is as follows:

- Reinforced or framed structures: 25.0 mm/s;
- Unreinforced or light framed structures: 7.5 mm/s;
- Heritage structures (structurally sound): 7.5 mm/s; and
- Heritage structures (structurally unsound): 2.5 mm/s.

Also, in accordance with the Hurlstone Park Station Vibration Monitoring Plan developed in consultation with the Project consulting structural engineers (Appendix 14), the established vibration limits for the affected garage structure at a residential property on Commons Street are shown below:

- Greater than or equal to 4 mm/s (cosmetic damage is possible);
- Greater than or equal to 8 mm/s (cosmetic damage becoming more likely).

During the reporting period, vibration monitoring was undertaken at the following locations:

	Date	Location
1	20/04/2022 – 04/05/2022	5 Railway Street, Hurlstone Park
2	02/07/2022 – 18/07/2022	Garage structure at 3A Commons Street, Hurlstone Park
3	02/07/2022 and 09/07/2022	Station building on platform 2, Belmore Station
4	27/04/2022 – 02/06/2022	3 Railway Street, Hurlstone Park
5	04/05/2022 – 27/05/2022	2 Hopetoun Street, Hurlstone Park
6	24/05/2022 – 09/06/2022	3A Commons Street, Hurlstone Park
7	27/05/2022 – 02/07/2022	5 Railway Street, Hurlstone Park
8	02/06/2022 – 22/06/2022	2 Hopetoun Street, Hurlstone Park (Assessing residential shed)
9	03/06/2022 – 22/06/2022	2 Hopetoun Street, Hurlstone Park (Assessing residential building)
10	25/07/2022 – 26/07/2022	The MSB work area adjacent to 5 Railway Street, Hurlstone Park
11	08/09/2022	The MSB work area adjacent to 5 Railway Street, Hurlstone Park
12	24/09/2022 – 27/09/2022	Punchbowl Station southern lift
13	24/09/2022 – 28/09/2022	Garage structure at 3A Commons Street, Hurlstone Park

1 – Residential property at 5 Railway Street, Hurlstone Park (20/04/2022 – 04/05/2022)

The results of the unattended vibration measurements at a residential property at 5 Railway Street, Hurlstone Park are presented below:

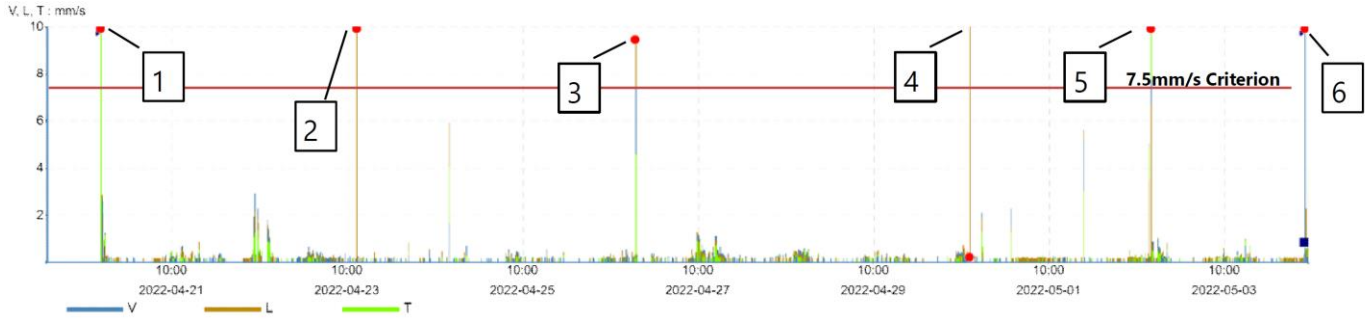

Figure 2 – Unattended vibration monitoring results for 5 Railway Street between 20/04/2022 and 04/05/2022

It can be seen in Figure 2 above that the vibration levels produced from the nearby trenching works is typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which are justified in the table below.

Exceedance ID	Date and Time	Cause of exceedance
1	20/04/2022 at 14:22	At this time, the vibration monitor was being installed on the ground spike to commence monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike and was not caused by construction activities.
2	23/04/2022 at 12:30	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. On 21/04/2022, the Project team already completed all required hammering and excavation at the rear of 5 Railway Street property. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
3	26/04/2022 at 16:38	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. On 26/04/2022, the Project team was excavating the trench and installing conduit. The works were being completed at the rear of 3 Railway Street, greater than 10 metres away from 5 Railway

		Street. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
4	30/04/2022 at 12:07	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. On 29/05/2022, the Project team was pouring the concrete encasement for the CSR route. The works were being completed at the rear of 3 Railway Street, greater than 10 metres away from 5 Railway Street. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
5	02/05/2022 at 13:44	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. On 02/05/2022, the Project team was completing service instillation and concrete pour preparation works at the rear of 2 Hopetoun Street. The works were being undertaken greater than 35 metres away from 5 Railway Street. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
	04/05/2022 at 07:52	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitor from the ground spike. No construction activities were occurring during this time.

2 – 3A Commons Street, Hurlstone Park (02/07/2022 – 18/07/2022)

The results of the unattended vibration measurements for the neighbouring garage structure at 3A Commons Street, Hurlstone Park are presented below:

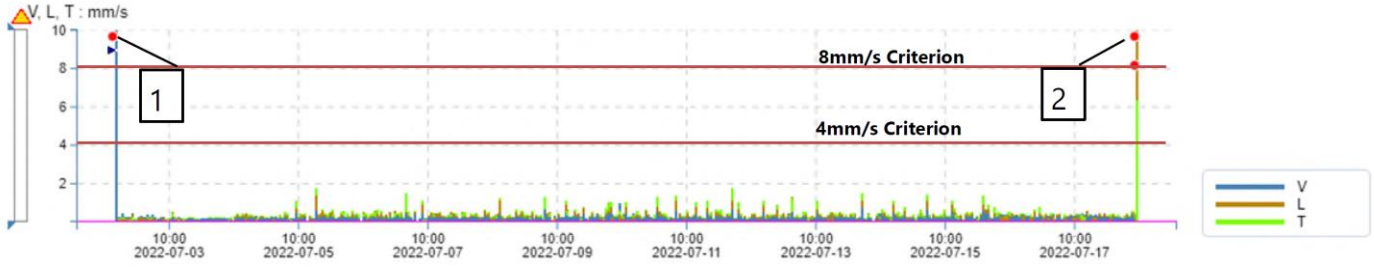

Figure 3 – Unattended vibration monitoring results for 3A Commons Street between 02/07/2022 and 18/07/2022

In accordance with the Hurlstone Park Station Vibration Monitoring Plan, the vibration levels produced from the vibration intensive works in the vicinity of the affected garage structure were below 4 mm/s as shown in Figure 3. Note that there were two events that resulted in an instantaneous vibration level of above 4 mm/s, however this event was not caused by the nearby construction activities, as justified in table below.

Exceedance ID	Date and Time	Cause of exceedance
1	02/07/2022 at 13:22	At this time, the vibration monitor was being tap tested and installed into the ground to commence the vibration monitoring. Exceedance was not caused by the nearby construction activities. No construction activities were occurring at this time.
2	18/07/2022 at 08:35	At this time, the vibration monitor was removed from the ground spike to complete the monitoring. Exceedance was not caused by the nearby construction activities. No construction activities were occurring at this time.

3 – Station building on platform 2, Belmore Station (02/07/2022 and 09/07/2022)

Vibration monitoring was undertaken at Belmore Station during observed periods of vibration intensive works. The results of the vibration monitoring are presented in table below. The applicable vibration criteria for cosmetic damage from the Sydney Metro Construction Noise and Vibration Statement is defined below as the screening level (7.5 mm/s).

Date and Time	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
02/07/2022	Baseline vibration monitoring	N/A	0.06	0.11	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite)
02/07/2022	2 x Jackhammers (spade chisel)	1-3 m	1.89	6.37	At 1-3m away, the jackhammers produced vibration levels that were below the established screening criteria for cosmetic damage. It is noted that jackhammering was occurring in soil below the platform slab.
09/07/2022	Jackhammer (spade chisel)	1-3 m	4.69	6.20	At 1-3m away, the jackhammers produced vibration levels that were below the established screening criteria for cosmetic damage. It is noted that jackhammering was occurring to break the platform slab. This change in surface being worked on during jackhammering can be attributed to the higher 95th percentile PPV compared to measurements.
09/07/2022	Baseline vibration monitoring	N/A	0.09	0.44	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite).

As can be noted from table above, the measured plants produced vibration levels below the established criteria for cosmetic damage. Given that the vibration monitoring results are below the established screening criteria, the risk of cosmetic damage from the measured jackhammering works are low.

4 – Residential property at 3 Railway Street, Hurlstone Park (27/04/2022 – 02/06/2022)

The vibration monitor was located in line with the residential shed in the backyard of 3 Railway Street, Hurlstone Park. Considering the shed is likely to be on top of a reinforced concrete structure, the corresponding vibration screening criterion for the shed is 25 mm/s.
The results of the unattended vibration monitoring for 3 Railway Street between 27/04/2022 and 02/06/2022 is shown in Figure 4 below.

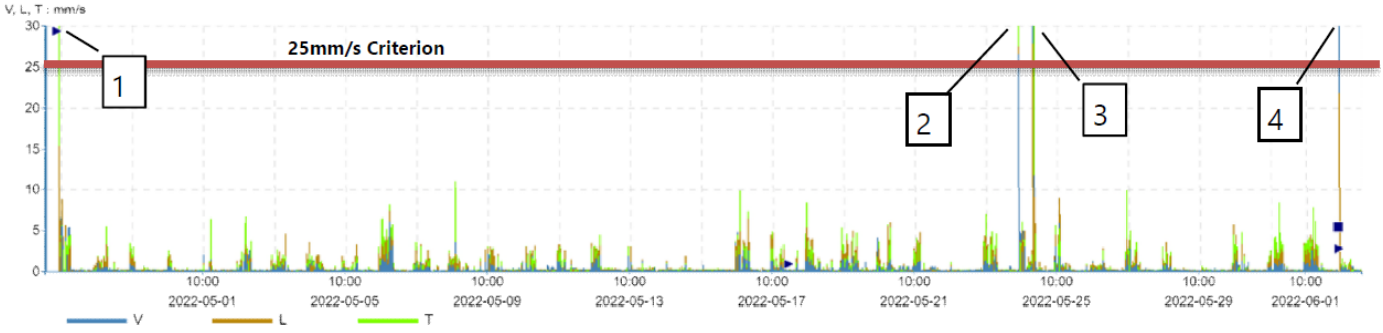

Figure 4 – Unattended vibration monitoring results for 3 Railway Street between 27/04/2022 and 02/06/2022

The discussion of the unattended vibration measurements is summarised in the table below:

Exceedance ID	Date and Time	Cause of exceedance
1	27/04/2022 at 07:34	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.

2	24/05/2022 at 07:12	The vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. No rock hammering activities were occurring. Therefore, the cause of the exceedance was deemed not construction related.
3	24/052022 at 17:10	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
4	02/06/2022 at 07:29	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitoring from the ground spike. No construction activities were occurring.

It can be seen in Figure 4 above that the vibration levels produced from the nearby trenching works is typically below 25 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 25 mm/s which have been deemed not construction related.

5 – Residential property at 2 Hopetoun Street, Hurlstone Park (04/05/2022 – 27/05/2022)

The vibration monitor was located in line with the residential shed in the backyard of 2 Hopetoun Street, Hurlstone Park. Considering the shed is likely to be on top of a reinforced concrete structure, the corresponding vibration screening criterion for the shed is 25 mm/s.

The results of the unattended vibration monitoring for 2 Hopetoun Street between 04/05/2022 and 27/05/2022 are shown in Figure 5 below.

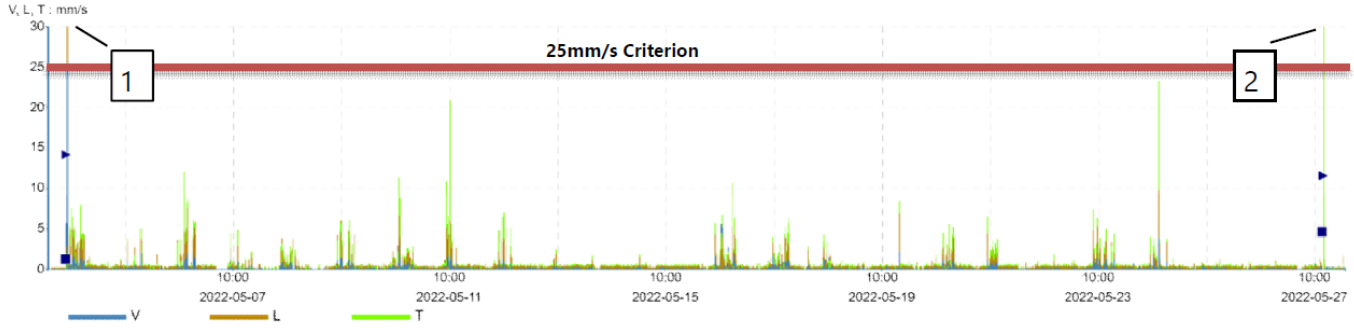

Figure 5 – Unattended vibration monitoring location for 2 Hopton Street between 04/05/2022 and 27/05/2022

The discussion of the unattended vibration measurements is summarised in the table below:

Exceedance ID	Date and Time	Cause of exceedance
1	04/05/2022 at 07:51	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	27/05/2022 at 12:56	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitoring from the ground spike. No construction activities were occurring at this time.

It can be seen in Figure 5 above that the vibration levels produced from the nearby trenching works is typically below 25 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 25 mm/s which have been deemed not construction related.

6 – Residential property at 3A Commons Street, Hurlstone Park (24/05/2022 – 09/06/2022)

The vibration monitor was located in line with the residential building of 3A Commons Street. The corresponding vibration screening criterion for the residential building is 7.5 mm/s. The results of the unattended vibration monitoring for 3A Commons Street between 24/05/2022 and 09/06/2022 are shown in Figure 6 below.

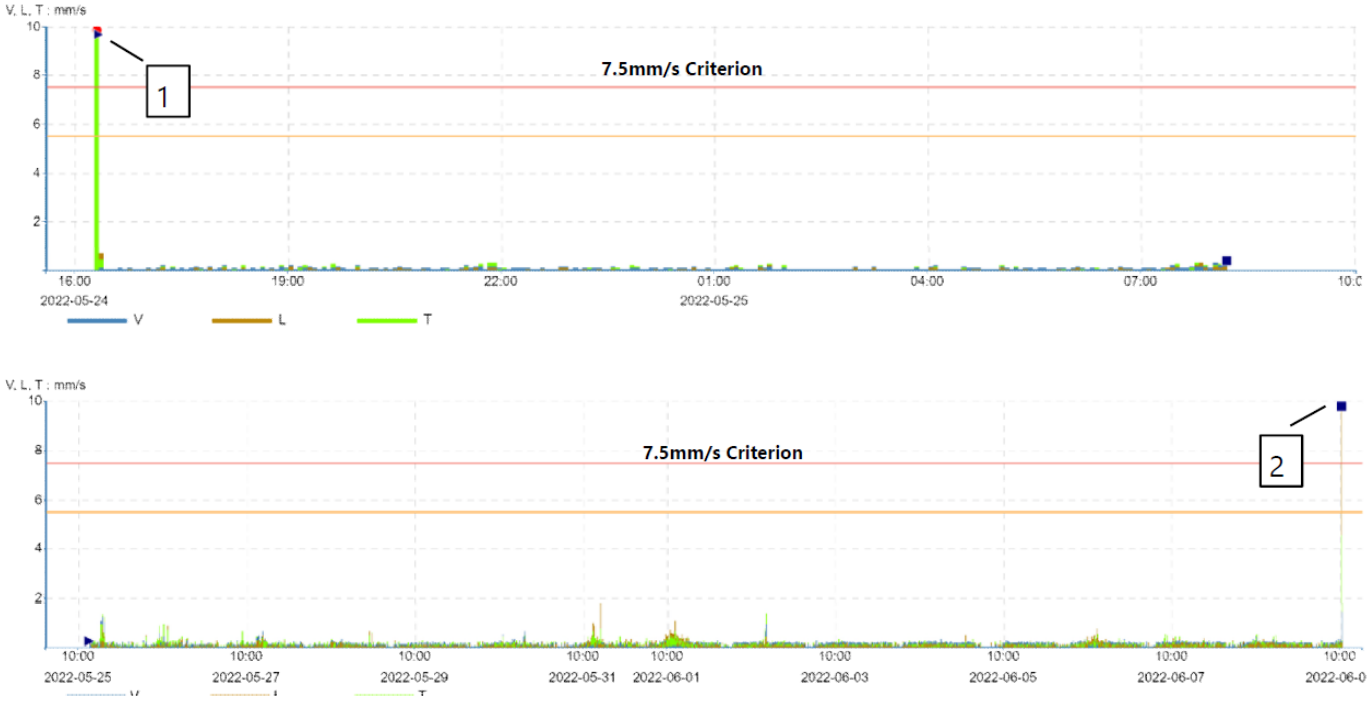

Figure 6 – Unattended vibration monitoring location for 3A Commons Street between 04/05/2022 and 27/05/2022

The discussion of the unattended vibration measurements is summarised in the table below:

Exceedance ID	Date and Time	Cause of exceedance
1	24/05/2022 at 04:39	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	09/06/2022 at 10:00	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitoring from the ground spike. No construction activities were occurring at this time.

It can be seen in Figure 6 that the vibration levels produced from the nearby piling works is typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been deemed not construction related.

7 – Residential property at 5 Railway Street, Hurlstone Park (27/05/2022 – 02/07/2022)

The vibration monitor was located in line with the residential building of 5 Railway Street. The corresponding vibration screening criterion for the residential building is 7.5 mm/s. The vibration monitoring results of 5 Railway Street between 27/05/2022 – 02/07/2022 are shown in Figure 7-1, Figure 7-2 and Figure 7-3.

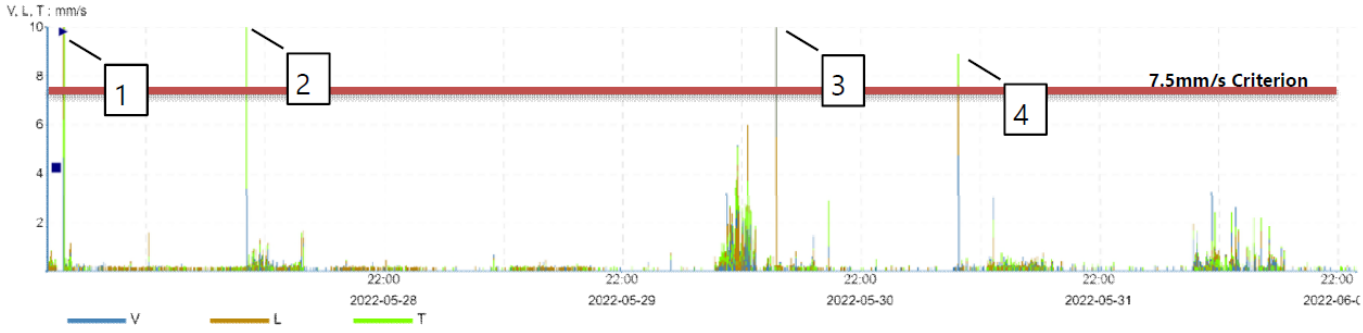

Figure 7-1 – Unattended vibration monitoring location for 5 Railway Street between 27/05/2022 and 01/06/2022

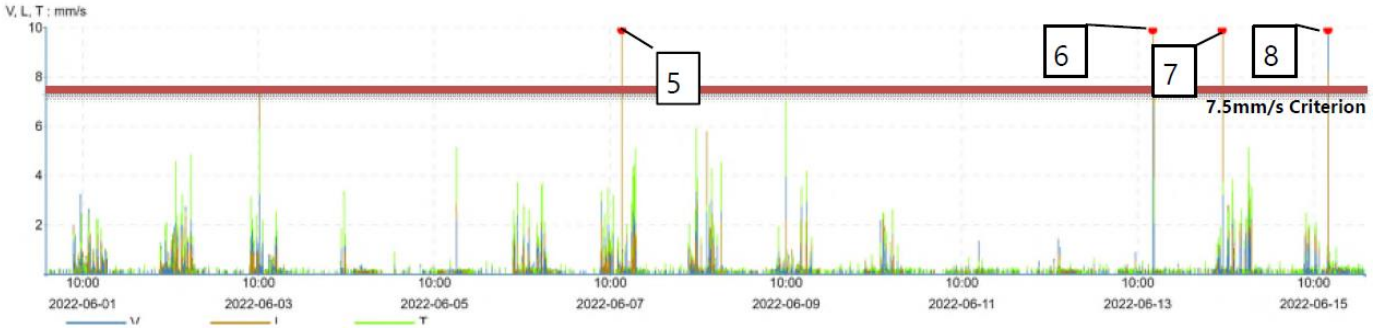

Figure 7-2 – Unattended vibration monitoring location for 5 Railway Street between 01/06/2022 and 15/06/2022

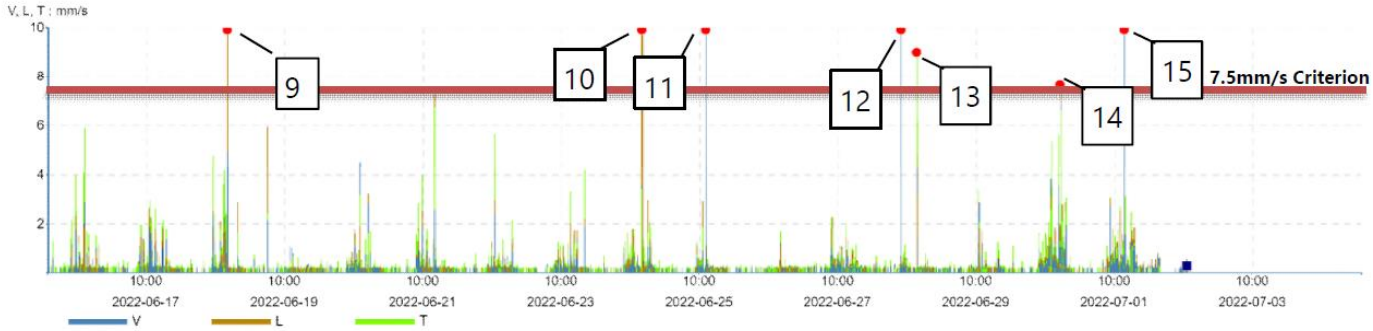

Figure 7-3 – Unattended vibration monitoring location for 5 Railway Street between 15/06/2022 and 02/07/2022

The discussion of the vibration monitoring results is summarised in Table below.

Exceedance ID	Date and Time	Cause of exceedance
1	27/05/2022 at 14:41	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	28/05/2022 at 08:04	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
3	30/05/2022 at 13:30	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rock hammering activities occurring during the time of exceedance. Only excavators were moving approximately 10m away from the monitoring location. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic

		vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
4	31/05/2022 at 07:46	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no rock hammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
5	07/06/2022 at 13:10	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction activities occurring during the time of exceedance. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
6	13/06/2022 at 14:10	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction works occurring on the day. Therefore, the cause of the exceedance was deemed not construction related.
7	14/06/2022 at 09:05	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rock hammering activities occurring during the time of exceedance. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
8	15/06/2022 at 13:59	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rock hammering activities occurring during the time of exceedance. Only concrete pouring works were occurring during this time. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
9	18/06/2022 at 14:01	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that all construction activities have finished for the day. Therefore, the cause of the exceedance was deemed not construction related.
10	24/06/2022 ta 13:53	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rock hammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
11	25/06/2022 at 12:02	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction activities occurring during the time of exceedance. Therefore, the cause of the exceedance was deemed not construction related.
12	28/06/2022 at 07:50	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rock hammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have

		caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
13	28/06/2022 at 13:11	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rock hammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
14	30/06/2022 at 15:02	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rock hammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
15	01/07/2022 at 13:16	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction activities occurring during the time of exceedance. Therefore, the cause of the exceedance was deemed not construction related.

As shown in Figure 7-1 Figure 7-2 and Figure 7-3 the vibration levels produced from the nearby trenching works are typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been deemed not construction related.

8 – Residential shed at 2 Hopton Street, Hurlstone Park (02/06/2022 – 22/06/2022)

The vibration monitor was located in line with the residential shed in the backyard of 2 Hopetoun Street, Hurlstone Park. Considering the shed is likely to be on top of a reinforced concrete structure, the corresponding vibration screening criterion for the shed is 25 mm/s.

The results of the unattended vibration monitoring for 2 Hopetoun Street between 02/06/2022 and 22/06/2022 is shown in Figure 8 below.

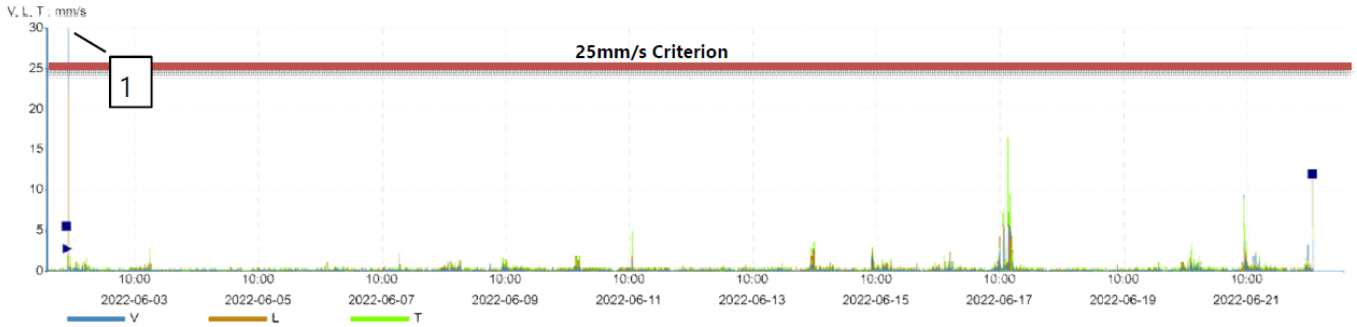

Figure 8 – Unattended vibration monitoring location for 2 Hopetoun Street (shed) between 02/06/2022 and 22/06/2022

The discussion of the vibration monitoring results is summarised in Table below:

Exceedance ID	Date and Time	Cause of exceedance
1	02/06/2022 at 08:18	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.

As shown in in Figure 8 the vibration levels produced from the nearby trenching works is typically below 25 mm/s. Note that there was an event that resulted in an instantaneous vibration level of above 25 mm/s which have been deemed not construction related.

9 – Residential property at 2 Hopton Street, Hurlstone Park (03/06/2022 – 22/06/2022)

The vibration monitor was located in line with the residential building of 2 Hopetoun Street, Hurlstone Park. The corresponding vibration screening criterion for the residential building is 7.5 mm/s.

The results of the unattended vibration monitoring for 2 Hopetoun Street between 03/06/2022 and 22/06/2022 is shown in Figure 9 below.

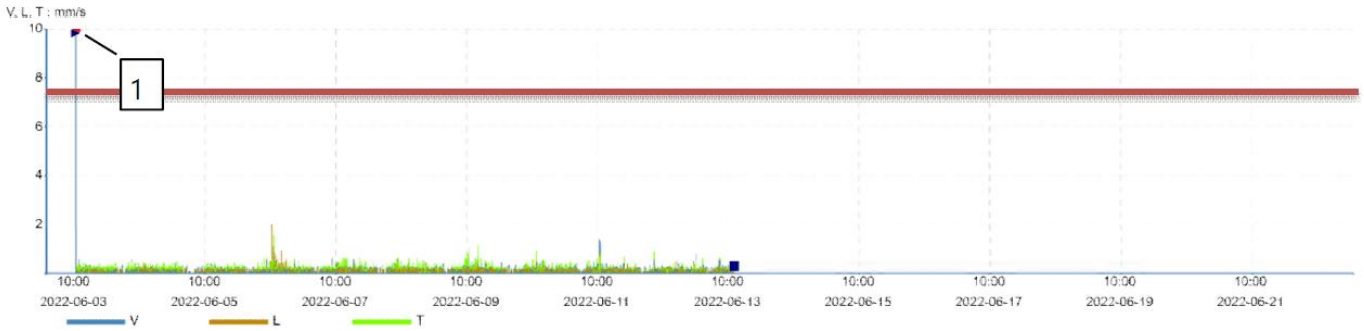

Figure 8 – Unattended vibration monitoring location for 2 Hopetoun Street (building) between 03/06/2022 and 22/06/2022

The discussion of the vibration monitoring results is summarised in Table below:

Exceedance ID	Date and Time	Cause of exceedance
1	03/06/2022 at 10:32	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	22/06/2022 at 11:09	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.

As shown in Figure 8 the vibration levels produced from the nearby trenching works is typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been deemed not construction related.

10 – The MSB work area adjacent to 5 Railway Street, Hurlstone Park (25/07/2022 – 26/07/2022)

The vibration monitors were mounted within the MSB working area as close as possible to the boundary fence at the rear of 5 Railway Street, Hurlstone Park. The vibration monitoring locations were approximately 300mm from the closest affected structure at the residence and 100m from the boundary fence.

In accordance with the Hurlstone Park Station Vibration Monitoring Plan, the established cosmetic damage vibration screening criterion for 5 Railway Street, Hurlstone Park is 7.5 mm/s for the unreinforced or light framed structures.

The results of the vibration monitoring for 5 Railway Street, Hurlstone Park are presented in Table below.

Date and Time	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
25/07/2022 16:40 – 16:42	Baseline vibration monitoring	N/A	0.03	0.75	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite).
25/07/2022 16:40 – 16:54	15T Excavator with hammer attachment (low–medium hammer force)	2-5m	3.19	4.86	At 2m-5m away, the 15T excavator with hammer attachment produced vibration levels that were below the established screening criterion for cosmetic damage. The vibration monitor installed 100mm from the boundary fence behind the sediment fence.
26/07/2022 09:44 – 09:50	Baseline vibration monitoring	N/A	0.03	0.16	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite).
26/07/2022 09:51 – 10:21	15T Excavator with hammer attachment (low–medium hammer force)	2-5m	1.94	3.28	At 2m-5m away, the 15T excavator with hammer attachment produced vibration levels that were below the established screening criterion for cosmetic damage. The vibration monitor installed 100mm from the boundary fence behind the sediment fence.
26/07/2022 09:51 – 10:21	15T Excavator with hammer attachment (low–medium hammer force)	2-5m	0.96	3.53	At 2m-5m away, the 15T excavator with hammer attachment produced vibration levels on the boundary fence that were below the established screening criterion for cosmetic damage. As a result, no further monitoring is required for the 15T excavator with hammer attachment in this work area on the specified force setting. The vibration monitor attached directly onto the boundary fence of 5 Railway Street, Hurlstone Park.

As can be noted from table above, the 15T excavator with hammer attachment on low-medium force setting produced vibration levels below the established cosmetic damage vibration screening criterion. Given that the vibration monitoring results are below the screening criterion, the risk of cosmetic damage is assessed as low.

11 – The MSB work area adjacent to 5 Railway Street, Hurlstone Park (08/08/2022)

The vibration monitor was mounted as close as possible to the boundary fence at the rear of 5 Railway Street, Hurlstone Park. Another one was mounted inside the vibratory roller and jumping jack compactor work area.

In accordance with the Hurlstone Park Station Vibration Monitoring Plan, the established cosmetic damage vibration screening criterion for 5 Railway Street, Hurlstone Park is 7.5 mm/s for the unreinforced or light framed structures.

The results of the vibration monitoring for 5 Railway Street, Hurlstone Park are presented in Table below.

Date and Time	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
08/08/2022 13:38 – 13:39	Baseline Monitoring	N/A	0.03	0.03	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite)
08/08/2022 13:39 – 13:41	Jumping jack compactor	3.35m	0.47	0.58	At 3.35m away, the jumping jack compactor produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street and the jumping jack compactor work area is 5m.
08/08/2022 13:44 – 13:45	5T padfoot roller on low rev and vibratory mode	3.35m	0.03	0.04	At 3.35m away, the 5T padfoot roller on high rev and static mode produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.

08/08/2022 13:45 – 13:46	5T padfoot roller on high rev and static mode	3.35m	0.03	0.04	At 3.35m away, the 5T padfoot roller on high rev and static mode produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
08/08/2022 13:46 – 13:48	5T padfoot roller on low rev and vibratory mode	3.35m	0.03	0.05	At 3.35m away, the 5T padfoot roller on low rev and vibratory mode produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
08/08/2022 13:48 – 13:50	5T padfoot roller on high rev and vibratory mode	3.35m	0.81	1.07	At 3.35m away, the 5T padfoot roller on high rev and vibratory mode produced vibration levels that were below the established screening criterion for cosmetic damage. Therefore, the 5T padfoot roller on high rev and vibratory mode can be used for the work area defined in Figure 2-1. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
08/08/2022 14:00 – 14:02	5T padfoot roller on high rev and vibratory mode	1m	7.88	9.33	At 1m away, the 5T padfoot roller on high rev and vibratory mode produced vibration levels that were above the established screening criterion for cosmetic damage. Therefore, the 5T padfoot roller on high rev and vibratory mode shall not be used within 1m from the boundary fence of 5 Railway Street. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
08/08/2022 14:03 – 14:04	Jumping jack compactor	1m	6.39	7.16	At 1m away, the jumping jack compactor produced vibration levels that were below the established screening criterion for cosmetic damage. Therefore, the site-specific minimum working distance for the jumping jack compactor is 1m. Note that the closest distance between the boundary fence of 5 Railway Street to the jumping jack compactor work area is 5m.
08/08/2022 14:07 – 14:09	5T padfoot roller on high rev and vibratory mode	2m	6.72	8.15	At 2m away, the 5T padfoot roller on high rev and vibratory mode produced maximum vibration levels that were above the established screening criterion for cosmetic damage. Therefore, the 5T padfoot roller on high rev and vibratory mode shall not be used within 2m from the boundary fence of 5 Railway Street. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.

The vibration monitoring results show that the 5T padfoot roller on high rev and vibratory mode and jumping jack compactor produced vibration levels below the established cosmetic damage vibration screening criterion at 3.35m away from the works. Given that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller and jumping jack compactor work area is 5m, the measured plants can be used without exceeding the established cosmetic damage vibration screening criterion.

The site-specific minimum working distances for the 5T padfoot roller on high rev and vibratory mode is 3 metres and for the jumping jack compactor is 1 metre. It was recommended to use a smaller vibratory roller if the vibratory roller needs to work less than 3m away from the boundary fence of 5 Railway Street.

12 – Punchbowl Station (24/09/2022 – 27/09/2022)

The vibration monitor was located near the new station lift at Punchbowl Station. The corresponding vibration screening criterion for cosmetic damage of unreinforced or light framed structures is 7.5 mm/s. The results of the unattended vibration measurements for Punchbowl Station are presented in Figure 9 below.

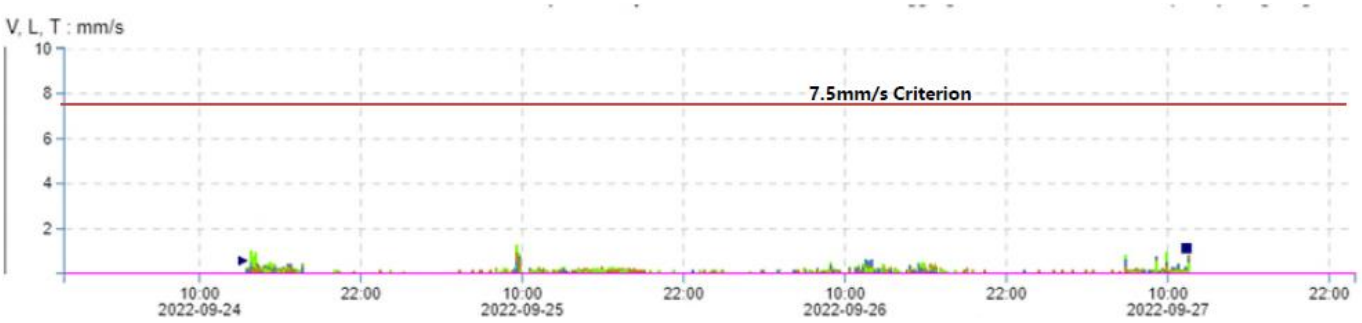

Figure 9 – Unattended vibration monitoring at Punchbowl Station between 24/09/2022 and 27/09/2022

As shown in Figure 9, the vibration levels produced from the vibration intensive works in the proximity of the station lift at Punchbowl Station are below 7.5mm/s.

13 – Neighbouring garage structure at 3A Commons Street, Hurlstone Park (24/09/2022 – 28/09/2022)

In accordance with the Hurlstone Park Station Vibration Monitoring Plan, the established vibration limits for the neighbouring garage structure are shown below:

- Greater than or equal to 4 mm/s (cosmetic damage is possible);
- Greater than or equal to 8 mm/s (cosmetic damage becoming more likely).

The results of the unattended vibration measurements for the neighbouring garage structure at 3A Commons Street are presented in Figure 10 below.

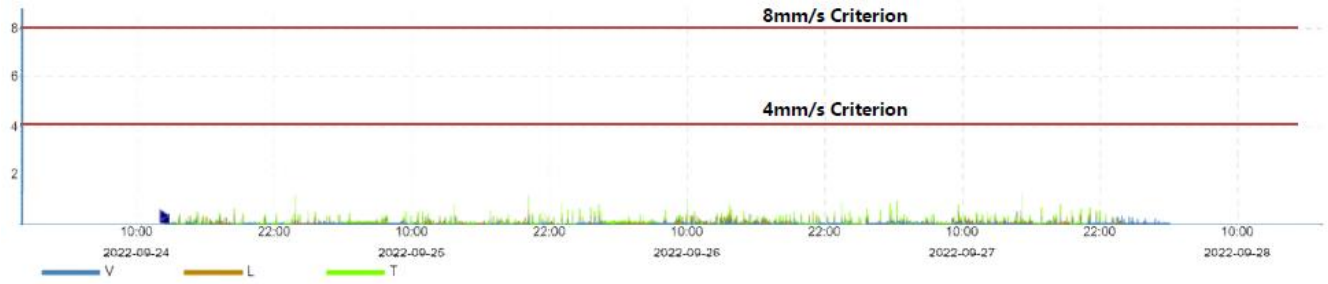

Figure 10 – Unattended vibration monitoring at 3A Commons Street, Hurlstone Park between 24/09/2022 and 27/09/2022.

As shown in Figure 10, the vibration levels produced from the vibration intensive works nearby the garage structure at 3A Commons Street are below 4mm/s.

DISCUSSION – NOISE AND VIBRATION MONITORING

The results of the noise measurements were typically below or consistent with the predicted noise levels for the works. There were three (3) instances where the results of the noise measurements were above the predicted noise levels. One measurement that exceeded the predicted noise level was related to extraneous road traffic noise rather than measured noise levels of construction activities conducted at Wiley Park Station. Second exceedance was related to other subcontractor works in close proximity to Punchbowl Station. Third measurement that exceeded the predicted noise level was related to trains operation rather than measured noise levels of construction activities conducted at the MSB area, Railway Street, Hurlstone Park.

Noise monitoring results demonstrated that the provision of construction noise mitigation measures was appropriate.

The results of the unattended vibration measurements were typically below the established vibration screening criterion presented in the CNVS. There were events that resulted in an instantaneous vibration level above screening criterion that were investigated and found to be unrelated construction activities. The results of the attended vibration measurements show that the measured vibration levels produced by the jackhammering and compacting works were below the established vibration screening criteria for cosmetic damage. Therefore, the risk of cosmetic damage was assessed as low.

It should also be noted that Downer conducts regular inspection of the environmental controls, including noise and vibration mitigation measures, across all work sites. These inspections are conducted by the Project Team and the Environmental Team. This proactive approach ensures that environmental controls are functioning properly rather than reactively inspecting the worksite following monitoring and reporting.

Appendix 1 – Surface Water Monitoring Report - Wiley Park Station - NE30161_R009_SWM_WileyPark_Rev0

Surface Water Monitoring Report - Wiley Park Station

Wiley Park Station

304500142

Prepared for

Downer EDI Works Pty Ltd

11 July 2022

Cardno

now

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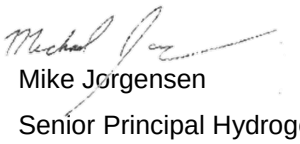

Mike Jorgensen
Senior Principal Hydrogeologist

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
RevA	1/07/2022	Draft for Client Review	J.Zhou	M.Jorgensen
Rev0	11/07/2022	First Final	J.Zhou	M.Jorgensen

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Appendices

Tables

1 Introduction

1.1 Background

Stantec Australia Pty Ltd ("Stantec") was commissioned by Downer EDI Works Pty Ltd ("Downer") to undertake monitoring and reporting of surface water quality of the unnamed channel within proximity to Wiley Park Station Upgrade Site. The proposed works includes the upgrade of the main station and installation of the Metro Services Building (MSB).

Surface water quality of the channel within proximity to Wiley Park Upgrade Site is to be monitored as per the requirements summarised in the **Table 1-2**, which is excerpted from the Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Soil and Water Management Plan (SWMP). The monitoring program are prepared to meet the requirements outlined in *The Sydney Metro City and Southwest – Sydenham to Bankstown Upgrade Conditions of Approval SSi-8256*, specifically Condition 8 to Condition 10. The sampling locations (WP1 – Upstream and WP2 – Downstream) of the water quality monitoring are shown on in **Appendix A.** In order to establish a more robust dataset of how the downstream discharge points affect the water quality, Downer has requested two additional sampling locations at the downstream discharge points (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) of the water quality monitoring commenced in May 2022. This additional sampling at the downstream discharge points is subject to the flow contribution at the time of each monitoring event. Refer to **Appendix A** for approximate locations of the sampling locations.

The closest Project worksite to an existing watercourse is Wiley Park Station services building, which is located approximately 100 m from an unnamed concrete-lined channel, which forms the upper reaches of Coxs Creek and is identified as a first-order stream.

For the purpose of establishing baseline water quality data within the first-order stream at Wiley Park, water quality monitoring was intended to be undertaken for a period prior to construction of the Wiley Park services building as outlined in the Table 13 of the SWMP. At a minimum, one dry-weather sample and one wet weather sample (weather permitting) were intended to be collected during the pre-construction period. The frequency of pre-construction water quality monitoring within this channel was subject to water being present within the structure. However, during the baseline monitoring period no wet-weather events were able to be captured prior to commencement of construction. A dry-weather baseline monitoring event was undertaken on 10 March 2021.

This report presents the findings from the eleventh surface water monitoring event, which was undertaken by Stantec on 24 May 2022. The event undertaken was a mid-construction quarterly wet-weather event. **Table 1-1** below summarises the surface water monitoring events undertaken to date by Stantec.

Table 1-1 Summary of Surface Water Monitoring Event Undertaken to Date

Date of Monitoring	Type of Event	Report Reference
10 March 2021	Pre-construction Dry Baseline	4NE30187_R001_SWM_WileyPark_Rev0
20 March 2021	Mid Construction Wet Weather	4NE30187_R001_SWM_WileyPark_Rev0
5 May 2021	Mid Construction Wet Weather	4NE30187_R002_SWM_WileyPark_Rev0
1 July 2021	Mid Construction Dry Weather	NE30161_R003_SWM_WileyPark_Rev0
30 September 2021	Mid Construction Dry Weather	NE30161_R004_SWM_WileyPark_Rev0
12 November 2021	Mid Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
26 November 2021	Mid Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
9 and 10 February 2022	Mid Construction Dry Weather	NE30161_R006_SWM_WileyPark_Rev0
23 February 2022	Mid Construction Wet Weather	NE30161_R007_SWM_WileyPark_Rev0
9 March 2022	Mid Construction Wet Weather	NE30161_R008_SWM_WileyPark_Rev0
24 May 2022	Mid Construction Wet Weather	NE30161_R009_SWM_WileyPark_Rev0

1.1 Purpose and Objective

The purpose of the surface water monitoring works is to monitor and record surface water quality within the unnamed channel in accordance with the monitoring program as outlined in the Site's SWMP. The objective of the works is to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel.

1.2 Scope of Works

Stantec undertook the following tasks during the surface water monitoring events:

- Inspected and sampled two (2) original nominated surface water sampling locations (WP1 – upstream and WP2 – downstream) on 24 May 2022 as part of mid-construction quarterly wet-weather monitoring event.
- Inspected two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) and sampled one (1) additional nominated downstream discharge point (WP2-DP1) on 24 May 2022 as part of mid-construction quarterly wet-weather monitoring event. No sampling work was undertaken at the downstream discharge point – WP2-DP2 due to lack of flow contribution.
- Recorded field parameters and noted observations of the water bodies during sampling.
- Collected three (3) primary surface water samples from WP1, WP2 and WP2-DP1, one (1) intra-lab duplicate sample and one (1) inter-lab duplicate sample per sampling event for submission to a National Association of Testing Authorities, Australia (NATA) certified laboratory for analytical testing of primary and additional quality assurance/quality control (QA/QC) samples. Samples were submitted for analysis of:
  - Oil & Grease;
  - Total Suspended Solids (TSS);
  - Nutrients (Total Phosphorous and Total Nitrogen);
  - Turbidity; and
  - Chlorophyll-*a*.
- Reviewed the analytical and field data and prepared this report.

Details of the monitoring program are shown below.

Table 1-2 Wiley Park Water Quality Monitoring Program

Wiley Park Water Quality Monitoring Program	
Waterway	Sydney Water Cooks River Channel (first-order stream)
Indicative monitoring points	WP1 – upstream
	WP2 – downstream
	WP2-DP1 – downstream eastern discharge point
Interaction with Project works	Channel within proximity to Wiley Park service building site
Pre-construction works	Monthly for parameters detailed in Table 11 (including at least one dry-weather round of sampling). One wet-weather event, if possible, for the parameters detailed in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling is undertaken immediately during construction hours and if it is safe to do so.
During construction of the Wiley Park services building	Quarterly for parameters detailed in Table 11 (including during dry weather). Four wet-weather events per year for the parameters in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.

2 Guidelines and Legislation

There are a range of Guidelines and Legislation and Conditions of Approval (CoA) that are applicable to the surface water monitoring program which are summarised below.

The CoA applicable to this job include:

- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018;

The State and Federal legislation and policy and guidelines that apply to the program include:

- Environmental Planning and Assessment Act 1979 (EP&A Act);
- Contaminated Land Management Act 1997;
- Protection of the Environment Operations Act 1997 (POEO Act); and
- Water Management Act 2000 Water Management (General) Regulation 2018;

Additional guidelines and standards to the management of soil and water include:

- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book');
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book');
- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines');
- ANZECC (2018). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines'); and
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').

3 Monitoring Locations

Details of the sampling locations are provided in **Table 3-1**. The locations are provided in **Appendix A.** Representative photographs are presented in **Appendix B**.

3.1 Monitoring Locations

Table 3-1 Surface Water Monitoring Location Details

Sample Location	Latitude	Longitude	Description
WP1 (up-stream)	-33.924014	151.065315	Immediately south of the Boulevarde and east of 118 the Boulevarde.
WP2 (down-stream)	-33.923339	151.064970	Immediately north of the Urunga Parade and west of 4 Urunga Parade.
WP2-DP1 (downstream eastern discharge point)	-33.923543	151.065058	Immediately south of the Urunga Parade, east side of the channel, approximately 20 m south of WP2.

4 Quality Management

The Data Quality Objective (DQO) process is used to establish a systematic planning approach to set the type, quantity and quality of data required for making decisions based on the environmental condition of the project area. The DQO process involves the seven steps detailed in **Table 4-1**.

Table 4-1 Data Quality Objectives

DQO	Description
Step 1 State the Problem	Construction work may adversely impact the local surface water quality within the unnamed channel near the site.
Step 2 Identify the Decisions	Are there any impacts to surface water quality from construction activities at the site?
Step 3 Identify Inputs to the Decision	The primary inputs to the decisions described above are: ▪ Assessment of surface water quality of the unnamed channel within proximity to Wiley Park service building site per the requirements outlined in the site's SWMP, with samples collected from two locations (upstream and downstream of the site); ▪ Laboratory analysis of surface water samples for relevant parameters; ▪ Assessment of the suitability of the analytical data obtained, against the Data Quality Indicators (DQIs); ▪ Assessment of the analytical results against applicable guideline criteria; and ▪ Aesthetic observations of surface water bodies, including odours, sheen and condition, if encountered.
Step 4 Define the Study Boundaries	The lateral extent of the study area is the channel near the Wiley Park service building site. The temporal boundaries of the study comprise the duration of the monitoring program, including pre-construction monitoring, construction phase, and post-construction monitoring as required.
Step 5 Develop a Decision Rule	The decision rules for the water quality monitoring sampling events included: ▪ Were primary and QA/QC samples analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses? ▪ Did the field and laboratory QA/QC results indicate that the data set was reliable and representative of the water quality with Relative Percentage Difference (RPD) values of 30% or less?

DQO	Description
	▪ Were the laboratory limits of reporting (LORs) below the applicable guideline criteria for the analysed parameters? ▪ Were guideline criteria sourced from endorsed guidelines? ▪ Were surface water aesthetic characteristics evaluated including odours and sheen? ▪ Were the monitoring results obtained from the downstream sample collected during construction phase greater than the upstream sample collected during the same monitoring event? If so, then the adverse impact to the quality of water in the unnamed channel is considered to have potentially occurred.
Step 6 Specify Limits on Decision Error	In accordance with the relevant guidelines as endorsed under the *Contaminated Land Management Act 1997*. Specific limits for this project are in accordance with the appropriate guidance made or endorsed by state and national regulations, appropriate indicators of data quality, and standard procedures for field sampling and handling. This step also examines the certainty of conclusive statements based on the available new Site data collected. This should include the following points to quantify tolerable limits: ▪ A decision can be made based on a certainty assumption of 95% confidence in any given data set (excluding asbestos). A limit on the decision error will be 5% that a conclusive statement may be a false positive or false negative. A decision error in the context of the decision rule presented above would lead to either underestimation or overestimation of the risk level associated with a particular sampling area. Decision errors may include: ▪ Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the Site. To address this, minimum numbers of samples are proposed to be collected from each media. As such, there may be limitations in the data if aspects of the sampling plan cannot be implemented. Some examples of this scenario include but not limited to: – Proposed samples are not collected due to lack of water flow or access being restricted to a given location. ▪ Limitations in ability to acquire useful and representative information from the data collected. The data are proposed to be collected from multiple locations and sample media. ▪ Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed: – Field staff to follow a standard procedure when undertaking samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, collection of representative samples and use of appropriate sample containers and preservation methods. – Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis. – Laboratories to report QA/QC data for comparison with the DQIs established for the project
Step 7 Optimise the Design for Obtaining Data	To achieve the DQOs and DQIs, the following sampling procedures were implemented to optimise the design for obtaining data: ▪ Surface water samples was collected from upstream and downstream sampling locations, as available due to access and water level; ▪ Surface water samples was collected from two (2) discharge points between upstream and downstream, as available due to access and water level; ▪ Surface water parameters were selected based on project monitoring requirements provided to Stantec; ▪ Samples were collected by suitably qualified and experienced environmental scientists;

DQO	Description
	▪ Samples were collected and preserved in accordance with relevant standards/guidelines; and ▪ Field and laboratory QA/QC procedures were adopted and reviewed to indicate the reliability of the results obtained.

4.1 Data Quality Indicators

The following DQIs have been adopted for the project. The DQIs outlined in **Figure 2015239694-0Table 4-2** assist with decisions regarding the usefulness of the data obtained, including the quality of the laboratory data.

Table 4-2 Summary of Data Quality Indicators

Data Quality Indicator	Frequency	Data Acceptance Criteria
Completeness		
Field documentation correct	All samples	The work was documented in accordance with Stantec SOPs
Suitably qualified and experience sampler	All samples	Person deemed competent by Stantec collecting and logging samples
Appropriate lab methods and limits of reporting (LORs)	All samples	Samples were analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses.
Chain of custodies (COCs) completed appropriately	All samples	The work was documented in accordance with Stantec SOPs
Sample holding times complied with	All samples	The samples were extracted and analysed within holding times specified by the project NATA-accredited laboratory
Proposed/critical locations sampled	-	Proposed/critical locations sampled
Comparability		
Consistent standard operating procedures for collection of each sample. Samples should be collected, preserved and handled in a consistent manner	All samples	All works undertaken in accordance with Stantec SOPs
Experienced sampler	All samples	Person deemed competent by Stantec collecting and logging samples
Climatic conditions (temp, rain etc) recorded and influence on samples quantified (if required)	All samples	Climatic conditions documented in field sheets
Consistent analytical methods, laboratories and units	All samples	Sample analysis to be in accordance with NATA-approved methods
Representativeness		
Sampling appropriate for media and analytes (appropriate collection, handling and storage)	All samples	Sample analysis to be in accordance with NATA-approved methods
Samples homogenous	All samples	All works undertaken in accordance with Stantec SOPs
Detection of laboratory artefacts, e.g. contamination blanks	-	Laboratory artefacts assessed and impact on results determined
Samples extracted and analysed within holding times	All samples	The samples were extracted and analysed within holding times specified by the laboratory
Precision		
Blind duplicates (intra-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD Result less than 10 × LOR
Split duplicates (inter-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD Result less than 10 × LOR

Data Quality Indicator	Frequency	Data Acceptance Criteria
Laboratory duplicates	1 per 20 samples	Results greater than 10 x LOR: less than or equal to 30% RPD Results less than 10 x LOR: No limit on RPD
Accuracy (Bias)		
Surrogate spikes	All organic samples	50-150%
Matrix spikes	1 per 20 samples	70-130%
Laboratory control samples	1 per 20 samples	70-130%
Method blanks	1 per 20 samples	Less than LOR

The DQOs for the project were met during the monitoring event. Discussion of the QA/QC assessment is provided in **Appendix E**.

5 Field Investigation

The scope and method of the surface water monitoring is summarised in **Table 5-1**.

Table 5-1 Investigation Activity Summary

Activity	Details
Dates of Fieldwork	24 May 2022
Surface Water Sampling	Stantec inspected four (4) surface water monitoring locations (WP1 – upstream, WP2 – downstream, WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point). However, only three (3) primary samples were collected from WP1, WP2 and WP2-DP1 due to lack of water flow at WP2-DP2. Stantec undertook the sampling as per the following procedures: Surface Water Body Inspection - The general site condition was observed prior to commencement of field works for signs of any site activities that may have altered the surface water contamination status or require modifications to the field or laboratory works program. Each surface water location was inspected for indicators of contamination and the presence as well as the flow of surface water. This information is recorded on the field sheets presented in **Appendix C.** Surface water sampling - Field parameters and visual/olfactory observations were recorded prior to sampling at each location. Physico-chemical parameters including pH, electrical conductivity (EC), dissolved oxygen (DO), reduction-oxidation potential (redox), and temperature were measured using a calibrated water quality meter. Surface water samples were collected either directly into the sampling bottle or directly from the telescopic scoop. Once field parameters were recorded, the surface water samples were transferred to appropriately preserved sample containers provided by the laboratories. Field observations, and parameters are presented in **Appendix C**. Surface water samples were placed into an Esky containing ice and maintained at or below 4°C whilst onsite and in transit to the NATA-accredited laboratories for the targeted analyses.
Surface Water Analysis	Surface water samples from the monitoring event were submitted under standard chain-of-custody (CoC) procedures to NATA-accredited Eurofins Environment Testing Australia analysis of the parameters as follows: – Oil & Grease;

Activity	Details
	– Total Suspended Solids (TSS); – Nutrients (Total Phosphorous and Total Nitrogen); – Turbidity; and – Chlorophyll-*a*. Tabulated laboratory results are presented in **Appendix D**. The Data QA /QC program and data quality review including calibration certificates is presented in **Appendix E**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and CoC documentation are included in **Appendix F**.
Decontamination	Decontamination was undertaken in the event of reusable sampling, monitoring equipment (telescopic scoop, water quality meter) or switching between sampling locations using a standard bucket wash. Equipment was washed in phosphate-free detergent (Liquinox) and rinsed in laboratory supplied rinsate water.

6 Surface Water Assessment Criteria

The assessment criteria for surface water analytical and field data were adopted from Table 11 of the site's SWMP. The criteria for selected parameters are provided in **Table 6-1** below. ANZECC guideline criteria are included in the table for reference.

Table 6-1 Water Quality Monitoring Parameters and Adopted Criteria at Wiley Park

Parameter	ANZECC Criteria – Freshwater[1]	Proposed Trigger Values[2]	Proposed Actions
Temperature (°C)	>80% ile; <20% ile	Downstream results are greater than upstream results in rainfall events up to and including the significant event threshold of greater than 20 mm in 24 hours. Downstream results are greater than upstream results during dry-weather sampling.	The client's Environment Manager (or delegate) to re-test to confirm results and undertake an inspection of the adjacent works and propose actions where required.
DO (%Sat)	Lower limit – 85% Upper limit – 110%		
Turbidity (NTU)	6-50 NTU		
Oil and grease	-		
pH	Lower limit – 6.5 Upper limit – 8.5		
Salinity (as EC)	125 – 2,200 µS/cm		
TSS	-		
Total Phosphorus as P	25 µg/L		
Total Nitrogen as N	350 µg/L		
Chlorophyll-a	3 µg/L		

Note to Table
1 ANZECC guideline criteria are included for reference. It is noted that for dry weather events baseline testing comparison will indicate whether this existing water quality within the channel meet ANZECC guidelines, prior to construction of the services building. For wet-weather events where no baseline data is available a direct comparison to upstream and downstream results is undertaken. Sydney Metro's Principal Contractor will comply with Section 120 of the Protection of the Environment Operations Act 1997.
2 For the ANZECC criteria given in a range (i.e. DO, pH, temperature, etc.), measured field parameters at downstream and upstream were assessed in comparison to the closeness to the criteria range.

7 Summary of Results

7.1 Summary of Field Observations

Three (3) surface water sampling locations (WP1 – upstream, WP2 – downstream and WP2-DP1 – downstream eastern discharge point) were able to be sampled whereas the WP2-DP2 (downstream western discharge point) was not able to be sampled due to lack of flow contribution during the sampling event conducted on 24 May 2022. Photos of each sampling location are included in **Appendix B**. The following observations were made:

7.1.1 Mid-Construction Quarterly Wet-weather Event – 24 May 2022

- The sampling event was considered as a mid-construction quarterly wet-weather event based on the rainfall data recorded by the nearby weather station:
  - Canterbury Racecourse AWS station (ID: 066194): approximately 4.6 km from the site with the rainfall data recorded 20.4 mm over the last 24 hours prior to the field sampling. Refer to **Appendix C** for weather recordings.
- Observation of water body:
  - WP 1 (upstream of work area) contained medium flowing clear water with low turbidity. The estimated depth of the water body was 0.20 m;
  - WP 2 (downstream of work area) contained medium flowing clear water with low turbidity. The estimated depth of the water body was 0.25 m;
  - WP2-DP1 (downstream eastern discharge point) contained low flowing clear water with low turbidity. The estimated depth of the water body was 0.05 m;
  - WP2-DP2 (downstream western discharge point) was dry, not contribution to the water body was observed during the time of sampling.
- Additional observation:
  - WP1 (upstream of work area):
    - One discharge point (WP1-DP1) was observed immediately downstream / north of WP1. Low flow contribution was observed at the time of sampling. Refer to **Appendix A** for approximate location of WP1-DP1. Refer to **Appendix B** for a detailed photo.

7.2 Field Parameters

The parameters from each location sampled are presented in **Table 7-1**.

Table 7-1 Field Physico-chemical Parameters and Field Observations on 24 May 2022

Location ID	WP1 (upstream)	WP2 (downstream)	WP2-DP1 (downstream eastern discharge point)
Water depth (m)	0.20	0.25	0.05
Estimated Flow Rate	medium	medium	low
Temperature (°C)	17.1	16.9	17.4
pH	6.82	9.02	10.49
Electrical Conductivity (µS/cm)	590.0	556.4	502.3
Dissolved Oxygen (mg/L)	8.10	8.05	6.22
Dissolved Oxygen (%)	85.3	83.2	64.4
Oxidation-Reduction Potential (mV)	71.3	46.0	-34.8

Location ID	WP1 (upstream)	WP2 (downstream)	WP2-DP1 (downstream eastern discharge point)
SHE[1] Redox Potential (mV)[2]	281.7	256.4	175.6
Condition	Clear Low Turbidity	Clear Low Turbidity	Clear Low Turbidity

Note to Table
1 SHE – Standard Hydrogen Electrode
2 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: *SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP)*.

7.3 Surface Water Analytical Results

Surface Water Analytical results are presented in **Appendix D**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Appendix F**.

7.3.1 Mid-Construction Wet-weather Event – 24 May 2022

The results of the monitoring event indicate that:

- Laboratory analytical results:
  - Concentrations of Chlorophyll-*a* were reported below the laboratory detection limit for each sample. It is noted that due to insufficient volume of the sample being available for analyse by the lab (Eurofins), the LOR of this analyte was raised from 2 µg/L to 10 µg/L which is above the applicable criteria adopted. This non-compliance to the DQO as outlined in step 5 of **Table 4-1** has been communicated with the lab (Eurofins) and will be avoided for future sampling events;
  - Concentrations of Oil and Grease were reported below the laboratory detection limit at all sample locations;
  - Concentrations of inorganics (total nitrogen and the total phosphorous) were reported:
    - Total nitrogen:
      - WP1 (upstream): 2.5 mg/L
      - WP2 (downstream): 1.8 mg/L
      - WP2-DP1 (downstream eastern discharge point): 3.1 mg/L
    - Total phosphorous:
      - WP1 (upstream): 0.16 mg/L
      - WP2 (downstream): 0.14 mg/L
      - WP2-DP1 (downstream eastern discharge point): 0.04 mg/L
  - TSS were reported below the laboratory detection limit at sample WP1 (upstream) and WP2 (downstream) whereas reported with concentration of 23 mg/L at sample WP2-DP1 (downstream eastern discharge point); and
  - Turbidity was reported with concentration of 14 NTU at sample WP1 (upstream), 16 NTU at WP2 (downstream) and 18 NTU WP2-DP1 (downstream eastern discharge point).

7.3.2 Baseline Results Comparison

One sampling event during the pre-construction period (baseline event) was undertaken on 10 March 2021 which was during dry condition. It should be noted that wet-weather or storm-event pre-construction sampling events were not able to be conducted because of the lack of rainfall. The monitoring results of the baseline event (10 March 2021) has not been used for comparison with the monitoring results under this report because the conditions encountered were different (i.e., non-trigger for wet-weather event criteria). However, six previous mid-construction wet weather sampling events were used to compare and check if there is any potential adverse impact to the water quality caused by the construction activities.

Table 7-2 summarises the range and average numbers of each parameter from upstream and downstream in the previous six wet-weather events between 20 March 2021 and 9 March 2022. Overall, conditions are similar between upstream and downstream samples on 24 May 2022 and previous mid-construction wet weather

events except for pH values reported from the down-stream sampling locations relative to the up-stream sampling location.

Table 7-2 Comparison of current wet condition sampling event to previous wet condition sampling events

Time of sampling		Previous Wet-Weather Events - Range		Previous Wet-Weather Events - Average		24 May 2022		
Location ID	Assessment Criteria	WP1	WP2	WP1	WP2	WP1	WP2	WP2-DP1
Temperature (ºC)	N/A[2]	18.6 – 22.6	18.2 – 23.4	20.0	20.0	17.1	16.9	17.4
pH	6.5 - 8.5	6.07 – 8.10	7.34 – 8.42	7.59	7.76	6.82	**9.02**	**10.49**
EC (µS/cm)	125 – 2,200	230 – 2,500	92.9 – 659.0	750	385	590.0	556.4	502.3
DO (mg/L)	N/A[2]	4.79 - 9.05	3.92 -9.31	6.16	6.03	8.10	8.05	6.22
DO (%)	85% - 110%	52.9 – 99.0	43.2 – 102.0	66.7	66.9	85.3	**83.2**	**64.4**
SHE[1] Redox Potential (mV)[3]	N/A[2]	70.8 - 282.3	80.4 – 290.4	180.9	183.3	281.7	256.4	175.6
Chlorophyll a (µg/L)	3	<LOR[4]	<LOR[4] – 2.7	3.0[5]	3.1[5]	**<10**	**<10**	**<10**
Oil and Grease (mg/L)	Comparison	<10 - 10	<10	10[5]	<10	<10	<10	<10
Nitrogen (Total) (mg/L)	0.35	1.6 - 5.0	1.0 – 2.8	2.52	2.15	**2.5**	**1.8**	**3.1**
Phosphate total (as P) (mg/L)	0.025	<LOR[6] – 0.23	<LOR[6] - 0.28	0.23[5]	0.21[5]	**0.16**	**0.14**	**0.04**
TSS (mg/L)	N/A[2]	4.0 – 18.0	7.6 – 47.0	12.1	19.1	<5	<5	23
Turbidity (NTU)	6-50	4.3 – 37.0	13.0 – 28.0	21.3	20.0	14	16	18

Note to Table
1 SHE – Standard Hydrogen Electrode
2 Not Applicable
3 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: *SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP)*.
4 Laboratory limit of reporting (LOR). For wet-weather event conducted on 20 March and 5 March 2021, the LOR of Chlorophyll a was used as 5 ug/L, and for wet we-weather events conducted on 12 November, 26 November 2021, 23 February and 9 March 2022, LOR of Chlorophyll a was used as 2 ug/L. Stantec is still in the process communicating with the lab of adjusting the LOR of Chlorophyll a to 2 ug/L for all relevant samples.
5 Value of the laboratory limit of reporting (LOR) was used for calculation of average when below detection limit reported.
6 Laboratory limit of reporting (LOR). Due to the laboratory matrix interference, the LOR of phosphate total (as P) in the wet-weather event conducted on 20 March 2021 was raised to 0.5 mg/L. The LOR of phosphate total (as P) in the rest wet-weather events was 0.01 mg/L.

7.4 Results Discussion

7.4.1 Comparison to ANZG 2018 / ANZECC 2000 Criteria

Results for the mid-construction quarterly wet-weather event sampled on 24 May 2022 generally showed monitored parameters were within the adopted threshold criteria, with the exception of Chlorophyll a, pH, dissolved oxygen saturation, total nitrogen, and total phosphorous.

- pH measured at upstream sample (WP1: 6.82) was within the adopted criterion range, whereas downstream sample (WP2: 9.02) and downstream eastern discharge point sample (WP2-DP1: 10.49) were above the adopted criterion range (i.e., 6.5 – 8.5). Moreover, the pH at downstream sample WP2 was slightly above the previous wet-weather event range (i.e. 7.34 to 8.42).
- Dissolved oxygen saturation measured at upstream sample (WP1: 85.3%) was within the adopted criterion range, but downstream sample (WP2: 83.2%) and downstream eastern discharge point sample (WP2-DP1: 64.4%) were below the adopted criterion range (i.e., 85% - 110%). However, these slight exceedances in dissolved oxygen saturation concentrations are not considered a significant issue based on:
  - The dissolved oxygen saturation measurement at WP2 was within the range of the measurements obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between 43.2 and 102.0 %.
  - Although the dissolved oxygen saturation measurement at WP2-DP1 is considerably lower than the measurements obtained from the other two monitoring locations (i.e. WP1 and WP2), it is not considered to have significant impacts on the downstream water quality due to the similarity of the dissolved oxygen saturation between WP1 and WP2 (2.5% in percentage difference).
- Total nitrogen results at upstream sample (WP1: 2.5 mg/L), downstream sample (WP2: 1.8 mg/L) and downstream eastern discharge point sample (WP2-DP1: 3.1 mg/L) were above the adopted criteria (i.e. 0.35 mg/L). However, these exceedances in total nitrogen concentration are not considered to be a significant issue based on:
  - The total nitrogen result at WP1 was within the range obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between 1.6 and 5.0 mg/L.
  - The total nitrogen result at WP2 was within the range obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between 1.0 and 2.8 mg/L.
- Total phosphorus results at upstream sample (WP1: 0.16 mg/L), downstream sample (WP2: 0.14 mg/L) and downstream eastern discharge point sample (WP2-DP1: 0.04 mg/L) were above the adopted criteria (i.e. 0.025 mg/L). However, these exceedances in total phosphorus concentration are not considered to be a significant issue based on:
  - The total phosphorus result at WP1 was within the range of the results obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between below the laboratory detection limit to 0.23 mg/L.
  - The total phosphorus result at WP2 was within the range of the results obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated below the laboratory detection limit to 0.28 mg/L.
  - Although the total phosphorus result at WP2-DP1 was above the applicable criteria, it is not considered to be a significant issue because the total phosphorus result at WP2-DP1 was the closest to the applicable criteria compared to the results obtained from the other two monitoring locations (i.e. WP1 and WP2).
- Although concentrations of Chlorophyll-*a* were reported below the laboratory detection limit at all sample locations, the LOR of this analyte was raised from 2 ug/L to 10 ug/L and above the applicable criteria adopted for all the samples collected and analysed during this round of monitoring. This is due to insufficient volume of the sample being available for analyse by the lab (Eurofins). This non-compliance to the DQO as outlined in step 5 of **Table 4-1** has been communicated with the lab (Eurofins) and will be avoided for the future monitoring work. Overall, this issue is not considered to be a significant issue based on:
  - Concentrations of Chlorophyll-*a* were reported below the laboratory detection limit at all samples collected and analysed.
  - As outlined in **Table 7-2**, no Chlorophyll-*a* exceedance to the adopted assessment criteria was historically detected from previous mid-construction wet weather monitoring events with similar water

quality being visually as well as analytically observed between this round of monitoring undertaken on 24 May 2022 and previous monitoring events.

7.4.2 Comparison of Downstream, Downstream Discharge Point to Upstream Results

Results for upstream, downstream and downstream discharging point sampling on 24 May 2022 were comparable, with the exception of:

- The pH results at downstream sample (WP2: 9.02) and downstream eastern discharge point sample (WP2-DP1: 10.49) were considerably higher than the result at upstream sample (WP1: 6.82). As such, the downstream eastern discharge point (WP2-DP1) is highly likely to contribute a high pH to the downstream water body.
- The total nitrogen result at downstream eastern discharge point sample (WP2-DP1: 3.1 mg/L) was higher than the results at upstream sample (WP1: 2.5 mg/L) and downstream sample (WP2: 1.8 mg/L). However, it is not considered to be a significant issue since the results of the samples collected from WP2 (i.e. WP2, QA100 and QA200), the average value of the total nitrogen result (2.3 mg/L) is slightly lower than the results at WP1.
- The total suspended solids at downstream eastern discharge point sample (WP2-DP1: 23 mg/L) was higher than the upstream sample (WP1) and the downstream sample (WP2). However, it is not considered to be a significant issue because both downstream and upstream samples were below the laboratory detection limit (i.e. 5 mg/L).
- The turbidity results at downstream sample (WP2: 16.0 NTU) and downstream eastern discharge point sample (WP2-DP1: 18.0 NTU) were slightly higher than the results at the upstream sample (WP1:14.0 NTU). However, it is not considered to be a significant issue based on:
  - There was only a slight difference between the turbidity results in these three locations.
  - The turbidity results in these three locations were within the ANZG 2018 / ANZECC 2000 Criteria.

Refer to **Appendix D** for details. It should be noted that wet-weather and storm-event pre-construction monitoring was not able to be conducted because of the lack of rainfall.

8 Conclusion

Stantec was engaged to undertake surface water monitoring of the unnamed channel west of Wiley Park Station in accordance with the SWMP for the project. The objective of the works was to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel that receives in part stormwater from the construction area.

This report presents monitoring data from mid-construction wet-weather event on 24 May 2022. Samples were collected from three locations. Sampling point WP1 and WP2 are located upstream and downstream from the work site respectively, while sampling point WP2-DP1 is located at the eastern side of the channel adjacent to the work site and approximately 20 m south of the WP2.

During this quarterly wet-weather monitoring event, sampling results showed monitored parameters were generally within the adopted ANZG 2018 / ANZECC 2000 screening criteria with the exception of chlorophyll a, pH, dissolved oxygen saturation, total nitrogen and total phosphorous. For the dissolved oxygen saturation, total nitrogen and total phosphorous, the comparison of the mid-construction wet-weather event conducted on 24 May 2022 to the six previous wet-weather sampling events showed no significant difference. However, for the measurement of pH at downstream sample WP2, the pH is above the previous wet-weather events range for WP2.

During this quarterly wet-weather monitoring event, the results of the downstream WP2, downstream eastern discharge point WP2-DP1 and upstream samples WP1 were generally comparable with the exceptions of pH, total nitrogen, total suspended solids and turbidity:

- For the pH, the measurements at the downstream WP2 and downstream discharge point WP2-DP1 samples were significantly higher than the upstream sample WP1.
- For the total nitrogen, total suspended solids and turbidity, the comparison of the upstream WP1, downstream WP2 and downstream eastern discharge point WP2-DP1 samples conducted on 24 May 2022 showed no significant difference based on:

- Total nitrogen and total suspended solids: even though the results of the downstream eastern discharge point sample (WP2-DP1) were slightly higher than the upstream sample WP1, the results of the downstream sample WP2 were lower the upstream sample or below the laboratory detected limit.
- Turbidity: the results at the downstream WP2 and downstream eastern discharge point WP2-DP1 samples were slightly higher than the upstream sample WP1, but the results at these three locations were within the ANZG 2018/ANZECC 2000 criterion range.

Based on comparison to the ANZG 2018 / ANZECC 2000 criteria, comparison with six previous mid-construction wet-weather events, and comparison of the upstream WP1, downstream WP2 and downstream eastern discharge point WP2-DP1 results, the results reported for the 24 May 2022 sampling event are generally not considered to reflect an adverse impact to water quality due to construction activities at the subject site with the exception of pH.

9 References

- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades – Soil and Water Management Plan, dated 16th February 2021;
- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018;
- Environmental Planning and Assessment Act 1979 (EP&A Act);
- Contaminated Land Management Act 1997;
- Protection of the Environment Operations Act 1997 (POEO Act);
- Water Management Act 2000 Water Management (General) Regulation 2018;
- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book');
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book');
- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines');
- ANZECC (2000). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines');
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').

10 Limitations

This assessment has been undertaken in general accordance with the current industry standards for a surface water monitoring report for the purpose and objectives and scope identified in this report. The agreed scope of this assessment has been limited for the current purposes of the Client. The assessment may not identify contamination occurring in all areas of the site, or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained. This Document has been provided by Stantec subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Stantec's proposal and Section 1 of this report and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of Stantec's services are as described in Stantec's proposal, and are subject to restrictions and limitations. Stantec did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Stantec in regards to it.
- Conditions may exist which were undetectable given the limited nature of the enquiry Stantec was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Stantec's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Stantec to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.
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- Stantec may have retained sub consultants affiliated with Stantec to provide services for the benefit of Stantec. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Stantec's affiliated companies, and their employees, officers and directors.

This assessment report is not any of the following:

- A Site Audit Report or Site Audit Statement (SAR/SAS) as defined under the *Contaminated Land Management Act, 1997* or an assessment sufficient for an Environmental Auditor to be able to conclude a SAR/SAS.
- A geotechnical report and the bore logs/test pit logs may not be sufficient for geotechnical advice.
- An assessment of surface water contaminants potentially arising from other sites or sources nearby.
- A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land

APPENDIX

A

FIGURES

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Downer

Surface Water Monitoring

WILEY PARK STATION

Legend

- Sample Location
- Discharging Points
- Watercourse (NSW SS)
- Railway (NSW SS)
- Cadastre (NSW SS, 2019)

1:800 Scale at A3

m
0 10 20 30 40

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (SYD)
Date: 2022-05-10 | Project: 4NE30187
Coordinate System: GDA 1994 MGA Zone 56
Map: 4NE30187-GS-002-SurfaceWater.mxd 03
Aerial imagery supplied by MetroMap (February 2022)

APPENDIX

B

PHOTOGRAPHS

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Photograph 1. Upstream sampling location WP1. Date: 24 May 2022.

Photograph 2. Low stormwater in-flow observed from the discharge point WP1-DP1 which was located within the rail corridor and immediately downstream/north from WP1. Date: 24 May 2022.

Photograph 3. Downstream sampling location WP2. Date: 24 May 2022.

Photograph 4. Low level of flow contribution was observed from downstream eastern discharge point WP2-DP1. Date: 24 May 2022.

Photograph 5. No flow contribution was observed from downstream western discharge point WP2-DP2. Date: 24 May 2022.

APPENDIX

C

FILED RECORDS

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Surface Water Sampling Field Record

Site / Project: 304500142	Sampling Point:
Client: Downer	Job No. Wiley Park Station SWM
Person Sampling: CZ	Initials: CZ

Site Details

Sampling Equipment – Directly into bottle / (Water Scoop) / Van Dorn Sampler / Other:	Date: 24 May 2022
Observations on Site: Last Rain Event / (Recent Storms) / Releases / Other :	

Sample Details, Observations, GPS Coordinates & Field Physiochemical Measurements

(if possible, record parameters once stable)

Sample ID	WP01	WP02-DP01	WP02 (QA100 QA200)		
Start Time:	10:30	11:30	12:30		
Easting	-	-	-		
Northing	-	-	-		
Sample Depth (m)	0.15-0.2	0.00-0.05	0.20-0.25		
Water Body Depth (m)	0.2	0.05	0.25		
Location – Onsite/Offsite /Inlet/Outlet/ Middle	Upstream	Downstream East discharging point	Downstream		
Flow Rate None/ Low / Med / High	med	low	med		
DO (mg/L)	8.10	6.22	8.05		
DO (%S)	85.3	64.4	83.2		
EC (µS/Cm) SPC	590	502.3	556.4		
pH	6.82	10.49	9.02		
Eh (mV)	71.3	-34.8	46.0		
Temp (°C)	17.1	17.4	16.9		
Water Colour	Clear	clear	Clear		
Turbidity Low / Med / High	low	low	low		
Observations / Notes	Upstream DP Contributes Flows.	Downstream DP: WP2-DP1 = flowing DP2-DP2 - dry			

Sample Container & Preservation Data

Number of sample containers:	5	5				
Container Volume						
Container Type						
Preservation						
Filtration						
Sample Number (for Lab ID):						
QA Dup Sample No.						

Australian Government
Bureau of Meteorology

Latest Weather Observations for Canterbury

IDN60801

Issued at 4:42 pm EST Tuesday 24 May 2022 (issued every 10 minutes, with the page automatically refreshed every 10 minutes)

Station Details **ID:** 066194 **Name:** CANTERBURY RACECOURSE AWS **Lat:** -33.91 **Lon:** 151.11 **Height:** 3.0 m

Data from the previous 72 hours. | See also: Recent months at Canterbury

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
24/04:30pm	16.9	16.1	11.6	71	2.9	NNE	7	9	4	5	-	-	0.2
24/04:00pm	17.8	17.3	12.7	72	2.8	NNE	7	13	4	7	-	-	0.2
24/03:30pm	18.8	18.6	13.6	72	3.0	ENE	7	11	4	6	-	-	0.2
24/03:00pm	18.9	18.5	12.9	68	3.4	NNW	7	13	4	7	-	-	0.2
24/02:30pm	18.8	18.3	12.5	67	3.5	NNE	7	13	4	7	-	-	0.2
24/02:00pm	17.2	18.0	12.5	74	2.6	CALM	0	0	0	0	-	-	0.2
24/01:30pm	16.4	17.5	13.5	83	1.6	CALM	0	0	0	0	-	-	0.2
24/01:00pm	16.6	15.9	13.1	80	2.0	E	9	15	5	8	-	-	0.2
24/12:30pm	16.3	14.8	13.0	81	1.8	SSE	13	19	7	10	-	-	0.2
24/12:00pm	16.7	14.3	12.8	78	2.2	SSE	17	24	9	13	-	-	0.2
24/11:30am	17.5	16.4	13.2	76	2.4	SSW	11	22	6	12	-	-	0.2
24/11:00am	16.7	16.8	14.5	87	1.3	WSW	7	11	4	6	-	-	0.2
24/10:30am	15.8	15.8	14.2	90	0.9	WSW	7	17	4	9	-	-	0.2
24/10:00am	15.3	14.9	14.0	92	0.7	W	9	13	5	7	-	-	0.2
24/09:30am	14.6	14.6	14.3	98	0.2	W	7	11	4	6	-	-	0.0
24/09:00am	13.9	14.0	13.9	100	0.0	NW	6	11	3	6	-	-	20.8
24/08:30am	13.3	13.0	13.3	100	0.0	NNW	7	11	4	6	-	-	20.8
24/08:00am	12.5	12.1	12.5	100	0.0	NNW	6	9	3	5	-	-	20.8
24/07:30am	12.4	12.0	12.4	100	0.0	NW	6	9	3	5	-	-	20.8
24/07:00am	12.4	12.0	12.4	100	0.0	NW	6	9	3	5	-	-	20.8
24/06:30am	12.5	12.5	12.5	100	0.0	NNW	4	9	2	5	-	-	20.8
24/06:00am	12.6	13.4	12.6	100	0.0	CALM	0	0	0	0	-	-	20.6
24/05:30am	12.8	12.9	12.8	100	0.0	W	4	7	2	4	-	-	20.6
24/05:00am	13.0	12.8	13.0	100	0.0	W	6	11	3	6	-	-	20.6
24/04:30am	12.9	12.7	12.9	100	0.0	NW	6	9	3	5	-	-	20.4
24/04:00am	13.1	12.7	13.1	100	0.0	WSW	7	11	4	6	-	-	19.8
24/03:30am	13.1	12.9	13.1	100	0.0	NNW	6	9	3	5	-	-	18.4
24/03:00am	13.3	14.3	13.3	100	0.0	CALM	0	0	0	0	-	-	16.8
24/02:50am	13.3	13.6	13.3	100	0.0	NNE	4	9	2	5	-	-	16.4

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
24/02:36am	13.4	12.7	13.2	99	0.1	NNE	9	17	5	9	-	-	16.2
24/02:30am	13.5	13.4	13.3	99	0.1	SW	6	11	3	6	-	-	16.2
24/02:22am	13.6	13.3	13.4	99	0.1	S	7	11	4	6	-	-	16.0
24/02:21am	13.6	13.3	13.4	99	0.1	S	7	11	4	6	-	-	16.0
24/02:00am	13.8	12.1	13.6	99	0.1	S	15	26	8	14	-	-	15.0
24/01:30am	13.0	12.6	13.0	100	0.0	NNW	7	13	4	7	-	-	10.4
24/01:00am	12.6	12.7	12.6	100	0.0	W	4	11	2	6	-	-	6.4
24/12:51am	12.5	11.2	12.5	100	0.0	NE	11	15	6	8	-	-	4.2
24/12:30am	11.5	11.6	11.5	100	0.0	NW	2	11	1	6	-	-	4.2
24/12:21am	11.2	10.8	11.2	100	0.0	WNW	4	9	2	5	-	-	4.2
24/12:00am	11.3	11.7	11.3	100	0.0	CALM	0	0	0	0	-	-	4.2

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
23/11:57pm	11.3	11.7	11.3	100	0.0	CALM	0	0	0	0	-	-	4.2
23/11:37pm	11.8	12.4	11.8	100	0.0	CALM	0	0	0	0	-	-	4.2
23/11:30pm	11.6	12.1	11.6	100	0.0	CALM	0	0	0	0	-	-	4.2
23/11:04pm	11.7	12.2	11.7	100	0.0	CALM	0	0	0	0	-	-	4.2
23/11:00pm	11.9	12.5	11.9	100	0.0	CALM	0	0	0	0	-	-	4.2
23/10:30pm	12.8	13.6	12.6	99	0.1	CALM	0	0	0	0	-	-	4.2
23/10:00pm	13.2	13.8	13.0	99	0.1	W	2	6	1	3	-	-	4.2
23/09:30pm	13.8	14.7	13.0	95	0.4	CALM	0	0	0	0	-	-	4.2
23/09:00pm	14.4	15.1	13.4	94	0.6	SSE	2	9	1	5	-	-	4.2
23/08:30pm	14.5	13.9	13.5	94	0.6	SSE	9	15	5	8	-	-	4.2
23/08:00pm	14.2	14.1	13.4	95	0.4	SE	6	9	3	5	-	-	4.2
23/07:30pm	14.1	13.5	13.6	97	0.3	S	9	13	5	7	-	-	4.2
23/07:00pm	14.0	14.2	13.1	94	0.5	SSE	4	7	2	4	-	-	4.2
23/06:30pm	14.3	14.2	13.2	93	0.6	SSE	6	9	3	5	-	-	4.2
23/06:00pm	14.4	14.1	13.3	93	0.6	S	7	13	4	7	-	-	4.2
23/05:30pm	14.3	14.1	13.0	92	0.7	S	6	9	3	5	-	-	4.2
23/05:00pm	14.5	14.2	13.2	92	0.7	S	7	11	4	6	-	-	4.0
23/04:30pm	14.8	14.4	14.0	95	0.4	ESE	9	13	5	7	-	-	4.0
23/04:00pm	15.2	14.4	14.1	93	0.6	SE	11	15	6	8	-	-	4.0
23/03:30pm	15.5	15.1	14.0	91	0.8	E	9	13	5	7	-	-	3.8
23/03:00pm	16.1	14.9	14.1	88	1.1	E	13	19	7	10	-	-	3.8
23/02:30pm	16.5	15.6	14.9	90	0.9	E	13	19	7	10	-	-	3.6
23/02:00pm	16.2	15.4	13.9	86	1.3	ESE	11	17	6	9	-	-	3.6
23/01:30pm	16.5	15.7	14.0	85	1.4	ESE	11	19	6	10	-	-	3.6
23/01:00pm	16.7	16.1	14.5	87	1.3	ENE	11	17	6	9	-	-	3.6
23/12:30pm	16.4	16.4	15.3	93	0.6	E	9	13	5	7	-	-	3.4
23/12:00pm	15.3	16.2	15.1	99	0.1	ESE	4	7	2	4	-	-	3.2
23/11:49am	14.7	14.8	14.5	99	0.1	SSE	7	15	4	8	-	-	3.2
23/11:39am	14.5	14.1	14.0	97	0.3	S	9	17	5	9	-	-	2.8

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
23/11:30am	14.4	13.1	13.6	95	0.4	S	13	17	7	9	-	-	2.8
23/11:17am	14.9	14.6	14.4	97	0.3	SSE	9	13	5	7	-	-	2.6
23/11:00am	14.9	15.0	14.4	97	0.3	SSE	7	15	4	8	-	-	2.0
23/10:30am	15.5	15.5	15.3	99	0.1	SE	9	13	5	7	-	-	0.8
23/10:15am	15.5	15.0	14.9	96	0.3	S	11	19	6	10	-	-	0.6
23/10:00am	15.7	16.8	14.7	94	0.6	WNW	2	7	1	4	-	-	0.6
23/09:54am	15.7	17.2	14.7	94	0.6	CALM	0	6	0	3	-	-	0.4
23/09:49am	15.7	16.9	14.9	95	0.5	W	2	7	1	4	-	-	0.2
23/09:30am	15.7	16.0	14.4	92	0.7	SSE	6	13	3	7	-	-	0.0
23/09:28am	15.7	15.8	14.4	92	0.7	SSE	7	17	4	9	-	-	0.0
23/09:00am	15.8	15.2	13.6	87	1.2	SW	9	20	5	11	-	-	2.8
23/08:30am	14.6	13.7	13.8	95	0.4	SW	11	19	6	10	-	-	2.8
23/08:00am	13.5	13.3	13.5	100	0.0	WSW	7	15	4	8	-	-	2.6
23/07:30am	12.9	13.8	12.9	100	0.0	CALM	0	0	0	0	-	-	2.2
23/07:00am	12.5	12.9	12.5	100	0.0	WSW	2	9	1	5	-	-	2.2
23/06:30am	12.5	12.9	12.5	100	0.0	WNW	2	7	1	4	-	-	2.2
23/06:12am	12.4	12.8	12.4	100	0.0	W	2	7	1	4	-	-	2.0
23/06:00am	12.4	12.8	12.4	100	0.0	W	2	11	1	6	-	-	1.8
23/05:59am	12.4	12.4	12.4	100	0.0	W	4	11	2	6	-	-	1.8
23/05:58am	12.4	12.4	12.4	100	0.0	W	4	11	2	6	-	-	1.8
23/05:30am	12.4	12.0	12.4	100	0.0	W	6	9	3	5	-	-	1.4
23/05:24am	12.4	11.8	12.4	100	0.0	WSW	7	9	4	5	-	-	1.4
23/05:00am	12.4	11.8	12.4	100	0.0	W	7	11	4	6	-	-	1.0
23/04:49am	12.4	11.8	12.4	100	0.0	SW	7	11	4	6	-	-	1.0
23/04:30am	12.4	12.4	12.4	100	0.0	WNW	4	9	2	5	-	-	0.6
23/04:15am	12.4	12.0	12.4	100	0.0	WNW	6	9	3	5	-	-	0.4
23/04:00am	12.5	12.1	12.3	99	0.1	WNW	6	9	3	5	-	-	0.4
23/03:53am	12.4	12.7	12.2	99	0.1	WNW	2	7	1	4	-	-	0.0
23/03:30am	12.6	12.2	12.4	99	0.1	WNW	6	9	3	5	-	-	0.0
23/03:00am	12.8	11.9	12.6	99	0.1	WSW	9	13	5	7	-	-	0.0
23/02:30am	12.4	11.8	12.2	99	0.1	NNE	7	13	4	7	-	-	0.0
23/02:00am	12.3	11.9	12.3	100	0.0	NW	6	11	3	6	-	-	0.0
23/01:30am	12.1	12.8	12.1	100	0.0	CALM	0	7	0	4	-	-	0.0
23/01:00am	12.0	11.9	12.0	100	0.0	NNW	4	7	2	4	-	-	0.0
23/12:30am	11.7	12.2	11.7	100	0.0	CALM	0	0	0	0	-	-	0.0
23/12:07am	12.0	10.9	12.0	100	0.0	NW	9	13	5	7	-	-	0.0
23/12:00am	11.8	11.0	11.6	99	0.1	NNW	7	13	4	7	-	-	0.0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/11:43pm	11.0	11.3	10.8	99	0.1	CALM	0	0	0	0	-	-	0.0
22/11:30pm	11.9	12.4	11.7	99	0.1	CALM	0	6	0	3	-	-	0.0
22/11:00pm	12.7	12.2	12.2	97	0.3	SW	6	7	3	4	-	-	0.0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/10:30pm	12.9	12.9	12.3	96	0.3	S	4	9	2	5	-	-	0.0
22/10:00pm	13.5	13.0	12.6	94	0.5	SSW	7	11	4	6	-	-	0.0
22/09:30pm	13.9	13.0	12.6	92	0.7	SSW	9	15	5	8	-	-	0.0
22/09:00pm	14.3	13.9	12.3	88	1.1	SW	6	9	3	5	-	-	0.0
22/08:30pm	14.6	14.2	12.5	87	1.1	E	6	13	3	7	-	-	0.0
22/08:00pm	14.5	13.6	12.7	89	1.0	N	9	15	5	8	-	-	0.0
22/07:30pm	14.6	13.7	12.5	87	1.1	S	9	13	5	7	-	-	0.0
22/07:00pm	15.0	13.4	12.7	86	1.3	S	13	22	7	12	-	-	0.0
22/06:30pm	15.0	13.4	12.9	87	1.2	S	13	24	7	13	-	-	0.0
22/06:00pm	15.1	14.2	12.6	85	1.4	S	9	19	5	10	-	-	0.0
22/05:30pm	15.4	14.5	12.7	84	1.5	S	9	17	5	9	-	-	0.0
22/05:00pm	16.3	14.1	13.4	83	1.6	S	17	28	9	15	-	-	0.0
22/04:30pm	16.6	15.9	14.2	86	1.4	SSW	11	17	6	9	-	-	0.0
22/04:00pm	17.1	16.3	14.0	82	1.8	S	11	17	6	9	-	-	0.0
22/03:30pm	17.5	16.6	13.8	79	2.1	S	11	19	6	10	-	-	0.0
22/03:00pm	18.1	17.2	13.6	75	2.6	S	11	17	6	9	-	-	0.0
22/02:30pm	18.1	17.0	14.4	79	2.1	S	13	26	7	14	-	-	0.0
22/02:00pm	18.5	16.5	15.0	80	2.0	SSE	19	30	10	16	-	-	0.0
22/01:30pm	18.1	16.3	14.4	79	2.1	SSE	17	28	9	15	-	-	0.0
22/01:00pm	18.0	16.1	14.1	78	2.2	SSE	17	24	9	13	-	-	0.0
22/12:30pm	17.9	16.2	14.6	81	1.9	SSE	17	28	9	15	-	-	0.0
22/12:00pm	18.0	15.7	14.1	78	2.2	SSE	19	28	10	15	-	-	0.0
22/11:30am	18.5	15.5	12.0	66	3.6	SE	19	32	10	17	-	-	0.0
22/11:00am	18.4	18.2	16.7	90	1.0	SSE	13	20	7	11	-	-	0.0
22/10:30am	15.8	16.4	15.8	100	0.0	NNW	7	11	4	6	-	-	0.0
22/10:00am	13.8	14.6	13.8	100	0.0	NW	2	7	1	4	-	-	0.0
22/09:30am	13.4	13.3	13.4	100	0.0	NW	6	9	3	5	-	-	0.0
22/09:00am	13.4	13.1	13.4	100	0.0	NNW	7	13	4	7	-	-	5.0
22/08:30am	13.4	13.1	13.4	100	0.0	NNW	7	9	4	5	-	-	5.0
22/08:00am	13.1	13.3	13.1	100	0.0	W	4	7	2	4	-	-	5.0
22/07:30am	13.1	12.4	13.1	100	0.0	N	9	13	5	7	-	-	5.0
22/07:00am	12.8	12.5	12.8	100	0.0	NNE	6	9	3	5	-	-	5.0
22/06:53am	12.7	12.2	12.7	100	0.0	ENE	7	15	4	8	-	-	5.0
22/06:37am	11.6	11.3	11.6	100	0.0	WNW	4	13	2	7	-	-	5.0
22/06:30am	12.2	12.5	12.2	100	0.0	W	2	7	1	4	-	-	5.0
22/06:00am	12.6	13.4	12.6	100	0.0	CALM	0	6	0	3	-	-	4.8
22/05:30am	12.5	12.9	12.5	100	0.0	WSW	2	7	1	4	-	-	4.8
22/05:00am	12.4	13.2	12.4	100	0.0	CALM	0	0	0	0	-	-	4.8
22/04:51am	12.3	12.6	12.3	100	0.0	NW	2	7	1	4	-	-	4.8
22/04:30am	12.3	13.0	12.3	100	0.0	CALM	0	0	0	0	-	-	4.8
22/04:00am	12.1	12.4	12.1	100	0.0	NW	2	7	1	4	-	-	4.8
22/03:47am	12.3	13.0	12.3	100	0.0	CALM	0	0	0	0	-	-	4.8
22/03:38am	12.7	12.8	12.7	100	0.0	NW	4	7	2	4	-	-	4.8
22/03:30am	12.6	12.1	12.6	100	0.0	NNW	7	9	4	5	-	-	4.8

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/03:22am	12.5	12.1	12.5	100	0.0	NW	6	9	3	5	-	-	4.8
22/03:00am	12.6	12.3	12.6	100	0.0	NW	6	11	3	6	-	-	4.8
22/02:55am	12.8	12.5	12.8	100	0.0	N	6	11	3	6	-	-	4.8
22/02:30am	11.8	12.4	11.8	100	0.0	CALM	0	0	0	0	-	-	4.8
22/02:00am	12.5	13.3	12.5	100	0.0	CALM	0	0	0	0	-	-	4.6
22/01:30am	13.1	12.9	13.1	100	0.0	NW	6	9	3	5	-	-	4.6
22/01:00am	13.2	13.8	13.2	100	0.0	NW	2	7	1	4	-	-	4.6
22/12:30am	13.2	13.8	13.2	100	0.0	NNW	2	6	1	3	-	-	4.6
22/12:00am	13.4	13.7	13.4	100	0.0	NW	4	7	2	4	-	-	4.6

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
21/11:30pm	13.8	14.6	13.8	100	0.0	W	2	7	1	4	-	-	4.6
21/11:00pm	14.1	14.3	14.1	100	0.0	WSW	6	13	3	7	-	-	4.6
21/10:30pm	14.2	14.2	14.2	100	0.0	NW	7	11	4	6	-	-	4.4
21/10:28pm	14.2	13.8	14.2	100	0.0	NW	9	13	5	7	-	-	4.4
21/10:08pm	14.3	15.3	14.3	100	0.0	WSW	2	6	1	3	-	-	4.0
21/10:00pm	14.3	14.9	14.3	100	0.0	WSW	4	9	2	5	-	-	4.0
21/09:30pm	14.4	14.5	14.4	100	0.0	SW	7	11	4	6	-	-	3.8
21/09:07pm	14.4	14.1	14.4	100	0.0	WSW	9	11	5	6	-	-	3.6
21/09:00pm	14.4	14.1	14.4	100	0.0	WSW	9	13	5	7	-	-	3.6
21/08:30pm	14.4	15.1	14.4	100	0.0	NE	4	9	2	5	-	-	3.4
21/08:25pm	14.4	14.7	14.4	100	0.0	NNW	6	11	3	6	-	-	3.0
21/08:09pm	14.5	15.2	14.5	100	0.0	SW	4	9	2	5	-	-	3.0
21/08:00pm	14.5	15.2	14.5	100	0.0	SSE	4	9	2	5	-	-	2.8
21/07:45pm	14.5	14.6	14.5	100	0.0	ENE	7	9	4	5	-	-	2.4
21/07:30pm	14.5	14.7	14.3	99	0.1	W	6	9	3	5	-	-	1.8
21/07:00pm	14.7	15.0	14.5	99	0.1	WNW	6	9	3	5	-	-	1.6
21/06:30pm	14.5	15.9	14.3	99	0.1	CALM	0	0	0	0	-	-	1.6
21/06:00pm	14.5	14.5	14.3	99	0.1	NW	7	11	4	6	-	-	1.6
21/05:30pm	14.6	15.0	13.8	95	0.4	NE	4	7	2	4	-	-	1.6
21/05:00pm	15.5	15.3	13.7	89	1.0	S	7	11	4	6	-	-	1.6

This page was created at **16:53 on Tuesday 24 May 2022 (AEST)**

APPENDIX D

LABORATORY SUMMARY TABLES

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Results Table 1

Project Number: 304500142
Site Identification: Wiley Park Station
Report Title: Surface Water Monitoring

				TPH	Inorganics				Physio-Chemical			
			Chlorophyll a	Oil and Grease	Nitrogen (Total as N)	Phosphorus (Total as P)	TSS	Turbidity	pH	°C Temprature	Electrical Conductivity	Dissolved Oxygen
			mg/L	mg/L	mg/L	µg/L	mg/L	NTU	Units	°C	uS/cm	%Sat
EQL			0.002	10	0.2	10	1	1	0.01	0.1	0.1	0.1
ANZECC Criteria - Freshwater			**0.003**	**-**	**0.35**	**25**	**-**	**<6-50**	**6.5-8.5**	**-**	**125-2200**	**85% - 110%**
Lab Report Number	**Field ID**	**Date**										
892410	**WP1**	**24/05/2022**	**<0.010**	<10	**2.5**	**160**	<5	14.0	6.82	17.1	590.0	85.3
892410	**WP2**	**24/05/2022**	**<0.010**	<10	**1.8**	**140**	<5	16.0	**9.02**	16.9	556.4	**83.2**
892410	**WP2-DP1**	**24/05/2022**	**<0.010**	<10	**3.1**	**40**	23	18.0	**10.49**	17.4	502.3	**64.4**
892410	**QA100**	**24/05/2022**	-	<10	**2.7**	**130**	<5	15.0	-	-	-	-
ES2218009	**QA200**	**24/05/2022**	-	<5	**2.4**	**130**	6	17.7	-	-	-	-
Maximum Concentration			**<0.010**	<10	**3.1**	**160**	23	18.0	**10.49**	17.4	590.0	**85.3**

APPENDIX

E

QUALITY ASSURANCE/QUALITY CONTRAL

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Quality Assurance/Quality Control (QA/QC) procedures were implemented to ensure the precision accuracy, representativeness, completeness and comparability of all data gathered. The QA/QC procedures included:

- Equipment calibration to ensure field measurements obtained are accurate
- Equipment decontamination to prevent cross contamination
- Use of appropriate measures (i.e. gloves) to prevent cross contamination
- Appropriate sample identification
- Correct sample preservation
- Sample transport with Chain of Custody (CoC) documentation
- Laboratory analysis in accordance with NATA accredited methods.

Table E1 details the QA/QC procedures and sample collection details undertaken through the surface water elements of the investigation. Copies of all the CoCs, along with the Sample Receipt Notifications (SRNs), Interpretive QA/QC Reports are provided in **Appendix F**.

Table E1 Field QA/QC Method Validation

Requirement	Yes / No	Comments
Equipment decontamination	Yes	In the event of involving reusable equipment. Decontamination of sampling equipment (water quality meter, telescopic water scoop etc.) was undertaken by washing with phosphate free detergent (Liquinox) followed by a rinse with potable water.
Sample collection	Yes	Samples were collected using disposable nitrile gloves via telescopic water scoop. A clean pair of gloves was used for each new sample being collected to limit the possibility of cross-contamination.
QA/QC sample collection*	Yes	One (1) surface water duplicate and one (1) surface water triplicate sample were collected for intra and inter-lab QA/QC purposes to monitor the quality of the field practices for sample collection. Stantec based the investigation around a rate of one duplicate and triplicate sample per sampling event, as the requirement for duplicate and triplicate sample collection.
Sample identification	Yes	All samples were marked with a unique identifier including project number, sample location, and date.
Sample preservation	Yes	Samples were placed in a chilled ice box with ice for storage and transport to the laboratory.
CoC documentation	Yes	A CoC form was completed by Stantec detailing sample identification, collection date, sampler and laboratory analysis required. The CoC form was signed off and returned to Stantec by the laboratory staff upon receipt of all the samples. CoC forms and Sample Receipt Notification (SRN) are provided in **Appendix F**. The SRN indicates that the samples were received at the laboratory intact and chilled and within the required holding times.
NATA accredited methods	Yes	The NATA accredited Eurofins mgt and ALS Analysed the samples in accordance with NATA accredited methods. Analytical methods used are indicated in the stamped laboratory results provided in **Appendix F**.
Laboratory Internal QC	Yes	All Data Quality Objectives were met by the laboratories.

Table E2 Field QA/QC Collection Summary

Environmental Media	Date	Primary	Duplicate	Triplicate
Surface Water	24/05/2022	WP2	QA100	QA200

Relative Percentage Difference Determination

Laboratory results for duplicate and triplicate samples are assessed using a determination of the Relative Percentage Difference (RPD). Where a primary sample and a duplicate sample are compared, the RPD provides an indication of the reproducibility of the results, which incorporates the sampling method. Where a primary sample and a split sample are compared, the RPD provides an indication of the accuracy of the primary laboratory results as compared to the secondary laboratory result.

The calculation used to determine the RPD is:

$$RPD = \frac{(Co - Cs)}{\left(\frac{Co + Cs}{2}\right)} x100$$

Where:

Co = Concentration of the original sample

Cs = Concentration of the duplicate sample

In calculating the RPD values the following protocols were adopted:

- Where both concentrations are above laboratory reporting limits the RPD formula is used;
- Where both concentrations are below the laboratory reporting limits, no RPD is calculated; and
- Where one or both sample concentrations are reported to be less than ten times (<10x) the laboratory reporting limit, the RPD is calculated but is not assessed against the adopted criterion.

In accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013, Stantec adopts an RPD acceptance criterion up to 30% of the mean concentration of the analyte. It should be noted that variations might be higher for organic analysis, due to the volatile nature of the components, and for low concentrations of analytes.

The adopted criterion will not apply to RPDs where one of both concentrations are less than 10 times the reporting limit, as this criterion would otherwise overestimate the significance of minor variations in concentrations at or near the laboratory reporting limit. Large RPDs returned for low concentrations of analytes near the reporting limit is not as indicative of a significant difference in the results as a small RPD is for larger concentrations.

This approach is employed by NATA-accredited laboratories when assessing internal duplicate sample RPDs. This approach acknowledges that concentrations at or around the reporting limit are too low for an accurate evaluation of the significance of the RPD.

This approach has been adopted when assessing the relevance (compliance) of RPDs during this investigation. RPDs will be calculated for sample sets where one or both concentrations are less than 10 times the reporting limit for discussion purposes, but will not be assessed as a pass or fail in relation to the criterion.

The RPD results for duplicate samples are presented in this appendix. Although two (2) RPD values were reported to be above the accepted 30% RPD criteria. The breaches in RPDs are not considered to alter the overall outcome of the assessment. It can be concluded that the analytical data can be relied upon for the purposes of this factual report.

Laboratory QC and QCI Report Summary

The laboratories selected for undertaking the analysis (Eurofins mgt and ALS) are NATA-accredited for the analysis required, and undertook certain QA/QC requirements to demonstrate the suitability of the data that is obtained. The laboratory is required to undertake and report internal laboratory Quality Control (QC) procedures for all chemical analysis undertaken. The QC testing is required to include:

- Laboratory duplicate sample analysis at the rate of one duplicate analysis per ten samples
- Method blank at the rate of one method blank analysis per 20 samples

- Laboratory control sample at the rate of one laboratory control sample analysis per 20 samples
- Spike recovery analysis at the rate of one spike recovery analysis per 20 samples.

Compliance with the laboratory QA/QC requirements and non-conformance details are discussed in the internal Laboratory QA/QC reports included with the certificates of analysis in **Appendix F**. Laboratory QA/QC requirements were within acceptance limits.

Stantec concludes that the data reported by the NATA-accredited Eurofins mgt and ALS as presented in this report is suitable for interpretative purposes and to make conclusions/recommendations regarding water quality.

				TPH					
				Oil and Grease	Phosphate total (as P)	Chlorophyll a	Nitrogen (Total)	TSS	Turbidity
				mg/L	mg/L	µg/L	µg/L	µg/L	NTU
EQL				5	0.01	5	100	5,000	0.1
Lab Report Number	**Field ID**	**Matrix Type**	**Date**						
892410	**WP2**	**water**	**24/05/2022**	<10	0.14	<10	1,800	<5,000	16
	QA100	**water**	**24/05/2022**	<10	0.13	NT	2,700	<5,000	15
RPD				0	7	-	**40**	0	6
892410	**WP2**	**water**	**24/05/2022**	<10	0.14	<10	1,800	<5,000	16
ES2218009	**QA200**	**water**	**24/05/2022**	<5	0.13	NT	2,400	6,000	17.7
RPD				0	7	-	**29**	**18**	10

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

APPENDIX

F

LABORATORY REPORTS

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CHAIN OF CUSTODY AND ANALYSIS REQUEST

Contact Person:	Jiaqi Zhou	**Project Name:**	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	**Project Number:**	NE30161
Alternative Contact:	Chong Zheng	**PO No.:**	
Telephone Number:	0451 780 991	**Project Specific Quote No. :**	190408CDNN_1
Sampler:	CZ	**Turnaround Requirements:**	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	**Lab:**	Eurofins | Unit F3, Building F, 16 Mars Rd, Lane Cove West NSW2066
Address:	Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia	**Attn:**	Sample Receipt

Sample information						Analysis Required												Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	Chlorophyll-a	TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							
WP1		5	ICE	24/05/2022	Water	1	1	1	1	1	1							Please reduce the detection limit of Chlorophyll a from 5 ug/L to 2 ug/L
WP2		5	ICE	24/05/2022	Water	1	1	1	1	1	1							
WP2-DP1		5	ICE	24/05/2022	Water	1	1	1	1	1	1							
QA100		4	ICE	24/05/2022	Water		1	1	1	1	1							

Relinquished by: Chong Zeng	**Received by:**	**Relinquished by:**	**Received by:**	**Relinquished by:**
(name / company) Cardno ACT/NSW Pty Ltd	(name / company)	(name / company	(name / company)	(name / company)
Date & Time: 24/05/2022	**Date & Time:**	**Date & Time:**	**Date & Time:**	**Date & Time:**
Signature: CZ	**Signature:**	Signature:	Signature:	**Signature:**
Received by:	**Relinquished by:**	**Received by:**	**Relinquished by:**	***Lab use:***
(name / company)	(name / company)	(name / company	(name / company)	**Samples Received: Cool or Ambient (circle one)**
Date & Time:	**Date & Time:**	**Date & Time:**	**Date & Time:**	**Temperature Received at: (if applicable)**
Signature:	**Signature:**	**Signature:**	**Signature:**	**Transported by: Hand delivered / courier**

Gil . Syd ~~2??~~ 24/5/22 3:30pm 12°c 892410

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www.eurofins.com.au EnviroSales@eurofins.com

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

Newcastle
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Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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NATA # 2377 Site # 2370

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IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name:	Stantec Australia Pty Ltd (NSW/ACT)
Contact name:	- ALL INVOICES
Project name:	DOWNER SYDNEY METRO STATIONS- WILEY PARK
Project ID:	NE30161
Turnaround time:	5 Day
Date/Time received	May 24, 2022 3:30 PM
Eurofins reference	892410

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Hannah Mawbey on phone : or by email: HannahMawbey@eurofins.com

Results will be delivered electronically via email to - ALL INVOICES - sapinvoices@stantec.com.

Note: A copy of these results will also be delivered to the general Stantec Australia Pty Ltd (NSW/ACT) email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Project Name: DOWNER SYDNEY METRO STATIONS- WILEY PARK
Project ID: NE30161

Order No.:
Report #: 892410
Phone:
Fax:

Received: May 24, 2022 3:30 PM
Due: May 31, 2022
Priority: 5 Day
Contact Name: - ALL INVOICES

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Suspended Solids Dried at 103°C–105°C	Turbidity	Total Nitrogen Set (as N)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X				X
Sydney Laboratory - NATA # 1261 Site # 18217								X	X	X	
Brisbane Laboratory - NATA # 1261 Site # 20794											
Mayfield Laboratory - NATA # 1261 Site # 25079											
Perth Laboratory - NATA # 2377 Site # 2370											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	May 24, 2022		Water	S22-My0067432	X	X	X	X	X	X
2	WP2	May 24, 2022		Water	S22-My0067433	X	X	X	X	X	X
3	WP2-DP1	May 24, 2022		Water	S22-My0067434	X	X	X	X	X	X
4	QA100	May 24, 2022		Water	S22-My0067435		X	X	X	X	X
Test Counts						3	4	4	4	4	4

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Stantec Australia Pty Ltd
Level 22, 570 Bourke Street
Melbourne
VIC 3000

Attention: **- ALL INVOICES**

Report **892410-W**
Project name DOWNER SYDNEY METRO STATIONS- WILEY PARK
Project ID NE30161
Received Date May 24, 2022

Client Sample ID			**WP1**	**WP2**	**WP2-DP1**	**QA100**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**S22-My0067432**	**S22-My0067433**	**S22-My0067434**	**S22-My0067435**
Date Sampled			**May 24, 2022**	**May 24, 2022**	**May 24, 2022**	**May 24, 2022**
Test/Reference	LOR	Unit				
Chlorophyll a	5	ug/L	< 10	< 10	< 10	-
Nitrate & Nitrite (as N)	0.05	mg/L	1.9	1.8	2.3	1.8
Oil & Grease (HEM)	10	mg/L	< 10	< 10	< 10	< 10
Phosphate total (as P)	0.01	mg/L	0.16	0.14	0.04	0.13
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.6	< 0.2	0.8	0.9
Total Nitrogen (as N)*	0.2	mg/L	2.5	1.8	3.1	2.7
Total Suspended Solids Dried at 103°C–105°C	5	mg/L	< 5	< 5	23	< 5
Turbidity	1	NTU	14	16	18	15

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chlorophyll a	Melbourne	May 31, 2022	28 Days
- Method: LTM-INO-4340 Chlorophyll a in Waters			
Oil & Grease (HEM)	Melbourne	May 30, 2022	28 Days
- Method: LTM-INO-4180 Oil and Grease (APHA 5520B)			
Phosphate total (as P)	Sydney	May 31, 2022	28 Days
- Method: E052 Total Phosphate (as P)			
Total Suspended Solids Dried at 103°C–105°C	Sydney	May 31, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	May 31, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	May 30, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	May 30, 2022	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			

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Rolleston, Christchurch 7675
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IANZ # 1290

Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Order No.:
Report #: 892410
Phone:
Fax:

Received: May 24, 2022 3:30 PM
Due: May 31, 2022
Priority: 5 Day
Contact Name: - ALL INVOICES

Project Name: DOWNER SYDNEY METRO STATIONS- WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Suspended Solids Dried at 103°C–105°C	Turbidity	Total Nitrogen Set (as N)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X				X
Sydney Laboratory - NATA # 1261 Site # 18217								X	X	X	
Brisbane Laboratory - NATA # 1261 Site # 20794											
Mayfield Laboratory - NATA # 1261 Site # 25079											
Perth Laboratory - NATA # 2377 Site # 2370											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	May 24, 2022		Water	S22-My0067432	X	X	X	X	X	X
2	WP2	May 24, 2022		Water	S22-My0067433	X	X	X	X	X	X
3	WP2-DP1	May 24, 2022		Water	S22-My0067434	X	X	X	X	X	X
4	QA100	May 24, 2022		Water	S22-My0067435		X	X	X	X	X
Test Counts						3	4	4	4	4	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Oil & Grease (HEM)	mg/L	< 10			10	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Total Suspended Solids Dried at 103°C–105°C	mg/L	< 5			5	Pass	
Turbidity	NTU	< 1			1	Pass	
LCS - % Recovery							
Nitrate & Nitrite (as N)	%	98			70-130	Pass	
Oil & Grease (HEM)	%	120			70-130	Pass	
Phosphate total (as P)	%	98			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	99			70-130	Pass	
Total Suspended Solids Dried at 103°C–105°C	%	112			70-130	Pass	
Turbidity	%	85			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Kjeldahl Nitrogen (as N)	S22-My0067432	CP	%	80			70-130	Pass	
Total Suspended Solids Dried at 103°C–105°C	S22-My0062961	NCP	%	109			70-130	Pass	
Spike - % Recovery									
				Result 1					
Phosphate total (as P)	S22-My0067433	CP	%	84			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M22-My0060637	NCP	mg/L	0.06	0.07	17	30%	Pass	
Total Suspended Solids Dried at 103°C–105°C	S22-My0062297	NCP	mg/L	26	27	3.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Turbidity	S22-My0067433	CP	NTU	16	17	3.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Phosphate total (as P)	S22-My0067434	CP	mg/L	0.04	0.06	27	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	S22-My0067435	CP	mg/L	0.9	0.5	67	30%	Fail	Q15

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Robert Biviano	Analytical Services Manager
Caitlin Breeze	Senior Analyst-Inorganic
Ryan Phillips	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Shaping the Future

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zheng	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	CZ	Turnaround Requirements:	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	Lab:	ALS | 277-289 Woodpark Rd, Smithfield NSW 2164
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix		TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							Comments
QA200		4	ICE		Water		1	1	1	1	1							

HT

Environmental Division
Sydney
Work Order Reference
ES2218009

Telephone : + 61-2-8784 8555

Relinquished by: Chong Zeng	Received by: SCS	Relinquished by:	Received by:	Relinquished by:
(name / company) Cardno ACT/NSW Pty Ltd	(name / company)	(name / company	(name / company)	(name / company)
Date & Time: 24/05/2022	Date & Time: 24/5/22 1600	Date & Time:	Date & Time:	Date & Time:
Signature: CZ	Signature: [signature] 1620	Signature:	Signature:	Signature:
Received by:	Relinquished by:	Received by:	Relinquished by:	*Lab use:*
(name / company)	(name / company)	(name / company	(name / company)	Samples Received: Cool or Ambient (circle one)
Date & Time:	Date & Time:	Date & Time:	Date & Time:	Temperature Received at: (if applicable)
Signature:	Signature:	Signature:	Signature:	Transported by: Hand delivered / courier

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2218009**

Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jiaqi.zhou@cardno.com.au	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: Downer Sydney Metro Stations - WIley Park	Page	: 1 of 2
Order number	: NE030161	Quote number	: EB2022MWHAUS0006 (BN/BQ)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CZ		

Dates

Date Samples Received	: 24-May-2022 16:00	Issue Date	: 27-May-2022
Client Requested Due Date	: 31-May-2022	Scheduled Reporting Date	: **31-May-2022**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 10.2'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA025H Suspended Solids - Standard Level	WATER - EA045 Turbidity	WATER - EP020 Oil & Grease (O&G)	WATER - NT-11 Total Nitrogen and Total Phosphorus
ES2218009-001	24-May-2022 00:00	QA200	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS ADDRESS		
- A4 - AU Tax Invoice (INV)	Email	accounts.au@stantec.com
CHONG ZENG		
- *AU Certificate of Analysis - NATA (COA)	Email	chong.zeng@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	chong.zeng@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	chong.zeng@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	chong.zeng@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	chong.zeng@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	chong.zeng@cardno.com.au
- EDI Format - XTab (XTAB)	Email	chong.zeng@cardno.com.au
CONTAM NSW		
- *AU Certificate of Analysis - NATA (COA)	Email	contamnsw@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	contamnsw@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	contamnsw@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	contamnsw@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	contamnsw@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	contamnsw@cardno.com.au
- EDI Format - XTab (XTAB)	Email	contamnsw@cardno.com.au
JIAQI ZHOU		
- *AU Certificate of Analysis - NATA (COA)	Email	jiaqi.zhou@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jiaqi.zhou@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jiaqi.zhou@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jiaqi.zhou@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - XTab (XTAB)	Email	jiaqi.zhou@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2218009**	Page	: 1 of 2
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 24-May-2022 16:00
Order number	: NE030161	Date Analysis Commenced	: 27-May-2022
C-O-C number	: ----	Issue Date	: 31-May-2022 14:38
Sampler	: CZ		
Site	: ----		
Quote number	: BN/BQ		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QA200**	----	----	----	----
			Sampling date / time	24-May-2022 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2218009-001**	--------	--------	--------	--------
				Result	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**6**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**17.7**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.46**	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.9**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**2.4**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.13**	----	----	----	----
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	----	----	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2218009**	Page	: 1 of 3
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 24-May-2022
Order number	: NE030161	Date Analysis Commenced	: 27-May-2022
C-O-C number	: ----	Issue Date	: 31-May-2022
Sampler	: CZ		
Site	: ----		
Quote number	: BN/BQ		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4366750)									
ES2218009-001	QA200	EA025H: Suspended Solids (SS)	----	5	mg/L	6	<5	26.1	No Limit
ES2218426-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	70	66	6.2	0% - 50%
EA045: Turbidity (QC Lot: 4366241)									
ES2217838-002	Anonymous	EA045: Turbidity	----	0.1	NTU	141	141	0.0	0% - 20%
ES2217969-007	Anonymous	EA045: Turbidity	----	0.1	NTU	1.9	1.9	0.0	0% - 50%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4365751)									
ES2218069-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	<0.10	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4365753)									
ES2218009-001	QA200	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.9	1.0	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4365754)									
ES2218009-001	QA200	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.13	0.14	0.0	0% - 50%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4366750)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	83.0	129
				<5	1000 mg/L	99.8	82.0	110
				<5	835 mg/L	98.7	83.0	118
EA045: Turbidity (QCLot: 4366241)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	97.2	91.0	105
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4365751)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	96.8	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4365753)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	90.7	69.0	101
				<0.1	1 mg/L	85.6	70.0	118
				<0.1	5 mg/L	81.1	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4365754)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	95.2	71.3	126
				<0.01	0.442 mg/L	93.2	71.3	126
				<0.01	1 mg/L	94.3	71.3	126
EP020: Oil and Grease (O&G) (QCLot: 4366760)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	92.1	81.0	121

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4365751)							
ES2218069-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	100	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4365753)							
ES2218069-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	78.1	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4365754)							
ES2218069-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	87.9	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2218009**	Page	: 1 of 4
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Telephone	: +61-2-8784 8555
Project	: Downer Sydney Metro Stations - Wlley Park	Date Samples Received	: 24-May-2022
Site	: ----	Issue Date	: 31-May-2022
Sampler	: CZ	No. of samples received	: 1
Order number	: NE030161	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA045: Turbidity						
Clear Plastic Bottle - Natural						
QA200	----	----	----	28-May-2022	26-May-2022	**2**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
QA200	**24-May-2022**	**----**	----	----	**30-May-2022**	31-May-2022	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
QA200	**24-May-2022**	**----**	----	----	**28-May-2022**	26-May-2022	×
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
QA200	**24-May-2022**	**----**	----	----	**27-May-2022**	21-Jun-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
QA200	**24-May-2022**	**27-May-2022**	21-Jun-2022	✓	**27-May-2022**	21-Jun-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
QA200	**24-May-2022**	**27-May-2022**	21-Jun-2022	✓	**27-May-2022**	21-Jun-2022	✓
EP020: Oil and Grease (O&G)							
Amber Jar - Sulfuric Acid or Sodium Bisulfate (EP020)							
QA200	**24-May-2022**	**----**	----	----	**30-May-2022**	21-Jun-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	4	**75.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	4	**75.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

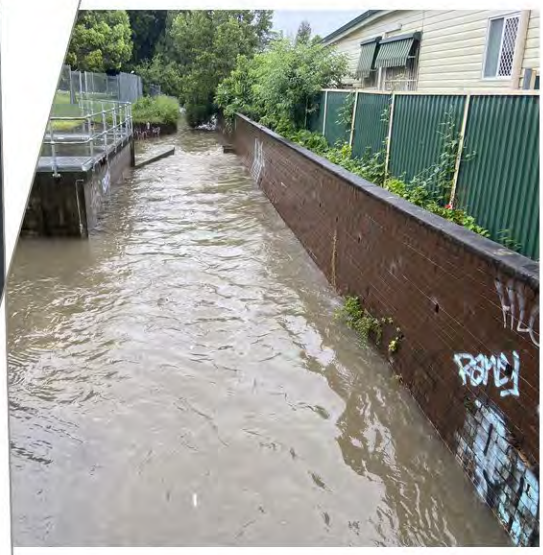
The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

Appendix 2 – Surface Water Monitoring Report - 304100142_R010_SWM_WileyPark_Rev0

Surface Water Monitoring Report - Wiley Park Station



Wiley Park Station

304500142

Prepared for
Downer EDI Works Pty Ltd

15 September 2022

Cardno

now

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Rev0	15/09/2022	Final	M.Jorgensen	M.Jorgensen

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Appendices

Tables

1 Introduction

1.1 Background

Stantec Australia Pty Ltd ("Cardno now Stantec") was commissioned by Downer EDI Works Pty Ltd ("Downer EDI") to undertake monitoring and reporting of surface water quality of the unnamed channel within proximity to Wiley Park Station Upgrade worksite. The proposed works includes the upgrade of the main station and installation of the Metro Services Building (MSB).

Surface water quality of the channel within proximity to Wiley Park Upgrade worksite is to be monitored as per the requirements summarised in the **Table 1-2**, which is excerpted from the Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Soil and Water Management Plan (SWMP). The monitoring program are prepared to meet the requirements outlined in *The Sydney Metro City and Southwest – Sydenham to Bankstown Upgrade Conditions of Approval SSi-8256*, specifically Condition 8 to Condition 10. The sampling locations (WP1 – Upstream and WP2 – Downstream) of the water quality monitoring are shown on Figure GS004 in **Appendix A.** In order to establish a more robust dataset of how the downstream discharge points affect the water quality, Downer EDI has requested two additional sampling locations at the downstream discharge points (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) of the water quality monitoring since May 2022. This additional sampling at the downstream discharge points is subject to the flow contribution at the time of each monitoring event. Refer to Figure GS004 in **Appendix A** for approximate locations of the sampling locations.

The closest project worksite to an existing watercourse is Wiley Park Station services building, which is located approximately 100 m from an unnamed concrete-lined channel, which forms the upper reaches of Coxs Creek and is identified as a first-order stream.

For the purpose of establishing baseline water quality data within the first-order stream at Wiley Park, water quality monitoring was intended to be undertaken for a period prior to construction of the Wiley Park services building as outlined in the Table 13 of the SWMP. At a minimum, one dry-weather sample and one wet weather sample (weather permitting) were intended to be collected during the pre-construction period. The frequency of pre-construction water quality monitoring within this channel was subject to water being present within the structure. However, during the baseline monitoring period no wet-weather events were able to be captured prior to commencement of construction. A dry-weather baseline monitoring event was undertaken on 10 March 2021.

This report presents the findings from the twelfth surface water monitoring event which includes:

- Original scope: routine investigation works per agreed scope were undertaken by Cardno now Stantec on 4 July 2022.
- Additional scope: additional investigation works per request from the client were undertaken by Cardno now Stantec on 4 and 21 July 2022 regarding the elevated pH measured at WP2-DP1 during routine investigation works.

The event undertaken was a mid-construction wet-weather event. **Table 1-1** below summarises the surface water monitoring events undertaken to date by Cardno now Stantec.

Table 1-1 Summary of Surface Water Monitoring Event Undertaken to Date

Date of Monitoring	Type of Event	Report Reference
10 March 2021	Pre-construction Dry Baseline	4NE30187_R001_SWM_WileyPark_Rev0
20 March 2021	Mid Construction Wet Weather	4NE30187_R001_SWM_WileyPark_Rev0
5 May 2021	Mid Construction Wet Weather	4NE30187_R002_SWM_WileyPark_Rev0
1 July 2021	Mid Construction Dry Weather	NE30161_R003_SWM_WileyPark_Rev0
30 September 2021	Mid Construction Dry Weather	NE30161_R004_SWM_WileyPark_Rev0
12 November 2021	Mid Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
26 November 2021	Mid Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
9 and 10 February 2022	Mid Construction Dry Weather	NE30161_R006_SWM_WileyPark_Rev0
23 February 2022	Mid Construction Wet Weather	NE30161_R007_SWM_WileyPark_Rev0
9 March 2022	Mid Construction Wet Weather	NE30161_R008_SWM_WileyPark_Rev0
24 May 2022	Mid Construction Wet Weather	NE30161_R009_SWM_WileyPark_Rev0
4 and 21 July 2022	Mid Construction Wet Weather	NE30161_R010_SWM_WileyPark_RevA

1.1 Purpose and Objective

The purpose of the surface water monitoring works is to monitor and record surface water quality within the unnamed channel in accordance with the monitoring program as outlined in the site's SWMP. The objective of the works is to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel.

1.2 Scope of Works

Cardno now Stantec undertook the following scope of works during this monitoring event to meet the objectives of this investigation:

> Original scope:

- Inspected and sampled two (2) original nominated surface water sampling locations (WP1 – upstream and WP2 – downstream) on 4 July 2022 as part of mid-construction wet-weather monitoring event.
- Inspected and sampled two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) on 4 July 2022 as part of mid-construction wet-weather monitoring event.
- Recorded field parameters (measured using a calibrated water quality meter) and noted observations of the water bodies during sampling. Field parameters measured included:
  - Dissolved oxygen (DO);
  - Electrical conductivity (EC);
  - Potential of hydrogen (pH);
  - Oxidation-reduction potential (ORP); and
  - Temperature.
- Collected four (4) primary surface water samples from WP1, WP2, WP2-DP1 and WP2-DP2 with one (1) intra-lab duplicate sample and one (1) inter-lab duplicate sample per sampling event for submission to a National Association of Testing Authorities, Australia (NATA) certified laboratory for analytical testing of primary and additional quality assurance/quality control (QA/QC) samples. Samples were submitted for analysis of:

    - Oil & Grease;
    - Total Suspended Solids (TSS);
    - Nutrients (Total Phosphorous and Total Nitrogen);
    - Turbidity; and
    - Chlorophyll-*a*.
  - Reviewed the analytical and field data and prepared this report.
- Additional scope:
  - Additional investigation works undertaken on 4 July 2022
    - Cardno now Stantec field team accompany with a Downer EDI delegate undertook a walkover inspection within the Wiley Park worksite that is upstream of WP2-DP1 where elevated pH was measured. This inspection is intended to identify any potential flow contribution(s) from an on-site or off-site source;
    - Field measurements were undertaken of the water from identified flow contributions using a calibrated water quality meter. Field parameters recorded included:
      - DO;
      - EC;
      - pH;
      - ORP; and
      - Temperature.
  - Additional investigation works undertaken on 21 July 2022
    - Review of Wiley Park worksite drainage plans (refer to **Appendix G**) provided by Downer EDI with focus on the Wiley Park worksite area that is upstream of WP2-DP1. Drainage plans reviewed included:
      - SMCSWSWM-MTM-WWP-CE-DWG-483301.00.AFC.00.02;
      - SMCSWSWM-MTM-WWP-DD-DWG-233308.00.AFC.00.01;
      - SMCSWSWM-MTM-WWP-DD-DWG-233317.00.AFC.00.01;
      - SMCSWSWM-MTM-WWP-DD-DWG-233318.00.AFC.00.02;
      - SMCSWSWM-MTM-WWP-DD-DWG-233319.00.AFC.00.01; and
      - SMCSWSWM-MTM-WWP-DD-DWG-233320.01.AFC.01.01.
    - Based on the review of the drainage plans, a detailed inspection and investigation plan was provided to Downer EDI via email for review and approval. The plan aims to identify any potential source(s) that has caused this elevated pH measurement at WP2-DP1 and generally includes:
      - Check all the accessible drainage pits and surface water within the worksite area that is upstream to WP2-DP1 and undertake the field measurements (DO, EC, pH, ORP and temperature) of the surface water at various locations as planned using a calibrated water quality meter.
      - Undertake soil pH measurement for the surficial site soils on-site via a soil pH testing kit (Manutec soil pH test kit) as well as via laboratory analysis.
    - Field inspection and investigation per details outlined in the plan above.
  - Reviewed the analytical and field data and prepared this report.

Details of the monitoring program are shown below.

Table 1-2 Wiley Park Water Quality Monitoring Program

Wiley Park Water Quality Monitoring Program	
Waterway	Sydney Water Cooks River Channel (first-order stream)
Indicative monitoring points	WP1 – upstream
	WP2 – downstream
	WP2-DP1 – downstream eastern discharge point
	WP2-DP2 – downstream western discharge point
Additional monitoring works	Based on the measurements of elevated pH level at WP2-DP1, additional works were undertaken as requested by the client in order to identify any potential source(s) within the upstream area. Refer to Section 1.2 for the detailed scope of additional works undertaken.
Interaction with Project works	Channel within proximity to Wiley Park service building site
Pre-construction works	Monthly for parameters detailed in Table 11 (including at least one dry-weather round of sampling). One wet-weather event, if possible, for the parameters detailed in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling is undertaken immediately during construction hours and if it is safe to do so.
During construction of the Wiley Park services building	Quarterly for parameters detailed in Table 11 (including during dry weather). Four wet-weather events per year for the parameters in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.

2 Guidelines and Legislation

There are a range of Guidelines and Legislation and Conditions of Approval (CoA) that are applicable to the surface water monitoring program which are summarised below.

The CoA applicable to this job include:

- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018;

The State and Federal legislation and policy and guidelines that apply to the program include:

- Environmental Planning and Assessment Act 1979 (EP&A Act);
- Contaminated Land Management Act 1997;
- Protection of the Environment Operations Act 1997 (POEO Act); and
- Water Management Act 2000 Water Management (General) Regulation 2018;

Additional guidelines and standards to the management of soil and water include:

- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book');
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book');
- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines');
- ANZECC (2018). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines'); and
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').

3 Monitoring Locations

Details of the routine monitoring locations are provided in **Table 3-1**. The routine monitoring locations are also mapped in Figure GS-004 in **Appendix A.** Representative photographs are presented in **Appendix B**.

Details of the additional investigation are summarised in **Section 1.2** and **Section 5**. The additional investigation locations undertaken on 4 July 2022 and 21 July 2022 are also mapped in Figure GS-001 and GS-003 in **Appendix A.** Representative photographs are presented in **Appendix B**.

3.1 Routine Monitoring Locations

Table 3-1 Surface Water Monitoring Location Details

Sample Location	Latitude	Longitude	Description
WP1 (up-stream)	-33.924014	151.065315	Immediately south of the Boulevarde and east of 118 the Boulevarde.
WP2 (down-stream)	-33.923339	151.064970	Immediately north of the Urunga Parade and west of 4 Urunga Parade.
WP2-DP1 (downstream eastern discharge point)	-33.923543	151.065058	Immediately south of the Urunga Parade, east side of the channel, approximately 20 m south / upstream of WP2.
WP2-DP2 (downstream western discharge point)	-33.923529	151.065048	Immediately south of the Urunga Parade, west side of the channel, approximately 20 m south / upstream of WP2.

4 Quality Management

The Data Quality Objective (DQO) process is used to establish a systematic planning approach to set the type, quantity and quality of data required for making decisions based on the environmental condition of the project area. The DQO process involves the seven steps detailed in **Table 4-1**.

Table 4-1 Data Quality Objectives

DQO	Description
Step 1 State the Problem	Construction work may adversely impact the local surface water quality within the unnamed channel near the site.
Step 2 Identify the Decisions	Are there any impacts to surface water quality from construction activities at the site?
Step 3 Identify Inputs to the Decision	The primary inputs to the decisions described above are: ▪ Assessment of surface water quality of the unnamed channel within proximity to Wiley Park service building site per the requirements outlined in the site's SWMP, with samples collected from two locations (upstream and downstream of the site); ▪ Laboratory analysis of surface water samples for relevant parameters; ▪ Assessment of the suitability of the analytical data obtained, against the Data Quality Indicators (DQIs); ▪ Assessment of the analytical results against applicable guideline criteria; and ▪ Aesthetic observations of surface water bodies, including odours, sheen and condition, if encountered.
Step 4 Define the Study Boundaries	The lateral extent of the study area is the channel near the Wiley Park service building site. The temporal boundaries of the study comprise the duration of the monitoring program, including pre-construction monitoring, construction phase, and post-construction monitoring as required.
Step 5 Develop a Decision Rule	The decision rules for the water quality monitoring sampling events included: ▪ Were primary and QA/QC samples analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses? ▪ Did the field and laboratory QA/QC results indicate that the data set was reliable and representative of the water quality with Relative Percentage Difference (RPD) values of 30% or less? ▪ Were the laboratory limits of reporting (LORs) below the applicable guideline criteria for the analysed parameters?

DQO	Description
	▪ Were guideline criteria sourced from endorsed guidelines? ▪ Were surface water aesthetic characteristics evaluated including odours and sheen? ▪ Were the monitoring results obtained from the downstream sample collected during construction phase greater than the upstream sample collected during the same monitoring event? If so, then the adverse impact to the quality of water in the unnamed channel is considered to have potentially occurred.
Step 6 Specify Limits on Decision Error	In accordance with the relevant guidelines as endorsed under the *Contaminated Land Management Act 1997*. Specific limits for this project are in accordance with the appropriate guidance made or endorsed by state and national regulations, appropriate indicators of data quality, and standard procedures for field sampling and handling. This step also examines the certainty of conclusive statements based on the available new Site data collected. This should include the following points to quantify tolerable limits: ▪ A decision can be made based on a certainty assumption of 95% confidence in any given data set (excluding asbestos). A limit on the decision error will be 5% that a conclusive statement may be a false positive or false negative. A decision error in the context of the decision rule presented above would lead to either underestimation or overestimation of the risk level associated with a particular sampling area. Decision errors may include: ▪ Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the Site. To address this, minimum numbers of samples are proposed to be collected from each media. As such, there may be limitations in the data if aspects of the sampling plan cannot be implemented. Some examples of this scenario include but not limited to: – Proposed samples are not collected due to lack of water flow or access being restricted to a given location. ▪ Limitations in ability to acquire useful and representative information from the data collected. The data are proposed to be collected from multiple locations and sample media. ▪ Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed: – Field staff to follow a standard procedure when undertaking samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, collection of representative samples and use of appropriate sample containers and preservation methods. – Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis. – Laboratories to report QA/QC data for comparison with the DQIs established for the project
Step 7 Optimise the Design for Obtaining Data	To achieve the DQOs and DQIs, the following sampling procedures were implemented to optimise the design for obtaining data: ▪ Surface water samples was collected from upstream and downstream sampling locations, as available due to access and water level; ▪ Surface water samples was collected from two (2) discharge points between upstream and downstream, as available due to access and water level; ▪ Surface water parameters were selected based on project monitoring requirements provided to Cardno now Stantec; ▪ Samples were collected by suitably qualified and experienced environmental scientists; ▪ Samples were collected and preserved in accordance with relevant standards/guidelines; and ▪ Field and laboratory QA/QC procedures were adopted and reviewed to indicate the reliability of the results obtained.

4.1 Data Quality Indicators

The following DQIs have been adopted for the project. The DQIs outlined in **Table 4-2** assist with decisions regarding the usefulness of the data obtained, including the quality of the laboratory data.

Table 4-2 Summary of Data Quality Indicators

Data Quality Indicator	Frequency	Data Acceptance Criteria
Completeness		
Field documentation correct	All samples	The work was documented in accordance with Cardno now Stantec SOPs
Suitably qualified and experience sampler	All samples	Person deemed competent by Cardno now Stantec collecting and logging samples
Appropriate lab methods and limits of reporting (LORs)	All samples	Samples were analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses.
Chain of custodies (COCs) completed appropriately	All samples	The work was documented in accordance with Cardno now Stantec SOPs
Sample holding times complied with	All samples	The samples were extracted and analysed within holding times specified by the project NATA-accredited laboratory
Proposed/critical locations sampled	-	Proposed/critical locations sampled
Comparability		
Consistent standard operating procedures for collection of each sample. Samples should be collected, preserved and handled in a consistent manner	All samples	All works undertaken in accordance with Cardno now Stantec SOPs
Experienced sampler	All samples	Person deemed competent by Cardno now Stantec collecting and logging samples
Climatic conditions (temp, rain etc) recorded and influence on samples quantified (if required)	All samples	Climatic conditions documented in field sheets
Consistent analytical methods, laboratories and units	All samples	Sample analysis to be in accordance with NATA-approved methods
Representativeness		
Sampling appropriate for media and analytes (appropriate collection, handling and storage)	All samples	Sample analysis to be in accordance with NATA-approved methods
Samples homogenous	All samples	All works undertaken in accordance with Cardno now Stantec SOPs
Detection of laboratory artefacts, e.g. contamination blanks	-	Laboratory artefacts assessed and impact on results determined
Samples extracted and analysed within holding times	All samples	The samples were extracted and analysed within holding times specified by the laboratory
Precision		
Blind duplicates (intra-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD Result less than 10 × LOR
Split duplicates (inter-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD Result less than 10 × LOR
Laboratory duplicates	1 per 20 samples	Results greater than 10 x LOR: less than or equal to 30% RPD Results less than 10 x LOR: No limit on RPD
Accuracy (Bias)		
Surrogate spikes	All organic samples	50-150%
Matrix spikes	1 per 20 samples	70-130%
Laboratory control samples	1 per 20 samples	70-130%
Method blanks	1 per 20 samples	Less than LOR

The DQOs for the project were met during the monitoring event. Discussion of the QA/QC assessment is provided in **Appendix E**.

5 Field Investigation

The original scope and method of the surface water monitoring is summarised in **Table 5-1**. The additional scope and method of the investigation works regarding the elevated pH identified at WP2-DP1 is summarised in **Table 5-2**.

Table 5-1 Routine Investigation Activity Summary

Activity	Details
Dates of Fieldwork	4 July 2022
Surface Water Sampling	Cardno now Stantec inspected, monitored and sampled four (4) surface water monitoring locations (WP1 – upstream, WP2 – downstream, WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point). Cardno now Stantec undertook the sampling as per the following procedures: Surface Water Body Inspection - The general site condition was observed prior to commencement of field works for signs of any site activities that may have altered the surface water contamination status or require modifications to the field or laboratory works program. Each surface water location was inspected for indicators of contamination and the presence as well as the flow of surface water. This information is recorded on the field sheets presented in **Appendix C**. Surface water sampling - Field parameters and visual/olfactory observations were recorded prior to sampling at each location. Physico-chemical parameters including pH, electrical conductivity (EC), dissolved oxygen (DO), reduction-oxidation potential (redox), and temperature were measured using a calibrated water quality meter. Surface water samples were collected either directly into the sampling bottle or directly from the telescopic scoop. Once field parameters were recorded, the surface water samples were transferred to appropriately preserved sample containers provided by the laboratories. Field observations, and parameters are presented in **Appendix C**. Surface water samples were placed into an Esky containing ice and maintained at or below 4°C whilst onsite and in transit to the NATA-accredited laboratories for the targeted analyses.
Surface Water Analysis	Surface water samples from the monitoring event were submitted under standard chain-of-custody (CoC) procedures to NATA-accredited Eurofins Environment Testing Australia analysis of the parameters as follows: - Oil & Grease; - Total Suspended Solids (TSS); - Nutrients (Total Phosphorous and Total Nitrogen); - Turbidity; and - Chlorophyll-*a*. Tabulated laboratory results are presented in **Appendix D**. The Data QA /QC program and data quality review including calibration certificates is presented in **Appendix E**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and CoC documentation are included in **Appendix F**.
Decontamination	Decontamination was undertaken in the event of reusable sampling, monitoring equipment (telescopic scoop, water quality meter) or switching between sampling locations using a standard bucket wash. Equipment was washed in phosphate-free detergent (Liquinox) and rinsed in laboratory supplied rinsate water.

Table 5-2 Additional pH Investigation Activity Summary

Activity	Details
Dates of Fieldwork	4 July 2022 and 21 July 2022
Inspection Walkover	Walkover inspection was undertaken on both dates by Cardno now Stantec field team with a Downer EDI delegate within the Wiley Park worksite. The worksite is considered to form part of the upstream area of the elevated pH measured at WP2-DP1. This inspection was intended to identify any potential flow contribution(s) from an on-site or off-site source.
Surface Water Monitoring	Surface water monitoring works were undertaken by Cardno now Stantec's field team at various locations within the Wiley Park worksite that is upstream to WP2-DP1. Refer to Figure GS-001 in

Activity	Details
	Appendix A for approximate locations of the additional monitoring works undertaken on 4 July 2022. Refer to Figure GS-003 in **Appendix A** for approximate locations of the additional monitoring works undertaken on 21 July 2022. At each monitoring location, field parameters including pH, EC, DO, ORP and temperature were measured using a calibrated water quality meter. Photos of the monitoring locations were also undertaken. Surface water at each monitoring location was collected directly from a telescopic scoop and then parameter measured using a calibrated water quality meter. Monitoring results are summarised in **Section 7.1.2** and **Section 7.2**.
Soil Sampling and Testing	Surficial soil samples were collected within the Wiley Park worksite area upstream to WP2-DP1 with pH measured on-site by a soil pH testing kit (Manutec soil pH test kit) as well as via laboratory analysis by a NATA-accredited laboratory (Eurofins Environment Testing Australia). Soil pH testing results are summarised in **Section 7.4**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and CoC documentation are included in **Appendix F**.
Decontamination	Decontamination was undertaken in the event of reusable sampling, monitoring equipment (telescopic scoop, water quality meter) or switching between sampling locations using a standard bucket wash. Equipment was washed in phosphate-free detergent (Liquinox) and rinsed in laboratory supplied rinsate water.

6 Surface Water Assessment Criteria

The assessment criteria for surface water analytical and field data were adopted from Table 11 of the site's SWMP. The criteria for selected parameters are provided in **Table 6-1** below. ANZECC guideline criteria are included in the table for reference.

Table 6-1 Water Quality Monitoring Parameters and Adopted Criteria at Wiley Park

Parameter	ANZECC Criteria – Freshwater[1]	Proposed Trigger Values[2]	Proposed Actions
Temperature (°C)	>80% ile; <20% ile	Downstream results are greater than upstream results in rainfall events up to and including the significant event threshold of greater than 20 mm in 24 hours. Downstream results are greater than upstream results during dry-weather sampling.	The client's Environment Manager (or delegate) to re-test to confirm results and undertake an inspection of the adjacent works and propose actions where required.
DO (%Sat)	Lower limit – 85% Upper limit – 110%		
Turbidity (NTU)	6-50 NTU		
Oil and grease	-		
pH	Lower limit – 6.5 Upper limit – 8.5		
Salinity (as EC)	125 – 2,200 µS/cm		
TSS	-		
Total Phosphorus as P	25 µg/L		
Total Nitrogen as N	350 µg/L		
Chlorophyll-a	3 µg/L		

Note to Table
1 ANZECC guideline criteria are included for reference. It is noted that for dry weather events baseline testing comparison will indicate whether this existing water quality within the channel meet ANZECC guidelines, prior to construction of the services building. For wet-weather events where no baseline data is available a direct comparison to upstream and downstream results is undertaken. Sydney Metro's Principal Contractor will comply with Section 120 of the Protection of the Environment Operations Act 1997.
2 For the ANZECC criteria given in a range (i.e. DO, pH, temperature, etc.), measured field parameters at downstream and upstream were assessed in comparison to the closeness to the criteria range.

7 Summary of Results

7.1 Summary of Field Observations

7.1.1 Mid-Construction Wet-weather Event – 4 July 2022

> The monitoring event was considered as a mid-construction wet-weather event based on the rainfall data recorded by the nearby weather station:
  - Canterbury Racecourse AWS station (ID: 066194): approximately 4.6 km from the site with the rainfall data recorded 31.8 mm over the last 24 hours prior to the field sampling. Refer to **Appendix C** for a copy of the weather recordings obtained from the Bureau of Meteorology website (http://www.bom.gov.au/).

> Observation of water body (i.e. the unnamed water channel):
  - WP1 contained high flowing clear water with low turbidity. The estimated depth of the water body was 0.45 m. No visible oil and grease observed at WP1;
  - WP2 contained high flowing clear water with low turbidity. The estimated depth of the water body was 0.4 m. No visible oil and grease observed at WP2;
  - WP2-DP1 contained high flowing clear water with low turbidity. The estimated depth of the water body was 0.3 m. No visible oil and grease observed at WP2-DP1; and
  - WP2-DP2 contained medium flowing clear water with low turbidity. The estimated depth of the water body was 0.3 m. No visible oil and grease observed at WP2-DP2.

> Additional observations:
  - WP1:
    - One discharge point (WP1-DP1) was observed immediately downstream / north of WP1. Low flow contribution was observed at the time of sampling. Refer to **Appendix A** for approximate location of WP1-DP1. Refer to **Appendix B** for a detailed photo. Note that no field measurements or sampling was undertaken at this location due to access restrictions.
  - WP2-DP1: due to the measurements of the elevated pH at WP2-DP1, a walkover inspection was undertaken by Cardno now Stantec field team with a Downer EDI delegate within the Wiley Park worksite area upstream of the elevated pH measured at WP2-DP1. Following observations were made:
    - Three (3) potential upstream flow contributions to WP2-DP1 were identified during the inspection:
      > On-site – platform 1 drainage system: run-off collected within the platform 1 aco drain of Wiley Park Station was observed to flow in a westerly direction via the concrete lined swale as well as underground drainage system passing beneath the MSB building then entered into the main water channel via WP2-DP2. Refer to Figure GS-005 in **Appendix A** for details;

      > On-site – temporary surface water erosion and sediment control trenches: temporary surface water erosion and sediment control trenches that cut into the soil profile were observed to start from the north-eastern corner of the MSB building and to flow westerly and then entered into the main water channel through a series of Downer EDI installed erosion and sediment control measures via WP2-DP2. Refer to Figure GS-005 in **Appendix A** for details; and

      > Off-site – urban run-off drainage system: urban run-off drainage system carrying stormwater captured from the off-site area surrounding Shadforth Street was observed to join into the platform 1 drainage system via the concrete lined swale within the Wiley Park worksite. The flow was observed in a westerly direction via the concrete lined swale as well as underground drainage system passing beneath the MSB building then entered into the main water channel via WP2-DP2. Refer to Figure GS-005 in **Appendix A** for details.

7.1.2 Additional pH Investigation – 21 July 2022

> The additional pH investigation was undertaken during a rain weather condition with total of 6.8 mm precipitation recorded by the nearest BOM weather station Canterbury Racecourse AWS station (ID: 066194) over the last 24 hours prior to the field investigation.

> Observation of water body (i.e. the unnamed water channel):

- WP1 contained medium flowing clear water with low turbidity. The estimated depth of the water body was 0.3 m. No visible oil and grease observed at WP1;
- WP2 contained medium flowing clear water with low turbidity. The estimated depth of the water body was 0.3 m. No visible oil and grease observed at WP2;
- WP2-DP1 contained low flowing clear water with low turbidity. The estimated depth of the water body was 0.2 m. No visible oil and grease observed at WP2-DP1; and
- WP2-DP2 contained low flowing clear water with low turbidity. The estimated depth of the water body was 0.2 m. No visible oil and grease observed at WP2-DP2.

> Additional observation:

- WP2-DP1: except the three (3) on-site and off-site flow contributions noted as a result of the inspection undertaken on 4 July 2022, one (1) additional flow contribution was identified
    - > On-site – track drainage: track drainage system collecting stormwater within the train track area and then entered into the main water channel via WP2-DP1 was observed. Refer to Figure GS-005 in **Appendix A** for details.

7.2 Surface Water Field Parameters

The surface water field parameters measured from each location monitored are summarised in following tables:

> **Table 7-1** summarises the field parameters measured on 4 July 2022 including the original scope undertaken and the additional pH investigation undertaken to the upstream worksite area of WP2-DP1; and

> **Table 7-2** summarises the field parameters measured on 21 July 2022 regarding the additional pH investigation undertaken to the upstream worksite area of WP2-DP1.

Table 7-1 Surface Water Field Physico-chemical Parameters and Field Observations – 4 July 2022

Location ID[3]	Flow Contribution[4]	Estimated Water depth (m)	Estimated Flow Rate	Temperature (ºC)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Oxidation-Reduction Potential (mV)	SHE[1] Redox Potential (mV)[2]	Condition
Worksite Area – Upstream to WP2-DP1											
URD1	URD[5]	0.1	Medium	15.9	6.62	162.7	9.29	93.9	43.4	254.6	Clear Low turbidity
PD1	PD[6]	0.1	Low	15.8	9.40	116.4	7.06	71.2	31.8	243	Light brown High turbidity
DT1	TSRT[7]	0.2	Low	16.2	9.76	281.8	9.93	101.1	11.7	222.9	Light brown High turbidity
DT2	TSRT[7]	0.1	Low	16.1	9.34	254	6.67	67.8	26.1	237.3	Light brown High turbidity
SD1	TSRT[7]	0.1	Low	16.1	9.34	283.1	6.44	65.4	30.4	241.6	Not recorded
Unnamed / Main Water Channel											
WP1	Not Applicable	0.45	High	15.9	6.87	296.3	7.52	73.6	92.5	303.7	Clear Low turbidity
WP2-DP1	Not Applicable	0.3	High	16	10.81	400.6	6.28	61.8	25.4	236.6	Clear Low turbidity
WP2-DP2	Not Applicable	0.3	Medium	16	7.29	375.5	6.42	67.7	-13.4	197.8	Clear Low turbidity
WP2	Not Applicable	0.4	High	15.9	6.92	330.5	7.13	71.3	102.8	314	Clear Low turbidity

Note to Table
1 SHE – Standard Hydrogen Electrode
2 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: *SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP)*.
3 Refer to Figure GS001 in **Appendix A** for the approximate monitoring locations.
4 Refer to Figure GS005 in **Appendix A** for the approximate location of flow contributions identified.
5 Urban Runoff Drainage – Stormwater (URD)
6 Platform Drainage (PD)
7 Temporary Surface Runoff Trench (TSRT)

Table 7-2 Surface Water Field Physico-chemical Parameters and Field Observations – 21 July 2022 (Additional pH Investigation)

Location ID[3]	Flow Contribution[4]	Estimated Water depth (m)	Estimated Flow Rate	Temperature (ºC)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Oxidation-Reduction Potential (mV)	SHE[1] Redox Potential (mV)[2]	Condition
Worksite Area – Upstream to WP2-DP1											
PD1	PD[6]	0.03	Very low	13.2	9.12	32.0	11.07	105.6	176.8	390.0	Light brown Low turbidity
PD2	PD[6]	0.02	Very low	13.3	9.08	40.9	8.22	78.5	164.0	377.2	Clear Low turbidity
URD1	URD[5]	0.1	Low	13.7	8.26	32.8	7.74	74.6	178.5	391.1	Clear Low turbidity
Mix-PD&URD1	Mix: PD & URD[7]	0.1	Low to medium	13.6	8.75	68.8	8.52	82.0	172.4	385.0	Clear Low turbidity
Mix-PD&URD2	Mix: PD & URD[7]	0.1	Low to medium	13.7	8.87	79.7	10.73	103.5	168.5	381.1	Clear Low turbidity
Mix-PD&URD3	Mix: PD & URD[7]	0.1	Low to medium	13.7	9.00	89.1	8.67	83.6	164.6	377.2	Clear Low turbidity
Mix-PD&URD4	Mix: PD & URD[7]	0.15	Low	13.7	8.95	88.3	8.43	81.3	164.9	377.5	Clear Low turbidity
TSRT1	TSRT[8]	0.1	Low	13.7	8.57	101.1	8.76	84.4	170.0	382.6	Brown Medium turbidity
TSRT2	TSRT[8]	0.1	Low	13.6	8.48	91.8	8.45	81.2	169.9	382.5	Brown Medium turbidity
TSRT3	TSRT[8]	0.1	Low	13.7	8.64	102.4	8.55	82.3	163.5	376.1	Brown Medium turbidity
TSRT4	TSRT[8]	0.1	Low	13.6	8.91	97.2	7.96	76.6	160.5	373.1	Brown Medium turbidity
TSRT5	TSRT[8]	0.1	Low	13.7	9.13	113.3	7.80	75.2	155.4	368.0	Brown Medium turbidity
TSRT6	TSRT[8]	0.15	Very low	13.7	9.53	108.3	7.42	71.6	149.5	362.1	Brown Medium turbidity
TD1	TD[9]	0.05	Very low	14.6	7.82	152.1	7.80	76.7	208.3	420.3	Light Brown Low to medium turbidity
Mix-PD&URD&TD&TSRT1	Mix: PD&URD&TD&TSRT[10]	0.3	Very low	13.8	9.39	52.9	8.92	86.1	150.0	362.6	Brown Medium turbidity
Unnamed / Main Water Channel											
WP1	Not Applicable	0.2	Medium	13.8	7.71	61.0	22.98	221.8	209.8	422.4	Clear Low turbidity
WP2-DP1	Not Applicable	0.05	Very low	13.7	9.76	84.1	7.63	73.6	146.2	358.8	Clear Low turbidity
WP2-DP2	Not Applicable	0.05	Very low	13.8	8.48	90.6	10.61	102.6	157.6	370.2	Clear Low turbidity
WP2	Not Applicable	0.3	Medium	13.8	7.93	108.2	8.95	86.4	160.9	373.5	Clear Low turbidity

Note to Table
1 SHE – Standard Hydrogen Electrode
2 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: *SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP)*.
3 Refer to Figure GS003 in **Appendix A** for the approximate monitoring locations.
4 Refer to Figure GS005 in **Appendix A** for the approximate location of flow contributions identified.
5 Urban Runoff Drainage – Stormwater (URD)
6 Platform Drainage (PD)
7 Mixture of Platform Drainage Flow and Urban Runoff Flow
8 Temporary Surface Runoff Trench (TSRT)
9 Track Drainage (TD)
10 Mixture of Platform Drainage Flow, Urban Runoff Flow, Track Drainage Flow and Temporary Surface Runoff Trench Flow

7.3 Surface Water Analytical Results

Four (4) surface water samples associated with QA/QC samples were collected at the routine monitoring locations (WP1, WP2, WP2-DP1 and WP2-DP2) for laboratory analysis as detailed in **Section 1.2 as** per the agreed scope. The laboratory analytical results are presented in **Appendix D**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Appendix F**.

7.3.1 Mid-Construction Wet-weather Event – 4 July 2022

The laboratory analytical results for samples collected at WP1, WP2, WP2-DP1 and WP2-DP2 indicate that:

- Concentrations of Chlorophyll-*a* were reported below the laboratory detection limit (<0.002 mg/L) for each sample with the exception of WP1 detected at 0.0036 mg/L;
- Concentrations of Oil and Grease were reported below the laboratory detection limit at all sample locations;
- Concentrations of nutrients (total nitrogen and the total phosphorous) were reported:
  - Total nitrogen:
    - WP1: 0.48 mg/L
    - WP2: 0.57 mg/L
    - WP2-DP1: 3.1 mg/L
    - WP2-DP2: 1.68 mg/L
  - Total phosphorous:
    - WP1: 0.09 mg/L
    - WP2: 0.06 mg/L
    - WP2-DP1: 0.04 mg/L
    - WP2-DP2: 0.14 mg/L
- TSS were reported:
  - WP1: 11 mg/L
  - WP2: 9 mg/L
  - WP2-DP1: 42 mg/L
  - WP2-DP2: 26 mg/L
- Turbidity was reported:
  - WP1: 9.4 NTU
  - WP2: 11 NTU
  - WP2-DP1: 14 NTU
  - WP2-DP2: 22 NTU
- pH was reported:
  - WP1: 6.8
  - WP2: 7.6
  - WP2-DP1: 11
  - WP2-DP2: 7.5

7.4 Surficial Soil pH Results

Eight (8) soil samples were collected during the additional investigation on 21 July 2022 to assess the pH status of the surficial soils within the Wiley Park worksite upstream to the WP2-DP1. pH assessments were undertaken to all soil samples using both on-site soil pH testing kit (Manutec soil pH test kit) as well as

laboratory analysis. Refer to Figure GS003 in **Appendix A** for the approximate locations of the soil samples collected. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Appendix F**. **Table 7-3** below summarises the pH results.

Table 7-3 Summary of Surficial Soil pH Results

Sample Location ID	pH – On-site Testing Results[1]	pH – Laboratory Analytical Results
Soil1	9.5 - 10	9.9
Soil2	9.5 - 10	10
Soil3	9.5 - 10	11
Soil4	9.5 - 10	12
Soil5	9.5 - 10	12
Soil6	9.5 - 10	11
Soil7	9.5 - 10	11
Soil8	9.5 - 10	10

Notes to Table
1 The upper detection limit of the on-site testing kit is 10.

8 Discussion

8.1 The Unnamed Water Channel

Investigation results obtained from the unnamed water channel including monitoring locations (WP1, WP2, WP2-DP1 and WP2-DP2) are discussed in following sub-sections.

8.1.1 Baseline Results Comparison

One sampling event during the pre-construction period (baseline event) was undertaken on 10 March 2021 which was during dry conditions. It should be noted that wet-weather or storm-event pre-construction sampling events were not able to be conducted because of the lack of rainfall. The monitoring results of the baseline event (10 March 2021) has not been used for comparison with the monitoring results under this report because the conditions encountered were different (i.e., non-trigger for wet-weather event criteria). However, seven (7) previous mid-construction wet weather sampling events were used to compare and check if there is any potential adverse impact to the water quality caused by the construction activities done around the date of this monitoring works undertaken.

Table 8-1 summarises the range and average numbers of each parameter from upstream and downstream in the previous seven (7) wet-weather events between 20 March 2021 and 24 May 2022. Overall, conditions are similar between upstream and downstream samples collected on 4 July 2022 and previous mid-construction wet weather events except for pH values reported from WP2-DP1 relative to rest of the sampling locations.

Table 8-1 Comparison of current wet-weather condition sampling event to previous wet-weather condition sampling events

Monitoring Events		Previous Wet-Weather Events - Range			Previous Wet-Weather Events - Average		4 July 2022				21 July 2022			
Location ID	Assessment Criteria	WP1	WP2	WP2-DP1[7]	WP1	WP2	WP1	WP2	WP2-DP1	WP-DP2	WP1	WP2	WP2-DP1	WP-DP2
Temperature (ºC)	N/A[2]	17.1 – 22.6	16.9 – 23.4	17.4	19.5	19.6	15.9	15.9	16.0	16.0	13.8	13.8	13.7	13.8
pH	6.5 - 8.5	**6.07** – 8.10	7.34 – **9.02**	**10.49**	7.45	7.9	6.87	6.92	**10.81**	7.29	7.71	7.93	**9.76**	8.48
EC (µS/cm)	125 – 2,200	230 – **2,500**	92.9 – 659.0	502.3	727.3	409.4	296.3	330.5	400.6	375.5	**61.0**	**108.2**	**84.1**	**90.6**
DO (%)	85% - 110%	**52.9** – 98.7	**43.2** – 101.9	**64.4**	**69.3**	**69.2**	**73.6**	**71.3**	**61.8**	**67.7**	**221.8**	86.4	**73.6**	102.6
Chlorophyll a (µg/L)	3	<LOR[4]	<LOR[4] – 2.7	**<10**	2[5]	2[5]	**3.6**	<2	<2	<2	Not Tested	Not Tested	Not Tested	Not Tested
Oil and Grease (mg/L)	Comparison	<10 - 10	<10	<10	5.7[5]	<10	<10	<10	<10	<10	Not Tested	Not Tested	Not Tested	Not Tested
Nitrogen (Total) (mg/L)	0.35	**1.6 - 5.0**	**1.0 – 2.8**	**3.1**	**2.5**	**2.1**	**0.48**	**0.57**	**3.1**	**1.68**	Not Tested	Not Tested	Not Tested	Not Tested
Phosphate total (as P) (mg/L)	0.025	<LOR[6] – **0.23**	<LOR[6] – **0.28**	**0.04**	**0.18[5]**	**0.17[5]**	**0.09**	**0.06**	**0.04**	**0.14**	Not Tested	Not Tested	Not Tested	Not Tested
TSS (mg/L)	N/A[2]	4.0 – 18.0	<5 – 47.0	23	10.7[5]	16.7[5]	11	9	42	26	Not Tested	Not Tested	Not Tested	Not Tested
Turbidity (NTU)	6-50	4.3 – 37.0	13.0 – 28.0	18	20.2	19.4	9.4	11.0	14.0	22.0	Not Tested	Not Tested	Not Tested	Not Tested

Note to Table
1 SHE – Standard Hydrogen Electrode
2 Not Applicable
3 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: *SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP)*.
4 Laboratory limit of reporting (LOR). For wet-weather event conducted on 20 March and 5 March 2021, the LOR of Chlorophyll a was used as 5 ug/L, and for wet-weather events conducted on 12 November, 26 November 2021, 23 February and 9 March 2022, LOR of Chlorophyll a was used as 2 ug/L and for wet-weather event conducted on 24 May 2022, the LOR of Chlorophyll a was used as 10 ug/L.
5 Half of the value of the laboratory limit of reporting (LOR) was used for calculation of average when below detection limit reported.
6 Laboratory limit of reporting (LOR). Due to the laboratory matrix interference, the LOR of phosphate total (as P) in the wet-weather event conducted on 20 March 2021 was raised to 0.5 mg/L. The LOR of phosphate total (as P) in the rest wet-weather events was 0.01 mg/L.
7 It is noted that only one round of previous monitoring results was obtained from this monitoring location on 24 May 2022. As such, no average or range of the results can be established.
Highlighted cell with the bold font indicates exceedance of the adopted assessment criteria.

8.1.2 Comparison to ANZG 2018 / ANZECC 2000 Criteria

Results for the mid-construction quarterly wet-weather event sampled on 4 July 2022 generally showed monitored parameters were within the adopted threshold criteria, with the exception of Chlorophyll a, total nitrogen, total phosphorous, pH, EC and dissolved oxygen saturation.

- Chlorophyll-a measured at upstream sample (WP1: 3.6 ug/L) was slightly above the adopted criteria of 3 ug/L, however, this sight exceedance is not considered as a significant issue due to all the results obtained from the downstream sample point (WP2) and downstream discharge points (WP2-DP1 and WP2-DP2) are below the laboratory detection limit (i.e. <2 ug/L).
- Total nitrogen results at all upstream, downstream sample point and downstream discharge points (WP1: 0.48 mg/L, WP2: 0.57 mg/L, WP2-DP1: 3.10 mg/L and WP2-DP2: 1.68 mg/L) were above the adopted criteria (i.e. 0.35 mg/L). However, these exceedances in total nitrogen concentration are not considered to be a significant issue based on:
  - The total nitrogen results at WP1 and WP2 were all below the historical range obtained from previous mid-construction wet-weather events, which were ranged from 1.6 to 5.0 mg/L and 1.0 to 2.8 mg/L, respectively.
  - The total nitrogen results at WP2-DP1 and WP2-DP2 are close to / within the historical range measured at WP1 and WP2 and are close to / below the historical average measured at WP1 (3.1 mg/L) and WP2 (2.5 mg/L).
- Total phosphorus results at all upstream, downstream sample point and downstream discharge points (WP1: 0.09 mg/L, WP2: 0.06 mg/L, WP2-DP1: 0.04 mg/L and WP2-DP2: 0.14 mg/L) were above the adopted criteria (i.e. 0.025 mg/L). However, these exceedances in total phosphorus concentration are not considered to be a significant issue based on:
  - The total phosphorus result at WP1 was within the range of the results obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between below the laboratory detection limit to 0.23 mg/L and below the historical average measured at WP1 (0.18 mg/L).
  - The total phosphorus result at WP2 was within the range of the results obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated below the laboratory detection limit to 0.28 mg/L and below the historical average measured at WP2 (0.17 mg/L).
  - The total phosphorus result at WP2-DP1 and WP2-DP2 were within the historical range measured at WP1 and WP2. Also, they are below the historical average measured at both WP1 and WP2.
- pH measured at WP1, WP2 and WP2-DP2 were within the adopted criterion range, whereas downstream eastern discharge point sample (WP2-DP1: 10.81 (4 July 2022) and 9.76 (21 July 2022)) was above the adopted criterion range (i.e. 6.5 – 8.5), which is consistent with the previous monitoring results obtained on 24 May 2022 under similar weather conditions. Further investigation to the potential source(s) of this elevated pH value to the upstream area within the Wiley Park worksite was undertaken as detailed in **Section 5**.
- EC measured at all upstream, downstream and downstream discharging points (WP1: 61.0 uS/cm (21 July 2022), WP2: 108.2 us/cm (21 July 2022), WP2-DP1: 84.1 us/cm (21 July 2022) and WP2-DP2: 90.6 us/cm (21 July 2022)) were below the adopted criteria range. However, it is not considered a significant issue based on:
  - Significant rainfall events occurred during July 2022 (total of 317.8 mm precipitation recorded by the nearest BOM station 066194 between 1 and 21 July 2022), which results in increasing volume of fresh water within the main water channel and may in turn cause decreasing trend of EC measurements.
  - Although EC measurement at the downstream sample point (WP2) was still below the adopted criteria range, the measurement at WP2 was closer to the adopted criterion range than the upstream measurement at WP1.
- Dissolved oxygen saturation measured at all upstream, downstream sample point and downstream discharge points (WP1: 73.6% (4 July 2022), 221.8% (21 July 2022); WP2: 71.3% (4 July 2022); WP2-DP1: 61.8% (4 July 2022), 73.6% (21 July 2022) and WP2-DP2: 67.7% (4 July 2022)) were below the adopted criterion range (i.e. 85% - 110%). However, these slight exceedances in dissolved oxygen saturation concentrations are not considered a significant issue based on:
  - The dissolved oxygen saturation measurement at WP1:

- The dissolved oxygen measurement on 4 July 2022 was within the range of the measurements obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between 52.9% and 98.7 % and similar to the adopted criteria range than the historical average measured at WP1 (69.3%).
- Although the dissolved oxygen measurement on 21 July 2022 was outside of the range of the measurements obtained from previous mid-construction wet-weather sampling events, the downstream sample point WP2 (86.4%) was measured within the adopted criteria range.

- The dissolved oxygen saturation measurement at WP2 was within the range of the measurements obtained from previous mid-construction wet-weather sampling events, which was historically fluctuated between 43.2% and 101.9 % and closer to the adopted criteria range than the historical average measured at WP2 (69.2%).
- The dissolved oxygen saturation measurements at WP2-DP1 and WP2-DP2 were within the historical range measured at WP1 and WP2. Also, they are close to the historical average measured at WP1 and WP2.

8.1.3 Comparison of Downstream, Downstream Discharge Point to Upstream Results

Results for upstream, downstream and downstream discharging point sampling on 4 July 2022 were comparable, with the exception of:

> Total nitrogen results at the downstream sample point (WP2: 0.57 mg/L) and downstream discharge points (WP2-DP1: 3.10 mg/L and WP2-DP2: 1.68 mg/L) are higher than the upstream sampling point (WP1: 0.48 mg/L). However, it is not considered this is a significant issue and this is not considered likely to be a result of the construction activities undertaken:

- The western downstream discharge point (WP2-DP2) is not connected to the Wiley Park worksite but connected to the rail corridor between Wiley Park and Punchbowl Station. Downer EDI suggested that the existing drainage within Punchbowl Station does note contribute flow to this discharge point.
- It is known that there is an off-site flow contribution to the eastern downstream discharge point (WP2-DP1) from the urban run-off drainage system at Shaforth Street. Refer to Figure GS005 in **Appendix A** and it is known that high level of total nitrogen (i.e. an order of magnitude higher than the WP2-DP1 results) was previously identified from this off-site flow contribution.
- No significant increase between the downstream sample point WP2 and upstream sample point WP1 was observed from this round of monitoring.

> Total phosphorous results at the western downstream discharge point (WP2-DP2: 0.14 mg/L) was higher than the upstream sampling point (WP1: 0.09 mg/L). However, it is not considered this is a significant issue as well as a result of the construction activities undertaken:

- The western downstream discharge point (WP2-DP2) is not connected to the Wiley Park worksite but the rail corridor between Wiley Park and Punchbowl Station. Downer EDI suggested that the existing drainage within Punchbowl Station does note contribute flow to this discharge point.
- Total phosphorous result at the downstream sample point WP2 is lower than the result at upstream sampling point WP1, which is located approximately 20 m downstream of WP2-DP2.

> The total suspended solids at the two downstream discharge points (WP2-DP1: 42 mg/L; WP2-DP2: 26 mg/L) were higher than the upstream sample (WP1) and the downstream sample (WP2). However, it is not considered to be a significant issue as both the TSS results at downstream sample point WP2 were below the upstream sample point.

> The turbidity results at downstream sample (WP2: 11 NTU) and downstream discharge point samples (WP2-DP1: 14 NTU; WP2-DP2: 22 NTU) were slightly higher than the result at the upstream sample (WP1:9.4 NTU). However, it is not considered to be a significant issue based on:

- There was only a slight difference between the turbidity results in these locations.
- The turbidity results in all these locations were within the ANZG 2018 / ANZECC 2000 Criteria.

> The pH results at downstream eastern discharge point sample (WP2-DP1: 10.81 (4 July 2022) and 9.76 (21 July 2022)) were considerably higher than the results measured at other three sample locations (WP1: 6.87 (4 July 2022) and 7.71 (21 July 2022); WP2: 6.92 (4 July 2022) and 7.93 (21 July 2022) and WP2-DP2: 7.29 (4 July 2022) and 8.84 (21 July 2022)). As such, the downstream eastern discharge point (WP2-DP1) is highly likely to contribute an increasing pH to the downstream water body. Further investigation to

the potential source(s) of this elevated pH value to the upstream area within the Wiley Park worksite was undertaken as detailed in **Section 5**.

> The electrical conductivity at downstream sample (WP2: 330.5 uS/cm (4 July 2022) and 108.2 uS/cm (21 July 2022)) and downstream discharge point samples (WP2-DP1: 400.6 uS/cm (4 July 2022) and 84.1 uS/cm (21 July 2022); WP2-DP2: 375.5 uS/cm (4 July 2022) and 90.6 uS/cm (21 July 2022)) were higher than the result at the upstream sample (WP1:296.3 uS/cm (4 July 2022) and 61.0 uS/cm (21 July 2022)). However, it is not considered to be a significant issue based on:

- 4 July 2022: the EC results measured in all these locations were within the ANZG 2018 / ANZECC 2000 Criteria.
- 21 July 2022: the downstream result measured at WP2 is closer to the adopted ANZG 2018 / ANZECC 2000 Criteria than upstream result measured at WP1.

8.2 Additional pH Investigation – Upstream Area to WP2-DP1

Due to the measurements of the elevated pH at WP2-DP1, an additional investigation and inspection were undertaken by Cardno now Stantec field team with a Downer EDI delegate within the Wiley Park worksite area upstream of WP2-DP1 on both 4 and 21 July 2022. The additional investigation works undertaken were summarised in **Section 5**. The results of the additional investigation work undertaken were summarised in **Section 7**. Key findings from this additional pH investigation are following:

> Four (4) potential flow contributions were identified from the additional investigation work and listed below. Refer to Figure GS005 in **Appendix A** for the approximate locations mapped out. It is noted that the drainage systems of the planform building downpipe and OSD tank have not been connected yet at the time of investigation undertaken and as such not considered to be credible potential flow contributions at this time.

- On-site – platform 1 drainage system: run-off collected within the platform 1 of Wiley Park Station was observed to flow westerly via the established drainage system and then entered into the main water channel via WP2-DP2;
- On-site – temporary surface water erosion and sediment control trenches: temporary surface water erosion and sediment control trenches that cut into the soil profile were observed to start from the north-eastern corner of the MSB building and to flow westerly and then entered into the main water channel via WP2-DP2;
- On-site – track drainage: track drainage system collecting stormwater within the train track area and then entered into the main water channel via WP2-DP1 was observed; and
- Off-site – urban run-off drainage system: urban run-off drainage system carrying stormwater captured from the off-site area surrounding Shadforth Street was observed to join into the platform 1 drainage system via the concrete lined swale within the Wiley Park worksite and flow westerly and then entered into the main water channel via WP2-DP2.

> On-site – platform 1 drainage system:

- Elevated pH values were consistently measured within platform drainage ranging from 9.08 to 9.40 during the additional investigation works undertaken on 4 and 21 July 2022 indicating that there is likely upstream source(s) causing elevated pH measured. Refer to **Section 7.2** for detailed results measured and refer to Figures GS001 and GS003 in **Appendix A** for the approximate monitoring locations.
- No investigation work was undertaken further upstream of monitoring location PD1 to determine the potential source(s) due to the inaccessibility at the time of investigation (i.e. the area is inaccessible without a rail possession). As such, the potential source(s) for the elevated pH identified from this drainage system is currently unknown. Once access of the drainage system within the platform 1 is obtained, further investigation to the potential source(s) of the elevated pH is required.

> On-site – temporary surface water erosion and sediment control trenches:

- Elevated pH values were consistently measured within this temporary surface water erosion and sediment control trenches with a clear trend that pH is increasing significantly towards west (downstream) direction and when it gets close to the area where the on-site detention tank (OSD) constructed. As suggested by Downer EDI, stabilising sand with cement as per the Metron T2M design was used as backfill materials to this area, which is considered likely to be a source of this elevated pH identified within the surface water.

- pH measurements (on-site test and laboratory analysis) undertaken from the surficial soil samples collected from this area indicates high alkalinity (ranged from 9.9 to 12 based on laboratory measurements).

> On-site – track drainage and off-site – urban run-off drainage system: no elevated pH was measured from neither track drainage nor urban run-off drainage system. Thus, these two flow contributions are not considered as potential sources of the elevated pH measured at WP2-DP1.

9 Conclusion

Cardno now Stantec was engaged to undertake surface water monitoring of the unnamed channel west of Wiley Park Station in accordance with the SWMP for the project. The objective of the works was to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel that receives in part stormwater from the construction area.

Routine monitoring works per agreed scope were undertaken on 4 July 2022 with elevated level of pH measured at WP2-DP1. The pH field measurement was repeated twice and checked via laboratory analysis returned with similar results. Subsequently, Cardno now Stantec immediately informed Downer EDI with this issue while on-site and undertook two additional investigation works to the Wiley Park worksite area that is upstream of WP2-DP1 on 4 and 21 July 2022. Based on the investigation results obtained, following conclusions are made:

- ANZG 2018 / ANZECC 2000 comparison and assessment: during this wet-weather monitoring event, monitored parameters were either within the adopted ANZG 2018 / ANZECC 2000 screening criteria or considered insignificant for the exceedances (Chlorophyll a, total nitrogen, total phosphorous, EC and dissolved oxygen saturation) based on the review of historical wet-weather monitoring events results. However, high pH was measured at the downstream discharge point WP2-DP1.
- Upstream and downstream comparison and assessment: during this wet-weather monitoring event, the results of downstream sample point WP2, downstream discharge points (WP2-DP1 and WP2-DP2) and upstream sample point WP1 were either comparable or considered insignificant / unlikely a result from the construction activities within Wiley Park worksite for the increases at downstream sample point / downstream discharge points (total nitrogen, total phosphorous, total suspended solids, turbidity and electrical conductivity) based on the review of site plan, historical wet-weather monitoring events and adopted ANZG 2018 / ANZECC 2000 criteria. However, the elevated pH measured at the downstream discharge point WP2-DP1 was considered significant and requires further investigation of the upstream area regarding the potential source(s).
- Additional pH investigation – Upstream area to WP2-DP1:
  - Four (4) potential flow contributions were identified from the additional investigation works upstream of WP2-DP1 including on-site sources (platform 1 drainage system, temporary surface water erosion and sediment control trenches, track drainage, urban run-off drainage system).
  - Elevated pH values were consistently measured within platform 1 drainage outlet ranging from 9.08 to 9.40 during the additional investigation works undertaken on 4 and 21 July 2022 indicating that there is likely upstream source(s) causing elevated pH measured. However, no investigation work was undertaken further upstream of monitoring location PD1 to determine the potential source(s) due to the inaccessibility at the time of investigation, as a result of the requirement to have a rail possession in place to work on the station platform. As such, the potential source(s) for the elevated pH identified from this drainage system is currently unknown.
  - Elevated pH values were consistently measured within temporary surface water erosion and sediment control trenches with a clear trend that pH is increasing significantly towards the west (downstream) direction and where the trenches cross the area where the on-site detention tank (OSD) is located. As noted by Downer EDI, stabilising sand with cement as per the Metro T2M design was used as backfill materials around the OSD, which is considered likely to be a source of this elevated pH identified within the surface water in the soil trenches.
  - No elevated pH was measured from either track drainage or urban run-off drainage system. Thus, these two flow contributions are not considered as potential sources of the elevated pH measured at WP2-DP1.

9.1 Recommendation

Based on the findings from this investigation, recommendations regarding the elevated pH identified at WP1-DP2 and the two upstream flow contributions (platform 1 drainage system and temporary surface water erosion and sediment control trenches) are made as following:

- Temporary surface water erosion and sediment control trenches: prior to rainfall events, it is recommended that installation of a non-permeable physical barrier (e.g. black plastic sheeting) within the drainage trench

path surrounding the construction footprint of the OSD tank. This would prevent surface water from coming into direct contact with the stabilised sand / cement mixture used to backfill the area.

> Platform 1 drainage system: it is understood that a rail possession is required to allow the access to the drainage system further upstream to PD1. Once access is obtained, further investigation is recommended to identify any potential source(s) for the elevated pH identified including:

- Soil pH Measurement: soil pH measurement is to be undertaken to all the areas potentially form the catchment area to the platform drainage (including the batter on the northern face) by on-site soil pH testing kit as well as laboratory analysis.
- Inspections to be undertaken of:
  - All the platform buildings (if accessible) for any potential source (e.g. storage for cleaning products, etc.).
  - All the Downer storages within the potential catchment area to the platform drainage for any potential sources.
- Platform aco drain check:
  - Scenario 1 – dry weather:
    > Downer to assist removing all the grates from the aco drain to allow sampling and inspection.
    > Check the pH of the tap water itself prior to pouring water into the aco drain using a calibrated water quality meter.
    > Pour the tap water from the eastern end of the aco drain for at least 5 mins prior to sampling.
    > Check the pH value of the water within the aco drain in approximately 10 m intervals from east towards west in order to identify any potential abnormal increase. If any abnormal increase identified within any section checked, then further scrutinized inspection and check will be undertaken to the targeted section for the potential source.
    > Check all the previously checked locations (21 July 2022) associated with the platform drainage system (downstream pits and swales) to identify any potential abnormal increase.
  - Scenario 2 – wet weather:
    > Downer to assist removing all the grates from the aco drain to allow sampling and inspection.
    > Check the pH value of the water within the aco drain in approximately 10 m intervals from east towards west in order to identify any potential abnormal increase. If any abnormal increase identified within any section checked, then further scrutinized inspection and check will be undertaken to the targeted section for the potential source.
    > Check all the previously checked locations (21 July 2022) associated with the platform drainage system (downstream pits and swales) to identify any potential abnormal increase.

10 References

- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines');
- ANZECC (2000). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines');
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book');
- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book');
- NSW Environmental Planning and Assessment Act 1979 (EP&A Act);
- NSW Contaminated Land Management Act 1997;
- NSW Protection of the Environment Operations Act 1997 (POEO Act);
- NSW Water Management Act 2000 Water Management (General) Regulation 2018;
- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades – Soil and Water Management Plan, dated 16th February 2021;
- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018;

11 Limitations

This assessment has been undertaken in general accordance with the current industry standards for a surface water monitoring report for the purpose and objectives and scope identified in this report. The agreed scope of this assessment has been limited for the current purposes of the Client. The assessment may not identify contamination occurring in all areas of the site, or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained. This Document has been provided by Cardno now Stantec subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Cardno now Stantec's proposal and Section 1 of this report and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of Cardno now Stantec's services are as described in Cardno now Stantec's proposal, and are subject to restrictions and limitations. Cardno now Stantec did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Cardno now Stantec in regards to it.
- Conditions may exist which were undetectable given the limited nature of the enquiry Cardno now Stantec was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Cardno now Stantec's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Cardno now Stantec to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.
- Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Cardno now Stantec for incomplete or inaccurate data supplied by others.
- Cardno now Stantec may have retained sub consultants affiliated with Cardno now Stantec to provide services for the benefit of Cardno now Stantec. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Cardno now Stantec's affiliated companies, and their employees, officers and directors.

This assessment report is not any of the following:

- A Site Audit Report or Site Audit Statement (SAR/SAS) as defined under the *Contaminated Land Management Act, 1997* or an assessment sufficient for an Environmental Auditor to be able to conclude a SAR/SAS.
- A geotechnical report and the bore logs/test pit logs may not be sufficient for geotechnical advice.
- An assessment of surface water contaminants potentially arising from other sites or sources nearby.
- A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land

APPENDIX

A

FIGURES

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Relationships creating success

Surface Water Monitoring

WILEY PARK STATION

Legend

- Monitoring Location
- Discharging Points
- Watercourse (NSW SS)
- Cadastre (NSW SS, 2022)

FIGURE GS004

1:500 Scale at A3

m
0 5 10 15 20

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-08-30 | Project:304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-004-SurfaceWater.mxd 01
Aerial imagery supplied by MetroMap (June 2022)

Downer

pH Investigation 4 July2022

SURFACE WATER MONITORING WILEY PARK

Legend

- Monitoring Location
- Discharging Points
- Watercourse (NSW SS)
- Railway (NSW SS)
- Approximate Location of the Shed
- Approxiamte Location of the Concrete Tank
- Cadastre (NSW SS, 2022)

Additional Monitoring Location (Field Measurement Only)

- Drainage Trench
- Platform Drainage
- Shed Drainage
- Urban Runoff Drainage

Observed Flow Contribution to WP2-DP1 (Approximate Location)

- Drainage Trench (DT) Surface
- Platform Drainage (PD) Surface
- Shed Drainge (SD) Underground
- Urban Runoff Drainage (URD) Surface
- Mixture (Surface): PD and URD
- Mixture (Underground): PD and URD

FIGURE GS001

1:600 Scale at A3

m
0 5 10 15 20

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-08-30 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-001-SWM-pH-4-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)

Downer

Potential Flow Contributions to WP2-DP1

WILEY PARK STATION

Legend

- Watercourse (NSW SS)
- Approximate Location of OSD Tank (Not Yet Connected to the Drainage System)
- Approximate Location of the Shed
- Cadastre (NSW SS, 2019)

Approx. Location of Identified Flow Contributions to WP2-DP1

- Downpipe - Platform Building (Not Yet Connected)
- Platform Drainage (PD) - Surface
- PD - Underground
- Urban Runoff Drainage - Surface (URD)
- Mixture: PD and URD - Surface
- Mixture: PD and URD - Underground
- Temporary surface water erosion and sediment control trenches (TSRT)
- Track Drainage (TD) - Underground

FIGURE GS-005

1:1,000 Scale at A3

m
0 10 20 30 40

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-09-01 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-005-SWM-pH-FlowContribution.mxd
Aerial imagery supplied by MetroMap (June 2022)

Downer

pH Investigation 21 July2022

WILEY PARK STATION

Legend

- Drainage Pit
- Cadastre (NSW SS, 2019)

Additional pH Investigation Location

- Water Sample: PD
- Water Sample: URD
- Water Sample: Mix-PD&URD

Approx. Location of Identified Flow Contributions to WP2-DP1

- Downpipe - Platform Building (Not Yet Connected)
- Platform Drainage (PD) - Surface
- PD - Underground
- Urban Runoff Drainage - Surface (URD)
- Mixture: PD and URD - Surface

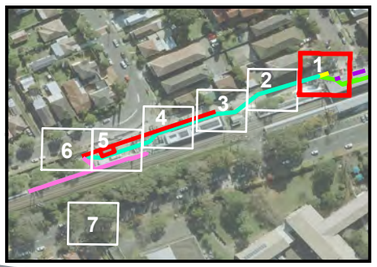


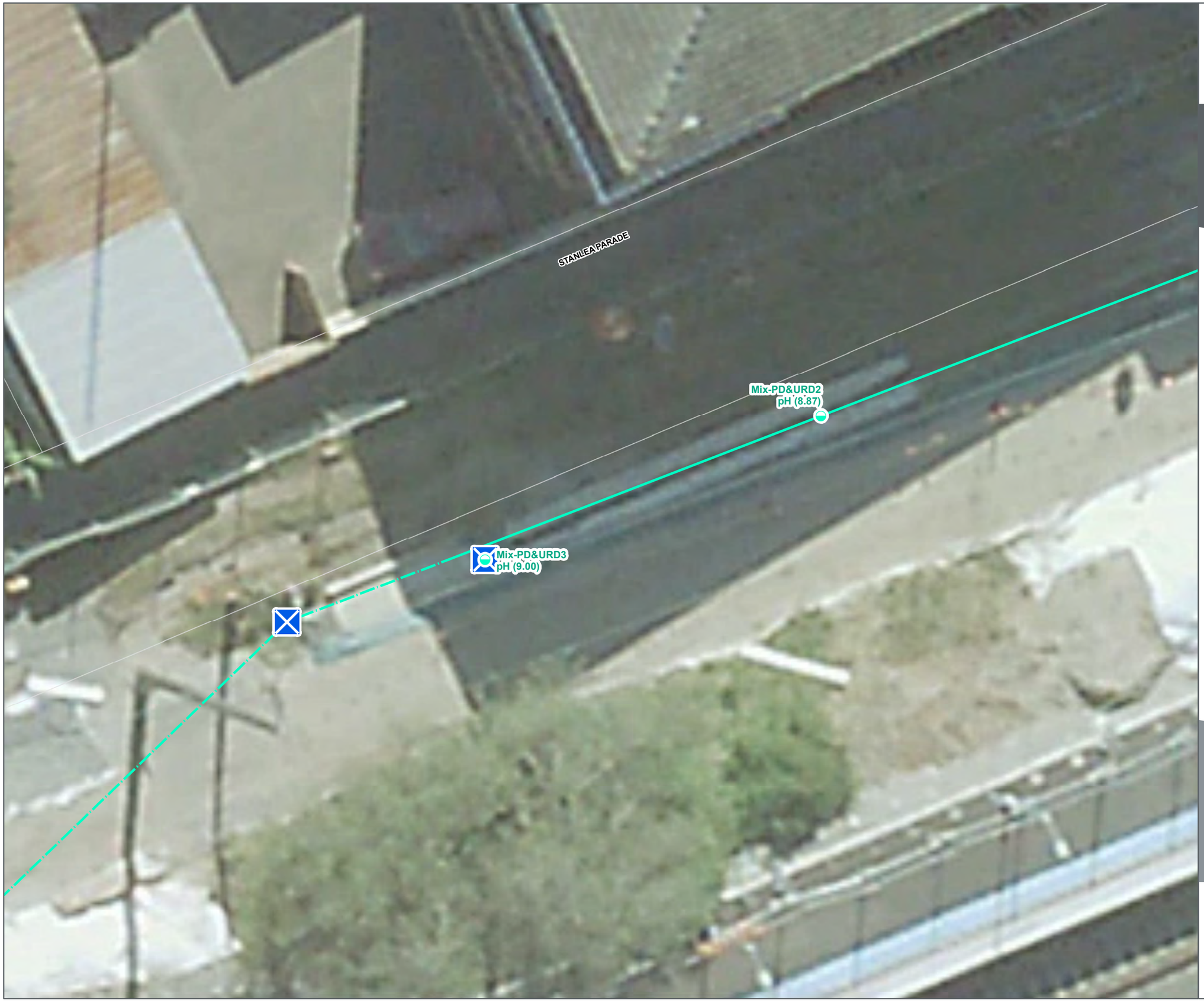
FIGURE GS-003

1:100 Scale at A3

m
0 1 2 3 4

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-09-01 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-003-SWM-pH-21-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)



pH Investigation 21 July2022

WILEY PARK STATION

Legend

- Drainage Pit
- Cadastre (NSW SS, 2019)

Additional pH Investigation Location

- Water Sample: Mix-PD&URD

Approx. Location of Identified Flow Contributions to WP2-DP1

- Mixture: PD and URD - Surface
- Mixture: PD and URD - Underground

FIGURE GS-003

1:100 Scale at A3

m
0 1 2 3 4

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-09-01 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-003-SWM-pH-21-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)

Downer

pH Investigation 21 July2022

WILEY PARK STATION

Legend

Drainage Pit

Cadastre (NSW SS, 2019)

Additional pH Investigation Location

Water Sample: Mix-PD&URD

Approx. Location of Identified Flow Contributions to WP2-DP1

Mixture: PD and URD - Underground

Temporary surface water erosion and sediment control trenches (TSRT)

FIGURE GS-003

1:100 Scale at A3

m
0 1 2 3 4

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-09-01 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-003-SWM-pH-21-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)

Downer

pH Investigation 21 July2022

WILEY PARK STATION

Legend

- Drainage Pit
- Cadastre (NSW SS, 2019)

Additional pH Investigation Location

- Water Sample: TSRT
- Soil Sample

Approx. Location of Identified Flow Contributions to WP2-DP1

- Mixture: PD and URD - Underground
- Temporary surface water erosion and sediment control trenches (TSRT)

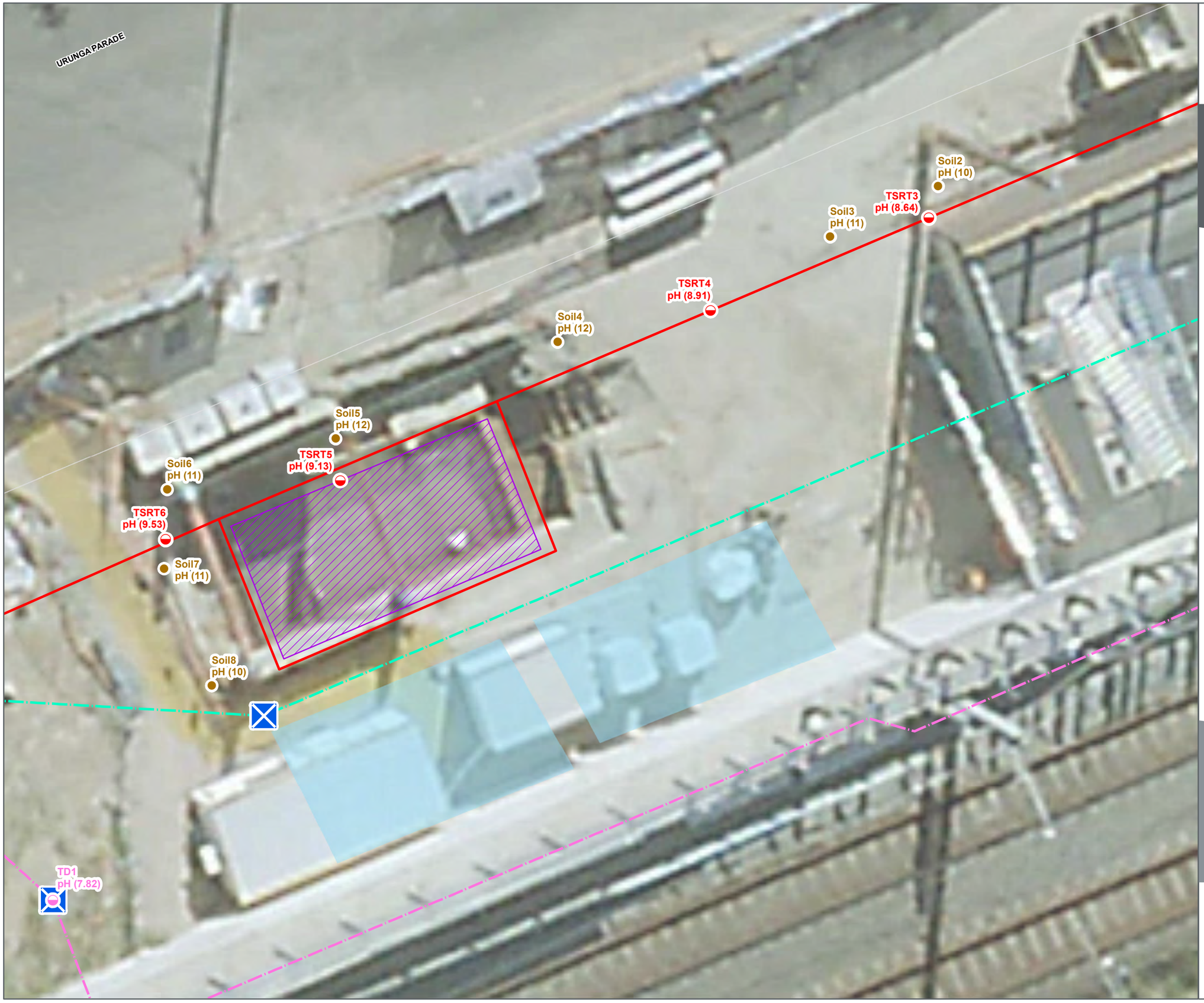
FIGURE GS-003

1:100 Scale at A3

m
0 1 2 3 4

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-09-01 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-003-SWM-pH-21-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)



pH Investigation 21 July2022

WILEY PARK STATION

Legend

- Drainage Pit
- Approximate Location of OSD Tank (Not Yet Connected to the Drainage System)
- Approximate Location of the Shed
- Cadastre (NSW SS, 2019)

Additional pH Investigation Location

- Water Sample: TSRT
- Water Sample: TD
- Soil Sample

Approx. Location of Identified Flow Contributions to WP2-DP1

- Mixture: PD and URD - Underground
- Temporary surface water erosion and sediment control trenches (TSRT)
- Track Drainage (TD) - Underground

FIGURE GS-003

1:100 Scale at A3

m
0 1 2 3 4

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-09-01 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-003-SWM-pH-21-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)

Downer

pH Investigation
21 July2022

WILEY PARK STATION

Legend

- Monitoring Location
- Discharging Points
- Drainage Pit
- Watercourse (NSW SS)
- Cadastre (NSW SS, 2019)

Additional pH Investigation Location

- Water Sample: TD
- Water Sample: Mix-PD&URD&TD&TSRT

Approx. Location of Identified Flow Contributions to WP2-DP1

- Mixture: PD and URD - Underground
- Temporary surface water erosion and sediment control trenches (TSRT)
- Track Drainage (TD) - Underground

FIGURE GS-003

1:100 Scale at A3

m
0 1 2 3 4

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-09-01 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-003-SWM-pH-21-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)

pH Investigation
21 July2022

WILEY PARK STATION

Legend

- Monitoring Location
- Discharging Points
- Watercourse (NSW SS)
- Cadastre (NSW SS, 2019)

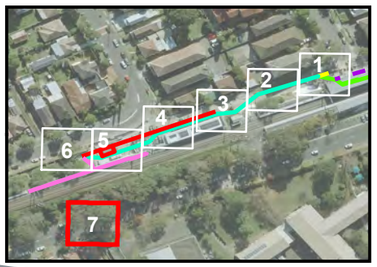


FIGURE GS-003

1:100 Scale at A3

m
0 1 2 3 4

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-08-30 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-003-SWM-pH-21-July-22.mxd
Aerial imagery supplied by MetroMap (June 2022)

APPENDIX

B

PHOTOGRAPHS

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Photograph 1. Upstream sampling location WP1. Date: 4 July 2022.

Photograph 2. Low stormwater in-flow observed from the discharge point WP1-DP1 which was located within the rail corridor and immediately downstream / north of WP1. Date: 4 July 2022.

Photograph 3. Downstream sampling location WP2. Date: 4 July 2022.

Photograph 4. Medium flow contribution was observed from downstream western discharge point WP2-DP2. Date: 4 July 2022.

Photograph 5. High level of flow contribution was observed from downstream eastern discharge point WP2-DP1. Date: 4 July 2022.

Photograph 6. Identified flow contribution to WP2-DP1: urban runoff drainage – stormwater. Date: 4 July 2022.

Photograph 7. Identified flow contribution to WP2-DP1: platform drainage – stormwater and it was mixed with urban runoff inflow once entering into the concrete lined swale. Date: 21 July 2022.

Photograph 8. Identified flow contribution to WP2-DP1: temporary surface water erosion and sediment control trenches and area surrounding constructed OSD tank. Date: 4 July 2022.

Photograph 9. Identified flow contribution to WP2-DP1: track drainage. Date: 21 July 2022.

Photograph 10. Western headwall within the project footprint – mixture of all upstream flow contributions for WP2-DP1. Date: 21 July 2022.

APPENDIX

C

FIELD RECORDS

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Shaping the Future

name. MSB building

Error! Unknown document property

Surface Water Sampling Field Record

Site / Project:	304500142 Wiley Park Station SWM	Sampling Point:	
Client:	Downer	Job No.	304500142
Person Sampling:	JZ	Initials:	

Site Details

Sampling Equipment – Directly into bottle / Water Scoop / Van Dorn Sampler / Other:	Date: 4 July 2022
Observations on Site: Last Rain Event / Recent Storms / Releases / Other :	

Sample Details, Observations, GPS Coordinates & Field Physiochemical Measurements
(If possible, record parameters once stable)

Sample ID	WP01	WP02	WP02-DP01	WP02-DP02	
Start Time:	11:50am	12:30pm	1:15pm	1:40 pm	
Easting	/	/	/	/	
Northing	/	/	/	/	
Sample Depth (m)	0.3-0.4m	0.2-0.3m	0.3-0.4m	0.3-0.4m	
Water Body Depth (m)	0.35-0.45m	0.3-0.4m	0.2-0.3	0.3m	
Location – Onsite/Offsite /Inlet/Outlet/ Middle	upstream	downstream	Discharge point (Downstream) East side	Discharge point Downstream west side	
Flow Rate None / Low / Med / High	High	High	High	Med	
DO (mg/L)	~~75.2~~	7.13	~~6.28~~	6.42	
EC (µS/Cm) SPC	296.3	330.5	* 400.6	*375.5	
pH	6.87	6.92	* 10.81	7.29	
Eh (mV) ORP	92.5	102.8	25.4	-13.4	
Temp (°C)	15.9	15.9	16.0	16.0	
Water Colour	clear	clear	clear	clear	
Turbidity Low / Med / High	Low	Low	Low	Low	
Observations / Notes DO%)	73.6	71.3	61.8	67.7	

Sample Container & Preservation Data

Number of sample containers:	6	6	6	6	
Container Volume					
Container Type					
Preservation					
Sample Number (for Lab ID):		QA100			
QC Dup Sample No.:		QA200			

photos ☑

Surface Water Sampling Field Record

Site / Project: 304500142 Wiley Park Station	Sampling Point:
Client: Dawner SWM DP01 Investigation	Job No: 304500142
Person Sampling: JZ	Initials: JZ
Site Details	
Sampling Equipment – Directly into bottle / Water Scoop / Van Dorn Sampler / Other:	Date: 04.07.2022
Observations on Site: Last Rain Event / Recent Storms / Releases / Other :	

Sample Details, Observations, GPS Coordinates & Field Physiochemical Measurements
(if possible, record parameters once stable)

Sample ID	URD1	PD1	DT1	DT2	SD1
Start Time:	2:00pm.	2:20pm	2:40pm	3:00pm.	3:35pm
Easting	/	/	/	/	/
Northing	/	/	/	/	/
Sample Depth (m)	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Water Body Depth (m)	0.1	0.05-0.1	0.1-0.2	0.1	0.1
Location – Onsite/Offsite /Inlet/Outlet/ Middle	East-north (Street sewage)	(rail corridor trench water)	(surface water east side)	Join point. (surface water west side)	East end (shed standing water)
Flow Rate None/ Low / Med / High	M	L	L	L	L
DO (mg/L)	9.29	7.06	9.93	6.67	6.44
DO (%)	93.9	71.2	101.1	67.8	65.4
EC (µS/Cm) SPC	162.7	116.4	281.8	254.0	283.1
pH	6.62	9.40	9.76	9.34	9.34
ORP (mV)	43.4	31.8	11.7	26.1	30.4
Temp (°C)	15.9	15.8	16.2	16.1	16.1
Water Colour	clear	yellow	yellow	yellow	yellow
Turbidity Low / Med / High	L	H	H	H	/
Observations / Notes					covered by geofabric.

Sample Container & Preservation Data

Number of sample containers:					
Container Volume					
Container Type					
Preservation					
Sample Number (for Lab ID):					
QC Dup Sample No.:					

Latest Weather Observations for Canterbury

IDN60801

Issued at 9:43 pm EST Monday 4 July 2022 (issued every 10 minutes, with the page automatically refreshed every 10 minutes)

About weather observations | Map of weather stations | Latest weather observations for NSW | Other Formats

Station Details ID: 066194 Name: CANTERBURY RACECOURSE AWS Lat: -33.91 Lon: 151.11 Height: 3.0 m

Data from the previous 72 hours. | See also: Recent months at Canterbury

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
04/09:39pm	14.9	11.2	14.9	100	0.0	SSE	28	46	15	25	-	-	40.4
04/09:30pm	15.1	12.6	15.1	100	0.0	SSE	22	39	12	21	-	-	37.6
04/09:00pm	15.1	11.0	14.9	99	0.1	SSE	30	54	16	29	-	-	35.4
04/08:31pm	15.1	11.4	14.9	99	0.1	SSE	28	54	15	29	-	-	33.4
04/08:30pm	15.1	11.8	14.9	99	0.1	SSE	26	54	14	29	-	-	33.0
04/08:00pm	15.6	11.0	15.0	96	0.3	SSE	33	67	18	36	-	-	31.8
04/07:30pm	15.7	10.7	15.1	96	0.3	SSE	35	59	19	32	-	-	31.2
04/07:27pm	15.8	11.2	15.2	96	0.3	SSE	33	59	18	32	-	-	31.2
04/07:00pm	15.6	10.8	14.5	93	0.6	SSE	33	57	18	31	-	-	31.0
04/06:53pm	15.6	11.1	14.8	95	0.5	SSE	32	50	17	27	-	-	31.0
04/06:47pm	15.6	11.0	15.0	96	0.3	SSE	33	48	18	26	-	-	31.0
04/06:31pm	15.3	11.6	15.1	99	0.1	SSE	28	48	15	26	-	-	30.6
04/06:30pm	15.4	11.8	15.2	99	0.1	SE	28	44	15	24	-	-	30.6
04/06:20pm	15.6	12.4	15.4	99	0.1	SSE	26	44	14	24	-	-	29.4
04/06:19pm	15.6	12.8	15.4	99	0.1	SSE	24	44	13	24	-	-	29.4
04/06:04pm	15.5	12.3	15.3	99	0.1	SSE	26	46	14	25	-	-	29.0
04/06:00pm	15.6	11.7	15.4	99	0.1	SSE	30	50	16	27	-	-	29.0
04/05:57pm	15.6	11.3	15.4	99	0.1	SE	32	50	17	27	-	-	28.6
04/05:42pm	15.2	11.6	15.2	100	0.0	SE	28	57	15	31	-	-	28.4
04/05:41pm	15.2	11.6	15.2	100	0.0	SE	28	57	15	31	-	-	28.4
04/05:30pm	15.0	13.8	15.0	100	0.0	SE	15	28	8	15	-	-	25.8
04/05:02pm	15.3	12.9	15.3	100	0.0	SE	22	37	12	20	-	-	15.0
04/05:00pm	15.2	12.7	15.2	100	0.0	SSE	22	33	12	18	-	-	14.4
04/04:30pm	15.4	12.5	15.1	98	0.2	SSE	24	35	13	19	-	-	13.8
04/04:00pm	15.6	11.5	15.0	96	0.3	SE	30	48	16	26	-	-	13.4
04/03:53pm	15.9	12.4	15.6	98	0.2	SSE	28	48	15	26	-	-	13.0
04/03:30pm	16.3	13.4	16.1	99	0.1	SSE	26	39	14	21	-	-	12.4
04/03:00pm	16.6	13.3	16.0	96	0.4	SE	28	41	15	22	-	-	11.4
04/02:38pm	16.5	13.2	16.0	97	0.3	SSE	28	48	15	26	-	-	11.4
04/02:30pm	16.4	13.9	16.1	98	0.2	SE	24	33	13	18	-	-	11.4
04/02:23pm	16.4	13.9	16.2	99	0.1	SE	24	43	13	23	-	-	11.4
04/02:00pm	16.5	15.0	15.2	92	0.8	S	17	24	9	13	-	-	7.6
04/01:59pm	16.7	15.2	15.2	91	0.9	S	17	26	9	14	-	-	6.6
04/01:30pm	18.2	16.1	16.2	88	1.2	S	22	37	12	20	-	-	4.8
04/01:00pm	17.5	13.9	15.3	87	1.3	SSE	28	43	15	23	-	-	4.8
04/12:30pm	16.7	14.3	16.4	98	0.2	SSE	24	39	13	21	-	-	4.8
04/12:00pm	16.4	13.2	16.2	99	0.1	SSE	28	48	15	26	-	-	4.8
04/11:53am	16.3	13.0	16.1	99	0.1	SSE	28	46	15	25	-	-	4.8
04/11:52am	16.3	12.6	16.1	99	0.1	SSE	30	46	16	25	-	-	4.8
04/11:30am	16.1	12.7	15.9	99	0.1	SSE	28	48	15	26	-	-	3.4
04/11:24am	16.2	12.9	16.0	99	0.1	SSE	28	50	15	27	-	-	3.2
04/11:16am	16.4	13.2	16.2	99	0.1	SSE	28	50	15	27	-	-	3.0
04/11:00am	16.1	12.7	15.9	99	0.1	SSE	28	52	15	28	-	-	2.8
04/10:56am	16.3	13.0	16.0	98	0.2	SSE	28	46	15	25	-	-	2.4
04/10:53am	16.5	12.8	16.0	97	0.3	SSE	30	54	16	29	-	-	2.2
04/10:30am	16.0	12.2	15.8	99	0.1	SSE	30	48	16	26	-	-	2.0

04/10:23am	16.0	12.6	15.7	98	0.2	SSE	28	48	15	26	-	-	1.8
04/10:20am	16.0	12.9	15.5	97	0.3	SSE	26	41	14	22	-	-	1.8
04/10:13am	16.4	13.0	15.8	96	0.4	SSE	28	44	15	24	-	-	1.4
04/10:00am	16.1	12.7	15.9	99	0.1	SSE	28	44	15	24	-	-	1.4
04/09:55am	16.2	13.6	16.0	99	0.1	SSE	24	39	13	21	-	-	1.2
04/09:52am	16.2	13.6	16.0	99	0.1	SSE	24	39	13	21	-	-	1.2
04/09:30am	15.8	12.2	15.3	97	0.3	SSE	28	48	15	26	-	-	0.6
04/09:27am	16.0	12.1	15.4	96	0.3	SSE	30	44	16	24	-	-	0.0
04/09:02am	16.1	12.4	15.1	94	0.6	SSE	28	46	15	25	-	-	0.0
04/09:00am	16.1	12.1	15.1	94	0.6	SE	30	46	16	25	-	-	28.4
04/08:37am	16.0	11.9	15.0	94	0.6	SSE	30	48	16	26	-	-	28.4
04/08:30am	15.8	11.3	14.8	94	0.6	SSE	32	52	17	28	-	-	28.4
04/08:17am	15.8	11.6	14.7	93	0.6	SSE	30	52	16	28	-	-	28.2
04/08:00am	16.4	12.5	14.4	88	1.1	SSE	28	54	15	29	-	-	27.6
04/07:30am	16.3	11.5	14.0	86	1.3	SSE	32	54	17	29	-	-	27.6
04/07:00am	16.4	12.2	13.5	83	1.6	SSE	28	48	15	26	-	-	27.6
04/06:36am	16.0	11.6	14.0	88	1.1	SSE	30	48	16	26	-	-	27.6
04/06:30am	16.0	11.6	14.0	88	1.1	SSE	30	46	16	25	-	-	27.6
04/06:00am	15.8	11.7	13.8	88	1.1	SSE	28	46	15	25	-	-	27.4
04/05:30am	15.5	11.0	13.7	89	1.0	SE	30	44	16	24	-	-	27.2
04/05:00am	15.8	11.6	13.5	86	1.3	SE	28	43	15	23	-	-	26.8
04/04:30am	16.3	12.4	13.2	82	1.7	SE	26	41	14	22	-	-	26.6
04/04:00am	16.5	12.1	13.0	80	1.9	SE	28	41	15	22	-	-	26.6
04/03:30am	16.3	12.4	13.4	83	1.6	SSE	26	41	14	22	-	-	26.6
04/03:00am	16.3	12.4	13.2	82	1.7	SE	26	43	14	23	-	-	26.6
04/02:48am	16.2	11.8	12.9	81	1.8	SE	28	46	15	25	-	-	26.6
04/02:30am	16.2	11.3	12.7	80	1.9	SE	30	44	16	24	-	-	26.6
04/02:20am	16.2	11.5	13.1	82	1.7	SE	30	48	16	26	-	-	26.6
04/02:00am	16.1	12.0	12.8	81	1.8	SE	26	41	14	22	-	-	26.6
04/01:30am	16.0	11.7	13.3	84	1.5	SE	28	50	15	27	-	-	26.6
04/01:13am	15.8	11.5	13.3	85	1.4	SE	28	46	15	25	-	-	26.6
04/01:00am	15.3	11.3	14.0	92	0.7	SE	28	44	15	24	-	-	26.6
04/12:46am	15.3	11.3	14.0	92	0.7	SE	28	46	15	25	-	-	26.6
04/12:30am	14.8	10.1	14.3	97	0.3	SSE	32	56	17	30	-	-	26.6
04/12:26am	15.0	10.2	14.0	94	0.6	SE	32	56	17	30	-	-	26.4
04/12:21am	15.0	10.2	13.9	93	0.6	SE	32	52	17	28	-	-	26.2
04/12:10am	15.1	10.6	13.8	92	0.7	SE	30	50	16	27	-	-	25.8
04/12:03am	15.1	10.3	14.0	93	0.6	SE	32	46	17	25	-	-	25.8
04/12:00am	15.3	10.9	14.0	92	0.7	SSE	30	46	16	25	-	-	25.8

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
03/11:58pm	15.3	11.3	14.0	92	0.7	SSE	28	46	15	25	-	-	25.8
03/11:51pm	15.3	11.3	14.2	93	0.6	SSE	28	44	15	24	-	-	25.8
03/11:31pm	15.1	10.1	14.0	93	0.6	SE	33	52	18	28	-	-	25.6
03/11:30pm	15.2	10.2	13.9	92	0.7	SE	33	52	18	28	-	-	25.6
03/11:00pm	15.3	10.1	13.5	89	1.0	SE	33	54	18	29	-	-	25.6
03/10:50pm	15.1	10.9	13.6	91	0.8	SE	28	46	15	25	-	-	25.6
03/10:37pm	15.0	10.5	13.7	92	0.7	SSE	30	44	16	24	-	-	25.4
03/10:30pm	14.8	10.3	13.8	94	0.6	SSE	30	46	16	25	-	-	25.4
03/10:24pm	14.9	11.0	14.4	97	0.3	SSE	28	46	15	25	-	-	25.4
03/10:23pm	14.9	11.0	14.4	97	0.3	SSE	28	44	15	24	-	-	25.4
03/10:01pm	14.8	10.8	14.2	96	0.3	SSE	28	52	15	28	-	-	25.4
03/10:00pm	14.8	10.9	14.3	97	0.3	SSE	28	41	15	22	-	-	25.4
03/09:30pm	14.5	10.2	14.3	99	0.1	SE	30	46	16	25	-	-	24.0
03/09:14pm	14.6	9.6	13.5	93	0.6	SE	32	43	17	23	-	-	22.8
03/09:01pm	14.9	9.7	13.3	90	0.9	SE	33	48	18	26	-	-	22.8
03/09:00pm	14.9	9.9	13.4	91	0.8	SE	32	48	17	26	-	-	22.8
03/08:32pm	14.8	10.3	13.8	94	0.6	SSE	30	48	16	26	-	-	21.8
03/08:30pm	14.8	10.8	14.2	96	0.3	SSE	28	44	15	24	-	-	21.8
03/08:26pm	14.8	11.7	14.5	98	0.2	SSE	24	44	13	24	-	-	21.4

03/08:20pm	14.7	11.9	14.4	98	0.2	SSE	22	35	12	19	-	-	21.0
03/08:02pm	14.4	10.4	14.2	99	0.1	SE	28	56	15	30	-	-	20.2
03/08:00pm	14.5	11.3	14.3	99	0.1	SE	24	44	13	24	-	-	20.2
03/07:43pm	14.6	11.3	14.1	97	0.3	SE	24	33	13	18	-	-	17.6
03/07:30pm	14.5	10.3	13.4	93	0.6	SE	28	46	15	25	-	-	16.8
03/07:06pm	14.4	9.7	13.1	92	0.7	SE	30	48	16	26	-	-	16.4
03/07:00pm	14.3	10.4	13.3	94	0.6	SE	26	43	14	23	-	-	16.4
03/06:38pm	14.4	9.4	13.4	94	0.6	SE	32	50	17	27	-	-	15.6
03/06:30pm	14.5	8.8	13.0	91	0.8	SE	35	50	19	27	-	-	15.4
03/06:07pm	14.5	9.9	13.5	94	0.6	SE	30	63	16	34	-	-	14.8
03/06:00pm	14.7	11.0	13.9	95	0.4	SE	26	39	14	21	-	-	14.6
03/05:34pm	14.5	10.3	13.4	93	0.6	SE	28	56	15	30	-	-	14.0
03/05:31pm	14.4	10.2	13.4	94	0.6	SE	28	41	15	22	-	-	14.0
03/05:30pm	14.3	10.0	13.3	94	0.6	SE	28	41	15	22	-	-	14.0
03/05:12pm	14.4	10.3	13.9	97	0.3	SE	28	46	15	25	-	-	13.6
03/05:11pm	14.6	10.6	14.1	97	0.3	SE	28	46	15	25	-	-	13.4
03/05:00pm	14.5	10.5	14.2	98	0.2	SSE	28	43	15	23	-	-	12.8
03/04:43pm	14.6	9.9	14.3	98	0.2	SSE	32	48	17	26	-	-	12.6
03/04:30pm	14.5	10.6	14.5	100	0.0	SSE	28	52	15	28	-	-	12.4
03/04:26pm	14.5	10.6	14.3	99	0.1	SSE	28	52	15	28	-	-	12.0
03/04:21pm	14.4	10.4	14.2	99	0.1	SSE	28	52	15	28	-	-	11.8
03/04:14pm	14.6	10.3	14.4	99	0.1	SSE	30	43	16	23	-	-	11.6
03/04:00pm	14.5	9.8	14.3	99	0.1	SSE	32	54	17	29	-	-	11.4
03/03:59pm	14.5	9.8	14.3	99	0.1	SSE	32	50	17	27	-	-	11.4
03/03:49pm	14.4	9.6	13.9	97	0.3	SE	32	44	17	24	-	-	10.8
03/03:31pm	14.8	10.5	13.2	90	0.9	SSE	28	50	15	27	-	-	10.0
03/03:30pm	14.8	10.5	13.2	90	0.9	SSE	28	43	15	23	-	-	10.0
03/03:06pm	15.0	9.7	12.5	85	1.4	SSE	32	50	17	27	-	-	9.2
03/03:00pm	14.9	9.8	13.1	89	1.0	SE	32	46	17	25	-	-	9.2
03/02:30pm	15.1	10.3	14.0	93	0.6	SSE	32	56	17	30	-	-	8.8
03/02:24pm	15.0	11.0	14.2	95	0.5	SSE	28	50	15	27	-	-	8.4
03/02:02pm	14.9	10.2	14.4	97	0.3	SSE	32	52	17	28	-	-	7.2
03/02:00pm	14.9	10.2	14.4	97	0.3	SSE	32	44	17	24	-	-	7.0
03/01:31pm	14.7	10.8	14.5	99	0.1	SSE	28	46	15	25	-	-	3.6
03/01:30pm	14.6	10.3	14.4	99	0.1	SSE	30	46	16	25	-	-	3.6
03/01:00pm	14.9	9.1	13.9	94	0.6	SE	37	61	20	33	-	-	1.2
03/12:57pm	15.0	9.9	13.7	92	0.7	SE	33	61	18	33	-	-	1.0
03/12:30pm	15.9	11.2	13.2	84	1.5	SE	30	50	16	27	-	-	0.2
03/12:00pm	16.4	11.1	12.4	77	2.2	SE	32	56	17	30	-	-	0.0
03/11:33am	16.6	11.4	13.3	81	1.8	SE	33	52	18	28	-	-	0.0
03/11:30am	16.7	11.1	13.4	81	1.9	SE	35	52	19	28	-	-	0.0
03/11:00am	16.4	11.5	13.7	84	1.5	SE	32	50	17	27	-	-	0.0
03/10:30am	15.9	10.8	13.7	87	1.2	SE	33	52	18	28	-	-	0.0
03/10:00am	15.8	11.2	14.5	92	0.7	SE	32	50	17	27	-	-	0.0
03/09:36am	15.2	10.1	14.7	97	0.3	SE	35	54	19	29	-	-	0.0
03/09:30am	15.1	10.0	14.8	98	0.2	SE	35	57	19	31	-	-	0.0
03/09:20am	15.1	9.2	14.6	97	0.3	SE	39	61	21	33	-	-	0.0
03/09:02am	15.4	10.5	14.4	94	0.6	SE	33	54	18	29	-	-	0.0
03/09:00am	15.3	10.7	14.5	95	0.5	SE	32	54	17	29	-	-	111.4
03/08:30am	15.1	10.0	14.9	99	0.1	ESE	35	57	19	31	-	-	111.2
03/08:00am	15.0	10.9	14.8	99	0.1	ESE	30	56	16	30	-	-	110.0
03/07:31am	15.2	11.4	14.7	97	0.3	ESE	28	48	15	26	-	-	108.0
03/07:30am	15.1	11.3	14.6	97	0.3	ESE	28	43	15	23	-	-	108.0
03/07:17am	15.2	11.0	14.7	97	0.3	SE	30	56	16	30	-	-	107.0
03/07:00am	15.2	13.1	15.2	100	0.0	ESE	20	28	11	15	-	-	106.2
03/06:42am	15.2	11.5	15.0	99	0.1	SE	28	41	15	22	-	-	105.4
03/06:38am	15.1	11.0	14.8	98	0.2	SE	30	50	16	27	-	-	104.4
03/06:30am	15.1	10.9	14.6	97	0.3	ESE	30	54	16	29	-	-	104.4
03/06:25am	15.2	11.5	14.9	98	0.2	ESE	28	54	15	29	-	-	104.4
03/06:19am	15.3	11.5	14.8	97	0.3	SE	28	41	15	22	-	-	104.4
03/06:05am	15.4	11.2	14.6	95	0.5	SE	30	50	16	27	-	-	103.2
03/06:00am	15.3	11.5	14.7	96	0.3	SE	28	41	15	22	-	-	103.0

03/05:39am	15.4	10.9	14.9	97	0.3	SE	32	46	17	25	-	-	102.4
03/05:30am	15.5	11.5	15.3	99	0.1	SE	30	46	16	25	-	-	102.2
03/05:26am	15.4	10.8	15.2	99	0.1	SE	33	52	18	28	-	-	102.2
03/05:22am	15.5	10.6	15.3	99	0.1	SE	35	52	19	28	-	-	102.0
03/05:08am	15.7	12.2	15.4	98	0.2	SE	28	48	15	26	-	-	101.6
03/05:00am	15.5	11.9	15.3	99	0.1	SE	28	43	15	23	-	-	101.6
03/04:51am	15.4	12.2	15.4	100	0.0	SE	26	35	14	19	-	-	101.6
03/04:30am	15.3	13.4	15.3	100	0.0	SE	19	30	10	16	-	-	101.4
03/04:00am	14.8	13.1	14.8	100	0.0	SE	17	32	9	17	-	-	99.6
03/03:30am	14.7	12.4	14.7	100	0.0	ESE	20	35	11	19	-	-	97.8
03/03:00am	14.8	11.8	14.8	100	0.0	SE	24	37	13	20	-	-	91.2
03/02:30am	14.6	11.5	14.6	100	0.0	SE	24	37	13	20	-	-	83.0
03/02:29am	14.7	11.7	14.7	100	0.0	SE	24	37	13	20	-	-	82.8
03/02:10am	14.9	12.9	14.9	100	0.0	ESE	19	30	10	16	-	-	81.8
03/02:00am	14.7	12.6	14.7	100	0.0	SE	19	35	10	19	-	-	81.2
03/01:30am	14.5	13.5	14.5	100	0.0	SE	13	30	7	16	-	-	77.6
03/01:00am	14.5	12.1	14.5	100	0.0	ESE	20	30	11	16	-	-	72.0
03/12:39am	14.4	11.2	14.2	99	0.1	ESE	24	41	13	22	-	-	70.0
03/12:30am	15.0	13.4	15.0	100	0.0	ESE	17	26	9	14	-	-	69.4
03/12:00am	14.8	11.0	14.6	99	0.1	ESE	28	43	15	23	-	-	69.4

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
02/11:56pm	14.8	11.0	14.8	100	0.0	ESE	28	43	15	23	-	-	69.4
02/11:35pm	14.5	11.0	14.5	100	0.0	SE	26	39	14	21	-	-	68.4
02/11:33pm	14.5	11.4	14.5	100	0.0	SE	24	39	13	21	-	-	66.8
02/11:30pm	14.6	11.5	14.6	100	0.0	SE	24	39	13	21	-	-	66.8
02/11:04pm	14.4	10.9	14.4	100	0.0	SE	26	43	14	23	-	-	64.6
02/11:00pm	14.3	11.0	14.1	99	0.1	SE	24	41	13	22	-	-	64.0
02/10:54pm	14.4	11.2	14.2	99	0.1	ESE	24	39	13	21	-	-	63.4
02/10:30pm	14.6	12.5	14.6	100	0.0	ESE	19	26	10	14	-	-	61.8
02/10:00pm	14.8	11.0	14.6	99	0.1	E	28	56	15	30	-	-	60.0
02/09:58pm	15.0	12.4	15.0	100	0.0	E	22	33	12	18	-	-	60.0
02/09:30pm	14.6	10.7	14.4	99	0.1	ESE	28	44	15	24	-	-	59.6
02/09:00pm	14.5	10.6	14.3	99	0.1	ESE	28	46	15	25	-	-	59.6
02/08:43pm	14.8	11.0	14.8	100	0.0	ESE	28	48	15	26	-	-	59.2
02/08:38pm	14.7	10.9	14.7	100	0.0	ESE	28	48	15	26	-	-	59.2
02/08:30pm	14.7	13.4	14.7	100	0.0	ESE	15	32	8	17	-	-	59.2
02/08:27pm	14.7	14.1	14.7	100	0.0	ESE	11	32	6	17	-	-	59.2
02/08:00pm	14.3	14.0	14.3	100	0.0	SE	9	17	5	9	-	-	58.8
02/07:43pm	14.3	12.8	14.3	100	0.0	SE	15	22	8	12	-	-	58.4
02/07:30pm	14.5	13.1	14.5	100	0.0	ESE	15	24	8	13	-	-	57.8
02/07:22pm	14.6	13.6	14.6	100	0.0	E	13	20	7	11	-	-	57.0
02/07:02pm	14.6	12.9	14.6	100	0.0	ESE	17	32	9	17	-	-	55.8
02/07:00pm	14.6	12.5	14.6	100	0.0	ESE	19	32	10	17	-	-	55.8
02/06:30pm	14.7	10.9	14.7	100	0.0	SE	28	41	15	22	-	-	52.8
02/06:03pm	14.7	9.9	14.7	100	0.0	ESE	33	52	18	28	-	-	49.4
02/06:00pm	14.8	10.3	14.8	100	0.0	ESE	32	46	17	25	-	-	48.6
02/05:30pm	14.7	9.9	14.7	100	0.0	SE	33	56	18	30	-	-	44.2
02/05:00pm	14.7	10.5	14.7	100	0.0	SE	30	48	16	26	-	-	40.8
02/04:59pm	14.7	10.5	14.7	100	0.0	SE	30	48	16	26	-	-	40.8
02/04:49pm	15.1	10.7	15.1	100	0.0	SE	32	46	17	25	-	-	39.6
02/04:36pm	15.1	11.4	15.1	100	0.0	SE	28	39	15	21	-	-	38.6
02/04:30pm	15.2	11.6	15.2	100	0.0	SE	28	43	15	23	-	-	38.4
02/04:14pm	15.1	11.4	15.1	100	0.0	SE	28	46	15	25	-	-	37.2
02/04:00pm	15.0	13.0	15.0	100	0.0	ESE	19	37	10	20	-	-	35.0
02/03:49pm	14.9	12.3	14.9	100	0.0	SE	22	33	12	18	-	-	32.2
02/03:30pm	14.9	11.2	14.9	100	0.0	SE	28	43	15	23	-	-	30.6
02/03:06pm	14.6	10.8	14.6	100	0.0	SE	28	43	15	23	-	-	29.6
02/03:00pm	14.7	11.7	14.7	100	0.0	SE	24	43	13	23	-	-	29.4
02/02:39pm	14.7	12.0	14.7	100	0.0	SE	22	32	12	17	-	-	27.8

02/02:30pm	14.6	12.5	14.6	100	0.0	SE	19	32	10	17	-	-	27.0
02/02:16pm	14.5	12.1	14.5	100	0.0	SE	20	30	11	16	-	-	26.6
02/02:00pm	14.5	13.9	14.5	100	0.0	ESE	11	19	6	10	-	-	26.0
02/01:30pm	14.4	14.5	14.4	100	0.0	SW	7	15	4	8	-	-	21.0
02/01:00pm	14.7	15.8	14.7	100	0.0	SE	2	7	1	4	-	-	15.8
02/12:33pm	15.2	15.8	15.2	100	0.0	S	6	11	3	6	-	-	9.2
02/12:30pm	15.3	16.3	15.3	100	0.0	S	4	9	2	5	-	-	9.2
02/12:16pm	15.3	16.3	15.3	100	0.0	NW	4	9	2	5	-	-	8.6
02/12:00pm	14.8	16.4	14.8	100	0.0	CALM	0	6	0	3	-	-	8.6
02/11:30am	14.8	15.2	14.8	100	0.0	SSW	6	7	3	4	-	-	6.2
02/11:17am	14.6	14.8	14.6	100	0.0	WSW	7	13	4	7	-	-	5.4
02/11:00am	14.9	15.7	14.9	100	0.0	SW	4	9	2	5	-	-	5.0
02/10:32am	13.9	14.0	13.9	100	0.0	WNW	6	9	3	5	-	-	5.0
02/10:30am	13.8	13.9	13.8	100	0.0	NW	6	9	3	5	-	-	5.0
02/10:07am	13.4	14.1	13.4	100	0.0	W	2	9	1	5	-	-	4.2
02/10:02am	13.3	13.2	13.3	100	0.0	W	6	9	3	5	-	-	3.8
02/10:00am	13.2	13.1	13.2	100	0.0	WSW	6	9	3	5	-	-	3.8
02/09:30am	12.1	12.8	12.1	100	0.0	CALM	0	0	0	0	-	-	3.0
02/09:00am	11.8	12.4	11.8	100	0.0	CALM	0	0	0	0	-	-	10.0
02/08:51am	11.8	11.6	11.8	100	0.0	N	4	9	2	5	-	-	9.6
02/08:33am	11.5	12.0	11.5	100	0.0	CALM	0	0	0	0	-	-	9.2
02/08:30am	11.6	12.1	11.6	100	0.0	CALM	0	0	0	0	-	-	9.2
02/08:16am	11.4	11.5	11.4	100	0.0	N	2	7	1	4	-	-	9.2
02/08:00am	11.3	11.7	11.3	100	0.0	CALM	0	4	0	2	-	-	9.0
02/07:36am	11.2	11.2	11.2	100	0.0	NE	2	6	1	3	-	-	9.0
02/07:30am	11.1	10.3	11.1	100	0.0	N	6	11	3	6	-	-	9.0
02/07:09am	11.1	10.1	11.1	100	0.0	N	7	11	4	6	-	-	8.4
02/07:00am	11.1	10.1	11.1	100	0.0	N	7	11	4	6	-	-	8.2
02/06:30am	10.9	10.1	10.9	100	0.0	NNW	6	7	3	4	-	-	8.2
02/06:00am	11.0	10.2	11.0	100	0.0	NW	6	9	3	5	-	-	8.2
02/05:30am	10.8	9.7	10.8	100	0.0	WNW	7	9	4	5	-	-	8.2
02/05:00am	10.9	9.9	10.9	100	0.0	NW	7	9	4	5	-	-	8.2
02/04:30am	11.1	11.1	11.1	100	0.0	W	2	7	1	4	-	-	8.2
02/04:00am	11.0	10.0	11.0	100	0.0	W	7	11	4	6	-	-	8.2
02/03:45am	10.9	10.1	10.9	100	0.0	NNW	6	7	3	4	-	-	8.2
02/03:30am	10.8	9.9	10.8	100	0.0	NW	6	9	3	5	-	-	8.2
02/03:00am	10.8	11.1	10.8	100	0.0	CALM	0	0	0	0	-	-	7.8
02/02:30am	10.7	9.8	10.7	100	0.0	WNW	6	9	3	5	-	-	7.8
02/02:00am	10.6	9.7	10.6	100	0.0	NNW	6	9	3	5	-	-	7.8
02/01:30am	10.6	9.7	10.6	100	0.0	WNW	6	9	3	5	-	-	7.8
02/01:00am	10.6	10.4	10.6	100	0.0	NW	2	7	1	4	-	-	7.8
02/12:56am	10.6	9.7	10.6	100	0.0	NW	6	7	3	4	-	-	7.8
02/12:46am	10.3	10.1	10.3	100	0.0	NNW	2	7	1	4	-	-	7.8
02/12:35am	10.4	9.2	10.4	100	0.0	NNW	7	11	4	6	-	-	7.8
02/12:30am	10.4	8.9	10.4	100	0.0	N	9	13	5	7	-	-	7.8
02/12:08am	10.0	9.7	10.0	100	0.0	SW	2	7	1	4	-	-	7.8
02/12:00am	10.8	9.9	10.8	100	0.0	WSW	6	9	3	5	-	-	7.8

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
01/11:30pm	10.9	10.1	10.9	100	0.0	NNW	6	9	3	5	-	-	7.6
01/11:00pm	10.9	10.1	10.9	100	0.0	N	6	9	3	5	-	-	7.6
01/10:43pm	10.9	9.9	10.9	100	0.0	WSW	7	11	4	6	-	-	7.6
01/10:30pm	11.0	10.0	11.0	100	0.0	W	7	9	4	5	-	-	7.6
01/10:00pm	11.0	11.3	11.0	100	0.0	CALM	0	0	0	0	-	-	6.4

Other formats

Comma delimited format used in spreadsheet applications
http://www.bom.gov.au/fwo/IDN60801/IDN60801.94766.axf

JavaScript Object Notation format (JSON) in row-major order
http://www.bom.gov.au/fwo/IDN60801/IDN60801.94766.json

Data quality

Most of these data are generated automatically and are frequently updated. Quality checks on data are not normally performed. It is possible for incorrect values to appear. Refer to information at About Latest Weather Observations and please check the disclaimer before using these data.

Australian Government
Bureau of Meteorology

Latest Weather Observations for Canterbury

IDN60801

Issued at 8:13 am EST Friday 22 July 2022 (issued every 10 minutes, with the page automatically refreshed every 10 minutes)

Station Details **ID:** 066194 **Name:** CANTERBURY RACECOURSE AWS **Lat:** -33.91 **Lon:** 151.11 **Height:** 3.0 m

Data from the previous 72 hours. | See also: Recent months at Canterbury

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/08:07am	12.0	11.5	12.0	100	0.0	WNW	6	15	3	8	-	-	13.8
22/08:00am	11.8	12.4	11.8	100	0.0	CALM	0	0	0	0	-	-	13.4
22/07:30am	11.3	11.7	11.3	100	0.0	CALM	0	0	0	0	-	-	13.4
22/07:00am	10.9	10.0	10.7	99	0.1	SW	6	7	3	4	-	-	13.4
22/06:30am	11.3	11.7	11.1	99	0.1	CALM	0	2	0	1	-	-	13.4
22/06:00am	12.0	11.4	11.8	99	0.1	WSW	6	9	3	5	-	-	13.4
22/05:59am	11.9	11.3	11.7	99	0.1	WSW	6	9	3	5	-	-	13.4
22/05:44am	12.0	10.5	11.8	99	0.1	ENE	11	33	6	18	-	-	13.4
22/05:30am	11.0	10.5	10.8	99	0.1	SSE	4	7	2	4	-	-	12.8
22/05:02am	11.6	10.7	11.4	99	0.1	SE	7	13	4	7	-	-	12.8
22/05:00am	11.8	11.0	11.6	99	0.1	SSE	7	13	4	7	-	-	12.8
22/04:42am	11.6	10.9	11.4	99	0.1	ESE	6	15	3	8	-	-	12.4
22/04:30am	11.6	12.0	11.1	97	0.3	CALM	0	0	0	0	-	-	11.4
22/04:00am	12.3	11.3	11.0	92	0.7	ESE	7	9	4	5	-	-	11.4
22/03:55am	12.4	11.4	11.1	92	0.7	ESE	7	9	4	5	-	-	11.4
22/03:42am	12.6	9.3	10.8	89	0.9	ESE	19	30	10	16	-	-	11.4
22/03:30am	12.1	11.8	11.3	95	0.4	SE	4	22	2	12	-	-	11.0
22/03:00am	12.5	11.5	11.1	91	0.7	SE	7	11	4	6	-	-	11.0
22/02:30am	12.9	10.0	11.1	89	0.9	ESE	17	24	9	13	-	-	11.0
22/02:00am	12.2	10.4	12.0	99	0.1	ESE	13	32	7	17	-	-	11.0
22/01:30am	11.4	11.8	11.1	98	0.2	CALM	0	0	0	0	-	-	11.0
22/01:00am	11.9	11.9	11.1	95	0.4	S	2	9	1	5	-	-	11.0
22/12:49am	12.0	11.2	11.2	95	0.4	S	6	11	3	6	-	-	11.0
22/12:35am	12.3	10.1	10.9	91	0.7	ESE	13	22	7	12	-	-	10.8
22/12:30am	12.3	9.6	10.5	89	0.9	E	15	24	8	13	-	-	10.6
22/12:00am	12.4	10.7	11.1	92	0.7	SE	11	15	6	8	-	-	10.4

Date/Time EST	Temp °C	App Temp	Dew Point	Rel Hum	Delta-T °C	Wind	Press QNH	Press MSL	Rain since 9am

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind Dir	Wind Spd km/h	Wind Gust km/h	Wind Spd kts	Wind Gust kts	Press QNH hPa	Press MSL hPa	Rainfall since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
21/11:30pm	13.1	9.7	10.5	84	1.4	E	19	28	10	15	-	-	10.0
21/11:00pm	13.5	10.8	9.0	74	2.3	ESE	13	24	7	13	-	-	9.8
21/10:30pm	13.5	10.6	9.6	77	2.0	ESE	15	20	8	11	-	-	9.8
21/10:00pm	13.6	10.5	10.4	81	1.7	ESE	17	28	9	15	-	-	9.8
21/09:30pm	14.7	10.8	9.5	71	2.7	ESE	20	32	11	17	-	-	9.6
21/09:00pm	14.7	11.1	9.7	72	2.6	ESE	19	32	10	17	-	-	9.6
21/08:30pm	14.6	10.4	9.6	72	2.6	E	22	35	12	19	-	-	9.6
21/08:00pm	14.5	11.6	9.5	72	2.6	ESE	15	24	8	13	-	-	9.6
21/07:30pm	14.5	10.7	9.1	70	2.8	ESE	19	30	10	16	-	-	9.6
21/07:00pm	14.6	10.6	10.6	77	2.1	ESE	22	37	12	20	-	-	9.6
21/06:30pm	14.3	11.0	10.9	80	1.8	ESE	19	30	10	16	-	-	9.6
21/06:00pm	14.2	10.9	10.8	80	1.8	ESE	19	30	10	16	-	-	9.6
21/05:30pm	14.0	11.1	11.0	82	1.6	ESE	17	26	9	14	-	-	9.6
21/05:00pm	12.8	12.3	12.0	95	0.4	E	6	11	3	6	-	-	9.6
21/04:40pm	12.9	11.8	11.8	93	0.6	E	9	13	5	7	-	-	9.6
21/04:30pm	13.0	10.6	11.4	90	0.8	E	15	28	8	15	-	-	9.6
21/04:24pm	13.1	9.3	11.0	87	1.1	ESE	22	41	12	22	-	-	9.2
21/04:19pm	13.7	10.3	10.7	82	1.6	ESE	19	41	10	22	-	-	9.0
21/04:00pm	14.6	12.9	11.2	80	1.8	ESE	11	17	6	9	-	-	9.0
21/03:30pm	14.5	11.6	11.1	80	1.8	ESE	17	28	9	15	-	-	9.0
21/03:00pm	14.0	12.5	11.9	87	1.1	E	11	17	6	9	-	-	9.0
21/02:48pm	13.8	12.9	12.7	93	0.6	E	9	15	5	8	-	-	9.0
21/02:30pm	13.3	10.3	11.9	91	0.7	ENE	19	32	10	17	-	-	8.8
21/02:29pm	13.3	10.3	11.9	91	0.7	ENE	19	32	10	17	-	-	8.8
21/02:00pm	14.6	14.7	13.8	95	0.4	NNE	6	7	3	4	-	-	8.4
21/01:52pm	14.0	14.8	13.8	99	0.1	ESE	2	7	1	4	-	-	8.4
21/01:30pm	13.3	13.9	13.1	99	0.1	ESE	2	7	1	4	-	-	8.0
21/01:00pm	12.7	9.6	12.2	97	0.3	SE	20	33	11	18	-	-	6.4
21/12:30pm	13.3	10.8	12.2	93	0.6	NE	17	24	9	13	-	-	5.0
21/12:11pm	14.0	12.1	11.9	87	1.1	NNE	13	26	7	14	-	-	4.4
21/12:00pm	14.6	13.5	12.1	85	1.4	ENE	9	15	5	8	-	-	3.0
21/11:40am	14.2	12.7	13.1	93	0.6	SE	13	19	7	10	-	-	3.0
21/11:30am	13.8	11.5	12.9	94	0.5	ESE	17	26	9	14	-	-	3.0
21/11:20am	13.6	10.8	11.5	87	1.1	E	17	46	9	25	-	-	2.6
21/11:00am	13.8	14.0	13.2	96	0.3	NW	4	9	2	5	-	-	0.6
21/10:30am	12.6	12.3	12.6	100	0.0	WNW	6	9	3	5	-	-	0.4
21/10:24am	12.6	12.1	12.6	100	0.0	WNW	7	11	4	6	-	-	0.4
21/10:13am	11.7	11.1	11.7	100	0.0	NW	6	11	3	6	-	-	0.4
21/10:00am	11.6	10.8	11.6	100	0.0	WNW	7	9	4	5	-	-	0.0
21/09:30am	11.1	9.8	11.1	100	0.0	NW	9	15	5	8	-	-	0.0
21/09:00am	10.7	9.6	10.7	100	0.0	W	7	15	4	8	-	-	4.0
21/08:30am	11.1	10.7	11.1	100	0.0	N	4	15	2	8	-	-	4.0
21/08:00am	10.5	10.7	10.5	100	0.0	CALM	0	0	0	0	-	-	4.0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
21/07:30am	10.0	9.3	10.0	100	0.0	SSE	4	7	2	4	-	-	4.0
21/07:00am	9.9	8.6	9.9	100	0.0	SSE	7	9	4	5	-	-	4.0
21/06:30am	9.4	8.5	9.4	100	0.0	WSW	4	9	2	5	-	-	4.0
21/06:00am	9.2	8.7	9.2	100	0.0	WNW	2	7	1	4	-	-	3.8
21/05:39am	9.1	8.5	9.1	100	0.0	NNW	2	7	1	4	-	-	3.4
21/05:30am	9.0	7.5	9.0	100	0.0	NW	7	13	4	7	-	-	3.4
21/05:01am	8.5	8.2	8.5	100	0.0	CALM	0	0	0	0	-	-	3.4
21/05:00am	8.4	8.0	8.4	100	0.0	CALM	0	0	0	0	-	-	3.4
21/04:50am	8.6	7.5	8.6	100	0.0	WNW	4	9	2	5	-	-	3.4
21/04:30am	8.3	7.9	8.3	100	0.0	CALM	0	0	0	0	-	-	3.4
21/04:00am	8.6	8.3	8.6	100	0.0	CALM	0	0	0	0	-	-	3.4
21/03:30am	8.9	8.7	8.9	100	0.0	CALM	0	0	0	0	-	-	3.4
21/03:00am	9.0	8.4	9.0	100	0.0	WNW	2	7	1	4	-	-	3.4
21/02:49am	9.1	8.5	9.1	100	0.0	WNW	2	7	1	4	-	-	3.4
21/02:30am	9.6	9.2	9.6	100	0.0	WNW	2	7	1	4	-	-	3.4
21/02:19am	9.7	8.9	9.7	100	0.0	NNW	4	9	2	5	-	-	3.4
21/02:00am	9.3	8.4	9.3	100	0.0	N	4	9	2	5	-	-	3.4
21/01:58am	9.3	8.4	9.3	100	0.0	N	4	9	2	5	-	-	3.4
21/01:30am	9.1	8.9	9.1	100	0.0	CALM	0	0	0	0	-	-	3.4
21/01:00am	9.9	9.9	9.9	100	0.0	CALM	0	0	0	0	-	-	3.4
21/12:38am	9.3	9.2	9.3	100	0.0	CALM	0	0	0	0	-	-	3.4
21/12:30am	10.2	10.3	10.2	100	0.0	CALM	0	0	0	0	-	-	3.4
21/12:00am	10.8	10.3	10.8	100	0.0	WNW	4	7	2	4	-	-	3.4

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
20/11:30pm	10.9	9.5	10.9	100	0.0	NW	9	13	5	7	-	-	3.4
20/11:00pm	10.9	9.9	10.9	100	0.0	W	7	13	4	7	-	-	3.2
20/10:30pm	10.5	10.7	10.5	100	0.0	CALM	0	0	0	0	-	-	3.2
20/10:00pm	10.4	9.8	10.4	100	0.0	S	4	7	2	4	-	-	3.2
20/09:30pm	10.9	9.9	10.9	100	0.0	SSW	7	11	4	6	-	-	3.2
20/09:00pm	10.7	10.9	10.5	99	0.1	CALM	0	0	0	0	-	-	3.2
20/08:30pm	11.0	10.5	10.8	99	0.1	WSW	4	7	2	4	-	-	3.0
20/08:00pm	11.0	10.1	10.8	99	0.1	SSW	6	11	3	6	-	-	3.0
20/07:30pm	11.0	9.9	10.8	99	0.1	W	7	13	4	7	-	-	3.0
20/07:00pm	11.4	10.5	11.2	99	0.1	SW	7	13	4	7	-	-	3.0
20/06:30pm	11.5	11.9	11.3	99	0.1	CALM	0	0	0	0	-	-	2.8
20/06:00pm	11.9	10.7	11.6	98	0.2	SSW	9	17	5	9	-	-	2.6
20/05:30pm	11.7	10.9	11.2	97	0.3	SW	6	9	3	5	-	-	2.6
20/05:00pm	11.7	10.9	11.1	96	0.3	SSW	6	9	3	5	-	-	2.4
20/04:30pm	12.1	12.2	11.5	96	0.3	SSW	2	7	1	4	-	-	2.4
20/04:17pm	12.1	11.2	11.5	96	0.3	SW	7	11	4	6	-	-	2.4

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
20/04:00pm	12.1	10.8	11.2	94	0.5	SE	9	19	5	10	-	-	2.4
20/03:51pm	12.2	10.8	10.9	92	0.7	SE	9	17	5	9	-	-	1.8
20/03:48pm	12.5	11.6	11.2	92	0.7	SE	7	11	4	6	-	-	1.2
20/03:30pm	12.6	10.6	10.3	86	1.2	SE	11	20	6	11	-	-	1.2
20/03:27pm	12.7	10.7	10.2	85	1.3	S	11	20	6	11	-	-	0.8
20/03:00pm	13.4	12.0	10.8	84	1.4	SSE	9	15	5	8	-	-	0.2
20/02:30pm	13.6	11.2	11.3	86	1.2	S	15	22	8	12	-	-	0.2
20/02:00pm	14.5	11.8	11.8	84	1.5	S	17	24	9	13	-	-	0.2
20/01:30pm	14.1	12.8	11.1	82	1.6	S	9	15	5	8	-	-	0.2
20/01:00pm	13.5	11.9	11.4	87	1.1	S	11	15	6	8	-	-	0.2
20/12:30pm	13.0	10.8	10.9	87	1.1	SW	13	17	7	9	-	-	0.2
20/12:00pm	13.4	12.2	11.6	89	1.0	SW	9	15	5	8	-	-	0.2
20/11:48am	13.3	12.9	13.1	99	0.1	SSW	7	11	4	6	-	-	0.2
20/11:30am	12.2	10.5	11.3	94	0.5	SSE	11	17	6	9	-	-	0.2
20/11:28am	12.3	10.7	11.4	94	0.5	SSE	11	17	6	9	-	-	0.2
20/11:00am	13.0	11.7	11.4	90	0.8	SSW	9	17	5	9	-	-	0.0
20/10:30am	12.7	11.7	12.2	97	0.3	SW	9	17	5	9	-	-	0.0
20/10:00am	11.6	10.7	11.4	99	0.1	W	7	9	4	5	-	-	0.0
20/09:30am	11.4	10.1	11.4	100	0.0	WSW	9	13	5	7	-	-	0.0
20/09:10am	10.9	9.5	10.9	100	0.0	SW	9	17	5	9	-	-	0.0
20/09:00am	10.5	9.0	10.5	100	0.0	WSW	9	17	5	9	-	-	14.4
20/08:45am	10.1	8.8	10.1	100	0.0	SW	7	13	4	7	-	-	14.2
20/08:30am	9.8	8.7	9.8	100	0.0	SW	6	11	3	6	-	-	14.2
20/08:00am	9.3	7.8	9.3	100	0.0	WNW	7	11	4	6	-	-	14.2
20/07:31am	8.9	7.9	8.9	100	0.0	NW	4	9	2	5	-	-	14.2
20/07:30am	9.0	8.0	9.0	100	0.0	WNW	4	7	2	4	-	-	14.2
20/07:07am	8.8	7.2	8.8	100	0.0	NNW	7	11	4	6	-	-	13.6
20/07:00am	8.7	6.7	8.7	100	0.0	N	9	11	5	6	-	-	13.4
20/06:40am	7.8	6.9	7.8	100	0.0	WNW	2	6	1	3	-	-	13.4
20/06:30am	8.2	7.0	8.2	100	0.0	NW	4	7	2	4	-	-	13.4
20/06:21am	8.0	7.2	8.0	100	0.0	NW	2	7	1	4	-	-	13.4
20/06:00am	8.4	6.7	8.4	100	0.0	NW	7	9	4	5	-	-	13.4
20/05:47am	8.3	6.8	8.3	100	0.0	NNW	6	11	3	6	-	-	13.4
20/05:30am	7.9	7.0	7.9	100	0.0	W	2	9	1	5	-	-	13.4
20/05:03am	8.1	7.3	8.1	100	0.0	W	2	6	1	3	-	-	13.4
20/05:00am	8.2	7.0	8.2	100	0.0	W	4	7	2	4	-	-	13.4
20/04:30am	8.8	7.2	8.8	100	0.0	W	7	13	4	7	-	-	13.2
20/04:28am	8.9	7.3	8.9	100	0.0	WSW	7	13	4	7	-	-	13.2
20/04:03am	9.0	8.4	9.0	100	0.0	NW	2	6	1	3	-	-	12.8
20/04:00am	9.0	8.0	9.0	100	0.0	NW	4	9	2	5	-	-	12.4
20/03:30am	8.8	8.2	8.8	100	0.0	W	2	7	1	4	-	-	12.0
20/03:00am	8.7	7.3	8.7	100	0.0	WNW	6	9	3	5	-	-	11.8
20/02:30am	8.6	7.0	8.6	100	0.0	W	7	13	4	7	-	-	11.8
20/02:00am	8.4	6.7	8.4	100	0.0	NNE	7	11	4	6	-	-	11.8

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
20/01:30am	8.3	6.8	8.3	100	0.0	NNW	6	9	3	5	-	-	11.8
20/01:00am	8.4	6.9	8.4	100	0.0	NNW	6	9	3	5	-	-	11.8
20/12:30am	8.7	7.7	8.7	100	0.0	NNW	4	9	2	5	-	-	11.8
20/12:00am	9.0	7.5	9.0	100	0.0	W	7	11	4	6	-	-	11.8

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
19/11:34pm	9.1	7.8	9.1	100	0.0	WSW	6	11	3	6	-	-	11.8
19/11:30pm	9.0	7.5	9.0	100	0.0	WSW	7	11	4	6	-	-	11.6
19/11:20pm	8.8	7.8	8.8	100	0.0	WNW	4	9	2	5	-	-	11.6
19/11:00pm	8.7	7.7	8.7	100	0.0	WSW	4	7	2	4	-	-	11.6
19/10:30pm	8.7	7.2	8.6	99	0.0	WNW	6	9	3	5	-	-	11.4
19/10:00pm	8.9	7.5	8.8	99	0.0	NW	6	9	3	5	-	-	11.4
19/09:30pm	9.3	8.0	9.2	99	0.0	WNW	6	7	3	4	-	-	11.4
19/09:00pm	9.6	8.4	9.5	99	0.0	WNW	6	11	3	6	-	-	11.2
19/08:30pm	9.9	8.2	9.8	99	0.1	WSW	9	13	5	7	-	-	11.0
19/08:00pm	9.6	8.2	9.5	99	0.0	WNW	7	11	4	6	-	-	10.8
19/07:30pm	9.8	8.6	9.7	99	0.0	SW	6	9	3	5	-	-	10.8
19/07:00pm	9.9	8.8	9.8	99	0.1	W	6	9	3	5	-	-	10.8
19/06:57pm	9.9	8.8	9.8	99	0.1	W	6	9	3	5	-	-	10.8
19/06:37pm	10.0	8.9	9.9	99	0.1	WSW	6	13	3	7	-	-	10.4
19/06:34pm	10.0	8.7	9.9	99	0.1	WSW	7	13	4	7	-	-	10.2
19/06:30pm	10.0	8.9	9.9	99	0.1	WSW	6	13	3	7	-	-	10.2
19/06:11pm	10.1	8.4	10.0	99	0.1	SW	9	15	5	8	-	-	9.8
19/06:05pm	10.2	8.2	10.1	99	0.1	SW	11	17	6	9	-	-	9.6
19/06:00pm	10.2	8.6	10.1	99	0.1	SSW	9	17	5	9	-	-	9.2
19/05:41pm	10.2	8.2	10.1	99	0.1	SW	11	22	6	12	-	-	8.0
19/05:30pm	10.3	8.3	10.1	99	0.1	SW	11	15	6	8	-	-	7.2
19/05:00pm	10.5	8.9	10.3	99	0.1	SW	9	13	5	7	-	-	7.2
19/04:50pm	10.5	8.9	10.3	99	0.1	SW	9	17	5	9	-	-	7.2
19/04:30pm	10.8	9.7	10.6	99	0.1	S	7	13	4	7	-	-	7.0
19/04:12pm	10.8	8.5	10.6	99	0.1	S	13	20	7	11	-	-	5.8
19/04:08pm	10.8	8.5	10.6	99	0.1	S	13	20	7	11	-	-	5.4
19/04:00pm	10.6	8.3	10.3	98	0.2	S	13	22	7	12	-	-	5.4
19/03:36pm	10.9	8.9	10.3	96	0.3	SSW	11	22	6	12	-	-	3.8
19/03:34pm	10.9	9.3	10.3	96	0.3	SSW	9	20	5	11	-	-	3.6
19/03:30pm	10.8	8.8	10.2	96	0.3	S	11	22	6	12	-	-	3.4
19/03:00pm	11.0	8.2	9.9	93	0.6	S	15	26	8	14	-	-	1.6
19/02:57pm	11.1	8.3	10.0	93	0.6	S	15	26	8	14	-	-	1.4
19/02:30pm	11.1	7.3	9.9	92	0.6	S	20	37	11	20	-	-	1.0
19/02:28pm	11.0	6.8	9.8	92	0.6	S	22	37	12	20	-	-	1.0
19/02:07pm	11.4	7.0	9.1	86	1.1	S	22	35	12	19	-	-	0.2
19/02:00pm	11.9	7.4	8.6	80	1.6	S	22	35	12	19	-	-	0.0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
19/01:30pm	11.8	6.5	8.3	79	1.7	S	26	41	14	22	-	-	0.0
19/01:00pm	12.3	6.7	7.2	71	2.5	S	26	48	14	26	-	-	0.0
19/12:30pm	12.9	8.3	6.3	64	3.1	S	20	43	11	23	-	-	0.0
19/12:00pm	13.3	8.2	6.2	62	3.4	S	22	37	12	20	-	-	0.0
19/11:30am	12.8	7.6	5.5	61	3.4	S	22	37	12	20	-	-	0.0
19/11:00am	12.9	8.0	5.3	60	3.5	S	20	37	11	20	-	-	0.0
19/10:30am	12.7	7.9	4.9	59	3.6	S	19	33	10	18	-	-	0.0
19/10:00am	11.3	7.4	3.3	58	3.5	SW	13	22	7	12	-	-	0.0
19/09:30am	10.3	6.6	2.4	58	3.4	WSW	11	17	6	9	-	-	0.0
19/09:00am	9.1	4.6	2.0	61	3.0	WSW	15	22	8	12	-	-	0.0
19/08:30am	7.9	4.1	1.5	64	2.6	WSW	11	20	6	11	-	-	0.0

This page was created at **08:21 on Friday 22 July 2022 (AEST)**

APPENDIX

D

LABORATORY SUMMARY TABLES

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				TPH	Inorganics				Field Physio-Chemical				
			Chlorophyll a	Oil and Grease	Nitrogen (Total as N)	Phosphorus (Total as P)	TSS	Turbidity	pH - Lab	pH - Field	Temprature	Electrical Conductivity	Dissolved Oxygen
			mg/L	mg/L	mg/L	µg/L	mg/L	NTU	Units	Units	°C	uS/cm	%Sat
EQL			0.002	10	0.2	10	1	1	0.01	0.01	0.1	0.1	0.1
ANZECC Criteria - Freshwater			**0.003**	**-**	**0.35**	**25**	**-**	**<6-50**	**6.5-8.5**	**6.5-8.5**	**-**	**125-2200**	**85% - 110%**
Lab Report Number	**Field ID**	**Date**											
903692	**WP1**	**4/07/2022**	**0.0036**	<10	**0.48**	**90**	11	9.4	6.8	6.87	15.9	296.3	**73.6**
903692	**WP2**	**4/07/2022**	<0.002	<10	**0.57**	**60**	9	11	7.6	6.92	15.9	330.5	**71.3**
903692	**WP2-DP1**	**4/07/2022**	<0.002	<10	**3.10**	**40**	42	14	**11**	**10.81**	16.0	400.6	**61.8**
903692	**WP2-DP2**	**4/07/2022**	<0.002	<10	**1.68**	**140**	26	22	7.5	7.29	16.0	375.5	**67.7**
903692	**QA100**	**4/07/2022**	Not Test	<10	**1.23**	**110**	12	10	7.6	Not Test	Not Test	Not Test	Not Test
ES2223404	**QA200**	**4/07/2022**	Not Test	<5	**1.10**	**110**	13	17.3	Not Test	Not Test	Not Test	Not Test	Not Test
Maximum Concentration			**0.0036**	<10	**3.1**	**140**	42	22.0	**11**	**10.81**	16.0	400.6	**73.6**

APPENDIX

E

QUALITY ASSURANCE/QUALITY CONTRAL

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Quality Assurance/Quality Control (QA/QC) procedures were implemented to ensure the precision accuracy, representativeness, completeness and comparability of all data gathered. The QA/QC procedures included:

- Equipment calibration to ensure field measurements obtained are accurate
- Equipment decontamination to prevent cross contamination
- Use of appropriate measures (i.e. gloves) to prevent cross contamination
- Appropriate sample identification
- Correct sample preservation
- Sample transport with Chain of Custody (CoC) documentation
- Laboratory analysis in accordance with NATA accredited methods.

Table E1 details the QA/QC procedures and sample collection details undertaken through the surface water elements of the investigation. Copies of all the CoCs, along with the Sample Receipt Notifications (SRNs), Interpretive QA/QC Reports are provided in **Appendix F**.

Table E1 Field QA/QC Method Validation

Requirement	Yes / No	Comments
Equipment decontamination	Yes	In the event of involving reusable equipment. Decontamination of sampling equipment (water quality meter, telescopic water scoop etc.) was undertaken by washing with phosphate free detergent (Liquinox) followed by a rinse with potable water.
Sample collection	Yes	Samples were collected using disposable nitrile gloves via telescopic water scoop. A clean pair of gloves was used for each new sample being collected to limit the possibility of cross-contamination.
QA/QC sample collection*	Yes	One (1) surface water duplicate and one (1) surface water triplicate sample were collected for intra and inter-lab QA/QC purposes to monitor the quality of the field practices for sample collection. Cardno now Stantec based the investigation around a rate of one duplicate and triplicate sample per sampling event, as the requirement for duplicate and triplicate sample collection.
Sample identification	Yes	All samples were marked with a unique identifier including project number, sample location, and date.
Sample preservation	Yes	Samples were placed in a chilled ice box with ice for storage and transport to the laboratory.
CoC documentation	Yes	A CoC form was completed by Cardno now Stantec detailing sample identification, collection date, sampler and laboratory analysis required. The CoC form was signed off and returned to Cardno now Stantec by the laboratory staff upon receipt of all the samples. CoC forms and Sample Receipt Notification (SRN) are provided in **Appendix F**. The SRN indicates that the samples were received at the laboratory intact and chilled and within the required holding times.
NATA accredited methods	Yes	The NATA accredited Eurofins mgt and ALS Analysed the samples in accordance with NATA accredited methods. Analytical methods used are indicated in the stamped laboratory results provided in **Appendix F**.
Laboratory Internal QC	Yes	All Data Quality Objectives were met by the laboratories.

Table E2 Field QA/QC Collection Summary

Environmental Media	Date	Primary	Duplicate	Triplicate
Surface Water	4/07/2022	WP2	QA100	QA200

Relative Percentage Difference Determination

Laboratory results for duplicate and triplicate samples are assessed using a determination of the Relative Percentage Difference (RPD). Where a primary sample and a duplicate sample are compared, the RPD provides an indication of the reproducibility of the results, which incorporates the sampling method. Where a primary sample and a split sample are compared, the RPD provides an indication of the accuracy of the primary laboratory results as compared to the secondary laboratory result.

The calculation used to determine the RPD is:

$$RPD = \frac{(Co - Cs)}{\left(\frac{Co + Cs}{2}\right)} x100$$

Where:

Co = Concentration of the original sample

Cs = Concentration of the duplicate sample

In calculating the RPD values the following protocols were adopted:

- Where both concentrations are above laboratory reporting limits the RPD formula is used;
- Where both concentrations are below the laboratory reporting limits, no RPD is calculated; and
- Where one or both sample concentrations are reported to be less than ten times (<10x) the laboratory reporting limit, the RPD is calculated but is not assessed against the adopted criterion.

In accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013, Cardno now Stantec adopts an RPD acceptance criterion up to 30% of the mean concentration of the analyte. It should be noted that variations might be higher for organic analysis, due to the volatile nature of the components, and for low concentrations of analytes.

The adopted criterion will not apply to RPDs where one of both concentrations are less than 10 times the reporting limit, as this criterion would otherwise overestimate the significance of minor variations in concentrations at or near the laboratory reporting limit. Large RPDs returned for low concentrations of analytes near the reporting limit is not as indicative of a significant difference in the results as a small RPD is for larger concentrations.

This approach is employed by NATA-accredited laboratories when assessing internal duplicate sample RPDs. This approach acknowledges that concentrations at or around the reporting limit are too low for an accurate evaluation of the significance of the RPD.

This approach has been adopted when assessing the relevance (compliance) of RPDs during this investigation. RPDs will be calculated for sample sets where one or both concentrations are less than 10 times the reporting limit for discussion purposes, but will not be assessed as a pass or fail in relation to the criterion.

The RPD results for duplicate samples are presented in this appendix. Although five (5) RPD values were reported to be above the accepted 30% RPD criteria. The breaches in RPDs are not considered to alter the overall outcome of the assessment. It can be concluded that the analytical data can be relied upon for the purposes of this factual report.

Laboratory QC and QCI Report Summary

The laboratories selected for undertaking the analysis (Eurofins mgt and ALS) are NATA-accredited for the analysis required, and undertook certain QA/QC requirements to demonstrate the suitability of the data that is obtained. The laboratory is required to undertake and report internal laboratory Quality Control (QC) procedures for all chemical analysis undertaken. The QC testing is required to include:

- Laboratory duplicate sample analysis at the rate of one duplicate analysis per ten samples
- Method blank at the rate of one method blank analysis per 20 samples

- Laboratory control sample at the rate of one laboratory control sample analysis per 20 samples
- Spike recovery analysis at the rate of one spike recovery analysis per 20 samples.

Compliance with the laboratory QA/QC requirements and non-conformance details are discussed in the internal Laboratory QA/QC reports included with the certificates of analysis in **Appendix F**. Laboratory QA/QC requirements were within acceptance limits.

Cardno now Stantec concludes that the data reported by the NATA-accredited Eurofins mgt and ALS as presented in this report is suitable for interpretative purposes and to make conclusions/recommendations regarding water quality.

APPENDIX

F

LABORATORY REPORTS

Cardno

now

Stantec

Cardno
Shaping the Future

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zheng	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	CZ	Turnaround Requirements:	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	Lab:	ALS | 277-289 Woodpark Rd, Smithfield NSW 2164
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample Information						Analysis Required												Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix		TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							HT
QA200		4	ICE	4/07/2022	Water		1	1	1	1	1							

Environmental Division
Sydney
Work Order Reference
ES2223404

Telephone : +61-2-8784 8555

Relinquished by: (name / company)	Chong Zeng Cardno ACT/NSW Pty Ltd	Received by: (name / company)	3055 Yho AJB 13:2	Relinquished by: (name / company		Received by: (name / company)	Relinquished by: (name / company)
Date & Time:	4/07/2022	Date & Time:	4/07/22 1735	Date & Time:		Date & Time:	Date & Time:
Signature:	CZ	Signature:		Signature:		Signature:	Signature:
Received by: (name / company)		Relinquished by: (name / company)		Received by: (name / company		Relinquished by: (name / company)	*Lab use:* Samples Received: Cool or Ambient (circle one)
Date & Time:		Date & Time:		Date & Time:		Date & Time:	Temperature Received at: (if applicable)
Signature:		Signature:		Signature:		Signature:	Transported by: Hand delivered / courier

Soy Stepho

From: Sarah Mathew
Sent: Monday, 4 July 2022 4:38 PM
To: Samples Sydney; Soy Stepho
Cc: Helen Simpson
Subject: FW: [EXTERNAL] - Cardno sample submission
Attachments: WP_SWM_COC_20220704 ALS.xlsx

Hi Fadi/Soy

Please see attached COC for Cardno/Stantec samples being submitted today.

Kind regards,

right solutions right partner

Sarah Mathew
Client Services Officer
Sydney, NSW

O: +61 2 8784 8555
D: +61 2 8784 8534
sarah.mathew@alsglobal.com
277-289 Woodpark Road
Smithfield NSW 2164 AUSTRALIA

alsglobal.com

From: Chong Zeng [mailto:chong.zeng@cardno.com.au]
Sent: Monday, 4 July 2022 4:35 PM
To: ALSEnviro Sydney <ALSEnviro.Sydney@ALSGlobal.com>
Cc: Jiaqi Zhou <jiaqi.zhou@cardno.com.au>; Sarah Mathew <sarah.mathew@ALSGlobal.com>
Subject: [EXTERNAL] - Cardno sample submission

Hi team,

Please see the CoCs attached regarding the water samples that Jiaqi is going to drop off shortly at your Smithfield campus.

Thanks a lot, please let me know if you have any questions.

Chong Zeng
Environmental Engineer

Phone: +61294967761
Mobile: 0451 780 991
chong.zeng@cardno.com.au

Stantec Australia
Level 9, The Forum, 203 Pacific Highway St Leonards New South Wales 2065 Australia

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2223404**

Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Graeme Jablonskas
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jiaqi.zhou@cardno.com.au	E-mail	: graeme.jablonskas@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9609
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Page	: 1 of 2
Order number	: ----	Quote number	: EB2022MWHAUS0006 (BN/BQ)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 04-Jul-2022 17:35	Issue Date	: 04-Jul-2022
Client Requested Due Date	: 11-Jul-2022	Scheduled Reporting Date	: **11-Jul-2022**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 13.2'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA025H Suspended Solids - Standard Level	WATER - EA045 Turbidity	WATER - EP020 Oil & Grease (O&G)	WATER - NT-11 Total Nitrogen and Total Phosphorus
ES2223404-001	04-Jul-2022 00:00	QA200	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS ADDRESS		
- A4 - AU Tax Invoice (INV)	Email	accounts.au@stantec.com
CHONG ZENG		
- *AU Certificate of Analysis - NATA (COA)	Email	chong.zeng@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	chong.zeng@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	chong.zeng@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	chong.zeng@cardno.com.au
- A4 - AU Tax Invoice (INV)	Email	chong.zeng@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	chong.zeng@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	chong.zeng@cardno.com.au
- EDI Format - XTab (XTAB)	Email	chong.zeng@cardno.com.au
CONTAM NSW		
- *AU Certificate of Analysis - NATA (COA)	Email	contamnsw@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	contamnsw@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	contamnsw@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	contamnsw@cardno.com.au
- A4 - AU Tax Invoice (INV)	Email	contamnsw@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	contamnsw@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	contamnsw@cardno.com.au
- EDI Format - XTab (XTAB)	Email	contamnsw@cardno.com.au
JIAQI ZHOU		
- *AU Certificate of Analysis - NATA (COA)	Email	jiaqi.zhou@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jiaqi.zhou@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jiaqi.zhou@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jiaqi.zhou@cardno.com.au
- A4 - AU Tax Invoice (INV)	Email	jiaqi.zhou@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - XTab (XTAB)	Email	jiaqi.zhou@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2223404**	Page	: 1 of 2
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Graeme Jablonskas
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +6138549 9609
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 04-Jul-2022 17:35
Order number	: ----	Date Analysis Commenced	: 06-Jul-2022
C-O-C number	: ----	Issue Date	: 11-Jul-2022 12:06
Sampler	: ----		
Site	: ----		
Quote number	: BN/BQ		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QA200**	**----**	**----**	**----**	**----**
			Sampling date / time	04-Jul-2022 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2223404-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**13**	**----**	**----**	**----**	**----**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**17.3**	**----**	**----**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.56**	**----**	**----**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.5**	**----**	**----**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.1**	**----**	**----**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.11**	**----**	**----**	**----**	**----**
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	**----**	**----**	**----**	**----**

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2223404**	Page	: 1 of 3
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Graeme Jablonskas
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +6138549 9609
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 04-Jul-2022
Order number	: ----	Date Analysis Commenced	: 06-Jul-2022
C-O-C number	: ----	Issue Date	: 11-Jul-2022
Sampler	: ----		
Site	: ----		
Quote number	: BN/BQ		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4446680)									
ES2223385-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	16	14	14.9	No Limit
ES2223789-003	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	258	255	1.4	0% - 20%
EA045: Turbidity (QC Lot: 4443118)									
ES2223298-001	Anonymous	EA045: Turbidity	----	0.1	NTU	0.4	0.4	0.0	No Limit
ES2223391-001	Anonymous	EA045: Turbidity	----	0.1	NTU	83.4	84.6	1.4	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4444892)									
ES2223385-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.66	0.66	0.0	0% - 20%
ES2223544-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.45	0.46	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4444887)									
ES2223385-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.4	2.4	0.0	No Limit
ES2223510-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.5	1.5	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4444886)									
ES2223385-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	2.24	2.23	0.0	0% - 20%
ES2223510-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.11	0.12	11.7	0% - 50%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4446680)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	102	83.0	129
				<5	1000 mg/L	99.1	82.0	110
				<5	835 mg/L	106	83.0	118
EA045: Turbidity (QCLot: 4443118)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	96.0	91.0	105
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4444892)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	101	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4444887)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	96.2	69.0	101
				<0.1	1 mg/L	99.7	70.0	118
				<0.1	5 mg/L	92.6	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4444886)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	100	71.3	126
				<0.01	0.442 mg/L	110	71.3	126
				<0.01	1 mg/L	100	71.3	126
EP020: Oil and Grease (O&G) (QCLot: 4447070)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	101	81.0	121

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4444892)							
ES2223385-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	107	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4444887)							
ES2223385-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	86.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4444886)							
ES2223385-002	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	100	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2223404**	Page	: 1 of 4
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Telephone	: +6138549 9609
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 04-Jul-2022
Site	: ----	Issue Date	: 11-Jul-2022
Sampler	: ----	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
QA200	**04-Jul-2022**	**----**	----	----	**07-Jul-2022**	11-Jul-2022	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
QA200	**04-Jul-2022**	**----**	----	----	**06-Jul-2022**	06-Jul-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
QA200	**04-Jul-2022**	**----**	----	----	**07-Jul-2022**	01-Aug-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
QA200	**04-Jul-2022**	**07-Jul-2022**	01-Aug-2022	✓	**07-Jul-2022**	01-Aug-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
QA200	**04-Jul-2022**	**07-Jul-2022**	01-Aug-2022	✓	**07-Jul-2022**	01-Aug-2022	✓
EP020: Oil and Grease (O&G)							
Amber Jar - Sulfuric Acid or Sodium Bisulfate (EP020)							
QA200	**04-Jul-2022**	**----**	----	----	**08-Jul-2022**	01-Aug-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

CHAIN OF CUSTODY RECORD

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- ☑ **Sydney Laboratory** — 179 Magowar Road, Girraween, NSW 2145 — +61 2 9900 8400 EnviroSampleNSW@eurofins.com
- ☐ **Brisbane Laboratory** — Unit 1/21 Smallwood Place, Murarrie, QLD 4172 — +61 7 3902 4600 EnviroSampleQLD@eurofins.com
- ☐ **Perth Laboratory** — 46-48 Banksia Road, Welshpool, WA 6106 — +61 8 6253 4444 EnviroSampleWA@eurofins.com
- ☐ **Melbourne Laboratory** — 6 Monterey Road Dandenong South VIC 3175 — +61 3 8564 5000 EnviroSampleVic@eurofins.com

Company	Stantec
Address	
Contact Name	Chong Zeng
Phone №	0451780991
Special Directions	24hrs TAT
Purchase Order	
Quote ID №	
Project №	304500142
Project Name	Downer Metro Stat
Project Manager	Chong Zeng
EDD Format (ESdat, EQuIS etc)	Esdat
Sampler(s)	Chong Zeng
Handed over by	Chong Zeng
Email for Invoice	jiaqi.zhou@cardno.com.au
Email for Results	chong.zeng@cardno.com.au

Analyses: Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.

Containers: Change container type & size if necessary. 500mL Plastic; 250mL Plastic; 125mL Plastic; 200mL Amber Glass; 40mL VOA vial; 500mL PFAS Bottle; Jar (Glass or HDPE); Other (Asbestos AS4984, WA Guidelines)

Required Turnaround Time (TAT) — Default will be 5 days if not ticked. ♦Surcharge will apply
- ☐ Overnight (reporting by 9am)♦
- ☐ Same day ♦
- ☑ 1 day ♦
- ☐ 2 days ♦
- ☐ 3
- ☐ 5 days (Standard)
- ☐ Other( )

№	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)	PH (1:5 aqueous)	Sample Comments / Dangerous Goods Hazard Warning
1	Soil 1	21.07.22	S	X	
2	Soil 2	↓	↓	X	
3	Soil 3			X	
4	Soil 4			X	
5	Soil 5			X	
6	Soil 6			X	
7	Soil 7			X	
8	Soil 8			X	
9					
10					
	Total Counts				

Method of Shipment: ☐ Courier (#) ☑ Hand Delivered ☐ Postal | Name | Signature | Date | Time

Laboratory Use Only									
Received By	Parmesh Conory	(SYD) | BNE | MEL | PER | ADL | NTL | DRW	Signature	[signature]	Date	21/7/22	Time	5:15	Temperature 3.9
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date		Time		Report №

Eurofins Environment Testing Australia Pty Ltd EnviroSales@eurofins.com

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

QS3009_R11 Modified by: Dr. R. Symons Approved by: T. Wong Approved on 15 March 2022

907690

eurofins | Environment Testing

www.eurofins.com.au EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	4/52 Industrial Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield East NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	PO Box 60 Wickham 2293
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	Tel: +61 2 4968 8448
NATA# 1261 Site# 1254	NATA# 1261 Site# 1254	NATA# 1261 Site# 18217		NATA# 1261 Site# 20794	NATA# 1261 Site# 25079

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NATA# 2377 Site# 2370

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NZBN: 9429046024954

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Penrose,	Rolleston,
Auckland 1061	Christchurch 7675
Tel: +64 9 526 45 51	Tel: 0800 856 450
IANZ# 1327	IANZ# 1290

Sample Receipt Advice

Company name:	Stantec Australia Pty Ltd (NSW/ACT)
Contact name:	Chong Zeng
Project name:	Downer Metro Station
Project ID:	304500142
Turnaround time:	1 Day
Date/Time received	Jul 21, 2022 5:18 PM
Eurofins reference	907690

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Hannah Mawbey on phone : or by email: HannahMawbey@eurofins.com

Results will be delivered electronically via email to Chong Zeng - chong.zeng@cardno.com.au.

Note: A copy of these results will also be delivered to the general Stantec Australia Pty Ltd (NSW/ACT) email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Project Name: Downer Metro Station
Project ID: 304500142

Order No.:
Report #: 907690
Phone:
Fax:

Received: Jul 21, 2022 5:18 PM
Due: Jul 22, 2022
Priority: 1 Day
Contact Name: Chong Zeng

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						pH (1:5 Aqueous extract at 25 °C as rec.)	Moisture Set
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	Soil 1	Jul 21, 2022		Soil	S22-Jl0043481	X	X
2	Soil 2	Jul 21, 2022		Soil	S22-Jl0043482	X	X
3	Soil 3	Jul 21, 2022		Soil	S22-Jl0043483	X	X
4	Soil 4	Jul 21, 2022		Soil	S22-Jl0043484	X	X
5	Soil 5	Jul 21, 2022		Soil	S22-Jl0043485	X	X
6	Soil 6	Jul 21, 2022		Soil	S22-Jl0043486	X	X
7	Soil 7	Jul 21, 2022		Soil	S22-Jl0043487	X	X
8	Soil 8	Jul 21, 2022		Soil	S22-Jl0043488	X	X
Test Counts						8	8

Stantec Australia Pty Ltd
Level 22, 570 Bourke Street
Melbourne
VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Chong Zeng**

Report **907690-S**
Project name Downer Metro Station
Project ID 304500142
Received Date Jul 21, 2022

Client Sample ID			**Soil 1**	**Soil 2**	**Soil 3**	**Soil 4**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S22-JI0043481**	**S22-JI0043482**	**S22-JI0043483**	**S22-JI0043484**
Date Sampled			**Jul 21, 2022**	**Jul 21, 2022**	**Jul 21, 2022**	**Jul 21, 2022**
Test/Reference	LOR	Unit				
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.9	10	11	12
% Moisture	1	%	14	27	17	22

Client Sample ID			**Soil 5**	**Soil 6**	**Soil 7**	**Soil 8**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S22-JI0043485**	**S22-JI0043486**	**S22-JI0043487**	**S22-JI0043488**
Date Sampled			**Jul 21, 2022**	**Jul 21, 2022**	**Jul 21, 2022**	**Jul 21, 2022**
Test/Reference	LOR	Unit				
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	12	11	11	10
% Moisture	1	%	20	26	23	28

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Jul 21, 2022	7 Days
- Method: LTM-GEN-7090 pH by ISE			
% Moisture	Sydney	Jul 21, 2022	14 Days
- Method: LTM-GEN-7080 Moisture			

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Priority: 1 Day
Contact Name: Chong Zeng

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						pH (1:5 Aqueous extract at 25 °C as rec.)	Moisture Set
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
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7	Soil 7	Jul 21, 2022		Soil	S22-Jl0043487	X	X
8	Soil 8	Jul 21, 2022		Soil	S22-Jl0043488	X	X
Test Counts						8	8

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S22-Jl0043031	NCP	%	9.3	7.9	16	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract at 25 °C as rec.)	S22-Jl0043487	CP	pH Units	11	11	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Hannah Mawbey	Analytical Services Manager
Ryan Phillips	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Cardno
Shaping the Future

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zheng	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	CZ	Turnaround Requirements:	5 Days TAT / 24hrs TAT for pH
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	Lab:	Eurofins | Unit F3, Building F, 16 Mars Rd, Lane Cove West NSW2066
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample information						Analysis Required											Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	Chlorophyll-a (LOR Required - 2 ug/L)	TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen	pH - 24 hrs TaT					
WP1		6	ICE	4/07/2022	Water	1	1	1	1	1	1	1					Please reduce the detection limit of Chlorophyll a from 5 ug/L to 2 ug/L
WP2		6	ICE		Water	1	1	1	1	1	1	1					
WP2-DP1		6	ICE		Water	1	1	1	1	1	1	1					
WP2-DP2		6	ICE		Water	1	1	1	1	1	1	1					
QA100		4	ICE		Water		1	1	1	1	1	1					

Relinquished by:	Chong Zeng	Received by:		Relinquished by:		Received by:	A. Sharma
(name / company)	Cardno ACT/NSW Pty Ltd	(name / company)		(name / company		(name / company)	
Date & Time:	7/4/2022	Date & Time:		Date & Time:		Date & Time:	04/07/22 4:31PM
Signature:	CZ	Signature:		Signature:		Signature:	
Received by:		Relinquished by:		Received by:		Relinquished by:	
(name / company)		(name / company)		(name / company		(name / company)	
Date & Time:		Date & Time:		Date & Time:		Date & Time:	

Relinquished by:	
(name / company)	
Date & Time:	
Signature:	
Lab use:	# 903692
Samples Received:	Cool or Ambient (circle one)
Temperature Received at:	13.5° (if applicable)

eurofins | Environment Testing

www.eurofins.com.au EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	4/52 Industrial Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield East NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	PO Box 60 Wickham 2293
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	Tel: +61 2 4968 8448
NATA# 1261 Site# 1254	NATA# 1261 Site# 1254	NATA# 1261 Site# 18217		NATA# 1261 Site# 20794	NATA# 1261 Site# 25079

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NZBN: 9429046024954

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Penrose,	Rolleston,
Auckland 1061	Christchurch 7675
Tel: +64 9 526 45 51	Tel: 0800 856 450
IANZ# 1327	IANZ# 1290

Sample Receipt Advice

Company name:	Stantec Australia Pty Ltd (NSW/ACT)
Contact name:	Jiaqi Zhou
Project name:	DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID:	NE30161
Turnaround time:	5 Day
Date/Time received	Jul 4, 2022 4:31 PM
Eurofins reference	903692

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Hannah Mawbey on phone : or by email: HannahMawbey@eurofins.com

Results will be delivered electronically via email to Jiaqi Zhou - jiaqi.zhou@cardno.com.au.

Note: A copy of these results will also be delivered to the general Stantec Australia Pty Ltd (NSW/ACT) email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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Christchurch
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Rolleston,
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Tel: 0800 856 450
IANZ# 1290

Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Order No.:
Report #: 903692
Phone:
Fax:

Received: Jul 4, 2022 4:31 PM
Due: Jul 11, 2022
Priority: 5 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	pH (at 25 °C)	Phosphate total (as P)	Total Suspended Solids Dried at 103°C–105°C	Turbidity	Total Nitrogen Set (as N)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X					X
Sydney Laboratory - NATA # 1261 Site # 18217								X	X	X	X	
External Laboratory												
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**							
1	WP1	Jul 04, 2022		Water	S22-Jl0011789	X	X	X	X	X	X	X
2	WP2	Jul 04, 2022		Water	S22-Jl0011790	X	X	X	X	X	X	X
3	WP2-DP1	Jul 04, 2022		Water	S22-Jl0011791	X	X	X	X	X	X	X
4	WP2-DP2	Jul 04, 2022		Water	S22-Jl0011792	X	X	X	X	X	X	X
5	QA100	Jul 04, 2022		Water	S22-Jl0011793		X	X	X	X	X	X
Test Counts						4	5	5	5	5	5	5

Stantec Australia Pty Ltd
Level 22, 570 Bourke Street
Melbourne
VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Jiaqi Zhou**

Report **903692-W-V2**
Project name DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID NE30161
Received Date Jul 04, 2022

Client Sample ID			**WP1**	**WP2**	**WP2-DP1**	**WP2-DP2**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**S22-JI0011789**	**S22-JI0011790**	**S22-JI0011791**	**S22-JI0011792**
Date Sampled			**Jul 04, 2022**	**Jul 04, 2022**	**Jul 04, 2022**	**Jul 04, 2022**
Test/Reference	LOR	Unit				
Chlorophyll a	2	ug/L	3.6	< 2	< 2	< 2
Nitrate & Nitrite (as N)	0.05	mg/L	0.48	0.57	1.7	0.88
Oil & Grease (HEM)	10	mg/L	< 10	< 10	< 10	< 10
pH (at 25 °C)	0.1	pH Units	6.8	7.6	11	7.5
Phosphate total (as P)	0.01	mg/L	0.09	0.06	0.04	0.14
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	1.4	0.8
Total Nitrogen (as N)*	0.2	mg/L	0.48	0.57	3.1	1.68
Total Suspended Solids Dried at 103°C–105°C	5	mg/L	11	9.0	42	26
Turbidity	1	NTU	9.4	11	14	22

Client Sample ID			**QA100**
Sample Matrix			**Water**
Eurofins Sample No.			**S22-JI0011793**
Date Sampled			**Jul 04, 2022**
Test/Reference	LOR	Unit	
Nitrate & Nitrite (as N)	0.05	mg/L	0.63
Oil & Grease (HEM)	10	mg/L	< 10
pH (at 25 °C)	0.1	pH Units	7.6
Phosphate total (as P)	0.01	mg/L	0.11
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.6
Total Nitrogen (as N)*	0.2	mg/L	1.23
Total Suspended Solids Dried at 103°C–105°C	5	mg/L	12
Turbidity	1	NTU	10

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chlorophyll a	Melbourne	Jul 08, 2022	28 Days
- Method: LTM-INO-4340 Chlorophyll a in Waters			
Oil & Grease (HEM)	Melbourne	Jul 08, 2022	28 Days
- Method: LTM-INO-4180 Oil and Grease (APHA 5520B)			
pH (at 25 °C)	Sydney	Jul 06, 2022	0 Hour
- Method: LTM-GEN-7090 pH in water by ISE			
Phosphate total (as P)	Sydney	Jul 06, 2022	28 Days
- Method: E052 Total Phosphate (as P)			
Total Suspended Solids Dried at 103°C–105°C	Sydney	Jul 06, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	Jul 06, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Jul 08, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Jul 08, 2022	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			

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Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Order No.:
Report #: 903692
Phone:
Fax:

Received: Jul 4, 2022 4:31 PM
Due: Jul 11, 2022
Priority: 5 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	pH (at 25 °C)	Phosphate total (as P)	Total Suspended Solids Dried at 103°C–105°C	Turbidity	Total Nitrogen Set (as N)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X					X
Sydney Laboratory - NATA # 1261 Site # 18217								X	X	X	X	
External Laboratory												
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**							
1	WP1	Jul 04, 2022		Water	S22-Jl0011789	X	X	X	X	X	X	X
2	WP2	Jul 04, 2022		Water	S22-Jl0011790	X	X	X	X	X	X	X
3	WP2-DP1	Jul 04, 2022		Water	S22-Jl0011791	X	X	X	X	X	X	X
4	WP2-DP2	Jul 04, 2022		Water	S22-Jl0011792	X	X	X	X	X	X	X
5	QA100	Jul 04, 2022		Water	S22-Jl0011793		X	X	X	X	X	X
Test Counts						4	5	5	5	5	5	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Oil & Grease (HEM)	mg/L	< 10			10	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Total Suspended Solids Dried at 103°C–105°C	mg/L	< 5			5	Pass	
Turbidity	NTU	< 1			1	Pass	
LCS - % Recovery							
Nitrate & Nitrite (as N)	%	99			70-130	Pass	
Oil & Grease (HEM)	%	73			70-130	Pass	
Phosphate total (as P)	%	101			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	88			70-130	Pass	
Total Suspended Solids Dried at 103°C–105°C	%	102			70-130	Pass	
Turbidity	%	101			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Kjeldahl Nitrogen (as N)	M22-Jl0013882	NCP	%	91			70-130	Pass	
Total Suspended Solids Dried at 103°C–105°C	R22-Jn0067188	NCP	%	105			70-130	Pass	
Spike - % Recovery									
				Result 1					
Phosphate total (as P)	S22-Jl0011790	CP	%	75			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chlorophyll a	S22-Jl0011789	CP	ug/L	3.6	2.8	26	30%	Pass	
Nitrate & Nitrite (as N)	S22-Jl0008509	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Oil & Grease (HEM)	S22-Jl0013683	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Phosphate total (as P)	S22-Jl0011789	CP	mg/L	0.09	0.09	<1	30%	Pass	
Total Suspended Solids Dried at 103°C–105°C	R22-Jn0067188	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Turbidity	S22-Jl0011790	CP	NTU	11	10	4.7	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	S22-Jl0011792	CP	mg/L	0.8	1.3	52	30%	Fail	Q15

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Charl Du Preez	Analytical Services Manager
Dilani Samarakoon	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Inorganic
Roopesh Rangarajan	Senior Analyst-Inorganic
Ryan Phillips	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

APPENDIX

G

SITE DRAINAGE PLANS

Cardno

now

Stantec

FROM SYDENHAM

TO BANKSTOWN

SMCSWSW6-DEW-CRFI-000854

DOWNPIPE CONNECTION FROM BUILDING TO BE CONNECTED TO WIL BUI01/5

FOR CHANNEL SETOUT PLAN REFER TO DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483140

ACO DRAIN K100 (Depth 300)

ACO DRAIN K200 (Depth 300)

WIL BUI06/5

WIL BUI01/4

WIL BUI03/2

WIL BUI14/2

WIL BUI01/2

WIL BUI04/2

WIL BUI04/3

WIL BUI06/2

WIL BUI07/3

FOR MODIFIED SWALE CONTOUR PLAN REFER DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483137

FOR CHANNEL SETOUT PLAN REFER TO DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483140

UNDERGROUND OSD TANK REFER TO NOTE4

PROVIDE ROCK RIPRAP AT END OF HEADWALL OUTLET
LENGTH-1.0m
D50-100mm
THICKNESS-200mm

FOR UPSTREAM DRAINAGE NETWORK, REFER TO STATION DRAINAGE PACKAGE 233

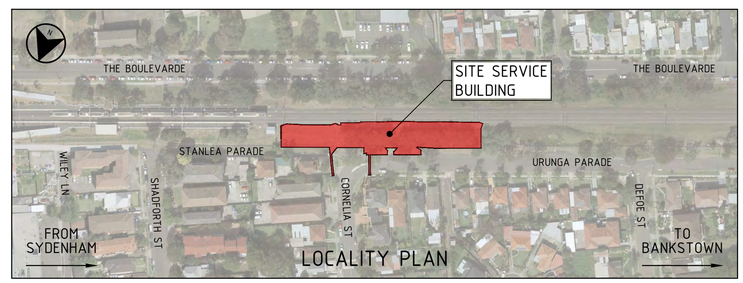
URUNGA PARADE

CORNELIA ST

PLAN
SCALE 1:200

NOTES

1. FOR GENERAL NOTES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-CE-DWG-483104 TO 483107.
2. FOR LEGEND REFER TO DRAWINGS SMCSWSWM-MTM-WWP-CE-DWG-483108 TO 483109.
3. FOR STORMWATER DRAINAGE DETAILS REFER DRAWINGS SMCSWSWM-MTM-WWP-CE-DWG-483311 AND 483312.
4. FOR OSD DETAILS REFER DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483321.



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00.02		10.03.2022	SMCSWSW6-DEW-CRFI-000854	TC
00	MC	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES
2 0 2 4 6 8m
1 : 200 FULL SIZE A1

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied

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ALT. DRG No. SMCSWSWM-MTM-WWP-CE-DWG-483301 0

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN R.TACADENA
DESIGNED T. WIJEKOON
DRG CHECK P. ALFORD
DESIGN CHECK R. PETERSON
APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION - SERVICE BUILDING
DRAINAGE DESIGN
SERVICE BUILDING - DRAINAGE
GENERAL ARRANGEMENT PLAN

STATUS: FOR CONSTRUCTION | SHEET 1 OF 1 | ©

DRG No. SMCSWSWM-MTM-WWP-CE-DWG-483301 | REV. 00.02

GENERAL LEGEND

GENERAL

- PROPERTY BOUNDARY
- PLATFORM / BUILDING WORKS (FOR DETAILS REFER TO ARCHITECTURAL DRAWINGS)

CIVIL WORKS

- RW — RETAINING WALL
- RW — RETAINING WALL BY OTHERS
- NW — NOISE WALL BY OTHERS
- SEMI-RIGID G4 W-BEAM
- ACCESS TRACK
- FOOTPATH / SHARED PATH
- NEW PLAZA
- PROPOSED BOLLARD

FENCING

- FENCING - SEGREGATION FENCE
- FENCING - SECURITY FENCE
- FENCING - VEHICLE ACCESS GATE
- FENCING - PEDESTRIAN ACCESS GATE
- IP — FENCING - ISOLATION PANEL
- FENCING - CONCRETE PLINTH FOR DEC AND CCTV EQUIPMENT
- FENCING - SAFETY RAIL
- X X X X X — FENCING - EXISTING FENCE TO BE REMOVED

STREET LIGHTING

- LIGHTING - STREET LIGHTING
- LIGHTING - DOWN LIGHT

DRAINAGE

- DRAINAGE - PROPOSED PIPE
- DRAINAGE - PROPOSED PIPE FOR DOWNPIPES
- DRAINAGE - PROPOSED PIT - GRATED
- DRAINAGE - PROPOSED PIT - JUNCTION
- DRAINAGE - PROPOSED GRASSED SWALE
- DRAINAGE - CONCRETE CHANNEL
- SS> — DRAINAGE - PROPOSED SUBSOIL
- DRAINAGE - EXISTING ACO DRAIN
- DRAINAGE - PROPOSED TRENCH DRAIN
- DRAINAGE - PROPOSED HEADWALL
- DRAINAGE - PROPOSED RIPRAP
- DRAINAGE - PROPOSED SHOTCRETE BATTER DRAIN
- DRAINAGE - EXISTING INFRASTRUCTURE
- X X X X X — DRAINAGE - ABANDONED PIPE TO BE REMOVED

UTILITIES

- S — SEWER - EXISTING MAIN (VERIS)
- SZ — SEWER - EXISTING MAIN DIGITISED (VERIS)
- W — WATER - EXISTING MAIN (VERIS)
- WZ — WATER - EXISTING MAIN DIGITISED (VERIS)
- G — GAS - EXISTING MAIN (VERIS)
- GZ — GAS - EXISTING MAIN DIGITISED (VERIS)
- E — ELEC - EXISTING U/G (VERIS)
- EZ — ELEC - EXISTING U/G DIGITISED (VERIS)
- T — COMMS - EXISTING U/G (VERIS)
- TZ — COMMS - EXISTING U/G DIGITISED (VERIS)
- OF — COMMS - EXISTING OPTIC U/G (VERIS)
- OFZ — COMMS - EXISTING OPTIC U/G DIGITISED (VERIS)
- GAS — GAS - EXISTING QENOS GAS LINE TO REMAIN
- X X — UTILITIES - ABANDONED PIPE TO BE REMOVED

DBYD - UTILITIES

- S — SEWER - EXISTING (DYBD)
- W — WATER - EXISTING (DYBD)
- D — DRAINAGE- EXISTING (DYBD)
- 330kV — TRANSGRID- EXISTING (DYBD)

CSR LEGEND

GENERAL

- IP — CSR - PROPOSED INSULATION PANEL/JOINT
- CSR - PROPOSED VERTICAL ALIGNMENT TRANSITION
- LCR - PROPOSED DROPPER TO TRACK SIDE EQUIPMENT
- CSR - PROPOSED GST ROUTE BY OTHERS
- CSR - PROPOSED FENCE ROUTE BY OTHERS

PROPOSED BURIED ROUTES

- CSR CSR — CSR - PROPOSED BURIED ROUTE CORRIDOR
- CSR CSR — CSR - PROPOSED BURIED ROUTE ULX-URX
- CSR CSR — CSR - PROPOSED BURIED ROUTE PLATFORM
- LCR — LCR - PROPOSED BURIED ROUTE INTERIM 11kV SUPPLY SYDNEY TRAINS
- LCR — LCR - PROPOSED BURIED ROUTE ULX-URX
- LCR — LCR - PROPOSED BURIED ROUTE PLATFORM
- LCR — LCR - PROPOSED BURIED ROUTE TRACK-SIDE EQUIPMENT

PROPOSED GROUND LEVEL ROUTES

- CSR CSR — CSR - PROPOSED GLT ROUTE

PROPOSED ABOVE GROUND ROUTES

- CSR CSR — CSR - PROPOSED GST ROUTE ON PILED POST
- CSR CSR — CSR - PROPOSED GST ROUTE ON FENCING
- CSR CSR — CSR - PROPOSED GST ROUTE ON BRIDGE ABUTMENT
- CSR CSR — CSR - PROPOSED CABLE LADDER ROUTE
- CSR CSR — CSR - PROPOSED ROUTE FIXED TO ROCK FACE
- CSR CSR — CSR - PROPOSED ROUTE THROUGH PLATFORM CONCOURSE

PROPOSED SYDNEY TRAINS RELOCATIONS

- CSR CSR — CSR - PROPOSED SYDNEY TRAINS RELOCATION
- CSR - PROPOSED SYDNEY TRAINS REMOVAL

TRACKSIDE EQUIPMENT

- ANT — ANTENNA
- PI — POINT INDICATOR
- PM — POINT MACHINE
- MAST & DCS/CCTV BOX
- AXC — AXLE COUNTER DISCONNECTION BOX
- MARKER BOARD
- RADIO REPEATER

DSS LEGEND - EXISTING FEATURES

- DSS - FENCE
- OHW STRUCTURE
- DRAINAGE PIT
- PIT — LARGE ROUND PIT (RAD>0.5m)
- EARTH TERMINAL
- RAILWAY SIGNAL
- JUNCTION BOX
- TELEPHONE
- POINTS EQUIPMENT
- SMALL PIT (<0.5m)
- RAILWAY TUNING UNIT
- TRAIN STOP
- CCTV CAMERA
- PA — PUBLIC ANNOUNCEMENT
- DI — DRAINAGE INSPECTION PIT (FLUSH POINT)
- ELECTRIC LIGHT POLE
- ANCHOR BLOCK
- BOOT LEG RISER
- ARTC SIGNAL EQUIPMENT

DSS LEGEND - EXISTING FEATURES (CONTINUED)

- GATE
- SURVEY MARK
- IMPEDANCE BOND
- BOLLARD
- POLE (AERIAL FEEDER)
- 0 — UNDER CONTROL AREA BOUNDARY
- 1 — SIGNAL CABLE - DIRECT BURIED
- 2 — SIGNAL CABLE - GALVANISED STEEL TROUGHING
- 3 — SIGNAL CABLE - GROUND LEVEL TROUGHING
- 4 — SIGNAL CABLE - DUCTED PIPE
- 5 — COPPER COMMS CABLE - DIRECT BURIED
- 6 — COPPER COMMS CABLE - GALVANISED STEEL TROUGHING
- 7 — COPPER COMMS CABLE - GROUND LEVEL TROUGHING
- 8 — COPPER COMMS CABLE - DUCTED PIPE
- 9 — SIGNAL & COPPER COMMS CABLE - DIRECT BURIED
- 10 — SIGNAL & COPPER COMMS CABLE - GALVANISED STEEL TROUGHING
- 11 — SIGNAL & COPPER COMMS CABLE - GROUND LEVEL TROUGHING
- 12 — SIGNAL & COPPER COMMS CABLE - DUCTED PIPE
- 13 — OPTIC FIBRE - DIRECT BURIED
- 14 — OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 15 — OPTIC FIBRE - GROUND LEVEL TROUGHING
- 16 — OPTIC FIBRE - DUCTED PIPE
- 17 — LV POWER - DIRECT BURIED
- 18 — LV POWER - GALVANISED STEEL TROUGHING
- 19 — LV POWER - GROUND LEVEL TROUGHING
- 20 — LV POWER - DUCTED PIPE
- 21 — HV - DIRECT BURIED
- 22 — HV - GALVANISED STEEL TROUGHING
- 23 — HV - GROUND LEVEL TROUGHING
- 24 — HV - DUCTED PIPE
- 26 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 27 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - GROUND LEVEL TROUGHING
- 28 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - DUCTED PIPE
- 30 — COPPER COMMS CABLE, OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 32 — COPPER COMMS CABLE, OPTIC FIBRE - DUCTED PIPE
- 34 — OPTIC FIBRE, LV POWER - GALVANISED STEEL TROUGHING
- 35 — OPTIC FIBRE, LV POWER - GROUND LEVEL TROUGHING
- 36 — OPTIC FIBRE, LV POWER - DUCTED PIPE
- 43 — SIGNAL CABLE, LV POWER - GROUND LEVEL TROUGHING
- 44 — SIGNAL CABLE, LV POWER - DUCTED PIPE
- 50 — SIGNAL & COPPER COMMS CABLE, LV POWER - GALVANISED STEEL TROUGHING
- 51 — SIGNAL & COPPER COMMS CABLE, LV POWER - GROUND LEVEL TROUGHING
- 52 — SIGNAL & COPPER COMMS CABLE, LV POWER - DUCTED PIPE
- 53 — SIGNAL & COPPER COMMS CABLE, HV - DIRECT BURIED
- 54 — SIGNAL & COPPER COMMS CABLE, HV - GALVANISED STEEL TROUGHING
- 56 — SIGNAL & COPPER COMMS CABLE, HV - DUCTED PIPE
- 58 — SIGNAL CABLE, OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 59 — SIGNAL CABLE, OPTIC FIBRE - GROUND LEVEL TROUGHING
- 64 — LV POWER, HV - DUCTED PIPE
- 66 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER - GALVANISED STEEL TROUGHING
- 67 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER - GROUND LEVEL TROUGHING
- 68 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER - DUCTED PIPE
- 70 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, HV - GALVANISED STEEL TROUGHING
- 71 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, HV - GROUND LEVEL TROUGHING
- 72 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, HV - DUCTED PIPE
- 75 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER, HV - GROUND LEVEL TROUGHING
- 76 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER, HV - DUCTED PIPE
- 80 — TRACK DRAINAGE - UNKNOWN
- 83 — COMPRESSED AIR - DIRECT BURIED
- 84 — COMPRESSED AIR - ABOVE GROUND
- 85 — ABANDONED ROUTE - UNKNOWN
- 91 — HV - DIRECTIONAL UNDER BORE
- 92 — SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - DIRECTIONAL UNDER BORE
- 105 — LV POWER - AERIAL
- 106 — LV POWER - AERIAL
- 108 — 1500V DC SYSTEM CABLE - GALVANISED STEEL TROUGHING
- 109 — 1500V DC SYSTEM CABLE - GROUND LEVEL TROUGHING
- 110 — 1500V DC SYSTEM CABLE - DUCTED PIPE
- 112 — ELECTROLYSIS BOND CABLE - UNKNOWN
- 113 — CLOSED CIRCUIT TELEVISION - DUCTED PIPE
- 116 — CLOSED CIRCUIT TELEVISION, COPPER COMMS CABLE - DUCTED PIPE
- 119 — CLOSED CIRCUIT TELEVISION, LV POWER - DUCTED PIPE
- 125 — STATION DATA - DUCTED PIPE
- 131 — LIQUID FUEL LINE - UNKNOWN
- 132 — VACANT - DUCTED PIPE
- 133 — VACANT - GALVANISED STEEL TROUGHING
- 134 — VACANT - GROUND LEVEL TROUGHING
- 197 — SERVICE PIT (POLYGON)
- 198 — SERVICE PIT (POINT)
- 199 — UN-CODED SERVICE MIX - UNKNOWN
- 200 — ELECTRIC POWER LESS THAN 33kV - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 201 — ELECTRIC POWER EQUAL TO OR GREATER THAN 33kV - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 202 — LOW PRESSURE GAS MAIN - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 203 — HIGH PRESSURE GAS MAIN - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 205 — TELSTRA - GALVANISED STEEL TROUGHING
- 206 — TELSTRA - GROUND LEVEL TROUGHING
- 207 — TELSTRA - DUCTED PIPE
- 211 — OPTUS - DUCTED PIPE
- 212 — POWERTEL - DIRECT BURIED
- 219 — VISION STREAM - DUCTED PIPE
- 220 — WATER - UNKNOWN
- 221 — SEWER - UNKNOWN
- 222 — OTHER SERVICE(S) - DIRECT BURIED
- 223 — UECOMM - DIRECT BURIED
- 233 — ELECTRIC POWER LESS THAN 33kV - AERIAL
- 234 — ELECTRIC POWER EQUAL TO OR GREATER THAN 33kV - AERIAL
- 235 — DRAINAGE SERVICE - DUCTED PIPE
- 236 — TELSTRA - AERIAL
- 244 — RTA - DUCTED PIPE

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SCALES

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied

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ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233308 P01

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN
DESIGNED K. VEKERIA
DRG CHECK P. ALFORD
DESIGN CHECK R. PETERSON
APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION
DRAINAGE DESIGN
DRAINAGE (15.846km to 16.211km)
LEGEND

STATUS: FOR CONSTRUCTION | SHEET 1 OF 1 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233308 | REV. 00

FROM SYDENHAM

TO BANKSTOWN

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233312

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233318

LIMIT OF STATION PRECINCT - REFER TO CORRIDOR PACKAGE

UP MSW

PROVIDE 2x50mm uPVC PIPES TO CONNECT UPSTREAM TRENCH DRAIN TO DOWNSTREAM TRENCH DRAIN

TRENCH DRAIN

WIL DP01\1

WIL DP01\2

WIL DP01\3

WIL DP01\4

DN100

CONNECT DOWNPIPE TO PROPOSED PIPE

RAMP TO PLATFORM

SEE SHEET 402 CW 053405

15km 840

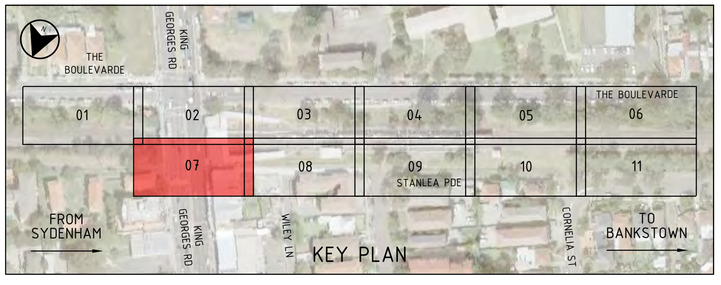
15km 860

15km 880

15km 900

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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SCALES

1 : 100 (1 0 1 2 3 4m) FULL SIZE A1

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ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233317 P01

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METRON T2M

DRAWN X. SEGUBAN

DESIGNED K. VEKERIA

DRG CHECK P. ALFORD

DESIGN CHECK R. PETERSON

APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION

DRAINAGE DESIGN

DRAINAGE (15.846km to 16.211km)

GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 7 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233317 | REV. 00

Cad File: C:_SMDSI_PACKAGE_6\wwp\SMCSWSWM-MTM-WWP-DD-DWG-233317.dwg

Plot Date: 31/03/21 - 12:13

100mm AT FULL SIZE

FROM SYDENHAM

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233313

TO BANKSTOWN

UP BANKSTOWN

UP MSW

N

PLATFORM 1

DN100 DN150 DN150 DN200 DN200 DN200

WIL W01\10 WIL W01\9 WIL W01\8 WIL W01\7 WIL W01\6

TRENCH DRAIN

LOCALLY REGRADE GROUND SURFACE TOWARDS PROPOSED ACO DRAIN

SMCSWSW6-DEW-CRFI-000940

WIL TD31

WIL DP02\1 WIL DP02\2 WIL DP03\2 WIL DP04\2 WIL DP05\2 WIL DP06\2

WIL DP02\1A WIL DP02\1B

WIL DP03\1 WIL DP04\1 WIL DP05\1 WIL DP06\1

CONNECT DOWNPIPE TO PROPOSED PIPE

DN100

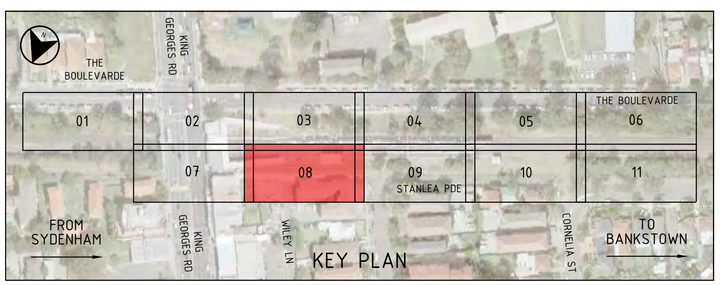
ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233317

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233319

15km 920 15km 940 15km 960 15km 980

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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00.02	BA	26.04.2022	SMCSWSW6-DEW-CRFI-000940	WO
00	TL	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES

1 0 1 2 3 4m

1 : 100 FULL SIZE A1

CLIENT

NSW GOVERNMENT | sydney METRO

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SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN

DESIGNED K. VEKERIA

DRG CHECK P. ALFORD

DESIGN CHECK R. PETERSON

APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION

DRAINAGE DESIGN

DRAINAGE (15.846km to 16.211km)

GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 8 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233318 | REV. 00.02

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied | NOTE: Do not scale from this drawing. | ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233318 P01

Cad File: C:_SMDS_PACKAGE_6\wwp\SMCSWSWM-MTM-WWP-DD-DWG-233318.dwg

Plot Date: 31/03/21 - 12:14

100mm AT FULL SIZE

FROM SYDENHAM

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233314

TO BANKSTOWN

UP BANKSTOWN

UP MSW

TRENCH DRAIN

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

SWALE U/S SETOUT
X=321276.737
Y=6244693.920

MINIMUM GRADE OF SWALE 4.80%

EOT

GATE No. M2415.377U

CONSTRUCT HEADWALL AT EDGE OF CONCRETE CHANNEL

CONCRETE SWALE REFER TO TYPICAL DETAILS ON SMCSWS-MTM-WWP-DD-DWG-233353

RECTANGULAR CONCRETE CHANNEL
LONGITUDINAL SLOPE - 1%
BASE WIDTH - 1.5m
DEPTH - 0.2m

STANLEA PARADE

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233318

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233320

16km 000

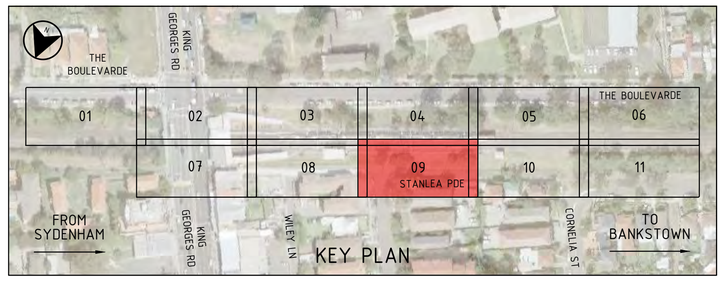
16km 020

16km 040

16km 060

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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FOR CONSTRUCTION

REV.	BY	DATE	DESCRIPTION	APPD.
00	TL	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES

1 0 1 2 3 4m

1 : 100 FULL SIZE A1

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN
DESIGNED K. VEKERIA
DRG CHECK P. ALFORD
DESIGN CHECK R. PETERSON
APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION
DRAINAGE DESIGN
DRAINAGE (15.846km to 16.211km)
GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 9 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233319 | REV. 00

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Cad File: C:\...SMDS\...PACKAGE_6\wwp\SMCSWSWM-MTM-WWP-DD-DWG-233319.dwg Plot Date: 31/03/21 - 12:15 100mm AT FULL SIZE

FROM SYDENHAM

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233315

TO BANKSTOWN

UP MSW

UP BANKSTOWN

SM278 LOCATION & POWER ROOM

REFER WILEY PARK STATION SERVICE BUILDING DRAINAGE PACKAGE FOR CONNECTION FROM HERE ONWARDS

WIL BUI06/6

WIL BUI06/5

DN600

DN600

DN100

WIL W02\2

WIL W02\1

01

MINIMUM APRON LEGNTH - 400 mm (TO SUIT THE BATTER SLOPE)

IP

GATE No. M2415.485U

REFER TO WILEY PARK SERVICE BUILDING PACKAGE 483

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233319

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233323

PARADE

16km 060

16km 080

16km 100

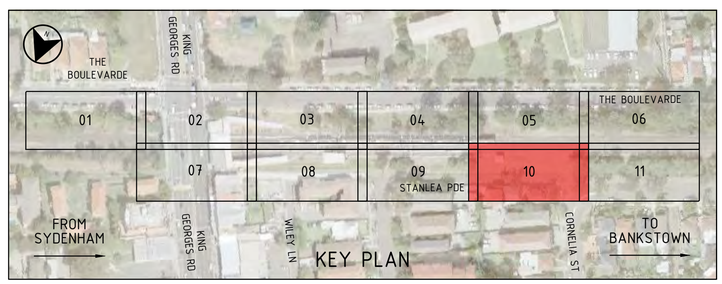
16km 120

LOCALLY REGRADE THE EXISTING CHANNEL BASE TO MATCH PIPE INVERT LEVEL AT INLET

PROVIDE RIP-RAP ROCK AT END OF HEADWALL OUTLET.
LENGTH=0.5m
WIDTH=0.4m
D50=100mm
DEPTH=2 x D50

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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REV.	BY	DATE	DESCRIPTION	APPD.
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00	TL	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES

1 : 100 — 1 0 1 2 3 4m — FULL SIZE A1

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN
DESIGNED K. VEKERIA
DRG CHECK P. ALFORD
DESIGN CHECK R. PETERSON
APPROVED L. PALMER 13.08.2021

SYDNEY METRO

WILEY PARK STATION
DRAINAGE DESIGN
DRAINAGE (15.846km to 16.211km)
GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 10 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233320 | REV. 01

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Appendix 3 – Surface Water Monitoring Report – Wiley Park Station
304100142_R011_SWM_WileyPark_Rev0

Surface Water Monitoring Report - Wiley Park Station

Wiley Park Station

304500142

Prepared for
Downer EDI EDI Works Pty Ltd

12 October 2022

Cardno

now

Stantec

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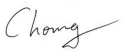
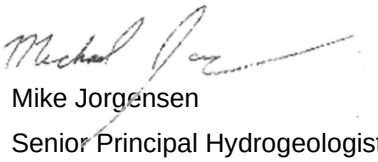


Chong Zeng
Environmental Engineer

Effective Date 12/10/2022

Approved By:



Mike Jorgensen
Senior Principal Hydrogeologist

Date Approved 12/10/2022

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
RevA	11/10/2022	Draft for Client Review	J.Zhou / C.Zeng	M.Jorgensen
Rev0	12/10/2022	First Final	C.Zeng	M.Jorgensen

Table of Contents

Appendices

Tables

1 Introduction

1.1 Background

Stantec Australia Pty Ltd ("Cardno now Stantec") was commissioned by Downer EDI Works Pty Ltd ("Downer EDI") to undertake monitoring and reporting of surface water quality of the unnamed channel within proximity to Wiley Park Station Upgrade worksite. The proposed upgrade includes the upgrade of the main station and installation of the Metro Services Building (MSB).

Surface water quality of the channel within proximity to Wiley Park Upgrade Site is to be monitored as per the requirements summarised in the **Table 1-2**, which is excerpted from the Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Soil and Water Management Plan (SWMP). The monitoring program are prepared to meet the requirements outlined in *The Sydney Metro City and Southwest – Sydenham to Bankstown Upgrade Conditions of Approval SSi-8256*, specifically Condition 8 to Condition 10. The sampling locations (WP1 – Upstream and WP2 – Downstream) of the water quality monitoring are shown on shown on Figure GS004 in **Appendix A**. In order to establish a more robust dataset of how the downstream discharge points affect the water quality, Downer EDI has requested two additional sampling locations at the downstream discharge points (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) of the water quality monitoring since May 2022. This additional sampling at the downstream discharge points is subject to the flow contribution at the time of each monitoring event. Refer to Figure GS004 in **Appendix A** for approximate locations of the sampling locations.

The closest Project worksite to an existing watercourse is Wiley Park Station services building, which is located approximately 100 m from an unnamed concrete-lined channel, which forms the upper reaches of Coxs Creek and is identified as a first-order stream.

For the purpose of establishing baseline water quality data within the first-order stream at Wiley Park, water quality monitoring was intended to be undertaken for a period prior to construction of the Wiley Park services building as outlined in the Table 13 of the SWMP. At a minimum, one dry-weather sample and one wet weather sample (weather permitting) were intended to be collected during the pre-construction period. The frequency of pre-construction water quality monitoring within this channel was subject to water being present within the structure. However, during the baseline monitoring period no wet-weather events were able to be captured prior to commencement of construction. A dry-weather baseline monitoring event was undertaken on 10 March 2021.

This report presents the findings from the thirteenth surface water monitoring event, which was undertaken by Cardno now Stantec on 25 August 2022. The event undertaken was a mid-construction quarterly dry-weather event. **Table 1-1** below summarised the surface water monitoring events undertaken to date by Cardno now Stantec.

Table 1-1 Summary of Surface Water Monitoring Event Undertaken to Date

Date of Monitoring	Type of Event	Report Reference
10 March 2021	Pre-construction Dry Baseline	4NE30187_R001_SWM_WileyPark_Rev0
20 March 2021	Mid Construction Wet Weather	4NE30187_R001_SWM_WileyPark_Rev0
5 May 2021	Mid Construction Wet Weather	4NE30187_R002_SWM_WileyPark_Rev0
1 July 2021	Mid Construction Dry Weather	NE30161_R003_SWM_WileyPark_Rev0
30 September 2021	Mid Construction Dry Weather	NE30161_R004_SWM_WileyPark_Rev0
12 November 2021	Mid Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
26 November 2021	Mid Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0

Date of Monitoring	Type of Event	Report Reference
9 and 10 February 2022	Mid Construction Dry Weather	NE30161_R006_SWM_WileyPark_Rev0
23 February 2022	Mid Construction Wet Weather	NE30161_R007_SWM_WileyPark_Rev0
9 March 2022	Mid Construction Wet Weather	NE30161_R008_SWM_WileyPark_Rev0
24 May 2022	Mid Construction Wet Weather	NE30161_R009_SWM_WileyPark_Rev0
4 and 21 July 2022	Mid Construction Wet Weather	NE30161_R010_SWM_WileyPark_Rev0
25 August 2022	Mid Construction Dry Weather	NE30161_R011_SWM_WileyPark_Rev0

1.2 Purpose and Objective

The purpose of the surface water monitoring works is to monitor and record surface water quality within the unnamed channel in accordance with the monitoring program as outlined in the Site's SWMP. The objective of the works is to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel.

1.3 Scope of Works

Cardno now Stantec undertook the following tasks during the surface water monitoring event:

- Inspected and sampled the two (2) nominated surface water sampling locations (WP1 – Upstream and WP2 – Downstream) on 25 August 2022 as a mid-construction quarterly dry-weather monitoring event.
- Inspected two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) and sample on additional nominated downstream discharge points location (WP2-DP1) on 25 August 2022 as part of mid-construction quaterly wet-weather monitoring event. No sampling work was undertaken at the downstream discharge point – WP2-DP2 due to dry condition.
- Recorded field parameters (measured using a calibrated water quality meter) and noted observations of the water bodies during sampling. Field parameters measured included:
  - Dissolved oxygen (DO);
  - Electrical conductivity (EC);
  - Potential of hydrogen (pH);
  - Oxidation-reduction potential (ORP); and
  - Temperature.
- Collected three (3) primary surface water samples from WP1, WP2 and WP2-DP1, one (1) intra-lab duplicate sample and one (1) inter-lab duplicate sample per sampling event for submission to a laboratory accredited by the National Association of Testing Authorities, Australia (NATA) for analytical testing of primary and additional quality assurance/quality control (QA/QC) samples. Samples were submitted for analysis of:
  - Oil & Grease;
  - Total Suspended Solids (TSS);
  - Nutrients (Total Phosphorous, Total Nitrogen);
  - Turbidity; and
  - Chlorophyll-*a*.
- Reviewed the analytical and field data and prepared this report.

Details of the monitoring program are shown below.

Table 1-2 Wiley Park Water Quality Monitoring Program

Wiley Park Water Quality Monitoring Program	
Waterway	Sydney Water Cooks River Channel (first-order stream)
Indicative inspection and / or monitoring points	WP1 – upstream
	WP2 – downstream
	WP2-DP1- downstream eastern discharge point
	WP2-DP2 – downstream western discharge point
Interaction with project works	Channel within proximity to Wiley Park service building site
Pre-construction works	Monthly for parameters detailed in Table 11 (including at least one dry-weather round of sampling). One wet-weather event, if possible, for the parameters detailed in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.
During construction of the Wiley Park services building	Quarterly for parameters detailed in Table 11 (including during dry weather). Four wet-weather events per year for the parameters in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.

2 Guidelines and Legislation

There are a range of Guidelines and Legislation and Conditions of Approval (CoA) that are applicable to the surface water monitoring program which are summarised below.

The CoA applicable to this job include:

> The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018;

The State and Federal legislation and policy and guidelines that apply to the program include:

> Environmental Planning and Assessment Act 1979 (EP&A Act);

> Contaminated Land Management Act 1997;

> Protection of the Environment Operations Act 1997 (POEO Act); and

> Water Management Act 2000 Water Management (General) Regulation 2018;

Additional guidelines and standards to the management of soil and water include:

> Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book');

> DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book');

> ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines');

> ANZECC (2018). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines'); and

> ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').

3 Monitoring Locations

Details of the inspection and / or sampling locations are provided in **Table 3-1**. The locations are provided in **Appendix A**. Representative photographs are presented in **Appendix B**.

Table 3-1 Surface Water Monitoring Location Details

Sample Location	Latitude	Longitude	Description
WP1 (up-stream)	-33.924014	151.065315	Immediately south of the Boulevarde and east of 118 the Boulevarde.
WP2 (down-stream)	-33.923339	151.064970	Immediately north of the Urunga Parade and west of 4 Urunga Parade.
WP2-DP1 (downstream eastern discharge point)	-33.923543	51.065058	Immediately south of the Urunga Parade, east side of the channel, approximately 20 m south of WP2.
WP2-DP2 (downstream western discharge point)	-33.923529	151.065048	Immediately south of the Urunga Parade, west side of the channel, approximately 20 m south / upstream of WP2.

4 Quality Management

The Data Quality Objective (DQO) process is used to establish a systematic planning approach to setting the type, quantity and quality of data required for making decisions based on the environmental condition of the project area. The DQO process involves the seven steps detailed in **Table 4-1**.

Table 4-1 Data Quality Objectives

DQO	Description
Step 1 State the Problem	Construction work may adversely impact the local surface water quality within the unnamed channel near the site.
Step 2 Identify the Decisions	Are there any impacts to surface water quality from construction activities at the site?
Step 3 Identify Inputs to the Decision	The primary inputs to the decisions described above are: ▪ Assessment of surface water quality of the unnamed channel within proximity to Wiley Park service building site per the requirements outlined in the site's SWMP, with samples collected from two locations (upstream and downstream of the site); ▪ Laboratory analysis of surface water samples for relevant parameters; ▪ Assessment of the suitability of the analytical data obtained, against the Data Quality Indicators (DQIs); ▪ Assessment of the analytical results against applicable guideline criteria; and ▪ Aesthetic observations of surface water bodies, including odours, sheen and condition, if encountered.
Step 4 Define the Study Boundaries	The lateral extent of the study area is the channel near the Wiley Park service building site. The temporal boundaries of the study comprises the duration of the monitoring program, including pre-construction monitoring, construction phase, and post-construction monitoring as required.
Step 5 Develop a Decision Rule	The decision rules for the water quality monitoring sampling events included: ▪ Were primary and QA/QC samples analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses? ▪ Did the field and laboratory QA/QC results indicate that the data set was reliable and representative of the water quality with Relative Percentage Difference (RPD) values of 30% or less? ▪ Were the laboratory limits of reporting (LORs) below the applicable guideline criteria for the analysed parameters? ▪ Were guideline criteria sourced from endorsed guidelines? ▪ Were surface water aesthetic characteristics evaluated including odours and sheen? ▪ Were the monitoring results obtained from the downstream sample collected during construction phase greater than the upstream sample collected during the same monitoring event? If so, then the adverse impact to the quality of water in the unnamed channel is considered to have potentially occurred.

DQO	Description
Step 6 Specify Limits on Decision Error	In accordance with the relevant guidelines as endorsed under the *Contaminated Land Management Act 1997*. Specific limits for this project are in accordance with the appropriate guidance made or endorsed by state and national regulations, appropriate indicators of data quality, and standard procedures for field sampling and handling. This step also examines the certainty of conclusive statements based on the available new Site data collected. This should include the following points to quantify tolerable limits: ▪ A decision can be made based on a certainty assumption of 95% confidence in any given data set (excluding asbestos). A limit on the decision error will be 5% that a conclusive statement may be a false positive or false negative. A decision error in the context of the decision rule presented above would lead to either underestimation or overestimation of the risk level associated with a particular sampling area. Decision errors may include: ▪ Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the Site. To address this, minimum numbers of samples are proposed to be collected from each media. As such, there may be limitations in the data if aspects of the sampling plan cannot be implemented. Some examples of this scenario include but not limited to: – Proposed samples are not collected due to lack of water flow or access being restricted to a given location. ▪ Limitations in ability to acquire useful and representative information from the data collected. The data are proposed to be collected from multiple locations and sample media. ▪ Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed: – Field staff to follow a standard procedure when undertaking samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, collection of representative samples and use of appropriate sample containers and preservation methods. – Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis. – Laboratories to report quality assurance/ quality control data for comparison with the DQIs established for the project
Step 7 Optimise the Design for Obtaining Data	To achieve the DQOs and DQIs, the following sampling procedures were implemented to optimise the design for obtaining data: ▪ Surface water samples was collected from upstream and downstream sampling locations, as available due to access and water level; ▪ Surface water samples was collected from two (2) discharge points between upstream and downstream, as available due to access and water level; ▪ Surface water parameters were selected based on project monitoring requirements provided to Cardno now Stantec; ▪ Samples were collected by suitably qualified and experienced environmental scientists; ▪ Samples were collected and preserved in accordance with relevant standards/guidelines; and ▪ Field and laboratory QA/QC procedures were adopted and reviewed to indicate the reliability of the results obtained.

4.1 Data Quality Indicators

The following DQIs have been adopted for the project. The DQIs outlined in **Table 4-2** assist with decisions regarding the usefulness of the data obtained, including the quality of the laboratory data.

Table 4-2 Summary of Data Quality Indicators

Data Quality Indicator	Frequency	Data Acceptance Criteria
Completeness		
Field documentation correct	All samples	The work was documented in accordance with Cardno now Stantec SOPs
Suitably qualified and experience sampler	All samples	Person deemed competent by Cardno now Stantec collecting and logging samples

Data Quality Indicator	Frequency	Data Acceptance Criteria
Appropriate lab methods and limits of reporting (LORs)	All samples	Samples were analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses.
Chain of custodies (COCs) completed appropriately	All samples	The work was documented in accordance with Cardno now Stantec SOPs
Sample holding times complied with	All samples	The samples were extracted and analysed within holding times specified by the project NATA-accredited laboratory
Proposed/critical locations sampled	-	Proposed/critical locations sampled
Comparability		
Consistent standard operating procedures for collection of each sample. Samples should be collected, preserved and handled in a consistent manner	All samples	All works undertaken in accordance with Cardno now Stantec SOPs
Experienced sampler	All samples	Person deemed competent by Cardno now Stantec collecting and logging samples
Climatic conditions (temp, rain etc) recorded and influence on samples quantified (if required)	All samples	Climatic conditions documented in field sheets
Consistent analytical methods, laboratories and units	All samples	Sample analysis to be in accordance with NATA-approved methods
Representativeness		
Sampling appropriate for media and analytes (appropriate collection, handling and storage)	All samples	Sample analysis to be in accordance with NATA-approved methods
Samples homogenous	All samples	All works undertaken in accordance with Cardno now Stantec SOPs
Detection of laboratory artefacts, e.g. contamination blanks	-	Laboratory artefacts assessed and impact on results determined
Samples extracted and analysed within holding times	All samples	The samples were extracted and analysed within holding times specified by the laboratory
Precision		
Blind duplicates (intra-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD result less than 10 × LOR
Split duplicates (inter-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD result less than 10 × LOR
Laboratory duplicates	1 per 20 samples	Results greater than 10 x LOR:less than or equal to 30% RPD Results less than 10 x LOR: No limit on RPD
Accuracy (Bias)		
Surrogate spikes	All organic samples	50-150%
Matrix spikes	1 per 20 samples	70-130%
Laboratory control samples	1 per 20 samples	70-130%
Method blanks	1 per 20 samples	Less than LOR

The DQOs and DQIs for the project were met during the monitoring events. Discussion of the Quality Control / Quality Assurance assessment is provided in **Appendix E**.

5 Field Investigation

The scope and method of the surface water monitoring is summarised in **Table 5-1**.

Table 5-1 Investigation Activity Summary

Activity	Details
Dates of Fieldwork	25 August 2022
Surface Water Sampling	Cardno now Stantec inspected four (4) surface water monitoring locations (WP1 – upstream, WP2 – downstream, WP2-DP1 – downstream eastern discharge point and WP2-DP2- downstream western discharge point). However, only three (3) primary samples were collected from WP1, WP2 and WP2-DP1 during the sampling event due to the dry condition at WP2-DP2. Cardno now Stantec undertook the sampling as per the following procedures: Surface Water Body Inspection - The general site condition was observed prior to commencement of field works for signs of any site activities that may have altered the surface water contamination status or require modifications to the field or laboratory works program. Each surface water location was inspected for indicators of contamination and the presence as well as the flow of surface water. This information is recorded on the field sheets presented in **Appendix C**. Surface water sampling - Field parameters and visual/olfactory observations were recorded prior to sampling at each location. Physico-chemical parameters including pH, electrical conductivity (EC), dissolved oxygen (DO), reduction-oxidation potential (redox), and temperature were measured using a calibrated water quality meter. Surface water samples were collected either directly into the sampling bottle or directly from the telescopic scoop. Once field parameters were recorded, the surface water samples were transferred to appropriately preserved sample containers provided by the laboratories. Field observations, and parameters are presented in **Appendix C**. Surface water samples were placed into an Esky containing ice and maintained at or below 4°C whilst onsite and in transit to the NATA-accredited laboratories for the targeted analyses.
Surface Water Analysis	Surface water samples from the monitoring event were submitted under standard chain-of-custody (CoC) procedures to NATA-accredited Eurofins Environment Testing Australia analysis of the parameters as follows: – Oil & Grease; – Total Suspended Solids (TSS); – Nutrients (Total Phosphorous, Total Nitrogen); – Turbidity; and – Chlorophyll-*a*. Tabulated laboratory results are presented in **Appendix D**. The Data QA /QC program and data quality review including calibration certificates is presented in **Appendix E**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and CoC documentation are included in **Appendix F**.
Decontamination	In the event of reusable sampling or monitoring equipment (telescopic scoop, water quality meter) was used decontamination was undertaken. Decontaminated between locations using a standard bucket wash. Equipment was washed in phosphate-free detergent (Liquinox) and rinsed in laboratory supplied rinsate water.

6 Surface Water Assessment Criteria

The assessment criteria for surface water analytical and field data were adopted from Table 11 of the site's SWMP. The criteria for selected parameters are provided in **Table 6-1** below. ANZECC guideline criteria are included in the table for reference.

Table 6-1 Water Quality Monitoring Parameters and Adopted Criteria at Wiley Park

Parameter	ANZECC Criteria – Freshwater[1]	Proposed Trigger Values	Proposed Actions
Temperature (°C)	>80% ile; <20% ile	Downstream results are greater than upstream results in rainfall events up to and including the significant event threshold of greater than 20 mm in 24 hours. Downstream results are greater than upstream results during dry-weather sampling.	Environment Manager (or delegate) to re-test to confirm results and undertake an inspection of the adjacent works and propose actions where required.
Dissolved Oxygen (DO)	Lower limit – 85% Upper limit -110%		
Turbidity (NTU)	6-50 NTU		
Oil and grease	-		
pH	Lower limit – 6.5 Upper limit – 8.5		
Salinity (as EC)	125 – 2200 µS/cm		
Total Suspended Solids (TSS)	-		
Total Phosphorus as P	25 µg/L		
Total Nitrogen as N	350 µg/L		
Chlorophyll-a	3 µg/L		

Note to Table
1 ANZECC guideline criteria are included for reference. It is noted that for dry weather events baseline testing comparison will indicate whether this existing water quality within the channel meet ANZECC guidelines, prior to construction of the services building. For wet weather events where no baseline data is available a direct comparison to upstream and downstream results is undertaken. Sydney Metro's Principal Contractor will comply with Section 120 of the Protection of the Environment Operations Act 1997.

7 Summary of Results

7.1 Summary of Field Observations

All four (4) nominated monitoring locations were inspected (WP1, WP2, WP2-DP1 and WP2-DP2) on 25 August 2022. Three (3) surface water sampling locations (WP1, WP2 and WP2-DP1) were able to be sampled whereas the WP2-DP2 was not able to be sample due to the dry condition during the time of the sampling event on 25 August 2022. Photos of each sampling location are included in **Appendix B**. The following observations were made:

7.1.1 Mid-Construction Quarterly Dry-Weather Event – 25 August 2022

- The sampling event was undertaken on 25 August 2022 during a dry-weather event with 0 mm precipitation over the last 24 hours prior to the field sampling (rainfall data was obtained from the closest Bureau of Meteorology weather station, i.e. Canterbury Racecourse AWS - station ID: 066194). Refer to **Appendix C** for a copy of the weather recordings obtained from the Bureau of Meteorology website (http://www.bom.gov.au/);
- Observation of water body:
  - WP 1 (upstream of work are) contained low flowing clear water with low turbidity. No visible oil sheen observed from the water surface. The estimated depth of the water body was 0.25 m.
  - WP 2 (downstream of work area) contained low flowing clear water with low turbidity. No visible oil sheen observed from the water surface. The estimated depth of the water body was 0.25 m;
  - WP2- DP1 (downstream eastern discharge point) contained low flowing clear water with low turbidity. The estimated depth of the water body was 0.35 m;
  - WP2-DP2 (downstream western discharge point) was dry. No contribution to the water body was observed during the time of sampling.
- Additional observation:
  - One discharge point (WP1-DP1) was observed immediately downstream / north of WP1. Minor flow contribution was observed at the time of sampling. Refer to **Appendix A** for approximate location of WP1-DP1. Refer to **Appendix B** for a detailed photo.

7.2 Field Parameters

The parameters from each location sampled are presented in **Table 7-1.**

Table 7-1 Laboratory Physico-chemical Parameters and Field Observations – 25 August 2022

Location ID	WP1 (upstream)	WP2 (downstream)	WP2-DP1 (downstream eastern discharge point)
Water Depth (m)	0.25	0.25	0.35
Estimated Flow Rate	low	low	low
Temperature (°C)	11.7	14.1	13.0
pH	7.16	9.02	10.71
Electrical Conductivity (µS/cm)	805.0	861.0	773.0
Dissolved Oxygen (mg/L)	13.50	10.32	4.06
Dissolved Oxygen (%)	124.1	101.0	40.8
Oxidation-Reduction Potential (mV)	81.4	39.8	16.9
SHE[1] Redox Potential (mV)	295.2	252.4	230.1

Location ID	WP1 (upstream)	WP2 (downstream)	WP2-DP1 (downstream eastern discharge point)
Condition	Clear Low turbidity	Clear Low turbidity	Clear Low turbidity

Note to Table
1 SHE – Standard Hydrogen Electrode
2 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: *SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP)*.

7.3 Surface Water Analytical Results

Laboratory analytical results for the surface water samples collected are presented in **Appendix D**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Appendix F**.

7.3.1 Mid-Construction Dry-Weather Event – 25 August 2022

The analytical results of the monitoring event indicate that:

- Concentrations of Chlorophyll-*a* were reported below the laboratory detection limit (<0.002 mg/L) and adopted assessment criteria at all sample locations;
- Concentrations of Oil and Grease were reported:
  - WP1: <10 mg/L
  - WP2: 19 mg/L
  - WP2-DP1: 13 mg/L
- Concentrations of nutrients (total nitrogen and the total phosphorous) were reported:
  - Total nitrogen:
    - WP1: 2.1 mg/L
    - WP2: 1.2 mg/L
    - WP2-DP1: 4.6 mg/L
  - Total phosphorous:
    - WP1: 0.31 mg/L
    - WP2: 0.35 mg/L
    - WP2-DP1: 0.11 mg/L
- TSS were reported below the laboratory detection limit (<5 mg/L).
- Turbidity was reported:
  - WP1: 3.9 NTU
  - WP2: 3.8 NTU
  - WP2-DP1: 1.2 NTU
- pH was reported:
  - WP1: 7.16
  - WP2: 9.02
  - WP2-DP1: 10.71

7.3.2 Baseline Results Comparison

One sampling event during the pre-construction period (baseline event) was undertaken on 10 March 2021. This event has been used for comparison of mid-construction monitoring events under similar conditions (i.e. not triggering the wet-weather event criteria). It should be noted that the baseline water quality monitoring represents a single sampling event, and may not be representative of the range of water quality within the channel prior to construction starting.

The parameters from each location sampled are presented in **Table 7-2** compared with the baseline pre-construction event undertaken on 10 March 2021. Overall, conditions are similar in the pre-construction results and the mid-construction sampling event on 25 August 2022. These baseline conditions have been taken into account in interpretation below. It is noted that due to the scope of work assigned to Cardno now Stantec by the time of baseline monitoring event, no sampling or monitoring work was undertaken at the downstream discharging points (WP2-DP1 and WP2-DP2) for comparison.

Table 7-2 Comparison of current sampling results to baseline results.

Location ID	Assessment Criteria	WP1 (upstream) Baseline Results 10 March 2021	WP1 (upstream) 25 August 2022	WP2 (downstream) Baseline Results 10 March 2021	WP2 (downstream) 25 August 2022
Temperature (ºC)	N/A	21.3	11.7	21.1	14.1
pH	6.5 - 8.5	7.90	7.16	7.61	**9.02**
Electrical Conductivity (µS/cm)	125 – 2,200	543	805	363	861
Dissolved Oxygen (%)	85% - 110%	**63**	**124.1**	**45.9**	101.0
Oxidation-Reduction Potential (mV)	N/A	140.7	81.4	181.0	39.8
SHE[1] Redox Potential (mV)	N/A	348.1[3]	295.2[3]	388.4[3]	252.4[3]
Chlorophyll a (µg/L)	3	**<5**	<2	**<5**	<2
Oil and Grease (mg/L)	Comparison	<10	<10	29	19
Nitrogen (Total) (mg/L)	0.35	**2.5**	**2.1**	**1.68**	**1.2**
Phosphorus (mg/L)	0.025	**0.34**	**0.31**	**0.12**	**0.35**
TSS (mg/L)	N/A	<1	<5	<1	<5
Turbidity (NTU)	6 - 50	2.9	3.9	<1	3.8

Note to Table
1 SHE – Standard Hydrogen Electrod
2 NT- Not Tested
3 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: *SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP)*.
Highlighted cell with the bold font indicates exceedance of the adopted assessment criteria.

7.4 Results Discussion

7.4.1 Comparison to ANZG 2018 / ANZECC 2000 Criteria

Results for the mid-construction dry-weather event sampled on 25 August 2022 generally showed monitored parameters were within the adopted threshold criteria, with the exception of dissolved oxygen**,** total nitrogen, total phosphorous, and pH:

- Dissolved oxygen saturation measured at WP2 (101.0%) was within the adopted criterion range whereas WP1 (124.1%) and WP2-DP1 (40.8%) were outside the adopted criterion range. This is not considered to be a significant issue, due to the pre-construction monitoring results showing saturations of 63% and 45.9% for WP1 and WP2 respectively, indicating this mid-construction results are close to the adopted thresholds than the pre-construction event.
- Total nitrogen measured at both WP1 and WP2 were above the adopted criterion range with the analytical results of 2.1 mg/L and 1.2 mg/L for WP1 and WP2 respectively. Overall, this is not considered to be a significant issue, due to the pre-construction monitoring results showing the total nitrogen concentrations of 2.5 mg/L and 1.68 mg/L for WP1 and WP2 respectively, indicating mid-construction results are closer to the adopted thresholds than the pre-construction event.
- Phosphorous measured at both WP1 and WP2 were above the adopted criterion range with the analytical results of 0.31 mg/L and 0.35 mg/L for WP1 and WP2 respectively. Overall, this is not considered to be a significant issue, due to the pre-construction monitoring results showing total phosphorus of 0.34 mg/L and 0.12 mg/L for WP1 and WP2 respectively, indicating the water quality from this mid-construction monitoring event was similar to the pre-construction event.
- pH measured at WP1 was within the adopted criterion range, whereas pH measured at WP2 and WP2-DP1 (WP2: 9.02 and WP2-DP1: 10.71) were above the adopted criterion range (i.e. 6.5 – 8.5).

7.4.2 Comparison of Upstream and Downstream Results

Results between upstream and downstream samples collected during the mid-construction dry-weather event were comparable, with the exception of:

- Oil and Grease results reported for the downstream sample location (WP2: 19 mg/L) and downstream discharge point (WP2-DP1: 13 mg/L) were higher than the upstream sample location (WP1: <10 mg/L). However, it is not considered this is a significant issue and this is not considered likely to be a result of the construction activities undertaken because:
  - Similar concentration to the Oil and Grease concentration reported for the downstream sample (WP2: 29 mg/L) collected during pre-construction baseline monitoring event undertaken on 10 March 2021.
  - No visible oil sheen observed from any of the downstream monitoring locations (WP2 and WP2-DP1). Refer to **Appendix B** for photos of the surface water condition at each downstream monitoring location.
- Total nitrogen result at the downstream discharge point (WP2-DP1: 4.6 mg/L) was higher than the upstream sampling point (WP1: 2.1 mg/L). However, it is not considered this is a significant issue and this is not considered likely to be a result of the construction activities undertaken because:
  - It is known that there is an off-site flow contribution to the eastern downstream discharge point (WP2-DP1) from the urban run-off drainage system at Shaforth Street. It is known that high level of total nitrogen (i.e. an order of magnitude higher than the WP2-DP1 results) was previously identified from this off-site flow contribution. This off-site source with elevated nitrogen concentration was documented in below report:
    - Cardno now Stantec (2022) *Source Investigation for Algal Growth Observed within the V-Drain near Shadforth Street*. Date: 2 September 2022. Revision: RevA. Report reference: 304100142_TM01_V-Drain Algal Growth_RevA.
  - Total nitrogen concentration within the downstream sample point WP2 (WP2: 1.2 mg/L) was lower than the upstream sample point WP1 (WP1: 2.1 mg/L).
- Total phosphorous results at the downstream sample point (WP2: 0.35 mg/L) was slightly higher than the upstream sampling point (WP1: 0.31 mg/L). However, it is not considered this is a significant issue:
  - Total phosphorous results at the downstream sample point was only slightly higher than the upstream sampling point.

  - Total phosphorous result at the downstream discharge point (WP2-DP1: 0.11 mg/L) was lower than both upstream and downstream monitoring locations. This downstream discharge point connects the surface water between the Wiley Park worksite and the subject unnamed water channel.

> The pH results at downstream eastern discharge point sample (WP2-DP1: 10.71) and downstream sample point (WP2:9.02) were considerably higher than the results measured at the upstream sample location (WP1: 7.16). As such, flow from the downstream eastern discharge point (WP2-DP1) is highly likely to contribute an increasing pH to the downstream water body.

> The electrical conductivity at downstream sample (WP2: 861.0 uS/cm) was higher than the result at the upstream sample (WP1:805.0 uS/cm). However, it is not considered to be a significant issue based on:

  - EC results measured at all locations were within the ANZG 2018 / ANZECC 2000 Criteria.

Refer to **Appendix D** for details.

8 Conclusion

Cardno now Stantec was engaged to undertake surface water monitoring of the unnamed channel west of Wiley Park Station in accordance with the SWMP for the project. The objective of the works was to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel that receives in part stormwater from the construction area.

This report presents monitoring data of a mid-construction dry-weather event on 25 August 2022. Based on the investigation results obtained, following conclusions are made:

- ANZG 2018 / ANZECC 2000 comparison and assessment: during this mid-construction dry-weather monitoring event, monitored parameters were either within the adopted ANZG 2018 / ANZECC 2000 screening criteria or considered insignificant for the exceedances (total nitrogen, total phosphorous and dissolved oxygen saturation) based on the comparison with the pre-construction baseline monitoring results. However, pH measured at the downstream discharge point WP2-DP1 (10.71) and downstream sample point WP2 (9.02) were outside the assessment criteria range of 6.5 to 8.5.
- Upstream and downstream comparison and assessment: during this mid-construction dry-weather monitoring event, the results of downstream sample point WP2, downstream discharge point (WP2-DP1) and upstream sample point WP1 were either comparable or considered insignificant / unlikely a result from the construction activities within Wiley Park worksite for the increases at downstream sample point / downstream discharge points (oil and grease, total nitrogen, total phosphorous and electrical conductivity) based on the review of site plan, comparison with the pre-construction baseline monitoring results, and adopted ANZG 2018 / ANZECC 2000 criteria. However, the elevated pH measured at the downstream discharge point WP2-DP1 and downstream sample point WP2 were considered significant and requires further investigation of the upstream area regarding the potential source(s).

8.1 Recommendation

Based on the findings from this investigation as well as the findings from the additional pH source investigation undertaken on 4 and 21 July 2022 (detailed in NE30161_R010_SWM_WileyPark_Rev0), recommendations regarding the elevated pH identified at WP1-DP2 and the two upstream flow contributions (platform 1 drainage system and temporary surface water erosion and sediment control trenches) are made as following:

- Temporary surface water erosion and sediment control trenches: prior to rainfall events, it is recommended that installation of a non-permeable physical barrier (e.g. black plastic sheeting) within the drainage trench path surrounding the construction footprint of the OSD tank. This would prevent surface water from coming into direct contact with the stabilised sand / cement mixture used to backfill the area.
- Platform 1 drainage system: it is understood that a rail possession is required to allow the access to the drainage system further upstream to PD1. Once access is obtained, further investigation is recommended to identify any potential source(s) for the elevated pH identified including:
  - Soil pH Measurement: soil pH measurement is to be undertaken to all the areas potentially form the catchment area to the platform drainage (including the batter on the northern face) by on-site soil pH testing kit as well as laboratory analysis.
  - Inspections to be undertaken of:
    - All the platform buildings (if accessible) for any potential source (e.g. storage for cleaning products, etc.).
    - All the Downer storages within the potential catchment area to the platform drainage for any potential sources.
  - Platform aco drain check:
    - Scenario 1 – dry weather:
      - Downer to assist removing all the grates from the aco drain to allow sampling and inspection.
      - Check the pH of the tap water itself prior to pouring water into the aco drain using a calibrated water quality meter.
      - Pour the tap water from the eastern end of the aco drain for at least 5 mins prior to sampling.

- Check the pH value of the water within the aco drain in approximately 10 m intervals from east towards west in order to identify any potential abnormal increase. If any abnormal increase identified within any section checked, then further scrutinized inspection and check will be undertaken to the targeted section for the potential source.
- Check all the previously checked locations (21 July 2022) associated with the platform drainage system (downstream pits and swales) to identify any potential abnormal increase.

- Scenario 2 – wet weather:
  - Downer to assist removing all the grates from the aco drain to allow sampling and inspection.
  - Check the pH value of the water within the aco drain in approximately 10 m intervals from east towards west in order to identify any potential abnormal increase. If any abnormal increase identified within any section checked, then further scrutinized inspection and check will be undertaken to the targeted section for the potential source.
  - Check all the previously checked locations (21 July 2022) associated with the platform drainage system (downstream pits and swales) to identify any potential abnormal increase.

9 References

- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades – Soil and Water Management Plan, dated 16th February 2021.
- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018.
- Environmental Planning and Assessment Act 1979 (EP&A Act).
- Contaminated Land Management Act 1997.
- Protection of the Environment Operations Act 1997 (POEO Act).
- Water Management Act 2000 Water Management (General) Regulation 2018.
- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book').
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book').
- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines').
- ANZECC (2000). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines').
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').

10 Limitations

This assessment has been undertaken in general accordance with the current industry standards for a surface water monitoring report for the purpose and objectives and scope identified in this report. The agreed scope of this assessment has been limited for the current purposes of the Client. The assessment may not identify contamination occurring in all areas of the site, or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained. This Document has been provided by Cardno subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Cardno's proposal and Section 1 of this report and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of Cardno's services are as described in Cardno's proposal, and are subject to restrictions and limitations. Cardno did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Cardno in regards to it.
- Conditions may exist which were undetectable given the limited nature of the enquiry Cardno was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Cardno's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Cardno to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.
- Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Cardno for incomplete or inaccurate data supplied by others.
- Cardno may have retained sub consultants affiliated with Cardno to provide services for the benefit of Cardno. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Cardno's affiliated companies, and their employees, officers and directors.

This assessment report is not any of the following:

- A Site Audit Report or Site Audit Statement (SAR/SAS) as defined under the *Contaminated Land Management Act, 1997* or an assessment sufficient for an Environmental Auditor to be able to conclude a SAR/SAS.
- A geotechnical report and the bore logs/test pit logs may not be sufficient for geotechnical advice.
- An assessment of surface water contaminants potentially arising from other sites or sources nearby.
- A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land

APPENDIX

A

FIGURES

Cardno

now

Stantec

Downer
Relationships creating success

Surface Water Monitoring

WILEY PARK STATION

Legend

- Monitoring Location
- Discharging Points
- Watercourse (NSW SS)
- Cadastre (NSW SS, 2022)

FIGURE GS004

1:500 Scale at A3

m
0 5 10 15 20

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-08-30 | Project:304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-004-SurfaceWater.mxd 01
Aerial imagery supplied by MetroMap (June 2022)

APPENDIX

B

PHOTOGRAPHS

Cardno

now

Stantec

Photograph 1. Condition observed from sampling location of WP1 during the monitoring event – 25 August 2022.

Photograph 2. Minor stormwater in-flow observed from the discharge point WP1-DP1 which was located within the rail corridor and immediately downstream / north from WP1 during the monitoring event – 25 August 2022.

Photograph 3. Condition observed from sampling location of WP2 during the monitoring event – 25 August 2022.

Photograph 4. Minor stormwater in-flow observed from the downstream discharge point WP2-DP1 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – 25 August 2022.

Photograph 5. Current condition and sediment / erosion control of the downstream discharge point WP2-DP1 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – 25 August 2022.

Photograph 6. No stormwater in-flow observed from the downstream discharge point WP2-DP2 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – 25 August 2022.

APPENDIX

C

FILED RECORDS

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Cardno
Shaping the Future

name.

Error! Unknown document property

Surface Water Sampling Field Record

Site / Project:	304500142 Wiley Park SWM	Sampling Point:
Client:	Downer	Job No. 304500142
Person Sampling:	~~EZ~~ telescopic scoop	Initials: JZ

Site Details

Sampling Equipment – Directly into bottle / Water Scoop / Van Dorn Sampler / Other — Date: 25.8.22.

Observations on Site: Last Rain Event / Recent Storms / Releases / Other: dry weather

Sample Details, Observations, GPS Coordinates & Field Physiochemical Measurements

(if possible, record parameters once stable)

Sample ID	WP01	WP02	WP02-DP01	WP02-DP02	
Start Time:	9:30	10:10	10:15		
Easting	—	—	—		
Northing	—	—	—		
Sample Depth (m)	0.05-0.25	0.15-0.25	005-0.25		
Water Body Depth (m)	0.05-0.25	0.15-0.25	0.1-0.35		
Location – Onsite/Offsite /Inlet/Outlet/ Middle	upstream	downstream	downstream discharge point		
Flow Rate None/ Low / Med / High	low	low	low		
DO (mg/L)	13.50	[redacted] 10.32	4.06		
DO (%)	124.1	[redacted] 101.0	40.8		
EC (µS/Cm) SPC	805	[redacted] 861	773		
pH	7.16	[redacted] 9.02	10.71		
Eh ORP (mV)	81.4	[redacted] 39.8	16.9		
Temp (°C)	11.7	14.1	13.0		
Water Colour	clear	clear	clear		
Turbidity Low / Med / High	low	low	low		
Observations / Notes	Upstream DP contribute (very minor)		With contribution (approximately 4%) to the water body	dry, no contribution (no sample taken)	

Sample Container & Preservation Data

Number of sample containers:	6	14	6	0	
Container Volume					
Container Type					
Preservation					
Sample Number (for Lab ID):		QA100			
QC Dup Sample No.:		QA200			

Checklist:

- Ice
- Photos (water body and samples)
- Cal certificate
- Call Chong if data go crazy or observed contamination on site
- Weather records
- COC
  - QA200 sample needs to be sent to ALS
  - Chlorophyll a from 5 ug/L to 2 ug/L)

WP2:

W: 0.6m
D: 0.2m
flow: 1

= 0.12

WP2-DD1

W: 0.6m
D: 0.08 m
flow: 0.8

= 0.0048

$\frac{0.0048}{0.12} = 0.04 \times 4\%$

Calibration & Service Report
Water Quality Meter

Company:	Active Environmental Solutions Hire	**Manufacturer:**	YSI	**Serial #:**	15H103057
Address:	Unit 16, 191 Parramatta Road AUBURN NSW 2144	**Instrument/Model:**	WQM Professional Plus w/ Quatro Cable	**Cable Length:**	1m
Phone:	02 9716 5966 | **Fax**: 02 9716 5988	**Client Company:**		**Client Email:**	
Email:	hire@aesoultions.com.au	**Client Name:**		**Client Phone:**	

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 60 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	
pH slope		✓	55 to 60 mV/pH; ideal 59mV
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	Variance range ± 20mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
A clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

Instrument Readings

Parameter	Standards	Reference	Calibration Point	Before	After	Units
Temperature	Center 370 Thermometer	Room Temp.	14	N/A	14.1	°C
pH	pH 4.00	378644	4.00	4.30	4.00	pH
pH	pH 7.00	378645	7.02	7.29	7.02	pH
Conductivity	2760 µs/cm at 25°C	378284	2549	2842	2549	µs/cm
ORP (Ref. check only)	Zobell Solutions	367761	225	303.5	225	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	-	0.0	0.2	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Fresh Air	100.0	115	100.1	%

Calibrated By: Satheesh Mani

Calibration Date: 14 June 2022 **Calibration Due:** 14 December 2022

Latest Weather Observations for Canterbury

IDN60801

Issued at 1:42 pm EST Thursday 25 August 2022 (issued every 10 minutes, with the page automatically refreshed every 10 minutes)

About weather observations | Map of weather stations | Latest weather observations for NSW | Other Formats

Station Details ID: 066194 Name: CANTERBURY RACECOURSE AWS Lat: -33.91 Lon: 151.11 Height: 3.0 m

Data from the previous 72 hours. | See also: Recent months at Canterbury

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
25/01:30pm	16.6	12.4	4.0	43	5.9	S	15	22	8	12	-	-	0.0
25/01:00pm	17.5	15.1	5.1	44	5.9	SW	7	13	4	7	-	-	0.0
25/12:30pm	17.4	14.4	6.0	47	5.6	SW	11	17	6	9	-	-	0.0
25/12:00pm	16.8	12.5	5.4	47	5.5	SW	17	24	9	13	-	-	0.0
25/11:30am	17.5	13.5	5.1	44	5.9	WSW	15	24	8	13	-	-	0.0
25/11:00am	17.4	14.0	5.7	46	5.7	SW	13	22	7	12	-	-	0.0
25/10:30am	16.2	12.0	5.8	50	5.0	SW	17	24	9	13	-	-	0.0
25/10:00am	14.9	10.6	5.4	53	4.5	WSW	17	28	9	15	-	-	0.0
25/09:30am	13.6	9.2	4.7	55	4.1	SW	17	26	9	14	-	-	0.0
25/09:00am	13.1	9.4	4.5	56	3.9	W	13	20	7	11	-	-	0.0
25/08:30am	12.3	9.0	4.5	59	3.5	WSW	11	20	6	11	-	-	0.0
25/08:00am	11.3	9.0	5.8	69	2.6	WSW	7	13	4	7	-	-	0.0
25/07:30am	8.4	5.7	3.7	72	2.0	NW	7	9	4	5	-	-	0.0
25/07:00am	7.4	4.9	3.5	76	1.7	NW	6	7	3	4	-	-	0.0
25/06:30am	5.9	3.6	2.5	79	1.4	WNW	4	9	2	5	-	-	0.0
25/06:00am	7.1	4.5	3.0	75	1.7	SW	6	11	3	6	-	-	0.0
25/05:30am	6.1	3.4	2.9	80	1.3	SW	6	7	3	4	-	-	0.0
25/05:00am	7.2	4.5	2.5	72	1.9	NW	6	9	3	5	-	-	0.0
25/04:30am	7.0	4.0	2.1	71	2.0	NNW	7	11	4	6	-	-	0.0
25/04:00am	7.1	4.3	2.0	70	2.1	NNW	6	9	3	5	-	-	0.0
25/03:30am	7.1	4.3	2.0	70	2.1	WNW	6	11	3	6	-	-	0.0
25/03:00am	6.9	3.9	2.0	71	2.0	WNW	7	9	4	5	-	-	0.0
25/02:30am	7.4	4.5	1.7	67	2.3	WNW	6	9	3	5	-	-	0.0
25/02:00am	7.7	4.7	1.8	66	2.4	WNW	7	15	4	8	-	-	0.0
25/01:30am	8.3	5.3	1.7	63	2.7	NW	7	13	4	7	-	-	0.0
25/01:00am	8.2	5.3	1.6	63	2.7	WNW	6	9	3	5	-	-	0.0
25/12:30am	8.5	5.0	1.4	61	2.9	NW	9	15	5	8	-	-	0.0
25/12:00am	8.8	5.7	1.5	60	3.0	WNW	7	13	4	7	-	-	0.0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
24/11:30pm	9.5	6.4	1.2	56	3.4	W	7	15	4	8	-	-	0.0
24/11:00pm	9.9	6.4	1.3	55	3.6	W	9	15	5	8	-	-	0.0
24/10:30pm	10.0	6.1	1.4	55	3.6	WSW	11	17	6	9	-	-	0.0
24/10:00pm	10.0	6.6	1.6	56	3.5	WNW	9	13	5	7	-	-	0.0
24/09:30pm	10.9	7.0	1.2	51	4.0	WSW	11	17	6	9	-	-	0.0
24/09:00pm	11.5	6.9	1.5	50	4.2	WSW	15	24	8	13	-	-	0.0
24/08:30pm	11.3	6.8	2.1	53	3.9	SW	15	22	8	12	-	-	0.0
24/08:00pm	11.2	7.9	4.4	63	3.1	SW	11	20	6	11	-	-	0.0
24/07:30pm	8.1	7.2	6.1	87	0.9	CALM	0	0	0	0	-	-	0.0
24/07:00pm	8.7	7.6	5.1	78	1.6	CALM	0	0	0	0	-	-	0.0
24/06:30pm	10.3	9.2	5.3	71	2.3	CALM	0	2	0	1	-	-	0.0
24/06:00pm	10.9	9.6	4.1	63	3.0	CALM	0	6	0	3	-	-	0.0
24/05:30pm	13.2	10.3	4.9	57	3.8	SSE	9	15	5	8	-	-	0.0
24/05:00pm	14.1	10.3	4.1	51	4.6	SSE	13	20	7	11	-	-	0.0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
24/04:30pm	14.6	10.5	4.3	50	4.8	SSE	15	22	8	12	-	-	0.0
24/04:00pm	15.0	10.9	4.4	49	4.9	SSE	15	24	8	13	-	-	0.0
24/03:30pm	15.4	11.1	3.5	45	5.4	SSE	15	24	8	13	-	-	0.0
24/03:00pm	15.8	12.3	3.6	44	5.6	SSE	11	20	6	11	-	-	0.0
24/02:30pm	16.1	12.2	3.5	43	5.8	S	13	19	7	10	-	-	0.0
24/02:00pm	16.2	11.9	1.1	36	6.6	S	13	22	7	12	-	-	0.0
24/01:30pm	15.9	11.5	0.5	35	6.6	SW	13	26	7	14	-	-	0.0
24/01:00pm	15.5	10.4	0.9	37	6.3	S	17	24	9	13	-	-	0.0
24/12:30pm	16.1	12.0	2.2	39	6.2	S	13	28	7	15	-	-	0.0
24/12:00pm	15.4	10.2	2.6	42	5.7	SSW	19	33	10	18	-	-	0.0
24/11:30am	15.3	10.2	3.1	44	5.5	SW	19	30	10	16	-	-	0.0
24/11:00am	14.0	9.1	2.0	44	5.2	SW	17	28	9	15	-	-	0.0
24/10:30am	13.2	7.3	1.8	46	4.9	SW	22	32	12	17	-	-	0.0
24/10:00am	12.4	6.1	1.7	48	4.6	WSW	24	35	13	19	-	-	0.0
24/09:30am	11.7	6.3	1.4	49	4.3	SW	19	30	10	16	-	-	0.0
24/09:00am	10.7	4.3	1.0	51	4.0	SW	24	37	13	20	-	-	19.0
24/08:30am	9.8	4.1	0.7	53	3.7	SW	20	33	11	18	-	-	19.0
24/08:00am	8.6	3.5	0.8	58	3.1	SW	17	26	9	14	-	-	19.0
24/07:30am	7.7	2.5	0.4	60	2.9	WSW	17	28	9	15	-	-	19.0
24/07:00am	7.1	1.9	0.1	61	2.7	SW	17	28	9	15	-	-	19.0
24/06:30am	6.8	2.0	0.3	63	2.5	SW	15	28	8	15	-	-	19.0
24/06:00am	6.9	2.2	0.6	64	2.5	WSW	15	28	8	15	-	-	19.0
24/05:30am	7.1	2.4	0.8	64	2.5	SW	15	24	8	13	-	-	19.0
24/05:00am	7.4	2.3	0.8	63	2.6	WSW	17	30	9	16	-	-	19.0
24/04:30am	7.7	2.6	0.9	62	2.7	SW	17	26	9	14	-	-	19.0
24/04:00am	8.0	3.3	1.2	62	2.8	SW	15	26	8	14	-	-	19.0
24/03:30am	8.3	3.7	1.5	62	2.8	SW	15	28	8	15	-	-	19.0
24/03:00am	8.5	3.5	1.6	62	2.8	SW	17	30	9	16	-	-	19.0
24/02:30am	8.9	3.6	2.0	62	2.9	SW	19	30	10	16	-	-	19.0
24/02:00am	9.1	4.3	2.4	63	2.8	SW	17	32	9	17	-	-	19.0
24/01:30am	9.1	4.4	3.1	66	2.6	SW	17	26	9	14	-	-	19.0
24/01:00am	9.1	4.5	3.7	69	2.3	SW	17	28	9	15	-	-	19.0
24/12:30am	8.9	4.4	4.3	73	2.0	SW	17	32	9	17	-	-	19.0
24/12:00am	8.6	4.2	5.0	78	1.6	SW	17	26	9	14	-	-	19.0
23/11:30pm	8.1	4.6	5.4	83	1.2	SW	13	22	7	12	-	-	19.0
23/11:00pm	7.8	4.3	5.6	86	1.0	SW	13	22	7	12	-	-	19.0
23/10:30pm	7.5	3.7	5.8	89	0.8	SW	15	22	8	12	-	-	18.8
23/10:00pm	7.3	3.5	5.9	91	0.6	WSW	15	24	8	13	-	-	18.6
23/09:30pm	7.2	3.0	5.8	91	0.6	SW	17	26	9	14	-	-	18.4
23/09:00pm	7.2	3.1	6.0	92	0.5	SW	17	28	9	15	-	-	18.0
23/08:30pm	7.2	3.1	6.0	92	0.5	SW	17	28	9	15	-	-	17.0
23/08:00pm	7.4	3.7	6.3	93	0.5	SW	15	26	8	14	-	-	15.6
23/07:30pm	7.6	4.0	6.7	94	0.4	SW	15	22	8	12	-	-	15.2
23/07:00pm	7.6	4.0	6.7	94	0.4	WSW	15	28	8	15	-	-	14.8
23/06:30pm	7.8	3.9	6.9	94	0.4	SW	17	28	9	15	-	-	14.2
23/06:00pm	8.4	5.0	7.5	94	0.4	SW	15	22	8	12	-	-	13.8
23/05:30pm	8.7	5.3	7.6	93	0.5	SW	15	20	8	11	-	-	13.6
23/05:00pm	8.6	5.1	7.4	92	0.6	SW	15	26	8	14	-	-	13.4
23/04:49pm	8.6	4.8	7.4	92	0.6	SW	17	32	9	17	-	-	13.4
23/04:30pm	8.6	3.8	7.4	92	0.6	SSW	22	35	12	19	-	-	12.4
23/04:00pm	8.6	4.2	7.2	91	0.7	SW	20	33	11	18	-	-	9.6
23/03:30pm	8.7	4.3	7.5	92	0.6	S	20	37	11	20	-	-	8.4
23/03:16pm	8.7	2.0	7.3	91	0.7	S	32	50	17	27	-	-	8.4
23/03:03pm	8.8	2.9	7.6	92	0.6	S	28	54	15	29	-	-	8.0
23/03:00pm	8.8	3.3	7.6	92	0.6	S	26	54	14	29	-	-	7.8
23/02:57pm	9.0	4.0	7.9	93	0.5	S	24	41	13	22	-	-	7.6
23/02:53pm	9.3	4.7	8.2	93	0.5	S	22	41	12	22	-	-	7.2
23/02:31pm	9.1	3.3	7.9	92	0.6	S	28	54	15	29	-	-	5.2

23/02:30pm	9.6	3.9	8.2	91	0.7	S	28	63	15	34	-	-	4.2
23/02:25pm	10.3	4.7	8.9	91	0.7	S	28	63	15	34	-	-	2.8
23/02:05pm	10.6	4.7	8.9	89	0.8	SSE	30	61	16	33	-	-	1.8
23/02:00pm	11.2	4.9	8.9	86	1.1	S	32	61	17	33	-	-	0.8
23/01:30pm	13.7	8.0	9.7	77	2.1	SSE	30	52	16	28	-	-	0.0
23/01:05pm	14.0	9.2	9.0	72	2.5	SSE	24	54	13	29	-	-	0.0
23/01:00pm	16.9	14.8	8.1	56	4.5	SW	9	33	5	18	-	-	0.0
23/12:30pm	19.5	16.1	5.9	41	6.7	NNW	13	24	7	13	-	-	0.0
23/12:00pm	20.9	16.6	5.3	36	7.7	NNW	17	30	9	16	-	-	0.0
23/11:30am	21.1	16.9	5.5	36	7.7	NNW	17	26	9	14	-	-	0.0
23/11:00am	20.6	15.7	5.0	36	7.6	N	20	32	11	17	-	-	0.0
23/10:30am	20.9	16.6	5.3	36	7.7	NNW	17	26	9	14	-	-	0.0
23/10:00am	19.6	15.1	6.0	41	6.7	N	19	32	10	17	-	-	0.0
23/09:30am	18.2	14.6	6.7	47	5.7	N	15	24	8	13	-	-	0.0
23/09:00am	17.0	13.1	5.3	46	5.6	N	15	20	8	11	-	-	0.0
23/08:30am	17.0	12.7	5.3	46	5.6	NNW	17	26	9	14	-	-	0.0
23/08:00am	16.3	13.1	5.0	47	5.4	NNW	11	17	6	9	-	-	0.0
23/07:30am	14.7	11.9	5.0	52	4.5	N	9	15	5	8	-	-	0.0
23/07:00am	13.3	10.0	4.7	56	4.0	N	11	17	6	9	-	-	0.0
23/06:30am	13.5	9.4	4.4	54	4.2	N	15	22	8	12	-	-	0.0
23/06:00am	13.7	10.0	4.3	53	4.3	N	13	20	7	11	-	-	0.0
23/05:30am	13.3	9.6	4.5	55	4.0	N	13	20	7	11	-	-	0.0
23/05:00am	13.2	9.1	4.6	56	3.9	N	15	22	8	12	-	-	0.0
23/04:30am	13.6	9.1	4.2	53	4.3	N	17	26	9	14	-	-	0.0
23/04:00am	14.2	9.7	4.2	51	4.6	N	17	26	9	14	-	-	0.0
23/03:30am	14.3	9.8	4.3	51	4.6	N	17	28	9	15	-	-	0.0
23/03:00am	13.7	9.5	4.0	52	4.4	N	15	20	8	11	-	-	0.0
23/02:30am	13.9	9.3	3.9	51	4.5	NNE	17	26	9	14	-	-	0.0
23/02:00am	14.0	9.8	3.8	50	4.6	N	15	24	8	13	-	-	0.0
23/01:30am	14.2	9.9	3.4	48	4.9	N	15	22	8	12	-	-	0.0
23/01:00am	14.5	10.2	3.3	47	5.1	N	15	20	8	11	-	-	0.0
23/12:30am	14.6	9.9	3.1	46	5.2	N	17	24	9	13	-	-	0.0
23/12:00am	15.5	11.0	2.3	41	5.9	N	15	32	8	17	-	-	0.0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/11:30pm	15.0	11.3	2.2	42	5.7	N	11	22	6	12	-	-	0.0
22/11:00pm	13.8	10.4	3.9	51	4.5	NNW	11	17	6	9	-	-	0.0
22/10:30pm	10.0	8.9	5.0	71	2.3	CALM	0	0	0	0	-	-	0.0
22/10:00pm	10.7	9.8	6.1	73	2.1	CALM	0	0	0	0	-	-	0.0
22/09:30pm	10.8	9.6	4.7	66	2.7	CALM	0	0	0	0	-	-	0.0
22/09:00pm	11.6	8.9	3.6	58	3.5	N	7	11	4	6	-	-	0.0
22/08:30pm	11.0	8.8	3.3	59	3.4	NNW	4	9	2	5	-	-	0.0
22/08:00pm	12.1	10.0	4.1	58	3.6	NNW	4	6	2	3	-	-	0.0
22/07:30pm	15.0	11.6	1.9	41	5.8	NNW	9	13	5	7	-	-	0.0
22/07:00pm	15.9	12.1	2.0	39	6.2	WNW	11	19	6	10	-	-	0.0
22/06:30pm	16.3	12.2	2.0	38	6.4	WNW	13	24	7	13	-	-	0.0
22/06:00pm	17.0	12.1	2.2	37	6.7	W	17	32	9	17	-	-	0.0
22/05:30pm	17.9	12.6	1.8	34	7.2	W	19	30	10	16	-	-	0.0
22/05:00pm	18.9	13.3	1.4	31	7.9	W	20	33	11	18	-	-	0.0
22/04:30pm	19.7	14.1	1.2	29	8.3	W	20	37	11	20	-	-	0.0
22/04:00pm	21.0	16.8	1.8	28	8.9	W	13	24	7	13	-	-	0.0
22/03:30pm	21.0	15.9	2.8	30	8.6	NW	19	30	10	16	-	-	0.0
22/03:00pm	21.3	16.0	3.0	30	8.7	NW	20	37	11	20	-	-	0.0
22/02:30pm	21.5	16.4	3.2	30	8.7	NW	19	32	10	17	-	-	0.0
22/02:00pm	21.7	16.6	3.9	31	8.6	NW	20	33	11	18	-	-	0.0

Other formats

Comma delimited format used in spreadsheet applications
http://www.bom.gov.au/fwo/IDN60801/IDN60801.94766.axf

JavaScript Object Notation format (JSON) in row-major order

http://www.bom.gov.au/fwo/IDN60801/IDN60801.94766.json

Data quality

Most of these data are generated automatically and are frequently updated. Quality checks on data are not normally performed. It is possible for incorrect values to appear. Refer to information at About Latest Weather Observations and please check the disclaimer before using these data.

APPENDIX D

LABORATORY SUMMARY TABLES

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				TPH	Inorganics				Field Physio-Chemical			
			Chlorophyll a	Oil and Grease	Nitrogen (Total as N)	Phosphorus (Total as P)	TSS	Turbidity	pH - Field	Temprature	Electrical Conductivity	Dissolved Oxygen
			mg/L	mg/L	mg/L	µg/L	mg/L	NTU	Units	°C	uS/cm	%Sat
EQL			0.002	10	0.2	10	1	1	0.01	0.1	0.1	0.1
ANZECC Criteria - Freshwater			**0.003**	**-**	**0.35**	**25**	**-**	**<6-50**	**6.5-8.5**	**-**	**125-2200**	**85% - 110%**
Lab Report Number	**Field ID**	**Date**										
917825	**WP1**	**25/08/2022**	<0.002	<10	**2.1**	**310**	<5	3.9	7.16	11.7	805.0	**124.1**
917825	**WP2**	**25/08/2022**	<0.002	19	**1.2**	**350**	<5	3.8	**9.02**	14.1	861.0	101
917825	**WP2-DP1**	**25/08/2022**	<0.002	13	**4.6**	**110**	<5	1.2	**10.71**	13.0	773.0	**40.8**
917825	**QA100**	**25/08/2022**	NT	13	**1.2**	**500**	6.3	3.7	NT	NT	NT	NT
ES2230429	**QA200**	**25/08/2022**	NT	<5	**1.6**	**70**	<5	8.8	NT	NT	NT	NT
Maximum Concentration			<0.002	19.00	**4.6**	**500**	6.30	8.80	**10.71**	14.10	861.0	**124.1**

APPENDIX

E

QUALITY ASSURANCE/QUALITY CONTRAL

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Quality Assurance/Quality Control (QA/QC) procedures were implemented to ensure the precision accuracy, representativeness, completeness and comparability of all data gathered. The QA/QC procedures included:

- Equipment calibration to ensure field measurements obtained are accurate
- Equipment decontamination to prevent cross contamination
- Use of appropriate measures (i.e. gloves) to prevent cross contamination
- Appropriate sample identification
- Correct sample preservation
- Sample transport with Chain of Custody (COC) documentation
- Laboratory analysis in accordance with NATA accredited methods.

Table E1 details the QA/QC procedures and sample collection details undertaken through the surface water elements of the investigation. Copies of all the COCs, along with the Sample Receipt Notifications (SRNs), Interpretive QA/QC Reports are provided in **Appendix F**.

Table E1 Field QA / QC Method Validation

Requirement	Yes / No	Comments
Equipment decontamination	Yes	In the event of involving reusable equipment. Decontamination of sampling equipment (water quality meter, telescopic water scoop etc.) was undertaken by washing with phosphate free detergent (Liquinox) followed by a rinse with potable water.
Sample collection	Yes	Samples were collected using disposable nitrile gloves via telescopic water scoop. A clean pair of gloves was used for each new sample being collected to limit the possibility of cross-contamination.
QA/QC sample collection	Yes	One (1) surface water duplicate and one (1) surface water triplicate sample were collected for intra and inter-lab QA/QC purposes to monitor the quality of the field practices for sample collection. Cardno based the investigation around a rate of one duplicate and triplicate sample per sampling event, as the requirement for duplicate and triplicate sample collection.
Sample identification	Yes	All samples were marked with a unique identifier including project number, sample location, and date.
Sample preservation	Yes	Samples were placed in a chilled ice box with ice for storage and transport to the laboratory.
COC documentation	Yes	A COC form was completed by Cardno detailing sample identification, collection date, sampler and laboratory analysis required. The COC form was signed off and returned to Cardno by the laboratory staff upon receipt of all the samples. COC forms and Sample Receipt Notification (SRN) are provided in **Appendix F**. The SRN indicates that the samples were received at the laboratory intact and chilled and within the required holding times.
NATA accredited methods	Yes	The NATA accredited Eurofins mgt and ALS Analysed the samples in accordance with NATA accredited methods. Analytical methods used are indicated in the stamped laboratory results provided in **Appendix F**.
Laboratory Internal QC	Yes	All Data Quality Objectives were met by the laboratories.

Table E2 Field QA/QC Collection Summary

Environmental Media	Date	Primary	Duplicate	Triplicate
Surface Water	25/08/2022	WP2	QA100	QA200

Relative Percentage Difference Determination

Laboratory results for duplicate and triplicate samples are assessed using a determination of the Relative Percentage Difference (RPD). Where a primary sample and a duplicate sample are compared, the RPD provides an indication of the reproducibility of the results, which incorporates the sampling method. Where a primary sample and a split sample are compared, the RPD provides an indication of the accuracy of the primary laboratory results as compared to the secondary laboratory result.

The calculation used to determine the RPD is:

$$RPD = \frac{(Co - Cs)}{\left(\frac{Co + Cs}{2}\right)} x100$$

Where:

Co = Concentration of the original sample

Cs = Concentration of the duplicate sample

In calculating the RPD values the following protocols were adopted:

- Where both concentrations are above laboratory reporting limits the RPD formula is used;
- Where both concentrations are below the laboratory reporting limits, no RPD is calculated; and
- Where one or both sample concentrations are reported to be less than ten times (<10x) the laboratory reporting limit, the RPD is calculated but is not assessed against the adopted criterion.

In accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013, Cardno adopts an RPD acceptance criterion up to 30% of the mean concentration of the analyte. It should be noted that variations might be higher for organic analysis, due to the volatile nature of the components, and for low concentrations of analytes.

The adopted criterion will not apply to RPDs where one of both concentrations are less than 10 times the reporting limit, as this criterion would otherwise overestimate the significance of minor variations in concentrations at or near the laboratory reporting limit. Large RPDs returned for low concentrations of analytes near the reporting limit is not as indicative of a significant difference in the results as a small RPD is for larger concentrations.

This approach is employed by NATA-accredited laboratories when assessing internal duplicate sample RPDs. This approach acknowledges that concentrations at or around the reporting limit are too low for an accurate evaluation of the significance of the RPD.

This approach has been adopted when assessing the relevance (compliance) of RPDs during this investigation. RPDs will be calculated for sample sets where one or both concentrations are less than 10 times the reporting limit for discussion purposes, but will not be assessed as a pass or fail in relation to the criterion.

The RPD results for duplicate samples are presented in this appendix. Although three (3) RPD values (total phosphate and turbidity) were reported to be above the accepted 30% RPD criteria (refer to the RPD table attached below), the breaches in RPDs are not considered to alter the overall outcome of the assessment. It can be concluded that the analytical data can be relied upon for the purposes of this factual report.

Laboratory QC and QCI Report Summary

The laboratories selected for undertaking the analysis (Eurofins mgt and ALS) are NATA-accredited for the analysis required, and undertook certain QA/QC requirements to demonstrate the suitability of the data that is obtained. The laboratory is required to undertake and report internal laboratory Quality Control (QC) procedures for all chemical analysis undertaken. The QC testing is required to include:

- Laboratory duplicate sample analysis at the rate of one duplicate analysis per ten samples
- Method blank at the rate of one method blank analysis per 20 samples

- Laboratory control sample at the rate of one laboratory control sample analysis per 20 samples
- Spike recovery analysis at the rate of one spike recovery analysis per 20 samples.

Compliance with the laboratory QA/QC requirements and non-conformance details are discussed in the internal Laboratory QA/QC reports included with the certificates of analysis in **Appendix F**. Laboratory QA/QC requirements were within acceptance limits.

Cardno concludes that the data reported by the NATA-accredited Eurofins mgt and ALS as presented in this report is suitable for interpretative purposes and to make conclusions/recommendations regarding water quality.

				NA	TPH	Inorganics		
				Phosphate total (as P)	Oil and Grease	Nitrogen (Total)	TSS	Turbidity
				MG/L	mg/L	µg/L	µg/L	NTU
EQL				0.01	5	100	5,000	0.1
Lab Report Number	**Field ID**	**Matrix Type**	**Date**					
917825	**WP2**	**water**	**25/08/2022**	0.35	19	1,200	<5,000	3.8
	QA100	**water**	**25/08/2022**	0.5	13	1,200	6,300	3.7
RPD				**35**	38	0	23	3
917825	**WP2**	**water**	**25/08/2022**	0.35	19	1,200	<5,000	3.8
ES2230429	**QA200**	**water**	**25/08/2022**	0.07	<5	1,600	<5,000	8.8
RPD				**133**	117	29	0	**79**

***RPDs have only been considered where a concentration is greater than 10 times the EQL.**

****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**

*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

APPENDIX

F

LABORATORY REPORTS

Cardno

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CHAIN OF CUSTODY AND ANALYSIS REQUEST

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zhang	PO No.:	
Telephone Number:	0451 760 991	Project Specific Quote No. :	199408CONN_1
Sampler:	CZ	Turnaround Requirements:	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au, chong.zhang@cardno.com.au, ContamNSW@cardno.com.au	Lab:	ALS | 277-289 Woodpark Rd, Smithfield NSW 2164
Address:	Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia	Attn:	Sample Receipt

Sample Information						Analysis Required									Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix		TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen				
QA200		4	ICE	25/08/2022	Water		1	1	1	1	1				

HT

Environmental Division
Sydney
Work Order Reference
ES2230429

Telephone : +61-2-8784 8555

Relinquished by: (name / company)	Jiaqi Zhou Cardno ACT/NSW Pty Ltd	Received by: (name / company)	Jack / ALS	Relinquished by: (name / company		Received by: (name / company)		Relinquished by: (name / company)	
Date & Time:	8/25/2022	Date & Time:	25/08/22 1650	Date & Time:		Date & Time:		Date & Time:	
Signature:	JZ	Signature:		Signature:		Signature:		Signature:	
Received by: (name / company)		Relinquished by: (name / company)		Received by: (name / company		Relinquished by: (name / company)		Lab use: Samples Received: Cool or Ambient (circle one)	
Date & Time:		Date & Time:		Date & Time:		Date & Time:		Temperature Received at:	(if applicable)
Signature:		Signature:		Signature:		Signature:		Transported by: Hand delivered / courier	

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2230429**

Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CHONG ZENG	Contact	: Graeme Jablonskas
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: chong.zeng@cardno.com.au	E-mail	: graeme.jablonskas@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9609
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Page	: 1 of 2
Order number	: ----	Quote number	: EP2022MWHAUS0030 (EN/024/)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CHONG ZENG		

Dates

Date Samples Received	: 25-Aug-2022 16:50	Issue Date	: 25-Aug-2022
Client Requested Due Date	: 01-Sep-2022	Scheduled Reporting Date	: **01-Sep-2022**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 3.1'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method Sample ID	Sample Container Received	Preferred Sample Container for Analysis
Oil and Grease : EP020		
QA200	- Miscellaneous Sulphuric preserved	- Amber Jar - Sulfuric Acid or Sodium Bisulfate

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA025H Suspended Solids - Standard Level	WATER - EA045 Turbidity	WATER - EP020 Oil & Grease (O&G)	WATER - NT-11 Total Nitrogen and Total Phosphorus
ES2230429-001	25-Aug-2022 00:00	QA200	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS ADDRESS		
- A4 - AU Tax Invoice (INV)	Email	sapinvoices@stantec.com
CHONG ZENG		
- *AU Certificate of Analysis - NATA (COA)	Email	chong.zeng@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	chong.zeng@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	chong.zeng@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	chong.zeng@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	chong.zeng@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	chong.zeng@cardno.com.au
- EDI Format - XTab (XTAB)	Email	chong.zeng@cardno.com.au
CONTAM NSW		
- A4 - AU Tax Invoice (INV)	Email	contamnsw@cardno.com.au
JIAQI ZHOU		
- *AU Certificate of Analysis - NATA (COA)	Email	jiaqi.zhou@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jiaqi.zhou@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jiaqi.zhou@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jiaqi.zhou@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - XTab (XTAB)	Email	jiaqi.zhou@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2230429**	Page	: 1 of 2
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CHONG ZENG	Contact	: Graeme Jablonskas
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +6138549 9609
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 25-Aug-2022 16:50
Order number	: ----	Date Analysis Commenced	: 27-Aug-2022
C-O-C number	: ----	Issue Date	: 01-Sep-2022 15:42
Sampler	: CHONG ZENG		
Site	: ----		
Quote number	: EN/024/		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QA200**	**----**	**----**	**----**	**----**
			Sampling date / time	25-Aug-2022 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2230429-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	**----**	**----**	**----**	**----**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**8.8**	**----**	**----**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.97**	**----**	**----**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.6**	**----**	**----**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.6**	**----**	**----**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.07**	**----**	**----**	**----**	**----**
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	**----**	**----**	**----**	**----**

QUALITY CONTROL REPORT

Work Order	: **ES2230429**	Page	: 1 of 3
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CHONG ZENG	Contact	: Graeme Jablonskas
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +6138549 9609
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 25-Aug-2022
Order number	: ----	Date Analysis Commenced	: 27-Aug-2022
C-O-C number	: ----	Issue Date	: 01-Sep-2022
Sampler	: CHONG ZENG		
Site	: ----		
Quote number	: EN/024/		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4550531)									
ES2230395-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2230518-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	328	330	0.7	0% - 20%
EA045: Turbidity (QC Lot: 4544930)									
ES2230318-003	Anonymous	EA045: Turbidity	----	0.1	NTU	<0.1	<0.1	0.0	No Limit
ES2230414-002	Anonymous	EA045: Turbidity	----	0.1	NTU	2.2	2.0	9.9	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4548237)									
ES2230452-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.30	0.30	0.0	0% - 20%
ES2230428-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.25	0.25	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4548233)									
ES2230415-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.1	0.1	0.0	No Limit
ES2230428-007	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.3	1.3	0.0	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4548234)									
ES2230415-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.01	0.0	No Limit
ES2230428-007	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.09	0.09	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4550531)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	96.0	83.0	129
				<5	1000 mg/L	90.8	82.0	110
				<5	835 mg/L	97.4	83.0	118
EA045: Turbidity (QCLot: 4544930)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	98.0	91.0	105
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4548237)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4548233)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	95.1	69.0	101
				<0.1	1 mg/L	96.7	70.0	118
				<0.1	5 mg/L	96.1	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4548234)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	97.7	71.3	126
				<0.01	0.442 mg/L	105	71.3	126
				<0.01	1 mg/L	108	71.3	126
EP020: Oil and Grease (O&G) (QCLot: 4550510)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	102	81.0	121

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4548237)							
ES2230428-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	104	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4548233)							
ES2230415-004	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	97.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4548234)							
ES2230415-004	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	106	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2230429**	Page	: 1 of 4
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CHONG ZENG	Telephone	: +6138549 9609
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 25-Aug-2022
Site	: ----	Issue Date	: 01-Sep-2022
Sampler	: CHONG ZENG	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
QA200	**25-Aug-2022**	**----**	----	----	**30-Aug-2022**	01-Sep-2022	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
QA200	**25-Aug-2022**	**----**	----	----	**27-Aug-2022**	27-Aug-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
QA200	**25-Aug-2022**	**----**	----	----	**30-Aug-2022**	22-Sep-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
QA200	**25-Aug-2022**	**30-Aug-2022**	22-Sep-2022	✓	**30-Aug-2022**	22-Sep-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
QA200	**25-Aug-2022**	**30-Aug-2022**	22-Sep-2022	✓	**30-Aug-2022**	22-Sep-2022	✓
EP020: Oil and Grease (O&G)							
Miscellaneous Sulphuric preserved (EP020)							
QA200	**25-Aug-2022**	**----**	----	----	**30-Aug-2022**	22-Sep-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Cardno — Shaping the Future

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zhang	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	CZ	Turnaround Requirements:	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zhang@cardno.com.au; ContamNSW@cardno.com.au	Lab:	Eurofins)
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample Information						Analysis Required												Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	Chlorophyll-a (LOR Required - 2 ug/L)	TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							
WP1		6	ICE	25/08/2022	Water	1	1	1	1	1	1							Please reduce the detection limit of Chlorophyll a from 5 ug/L to 2 ug/L
WP2		6	ICE		Water	1	1	1	1	1	1							
WP2-DP1		6	ICE		Water	1	1	1	1	1	1							
QA100		4	ICE		Water		1	1	1	1	1							

Relinquished by: (name / company)	Jiaqi Zhou Cardno ACT/NSW Pty Ltd	Received by: (name / company)		Relinquished by: (name / company)		Received by: (name / company)		Relinquished by: (name / company)	
Date & Time:	8/25/2022	Date & Time:		Date & Time:		Date & Time:		Date & Time:	
Signature:	JZ	Signature:		Signature:		Signature:		Signature:	
Received by: (name / company)		Relinquished by: (name / company)		Received by: (name / company)		Relinquished by: (name / company)		Lab use:	
Date & Time:		Date & Time:		Date & Time:		Date & Time:		Samples Received: Cool or Ambient (circle one)	
Signature:		Signature:		Signature:		Signature:		Temperature Received at:	(if applicable)
								Transported by: Hand delivered / courier	

#9178205

eurofins | Environment Testing

www.eurofins.com.au EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

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Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield East NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	PO Box 60 Wickham 2293
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NATA# 1261 Site# 1254	NATA# 1261 Site# 1254	NATA# 1261 Site# 18217		NATA# 1261 Site# 20794	NATA# 1261 Site# 25079

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Auckland 1061	Christchurch 7675
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IANZ# 1327	IANZ# 1290

Sample Receipt Advice

Company name:	Stantec Australia Pty Ltd (NSW/ACT)
Contact name:	Jiaqi Zhou
Project name:	DOWNER SYDNEY METRO STATION - WILEY PARK
Project ID:	NE30161
Turnaround time:	5 Day
Date/Time received	Aug 25, 2022 5:20 PM
Eurofins reference	917825

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Hannah Mawbey on phone : or by email: HannahMawbey@eurofins.com

Results will be delivered electronically via email to Jiaqi Zhou - jiaqi.zhou@cardno.com.au.

Note: A copy of these results will also be delivered to the general Stantec Australia Pty Ltd (NSW/ACT) email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Order No.:
Report #: 917825
Phone:
Fax:

Received: Aug 25, 2022 5:20 PM
Due: Sep 1, 2022
Priority: 5 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATION - WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Nitrogen (as N)	Total Suspended Solids Dried at 103 °C to 105 °C	Turbidity
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X		X		
Sydney Laboratory - NATA # 1261 Site # 18217								X		X	X
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	Aug 25, 2022		Water	S22-Au0060318	X	X	X	X	X	X
2	WP2	Aug 25, 2022		Water	S22-Au0060319	X	X	X	X	X	X
3	WP2-DP1	Aug 25, 2022		Water	S22-Au0060320	X	X	X	X	X	X
4	QA100	Aug 25, 2022		Water	S22-Au0060321		X	X	X	X	X
Test Counts						3	4	4	4	4	4

Stantec Australia Pty Ltd
Level 22, 570 Bourke Street
Melbourne
VIC 3000

Attention: **Jiaqi Zhou**

Report **917825-W-V2**
Project name DOWNER SYDNEY METRO STATION - WILEY PARK
Project ID NE30161
Received Date Aug 25, 2022

Client Sample ID			**WP1**	**WP2**	**WP2-DP1**	**QA100**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**S22-Au0060318**	**S22-Au0060319**	**S22-Au0060320**	**S22-Au0060321**
Date Sampled			**Aug 25, 2022**	**Aug 25, 2022**	**Aug 25, 2022**	**Aug 25, 2022**
Test/Reference	LOR	Unit				
Chlorophyll a	2	ug/L	< 2	< 2	< 2	-
Oil & Grease (HEM)	10	mg/L	< 10	19	13	13
Phosphate total (as P)	0.01	mg/L	0.31	0.35	0.11	0.50
Total Nitrogen (as N)	0.2	mg/L	2.1	1.2	4.6	1.2
Total Suspended Solids Dried at 103 °C to 105 °C	5	mg/L	< 5	< 5	< 5	6.3
Turbidity	1	NTU	3.9	3.8	1.2	3.7

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chlorophyll a	Melbourne	Sep 05, 2022	28 Days
- Method: LTM-INO-4340 Chlorophyll a in Waters			
Oil & Grease (HEM)	Melbourne	Aug 29, 2022	28 Days
- Method: LTM-INO-4180 Oil and Grease (APHA 5520B)			
Phosphate total (as P)	Sydney	Aug 30, 2022	28 Days
- Method: E052 Total Phosphate (as P)			
Total Nitrogen (as N)	Melbourne	Aug 29, 2022	7 Days
- Method: LTM-INO-4040 Phosphate and Nitrogen in waters			
Total Suspended Solids Dried at 103 °C to 105 °C	Sydney	Aug 30, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	Aug 30, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			

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Order No.:
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Received: Aug 25, 2022 5:20 PM
Due: Sep 1, 2022
Priority: 5 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATION - WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Nitrogen (as N)	Total Suspended Solids Dried at 103 °C to 105 °C	Turbidity
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X		X		
Sydney Laboratory - NATA # 1261 Site # 18217								X		X	X
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	Aug 25, 2022		Water	S22-Au0060318	X	X	X	X	X	X
2	WP2	Aug 25, 2022		Water	S22-Au0060319	X	X	X	X	X	X
3	WP2-DP1	Aug 25, 2022		Water	S22-Au0060320	X	X	X	X	X	X
4	QA100	Aug 25, 2022		Water	S22-Au0060321		X	X	X	X	X
Test Counts						3	4	4	4	4	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chlorophyll a	ug/L	< 5			2	Fail	
Oil & Grease (HEM)	mg/L	< 10			10	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	mg/L	< 5			5	Pass	
Turbidity	NTU	< 1			1	Pass	
LCS - % Recovery							
Oil & Grease (HEM)	%	90			70-130	Pass	
Phosphate total (as P)	%	96			70-130	Pass	
Total Nitrogen (as N)	%	102			70-130	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	%	102			70-130	Pass	
Turbidity	%	102			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103 °C to 105 °C	S22-Au0068550	NCP	%	110			70-130	Pass	
Spike - % Recovery									
				Result 1					
Phosphate total (as P)	S22-Au0060321	CP	%	102			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chlorophyll a	M22-Au0055101	NCP	ug/L	< 5	< 5	<1	30%	Pass	
Oil & Grease (HEM)	M22-Au0059618	NCP	mg/L	360	470	27	30%	Pass	
Total Nitrogen (as N)	B22-Au0060128	NCP	mg/L	0.5	0.5	3.8	30%	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	S22-Au0068550	NCP	mg/L	43	48	11	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Phosphate total (as P)	S22-Au0060320	CP	mg/L	0.11	0.11	7.0	30%	Pass	
Turbidity	S22-Au0060320	CP	NTU	1.2	1.1	8.1	30%	Pass	

Comments

V2- new version to amend chlorophyll LOR to 2 instead of 5 as per client request.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Andrew Black	Analytical Services Manager
Gabriele Cordero	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Inorganic
Ryan Phillips	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Appendix 4 – Technical Memorandum: Additional pH Source Investigation within the Platform 1 Drainage System at Wiley Park Station_304100142_TM02_Add_pH_Inv_P1_Rev0

Technical Memorandum

To	Mark Trethewy, Downer EDI Works Pty Ltd	**Prepared By**	Chong Zeng – Environmental Engineer
		Reviewed By	Mike Jorgensen – Senior Principal Hydrogeologist
CC	-	**Revision / Date**	Rev 0 / 09/11/2022
Project	Wiley Park Station Upgrade	**Location**	Sydney NSW
Subject	Additional pH Source Investigation within the Platform 1 Drainage System at Wiley Park Station		
Action Required	-	**Attachments**	Attachment A – Figure Attachment B – Photos Attachment C – Laboratory Analytical Certificates Attachment D – Site Drainage Plan Attachment E – Calibration Certificate

1 Introduction

1.1 Background

Downer EDI Works Pty Ltd ("Downer EDI") has been undertaking building and earthworks at Platform 1 of the Wiley Park Train Station. Stantec Australia Pty Ltd ("Cardno now Stantec") was commissioned by Downer EDI to undertake periodic monitoring of water discharging from the work site into an adjacent council drain. Measurements of the pH of water discharging from the work site identified that this pH was higher (more alkaline) than water upstream of the work site. To identify the source(s) of this alkaline water Cardno now Stantec measured the pH of water samples collected at several locations within the work site. Alkaline pH was measured in two site-derived water sources as documented in Section 8.2 of Cardno now Stantec (2022) (i.e., Platform 1 drainage system and temporary surface water erosion and sediment control trenches). However, due to the Platform 1 drainage system was inaccessible during the previous investigation, the potential source(s) causing this alkaline pH water discharged from the Platform 1 drainage system was undetermined. Therefore, Cardno now Stantec recommended that the potential source(s) of this elevated pH be evaluated at the work site per the recommendation made in the Section 9.1 of Cardno now Stantec (2022):

> *Surface Water Monitoring Report – Wiley Park Station*. Dated: 15 September 2022. Report reference: 304100142_R010_SWM_WileyPark_Rev0. Revision: 0. Prepared by Cardno now Stantec (Cardno now Stantec 2022).

1.2 Purpose and Objective

The purpose of this investigation work was to determine potential source(s) of the elevated pH previously measured from the surface water collected from the Platform 1 drainage system.

1.3 Scope of Works

Cardno now Stantec undertook the following scope of works to meet the purpose of this investigation:

> Reviewed Wiley Park worksite drainage plans (refer to **Attachment D**) provided by Downer with focus on Platform 1 drainage system. Drainage plans reviewed including:
>
> - SMCSWSWM-MTM-WWP-CE-DWG-483301.00.AFC.00.02;
> - SMCSWSWM-MTM-WWP-DD-DWG-233308.00.AFC.00.01;

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- SMCSWSWM-MTM-WWP-DD-DWG-233317.00.AFC.00.01;
- SMCSWSWM-MTM-WWP-DD-DWG-233318.00.AFC.00.02;
- SMCSWSWM-MTM-WWP-DD-DWG-233319.00.AFC.00.01; and
- SMCSWSWM-MTM-WWP-DD-DWG-233320.01.AFC.01.01.

> Reviewed details regarding the additional investigation to be carried out at Platform 1 drainage system in Section 9.1 of Cardno now Stantec (2022).

> Field investigation:

- Soil pH measurement: measured pH of samples of soil paste collected from areas potentially forming the catchment area to the platform drainage (including the batter on the northern face of the Platform 1) using an on-site soil pH testing kit (Manutec) as well as laboratory analysis (1 soil to 5 distilled water) (undertaken by a National Association of Testing Authorities, Australia (NATA) certified laboratory).
- Inspections were undertaken of:
  - All the platform buildings (if accessible) for any potential source (e.g., storage for cleaning products, etc.).
  - All the Downer EDI storages within the potential catchment area to the platform drainage for any potential sources.
- Platform 1 Aco drain check:
  - Downer EDI assisted with removal of all the grates from the aco drain to allow sampling and inspection.
  - Checked the pH of the tap water itself prior to pouring water into the aco drain using a calibrated water quality meter.
  - Poured the tap water from the eastern end of the aco drain for at least 5 mins prior to sampling.
  - Checked the pH value of the water within the aco drain at approximately 10-m to 15-m intervals from upstream (north-east) to downstream (south-west) in order to identify any potential abnormal increase(s) in pH using a calibrated water quality meter. If any abnormal increase of pH was identified within any section checked, then further inspection of that drain interval was undertaken to identify potential source(s).
  - Measured pH (on-site as well as laboratory analysis) of sediment / soil materials within the aco drain at approximately 10-m to 15-m intervals from upstream (north-east) to downstream (south-west).

> Prepared this report detailing the findings and conclusions based on the review and assessment of this investigation.

2 Investigation Results and Discussion

2.1 Soil pH Measurement

Four (4) soil samples were collected for pH measurement from the surrounding areas that potentially form the catchment area to the Platform 1 drainage system. A soil paste was prepared for each sample. The pH of each sample of paste was measured on-site using a soil pH testing kit (Manutec). In addition, soil samples were submitted to a NATA certified laboratory for pH measurement of soil-water pastes (1 soil to 5 distilled water) prepared at the laboratory.

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Results are summarised in **Table 2-1** below. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Attachment C**. Refer to **Figure GS-007** in **Attachment A** for approximate sample locations. Refer to **Photograph 1** in **Attachment B** for a photo taken for the potential catchment area during this investigation.

Table 2-1 Summary of Soil pH Measurement – Potential Catchment Areas

Sample ID	pH Measurement – On-site	pH Measurement – Laboratory
SP-Soil1	8.5	9.3
SP-Soil2	8.5	8.5
SP-Soil3	8.5	9.5
SP-Soil4	9.5	9.6

Based on the investigation results above, key findings indicated as following:

- On-site and laboratory pH measurements were similar and indicate that the soil materials assessed were alkaline with pH that ranged from 8.5 to 9.6.

2.2 Inspection – Platform 1

Inspections were undertaken to the buildings as well as all the Downer EDI storage areas within the Platform 1. Based on the inspections, key findings indicated as following:

- Inspection was undertaken of both buildings within platform 1 and confirmed both buildings were being renovated by Downer EDI and not in use. Storage of construction/renovation materials were sighted within both buildings (including paint, cement, electrical cables, tools, etc.). The paint and cement buckets were all in good and sealed condition. Refer to **Photograph 2** to **Photograph 5** in **Attachment B** for details.
- Inspection was undertaken of Downer EDI storage areas within Platform 1 and a few cement bags with one opened were observed stored on the ground near the Platform 1 aco drain at the time of inspection. Refer to **Photograph 6** in **Attachment B** for detail.

2.3 Aco Drain Check

Investigation of the Platform 1 aco drain was undertaken per the scope of work detailed in Section 1.3 to determine whether there is potential source in the aco drain that contributes to the elevated pH measured from the surface water collected from the Platform 1 drainage system. Investigation results and key findings are summarised in the following sub-sections.

2.3.1 Tap Water Test

Although some rainfall occurred during this investigation, only minor surface water runoff was collected by Platform 1 drainage system and insufficient for water monitoring purposes. Thus, tap water was applied to the aco drain with pH measured via a calibrated water quality meter at approximately 10-m to 15-m intervals from upstream to downstream within the aco drain.

Table 2-2 below summarises the pH measurements undertaken. Refer to **Figure GS-007** in **Attachment A** for approximate monitoring locations. Refer to **Photograph 7** and **8** in **Attachment B** for details. Refer to **Attachment E** for a copy of the calibration certificate for the water quality meter used.

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Table 2-2 Summary of Water pH Measurement – Aco Drain Tap Water Test

Sample ID	pH Measurement
Baseline Value – Tap Water	
Tap Water	6.33
Aco Drain Check	
Aco1	8.09
Aco2	8.64
Aco3	8.58
Aco4	8.35
Aco5	8.60
Aco6	8.08
Aco7	7.92
Aco8	7.87
Aco9	7.86
Aco10	7.97
Discharge Point of Platform 1 Drainage System	
Head Wall 1	9.78

2.3.2 Sediment / Soil pH Measurement

Sediment / soil materials within the aco drain were observed during the investigation. Nine (9) samples were collected at 10-m to 15-m intervals from the aco drain. A soil paste was prepared for each sample. The pH of each sample of paste was measured on-site using a soil pH testing kit (Manutec). In addition, soil samples were submitted to a NATA certified laboratory for pH measurement of soil-water pastes (1 soil to 5 distilled water) prepared at the laboratory. Results are summarised in **Table 2-3** below. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Attachment C**. Refer to **Figure GS-007** in **Attachment A** for approximate sample locations. Refer to **Photograph** 9 in Attachment B for a photo taken for the potential catchment area during the course of this investigation.

Table 2-3 Summary of Soil pH Measurement – Aco Drain

Sample ID	pH Measurement – On-site	pH Measurement – Laboratory
Aco1-Soil	8.5	9.3
Aco2-Soil	9.5	11.0
Aco3-Soil	9.5	9.4
Aco4-Soil	9	9.4

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Sample ID	pH Measurement – On-site	pH Measurement – Laboratory
Aco5-Soil	9	9.0
Aco6-Soil	8.5	8.6
Aco7-Soil	8	9.2
Aco8-Soil	8.5	9.0
Aco10-Soil	9	9.4

2.3.3 Additional Observation

Following additional observations were made during the investigation:

- Several drainage points providing connection between the aco drain and drainage pipe system underneath was observed within the aco drain. This observation was consistent with the drainage drawing reviewed (SMCSWSWM-MTM-WWP-DD-DWG-233318). According to the drainage drawing provided, this drainage pipe conveys the surface water collected from the aco drain to the downstream discharge point at Headwall 1. Refer to **Photograph 10** and **11** in **Attachment B** for details. Refer to **Figure GS-007** in **Attachment A** for approximate locations observed.
- Two drainage pits were observed between the downstream (south-western) end of the aco drain and the downstream discharge point (i.e., Headwall 1). This observation was consistent with the drainage drawing reviewed. However, neither drainage pit was accessible for inspection. Refer to **Figure GS-007** in **Attachment A** for approximate locations observed. to Refer to **Photograph 12** in **Attachment B** for details.

2.3.4 Discussion

Based on the investigation results, key findings indicated as following:

- Tap water pH increased significantly after entering the aco drain, which indicates the presence of potential source(s) that contribute to this pH increase within the aco drain.
- pH measurements of the soil / sediment materials sampled from the aco drain were all alkaline, which is consistent with the soil pH measured from the surrounding soils within the areas that are considered to fall within the catchment area of the Platform 1 drainage system. Additionally, the texture and the type of soil / sediment materials within the aco drain was noted to be similar to soils located within the surrounding area.
- Due to the inaccessibility of the drainage pipe underneath the aco drain and the two drainage pits, no inspection was undertaken of these two components. As such, unless it is confirmed via further inspection, the condition of the drainage pipe and the two drainage pits should be treated similarly to the aco drain (i.e., presence alkaline materials).
    - It is noted that the pH value measured at the downstream discharge point (i.e., Head Wall 1) was 9.78 which was the highest pH value measured from all the water pH monitoring points associated with this aco drain tap water check during the investigation. This result also indicates the likelihood of the presence of alkaline materials (e.g., alkaline soil, alkaline sediment, etc.) within the underground drainage pipe and the two drainage pits.

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3 Conclusions

Based on the results of this investigation, the following conclusions are made:

- The alkaline soil / sediment identified within the Platform 1 drainage system are likely derived from erosion of surrounding exposed soils.
- These soils in the drainage system are considered likely to be the main source of the elevated pH measured from the surface water collected from the Platform 1 drainage system.

4 Recommendations

Based on the findings from this investigation, the following recommendations regarding the elevated surface water pH identified at Platform 1 drainage system are made:

- Removal of soil / sediment materials from the Platform 1 drainage system: the identified alkaline soil / sediment should be removed from the Platform 1 drainage system after construction has been completed within the Platform 1 in general accordance with the following steps:
  - Excavation of any excessive soil / sediment materials from the Platform 1 drainage system including aco drain and connecting underground drainage pipe to the extent practicable.
  - Flushing of the soil / sediment materials that remain within the Platform 1 drainage system including aco drain and connecting underground drainage pipe following the excavation work outlined in the previous bullet point.
  - Following the flushing work, the two drainage pits located near the downstream end of aco drain (refer to **Figure GS-007** in **Attachment A** for approximate locations) should be checked and any soil / sediment materials should be removed by excavation.
- Validation test: following the removal and cleaning work of the Platform 1 drainage system, a validation test is recommended to check the effectiveness of the mitigation works undertaken by applying tap water at the start / upstream of the Platform 1 drainage system and measuring pH using a calibrated water quality meter at multiple downstream locations along the aco drain and associated drainage system.

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5 Limitations

This document has been prepared in general accordance with the current industry standards for the purpose and objectives and scope identified in this report. These standards are set out in:

- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure (NEPM). National Environment Protection Council (NEPC) 1999, Amendment 2013
- NEPC (2013) Schedule B(2) Guideline on Site Characterisation, NEPM 1999, Amendment 2013
- NSW EPA (2016) Environmental Guidelines: Solid Waste Landfills, Second edition. April 2016
- NSW EPA (2020) Guidelines for the Assessment and Management of Hazardous Ground Gases. New South Wales Environment Protection Authority. May 2020
- NSW EPA (2017) Guidelines for the NSW Auditor Scheme (3rd edition), New South Wales Environment Protection Authority, October 2017
- NSW EPA (2020) *Consultants Reporting on Contaminated Land, Contaminated Land Guidelines*. New South Wales Environment Protection Authority, April 2020, Updated May 2020.

The agreed scope of this monitoring program has been limited for the current purposes of the Client. Subsurface conditions may vary considerably away from the sample locations where information has been obtained.

This Document has been provided by Cardno subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Cardno's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of Cardno's services are as described in Cardno's proposal, and are subject to restrictions and limitations. Cardno did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Cardno in regards to it.
- Conditions may exist which were undetectable given the limited nature of the enquiry Cardno was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Cardno's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Cardno to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.
- Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Cardno for incomplete or inaccurate data supplied by others.

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This document is not any of the following:

- A Site Audit Report or Site Audit Statement as defined under the *Contaminated Land Management Act, 1997*.
- A Detailed ESA or Environmental Site Investigation sufficient for an Environmental Auditor to be able to conclude a Site Audit Report and Site Audit Statement.
- A geotechnical report and the bore logs or test pit logs may not be sufficient as the basis for geotechnical advice.
- A detailed hydrogeological assessment in conformance with NSW DEC (2007) Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination.
- An assessment of groundwater contaminants potentially arising from other sites or sources nearby.
- A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land.

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Attachment A - Figure

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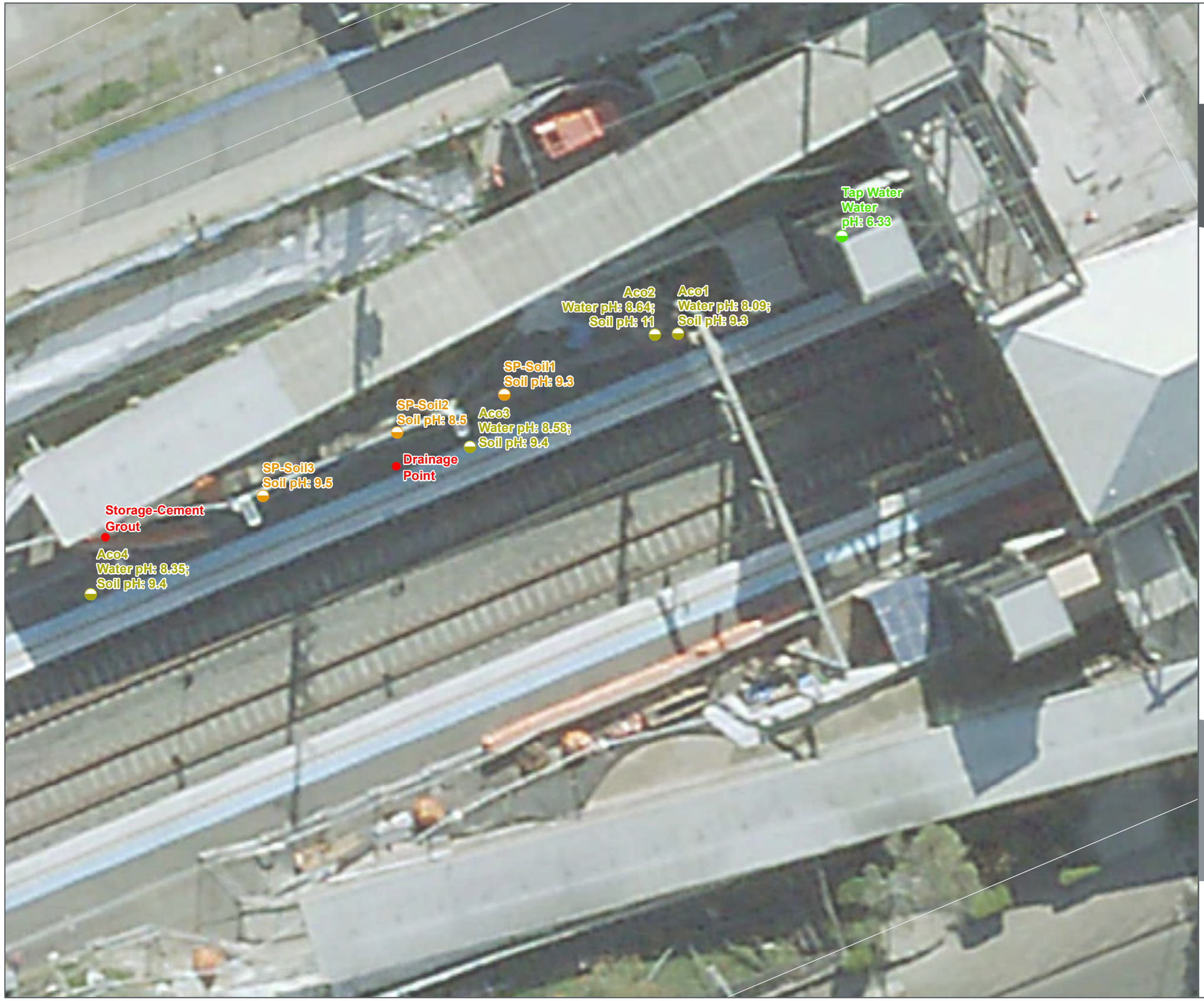


Downer

Platform 1 pH Investigation Page 1

WILEY PARK STATION

Legend

- Cadastre (NSW SS, 2022)

Investigation Location

- pH Measurement: Tap Water
- pH Measurement: Soil
- pH Measurement: Water and Soil
- Additional Observation

FIGURE GS-007

1:150 Scale at A3

m
0 1 2 3 4

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (3045)
Date: 2022-10-12 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-007-Platform1_pH.mxd
Aerial imagery supplied by MetroMap (June 2022)

Downer

Platform 1 pH Investigation Page 2

WILEY PARK STATION

Aco5
Water pH: 8.60;
Soil pH: 9.0

Drainage Point

Aco6
Water pH: 8.08;
Soil pH: 8.6

SP-Soil4
Soil pH: 9.6

Drainage Point

Aco7
Water pH: 7.92;
Soil pH: 9.2

Drainage Point

Aco8
Water pH: 7.87;
Soil pH: 9.0

Storage-Cement Grout

Drainage Point

Legend

- Cadastre (NSW SS, 2022)

Investigation Location

- pH Measurement: Soil
- pH Measurement: Water and Soil
- Additional Observation

FIGURE GS-007

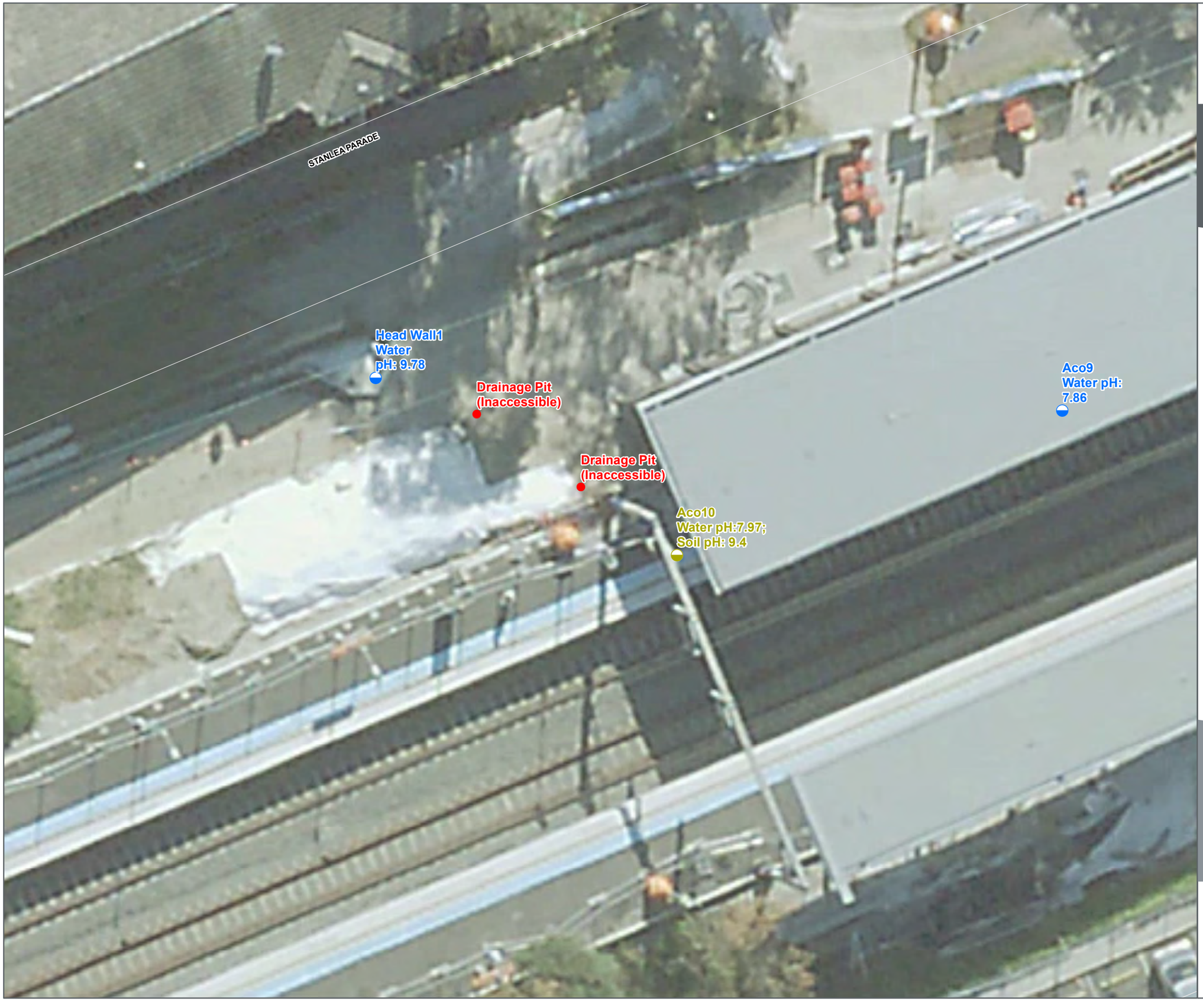
1:150 Scale at A3

m
0 1 2 3 4

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (3045)
Date: 2022-10-12 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-007-Platform1_pH.mxd
Aerial imagery supplied by MetroMap (June 2022)



Platform 1 pH Investigation Page 3

WILEY PARK STATION

Legend

- Cadastre (NSW SS, 2022)

Investigation Location

- pH Measurement: Water
- pH Measurement: Water and Soil
- Additional Observation

FIGURE GS-007

1:150 Scale at A3

m
0 1 2 3 4

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (3045)
Date: 2022-10-13 | Project: 304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-007-Platform1_pH.mxd
Aerial imagery supplied by MetroMap (June 2022)

Attachment B – Photos

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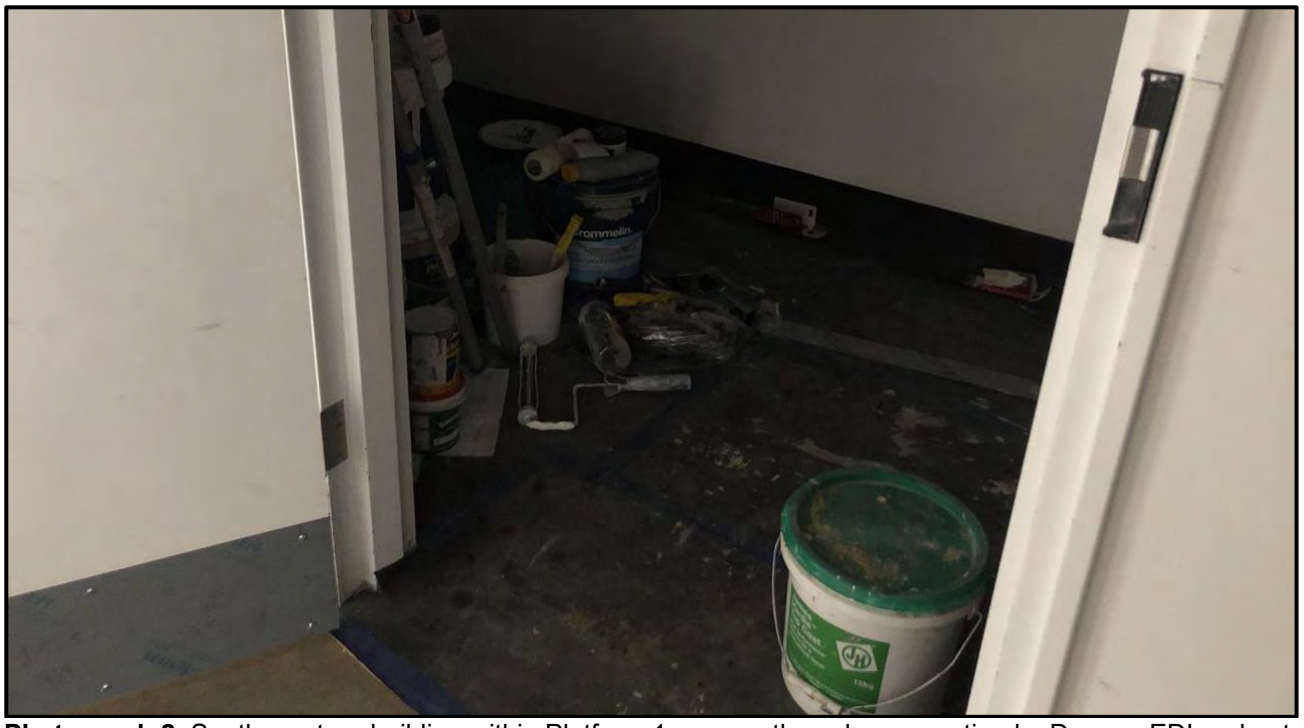
Photograph 1. Northern batter – potentially form part of the catchment area to the Platform 1 drainage system. Date: 5 October 2022.



Photograph 2. South-western building within Platform 1 – currently under renovation by Downer EDI and not in use. Storage of construction materials was sighted. Date: 5 October 2022.

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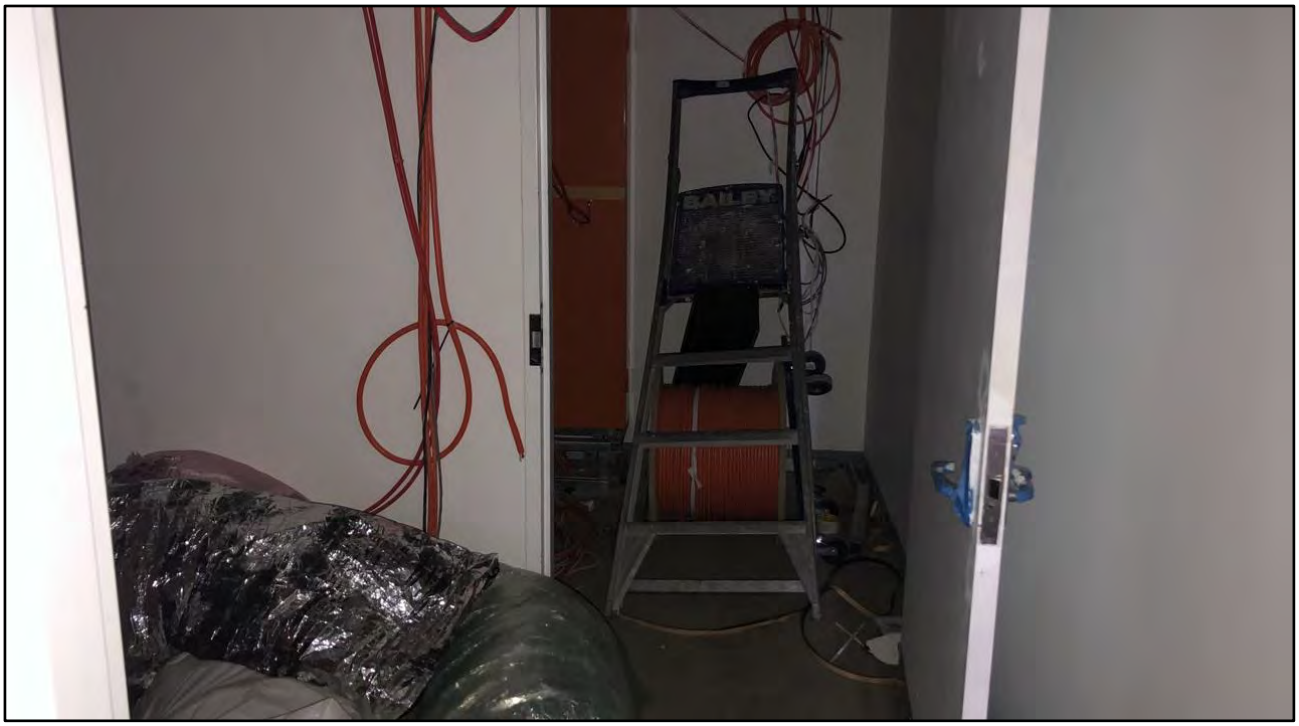
Photograph 3. South-western building within Platform 1 – currently under renovation by Downer EDI and not in use. Storage of construction materials was sighted. Date: 5 October 2022.



Photograph 4. South-western building within Platform 1 – currently under renovation by Downer EDI and not in use. Storage of construction materials was sighted. Date: 5 October 2022.

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Photograph 5. North-eastern building within Platform 1 – currently under renovation by Downer EDI and not in use. Storage of construction materials was sighted. Date: 5 October 2022.

Photograph 6. Inspection of Downer EDI storage area with Platform 1 – storage of cement materials with one opened cement bag near Platform 1 aco drain was sighted at the time of inspection. Date: 5 October 2022.

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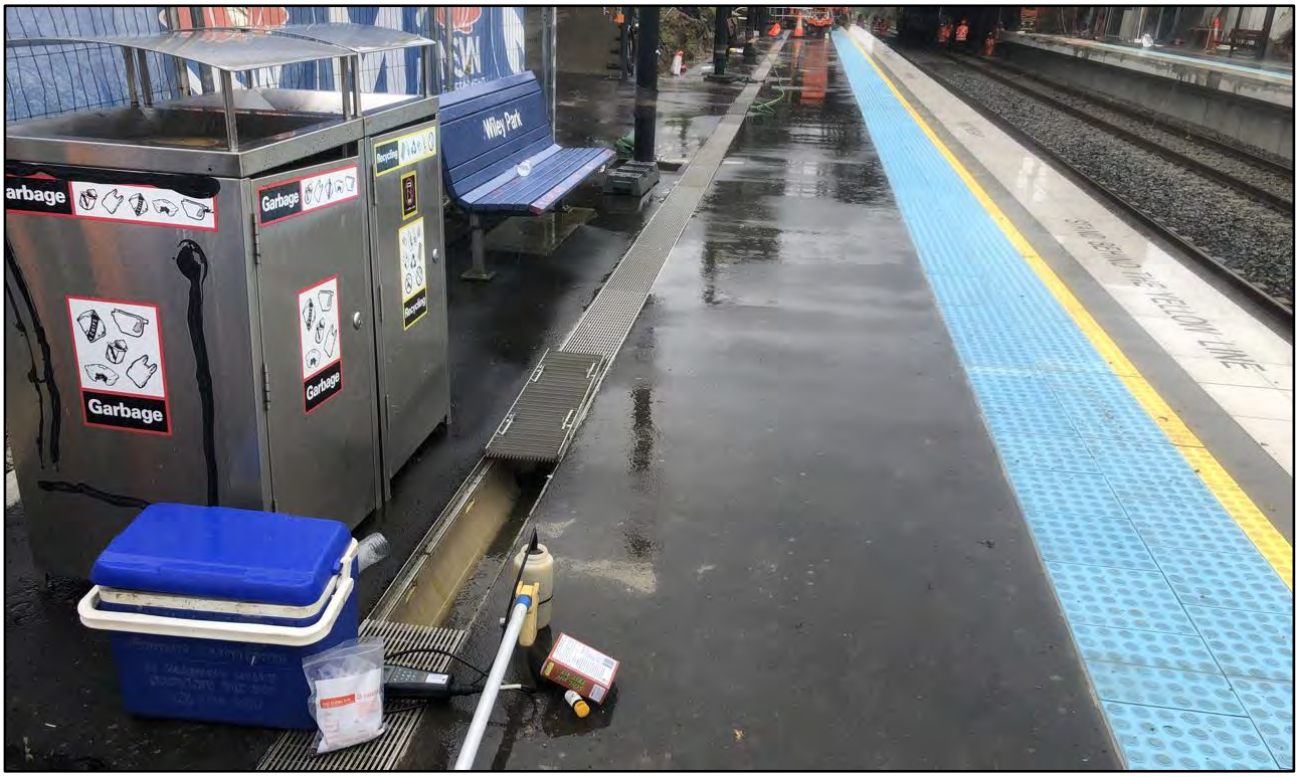

Photograph 7. Aco drain check – tap water test. Date: 5 October 2022.

Photograph 8. Aco drain check – tap water test. Date: 5 October 2022.

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Photograph 9. Aco drain check – soil/sediment pH measurement. Date: 5 October 2022.

Photograph 10. Aco drain check – additional observation – drainage point. Date: 5 October 2022.

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Photograph 11. Aco drain check – additional observation – drainage point. Date: 5 October 2022.

Photograph 12. Aco drain check – additional observation – drainage pit. Date: 5 October 2022.

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Photograph 13. Downstream discharge point (the middle conduit of the Head Wall 1) of the surface water collected by the Platform 1 drainage system. It is noted that the two smaller diameter conduits on the sides are not connected to any drainage system and only functioned as weepholes. Date: 5 October 2022.

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Attachment C – Laboratory Analytical Certificates

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CHAIN OF CUSTODY AND ANALYSIS REQUEST

Page 1 of 1

Contact Person:	Chong Zeng	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0451 780 991	Project Number:	NE30161
Alternative Contact:	Jiaqi Zhou	PO No.:	
Telephone Number:	0424 106 665	Project Specific Quote No. :	190408CDNN_1
Sampler:	CZ	Turnaround Requirements:	1 Day TaT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	Lab:	Eurofins |
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample Information						Analysis Required											Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	pH											
Aco1-Soil		1	Ice	5/10/2022	Soil	X											
Aco2-Soil		1	Ice			X											
Aco3-Soil		1	Ice			X											
Aco4-Soil		1	Ice			X											
Aco5-Soil		1	Ice			X											
Aco6-Soil		1	Ice			X											
Aco7-Soil		1	Ice			X											
Aco8-Soil		1	Ice			X											
Aco10-Soil		1	Ice			X											
SP-Soil1		1	Ice			X											
SP-Soil2		1	Ice			X											
SP-Soil3		1	Ice			X											
SP-Soil4		1	Ice			X											

Relinquished by:	Chong Zeng	Received by:	Forrest	Relinquished by:		Received by:		Relinquished by:	
(name / company)	Cardno ACT/NSW Pty Ltd	(name / company)	Linfoot	(name / company		(name / company)		(name / company)	
Date & Time:	10/5/2022	Date & Time:	10/5/22 5:00pm	Date & Time:		Date & Time:		Date & Time:	
Signature:	CZ	Signature:		Signature:		Signature:		Signature:	
Received by:		Relinquished by:		Received by:		Relinquished by:		*Lab use:*	
(name / company)		(name / company)		(name / company		(name / company)		Samples Received: Cool or Ambient (circle one)	
Date & Time:		Date & Time:		Date & Time:		Date & Time:		Temperature Received at:	(if applicable)
Signature:		Signature:		Signature:		Signature:		Transported by: Hand delivered / courier	

#929192

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www.eurofins.com.au EnviroSales@eurofins.com

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Sample Receipt Advice

Company name:	Stantec Australia Pty Ltd (NSW/ACT)
Contact name:	Jiaqi Zhou
Project name:	DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID:	NE30161
Turnaround time:	1 Day
Date/Time received	Oct 5, 2022 5:40 PM
Eurofins reference	929192

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Samples received by the laboratory after 5.30pm are deemed to have been received the following working day.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Hannah Mawbey on phone : or by email: HannahMawbey@eurofins.com

Results will be delivered electronically via email to Jiaqi Zhou - jiaqi.zhou@cardno.com.au.

Note: A copy of these results will also be delivered to the general Stantec Australia Pty Ltd (NSW/ACT) email address.

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email: EnviroSales@eurofins.com

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Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
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Order No.:
Report #: 929192
Phone:
Fax:

Received: Oct 5, 2022 5:40 PM
Due: Oct 6, 2022
Priority: 1 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						pH (1:5 Aqueous extract at 25 °C as rec.)
Sydney Laboratory - NATA # 1261 Site # 18217						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	ACO1-SOIL	Oct 05, 2022		Soil	S22-Oc0008762	X
2	ACO2-SOIL	Oct 05, 2022		Soil	S22-Oc0008763	X
3	ACO3-SOIL	Oct 05, 2022		Soil	S22-Oc0008764	X
4	ACO4-SOIL	Oct 05, 2022		Soil	S22-Oc0008765	X
5	ACO5-SOIL	Oct 05, 2022		Soil	S22-Oc0008766	X
6	ACO6-SOIL	Oct 05, 2022		Soil	S22-Oc0008767	X
7	ACO7-SOIL	Oct 05, 2022		Soil	S22-Oc0008768	X
8	ACO8-SOIL	Oct 05, 2022		Soil	S22-Oc0008769	X
9	ACO10-SOIL	Oct 05, 2022		Soil	S22-Oc0008770	X
10	SP-SOIL1	Oct 05, 2022		Soil	S22-Oc0008771	X
11	SP-SOIL2	Oct 05, 2022		Soil	S22-Oc0008772	X
12	SP-SOIL3	Oct 05, 2022		Soil	S22-Oc0008773	X
13	SP-SOIL4	Oct 05, 2022		Soil	S22-Oc0008774	X

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Received: Oct 5, 2022 5:40 PM
Due: Oct 6, 2022
Priority: 1 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail	pH (1:5 Aqueous extract at 25 °C as rec.)
Sydney Laboratory - NATA # 1261 Site # 18217	X
Test Counts	13

Stantec Australia Pty Ltd
Level 22, 570 Bourke Street
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VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Jiaqi Zhou**

Report **929192-S**
Project name DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID NE30161
Received Date Oct 05, 2022

Client Sample ID			**ACO1-SOIL**	**ACO2-SOIL**	**ACO3-SOIL**	**ACO4-SOIL**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S22-Oc0008762**	**S22-Oc0008763**	**S22-Oc0008764**	**S22-Oc0008765**
Date Sampled			**Oct 05, 2022**	**Oct 05, 2022**	**Oct 05, 2022**	**Oct 05, 2022**
Test/Reference	LOR	Unit				
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.3	11	9.4	9.4

Client Sample ID			**ACO5-SOIL**	**ACO6-SOIL**	**ACO7-SOIL**	**ACO8-SOIL**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S22-Oc0008766**	**S22-Oc0008767**	**S22-Oc0008768**	**S22-Oc0008769**
Date Sampled			**Oct 05, 2022**	**Oct 05, 2022**	**Oct 05, 2022**	**Oct 05, 2022**
Test/Reference	LOR	Unit				
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.0	8.6	9.2	9.0

Client Sample ID			**ACO10-SOIL**	**SP-SOIL1**	**SP-SOIL2**	**SP-SOIL3**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S22-Oc0008770**	**S22-Oc0008771**	**S22-Oc0008772**	**S22-Oc0008773**
Date Sampled			**Oct 05, 2022**	**Oct 05, 2022**	**Oct 05, 2022**	**Oct 05, 2022**
Test/Reference	LOR	Unit				
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.4	9.3	8.5	9.5

Client Sample ID			**SP-SOIL4**
Sample Matrix			**Soil**
Eurofins Sample No.			**S22-Oc0008774**
Date Sampled			**Oct 05, 2022**
Test/Reference	LOR	Unit	
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.6

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Oct 06, 2022	7 Days

- Method: LTM-GEN-7090 pH by ISE

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Order No.:
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Phone:
Fax:

Received: Oct 5, 2022 5:40 PM
Due: Oct 6, 2022
Priority: 1 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						pH (1:5 Aqueous extract at 25 °C as rec.)
Sydney Laboratory - NATA # 1261 Site # 18217						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	ACO1-SOIL	Oct 05, 2022		Soil	S22-Oc0008762	X
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Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

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Contact Name: Jiaqi Zhou

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail	pH (1:5 Aqueous extract at 25 °C as rec.)
Sydney Laboratory - NATA # 1261 Site # 18217	X
Test Counts	13

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract at 25 °C as rec.)	S22-Oc0008762	CP	pH Units	9.3	9.3	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract at 25 °C as rec.)	S22-Oc0008772	CP	pH Units	8.5	8.4	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Hannah Mawbey	Analytical Services Manager
Dilani Samarakoon	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Attachment D – Site Drainage Plan

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GENERAL LEGEND

GENERAL

- PROPERTY BOUNDARY
- PLATFORM / BUILDING WORKS (FOR DETAILS REFER TO ARCHITECTURAL DRAWINGS)

CIVIL WORKS

- RETAINING WALL
- RETAINING WALL BY OTHERS
- NOISE WALL BY OTHERS
- SEMI-RIGID G4 W-BEAM
- ACCESS TRACK
- FOOTPATH / SHARED PATH
- NEW PLAZA
- PROPOSED BOLLARD

FENCING

- FENCING - SEGREGATION FENCE
- FENCING - SECURITY FENCE
- FENCING - VEHICLE ACCESS GATE
- FENCING - PEDESTRIAN ACCESS GATE
- FENCING - ISOLATION PANEL
- FENCING - CONCRETE PLINTH FOR DEC AND CCTV EQUIPMENT
- FENCING - SAFETY RAIL
- FENCING - EXISTING FENCE TO BE REMOVED

STREET LIGHTING

- LIGHTING - STREET LIGHTING
- LIGHTING - DOWN LIGHT

DRAINAGE

- DRAINAGE - PROPOSED PIPE
- DRAINAGE - PROPOSED PIPE FOR DOWNPIPES
- DRAINAGE - PROPOSED PIT - GRATED
- DRAINAGE - PROPOSED PIT - JUNCTION
- DRAINAGE - PROPOSED GRASSED SWALE
- DRAINAGE - CONCRETE CHANNEL
- DRAINAGE - PROPOSED SUBSOIL
- DRAINAGE - EXISTING ACO DRAIN
- DRAINAGE - PROPOSED TRENCH DRAIN
- DRAINAGE - PROPOSED HEADWALL
- DRAINAGE - PROPOSED RIPRAP
- DRAINAGE - PROPOSED SHOTCRETE BATTER DRAIN
- DRAINAGE - EXISTING INFRASTRUCTURE
- DRAINAGE - ABANDONED PIPE TO BE REMOVED

UTILITIES

- SEWER - EXISTING MAIN (VERIS)
- SEWER - EXISTING MAIN DIGITISED (VERIS)
- WATER - EXISTING MAIN (VERIS)
- WATER - EXISTING MAIN DIGITISED (VERIS)
- GAS - EXISTING MAIN (VERIS)
- GAS - EXISTING MAIN DIGITISED (VERIS)
- ELEC - EXISTING U/G (VERIS)
- ELEC - EXISTING U/G DIGITISED (VERIS)
- COMMS - EXISTING U/G (VERIS)
- COMMS - EXISTING U/G DIGITISED (VERIS)
- COMMS - EXISTING OPTIC U/G (VERIS)
- COMMS - EXISTING OPTIC U/G DIGITISED (VERIS)
- GAS - EXISTING QENOS GAS LINE TO REMAIN
- UTILITIES - ABANDONED PIPE TO BE REMOVED

DBYD - UTILITIES

- SEWER - EXISTING (DYBD)
- WATER - EXISTING (DYBD)
- DRAINAGE- EXISTING (DYBD)
- TRANSGRID- EXISTING (DYBD)

CSR LEGEND

GENERAL

- CSR - PROPOSED INSULATION PANEL/JOINT
- CSR - PROPOSED VERTICAL ALIGNMENT TRANSITION
- LCR - PROPOSED DROPPER TO TRACK SIDE EQUIPMENT
- CSR - PROPOSED GST ROUTE BY OTHERS
- CSR - PROPOSED FENCE ROUTE BY OTHERS

PROPOSED BURIED ROUTES

- CSR - PROPOSED BURIED ROUTE CORRIDOR
- CSR - PROPOSED BURIED ROUTE ULX-URX
- CSR - PROPOSED BURIED ROUTE PLATFORM
- LCR - PROPOSED BURIED ROUTE INTERIM 11kV SUPPLY SYDNEY TRAINS
- LCR - PROPOSED BURIED ROUTE ULX-URX
- LCR - PROPOSED BURIED ROUTE PLATFORM
- LCR - PROPOSED BURIED ROUTE TRACK-SIDE EQUIPMENT

PROPOSED GROUND LEVEL ROUTES

- CSR - PROPOSED GLT ROUTE

PROPOSED ABOVE GROUND ROUTES

- CSR - PROPOSED GST ROUTE ON PILED POST
- CSR - PROPOSED GST ROUTE ON FENCING
- CSR - PROPOSED GST ROUTE ON BRIDGE ABUTMENT
- CSR - PROPOSED CABLE LADDER ROUTE
- CSR - PROPOSED ROUTE FIXED TO ROCK FACE
- CSR - PROPOSED ROUTE THROUGH PLATFORM CONCOURSE

PROPOSED SYDNEY TRAINS RELOCATIONS

- CSR - PROPOSED SYDNEY TRAINS RELOCATION
- CSR - PROPOSED SYDNEY TRAINS REMOVAL

TRACKSIDE EQUIPMENT

- ANTENNA
- POINT INDICATOR
- POINT MACHINE
- MAST & DCS/CCTV BOX
- AXLE COUNTER DISCONNECTION BOX
- MARKER BOARD
- RADIO REPEATER

DSS LEGEND - EXISTING FEATURES

- DSS - FENCE
- OHW STRUCTURE
- DRAINAGE PIT
- LARGE ROUND PIT (RAD>0.5m)
- EARTH TERMINAL
- RAILWAY SIGNAL
- JUNCTION BOX
- TELEPHONE
- POINTS EQUIPMENT
- SMALL PIT (<0.5m)
- RAILWAY TUNING UNIT
- TRAIN STOP
- CCTV CAMERA
- PUBLIC ANNOUNCEMENT
- DRAINAGE INSPECTION PIT (FLUSH POINT)
- ELECTRIC LIGHT POLE
- ANCHOR BLOCK
- BOOT LEG RISER
- ARTC SIGNAL EQUIPMENT

DSS LEGEND - EXISTING FEATURES (CONTINUED)

- GATE
- SURVEY MARK
- IMPEDANCE BOND
- BOLLARD
- POLE (AERIAL FEEDER)
- 0 UNDER CONTROL AREA BOUNDARY
- 1 SIGNAL CABLE - DIRECT BURIED
- 2 SIGNAL CABLE - GALVANISED STEEL TROUGHING
- 3 SIGNAL CABLE - GROUND LEVEL TROUGHING
- 4 SIGNAL CABLE - DUCTED PIPE
- 5 COPPER COMMS CABLE - DIRECT BURIED
- 6 COPPER COMMS CABLE - GALVANISED STEEL TROUGHING
- 7 COPPER COMMS CABLE - GROUND LEVEL TROUGHING
- 8 COPPER COMMS CABLE - DUCTED PIPE
- 9 SIGNAL & COPPER COMMS CABLE - DIRECT BURIED
- 10 SIGNAL & COPPER COMMS CABLE - GALVANISED STEEL TROUGHING
- 11 SIGNAL & COPPER COMMS CABLE - GROUND LEVEL TROUGHING
- 12 SIGNAL & COPPER COMMS CABLE - DUCTED PIPE
- 13 OPTIC FIBRE - DIRECT BURIED
- 14 OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 15 OPTIC FIBRE - GROUND LEVEL TROUGHING
- 16 OPTIC FIBRE - DUCTED PIPE
- 17 LV POWER - DIRECT BURIED
- 18 LV POWER - GALVANISED STEEL TROUGHING
- 19 LV POWER - GROUND LEVEL TROUGHING
- 20 LV POWER - DUCTED PIPE
- 21 HV - DIRECT BURIED
- 22 HV - GALVANISED STEEL TROUGHING
- 23 HV - GROUND LEVEL TROUGHING
- 24 HV - DUCTED PIPE
- 26 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 27 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - GROUND LEVEL TROUGHING
- 28 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - DUCTED PIPE
- 30 COPPER COMMS CABLE, OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 32 COPPER COMMS CABLE, OPTIC FIBRE - DUCTED PIPE
- 34 OPTIC FIBRE, LV POWER - GALVANISED STEEL TROUGHING
- 35 OPTIC FIBRE, LV POWER - GROUND LEVEL TROUGHING
- 36 OPTIC FIBRE, LV POWER - DUCTED PIPE
- 43 SIGNAL CABLE, LV POWER - GROUND LEVEL TROUGHING
- 44 SIGNAL CABLE, LV POWER - DUCTED PIPE
- 50 SIGNAL & COPPER COMMS CABLE, LV POWER - GALVANISED STEEL TROUGHING
- 51 SIGNAL & COPPER COMMS CABLE, LV POWER - GROUND LEVEL TROUGHING
- 52 SIGNAL & COPPER COMMS CABLE, LV POWER - DUCTED PIPE
- 53 SIGNAL & COPPER COMMS CABLE, HV - DIRECT BURIED
- 54 SIGNAL & COPPER COMMS CABLE, HV - GALVANISED STEEL TROUGHING
- 56 SIGNAL & COPPER COMMS CABLE, HV - DUCTED PIPE
- 58 SIGNAL CABLE, OPTIC FIBRE - GALVANISED STEEL TROUGHING
- 59 SIGNAL CABLE, OPTIC FIBRE - GROUND LEVEL TROUGHING
- 64 LV POWER, HV - DUCTED PIPE
- 66 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER - GALVANISED STEEL TROUGHING
- 67 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER - GROUND LEVEL TROUGHING
- 68 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER - DUCTED PIPE
- 70 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, HV - GALVANISED STEEL TROUGHING
- 71 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, HV - GROUND LEVEL TROUGHING
- 72 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, HV - DUCTED PIPE
- 75 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER, HV - GROUND LEVEL TROUGHING
- 76 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE, LV POWER, HV - DUCTED PIPE
- 80 TRACK DRAINAGE - UNKNOWN
- 83 COMPRESSED AIR - DIRECT BURIED
- 84 COMPRESSED AIR - ABOVE GROUND
- 85 ABANDONED ROUTE - UNKNOWN
- 91 HV - DIRECTIONAL UNDER BORE
- 92 SIGNAL & COPPER COMMS CABLE, OPTIC FIBRE - DIRECTIONAL UNDER BORE
- 105 LV POWER - AERIAL
- 106 LV POWER - AERIAL
- 108 1500V DC SYSTEM CABLE - GALVANISED STEEL TROUGHING
- 109 1500V DC SYSTEM CABLE - GROUND LEVEL TROUGHING
- 110 1500V DC SYSTEM CABLE - DUCTED PIPE
- 112 ELECTROLYSIS BOND CABLE - UNKNOWN
- 113 CLOSED CIRCUIT TELEVISION - DUCTED PIPE
- 116 CLOSED CIRCUIT TELEVISION, COPPER COMMS CABLE - DUCTED PIPE
- 119 CLOSED CIRCUIT TELEVISION, LV POWER - DUCTED PIPE
- 125 STATION DATA - DUCTED PIPE
- 131 LIQUID FUEL LINE - UNKNOWN
- 132 VACANT - DUCTED PIPE
- 133 VACANT - GALVANISED STEEL TROUGHING
- 134 VACANT - GROUND LEVEL TROUGHING
- 197 SERVICE PIT (POLYGON)
- 198 SERVICE PIT (POINT)
- 199 UN-CODED SERVICE MIX - UNKNOWN
- 200 ELECTRIC POWER LESS THAN 33kV - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 201 ELECTRIC POWER EQUAL TO OR GREATER THAN 33kV - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 202 LOW PRESSURE GAS MAIN - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 203 HIGH PRESSURE GAS MAIN - EXTERNAL AGENCY SERVICE (CONSULT ASSET OWNER)
- 205 TELSTRA - GALVANISED STEEL TROUGHING
- 206 TELSTRA - GROUND LEVEL TROUGHING
- 207 TELSTRA - DUCTED PIPE
- 211 OPTUS - DUCTED PIPE
- 212 POWERTEL - DIRECT BURIED
- 219 VISION STREAM - DUCTED PIPE
- 220 WATER - UNKNOWN
- 221 SEWER - UNKNOWN
- 222 OTHER SERVICE(S) - DIRECT BURIED
- 223 UECOMM - DIRECT BURIED
- 233 ELECTRIC POWER LESS THAN 33kV - AERIAL
- 234 ELECTRIC POWER EQUAL TO OR GREATER THAN 33kV - AERIAL
- 235 DRAINAGE SERVICE - DUCTED PIPE
- 236 TELSTRA - AERIAL
- 244 RTA - DUCTED PIPE

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FOR CONSTRUCTION

REV.	BY	DATE	DESCRIPTION	APPD.
00	TL	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN

DESIGNED K. VEKERIA

DRG CHECK P. ALFORD

DESIGN CHECK R. PETERSON

APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION

DRAINAGE DESIGN

DRAINAGE (15.846km to 16.211km)

LEGEND

STATUS: FOR CONSTRUCTION | SHEET 1 OF 1 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233308 | REV. 00

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied | NOTE: Do not scale from this drawing. | ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233308 P01

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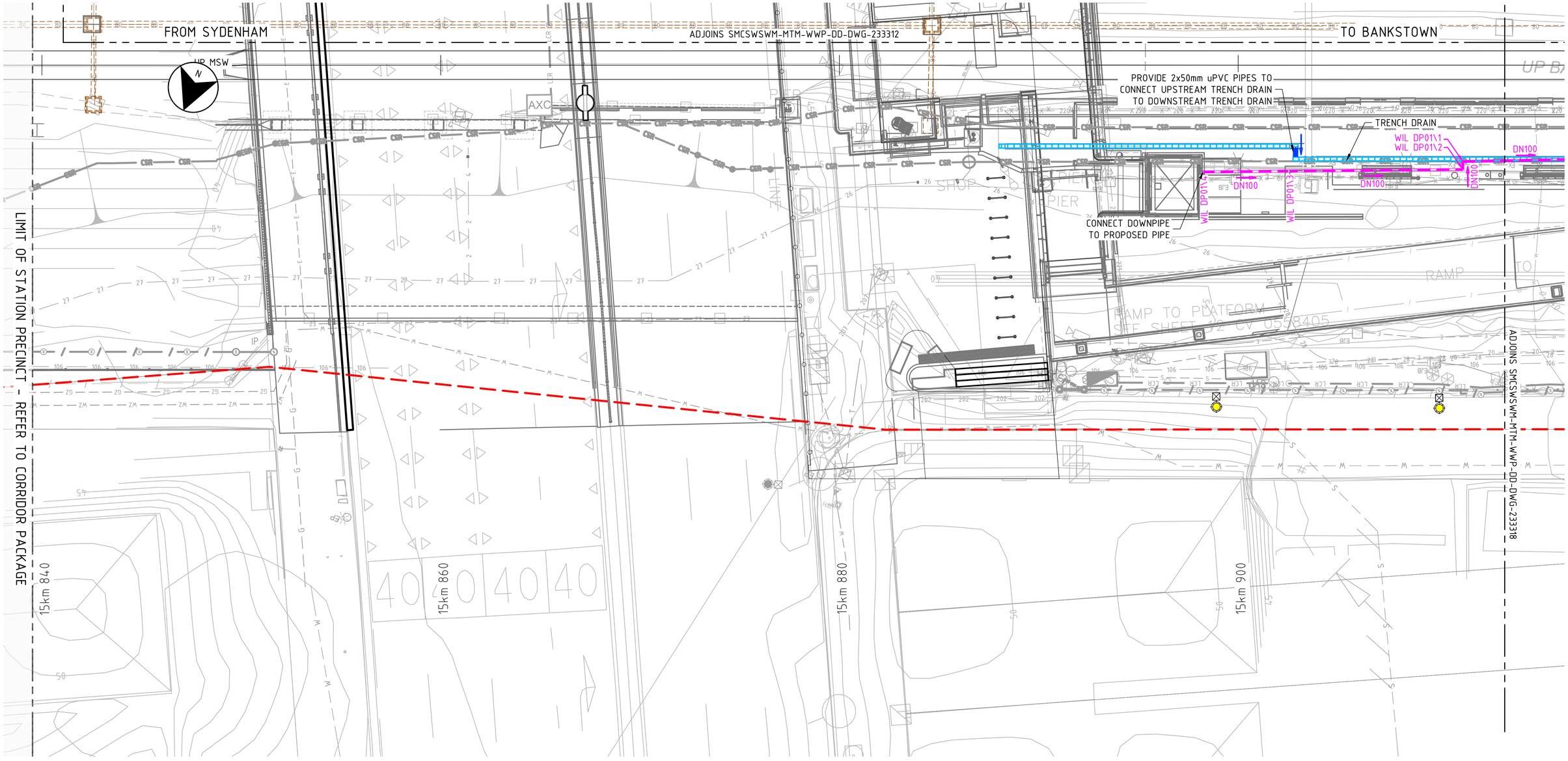
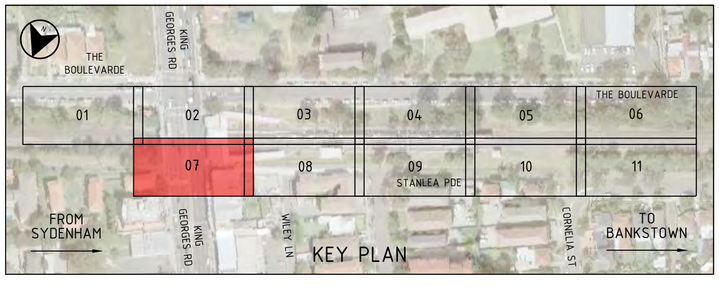
Plot Date: 31/03/21 - 12:05

100mm AT FULL SIZE



NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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FOR CONSTRUCTION

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SCALES

1 : 100 (1 0 1 2 3 4m) FULL SIZE A1

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN
DESIGNED K. VEKERIA
DRG CHECK P. ALFORD
DESIGN CHECK R. PETERSON
APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION
DRAINAGE DESIGN
DRAINAGE (15.846km to 16.211km)
GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 7 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233317 | REV. 00

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied | NOTE: Do not scale from this drawing. | ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233317 P01

FROM SYDENHAM

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233313

TO BANKSTOWN

UP BANKSTOWN

UP MSW

N

DN100

DN150

DN150

DN200

DN200

DN200

WIL W01\10

WIL W01\9

WIL W01\8

WIL W01\7

WIL W01\6

TRENCH DRAIN

CONNECT DOWNPIPE TO PROPOSED PIPE

LOCALLY REGRADE GROUND SURFACE TOWARDS PROPOSED ACO DRAIN

SMCSWSW6-DEW-CRFI-000940

WIL TD31

WIL DP02\1

WIL DP02\2

WIL DP03\1

WIL DP03\2

WIL DP04\1

WIL DP04\2

WIL DP02\4

WIL DP02\18

WIL DP05\1

WIL DP05\2

WIL DP06\1

WIL DP06\2

DN100

PLATFORM 1

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233317

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233319

15km 920

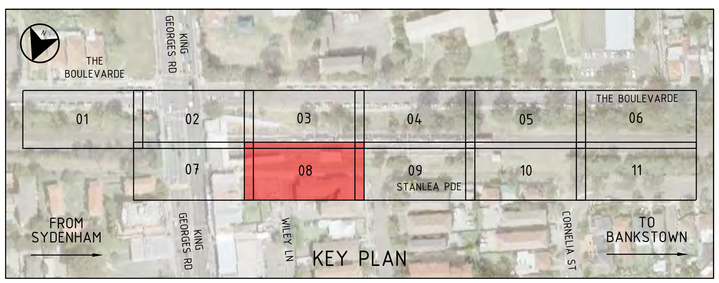
15km 940

15km 960

15km 980

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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FOR CONSTRUCTION

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00.02	BA	26.04.2022	SMCSWSW6-DEW-CRFI-000940	WO
00	TL	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES

1 : 100 (1 0 1 2 3 4m) FULL SIZE A1

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN

DESIGNED K. VEKERIA

DRG CHECK P. ALFORD

DESIGN CHECK R. PETERSON

APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION

DRAINAGE DESIGN

DRAINAGE (15.846km to 16.211km)

GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 8 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233318 | REV. 00.02

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied | NOTE: Do not scale from this drawing. | ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233318 P01

Cad File: C:_SMDS_PACKAGE_6\wwp\SMCSWSWM-MTM-WWP-DD-DWG-233318.dwg Plot Date: 31/03/21 - 12:14 100mm AT FULL SIZE

FROM SYDENHAM

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233314

TO BANKSTOWN

UP BANKSTOWN

UP MSW

TRENCH DRAIN

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

CONNECT DOWNPIPE TO PROPOSED PIPE

SWALE U/S SETOUT
X=321276.737
Y=6244693.920

MINIMUM GRADE OF SWALE 4.80%

EOT

GATE No. M2415.377U

CONSTRUCT HEADWALL AT EDGE OF CONCRETE CHANNEL

CONCRETE SWALE REFER TO TYPICAL DETAILS ON SMCSWS-MTM-WWP-DD-DWG-233353

RECTANGULAR CONCRETE CHANNEL
LONGITUDINAL SLOPE - 1%
BASE WIDTH - 1.5m
DEPTH - 0.2m

STANLEA PARADE

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233318

ADJOINS SMCSWSWM-MTM-WWP-DD-DWG-233320

16km 000

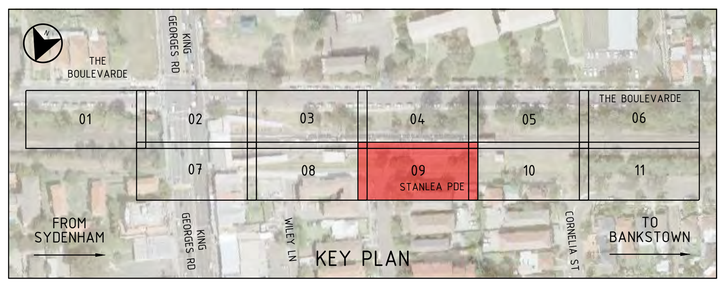
16km 020

16km 040

16km 060

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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FOR CONSTRUCTION

REV.	BY	DATE	DESCRIPTION	APPD.
00	TL	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES

1 : 100 (1 0 1 2 3 4m) FULL SIZE A1

CLIENT

NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS

METRON T2M

DRAWN X. SEGUBAN

DESIGNED K. VEKERIA

DRG CHECK P. ALFORD

DESIGN CHECK R. PETERSON

APPROVED L. PALMER 31.03.2021

SYDNEY METRO

WILEY PARK STATION
DRAINAGE DESIGN
DRAINAGE (15.846km to 16.211km)
GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 9 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233319 | REV. 00

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied | NOTE: Do not scale from this drawing. | ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233319 P01

FROM SYDENHAM

TO BANKSTOWN

SMCSWSW6-DEW-CRFI-000854

DOWNPIPE CONNECTION FROM BUILDING TO BE CONNECTED TO WIL BUI01/5

FOR CHANNEL SETOUT PLAN REFER TO DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483140

ACO DRAIN K100 (Depth 300)

ACO DRAIN K200

WIL BUI06/5

WIL BUI01/4

WIL BUI03/2

WIL BUI14/2

WIL BUI01/2

WIL BUI04/2

FOR MODIFIED SWALE CONTOUR PLAN REFER DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483137

FOR CHANNEL SETOUT PLAN REFER TO DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483140

UNDERGROUND OSD TANK REFER TO NOTE4

PROVIDE ROCK RIPRAP AT END OF HEADWALL OUTLET
LENGTH-1.0m
D50-100mm
THICKNESS-200mm

FOR UPSTREAM DRAINAGE NETWORK, REFER TO STATION DRAINAGE PACKAGE 233

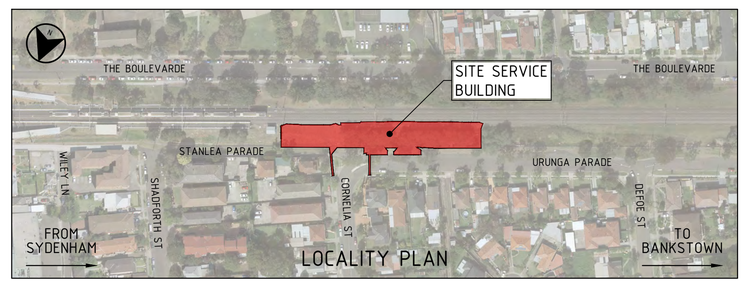
URUNGA PARADE

CORNELIA ST

PLAN
SCALE 1:200

NOTES

1. FOR GENERAL NOTES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-CE-DWG-483104 TO 483107.
2. FOR LEGEND REFER TO DRAWINGS SMCSWSWM-MTM-WWP-CE-DWG-483108 TO 483109.
3. FOR STORMWATER DRAINAGE DETAILS REFER DRAWINGS SMCSWSWM-MTM-WWP-CE-DWG-483311 AND 483312.
4. FOR OSD DETAILS REFER DRAWING SMCSWSWM-MTM-WWP-CE-DWG-483321.



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00.02		10.03.2022	SMCSWSW6-DEW-CRFI-000854	TC
00	MC	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES
2 0 2 4 6 8m
1 : 200 FULL SIZE A1

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied

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CLIENT
NSW GOVERNMENT | sydney METRO

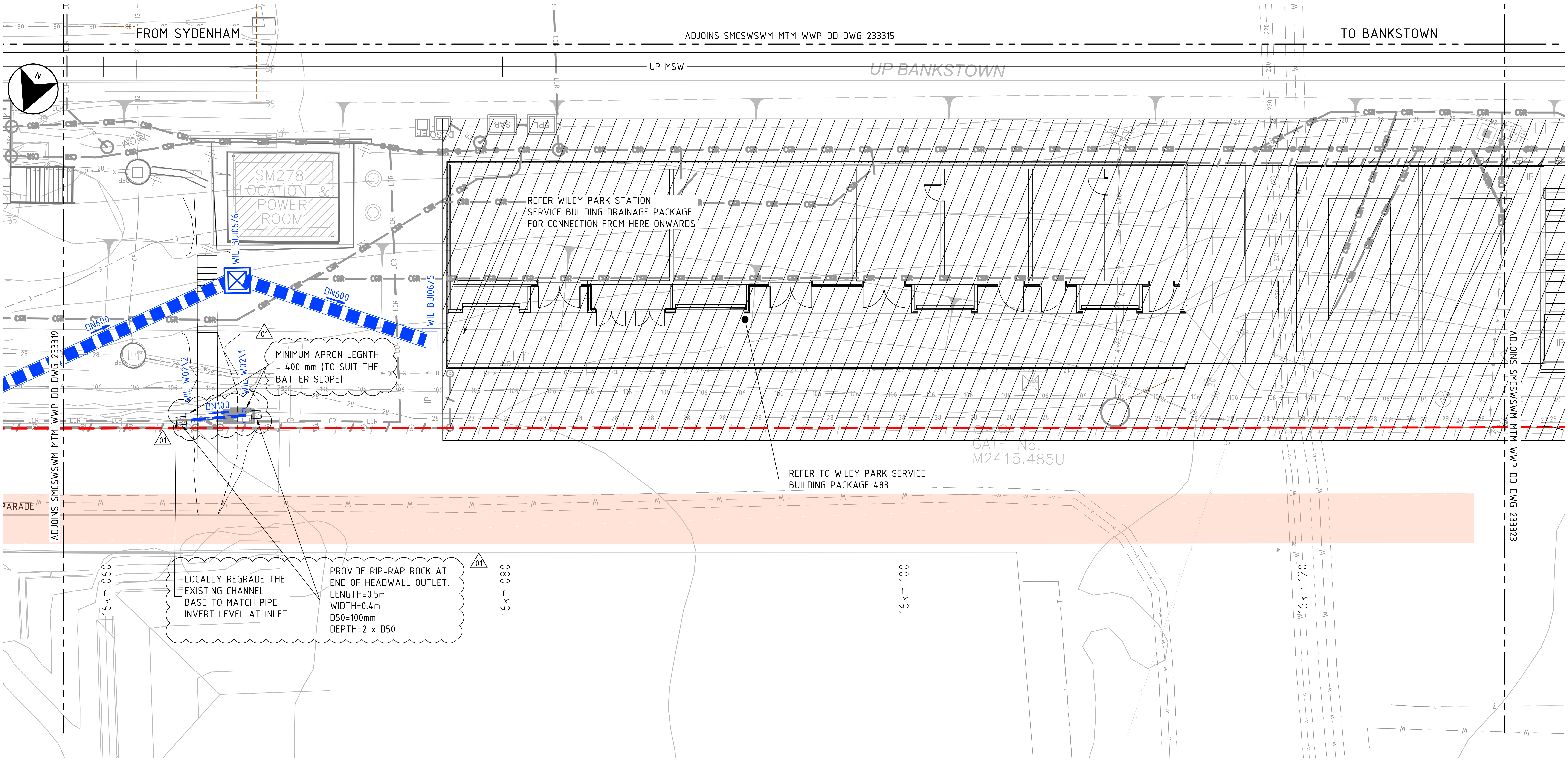
SERVICE PROVIDERS
METRON T2M

DRAWN R.TACADENA
DESIGNED T. WIJEKOON
DRG CHECK P. ALFORD
DESIGN CHECK R. PETERSON
APPROVED L. PALMER 31.03.2021

SYDNEY METRO
WILEY PARK STATION - SERVICE BUILDING
DRAINAGE DESIGN
SERVICE BUILDING - DRAINAGE
GENERAL ARRANGEMENT PLAN

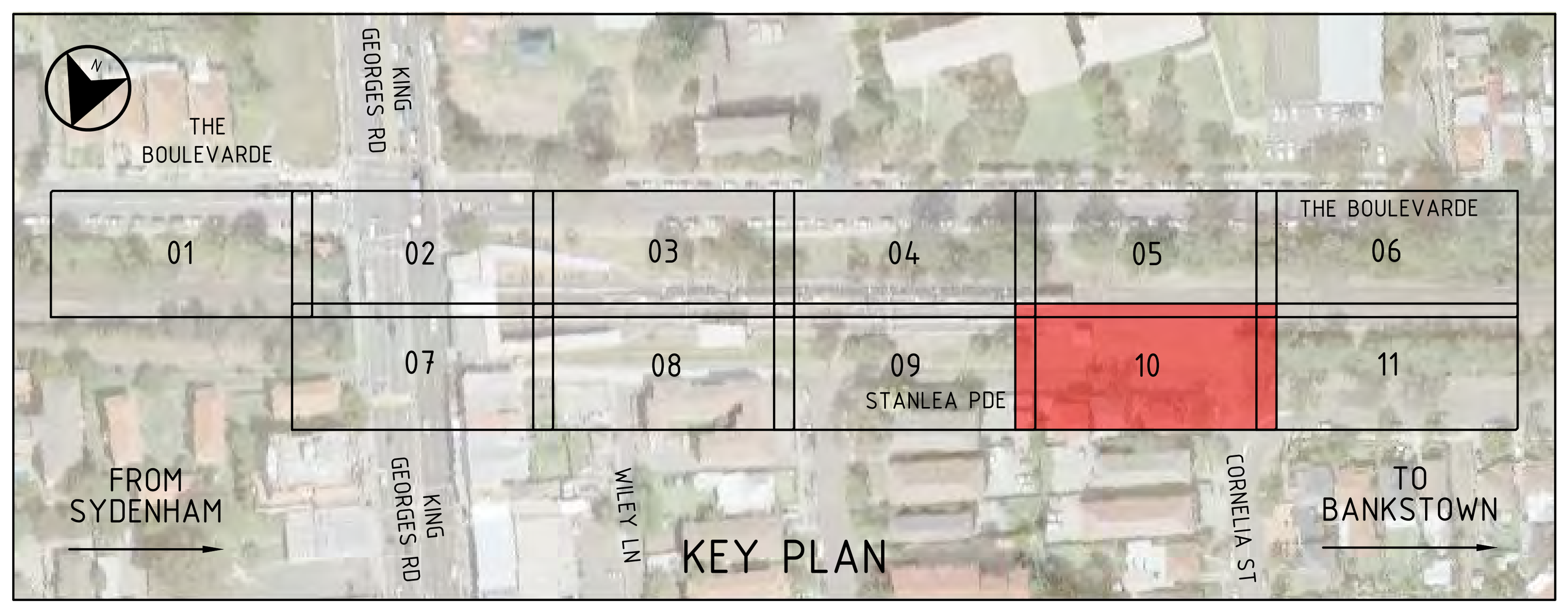
STATUS: FOR CONSTRUCTION | SHEET 1 OF 1 | ©

DRG No. SMCSWSWM-MTM-WWP-CE-DWG-483301 | REV. 00.02



NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SMCSWSWM-MTM-WWP-DD-DWG-233305.
2. FOR DRAINAGE LONGSECTIONS REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233341 TO 233350.
3. FOR DRAINAGE SCHEDULES REFER TO DRAWINGS SMCSWSWM-MTM-WWP-DD-DWG-233331 TO 233333.



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FOR CONSTRUCTION

REV.	BY	DATE	DESCRIPTION	APPD.
01	TL	13.08.2021	CRFI-000043	LP
00	TL	31.03.2021	APPROVED FOR CONSTRUCTION	LP

SCALES: 1 : 100 FULL SIZE A1

CLIENT: NSW GOVERNMENT, sydney METRO

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SERVICE PROVIDERS: METRON T2M

DRAWN: X. SEGUBAN
DESIGNED: K. VEKERIA
DRG CHECK: P. ALFORD
DESIGN CHECK: R. PETERSON
APPROVED: L. PALMER 13.08.2021

SYDNEY METRO
WILEY PARK STATION
DRAINAGE DESIGN
DRAINAGE (15.846km to 16.211km)
GENERAL ARRANGEMENT - DETAIL PLAN

STATUS: FOR CONSTRUCTION | SHEET 10 OF 11 | ©

DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233320 | REV. 01

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied | NOTE: Do not scale from this drawing. | ALT. DRG No. SMCSWSWM-MTM-WWP-DD-DWG-233320 P01

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Plot Date: 13/08/21 - 12:25
100mm AT FULL SIZE

Attachment E – Calibration Certificate

Stantec Australia Pty Ltd |
Level 9 - The Forum
203 Pacific Highway , St Leonards
NSW,2065
+61 2 9496 7700 | www.cardno.com | www.stantec.com

WAMSCIENTIFIC
Your water and air monitoring equipment specialists

Certificate of Service and Calibration
Water Quality Meter
YSI Professional Plus

Company Name	WAM Scientific
Office Address	26 Bungarra Crescent, Chipping Norton NSW 2170
Phone Number	+61 405 241 484
Contact Name	William Pak
Instrument	YSI Professional Plus Water Quality Meter w/ 1m Quatro Cable
Serial Number	21A102654
Client Name	Chong Zeng (Stantec Australia)
Project Number	304500142
Comments	-

Instrument Check

Item	Test	Test Passed	Comments
2 x Alkaline C-size Batteries	Klein Tools MM300 Multimeter	✓	Both batteries reading above 2.9V
Battery Saver Function	Operation	✓	Automatically turns off after 60 minutes if idle
Unit Display	Operation	✓	Screen visible, no damage
Keypad	Operation	✓	Responsive, no damage
Connection Port and Cable	Condition/Check	✓	Clean, no damage
Monitor Housing	Condition/Check	✓	No damage
Firmware	Version	✓	4.0.0
pH Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
pH millivolts for pH 7.00	Calibration	✓	pH 7.00 calibration range between 0 mV ± 50 mV
pH millivolts for pH 4.00	Calibration	✓	pH 4 mV range +165 to +180 from 7 buffer mV value
pH slope	Calibration	✓	Range between 55 to 60 mV/pH (ideal value 59 mV)
Response time < 90 seconds	Calibration	✓	Responds to correct value within 90 seconds
ORP Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
ORP Reading	Calibration	✓	Within ± 80 mV of reference Zobell Reading
Response time < 90 seconds	Calibration	✓	Responds to correct value within 90 seconds
Conductivity/Temp Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
Conductivity Cell	Calibration	✓	Conductivity cell constant 5.0 ± 1.0 in GLP file
Clean Sensor Readings	Calibration	✓	Clean sensor reads less than 3 uS/cm in dry air
Dissolved Oxygen Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
DO Cap	Condition/Calibration	✓	1.25 mil PE membrane (yellow membrane)
DO Sensor in Use	Condition	✓	Polarographic DO sensor
DO Sensor Value	Calibration	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA

Instrument Readings

Parameter	Standard Used	Reference No.	Calibration Value	Observed	Actual	Units
Temperature	Centre 370 Thermometer	Room Temp.	14.3	14.0	14.3	°C
pH	pH 4.00	386466	4.01	3.94	4.01	pH
pH	pH 7.00	387329	7.00	7.06	7.00	pH
Conductivity	2760 µs/cm at 25°C	388521	2760	2891	2760	µs/cm
ORP (Ref. check only)	Zobell A & B	380835/382785	242.0	245.9	242.0	mV
Zero Dissolved O_2	$NaSO_3$ in Distilled H_2O	389912	0.0	-0.2	0.0	%
100% Dissolved O_2	100% Air Saturated H_2O	Fresh Air	100.0	123.7	100.0	%

Declaration

WAM Scientific certifies that the above instrument was successfully tested according to manufacturer's standards and all necessary checks were conducted to ensure the instrument was fully operational prior to dispatch. The calibration data supplied was obtained in accordance with manufacturer's specifications using solutions of known values.

Calibrated By	William Pak
Calibration Date	04/10/2022
Calibration Due	04/04/2023

WAMSCIENTIFIC
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Appendix 5 – TL927-1-25F01 5 Railway Street, Hurlstone Park - Vibration Monitoring Report (r3)

5 September 2022

TL927-1-25F01 5 Railway Street, Hurlstone Park Vibration Monitoring Report (r3)

Downer EDI Works Pty Ltd
76 Berry Street
Nth Sydney NSW 2060

Sydney Metro Southwest - Station Upgrades - Hurlstone Park Station Vibration Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct vibration monitoring during the Station Upgrades works for Sydney Metro Southwest. The vibration monitoring was undertaken to monitor 5 Railway Street, Hurlstone Park property during the nearby trenching works. This report provides a summary of the monitoring results.

2 Details of monitoring

One unattended vibration monitor was installed at 5 Railway Street, Hurlstone Park between 02:00pm 20th April 2022 and 08:00am 4th May 2022.

2.1 Measurement location

The measurement location is listed in Table 2-1. Figures depicting the monitoring location is included in APPENDIX A.

Table 2-1: Measurement location

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	5 Railway Street, Hurlstone Park (Appendix A.1)	20.04.2022 – 04.05.2022 02:00pm – 08:00am	20T Excavator with hammer attachment	Vibration	5-10m	N/A

2.2 Measurement equipment

The instrumentation used for the vibration measurement are summarised in Table 2-2. The accelerometers used in the measurements have current calibration certificates.

Table 2-2: Summary of vibration instrumentation

Type	Make / Model
Triaxial Transducers	Sigicom C12 (SN: 70130)

3 Vibration Monitoring results

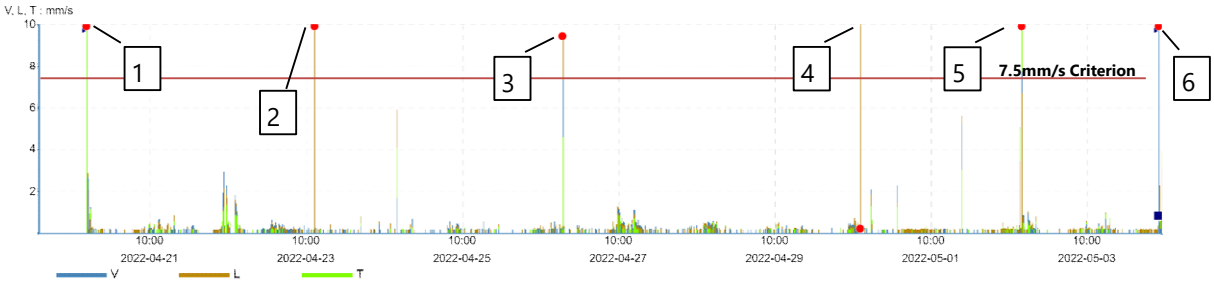
3.1 5 Railway Street, Hurlstone Park Vibration Monitoring

In accordance with the Sydney Metro City Southwest Chatswood to Sydenham Construction Noise and Vibration Strategy (CNVS)[1], the established vibration screening criterion for the affected structure is shown below:

- Unreinforced or light framed structures: 7.5 mm/s

The results of the unattended vibration measurements for 5 Railway Street, Hurlstone Park are presented in Figure 3-1.

Figure 3-1: Unattended vibration monitoring location results (refer to Appendix A.1)



The discussion of the unattended vibration measurements is summarised in Table 3-1 below.

Table 3-1: Unattended vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	20.04.2022 02:22pm	At this time, the vibration monitor was being installed on the ground spike to commence monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike and was not caused by construction activities.

[1] Sydney Metro City Southwest Chatswood to Sydenham Construction Noise and Vibration Strategy (ref: Sydney_Metro_City_Southwest_Construction_Noise_and_Vibration Strategy v0.4), version 0.4, dated 08 August 2016

Exceedance ID	Date and Time	Cause of exceedance
2	23.04.2022 12:30pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. The Project team as of the 21st of April 2022 had already completed all required hammering and excavation at the rear of 5 Railway Street property. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
3	26.04.2022 04:38pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. The Project team on the 26th of April 2022 was excavating the trench and installing conduit. The works were being completed at the rear of 3 Railway Street, greater than 10 metres away from 5 Railway Street. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
4	30.04.2022 12:07pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. The Project team on the 29th of April 2022 was pouring the concrete encasement for the CSR route. The works were being completed at the rear of 3 Railway Street, greater than 10 metres away from 5 Railway Street. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
5	02.05.2022 01:44pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no vibration intensive plants in use on this day. The Project team on the 2nd of May 2022 was completing service instillation and concrete pour preparation works at the rear of 2 Hopetoun Street. The works were being undertaken greater than 35 metres away from 5 Railway Street. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the remaining trenching works occurring during the entire monitoring period, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
6	04.05.2022 07:52am	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitor from the ground spike. No construction activities were occurring during this time.

It can be seen in Figure 3-1 that the vibration levels produced from the nearby trenching works is typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been deemed not construction related.

4 Conclusion

Renzo Tonin & Associates has completed vibration monitoring during the Station Upgrades works for Sydney Metro Southwest. The results of the unattended vibration measurements were typically below the established vibration screening criterion presented in the CNVS. There were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been investigated and deemed not construction related.

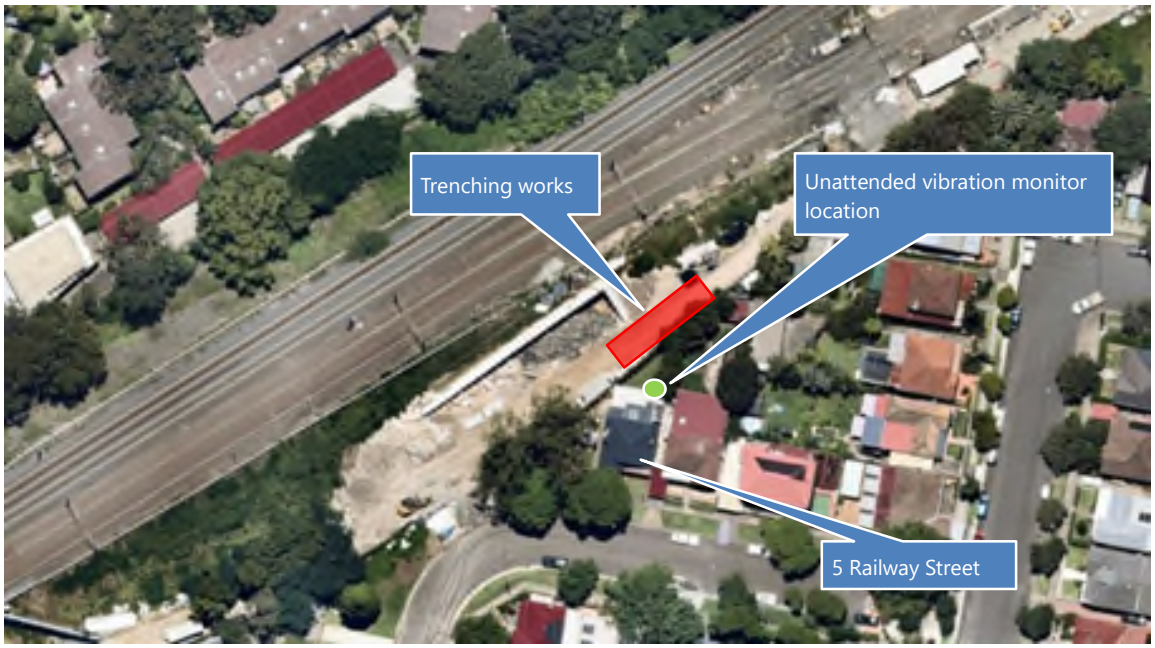
Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
27.05.2022	First Issue	0	1	R. Zhafranata	M. Tabacchi	M. Tabacchi
14.06.2022	Report revised to include the Project team's site records for exceedance ID 2-5	-	2	R. Zhafranata	M. Tabacchi	M. Tabacchi
05.09.2022	Report revised to address client's comments	-	3	R. Zhafranata	M. Tabacchi	M. Tabacchi

File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\25 May 2022 5 Railway Street, Hurlstone Park Vibration Monitoring\TL927-1-25F01 5 Railway Street, Hurlstone Park Vibration Monitoring Report (r3).docx

APPENDIX A Measurement location

A.1 5 Railway Street, Hurlstone Park



Appendix 6 – TL927-1-26F01 Shutdown 3 Noise and Vibration Monitoring Report (r1)

20 July 2022
TL927-1-26F01 Shutdown 3 Noise and Vibration Monitoring Report (r1)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road,
North Ryde NSW 2113

Sydney Metro Southwest - Station Upgrades - Shutdown 3 Possession Works

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise and vibration monitoring during the Station Upgrades Shutdown 3 possession works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding Gatewave model (Gatewave scenario ID: 4699). The vibration monitoring was undertaken to monitor potentially affected structures. This report provides a summary of the monitoring results.

2 Details of monitoring

Noise and vibration monitoring was undertaken at Belmore, Campsie, Dulwich Hill, Hurlstone Park, Punchbowl and Wiley Park Station between 2nd July 2022 and 12th July 2022. Note that no monitoring occurred between 3rd July 2022 and 7th July 2022 due to heavy rainfall and limited construction activity.

An unattended vibration monitor was installed at the neighbouring garage structure at 3A Commons Street, Hurlstone Park between 01:00pm 2nd July 2022 and 08:30am 18th July 2022.

2.1 Measurement location

The noise measurements were conducted at the worst affected residential receivers, relative to the measured works. The measurement locations are listed in Table 2-1. Figures depicting the monitoring locations are included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	51 Ewart Lane, Dulwich Hill (Appendix A.1)	08.07.2022 01:00pm – 01:15pm	5.5T excavator with bucket attachment, dump truck	Noise	20m	No
M2	71 Ewart Street, Dulwich Hill (Appendix A.1)	08.07.2022 01:19pm – 01:34pm	Concrete saw, 5.5T excavator with bucket attachment, handheld blower	Noise	6-15m	No
M3	12 Railway Street, Hurlstone Park (Appendix A.2)	08.07.2022 02:20pm – 02:35pm	21.5T excavator with lifting hook attachment, telehandler, hand tools	Noise	13-20m	No
M4	5 Railway Street, Hurlstone Park (Appendix A.2)	08.07.2022 02:58pm – 03:14pm	Agitator truck, 21.5T excavator with bucket attachment, telehandler	Noise	25m	No
M5	23 Anglo Road, Campsie (Appendix A.3)	08.07.2022 03:52pm – 04:07pm	Dump truck, 8.5T excavator with bucket attachment	Noise	21m	No
M6	13-15 Anglo Road, Campsie (Appendix A.3)	08.07.2022 04:13pm – 04:28pm	Generator, positrack	Noise	15m	Noise blankets fitted around generator
M7	12 Railway Street, Hurlstone Park (Appendix A.2)	09.07.2022 08:54am – 09:09am	Dump truck, 21.5T excavator with bucket attachment, telehandler	Noise	20m	No
M8	14 Railway Street, Hurlstone Park (Appendix A.2)	09.07.2022 09:20am – 09:35am	Telehandler, 21.5T excavator with lifting hook attachment, 25T excavator with bucket attachment	Noise	25m	No
M9	2 Hopetoun Street, Hurlstone Park (Appendix A.2)	09.07.2022 09:43am – 09:58am	14T excavator with lifting hook attachment, 8T excavator with lifting hooks attachment, hydrema	Noise	33m	No
M10	5-9 London Street, Campsie (Appendix A.3)	09.07.2022 11:05am – 11:20am	17T hi-rail excavator with forks, 5.5T excavator with bucket attachment, hand tools	Noise	64-80m	No
M11	1-3 Shadforth Street, Wiley Park (Appendix A.5)	09.07.2022 03:03pm – 03:18pm	EWP, hand tools	Noise	13m	No

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M12	2 Shadforth Street, Wiley Park (Appendix A.5)	09.07.2022 03:23pm – 03:38pm	EWP, hand tools	Noise	25m	No
M13	41 Urunga Parade, Punchbowl (Appendix A.6)	09.07.2022 03:56pm – 04:11pm	EWP, 8.5T hi-rail excavator with forks, trucks	Noise	48m	No
M14	14 Arthur Street, Punchbowl (Appendix A.6)	11.07.2022 12:21pm – 12:36pm	Rattlegun	Noise	95m	No
M15	279 The Boulevarde, Punchbowl (Appendix A.6)	11.07.2022 12:43pm – 12:58pm	Hand tools, EWP, 100T crane	Noise	24m	No
M16	1-3 Shadforth Street, Wiley Park (Appendix A.5)	11.07.2022 01:38pm – 01:53pm	EWP, hand tools, jackhammer	Noise	20m	No
M17	2 Shadforth Street, Wiley Park (Appendix A.5)	11.07.2022 01:56pm – 02:11pm	Hand tools, truck	Noise	28m	No
M18	30 Redman Parade, Belmore (Appendix A.4)	11.07.2022 03:29pm – 03:44pm	Jackhammer, hand tools	Noise	57m	No
M19	1 Acacia Street, Belmore (Appendix A.4)	11.07.2022 03:51pm – 04:06pm	Jackhammer, hand tools	Noise	53m	No
M20	3 Wilfred Avenue, Campsie (Appendix A.3)	11.07.2022 04:55pm – 05:10pm	Positrack, vacuum truck, hand tools, EWP	Noise	57-63m	No
M21	13-15 Anglo Road, Campsie (Appendix A.3)	11.07.2022 05:18pm – 05:33pm	Generator, hand tools, 5.5T excavator with forks	Noise	15m	Noise blankets fitted around generator
M22	107 Duntroon Street, Hurlstone Park (Appendix A.2)	11.07.2022 06:22pm – 06:36pm	8T hi-rail crane	Noise	39m	No
M23	107 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 07:07pm – 07:24pm	250T crane, trucks, lighting tower	Noise	30m	No

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M24	124 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 07:29pm – 07:44pm	250T crane, trucks	Noise	33m	No
M25	109 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 07:50pm – 08:05pm	250T crane, trucks	Noise	40m	No
M26	26 Floss Street, Hurlstone Park (Appendix A.2)	12.07.2022 08:13pm – 08:27pm	250T crane, hand tools	Noise	48m	No
M27	126 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 08:42pm – 08:57pm	250T crane	Noise	49m	No
M28	Neighbouring garage structure at 3A Commons Street, Hurlstone Park (Appendix A.2)	02.07.2022 – 18.02.2022 01:00pm – 08:30am	Associated plant with hammering and excavation works near the platform 2 staircase install as well e.g. Jackhammer, excavators with bucket as well as platform 2 non vibration intensive works e.g. hand tools	Vibration	5-70m	N/A
M29	Station building on platform 2, Belmore Station (Appendix A.4)	02.07.2022 03:49pm – 03:50pm	Baseline vibration monitoring	Vibration (baseline monitoring)	N/A	N/A
M30	Station building on platform 2, Belmore Station (Appendix A.4)	02.07.2022 03:56pm – 04:03pm	2 x Jackhammers (spade chisel)	Vibration	1-3m	N/A
M31	Station building on platform 1, Belmore Station (Appendix A.4)	09.07.2022 12:33pm – 12:46pm	Jackhammer (spade chisel)	Vibration	1-3m	N/A
M32	Station building on platform 1, Belmore Station (Appendix A.4	09.07.2022 12:50pm – 12:51pm	Baseline vibration monitoring	Vibration (baseline monitoring)	N/A	N/A

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies

with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	A2A-16217-E0	13 August 2021
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	3009707	2 December 2020

The instrumentation used for the vibration measurement are summarised in Table 2-3. The accelerometers used in the measurements have current calibration certificates. For monitoring on hard surfaces (e.g. asphalt), in accordance with AS 2775-2004[1], the surface was brushed to displace any dirt and the accelerometers were attached to the surface using double sided adhesive tape. For monitoring on soils, in accordance with AS 2775-2004 , a ground spike was planted into the surface and the triaxial transducers were mounted onto the ground spike.

Table 2-3: Summary of vibration instrumentation

Type	Make / Model
Triaxial Transducers	Sigicom C12 (SN: 66830)
Type 1 Signal Analyser	Soundbook-2
Accelerometer	Endevco 61C3

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-4. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-4: Environmental conditions

Measurement ID	Assessment Point	Date and Start Time	Environmental Conditions
M1	51 Ewart Lane, Dulwich Hill (Appendix A.1)	08.07.2022 01:00pm – 01:15pm	Clear sky; air temperature 15ºC, wind speed < 5m/s; relative humidity 47%
M2	71 Ewart Street, Dulwich Hill (Appendix A.1)	08.07.2022 01:19pm – 01:34pm	Clear sky; air temperature 15ºC, wind speed < 5m/s; relative humidity 47%
M3	12 Railway Street, Hurlstone Park (Appendix A.2)	08.07.2022 02:20pm – 02:35pm	Clear sky; air temperature 15ºC, wind speed < 5m/s; relative humidity 47%

[1] Australia Standard 2775-2004 Mechanical vibration and shock – Mechanical mounting of accelerometers

Measurement ID	Assessment Point	Date and Start Time	Environmental Conditions
M4	5 Railway Street, Hurlstone Park (Appendix A.2)	08.07.2022 02:58pm – 03:14pm	Clear sky; air temperature 15ºC, wind speed < 5m/s; relative humidity 47%
M5	23 Anglo Road, Campsie (Appendix A.3)	08.07.2022 03:52pm – 04:07pm	Clear sky; air temperature 14ºC, wind speed < 5m/s; relative humidity 50%
M6	13-15 Anglo Road, Campsie (Appendix A.3)	08.07.2022 04:13pm – 04:28pm	Clear sky; air temperature 14ºC, wind speed < 5m/s; relative humidity 50%
M7	12 Railway Street, Hurlstone Park (Appendix A.2)	09.07.2022 08:54am – 09:09am	Clear sky; air temperature 10ºC, wind speed < 5m/s; relative humidity 65%
M8	14 Railway Street, Hurlstone Park (Appendix A.2)	09.07.2022 09:20am – 09:35am	Clear sky; air temperature 10ºC, wind speed < 5m/s; relative humidity 65%
M9	2 Hopetoun Street, Hurlstone Park (Appendix A.2)	09.07.2022 09:43am – 09:58am	Clear sky; air temperature 12ºC, wind speed < 5m/s; relative humidity 61%
M10	5-9 London Street, Campsie (Appendix A.3)	09.07.2022 11:05am – 11:20am	Clear sky; air temperature 14ºC, wind speed < 5m/s; relative humidity 48%
M11	1-3 Shadforth Street, Wiley Park (Appendix A.5)	09.07.2022 03:03pm – 03:18pm	Partly cloudy; air temperature 16ºC, wind speed < 5m/s; relative humidity 54%
M12	2 Shadforth Street, Wiley Park (Appendix A.5)	09.07.2022 03:23pm – 03:38pm	Partly cloudy; air temperature 16ºC, wind speed < 5m/s; relative humidity 54%
M13	41 Urunga Parade, Punchbowl (Appendix A.6)	09.07.2022 03:56pm – 04:11pm	Partly cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 53%
M14	14 Arthur Street, Punchbowl (Appendix A.6)	11.07.2022 12:21pm – 12:36pm	Partly cloudy; air temperature 17ºC, wind speed < 5m/s; relative humidity 61%
M15	279 The Boulevarde, Punchbowl (Appendix A.6)	11.07.2022 12:43pm – 12:58pm	Overcast; air temperature 17ºC, wind speed < 5m/s; relative humidity 61%
M16	1-3 Shadforth Street, Wiley Park (Appendix A.5)	11.07.2022 01:38pm – 01:53pm	Partly cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 76%
M17	2 Shadforth Street, Wiley Park (Appendix A.5)	11.07.2022 01:56pm – 02:11pm	Partly cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 76%
M18	30 Redman Parade, Belmore (Appendix A.4)	11.07.2022 03:29pm – 03:44pm	Partly cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 80%

Measurement ID	Assessment Point	Date and Start Time	Environmental Conditions
M19	1 Acacia Street, Belmore (Appendix A.4)	11.07.2022 03:51pm – 04:06pm	Partly cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 80%
M20	3 Wilfred Avenue, Campsie (Appendix A.3)	11.07.2022 04:55pm – 05:10pm	Partly cloudy; air temperature 12ºC, wind speed < 5m/s; relative humidity 90%
M21	13-15 Anglo Road, Campsie (Appendix A.3)	11.07.2022 05:18pm – 05:33pm	Partly cloudy; air temperature 12ºC, wind speed < 5m/s; relative humidity 90%
M22	107 Duntroon Street, Hurlstone Park (Appendix A.2)	11.07.2022 06:22pm – 06:36pm	Partly cloudy; air temperature 12ºC, wind speed < 5m/s; relative humidity 91%
M23	107 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 07:07pm – 07:24pm	Clear sky; air temperature 11ºC, wind speed < 5m/s; relative humidity 84%
M24	124 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 07:29pm – 07:44pm	Clear sky; air temperature 11ºC, wind speed < 5m/s; relative humidity 84%
M25	109 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 07:50pm – 08:05pm	Clear sky; air temperature 11ºC, wind speed < 5m/s; relative humidity 87%
M26	26 Floss Street, Hurlstone Park (Appendix A.2)	12.07.2022 08:13pm – 08:27pm	Clear sky; air temperature 11ºC, wind speed < 5m/s; relative humidity 84%
M27	126 Duntroon Street, Hurlstone Park (Appendix A.2)	12.07.2022 08:42pm – 08:57pm	Clear sky; air temperature 10ºC, wind speed < 5m/s; relative humidity 88%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Measured noise levels $L_{Aeq(15min)}$

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	51 Ewart Lane, Dulwich Hill (Appendix A.1)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	82^{H}	5.5T excavator with bucket attachment, dump truck	59	73	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled directly opposite of this residential receiver. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 20 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10 metres. The measured works were intermittent during this measurement. Loud noise events originated to aircraft flyovers and noise due to natural sources e.g. wind.
M2	71 Ewart Street, Dulwich Hill (Appendix A.1)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	86^{H}	Concrete saw, 5.5T excavator with bucket attachment, handheld blower,	75 (70+5)*	82	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured concrete sawing works were intermittent during this measurement. Loud noise events can be attributed to vehicle movements along Ewart Lane and concrete sawing located approximately 6m away and above the sound level meter.
M3	12 Railway Street, Hurlstone Park (Appendix A.2)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	71^{T}	21.5T excavator with lifting hook attachment, telehandler, hand tools	65	80	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured works were intermittent during this measurement. Loud noise events originated from freight rail passbys and telehandler movements from Railway Street into the work area.
M4	5 Railway Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	82^{H}	Agitator truck, 21.5T excavator with bucket attachment, telehandler	64	78	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 25 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 3 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to engine noise and compressed air releases from the agitator truck.
M5	23 Anglo Road, Campsie (Appendix A.3)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	81^{T}	Dump truck, 8.5T excavator with bucket attachment	67	85	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the measured works were located approximately 21 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 6 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to truck movements in and out of the work area.
M6	13-15 Anglo Road, Campsie (Appendix A.3)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	75^{T}	Generator, positrack	63	80	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The dominating construction noise source during this measurement was the generator approximately 15 metres away from the monitoring location, which was fitted with noise blankets. The positrack was barely audible during the measurement, operating approximately 95m away from the assessment point. Loud noise events can be attributed to road traffic passbys on Lillian Lane.
M7	12 Railway Street, Hurlstone Park (Appendix A.2)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	71^{T}	Dump truck, 21.5T excavator with bucket attachment, telehandler	69	95	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured works were intermittent during this measurement. Loud noise events originated from compressed air being released from the dump truck as well as intermittent loud noise during spoil management activities.
M8	14 Railway Street, Hurlstone Park (Appendix A.2)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	70^{T}	Telehandler, 21.5T excavator with lifting hook attachment, 25T excavator with bucket attachment	58	77	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. During the measurement, the 25T excavator with bucket attachment was only briefly operated. Loud noise events can be attributed to the 25T excavator fitting the bucket attachment.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M9	2 Hopetoun Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	76[H]	14T excavator with lifting hook attachment, 8T excavator with lifting hooks attachment, hydrema	55	70	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 33 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10 metres. During the measurement, it was noted that the hydrema was on a low idle and was barely audible. Loud noise events originated from dropped items in the work area.
M10	5-9 London Street, Campsie (Appendix A.3)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	69[T]	17T hi-rail excavator with forks, 5.5T excavator with bucket attachment, hand tools	60	90	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Noise from the 17.5T hi-rail excavator with forks near the platforms was shielded by the site offices. Furthermore, noise from the 5.5T excavator with bucket attachment was barely audible, operating approximately 78m away. Hand tool use was barely audible during the monitoring, occurring near the station box and further down the alignment approximately 80m away. Loud noise events originated from nearby road traffic.
M11	1-3 Shadforth Street, Wiley Park (Appendix A.5)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	82[H]	EWP, hand tools	67	79	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the concourse work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 13 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 6 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to handheld sawing activities approximately 13m away.
M12	2 Shadforth Street, Wiley Park (Appendix A.5)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	84[H]	EWP, hand tools	57	82	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the concourse work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 25 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 8 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to loud slams from the Authorised Traffic Controller packing equipment into their vehicle.
M13	41 Urunga Parade, Punchbowl (Appendix A.6)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	72[H]	EWP, 8.5T hi-rail excavator with forks, trucks	53	71	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. During the measurement, the EWP was barely audible, operating approximately 48m away. The 8.5T hi-rail excavator with forks was shielded by site buildings.
M14	14 Arthur Street, Punchbowl (Appendix A.6)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	66[H]	Rattlegun	58	84	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less audible plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Construction noise at this location was barely audible. The ambient environment was dominated by road traffic along The Boulevarde and Arthur Street.
M15	279 The Boulevarde, Punchbowl (Appendix A.6)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	70[H]	Hand tools, EWP, 100T crane	70	93	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is consistent with the predicted noise level. Construction noise at this location was barely audible during periods of heavy traffic. The ambient noise environment was dominated by road traffic along The Boulevarde.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M16	1-3 Shadforth Street, Wiley Park (Appendix A.5)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	82[H]	EWP, hand tools, jackhammer	62 (57 + 5)*	71	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the measured works were located approximately 20 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 6 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to road traffic passbys and dropped items in the work area.
M17	2 Shadforth Street, Wiley Park (Appendix A.5)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	84[H]	Hand tools, truck	56	75	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the concourse work area. However, no high impact activities were occurring during this measurement. Furthermore, the measured works were located approximately 28 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 8 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to hand tool use such as power drills during ceiling installation of the new station buildings on the platforms.
M18	30 Redman Parade, Belmore (Appendix A.4)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	74[H]	Jackhammer, hand tools	74 (69 + 5)*	101	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is consistent with the predicted noise level. The platform works occurred approximately 58m away and below the measurement location. Loud noise events can be attributed to road traffic along Redman Parade.
M19	1 Acacia Street, Belmore (Appendix A.4)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	79[H]	Jackhammer, hand tools	61 (56 + 5)*	76	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the platform works occurred approximately 53m away and below the measurement location. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20 metres. Loud noise events can be attributed to road traffic along Tobruk Avenue and natural sources i.e. birds.
M20	3 Wilfred Avenue, Campsie (Appendix A.3)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	71[T]	Positrack, vacuum truck, hand tools, EWP	61	78	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Furthermore, the measured works were located approximately 63 metres away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 35 metres. The measured works were intermittent during this measurement. Loud noise events can be attributed to dropped items in the work area as well as road and rail passbys.
M21	13-15 Anglo Road, Campsie (Appendix A.3)	Excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	75[T]	Generator, hand tools, 5.5T excavator with forks	63	77	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The dominating construction noise source during this measurement was the generator approximately 15 metres away from the monitoring location, which was fitted with noise blankets. Operation of the 5.5T excavator with forks near the platform was barely audible and below the measurement location. Loud noise events can be attributed to road traffic along Lillian Lane.
M22	107 Duntroon Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	79[H]	8T hi-rail crane	56	72	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Operation of the 8T hi-rail crane near the platform during blockwork lifting was approximately 39m away and below the measurement position. Operation of this plant was barely audible and intermittent. Loud noise events can be attributed to road traffic along Duntroon Street and Floss Street.
M23	107 Duntroon Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	79[H]	250T crane, trucks, lighting tower	66	86	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this measurement. Loud noise events can be attributed to compressed air releases from truck air brakes and the crane revving up when deploying outriggers.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M24	124 Duntroon Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	68[H]	250T crane, trucks	61	80	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this measurement. Loud noise events can be attributed to jangling and attaching chains to the crane hook and lifted payloads.
M25	109 Duntroon Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	78[H]	250T crane, trucks	62	85	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this measurement. Loud noise events can be attributed to compressed air releases from truck air brakes, truck movements in and out of the work area and dropped items.
M26	26 Floss Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	69[H]	250T crane, hand tools	66	82	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. Crane activity was barely audible approximately 48m away with the ambient environment primarily influenced by idling noise from an ATC vehicle approximately 19m away. The measured works were intermittent during this measurement. Loud noise events can be attributed to road and rail passbys as well as truck movements in the work area.
M27	126 Duntroon Street, Hurlstone Park (Appendix A.2)	Concrete saw, excavator with hammer attachment, jackhammer, excavator with bucket attachment, vacuum truck, electrical chainsaw, hand tools, mobile crane, skid street/bobcat, bored piling rig, street sweeper, plate compactor, compressor, concrete agitator, drill rig, concrete pump, excavator with pulveriser attachment, dump truck and 2T roller on low vibration mode	66[H]	250T crane	59	68	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. Note that in the Gatewave model, high impact activities were modelled in the platform work area. However, no high impact activities were occurring during this measurement. The measured works were intermittent during this measurement. Loud noise events can be attributed to the crane lifting payloads from the truck bed across and into the platform.

Notes:

*: 5dB(A) penalty applied for high impact activities.

T: Predicted $L_{Aeq, 15min}$ for Typical activities.

H: Predicted $L_{Aeq, 15min}$ for High impact activities.

4 Vibration Monitoring results

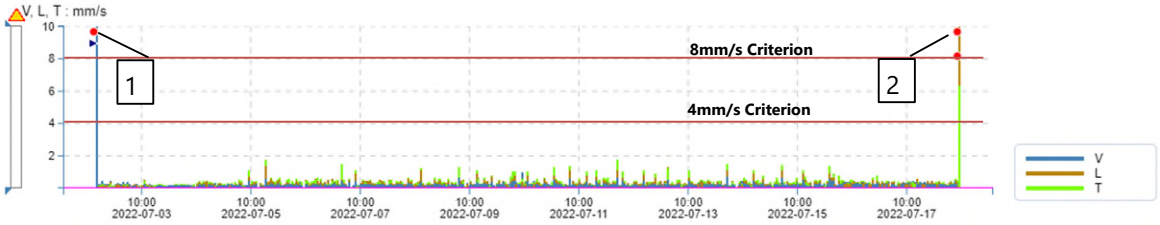
4.1 Neighbouring garage structure at 3A Commons Street vibration monitoring

In accordance with the Hurlstone Park Station Vibration Monitoring Plan[2], the established vibration limits for the affected garage structure are shown below:

- Greater than or equal to 4 mm/s (cosmetic damage is possible);
- Greater than or equal to 8 mm/s (cosmetic damage becoming more likely).

The results of the unattended vibration measurements for the neighbouring garage structure at 3A Commons Street are presented in Figure 4-1.

Figure 4-1: Unattended vibration monitoring at 3A Commons Street (refer to Appendix A.2)



The discussion of the unattended vibration measurements is summarised in Table 4-1 below.

Table 4-1: Unattended vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	02.07.2022 01:22pm	At this time, the vibration monitor was being tap tested and installed into the ground to commence the vibration monitoring. Exceedance was not caused by the nearby construction activities. No construction activities were occurring at this time.
2	18.07.2022 08:35am	At this time, the vibration monitor was removed from the ground spike to complete the monitoring. Exceedance was not caused by the nearby construction activities. No construction activities were occurring at this time.

It can be seen in Figure 4-1, that the vibration levels produced from the vibration intensive works in the vicinity of the affected garage structure is below 4 mm/s. Note that there were two events that resulted in an instantaneous vibration level of above 4 mm/s, however this event was not caused by the nearby construction activities, as justified in Table 4-1.

[2] Sydney Metro Southwest – Station Upgrades – Hurlstone Park Station Vibration Monitoring Plan (ref: TL927-1-14F01 Hurlstone Park Stn VIB MON PLAN (r2)), dated 14 October 2021

4.2 Belmore station vibration monitoring

The applicable vibration criteria for cosmetic damage from construction activities is outlined in Section 5.7 of the Hurlstone Park, Belmore and Wiley Park Station Upgrades Noise and Vibration Plan.

- Unreinforced or light framed structures: 7.5 mm/s
- Heritage structures (structurally sound): 7.5 mm/s

Vibration monitoring was undertaken at Belmore Station during observed periods of vibration intensive works. The results of the vibration monitoring are presented in Table 4-2 below.

Table 4-2: Belmore station vibration monitoring summary

Measurement ID	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
M29	Baseline vibration monitoring	N/A	0.06	0.11	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite)
M30	2 x Jackhammers (spade chisel)	1-3m	1.89	6.37	At 1-3m away, the jackhammers produced vibration levels that were below the established screening criteria for cosmetic damage. It is noted that jackhammering was occurring in soil below the platform slab.
M31	Jackhammer (spade chisel)	1-3m	4.69	6.20	At 1-3m away, the jackhammers produced vibration levels that were below the established screening criteria for cosmetic damage. It is noted that jackhammering was occurring to break the platform slab. This change in surface being worked on during jackhammering can be attributed to the higher 95th percentile PPV compared to M31.
M32	Baseline vibration monitoring	N/A	0.09	0.44	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite)

As can be noted from Table 4-2 above, the measured plants produced vibration levels below the established criteria for cosmetic damage. Given that the vibration monitoring results are below the established screening criteria, the risk of cosmetic damage from the measured jackhammering works are low.

5 Conclusion

Renzo Tonin & Associates completed noise and vibration monitoring for the Shutdown 3 possession works. The results of the noise measurements were below or consistent with the predicted $L_{Aeq\ 15minutes}$ levels presented in the Gatewave model prepared for the works.

The results of the unattended vibration measurements were typically below the established vibration criteria presented in the vibrtion monitoring plans prepared for the works. There were events that resulted in an instantaneous vibration level of above the established vibration criteria. The cause of each event was not related to construction activity.

The results of the attended vibration measurements show that the measured vibration levels produced by the jackhammering works were below the established vibration screening criteria for cosmetic damage. Therefore, the risk of cosmetic damage is assessed as low.

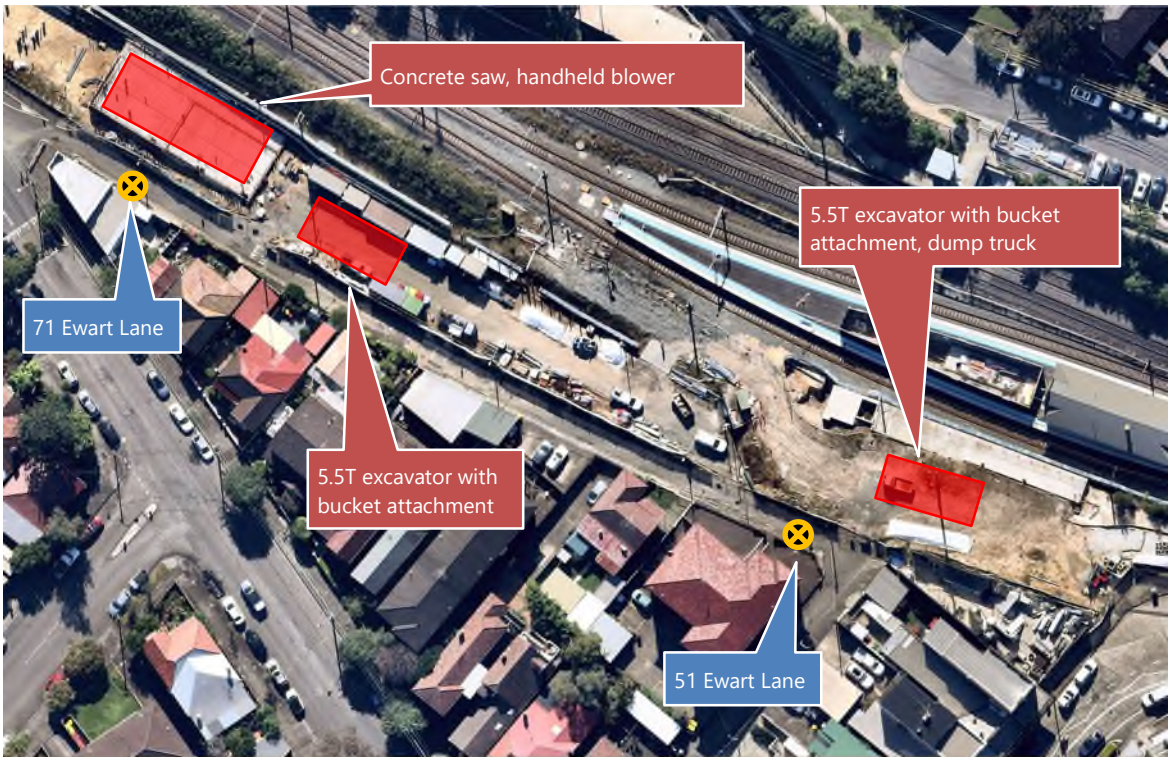
Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
20.07.2022	First issue	0	1	L. Woolf	R. Zhafranata	M. Tabacchi

File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\26 July Shutdown 3 possession\TL927-1-26F01 Shutdown 3 Noise and Vibration Monitoring Report (r1).docx

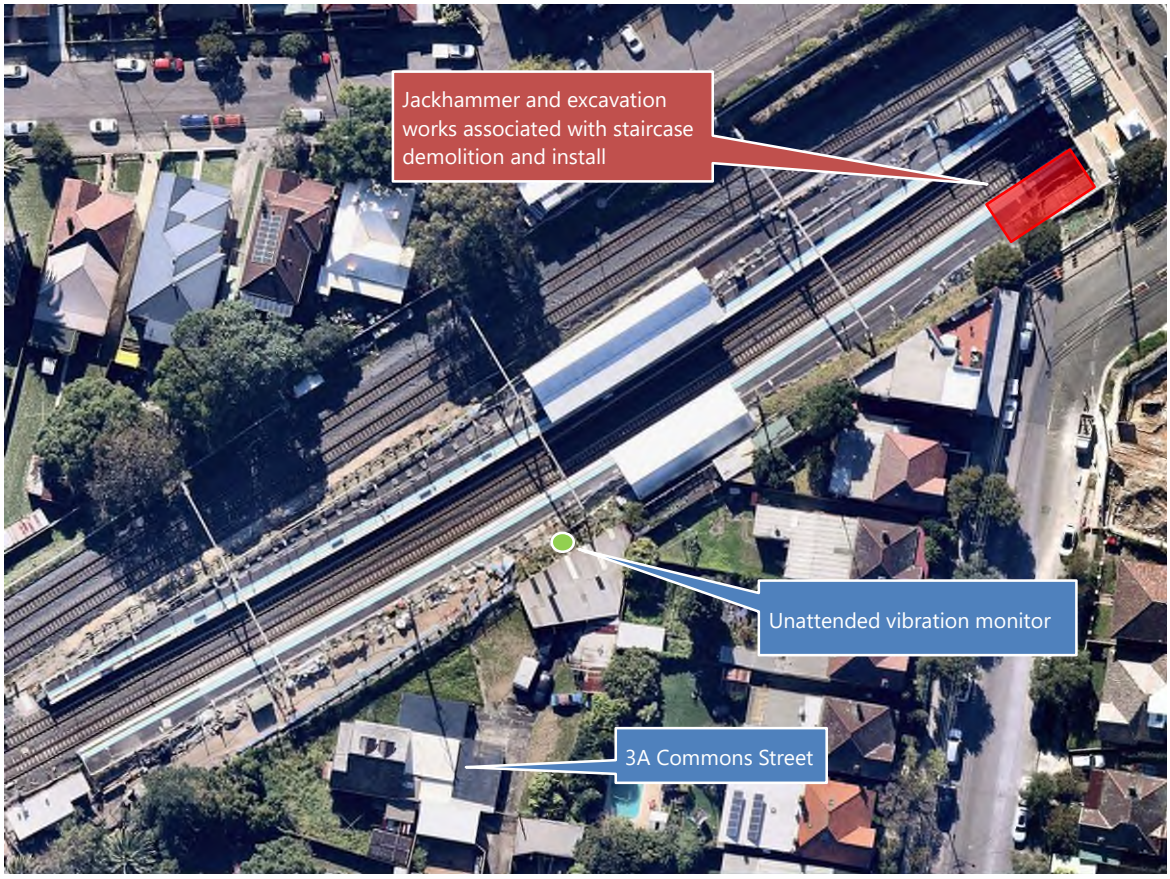
APPENDIX A Measurement locations

A.1 Dulwich Hill Station: 51 Ewart Lane, 71 Ewart Lane



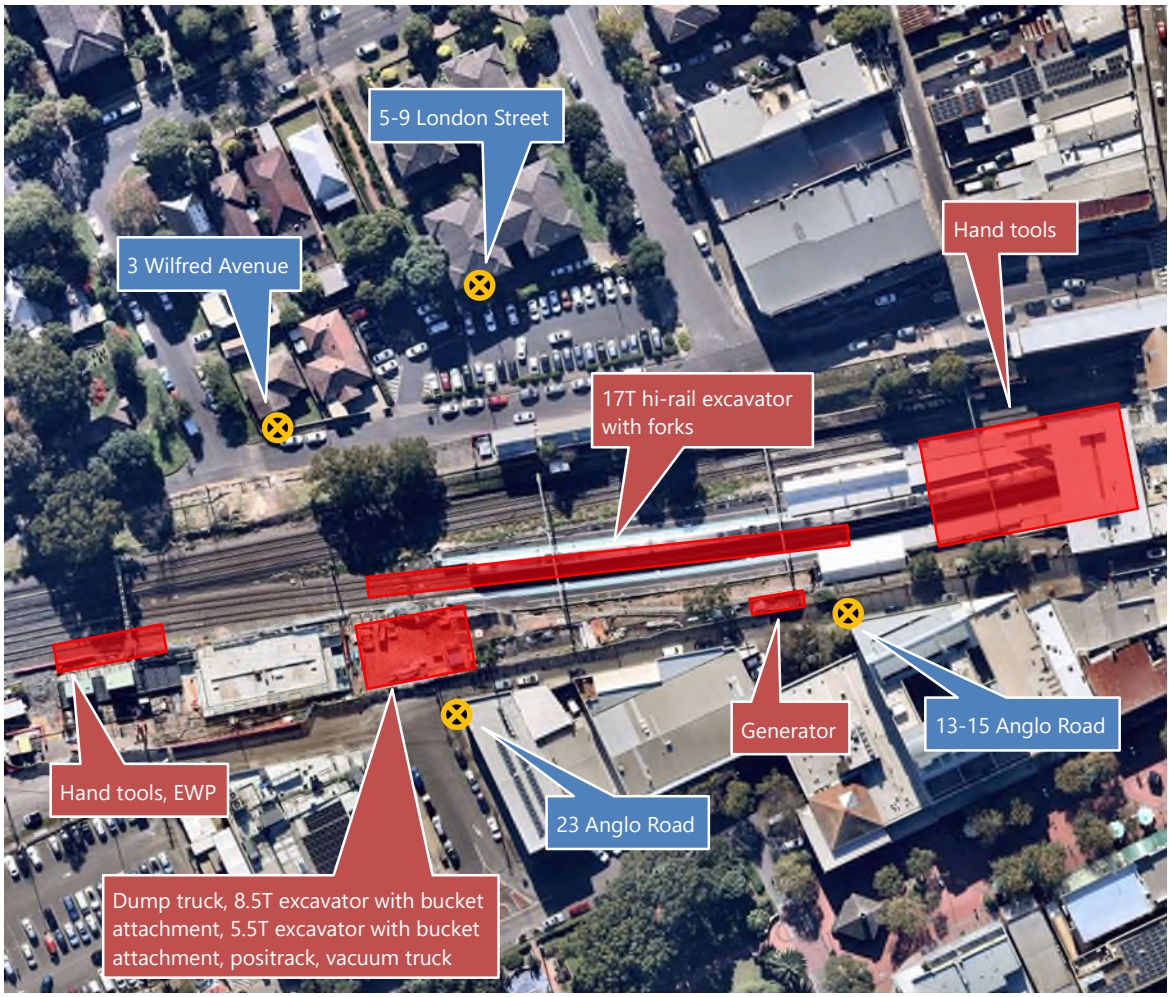
A.2 Hurlstone Park Station

A.2.1 Hurlstone Park – Vibration: 3A Commons Street

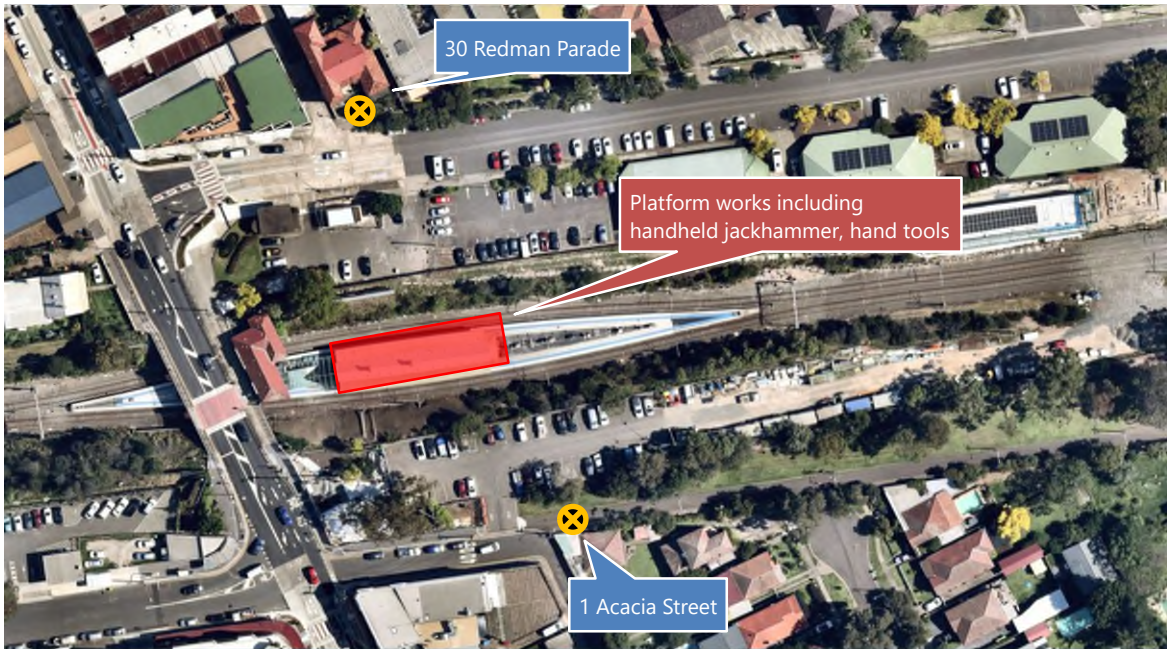


A.2.2 Hurlstone Park – Noise: 5 Railway Street, 12 Railway Street, 14 Railway Street, 2 Hopetoun Street, 107 Duntroon Street, 109 Duntroon Street, 124 Duntroon Street, 126 Duntroon Street, 26 Floss Street

A.3 Campsie Station: 13-15 Anglo Road, 23 Anglo Road, 5-9 London Street, 3 Wilfred Avenue



A.4 Belmore Station: 30 Redman Parade, 1 Acacia Street



A.5 Wiley Park Station: 1-3 Shadforth Street, 2 Shadforth Street

A.6 Punchbowl Station: 41 Urunga Street, 279 The Boulevarde, 14 Arthur Street

Appendix 7 – TL927-1-27F01 Hurlstone Park Station Vibration Monitoring Report (r2)

24 August 2022
TL927-1-27F01 Hurlstone Park Station Vibration Monitoring Report (r2)

Downer EDI Works Pty Ltd
76 Berry Street
Nth Sydney NSW 2060

Sydney Metro Southwest - Station Upgrades - Hurlstone Park Station Vibration Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct vibration monitoring during the Station Upgrades works for Sydney Metro Southwest. The vibration monitoring was undertaken to assess the potential vibration impacts on residential structures during vibration intensive works at Hurlstone Park Station. This report provides a summary of the monitoring results.

2 Details of monitoring

Unattended vibration monitors were installed within residential boundaries in Hurlstone Park between 27th April 2022 and 2nd July 2022.

2.1 Measurement location

The measurement locations are listed in Table 2-1. Figures depicting the monitoring location are included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date	Measured plant	Monitoring type	Approx. distance to measured plant
M1	3 Railway Street, Hurlstone Park. Assessing residential shed. Refer to Appendix A.1.	27.04.2022 – 02.06.2022	20T excavator with hammer attachment	Vibration	3m-10m
M2	2 Hopetoun Street, Hurlstone Park. Assessing residential shed. Refer to Appendix A.2.	04.05.2022 – 27.05.2022	20T excavator with hammer attachment	Vibration	3m-10m
M3	3A Commons Street, Hurlstone Park. Assessing residential building. Refer to Appendix A.3.	24.05.2022 – 09.06.2022	Bored piling rig	Vibration	3m-5m

Measurement ID	Assessment Point	Date	Measured plant	Monitoring type	Approx. distance to measured plant
M4	5 Railway Street, Hurlstone Park. Assessing residential building. Refer to Appendix A.4.	27.05.2022 – 02.07.2022	20T excavator with hammer attachment	Vibration	3m-10m
M5	2 Hopetoun Street, Hurlstone Park. Assessing residential shed. Refer to Appendix A.5.	02.06.2022 – 22.06.2022	20T excavator with hammer attachment	Vibration	3m-10m
M6	2 Hopetoun Street, Hurlstone Park. Assessing residential building. Refer to Appendix A.6.	03.06.2022 – 22.06.2022	20T excavator with hammer attachment	Vibration	10m-15m

2.2 Measurement equipment

The instrumentation used for the vibration measurement are summarised in Table 2-2:. The accelerometers used in the measurements have current calibration certificates.

Table 2-2: Summary of vibration instrumentation

Type	Make / Model
Triaxial Transducers	Sigicom C12 (SN: 66830)
Triaxial Transducers	Sigicom C12 (SN: 70130)
Triaxial Transducers	Sigicom C22 (SN: 107552)
Triaxial Transducers	Sigicom C22 (SN: 107777)

3 Vibration screening criteria

In accordance with the Sydney Metro City Southwest Chatswood to Sydenham Construction Noise and Vibration Strategy (CNVS)[1], the established vibration screening criteria for the affected structures are shown below:

- Reinforced or framed structures: 25 mm/s
- Unreinforced or light framed structures: 7.5 mm/s

[1] Sydney Metro City Southwest Chatswood to Sydenham Construction Noise and Vibration Strategy (ref: Sydney_Metro_City_Southwest_Construction_Noise_and_Vibration Strategy v0.4), version 0.4, dated 08 August 2016

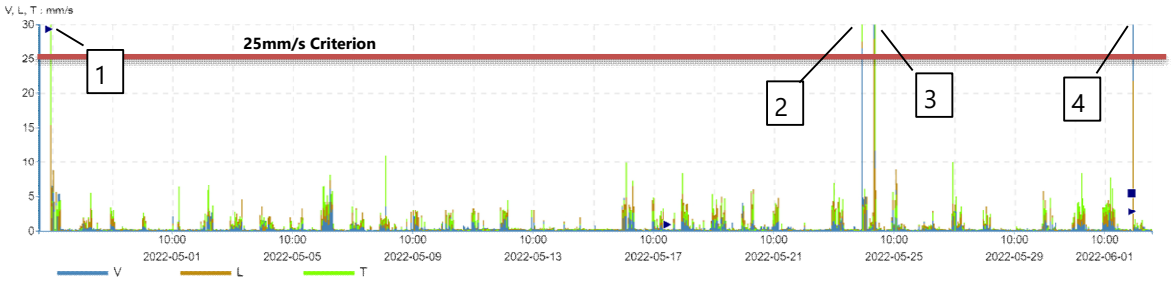
4 Vibration monitoring results

4.1 M1: 3 Railway Street, Hurlstone Park vibration monitoring

The M1 vibration monitor was located in line with the residential shed in the backyard of 3 Railway Street, Hurlstone Park. Considering the shed is likely to be on top of a reinforced concrete structure, the corresponding vibration screening criterion for the shed is 25 mm/s.

The results of the unattended vibration monitoring for 3 Railway Street between 27th April 2022 and 2nd June 2022 is shown in Figure 4-1.

Figure 4-1: M1 vibration monitoring results between 27th April 2022 and 2nd June 2022



The discussion of the M1 vibration monitoring results is summarised in Table 4-1.

Table 4-1: M1 vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	27.04.2022 07:34am	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	24.05.2022 07:12am	The vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. No rockhammering activities were occurring. Therefore, the cause of the exceedance was deemed not construction related.
3	24.05.2022 05:10pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
4	02.06.2022 07:29am	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitoring from the ground spike. No construction activities were occurring.

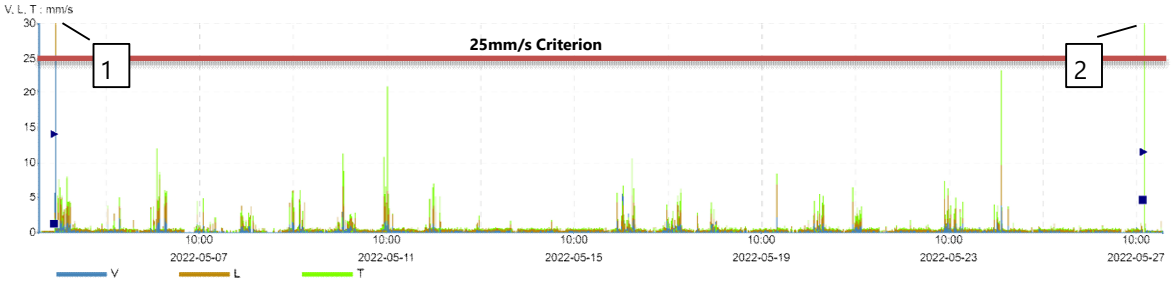
It can be seen in Figure 4-1 that the vibration levels produced from the nearby trenching works is typically below 25 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 25 mm/s which have been deemed not construction related.

4.2 M2: 2 Hopetoun Street, Hurlstone Park vibration monitoring

The M2 vibration monitor was located in line with the residential shed in the backyard of 2 Hopetoun Street, Hurlstone Park. Considering the shed is likely to be on top of a reinforced concrete structure, the corresponding vibration screening criterion for the shed is 25 mm/s.

The results of the unattended vibration monitoring for 2 Hopetoun Street between 4th May 2022 and 27th May 2022 is shown in Figure 4-2.

Figure 4-2: M2 vibration monitoring results between 4th May 2022 and 27th May 2022



The discussion of the M2 vibration monitoring results is summarised in Table 4-2.

Table 4-2: M2 vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	04.05.2022 07:51am	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	27.05.2022 12:56pm	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitoring from the ground spike. No construction activities were occurring at this time.

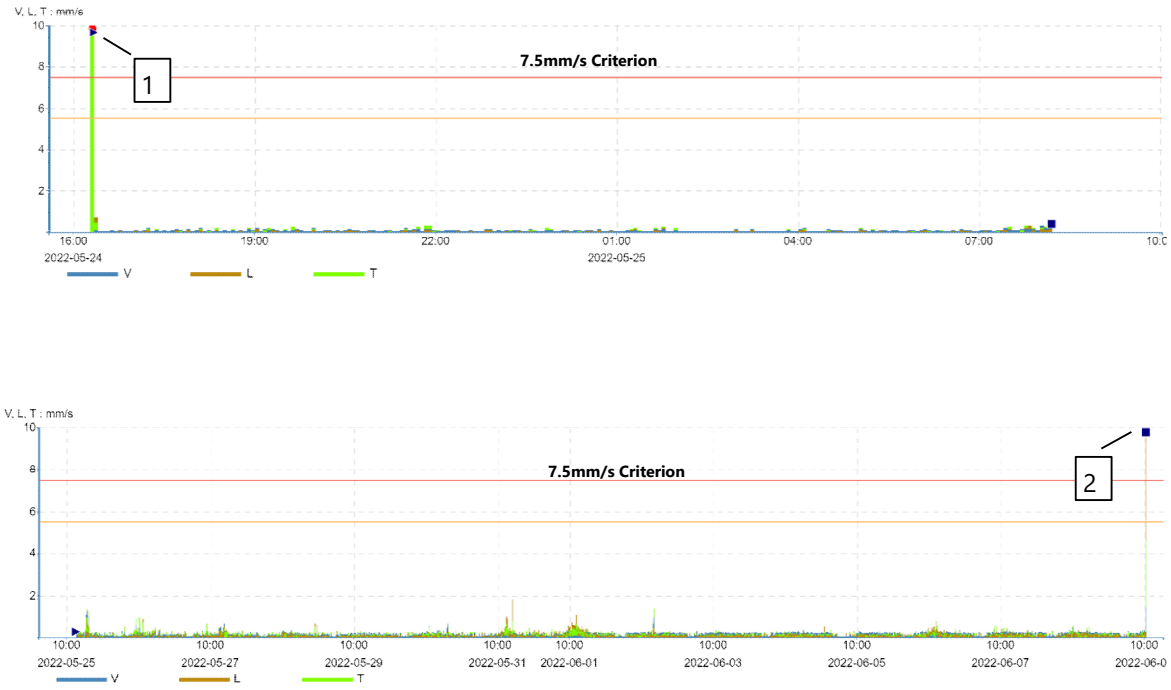
It can be seen in Figure 4-2 that the vibration levels produced from the nearby trenching works is typically below 25 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 25 mm/s which have been deemed not construction related.

4.3 M3: 3A Commons Street, Hurlstone Park

The M3 vibration monitor was located in line with the residential building of 3A Commons Street. The corresponding vibration screening criterion for the residential building is 7.5 mm/s.

The results of the unattended vibration monitoring for 3A Commons Street between 24th May 2022 and 9th June 2022 is shown in Figure 4-3.

Figure 4-3: M3 vibration monitoring results between 24th May 2022 and 9th June 2022



The discussion of the M3 vibration monitoring results is summarised in Table 4-3.

Table 4-3: M3 vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	24.05.2022 04:39pm	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	09.06.2022 10:00am	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitoring from the ground spike. No construction activities were occurring at this time.

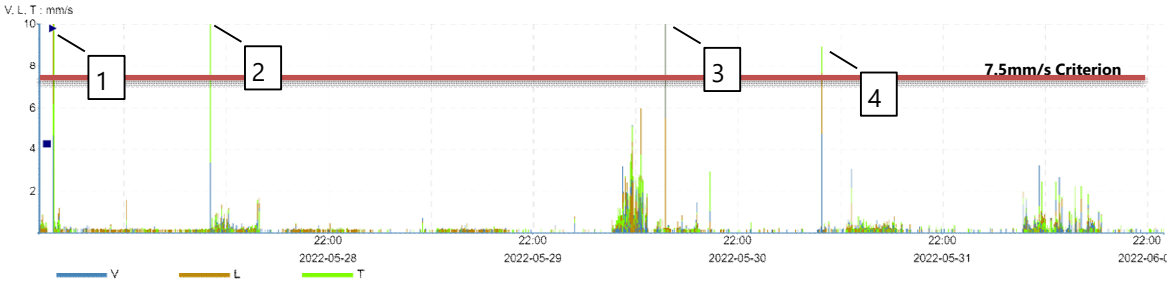
It can be seen in Figure 4-2 that the vibration levels produced from the nearby piling works is typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been deemed not construction related.

4.4 M4: 5 Railway Street, Hurlstone Park Vibration Monitoring

The M4 vibration monitor was located in line with the residential building of 5 Railway Street. The corresponding vibration screening criterion for the residential building is 7.5 mm/s.

The results of the unattended vibration monitoring for 5 Railway Street between 20th April 2022 and 4th May 2022 have been presented in the report *5 Railway Street, Hurlstone Park Vibration Monitoring Report*[2]. The vibration monitoring results of 5 Railway Street between 27th May 2022 and 2nd July 2022 are shown in Figure 4-4, Figure 4-5 and Figure 4-6.

Figure 4-4: M4 vibration monitoring results between 27th May 2022 and 1st June 2022



[2] TL927-1-25F01 5 Railway Street, Hurlstone Park Vibration Monitoring Report (r2), revision 2, dated 14 June 2022

Figure 4-5: M4 vibration monitoring results between 1st June 2022 and 15th June 2022

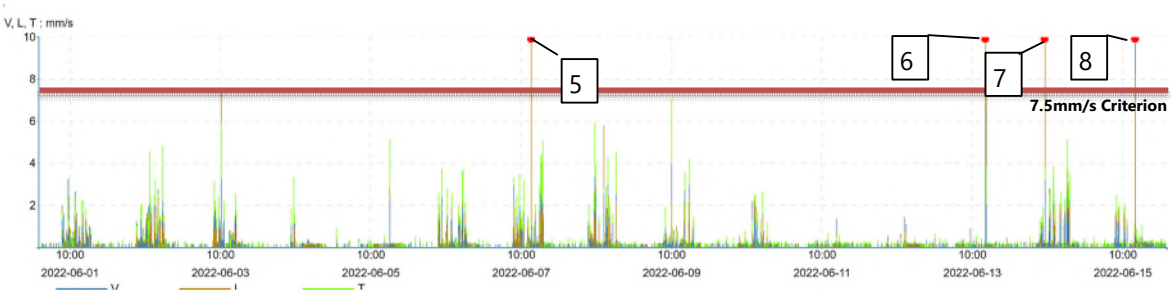
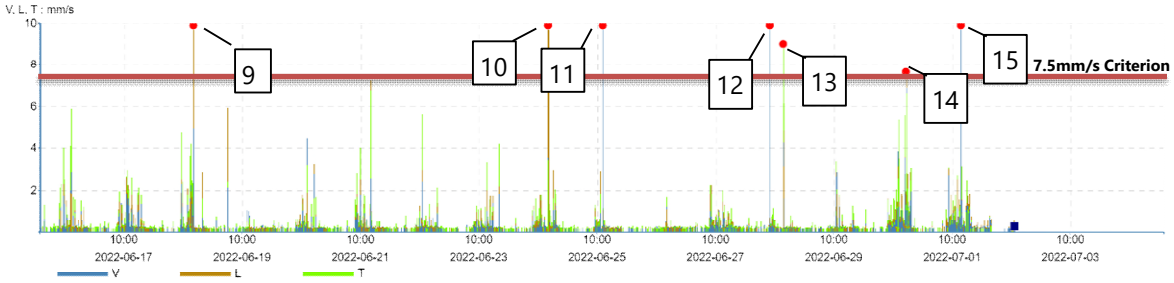


Figure 4-6: M4 vibration monitoring results between 15th June 2022 and 2nd July 2022



The discussion of the M4 vibration monitoring results is summarised in Table 4-4.

Table 4-4: M4 vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	27.05.2022 01:41pm	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	28.05.2022 08:04am	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
3	30.05.2022 1:30pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. Only excavators were moving approximately 10m away from the monitoring location. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.

Exceedance ID	Date and Time	Cause of exceedance
4	31.05.2022 07:46am	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
5	07.06.2022 01:10pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction activities occurring during the time of exceedance. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
6	13.06.2022 02:10pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction works occurring on the day. Therefore, the cause of the exceedance was deemed not construction related.
7	14.06.2022 09:05am	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
8	15.06.2022 01:59pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. Only concrete pouring works were occurring during this time. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
9	18.06.2022 02:01pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that all construction activities have finished for the day. Therefore, the cause of the exceedance was deemed not construction related.
10	24.06.2022 01:53pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
11	25.06.2022 12:02pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction activities occurring during the time of exceedance. Therefore, the cause of the exceedance was deemed not construction related.

Exceedance ID	Date and Time	Cause of exceedance
12	28.06.2022 07:50am	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
13	28.06.2022 01:11pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
14	30.06.2022 03:02pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there was no rockhammering activities occurring during the time of exceedance. Only excavators moving materials on site. It is noted that there was no gradual build-up of vibration levels before the exceedance. Furthermore, the sporadic nature of the exceedance and the uncharacteristic vibration level compared to the trenching works on the same day, coupled by the significant decrease in vibration levels after the exceedance indicates an extraneous event inadvertently nudging the monitor might have caused the exceedance. Therefore, the cause of the exceedance was deemed not construction related.
15	01.07.2022 1:16pm	At this time, the vibration monitor recorded an instantaneous vibration level over 7.5 mm/s. The Project team has confirmed that there were no construction activities occurring during the time of exceedance. Therefore, the cause of the exceedance was deemed not construction related.

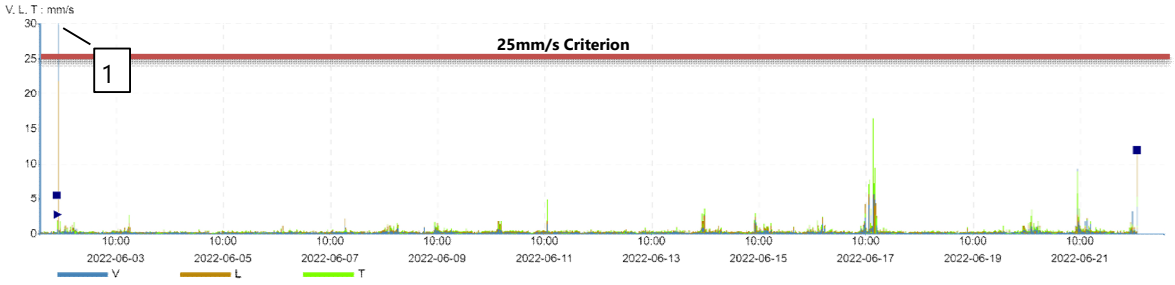
It can be seen in Figure 4-4:, Figure 4-5 and Figure 4-6 that the vibration levels produced from the nearby trenching works are typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been deemed not construction related.

4.5 M5: 2 Hopetoun Street, Hurlstone Park vibration monitoring

The M5 vibration monitor was located in line with the residential shed in the backyard of 2 Hopetoun Street, Hurlstone Park. Considering the shed is likely to be on top of a reinforced concrete structure, the corresponding vibration screening criterion for the shed is 25 mm/s.

The results of the unattended vibration monitoring for 2 Hopetoun Street between 2nd June 2022 and 22nd June 2022 is shown in Figure 4-7.

Figure 4-7: M5 vibration monitoring results between 2nd June 2022 and 22nd June 2022



The discussion of the M5 vibration monitoring results is summarised in Table 4-5.

Table 4-5: M5 vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	02.06.2022 08:18am	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.

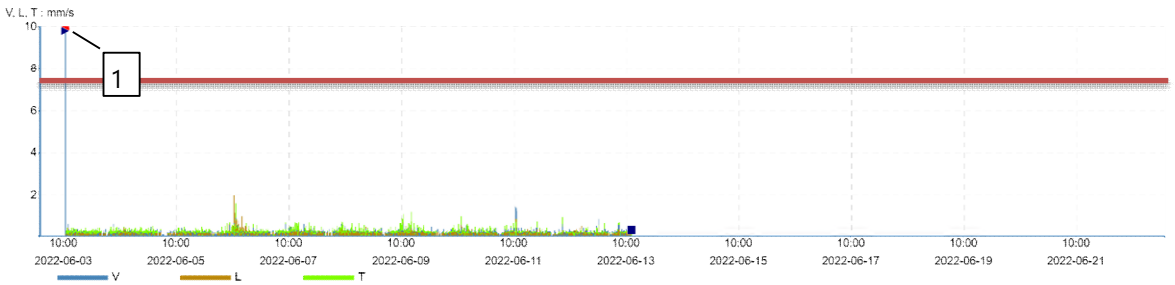
It can be seen in Figure 4-7 that the vibration levels produced from the nearby trenching works is typically below 25 mm/s. Note that there was an event that resulted in an instantaneous vibration level of above 25 mm/s which have been deemed not construction related.

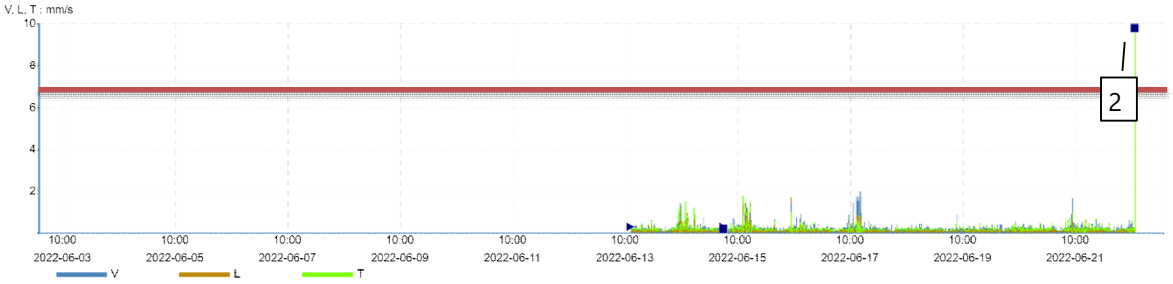
4.6 M6: 2 Hopetoun Street, Hurlstone Park vibration monitoring

The M6 vibration monitor was located in line with the residential building of 2 Hopetoun Street, Hurlstone Park. The corresponding vibration screening criterion for the residential building is 7.5 mm/s.

The results of the unattended vibration monitoring for 2 Hopetoun Street between 3rd June 2022 and 22nd June 2022 is shown in Figure 4-8.

Figure 4-8: M6 vibration monitoring results between 3rd June 2022 and 22nd June 2022





The discussion of the M5 vibration monitoring results is summarised in Table 4-6.

Table 4-6: M6 vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	03.06.2022 10:32am	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	22.06.2022 11:09am	At this time, the vibration monitor was removed from the ground spike to complete the vibration monitoring. The exceedance was caused by the RT&A engineer removing the monitoring from the ground spike. No construction activities were occurring at this time.

It can be seen in Figure 4-8 that the vibration levels produced from the nearby trenching works is typically below 7.5 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 7.5 mm/s which have been deemed not construction related.

5 Conclusion

Renzo Tonin & Associates has completed vibration monitoring during the Station Upgrades works at Hurlstone Park Station for Sydney Metro Southwest. The results of the unattended vibration monitoring were typically below the established vibration screening criteria established in the CNVS. There were events that resulted in an instantaneous vibration level of above the vibration screening criteria which have been investigated and deemed not construction related.

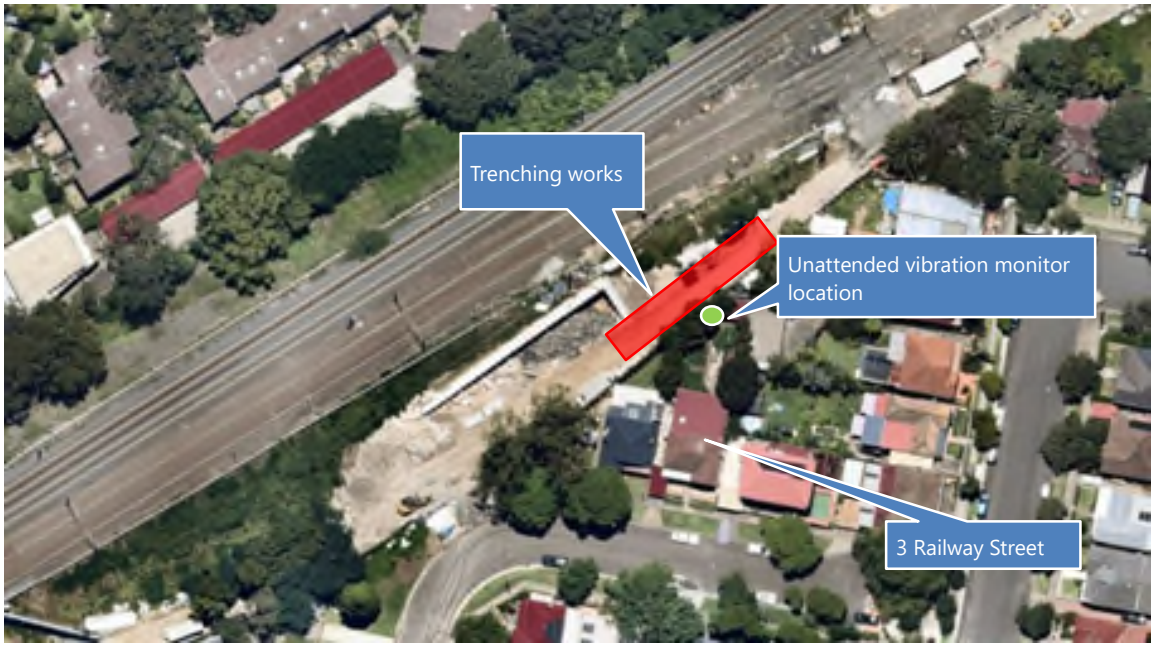
Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
08.08.2022	First Issue	0	1	J. Liang	R. Zhafranata	T. Gowen
24.08.2022	Report revised to address client's comments	-	2	R. Zhafranata	T. Gowen	T. Gowen

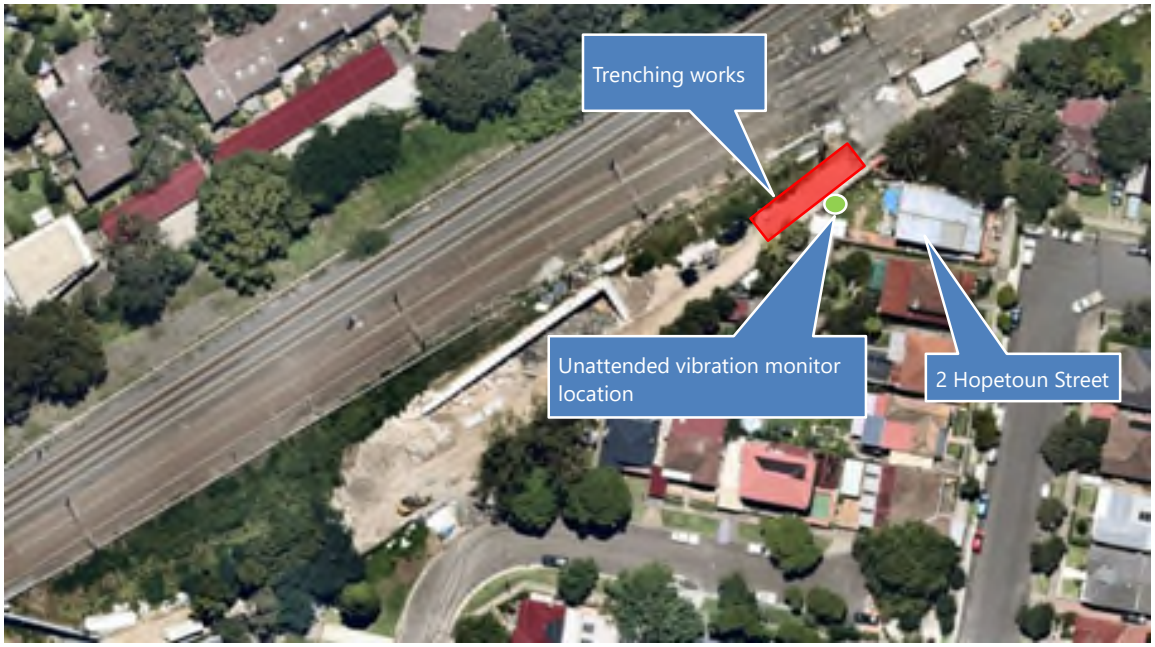
File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\27 April22 - July22 Hurlstone Park Vibration Monitoring\TL927-1-27F01 Hurlstone Park Station Vibration Monitoring Report (r2).docx

APPENDIX A Measurement locations

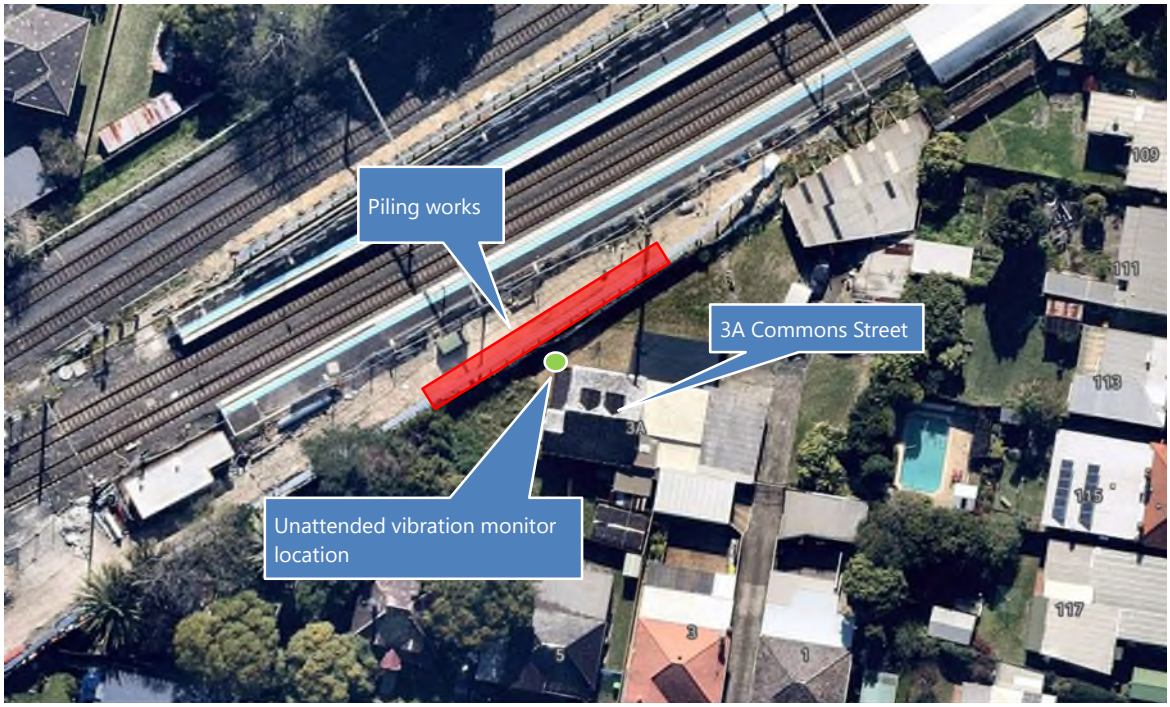
A.1 M1: 3 Railway Street, Hurlstone Park



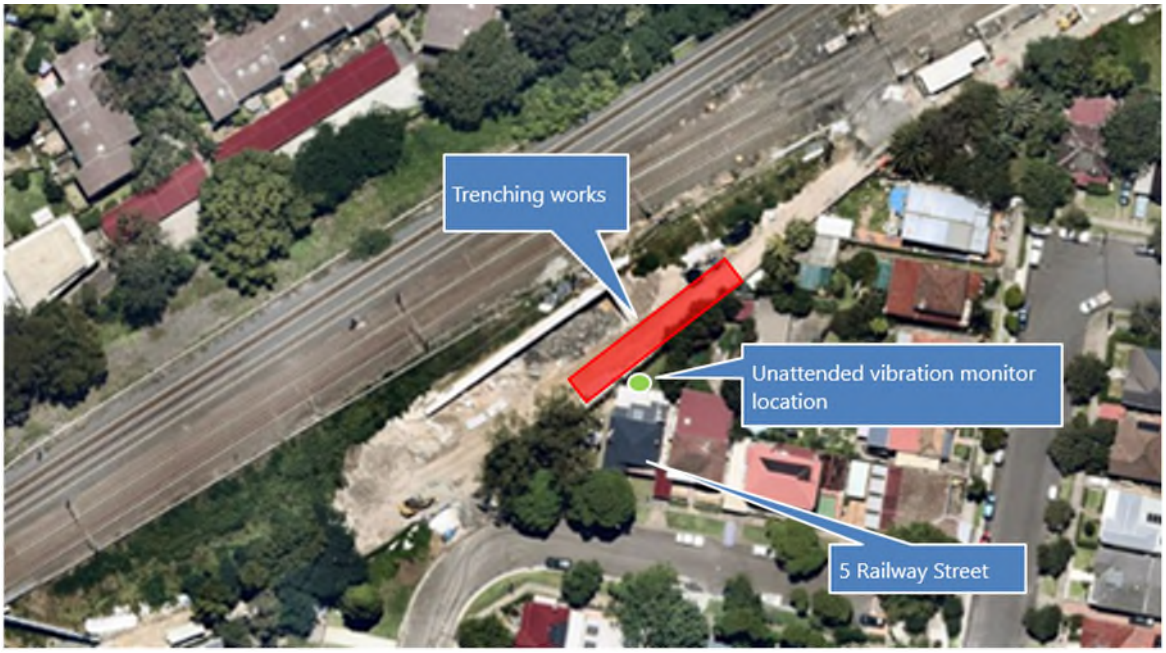
A.2 M2: 2 Hopetoun Street, Hurlstone Park



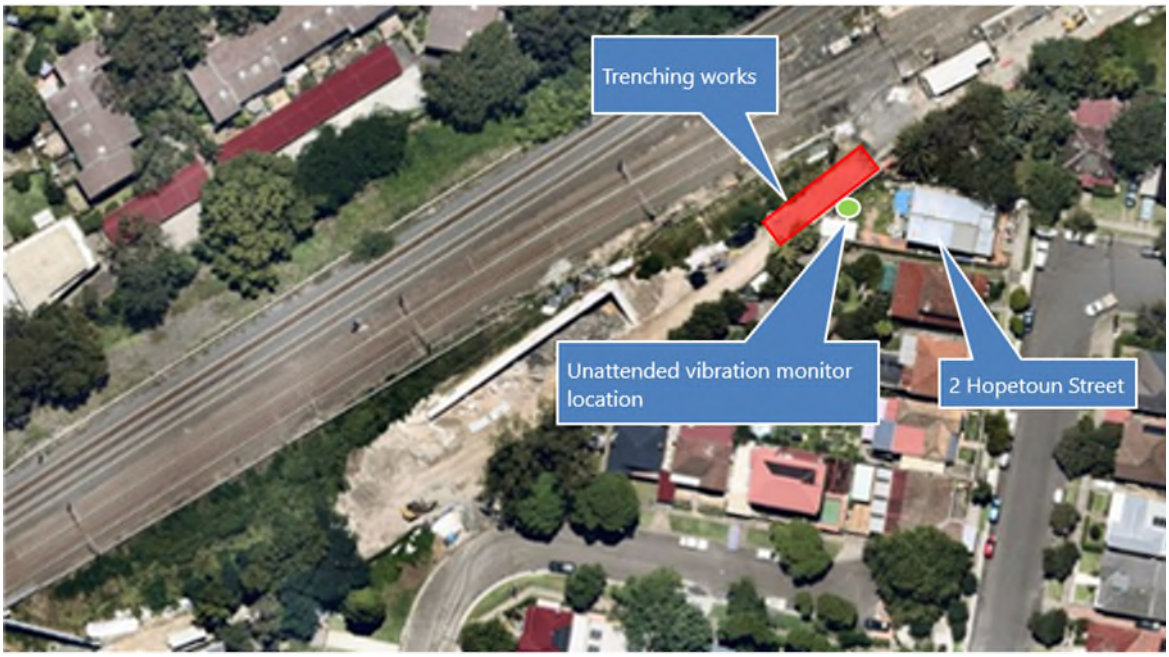
A.3 M3: 3A Commons Street, Hurlstone Park



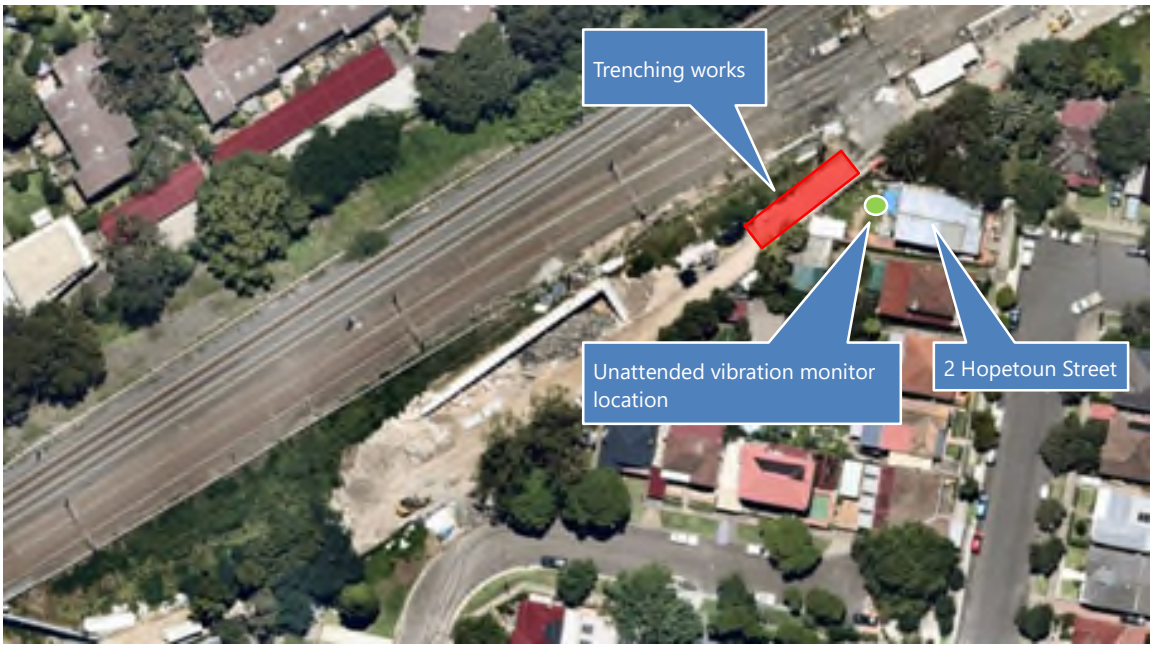
A.4 M4: 5 Railway Street, Hurlstone Park



A.5 M5: 2 Hopetoun Street, Hurlstone Park



A.6 M6: 2 Hopetoun Street, Hurlstone Park



Appendix 8 – TL927-1-28F01 5 Railway Street Hurlstone Park Station Vibration Monitoring Report (r2)

5 September 2022

TL927-1-28F01 5 Railway Street Hurlstone Park Station Vibration Monitoring Report (2)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road
North Ryde NSW 2113

Sydney Metro Southwest - Station Upgrades - Hurlstone Park Station Rockhammering Vibration Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct vibration monitoring during the Station Upgrades works for Sydney Metro Southwest. The vibration monitoring was undertaken at Hurlstone Park Station during the rockhammering works in the MSB work area adjacent to 5 Railway Street, Hurlstone Park. This report provides a summary of the monitoring results.

2 Details of monitoring

Vibration monitoring was undertaken between 25th July 2022 – 26th July 2022 in the MSB work area adjacent to 5 Railway Street, Hurlstone Park.

2.1 Monitoring location

The monitoring location is shown in Figure 2-1 and the details of the measurements are listed in Table 2-1. Photos depicting the monitoring location are included in APPENDIX A.

Figure 2-1: Monitoring location

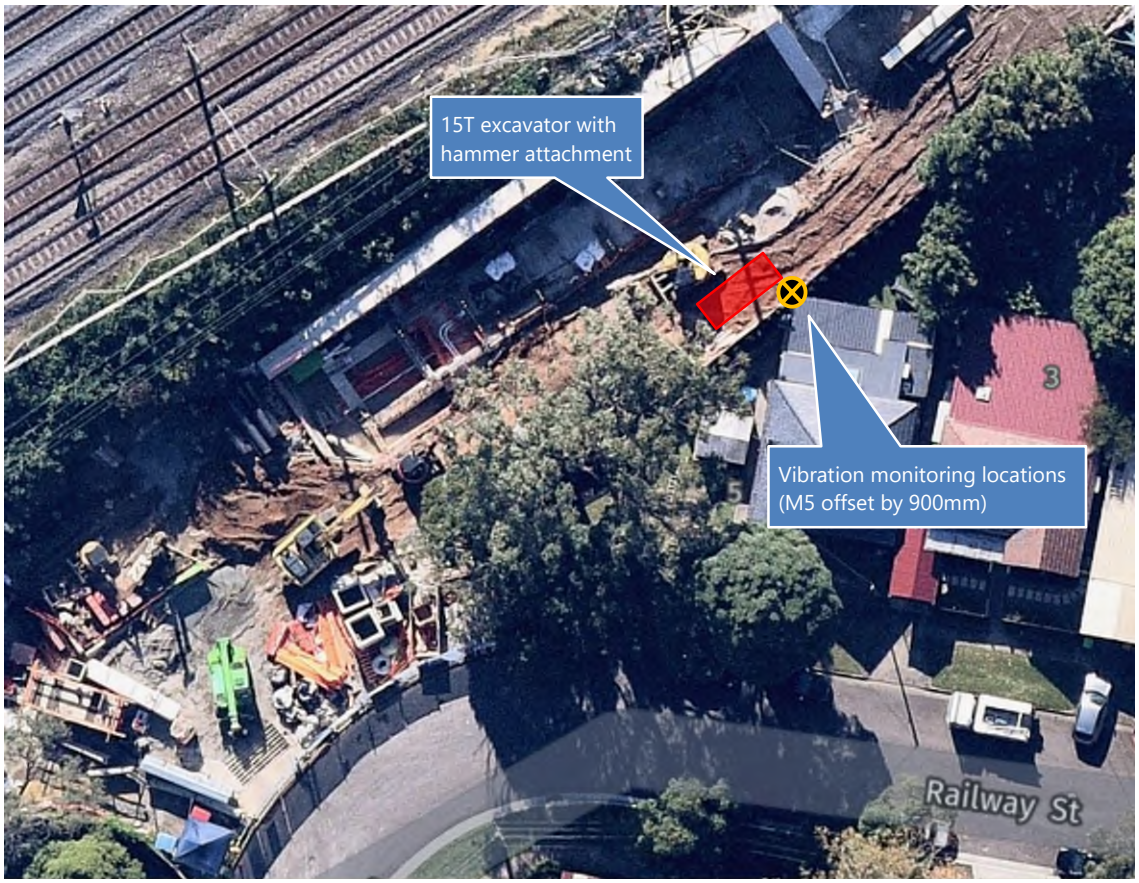


Table 2-1: Measurement details

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant
M1	100mm from the boundary fence behind the sediment fence. 300mm from the closest structure of 5 Railway Street, Hurlstone Park.	25.07.2022 04:40pm – 04:42pm	Baseline Monitoring	Vibration	N/A
M2	100mm from the boundary fence behind the sediment fence. 300mm from the closest structure of 5 Railway Street, Hurlstone Park.	25.07.2022 04:42pm – 04:54pm	15T Excavator with hammer attachment (low–medium hammer force)[1]	Vibration	2m–5m
M3	100mm from the boundary fence behind the sediment fence. 300mm from the closest structure of 5 Railway Street, Hurlstone Park.	26.07.2022 09:44am – 09:50am	Baseline Monitoring	Vibration	N/A
M4	100mm from the boundary fence behind the sediment fence. 300mm from the closest structure of 5 Railway Street, Hurlstone Park.	26.07.2022 09:51am – 10:21am	15T Excavator with hammer attachment (low–medium hammer force)[1]	Vibration	2m–5m
M5	Attached directly onto the boundary fence of 5 Railway Street, Hurlstone Park.	26.07.2022 09:51am – 10:21am	15T Excavator with hammer attachment (low–medium hammer force)[1]	Vibration	2m–5m

1. The specifications provided by the project engineer on site

2.2 Measurement equipment

The accelerometers were mounted as close as possible to the boundary fence at the rear of 5 Railway Street, Hurlstone Park. The vibration monitoring locations were approximately 300mm from the closest affected structure at the residence and 100m from the boundary fence as presented in Figure 2-1. In accordance with AS 2775-2004[1], a ground spike was planted into the surface and the accelerometers were mounted on the ground spike using double sided adhesive tape. An additional measurement was undertaken by attaching the accelerometer on the boundary fence using double sided adhesive tape.

The instrumentation used for the vibration measurement are summarised in Table 2-2. The accelerometers used in the measurements have current calibration certificates.

Table 2-2: Summary of vibration instrumentation

Type	Make / Model
Type 1 Signal Analyser	Soundbook-2
Accelerometer	Endevco 61C3

[1] Australia Standard 2775-2004 Mechanical vibration and shock – Mechanical mounting of accelerometers

3 Vibration monitoring results

In accordance with the Hurlstone Park Station Vibration Monitoring Plan[2], the established cosmetic damage vibration screening criterion for 5 Railway Street, Hurlstone Park is:

1. Unreinforced or light framed structures: 7.5 mm/s

The results of the vibration monitoring for 5 Railway Street, Hurlstone Park are presented in Table 3-1 below.

Table 3-1: Measured vibration level summary

Measurement ID	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
M1	Baseline Monitoring	N/A	0.03	0.75	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite)
M2	15T excavator with hammer attachment (low–medium hammer force)[1]	2m–5m	3.19	4.86	At 2m-5m away, the 15T excavator with hammer attachment produced vibration levels that were below the established screening criterion for cosmetic damage.
M3	Baseline Monitoring	N/A	0.03	0.16	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite)
M4	15T excavator with hammer attachment (low–medium hammer force)[1]	2m–5m	1.94	3.28	At 2m-5m away, the 15T excavator with hammer attachment produced vibration levels that were below the established screening criterion for cosmetic damage.
M5	15T excavator with hammer attachment (low–medium hammer force)[1]	2m–5m	0.96	3.53	At 2m-5m away, the 15T excavator with hammer attachment produced vibration levels on the boundary fence that were below the established screening criterion for cosmetic damage. As a result, no further monitoring is required for the 15T excavator with hammer attachment in this work area on the specified force setting.

1. The specifications provided by the project engineer on site

As can be noted from Table 3-1 above, the 15T excavator with hammer attachment on low-medium force setting produced vibration levels below the established cosmetic damage vibration screening criterion. Given that the vibration monitoring results are below the screening criterion, the risk of cosmetic damage is low. Therefore, further vibration monitoring is not required for cosmetic damage.

[2] Sydney Metro Southwest – Station Upgrades – Hurlstone Park Station Vibration Monitoring Plan (ref: TL927-1-14F01 Hurlstone Park Stn VIB MON PLAN (r2)), dated 14 October 2021

4 Conclusion

Renzo Tonin & Associates has completed vibration monitoring during the Station Upgrades works for Sydney Metro Southwest.

The vibration monitoring results show that the measured vibration levels produced by the 15T excavator with hammer attachment on low-medium force setting were below the established vibration screening criterion for cosmetic damage. Therefore, the risk of cosmetic damage is assessed as low.

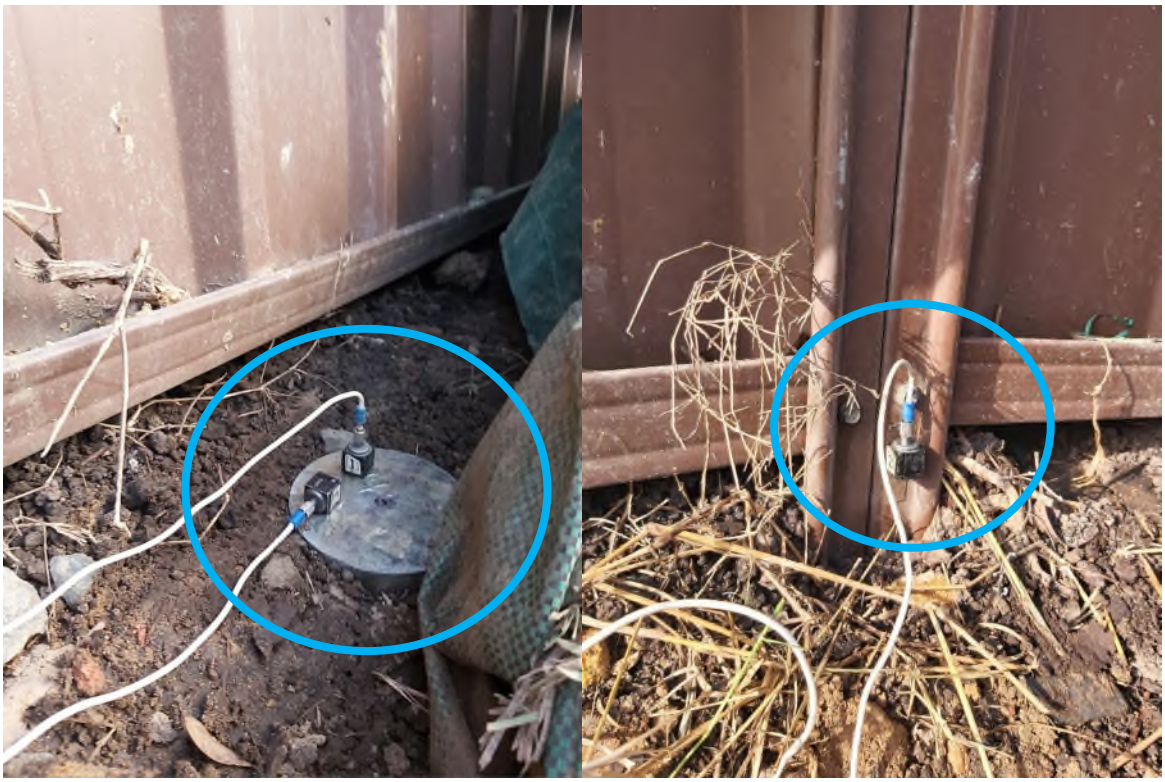
Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
27.07.2022	First Issue	0	1	L. Woolf	R. Zhafranata	M. Tabacchi
05.09.2022	Report revised to address client's comments	-	2	R. Zhafranata	M. Tabacchi	M. Tabacchi

File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\28 July 25-26 Hammering 5 Railway St Hurlstone Park Vibration Monitoring\TL927-1-28F01 5 Railway Street Hurlstone Park Station Vibration Monitoring Report (2).docx

APPENDIX A Measurement location

A.1 5 Railway Street, Hurlstone Park



Appendix 9 – TL927-1-29F01 5 Railway Street, Hurlstone Park Vibration Monitoring Report(r1)

18 August 2022
TL927-1-29F01 5 Railway Street, Hurlstone Park Vibration Monitoring Report (r1)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road
North Ryde NSW 2113

Sydney Metro Southwest - Station Upgrades - Hurlstone Park Station Vibratory Roller and Jumping Jack Compactor Vibration Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct vibration monitoring during the Station Upgrades works for Sydney Metro Southwest. The vibration monitoring was undertaken at Hurlstone Park Station during the vibratory roller and jumping jack compactor works in the MSB work area adjacent to 5 Railway Street, Hurlstone Park. This report provides a summary of the monitoring results.

2 Details of monitoring

Vibration monitoring was undertaken on 8th August 2022 in the MSB work area adjacent to 5 Railway Street, Hurlstone Park.

2.1 Monitoring location

The monitoring locations are shown in Figure 2-1 and the details of the measurements are listed in Table 2-1. Photos depicting the monitoring locations are included in APPENDIX A.

Figure 2-1: Monitoring locations

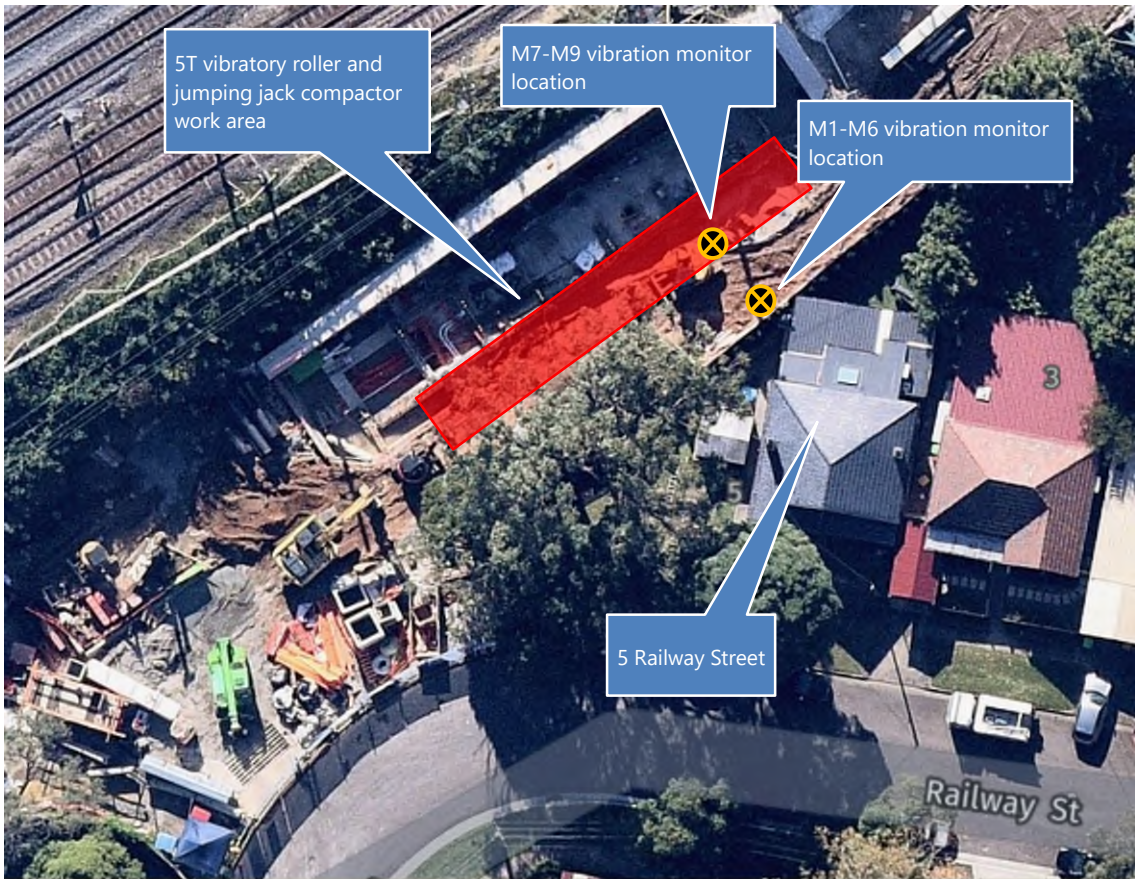


Table 2-1: Measurement details

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant
M1	5 Railway Street residential building structure.	08.08.2022 01:38pm – 01:39pm	Baseline Monitoring	Vibration	N/A
M2	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the jumping jack compactor work area is 5m.	08.08.2022 01:39pm – 01:41pm	Jumping jack compactor	Vibration	3.35m (the accelerometer was mounted as close as possible to the boundary fence).
M3	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.	08.08.2022 01:44pm – 01:45pm	5T padfoot roller on low rev and static mode[1]	Vibration	3.35m (the accelerometer was mounted as close as possible to the boundary fence).
M4	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.	08.08.2022 01:45pm – 01:46pm	5T padfoot roller on high rev and static mode[1]	Vibration	3.35m (the accelerometer was mounted as close as possible to the boundary fence).
M5	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.	08.08.2022 01:46pm – 01:48pm	5T padfoot roller on low rev and vibratory mode[1]	Vibration	3.35m (the accelerometer was mounted as close as possible to the boundary fence).
M6	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.	08.08.2022 01:48pm – 01:50pm	5T padfoot roller on high rev and vibratory mode[1]	Vibration	3.35m (the accelerometer was mounted as close as possible to the boundary fence).
M7	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.	08.08.2022 02:00pm – 02:02pm	5T padfoot roller on high rev and vibratory mode[1]	Vibration	1m
M8	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the jumping jack compactor work area is 5m.	08.08.2022 02:03pm – 02:04pm	Jumping jack compactor	Vibration	1m
M9	5 Railway Street residential building structure. The closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.	08.08.2022 02:07pm – 02:09pm	5T padfoot roller on high rev and vibratory mode[1]	Vibration	2m

1. The specifications provided by the project engineer on site

2.2 Measurement equipment

The accelerometer was mounted as close as possible to the boundary fence at the rear of 5 Railway Street, Hurlstone Park for M1-M6 measurements. The accelerometer was mounted inside the vibratory roller and jumping jack compactor work area for M7-M9 measurements. In accordance with AS 2775-2004[1], a ground spike was planted into the surface and the accelerometer was mounted on the ground spike using double sided adhesive tape for all measurements.

The instrumentation used for the vibration measurement are summarised in Table 2-2. The accelerometers used in the measurements have current calibration certificates.

Table 2-2: Summary of vibration instrumentation

Type	Make / Model
Type 1 Signal Analyser	Soundbook-2
Accelerometer	Endevco 61C3

3 Vibration monitoring results

In accordance with the Hurlstone Park Station Vibration Monitoring Plan[2], the established cosmetic damage vibration screening criterion for 5 Railway Street, Hurlstone Park is:

1. Unreinforced or light framed structures: 7.5 mm/s

The results of the vibration monitoring for 5 Railway Street, Hurlstone Park are presented in Table 3-1 below.

Table 3-1: Measured vibration level summary

Measurement ID	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
M1	Baseline Monitoring	N/A	0.03	0.03	Baseline monitoring was conducted to establish the baseline vibration levels on site (i.e. with no vibration intensive activity on the worksite)
M2	Jumping jack compactor	3.35m	0.47	0.58	At 3.35m away, the jumping jack compactor produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street and the jumping jack compactor work area is 5m.

[1] Australia Standard 2775-2004 Mechanical vibration and shock – Mechanical mounting of accelerometers

[2] Sydney Metro Southwest – Station Upgrades – Hurlstone Park Station Vibration Monitoring Plan (ref: TL927-1-14F01 Hurlstone Park Stn VIB MON PLAN (r2)), dated 14 October 2021

Measurement ID	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
M3	5T padfoot roller on low rev and static mode[1]	3.35m	0.03	0.04	At 3.35m away, the 5T padfoot roller on low rev and static mode produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
M4	5T padfoot roller on high rev and static mode[1]	3.35m	0.03	0.04	At 3.35m away, the 5T padfoot roller on high rev and static mode produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
M5	5T padfoot roller on low rev and vibratory mode[1]	3.35m	0.03	0.05	At 3.35m away, the 5T padfoot roller on low rev and vibratory mode produced vibration levels that were below the established screening criterion for cosmetic damage. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
M6	5T padfoot roller on high rev and vibratory mode[1]	3.35m	0.81	1.07	At 3.35m away, the 5T padfoot roller on high rev and vibratory mode produced vibration levels that were below the established screening criterion for cosmetic damage. Therefore, the 5T padfoot roller on high rev and vibratory mode can be used for the work area defined in Figure 2-1. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
M7	5T padfoot roller on high rev and vibratory mode[1]	1m	7.88	9.33	At 1m away, the 5T padfoot roller on high rev and vibratory mode produced vibration levels that were above the established screening criterion for cosmetic damage. Therefore, the 5T padfoot roller on high rev and vibratory mode shall not be used within 1m from the boundary fence of 5 Railway Street. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.
M8	Jumping jack compactor	1m	6.39	7.16	At 1m away, the jumping jack compactor produced vibration levels that were below the established screening criterion for cosmetic damage. Therefore, the site-specific minimum working distance for the jumping jack compactor is 1m. Note that the closest distance between the boundary fence of 5 Railway Street to the jumping jack compactor work area is 5m.

Measurement ID	Plant	Distance from source	95th percentile PPV (mm/s)	Maximum PPV (mm/s)	Comments
M9	5T padfoot roller on high rev and vibratory mode[1]	2m	6.72	8.15	At 2m away, the 5T padfoot roller on high rev and vibratory mode produced maximum vibration levels that were above the established screening criterion for cosmetic damage. Therefore, the 5T padfoot roller on high rev and vibratory mode shall not be used within 2m from the boundary fence of 5 Railway Street. Note that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller work area is 5m.

1. The specifications provided by the project engineer on site

As can be noted from Table 3-1 above, the 5T padfoot roller on high rev and vibratory mode and jumping jack compactor produced vibration levels below the established cosmetic damage vibration screening criterion at 3.35m away from the works. Given that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller and jumping jack compactor work area is 5m, the measured plants can be used without exceeding the established cosmetic damage vibration screening criterion.

The site-specific minimum working distances for the plant measured to minimise the likelihood of cosmetic damage to structures are:

- 5T padfoot roller on high rev and vibratory mode - 3 metres from the boundary fence;
- Jumping jack compactor - 1 metre from the boundary fence.

A smaller vibratory roller (such as a 2T smooth drum roller) shall be used if the vibratory roller work area is less than 3m away from the boundary fence of 5 Railway Street. Further vibration monitoring is recommended if the vibratory roller work area is less than 3m away from the boundary fence of 5 Railway Street, to confirm the vibration levels.

4 Conclusion

Renzo Tonin & Associates has completed vibration monitoring during the Station Upgrades works for Sydney Metro Southwest.

The vibration monitoring results show that the 5T padfoot roller on high rev and vibratory mode and jumping jack compactor produced vibration levels below the established cosmetic damage vibration screening criterion at 3.35m away from the works. Given that the closest distance between the boundary fence of 5 Railway Street to the vibratory roller and jumping jack compactor work area is 5m, the measured plants can be used without exceeding the established cosmetic damage vibration screening criterion.

The site-specific minimum working distances for the 5T padfoot roller on high rev and vibratory mode is 3 metres and for the jumping jack compactor is 1 metre. A smaller vibratory roller shall be used if the vibratory roller work area is less than 3m away from the boundary fence of 5 Railway Street. Further vibration monitoring is recommended if the vibratory roller work area is less than 3m away from the boundary fence of 5 Railway Street, to confirm the vibration levels.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
18.08.2022	First Issue	0	1	R. Zhafranata	T. Gowen	T. Gowen

File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\29 August22 Roller & Jumping Jack Compactor 5 Railway St Vibration Monitoring\TL927-1-29F01 VIB MON Hurlstone Park_5 Railway Street (r1).docx

APPENDIX A Measurement location

A.1 5 Railway Street, Hurlstone Park

Appendix 10 – TL927-1-30F01 WE07 Noise Monitoring Report (r1)

22 August 2022
TL927-1-30F01 WE07 Noise Monitoring Report (r1)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road,
North Ryde NSW 2113

Sydney Metro Southwest - Station Upgrades - WE07 Wiley Park Noise Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise monitoring during the Station Upgrades WE07 possession works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding Gatewave model (Gatewave scenario ID: 5230). This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Wiley Park Station on 13th August 2022.

2.1 Measurement location

The noise measurements were conducted at the nominated monitoring locations. The measurement locations are listed in Table 2-1. Figures depicting the monitoring locations are included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	1-3 Shadforth Street, Wiley Park (Appendix A.1)	13.08.2022 12:05am – 12:20am	Power hand tools and workers moving fences	Noise	40m	No
M2	15 Alice Street, Wiley Park (Appendix A.1)	13.08.2022 12:18am – 12:33am	Non-power hand tools and power hand tools	Noise	100m	No
M3	106 The Boulevarde, Wiley Park (Appendix A.1)	13.08.2022 12:52am – 01:07am	Power hand tools	Noise	80m	No

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	A2A-16217-E0	13 August 2021
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	3009707	3 December 2021

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-3. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-3: Environmental conditions

Measurement ID	Assessment Point	Date and Start Time	Environmental Conditions
M1	1-3 Shadforth Street, Wiley Park (Appendix A.1)	13.08.2022 12:05am	Clear sky; air temperature 20ºC, wind speed < 5m/s; relative humidity 50%
M2	15 Alice Street, Wiley Park (Appendix A.1)	13.08.2022 12:18am	Clear sky; air temperature 20ºC, wind speed < 5m/s; relative humidity 50%

Measurement ID	Assessment Point	Date and Start Time	Environmental Conditions
M3	106 The Boulevarde, Wiley Park (Appendix A.1)	13.08.2022 12:52am	Clear sky; air temperature 20ºC, wind speed < 5m/s; relative humidity 50%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Measured noise levels $L_{Aeq(15min)}$

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	1-3 Shadforth Street, Wiley Park (Appendix A.1)	Light vehicles/traffic control utes, lighting tower, heavy vehicle idling and power hand tool	54^{T}	Power hand tools and workers moving fences	54	66	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is consistent with the predicted noise level. The ambient noise environment was dominated by road traffic noise on King Georges Road. The measured works were intermittent during this measurement. Loud noise events originated from item drops in the construction work area.
M2	15 Alice Street, Wiley Park (Appendix A.1)	Light vehicles/traffic control utes, lighting tower, heavy vehicle idling and power hand tool	60^{T}	Non-power hand tools and power hand tools	52	68	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to less plant operating during the measurement compared to the assumed noisier plant. The measured works were intermittent during this measurement. Loud noise events originated from residents talking at the monitoring location.
M3	106 The Boulevarde, Wiley Park (Appendix A.1)	Light vehicles/traffic control utes, lighting tower, heavy vehicle idling and power hand tool	56^{T}	Power hand tools	61	76	Yes ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is higher than the predicted noise level. This can be attributed to the heavy road traffic noise on King Georges Road. The measured works were intermittent during this measurement. The construction noise was barely audible from the monitoring location and measured to be 49-51 dB(A) when no road traffic noise was present. Loud noise events originated from road traffic vehicle passybys on King Georges Road.

Notes: T: Predicted $L_{Aeq, 15min}$ for Typical activities.

4 Conclusion

Renzo Tonin & Associates completed noise monitoring for the WE07 possession works. The results of the noise measurements were below or consistent with the predicted $L_{Aeq\ 15minutes}$ levels presented in the Gatewave model prepared for the works except for one measurement that exceeded the predicted level. However, this exceedance was caused by extraneous road traffic noise as opposed to the measured construction activities.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
22.08.2022	First issue	0	1	D. Auld	R. Zhafranata	T. Gowen

File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\30 August22 WE07 Wiley Park Noise Monitoring\TL927-1-30F01 WE07 Noise Monitoring Report (r1).docx

APPENDIX A Measurement locations

A.1 Wiley Park Station: 1-3 Shadforth Street, 15 Alice Street, and 106 The Boulevarde

Appendix 11 – Noise Monitoring Record Sheet – Hurlstone Park

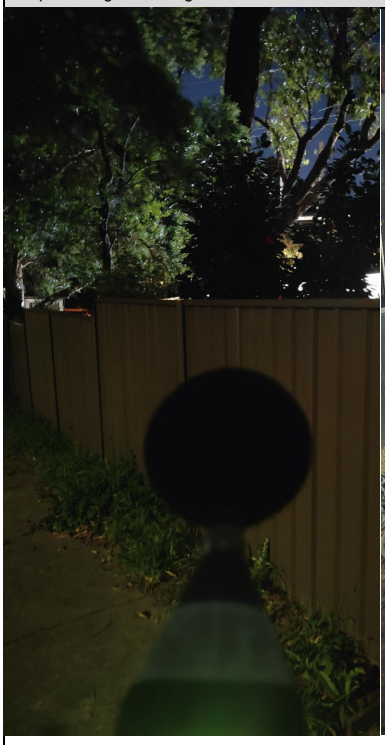
Noise Monitoring Record Sheet

DATE:	14-September-2022	**MAIN ACTIVITY**	Concrete finishing work at the MSB, Hurlstone Park	
CONDUCTED BY:	Elena Ivanova	**LOCATION OF WORKS:**	MSB, Hurlstone Park	
METEROLOGICAL CONDITIONS:				
Cloud cover (x/8)	**Wind speed (m/s) / Wind direction**	**Precipitation (mm)**	**Temp (°C)**	**RH (%) / Pressure (hPa)**
0	North East /11 km/hr	0	14.2	
INSTRUMENTATION				
SLM MAKE / MODEL:	SVAN971	**SERIAL NUMBER:**	103442	
TIME WEIGHTING:	FAST / ~~SLOW~~	**FREQUENCY WEIGHTING:**		A / ~~C / FLAT~~
FIELD CALIBRATION CHECK:	Yes (-0.03 dB drift)	**POST CALIBRATION CHECK:**		No

MONITORING DETAILS				
LOCATION No:	1	**ADDRESS:**	5 Railway Street, Hurlstone Park	
ACTIVITIES ON SITE (if applicable, Gatewave scenario ID):	Concrete finishing work		**MITIGATION MEASURES INSTALLED:**	Noise barries
PLANT OPERATION:	One powered concrete float, non-powered hand tools		**DISTANCE FROM PLANT (m):**	Approx. 19m
DISTANCE FROM OBSTACLES OR REFLECTING SURFACES:	-		**MEASUREMENT NEAR BUILDING?**	Y / ~~N~~
PHOTOGRAPH TAKEN (MONITORING LOC, WORKS and CLOSEST RECEIVERS):		Y / ~~N~~	**IN RESPONSE TO COMPLAINT?**	~~Y~~ / N
START TIME	**END TIME**	**MEASUREMENT PERIOD (DS, DO, E, N)**	**NML (dBA)**	**PREDICTED LEVEL (dBA)**
18:27	18:42	E	43	55
MEASUREMENT RESULTS (15 MIN PERIOD) from activity				
L_{aeq}	**L_{max}**	**L_{min}**	**L_{A10}**	**L_{A90}**
55.1	69.7	36.2	-	-
MONITORING OBSERVATIONS:				
XL2 file number:				
Time	**Source noise**	**Extraneous noise**	**LAF**	**Other comments**
XX:01	Powered concrete float		53.2	
XX:02	Powered concrete float		54.9	
XX:03	Cargo train (short)		66.8	
XX:04	Powered concrete float		54.5	
XX:05	Powered concrete float		54.7	
XX:06	Powered concrete float		55.0	
XX:07	Public Train		68.8	
XX:08	Powered concrete float		53.3	
XX:09	Powered concrete float		54.3	
XX:10	Multiple non-powered hand tools		45.2	
XX:11	Public Train		63.3	
XX:12	Multiple non-powered hand tools		45.6	
XX:13	Public Train		60.1	
XX:14	Wind gust		58.6	
XX:15	Public Train		69.7	
Further actions required to reduce noise?	No			
Additional comments	1.Works were audible 2.Measurement heavily influenced by trains.			

DIAGRAMS AND PHOTOS

Insert:
- Photo of works being monitored
- Map showing monitoring location or Screenshot of GPS Location



Appendix 12 – TL927-1-31F01 Shutdown 4 Noise and Vibration Monitoring Report (r3)

14 November 2022
TL927-1-31F01 Shutdown 4 Noise and Vibration Monitoring Report (r3)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road,
North Ryde NSW 2113

Sydney Metro Southwest - Station Upgrades - Shutdown 4 Possession Works

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise and vibration monitoring during the Station Upgrades Shutdown 4 possession works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding Gatewave model (Gatewave scenario ID: 5358 and 5376). The vibration monitoring was undertaken to monitor potentially affected structures. This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Belmore, Campsie, Dulwich Hill, Hurlstone Park, Punchbowl and Wiley Park Station between 24th September 2022 and 8th October 2022.

Unattended vibration monitoring was conducted at Punchbowl Station between 01:20pm 24th September 2022 and 11:30am 27th September 2022.

Unattended vibration monitoring was undertaken at Hurlstone Park Station between 12:30pm 24th September 2022 and 04:00am 28th September 2022.

2.1 Measurement location

The noise measurements were conducted at representative monitoring locations. The measurement locations are listed in Table 2-1. Figures depicting the monitoring locations are included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	41 Urunga Parade, Punchbowl (Appendix A.6.2)	24.09.2022 02:23pm – 02:38pm	Concrete pump, mobile crane and power handtools	Noise	50m	No
M2	2 Shadforth Street, Wiley Park (Appendix A.5)	24.09.2022 02:49pm – 03:04pm	Excavator with bucket attachment and power handtools	Noise	30m	No
M3	26 Redman Parade, Belmore (Appendix A.4)	24.09.2022 03:21pm – 03:36pm	Power handtools	Noise	80m	No
M4	2 Acacia Street, Belmore (Appendix A.4)	24.09.2022 04:08pm – 04:23pm	Hi-rail hydrema, excavator with bucket attachment and power handtools	Noise	50m	No
M5	13-15 Anglo Road, Campsie (Appendix A.3)	24.09.2022 04:34pm – 04:49pm	Generator, hi-rail hydrema and power handtools	Noise	5m from the generator. 60m from the platform works.	Noise blankets surrounding generator
M6	2 Wilfred Avenue, Campsie (Appendix A.3)	24.09.2022 05:30pm – 05:45pm	Dump truck, excavator with bucket and power handtools	Noise	50m	No
M7	3 Commons Street, Hurlstone Park (Appendix A.2)	24.09.2022 06:10pm – 06:25pm	Delivery truck, mobile crane and EWP	Noise	5m	No
M8	46 Floss Street, Hurlstone Park (Appendix A.2)	24.09.2022 06:40pm – 06:55pm	EWP	Noise	50m	No
M9	5 Bedford Crescent, Dulwich Hill (Appendix A.1)	24.09.2022 07:11pm – 07:26pm	Mobile crane and excavator with grapple attachment	Noise	60m	No
M10	94 Ewart Street, Dulwich Hill (Appendix A.1)	24.09.2022 07:33pm – 07:48pm	Excavator with bucket attachment, delivery truck and mobile crane	Noise	70m-100m	No
M11	41 Urunga Parade, Punchbowl (Appendix A.6.2)	25.09.2022 12:29pm – 12:34pm	Mobile crane, telehandler and power handtools	Noise	40m	No

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M12	2 Shadforth Street, Wiley Park (Appendix A.5)	25.09.2022 01:05pm – 01:20pm	Excavator with bucket attachment, power handtools	Noise	15m	No
M13	26 Redman Parade, Belmore (Appendix A.4)	25.09.2022 01:37pm – 01:52pm	Power handtools	Noise	80m	No
M14	2 Acacia Street, Belmore (Appendix A.4)	25.09.2022 02:04pm – 02:19pm	Excavator with bucket attachment and power handtools	Noise	50m	No
M15	13-15 Anglo Road, Campsie (Appendix A.3)	25.09.2022 02:31pm – 02:46pm	Generator, power handtools and EWP	Noise	5m from the generator. 70m from the platform works.	Noise blankets surrounding generator
M16	2 Wilfred Avenue, Campsie (Appendix A.3)	25.09.2022 02:53pm - 03:08pm	Excavator with bucket attachment and dump truck	Noise	60m	No
M17	3 Commons Street, Hurlstone Park (Appendix A.2)	25.09.2022 03:30pm – 03:45pm	Power handtools and hi-rail crane	Noise	70m	No
M18	46 Floss Street, Hurlstone Park (Appendix A.2)	25.09.2022 03:51pm – 04:06pm	Power handtools	Noise	40m	No
M19	5 Bedford Crescent, Dulwich Hill (Appendix A.1)	25.09.2022 04:23pm – 04:37pm	Excavator with bucket attachment, excavator with rockhammer attachment, power handtools, mobile crane and concrete saw	Noise	50m-60m	No
M20	94 Ewart Street, Dulwich Hill (Appendix A.1)	25.09.2022 04:44pm – 04:59pm	Telehandler and EWP	Noise	10m-50m	No
M21	94 Ewart Street, Dulwich Hill (Appendix A.1)	27.09.2022 06:22am – 06:37am	Power handtools and delivery truck	Noise	10m-50m	No
M22	5 Bedford Crescent, Dulwich Hill (Appendix A.1)	27.09.2022 06:49am – 07:04am	Power handtools and delivery truck	Noise	50m-70m	No

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M23	46 Floss Street, Hurlstone Park (Appendix A.2)	27.09.2022 07:35am – 07:50am	Power handtools and delivery truck	Noise	30m	No
M24	3A Commons Street, Hurlstone Park (Appendix A.2)	27.09.2022 07:58am – 08:13am	Power handtools, delivery truck and mobile crane	Noise	50m	No
M25	2 Wilfred Avenue, Campsie (Appendix A.3)	27.09.2022 08:28am – 08:43am	Power handtools and 2 excavators with bucket attachments	Noise	50m	No
M26	13-15 Anglo Road, Campsie (Appendix A.3)	27.09.2022 09:00am – 09:15am	Generator and power handtools	Noise	5m from the generator	Noise blankets surrounding generator
M27	2 Acacia Street, Belmore (Appendix A.4)	27.09.2022 09:27am – 09:42am	Generator, power handtools, delivery truck and EWP	Noise	40m	No
M28	26 Redman Parade, Belmore (Appendix A.4)	27.09.2022 10:00am – 10:15am	Power handtools	Noise	70m	No
M29	2 Shadforth Street, Wiley Park (Appendix A.5)	27.09.2022 10:48am – 11:03am	Power handtools	Noise	15m	No
M30	41 Urunga Parade, Punchbowl (Appendix A.6.2)	27.09.2022 11:47am – 12:02pm	Power handtools	Noise	30m	No
M31	94 Ewart Street, Dulwich Hill (Appendix A.1)	27.09.2022 3:49pm – 4:04pm	Mobile crane and power handtools	Noise	80m-90m	No
M32	Punchbowl station southern lift (Appendix A.6.1)	24.09.2022 – 27.09.2022 01:20pm – 11:30am	Concrete saw and excavator with rockhammer attachment	Vibration	10m-20m	N/A
M33	2 Hopetoun Street, Hurlstone Park – Inside Corridor (Appendix A.2)	05.10.2022 09:19am – 09:34am	Pilling rig, excavator with claw attachment and power handtools	Noise	15m	No
M34	2 Hopetoun Street, Hurlstone Park (Appendix A.2)	05.10.2022 08:32am – 08:47am	Pilling rig, excavator with claw attachment and power handtools	Noise	50m	No
M35	10 Hopetoun Street, Hurlstone Park (Appendix A.2)	05.10.2022 08:06am – 08:21am	Mobile crane, delivery trucks and power handtools	Noise	50m	No

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M36	5 Railway Street, Hurlstone Park (Appendix A.2)	05.10.2022 10:31am – 10:46am	Mobile crane, delivery trucks and power handtools	Noise	20m	No
M37	Garage structure at 3A Commons Street, Hurlstone Park (Appendix A.2)	24.09.2022 – 28.09.2022 12:30pm – 04:00am	Pilling rig, excavator with claw attachment and power handtools	Vibration	5m-10m	No
M38	59 Ewart Street, Dulwich Hill (Appendix A.1.1)	08.10.2022 8:01am – 8:16am	Excavator with rockhammer attachment, excavator with bucket attachment and power handtools	Noise	50m	No
M39	73 Ewart Street, Dulwich Hill (Appendix A.1.1)	08.10.2022 8:50am – 9:05am	Excavator with bucket attachment and power handtools	Noise	20m	No
M40	94 Ewart Street, Dulwich Hill (Appendix A.1)	08.10.2022 8:30am – 8:45am	650T crane, excavator with bucket attachment and power handtools	Noise	80m-90m	No
M41	5 Beford Crescent, Dulwich Hill (Appendix A.1)	08.10.2022 9:34am – 9:49am	650T crane, delivery truck and power handtools	Noise	5m	No

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	A2A-20889-E0	25 July 2022
Type 1 Sound Level Meter	NTi	XL2	A2A-19156-E0	10 March 2022
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	2677710	10 January 2022
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	3027924	04 April 2022

The instrumentation used for the vibration measurement are summarised in Table 2-3. The transducers used in the measurements have current calibration certificates. For monitoring on hard surfaces (e.g. asphalt), in accordance with AS 2775-2004[1], the surface was brushed to displace any dirt and the transducers were attached to the surface using double sided adhesive tape. For monitoring on soils, in accordance with AS 2775-2004, a ground spike was planted into the surface and the transducers were mounted on the ground spike using a double-sided adhesive tape.

Table 2-3: Summary of vibration instrumentation

Type	Make / Model
Triaxial Transducers	Sigicom C12 (SN: 70130)
Triaxial Transducers	Sigicom C12 (SN: 66830)

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-4. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-4: Environmental conditions

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M1	41 Urunga Parade, Punchbowl	24.09.2022 02:23pm – 02:38pm	Overcast; air temperature 24ºC, wind speed < 5m/s; relative humidity 66%
M2	2 Shadforth Street, Wiley Park	24.09.2022 02:49pm – 03:04pm	Overcast; air temperature 24ºC, wind speed < 5m/s; relative humidity 63%
M3	26 Redman Parade, Belmore	24.09.2022 03:21pm – 03:36pm	Overcast; air temperature 18ºC, wind speed < 5m/s; relative humidity 57%
M4	2 Acacia Street, Belmore	24.09.2022 04:08pm – 04:23pm	Overcast; air temperature 20ºC, wind speed < 5m/s; relative humidity 61%
M5	13-15 Anglo Road, Campsie	24.09.2022 04:34pm – 04:49pm	Overcast; air temperature 24ºC, wind speed < 5m/s; relative humidity 51%
M6	2 Wilfred Avenue, Campsie	24.09.2022 05:30pm – 05:45pm	Overcast; air temperature 25ºC, wind speed < 5m/s; relative humidity 54%
M7	3 Commons Street, Hurlstone Park	24.09.2022 06:10pm – 06:25pm	Partly cloudy; air temperature 22ºC, wind speed < 5m/s; relative humidity 52%
M8	46 Floss Street, Hurlstone Park	24.09.2022 06:40pm – 06:55pm	Partly cloudy; air temperature 21ºC, wind speed < 5m/s; relative humidity 65%
M9	5 Bedford Crescent, Dulwich Hill	24.09.2022 07:11pm – 07:26pm	Partly cloudy; air temperature 20ºC, wind speed < 5m/s; relative humidity 56%
M10	94 Ewart Street, Dulwich Hill	24.09.2022 07:33pm – 07:48pm	Partly cloudy; air temperature 20ºC, wind speed < 5m/s; relative humidity 54%

[1] Australia Standard 2775-2004 Mechanical vibration and shock – Mechanical mounting of accelerometers

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M11	41 Urunga Parade, Punchbowl	25.09.2022 12:29pm – 12:34pm	Clear; air temperature 26ºC, wind speed < 5m/s; relative humidity 48%
M12	2 Shadforth Street, Wiley Park	25.09.2022 01:05pm – 01:20pm	Clear; air temperature 24ºC, wind speed < 5m/s; relative humidity 51%
M13	26 Redman Parade, Belmore	25.09.2022 01:37pm – 01:52pm	Clear; air temperature 27ºC, wind speed < 5m/s; relative humidity 37%
M14	2 Acacia Street, Belmore	25.09.2022 02:04pm – 02:19pm	Clear; air temperature 26ºC, wind speed < 5m/s; relative humidity 52%
M15	13-15 Anglo Road, Campsie	25.09.2022 02:31pm – 02:46pm	Clear; air temperature 28ºC, wind speed < 5m/s; relative humidity 29%
M16	2 Wilfred Avenue, Campsie	25.09.2022 02:53pm – 03:08pm	Clear; air temperature 22ºC, wind speed < 5m/s; relative humidity 44%
M17	3A Commons Street, Hurlstone Park	25.09.2022 03:30pm – 03:45pm	Clear; air temperature 27ºC, wind speed < 5m/s; relative humidity 45%
M18	46 Floss Street, Hurlstone Park	25.09.2022 03:51pm – 04:06pm	Clear; air temperature 26ºC, wind speed < 5m/s; relative humidity 50%
M19	5 Bedford Crescent, Dulwich Hill	25.09.2022 04:23pm – 04:37pm	Clear; air temperature 20ºC, wind speed < 5m/s; relative humidity 48%
M20	94 Ewart Street, Dulwich Hill	25.09.2022 04:44pm – 04:59pm	Clear; air temperature 18ºC, wind speed < 5m/s; relative humidity 45%
M21	94 Ewart Street, Dulwich Hill	27.09.2022 06:22am – 06:37am	Cloudy; air temperature 8ºC, wind speed < 5m/s; relative humidity 65%
M22	5 Bedford Crescent, Dulwich Hill	27.09.2022 06:49am – 07:04am	Cloudy; air temperature 12ºC, wind speed < 5m/s; relative humidity 55%
M23	46 Floss Street, Hurlstone Park	27.09.2022 07:35am – 07:50am	Cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 60%
M24	3A Commons Street, Hurlstone Park	27.09.2022 07:58am – 08:13am	Cloudy; air temperature 12ºC, wind speed < 5m/s; relative humidity 62%
M25	2 Wilfred Avenue, Campsie	27.09.2022 08:28am – 08:43am	Cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 67%
M26	13-15 Anglo Road, Campsie	27.09.2022 09:00am – 09:15am	Cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 62%
M27	2 Acacia Street, Belmore	27.09.2022 09:27am – 09:42am	Cloudy; air temperature 17ºC, wind speed < 5m/s; relative humidity 60%
M28	26 Redman Parade, Belmore	27.09.2022 10:00am – 10:15am	Cloudy; air temperature 10ºC, wind speed < 5m/s; relative humidity 64%
M29	2 Shadforth Street, Wiley Park	27.09.2022 10:48am – 11:03am	Cloudy; air temperature 13ºC, wind speed < 5m/s; relative humidity 65%

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M30	41 Urunga Parade, Punchbowl	27.09.2022 11:47am – 12:02pm	Cloudy; air temperature 12ºC, wind speed < 5m/s; relative humidity 62%
M31	94 Ewart Street, Dulwich Hill	27.09.2022 15:49am – 16:04pm	Cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 58%
M33	2 Hopetoun Street, Hurlstone Park – Inside Corridor	05.10.2022 09:19am – 09:34am	Cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 60%
M34	2 Hopetoun Street, Hurlstone Park	05.10.2022 08:32am – 08:47am	Cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 65%
M35	10 Hopetoun Street, Hurlstone Park	05.10.2022 08:06am – 08:21am	Cloudy; air temperature 16ºC, wind speed < 5m/s; relative humidity 60%
M36	5 Railway Street, Hurlstone Park	05.10.2022 10:31am – 10:46am	Cloudy; air temperature 17ºC, wind speed < 5m/s; relative humidity 60%
M38	59 Ewart Street, Dulwich Hill	08.10.2022 8:01am – 8:16am	Cloudy; air temperature 14ºC, wind speed < 5m/s; relative humidity 60%
M39	73 Ewart Street, Dulwich Hill	08.10.2022 8:50am – 9:05am	Cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 60%
M40	94 Ewart Street, Dulwich Hill	08.10.2022 8:30am – 8:45am	Cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 60%
M41	5 Beford Crescent, Dulwich Hill	08.10.2022 9:34am – 9:49am	Cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 60%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Measured noise levels $L_{Aeq(15min)}$

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	41 Urunga Parade, Punchbowl	25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	56[T]	Concrete pump, mobile crane and power handtools	52	75	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • It was noted that the measured works were intermittent.
M2	2 Shadforth Street, Wiley Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	58[T]	Excavator with bucket attachment and power handtools	52	71	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 30m away. In the prediction model, the distance between the closest work area and the most affected facade is 10m. • It was noted that the measured works were intermittent.
M3	26 Redman Parade, Belmore	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	71[T]	Power handtools	58	79	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 80m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • It was noted that the measured works were intermittent.
M4	2 Acacia Street, Belmore	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	73[T]	Hi-rail hydrema, excavator with bucket attachment and power handtools	51	69	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • It was noted that the measured works were intermittent. • Noise from the handtools on the station platform was shielded by the site offices.
M5	13-15 Anglo Road, Campsie	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	78[H]	Generator, hi-rail hydrema and power handtools	65	93	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The dominating construction noise source was the generator approximately 5m away from the measurement location. The generator was fitted with noise blankets. • The measured works (except the generator) were located approximately 60m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • Aside from the generator, the measured works were intermittent.
M6	2 Wilfred Avenue, Campsie	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	71[H]	Dump truck, excavator with bucket and power handtools	56	77	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 15m.
M7	3 Commons Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	81[T]	Delivery truck, mobile crane and EWP	71	85	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • It was noted that the crane and EWP was only idling during the measurement, not operating under load.
M8	46 Floss Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	79[T]	EWP	51	69	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. • It was noted that the measured works were intermittent. • Noise from the EWP on the station platform was shielded by the site offices.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M9	5 Bedford Crescent, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	78^{H}	Mobile crane and excavator with grapple attachment	63	72	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 60m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. • It was noted that the measured works were intermittent.
M10	94 Ewart Street, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	74^{H}	Excavator with bucket attachment, delivery truck and mobile crane	64	86	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • It was noted that the measured works were intermittent.
M11	41 Urunga Parade, Punchbowl	25T excavator with bucket attachment, hand tools, 10T skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	56^{T}	Mobile crane, telehandler and power handtools	52	68	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • It was noted that the measured works were intermittent.
M12	2 Shadforth Street, Wiley Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	58^{T}	Excavator with bucket attachment, power handtools	58	83	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is consistent with the predicted noise level.
M13	26 Redman Parade, Belmore	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	71^{T}	Power handtools	58	83	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 80m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • It was noted that the measured works were intermittent.
M14	2 Acacia Street, Belmore	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	73^{T}	Excavator with bucket attachment and power handtools	51	73	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. • It was noted that the measured works were intermittent. • Noise from the handtools on the station platform was shielded by the site offices.
M15	13-15 Anglo Road, Campsie	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	78^{H}	Generator, power handtools and EWP	62	71	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The dominating construction noise source was the generator approximately 5m away from the measurement location. The generator was fitted with noise blankets. • The measured works (except the generator) were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • Aside from the generator the measured works were intermittent.
M16	2 Wilfred Avenue, Campsie	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	71^{H}	Excavator with bucket attachment and dump truck	53	76	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 60m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 15m. • It is noted that the measured works were intermittent.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M17	3A Commons Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	81[T]	Power handtools and hi-rail crane	44	68	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. • It is noted that the measured works were intermittent.
M18	46 Floss Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	79[T]	Power handtools	53	73	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 40m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. • It is noted that the measured works were intermittent. • Noise from the power handtools on the station platform was shielded by the site offices.
M19	5 Bedford Crescent, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	78[H]	Excavator with bucket attachment, excavator with rockhammer attachment, power handtools, mobile crane and concrete saw	71 (66 + 5)*	80	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • The measured works were located approximately 35m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m.
M20	94 Ewart Street, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	74[H]	Telehandler and EWP	66	89	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The dominant construction noise source was the telehandler that operated 10m from the measurement location, which ceased operation after one minute. • The measured works (except the telehandler) were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. • It is noted that the measured works were intermittent.
M21	94 Ewart Street, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	74[H]	Power handtools and delivery truck	62	87	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 10-50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10m. • It is noted that the measured works were intermittent.
M22	5 Bedford Crescent, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25T excavator with bucket attachment, hand tools, 10T skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	78[H]	Power handtools and delivery truck	51	52	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 50-70m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. • It is noted that the measured works were intermittent.
M23	46 Floss Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	79[T]	Power handtools and delivery truck	61	91	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 30m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. • It is noted that measured works were intermittent.
M24	3A Commons Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	81[T]	Power handtools, delivery truck and mobile crane	58	76	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. • It is noted that the measured works were intermittent.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M25	2 Wilfred Avenue, Campsie	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	71^{H}	Power handtools and 2 excavators with bucket attachments	56	75	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 15m. • It is noted that the measured works were intermittent.
M26	13-15 Anglo Road, Campsie	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	78^{H}	Generator and power handtools	64	76	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The dominating construction noise source during the measurement was the generator approximately 5m away from the measurement location was fitted with noise blankets. • Aside from the generator, the measured works were intermittent.
M27	2 Acacia Street, Belmore	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	73^{T}	Generator, power handtools, delivery truck and EWP	52	82	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 40m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. • It was noted that the measured works were intermittent.
M28	26 Redman Parade, Belmore	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	71^{T}	Power handtools	71 (ambient noise) Downer works inaudible	89 (ambient noise) Downer works inaudible	No ($L_{Aeq, 15min}$)	The construction works at the station platform were inaudible throughout the duration of the measurement. This measurement was heavily affected by the landscaping and residential construction taking place at 26 Redman Parade, Belmore.
M29	2 Shadforth Street, Wiley Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	58^{T}	Power handtools	51	69	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 15m away. In the prediction model the distance between the closest work area and the most affected facade is approximately 10m. • It was noted that the measured works were intermittent.
M30	41 Urunga Parade, Punchbowl	25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	56^{T}	Power handtools	66	87	Yes ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is higher than the predicted noise level. However, this can be attributed to a crane that was operating 10m from the front of 41 Urunga Parade which was part of the works conducted by a different Sydney Metro contractor, not Downer. All other loud noise events were due to traffic passbys and activities at nearby residential properties.
M31	94 Ewart Street, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	74^{H}	Mobile crane and power handtools	67	94	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 80-90m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. • It was noted that the measured works were intermittent.
M33	2 Hopetoun Street, Hurlstone Park – Inside Corridor	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	76^{T}	Pilling rig, excavator with claw attachment and power handtools	64	84	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 15m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10m. • It was noted that the measured works were intermittent.
M34	2 Hopetoun Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	76^{T}	Pilling rig, excavator with claw attachment and power Handtools	61	86	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10m. • It was noted that the measured works were intermittent.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M35	10 Hopetoun Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	65[T]	Mobile crane, delivery trucks and power handtools	59	78	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 40m. • It was noted that the measured works were intermittent.
M36	5 Railway Street, Hurlstone Park	25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	82[T]	Mobile crane, delivery trucks and power handtools	59	77	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 20m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 5m. • It was noted that the measured works were intermittent.
M38	59 Ewart Street, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	69[H]	Excavator with rockhammer attachment, excavator with bucket attachment and power handtools	65 (60+5)*	73	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. • It was noted that access to the most affected facade (Ewart Lane) for this receiver was prohibited due to the proximity of the works relative to the facade. As a result, the monitoring was conducted on Ewart Street.
M39	73 Ewart Street, Dulwich Hill (Gatewave scenario ID: 5376)	Delivery truck, excavator with bucket attachment and lighting tower	74[T]	Excavator with bucket attachment and power handtools	67	91	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 20m away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 10m. • It was noted that the measured works were intermittent.
M40	94 Ewart Street, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	74[H]	650T crane, excavator with bucket attachment and power handtools	63	83	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 80m-90mm away. In the prediction model, the distance between the closest work area and the most affected facade is approximately 20m. • It was noted that the measured works were intermittent.
M41	5 Beford Crescent, Dulwich Hill	Concrete saw, excavator with hammer attachment, jackhammer, 25t excavator with bucket attachment, vacuum truck, hand tools, 20t-250t mobile crane, hi-rail flatbed truck, piling rig – bored, street sweeper, compactor, compressor, concrete agi, concrete pump, dump truck, 2t vibratory roller, lighting tower and EWP	78[H]	650T crane, delivery truck and power handtools	72	81	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement.

Notes: *: 5dB(A) penalty applied for high impact activities.

T: Predicted $L_{Aeq, 15min}$ for Typical activities.

H: Predicted $L_{Aeq, 15min}$ for High impact activities.

4 Vibration Monitoring results

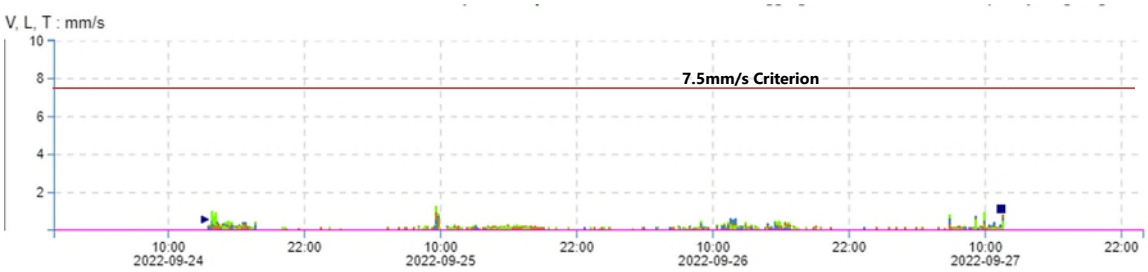
4.1 Punchbowl Station vibration monitoring

The established vibration screening criteria for cosmetic damage are as follows:

- Unreinforced or light framed structures: 7.5 mm/s

The results of the unattended vibration measurements for Punchbowl Station are presented in Figure 4-1.

Figure 4-1: Unattended vibration monitoring at Punchbowl Station (refer to Appendix A.6.1)



It can be seen in Figure 4-1, that the vibration levels produced from the vibration intensive works in the proximity of the station lift at Punchbowl Station are below 7.5mm/s.

4.2 Neighbouring garage structure at 3A Commons Street vibration monitoring

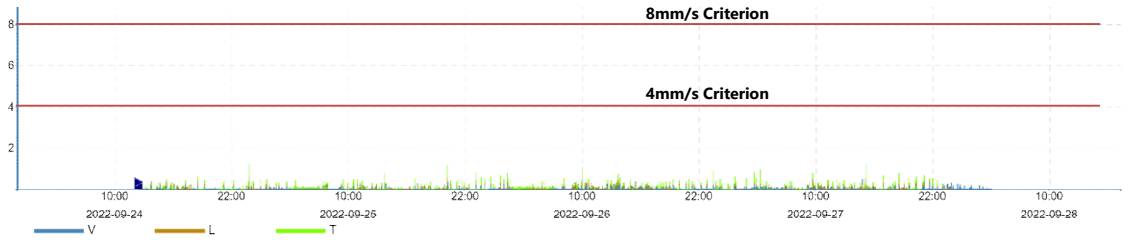
In accordance with the Hurlstone Park Station Vibration Monitoring Plan[2], the established vibration limits for the affected garage structure are shown below:

- Greater than or equal to 4 mm/s (cosmetic damage is possible);
- Greater than or equal to 8 mm/s (cosmetic damage becoming more likely).

The results of the unattended vibration measurements for the neighbouring garage structure at 3A Commons Street are presented in Figure 4-2.

[2] Sydney Metro Southwest – Station Upgrades – Hurlstone Park Station Vibration Monitoring Plan (ref: TL927-1-14F01 Hurlstone Park Stn VIB MON PLAN (r2)), dated 14 October 2021

Figure 4-2: Unattended vibration monitoring at 3A Commons Street (refer to Appendix A.2)



It can be seen in Figure 4-2, that the vibration levels produced from the vibration intensive works nearby the garage structure at 3A Commons Street are below 4mm/s.

5 Conclusion

Renzo Tonin & Associates has completed noise and vibration monitoring for the Station Upgrades Shutdown 4 possession works for Sydney Metro Southwest.

The results of the noise measurements were typically below or consistent with the predicted noise levels presented in the Gatewave model prepared for the works. There was an instance where the result of the noise measurement was above the predicted noise level (measurement id M30), but this was due to Linewide works and not due to Downer related construction works.

The difference between the measured $L_{Aeq,\ 15min}$ and the predicted noise level can be attributed to following:

- Less plant operating during the measurement compared to the modelled plants;
- Location of the measured works were further away than the modelled works;
- The predicted noise levels included multiple construction activities occurring concurrently. This was not always observed during the measurements, and
- The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the buildings was not provided. Sometimes this location might have not aligned with the most affected location for the receiver.

The results of the unattended vibration measurements were below the relevant vibration criteria.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
12.10.2022	First issue	0	1	A. Hannelly/D. Auld	R. Zhafranata	M. Tabacchi
24.10.2022	Report revised to address client's comments	-	2	R. Zhafranata	M. Tabacchi	M. Tabacchi
14.11.2022	Report revised to address client's comment	-	3	R. Zhafranata	M. Tabacchi	M. Tabacchi

File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\31 September22 Shutdown 4 possession\TL927-1-31F01 Shutdown 4 Noise and Vibration Monitoring Report (r3).docx

APPENDIX A Measurement locations

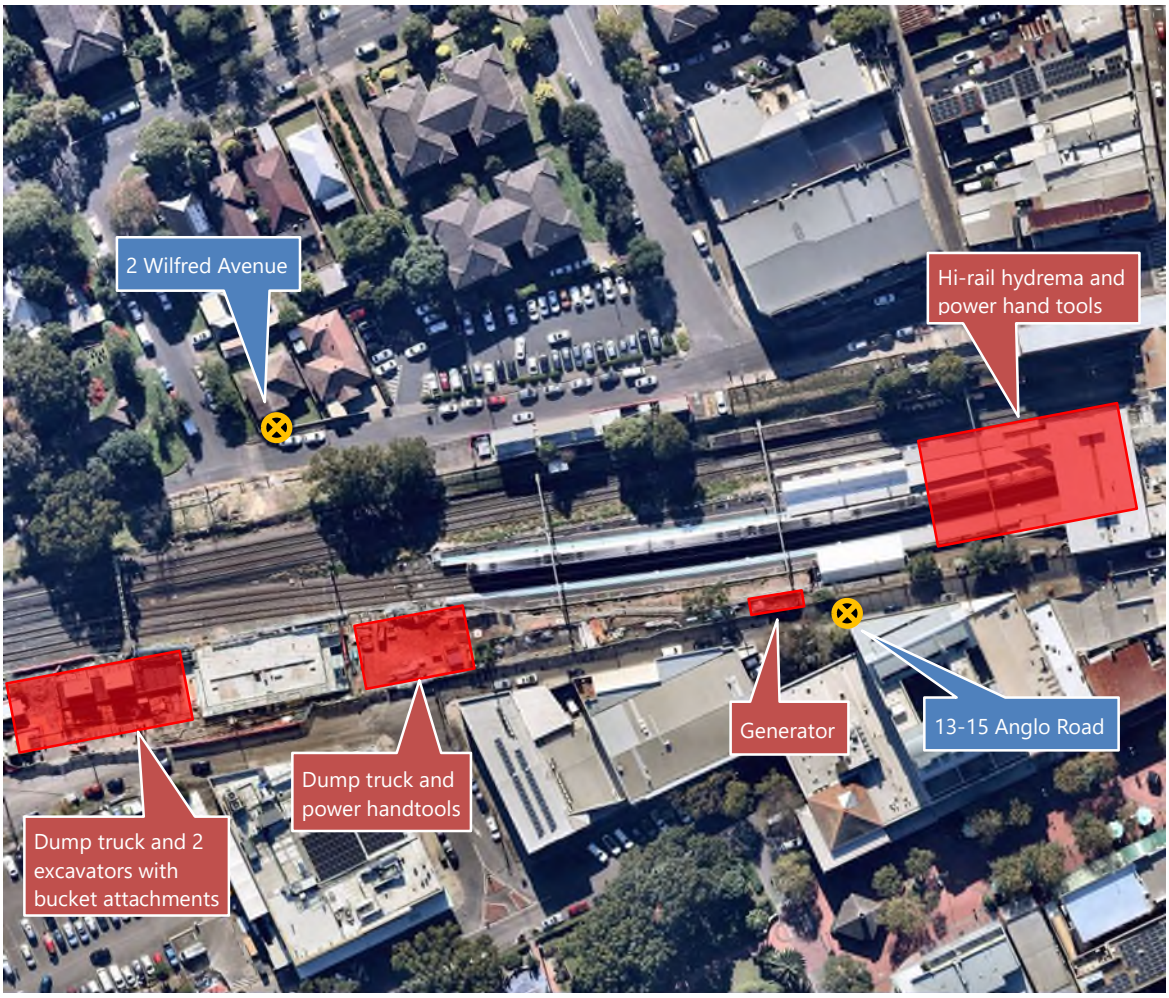
A.1 Dulwich Hill Station

A.1.1 Dulwich Hill Station: 94 Ewart Street, 5 Bedford Crescent

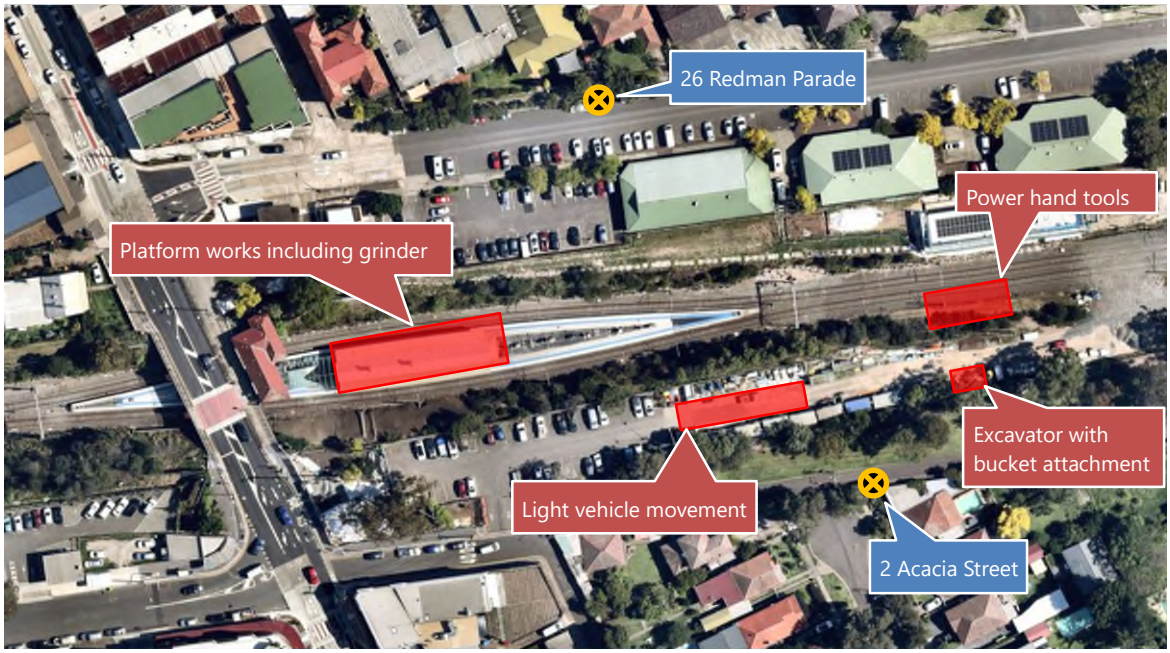
A.1.2 Dulwich Hill Station: 73 Ewart Street, 59 Ewart Street

A.2 Hurlstone Park Station: 3 Commons Street, 3A Commons Street, 46 Floss Street, 2 Hopetoun Street, 10 Hopetoun Street, 10 Railway Street

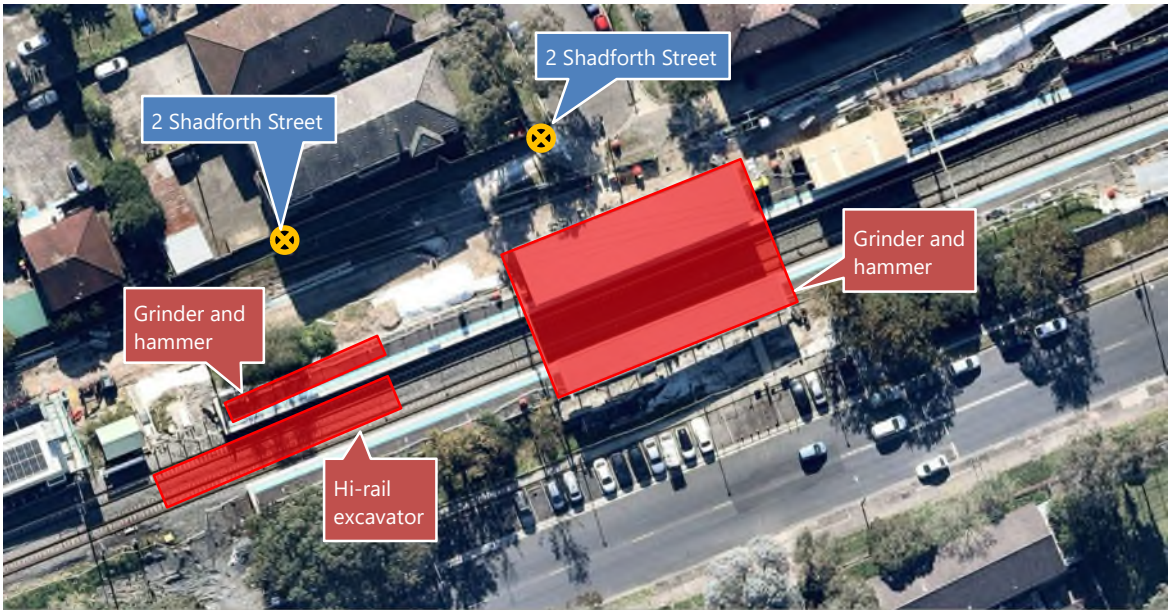
A.3 Campsie Station: 13-15 Anglo Road, 23 Anglo Road, 2 Wilfred Avenue



A.4 Belmore Station: 26 Redman Parade, 2 Acacia Street

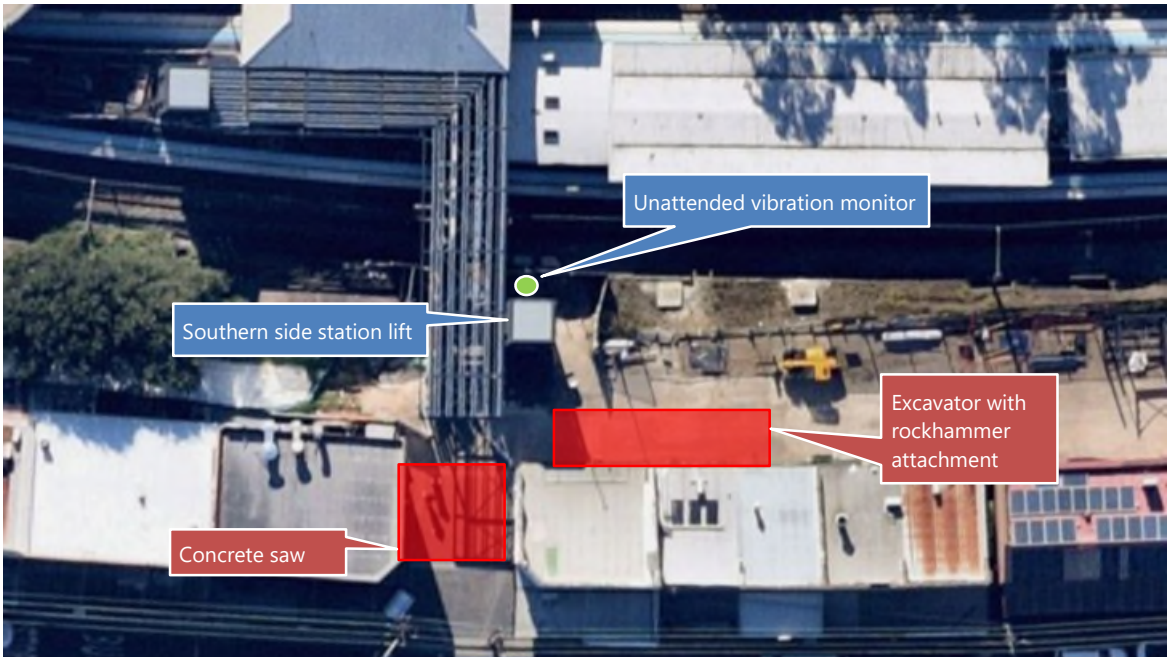


A.5 Wiley Park Station: 2 Shadforth Street

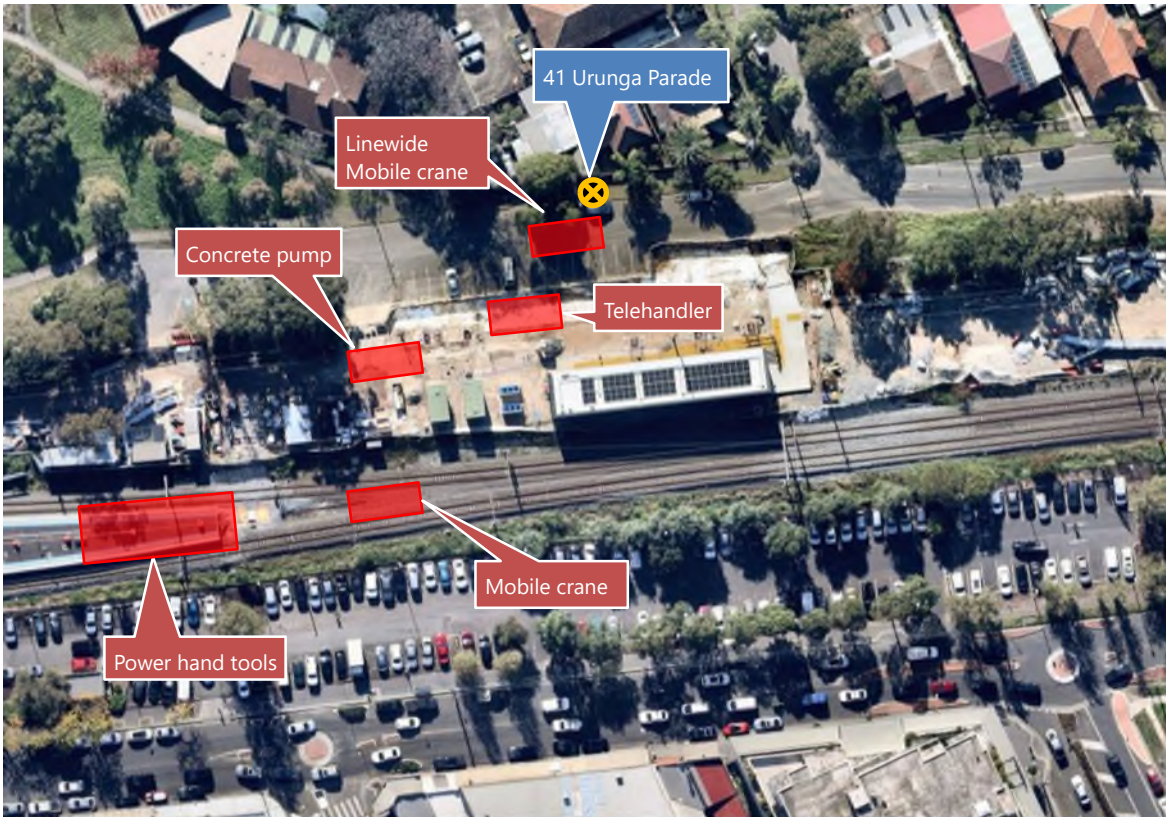


A.6 Punchbowl Station

A.6.1 Punchbowl Station – Vibration: Southern side station lift



A.6.2 Punchbowl Station – Noise: 41 Urunga Parade



Appendix 13 – TL927-1-32F01 WE19 Noise Monitoring Report (r2)

10 November 2022
TL927-1-32F01 WE19 Noise Monitoring Report (r2)

Downer EDI Works Pty Ltd
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Sydney Metro Southwest - Station Upgrades - 2022 WE19 Possession Works

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise monitoring during the Station Upgrades Weekend 19 possession works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding Gatewave model (Gatewave scenario ID: 5661). This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Campsie, Dulwich Hill, Hurlstone Park, and Wiley Park Station on 5th November 2022.

2.1 Measurement location

The noise measurements were conducted at the nominated monitoring locations from the Gatewave model. The measurement locations are listed in Table 2-1. Figures depicting the monitoring locations are included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	3 Bedford Crescent, Dulwich Hill (Appendix A.1)	05.11.2022 09:03am – 09:18am	Concrete pump & Concrete agi	Noise	10m	No
M2	57 Ewart Stret, Dulwich Hill (Appendix A.1)	05.11.2022 09:30am – 09:45am	Excavator, Concrete pump & Delivery trucks	Noise	70m	No
M3	3A Commons Street, Hurlstone Park (Appendix A.2)	05.11.2022 09:58am – 10:13am	Power Handtools	Noise	50m	No
M4	46 Floss Street, Hurlstone Park (Appendix A.2)	05.11.2022 10:19am – 10:34am	Delivery trucks & Power Handtools	Noise	30m	No
M5	13-15 Anglo Road, Campsie (Appendix A.3)	05.11.2022 11:11am – 11:26am	Generator & Handtools	Noise	30-40m	No
M6	2 Shadforth Street, Wiley Park (Appendix A.4)	05.11.2022 12:02pm – 12:17pm	Generator, Handtools, EWP & Excavator	Noise	40m	No

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	A2A-20297-E0	10 March 2022
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	2677710	10 January 2022

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-3. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-3: Environmental conditions

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M1	3 Bedford Crescent, Dulwich Hill	05.11.2022 09:03am – 09:18am	Partly cloudy; air temperature 16ºC, wind speed < 5m/s; relative humidity 65%
M2	57a Ewart Stret, Dulwich Hill	05.11.2022 09:30am – 09:45am	Partly cloudy; air temperature 15ºC, wind speed < 5m/s; relative humidity 61%
M3	3A Commons Street, Hurlstone Park	05.11.2022 09:58am – 10:13am	Partly cloudy; air temperature 18ºC, wind speed < 5m/s; relative humidity 57%
M4	46 Floss Street, Hurlstone Park	05.11.2022 10:19am – 10:34am	Partly cloudy; air temperature 17ºC, wind speed < 5m/s; relative humidity 60%
M5	13-15 Anglo Road, Campsie	05.11.2022 11:11am – 11:26am	Partly cloudy; air temperature 16ºC, wind speed < 5m/s; relative humidity 55%
M6	2 Shadforth Street, Wiley Park	05.11.2022 12:02pm – 12:17pm	Partly cloudy; air temperature 21ºC, wind speed < 5m/s; relative humidity 57%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Measured noise levels $L_{Aeq(15min)}$

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	3 Bedford Crescent, Dulwich Hill	Concrete cutting saw, excavator with hammers, jackhammer, 25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	82[H]	Concrete pump & Transit mixer	74	87	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • It was noted that the measured works were intermittent.
M2	57 Ewart Stret, Dulwich Hill	Concrete cutting saw, excavator with hammers, jackhammer, 25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	84[H]	Excavator, Concrete pump & Delivery trucks	65	89	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 70m away. In the prediction model, the distance between the closest work area and the most affected facade is 35m. • It was noted that the measured works were intermittent.
M3	3A Commons Street, Hurlstone Park	Concrete cutting saw, excavator with hammers, jackhammer, 25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	82[H]	Power Handtools	56	77	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 50m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. • It was noted that the measured works were intermittent.
M4	46 Floss Street, Hurlstone Park	Concrete cutting saw, excavator with hammers, jackhammer, 25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	76[H]	Delivery trucks & Power Handtools	58	79	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The measured works were located approximately 30m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • It was noted that the measured works were intermittent. • Noise from on the station platform was shielded by the site offices.
M5	13-15 Anglo Road, Campsie	25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	80[T]	Generator & Handtools	59	73	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • It was noted that no construction works were audible due to the pump room noise (extraneous noise source) within 13-15 Anglo Road building. • The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver.
M6	2 Shadforth Street, Wiley Park	25t excavator with bucket attachment, hand tools, 10t skid steer, piling rig – bored, compactor, compressor, concrete agi, drill rig, concrete pump, excavator with pulveriser attachment and pressure washer	75[T]	Generator, Handtools, EWP & Excavator	58	72	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 40m away. In the prediction model, the distance between the closest work area and the most affected facade is 15m. • It was noted that the EWP was only idling during the measurement. • It was noted that the excavator works were barely audible over the generator noise. • It was noted that the measured works were intermittent (except for the generator).

Notes: T: Predicted $L_{Aeq, 15min}$ for Typical activities.
H: Predicted $L_{Aeq, 15min}$ for High impact activities.

4 Conclusion

Renzo Tonin & Associates has completed noise monitoring for the Station Upgrades Weekend 19 possession works for Sydney Metro Southwest.

The results of the noise measurements were below the predicted noise levels presented in the Gatewave model prepared for the works.

The difference between the measured $L_{Aeq,\ 15min}$ and the predicted noise level can be attributed to following:

- Less plant operating during the measurement compared to the modelled plants;
- Location of the measured works were further away than the modelled works;
- The predicted noise levels included multiple construction activities occurring concurrently. This was not always observed during the measurements, and
- The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
09.11.2022	First issue	0	1	A. Hannelly	R. Zhafranata	M. Tabacchi
10.11.2022	Report revised to address client's comments	-	2	R. Zhafranata	M. Tabacchi	M. Tabacchi

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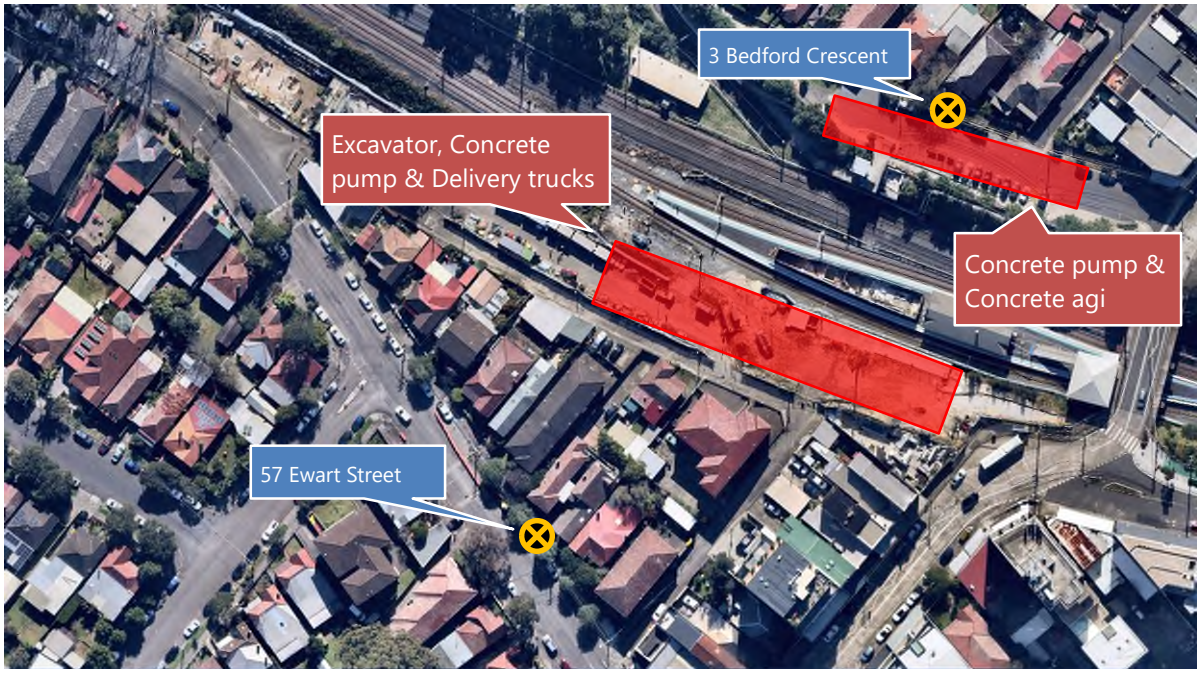
APPENDIX A Measurement locations

A.1 Dulwich Hill Station: 57 Ewart Street and 3 Bedford Crescent



A.2 Hurlstone Park Station: 3A Commons Street and 46 Floss Street

A.3 Campsie Station: 13-15 Anglo Road

A.4 Wiley Park Station: 2 Shadforth Street

Appendix 14 – EDS-00016589-HPS-18-0 - Garage Wall Monitoring

Tuesday, 31 August 2021 Project No. 00016589

Downer Group
39 Delhi Road
North Ryde NSW 2113

ATTENTION: Robel Chowdhury
Robel.Chowdhury@Downergroup.com

EDS-16589-HPS-18_0: SYDNEY METRO PACKAGE 5 AND PACKAGE 6 – HURLSTONE PARK STATION MONTIORING OF GARAGE WALL

Introduction

Lindsay Dynan Consulting Engineers have been requested to provide advice on the extent of survey and vibration monitoring recommended for proposed construction activities in the vicinity of the neighbouring garage and the collapsed boundary wall. We understand that proposed construction activities will include rock breakers that could cause ground vibrations.

Recommendation

GARAGE WALL – STABILITY AND CRACK MONITORING

Survey monitoring and crack gauge monitoring is recommended for the following:

- Crack width growth
- Wall out of plane displacement (tilts or leans)

Methodology:

- Visually monitor the condition of the garage wall during construction activities on a daily basis
- Inspect and record results of the survey and crack gauge position on a daily basis during rock breaking activities otherwise weekly
- Should any vertical or translation movement exceed 3mm refer to Lindsay Dynan for review
- Should any crack width increase by 1mm or greater refer to Lindsay Dynan for review (Note: 1mm limit is based on a Very Slight damage category in accordance with AS 2870. Refer appendix A for further details)

Figure 1: Survey Locations – Garage Wall

VIBRATION MONITORING

PPV or PVS is typically used to represent damage potential to buildings and structures and is subject to the type of construction, condition of the structure, ground conditions and distance from source. The garage building appears to in poor condition and includes unreinforced block construction. Damage associated with ground vibrations is also highly dependent on the fundamental frequency of the structure.

We recommend vibration monitoring be install at 2 locations along garage (say ¼ points). We further recommend that the following triggers be consider:

- Greater than or equal to 4mm/s (damage is possible)
  - Stop work and re-assess how to limit vibration
  - Progress with full time visual monitor of the wall

- Greater than or equal to 8mm/s (damage becoming more likely)
  - Stop work and refer to Lindsay Dynan

DILAPIDATION RECORD

We recommend that a photographic record of the existing garage is recorded prior to further works and include evidence of existing crack widths.

WALL TEMPORARY STABILTY

Lindsay Dynan inspected the garage wall on 26 August 2021 and observed that the wall is hollow unreinforced block. We also observed that the top of the wall is unrestrained at the roof level. On this basis we recommend that temporary propping is provided to the wall to provide lateral support and eliminate risk of collapse. Refer to separate correspondence on temporary propping.

LIMITATIONS

This assessment does not consider the following:

- Noise or vibration limits for compliance with EPA or other guidelines
- Comfort limits for neighbours
- Stability of the already damaged and partly demolished boundary wall
- We have not considered monitoring requirements for excavations adjacent to the garage or boundary wall

Please note that this letter does not relieve any party of their responsibility to comply with relevant documentation such as drawings, specifications and standards. This certificate shall not be construed as relieving any other party of their responsibilities, liabilities or contractual obligations, and does not constitute an inspection certificate.

Should you require any further advice or clarification of any of the above, please do not hesitate to contact us.

Yours faithfully
LINDSAY DYNAN
CONSULTING ENGINEERS PTY LIMITED

Peter Forder
Principal Engineer
BEng(Civil), CPEng, NER

Appendix A

Extract AS2870 – Residential Slabs and Footings

Classification of Damage due to Foundation Movement

TABLE C1

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 1)	Damage category
Hairline cracks	<0.1 mm	0 Negligible
Fine cracks that do not need repair	<1 mm	1 Very slight
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2 Slight
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weather tightness often impaired	5 mm to 15 mm (or a number of cracks 3 mm or more in one group)	3 Moderate
Extensive repair work involving breaking out and replacing sections of walls, especially over doors and windows. Window frames and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15 mm to 25 mm but also depends on number of cracks	4 Severe

NOTES: