

SYDNEY METRO MARTIN PLACE – INTEGRATED STATION DEVELOPMENT GROUNDWATER MONITORING REPORT JULY-DECEMBER 2021



REVISION STATUS

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TABLE OF CONTENTS

1.0	INTRODUCTION	3
1.1	Sydney Metro project background	3
1.2	Martin Place - Integrated Station Development (ISD)	3
1.3	Project Location	3
1.4	Construction Groundwater Management Plan	3
2.0	WORK ACTIVITIES	5
3.0	MONITORING REQUIREMENTS	6
3.1	Construction Groundwater Management Plan monitoring requirements	6
3.2	WTP Monitoring Objectives	6
4.0	MONITORING LOCATIONS	7
5.0	MONITORING RESULTS	7
6.0	CONCLUSION	11

List of Tables

Table 1 – CGMP monitoring criteria	6
Table 2 – WTP discharge monitoring summary	8
Table 3 – Trigger criteria exceedances	10

List of Figures

Figure 1 – Project Site Location and Project Sites	4
Figure 2 – WTP monitoring location	7

1.0 INTRODUCTION

1.1 Sydney Metro project background

The New South Wales (NSW) Government through Transport for NSW (TfNSW) is implementing Sydney's Rail Future, a plan to transform and modernise Sydney's rail network so that it can grow with the city's population and meet the needs of commuters and customers in the future.

Sydney Metro is a new standalone rail network identified in Sydney's Rail Future. The Sydney Metro network consists of Sydney Metro Northwest (previously known as the North West Rail Link), Sydney Metro City & Southwest and Sydney Metro West.

This monitoring report has been developed for the Martin Place Integrated Station Development (MPISD) construction.

1.2 Martin Place - Integrated Station Development (ISD)

The Martin Place Integrated Station Development comprises of the new Martin Place Metro Station. The Martin Place Metro Station works are being constructed as part of the Critical State Significant Infrastructure (CSSI) project (reference SSI 7400), and as approved by SSI 7400 MOD 3.

The south tower and north tower Over Station Development (OSD) works will be completed under separate State Significant Development (SSD) approvals.

1.3 Project Location

The Project is located at Martin Place, with the following components:

- North site, bounded by Hunter Street to the north, 50 Martin Place to the south, Elizabeth Street to the east and Castlereagh Street to the west.
- South site, bounded by Martin Place to the north, 65 Elizabeth Street to the south, Elizabeth Street to the east and Castlereagh Street to the west.
- Bligh Street compound, a temporary works location at 33 Bligh Street.

The location of this Project is shown in Figures 1 and 2 below.

MPISD works were undertaken at the Martin Place North site, South site, tunnels, station caverns and Bligh Street compound for the duration of the reporting period.

1.4 Construction Groundwater Management Plan

A Construction Groundwater Management Plan (CGMP) has been prepared for the construction of the MPISD project, and was updated during the reporting period.

The CGMP includes a groundwater monitoring program, which specifies monitoring required throughout construction. This monitoring report has been prepared to address the requirements of the groundwater monitoring program.

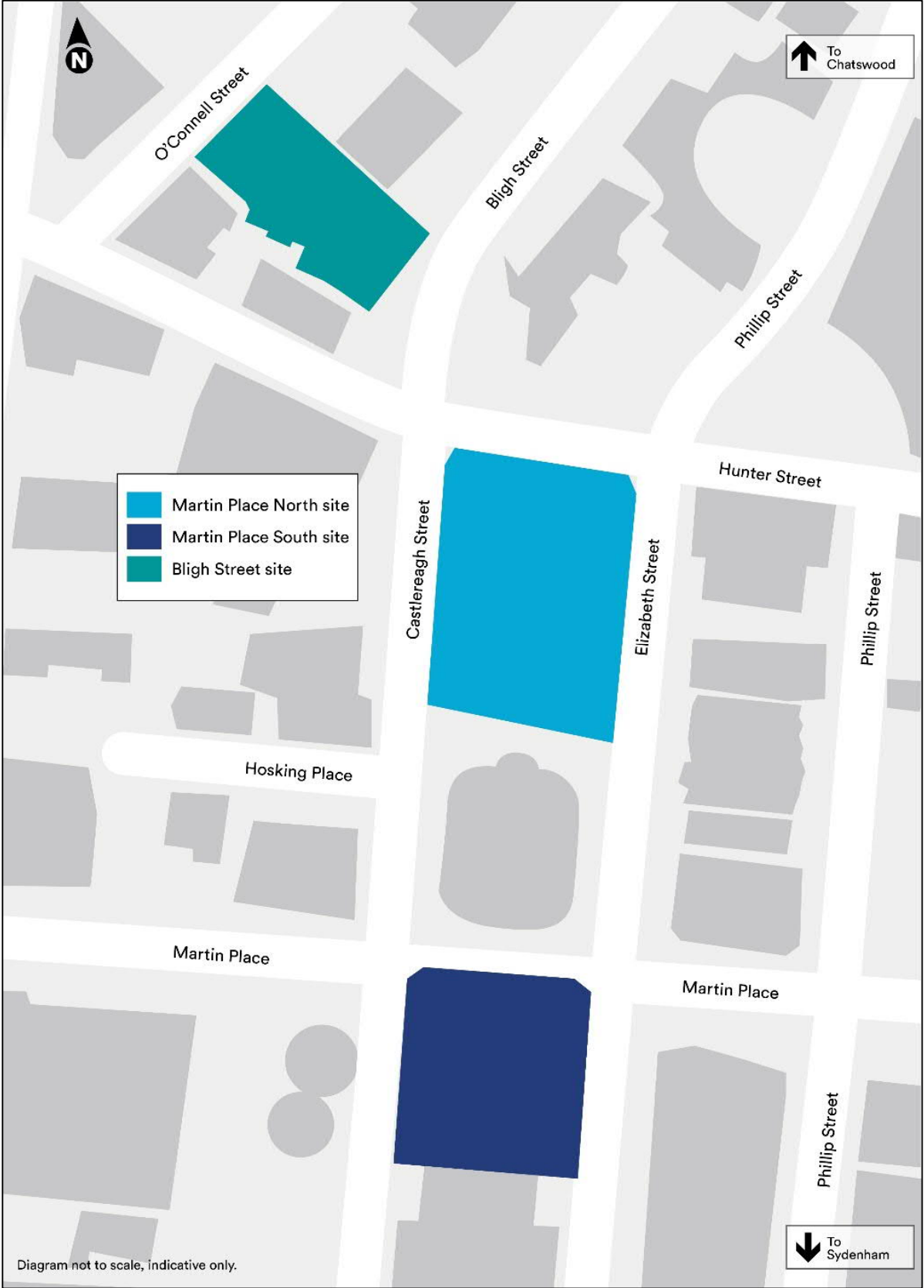


Figure 1 – Project Site Location and Project Sites

2.0 WORK ACTIVITIES

Works have comprised of the following activities:

- Deliveries
- Excavation of station footings and foundations using hydraulic hammers and saws.
- Loading and haulage of excavated material.
- Construction of station footings and foundations including steel and concrete placement.
- Waterproofing.
- Structural station elements including steel and concrete placement.
- Operation of the Bligh Street compound and water treatment plant (WTP).

The WTP was used to treat Sydney Metro tunnel construction water generated by the Linewide contractor between Central and Barangaroo up to October 2021. The WTP treated stormwater runoff from the MPISD site for the duration of the reporting period.

The WTP uses a multi-barrier approach to treat the water, consisting of the following stages:

- primary: pre-treatment consisting of chemical dosing with coagulant and flocculant, pH adjustment and settlement; and
- secondary: media and GAC filtration.

The pH is monitored continuously to ensure that the water is neutralised prior to filtration. The treated water is discharged via the stormwater system to Sydney Harbour near the Man O'War (MOW) steps and generated sludge is dewatered within the MPISD site and disposed offsite.

3.0 MONITORING REQUIREMENTS

3.1 Construction Groundwater Management Plan monitoring requirements

Table 1 below summarises monitoring criteria that was required by the Construction Groundwater Management Plan during the reporting period, along with the current status of monitoring.

Table 1 – CGMP monitoring criteria

Monitoring Location	Parameters	Frequency	Standards	Status at start of reporting period
Groundwater Bore – MMP-BH005	Groundwater elevation	Continuous, until completion of excavation	-	Complete
Groundwater Bore – MMP-BH007	Groundwater elevation	Continuous, until completion of excavation	-	Complete
Groundwater Bore – JCG-BH113	Groundwater elevation	Continuous, until completion of excavation	-	Complete
Groundwater discharge	pH, Turbidity, Suspended Solids, Oil and Grease, Metals, Hydrocarbons.	Fortnightly, subject to review.	Alert & trigger criteria	Ongoing

Groundwater levels at the completion of bulk excavation were stable and hence groundwater level monitoring at the groundwater bores adjacent to the site was completed in December 2020.

The remaining aspect of groundwater monitoring required by the Construction Groundwater Management Plan is water treatment plant (WTP) discharge, as per Table 1.

Note that the WTP treated a mix of groundwater seepage into the Sydney Metro tunnels between Central and Barangaroo, and MPISD construction site runoff. Due to this, the water treated does not represent groundwater conditions at the Martin Place site as it is mixed with stormwater runoff and construction runoff.

3.2 WTP Monitoring Objectives

Condition E107 of the SSI 7400 approval states that the project should maintain, or if not currently being achieved, contribute towards achieving NSW Water Quality Objectives (WQOs) for the Sydney Harbour.

Monitoring of the WTP has been undertaken to assess performance against site specific discharge criteria and water quality objectives prepared to ensure that the project meets Condition E107.

4.0 MONITORING LOCATIONS

The monitoring location is at the discharge from the Bligh St WTP, the location of which is shown in Figure 2 below.

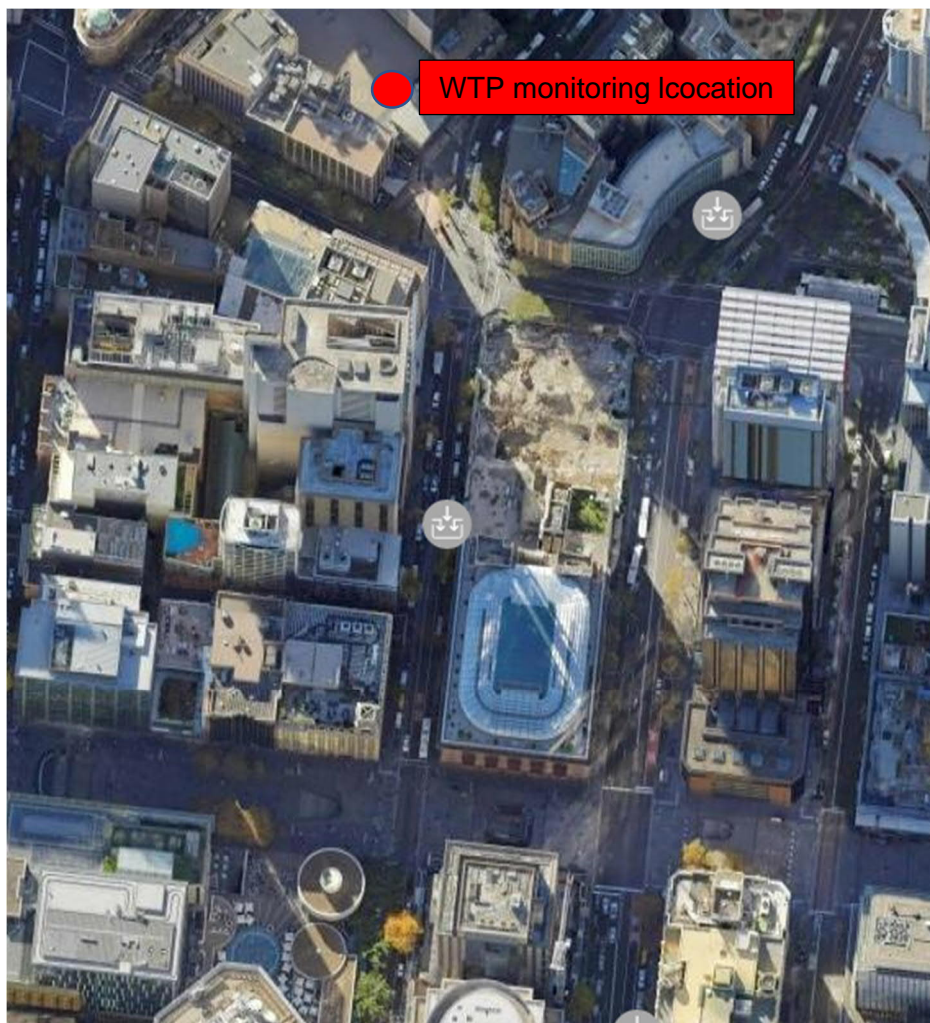


Figure 2 – WTP monitoring location

5.0 MONITORING RESULTS

A summary of WTP discharge monitoring results for the reporting period is provided in Table 2 below. Monitoring was undertaken fortnightly throughout the reporting period.

Relevant criteria shaded blue are the derived water quality criteria in the MPISD Water Monitoring Plan, dated April 2021. These criteria are based on:

- NSW WQO (2006) for Sydney Harbour, Lower Estuary.
- ANZG 95% (2018) protection of marine ecosystems / project specific guidelines for discharge at Sydney Harbour at Man O'War (MOW) Steps.

Exceedances of the trigger criteria are marked in red text, and are discussed further below.

Table 2 – WTP discharge monitoring summary

Parameter	Unit	EQL	Project Criteria	Minimum Concentration	Average Concentration	Maximum Concentration
Field	Temp (Field)	°C		15.9	18	20.8
	EC (field)	uS/cm		780	1,357	2,548
	pH (field)	-		7.0-8.5	7.4	7.88
	Redox Potential (Field)	mV		81.4	129	172.1
	Turbidity (Field)	NTU		5	0.78	3.6
	TDS (Field)	mg/L			507	847
	DO (Field)	mg/L			4.07	6.2
	TSS	mg/L	5		<5	12
	pH (Lab)	-	0.1		7.1	7.7
Analytical results – nutrients	Ammonia as N	mg/L	0.01	1.9	<0.01	0.23
	Nitrite + Nitrate as N	mg/L	0.01		0.33	1.2
	Kjeldahl Nitrogen Total	mg/L	0.1		0.2	1.2
	Nitrite (as N)	mg/L	0.01		0.02	0.075
	Nitrate (as N)	mg/L	0.01	2.9	0.28	1.1
	Nitrogen (Total)	mg/L	0.1	6	0.7	2.4
	Reactive Phosphorus as P	mg/L	0.01		<0.01	0.032
	Phosphorus	mg/L	0.01	1.1	0.03	0.12
Metals	Aluminium	mg/L	0.05		0.15	1.4
	Aluminium (filtered)	mg/L	0.05		<0.05	0.11
	Arsenic	mg/L	0.001	1	0.001	0.0012
	Arsenic (filtered)	mg/L	0.001	1	0.001	0.0011
	Barium	mg/L	0.001		<0.02	0.011
	Barium (filtered)	mg/L	0.001		<0.02	0.011
	Boron	mg/L	0.05		0.05	0.11
	Boron (filtered)	mg/L	0.05		0.05	0.099
	Cadmium	mg/L	0.0001	1	<0.0002	0.00011
	Cadmium (filtered)	mg/L	0.0001	1	<0.0002	0.0001
	Chromium (III+VI)	mg/L	0.001	1	0.003	0.01
	Chromium (III+VI) (filtered)	mg/L	0.001	1	0.002	0.0085
	Copper	mg/L	0.001	1.1	0.001	0.0034
	Copper (filtered)	mg/L	0.001	1.1	0.001	0.0032
	Strontium	mg/L	0.001		0.05	0.1
	Strontium (filtered)	mg/L	0.001		0.042	0.096
	Iron	mg/L	0.05		<0.05	0.094
	Iron (filtered)	mg/L	0.05		<0.05	0.025
	Lead	mg/L	0.001	1	0.001	0.00056
	Lead (filtered)	mg/L	0.001	1	<0.001	0.0005
	Manganese	mg/L	0.001	2.9	<0.005	0.0075
	Manganese (filtered)	mg/L	0.001	2.9	<0.005	0.0059
Mercury	mg/L	0.0001	0.04	0.0001	0.000053	

**SYDNEY METRO MARTIN PLACE STATION – INTEGRATED STATION DEVELOPMENT
GROUNDWATER MONITORING REPORT JUL-DEC 2021**

Parameter	Unit	EQL	Project Criteria	Minimum Concentration	Average Concentration	Maximum Concentration
Mercury (filtered)	mg/L	0.0001	0.04	<0.0001	0.00005	<0.0001
Nickel	mg/L	0.001	1.1	0.001	0.0019	0.005
Nickel (filtered)	mg/L	0.001	1.1	0.001	0.0016	0.004
Zinc	mg/L	0.005	1	0.005	0.056	0.22
Zinc (filtered)	mg/L	0.005	1	<0.005	0.04	0.24
BTEX						
Benzene	µg/L	1	7000	<1	0.5	<1
Ethylbenzene	µg/L	1	800	<1	0.5	<1
Toluene	µg/L	1	180	<1	0.5	<1
Xylene (m & p)	µg/L	2		<2	1	<2
Xylene (o)	µg/L	1		<1	0.5	<1
Xylene Total	µg/L	2	750	<3	1.5	<3
TRH						
C10-C16	µg/L	50		<50	50	480
C10-C16 (F2 minus Naphthalene)	µg/L	50		<50	50	480
C10-C40 (Sum of total)	µg/L	100	200	<100	90	500
C16-C34	µg/L	100		<100	235	2,600
C34-C40	µg/L	100		<100	53	100
C6-C10	µg/L	20		<20	10	20
C6-C10 (F1 minus BTEX)	µg/L	20		<20	10	20
Oil and Grease	mg/L	5	None visible	<10	7.2	33
PAH						
Naphthalene	µg/L	1	700	<1	0.5	<1
Acenaphthene	µg/L	1		<1	0.5	<1
Acenaphthylene	µg/L	1		<1	0.5	<1
Anthracene	µg/L	1		<1	0.5	<1
Benz(a)anthracene	µg/L	1		<1	0.5	<1
Benzo(a) pyrene	µg/L	0.5		<1	0.5	<1
Benzo(b+j)fluoranthene	mg/L	0.001		<0.001	0.0005	<0.001
Benzo(g,h,i)perylene	µg/L	1		<1	0.5	<1
Benzo(k)fluoranthene	µg/L	1		<1	0.5	<1
Chrysene	µg/L	1		<1	0.5	<1
Dibenz(a,h)anthracene	µg/L	1		<1	0.5	<1
Fluoranthene	µg/L	1		<1	0.5	<1
Fluorene	µg/L	1		<1	0.5	<1
PAHs (Sum of total)	µg/L	0.5		<1	0.5	<1
Indeno(1,2,3-c,d)pyrene	µg/L	1		<1	0.5	<1
Phenanthrene	µg/L	1		<1	0.5	<1
Pyrene	µg/L	1		<1	0.5	<1



Comparison of the results to the project criteria demonstrates that WTP discharges during the reporting period have not exceeded trigger criteria, apart from two occasions.

These trigger criteria exceedances, and responses to them, are described in Table 3 below:

Table 3 – Trigger criteria exceedances

Date	Exceedance details	Response (as per discharge water monitoring process)	Conclusion
18 November 2021	<ul style="list-style-type: none"> • TRH C10-C40 (sum of total) at 0.3mg/L exceeding trigger of 0.2 mg/L. • Clean up gel of same sample gave a result of <0.1 mg/L. • No exceedance in the corresponding Man O'War Steps environment - harbour sample for TRH C10-C40 (sum of total) was 0.1 mg/L. 	<p>Retest WTP discharge water.</p> <p>Reduce flow rate and recirculate water until water meets discharge criteria.</p> <p>Review and adjust WTP operations to improve water quality.</p>	<p>TRH criteria was adopted to indicate a change in GAC filter performance. TRH levels in samples does not indicate impact to the local environment, as shown by confirmatory sampling at Sydney Harbour.</p>
2 December 2021	<ul style="list-style-type: none"> • TRH C10-C40 (sum of total) at 0.5mg/L exceeding trigger of 0.2 mg/L. • Turbidity at 13.5 NTU, exceeding trigger of 5 NTU. • TSS at 27, hence <50, lower than Blue Book criteria. • No exceedance in the corresponding Man O'War Steps environment – harbour sample for TRH C10-C40 (sum of total) at <0.1mg/L and TSS at 12 mg/L. 	<p>Retest WTP discharge water.</p> <p>Reduce flow rate and recirculate water until water meets discharge criteria.</p> <p>Review and adjust WTP operations to improve water quality.</p> <p>Replaced carbon filter and disposed of spent carbon.</p>	<p>TRH criteria was adopted to indicate a change in GAC filter performance. TRH levels in samples does not indicate impact to the local environment, as shown by confirmatory sampling at Sydney Harbour.</p> <p>Turbidity criteria was adopted as a level that the WTP can perform to. Turbidity levels in samples do not indicate impact to the local environment, as shown by confirmatory sampling at Sydney Harbour.</p>

6.0 CONCLUSION

As groundwater levels at the end of 2020 were stable, groundwater level monitoring at the piezometers was completed in December 2020.

Remaining groundwater-related monitoring at the MPISD site comprised of WTP discharge monitoring.

Comparison of the WTP discharge results to the project criteria demonstrates that WTP discharges during the reporting period have largely not exceeded criteria.

The minor exceedances of trigger criteria discussed in Section 5 did not impact on ambient water quality within Sydney Harbour, as shown by confirmatory sampling at the Man O'War Steps in Sydney Harbour.

Hence the project has been able to meet the objective of contributing towards achieving NSW Water Quality Objectives (WQOs) for Sydney Harbour, as required by CSSI approval Condition E107.