Upper South Creek

Advanced Water Recycling Centre and Pipelines

Groundwater Monitoring Report

Document Number: USCP-JHG-RPT-ENV-0018
Revision: 02

Revisions and Distribution

Distribution

There are no restrictions on the distribution or circulation of this Construction Environmental Plan within John Holland.

	Uncontrolled Copy
Authorised By:	Richard Ioffrida (Project Director)
Date:	22/11/2024

Revisions

Draft issues of this document shall be identified as Revision 01, 02, 03 etc. Upon initial issue (generally Contract Award) this shall be changed to a sequential number commencing at Revision A. Revision numbers shall commence at Rev. A, B etc.

Date	Rev	Remarks	Section	Prepared By	Reviewed By & Approved By
19/11/2024	1	Initial version for review	All	R. Maxwell	A. Harrington
05/03/2025	2	Updated following ER and SW comments	All	R. Maxwell	A. Harrington

Glossary and Abbreviations

Abbreviation	Term	Definition
AWRC	Advanced Recycling Water Centre	Proposed centre for treatment of the wastewater prior to reuse applications or discharge, which includes liquids treatment, advanced water treatment, solids treatment, odour treatment, and residuals management
AHD	Australian Height Datum	A common reference level used in Australia which is approximately equivalent to the height above sea level in metres.
-	Brine Pipeline	A pipeline to transport brine (salty/concentrated wastewater). Brine water is a byproduct of reverse osmosis in the wastewater treatment process.
DMP	Dewatering Management Plan	A DMP is generally developed as a sub-plan under an overarching Construction Environmental Management Plan to document the management procedures and controls to mitigate potential environmental impacts associated with dewatering activities during construction.
EC	Electrical Conductivity	The ability of a material to conduct an electric current. In groundwater studies, electrical conductivity is used as an indicator of water quality, as it relates to the concentration of charged particles in water. Electrical conductivity provides an indication of the amount of total dissolved solids and the amount of salts in the water. Typically measured in µS/cm.
EIS	Environmental Impact Statement	An Environmental Impact Statement is a publicly available document that provides technical information on a project, including a summary of the environmental setting, its environmental impacts and mitigation measures, and is used to inform development consent decisions
-	Hydraulic Conductivity	The measure of how easily water can pass through a porous material. High values indicate permeable material through which water can pass easily and low values indicate a less permeable material. Hydraulic conductivity is dependent upon the intrinsic permeability of the material, the degree of saturation and the fluid properties (i.e. density and viscosity).
HSU	Hydrostratigraphic unit	A general grouping of geologic materials that form a distinct hydrogeological unit with respect to the flow and behaviour of groundwater.
LOR	Limit of reporting	The smallest concentration of a chemical that can be reported by the laboratory using the adopted analytical methodology. Also commonly referred to as the Estimated Quantitation Limit (EQL) or detection limit.
TOC	Top of Casing	Refers to the top of the groundwater monitoring well casing. This is used as a consistent datum from which groundwater levels are measured against. Surveyed elevation of the top of casing is also measured for each monitoring well, to enable groundwater level measurements to be converted to m AHD.
-	Treated water pipeline	The pipelines that will convey the highly treated water to the receiving environment. The pipelines will transport water from the AWRC to the discharge points at the Nepean River. These pipelines will range in size from about 0.6 m to 1.5 m in diameter and will generally consist of steel, glass reinforced plastic and polyethylene pipe materials.
USC	Upper South Creek	The catchment in which the AWRC will be located. South Creek discharges to the Nepean River which flows directly into the Hawkesbury River and then discharges out to the Pacific Ocean
WQO	Water Quality Objectives	Water Quality Objectives are long-term goals for water quality management. They are measures, levels or narrative statements of indicators of water quality that protect environmental values.. They define what the water quality should be to protect the environmental values—after consideration of the socio-economic assessment of protecting the water quality.

1 Background

The Upper South Creek (USC) Advanced Water Recycling Centre and Pipelines project (the project) has been proposed to support the population growth and economic development of the Western Sydney Aerotropolis Growth Area (WSAGA or Aerotropolis), South West Growth Area (SWGA) and the new Western Sydney International Airport. The project will provide wastewater services to Western Sydney to produce high-quality treated water for non-drinking reuse and for release to local waterways.

The project will comprise the following components:

- A new Advanced Water Recycling Centre (AWRC) to collect wastewater from businesses and homes and treat it, producing high-quality treated water, renewable energy and biosolids for beneficial reuse
- A new green space area around the AWRC, adjacent to South Creek and Kemps Creek, to support the ongoing development of a green spine through Western Sydney
- New infrastructure from the AWRC to South Creek, to release excess treated water during significant wet weather events, estimated to occur about 3 – 14 days each year
- A new treated water pipeline from the AWRC to Nepean River at Wallacia Weir, to release high-quality treated water to the river during normal weather conditions
- A new brine pipeline from the AWRC connecting into Sydney Water's existing wastewater system to transport brine to the Malabar Wastewater Treatment Plan
- A range of ancillary infrastructure.

2 Purpose

The purpose and scope of the Groundwater Monitoring Program (Appendix F of the Surface Water and Groundwater CEMP Sub-plan) is to monitor the effectiveness of mitigation measures applied during the construction phase of the AWRC site as it relates to the groundwater resources. This program is based on baseline studies developed for the USC AWRC Environmental Impact Statement (EIS) dated September 2021. Construction works at AWRC commenced on the 28th of August 2023.

As specified in Section 7.3 of the Groundwater Monitoring Program (GWMoP), this Groundwater Monitoring Report (GMR, or this 'report') will be produced every six months, in accordance with the Ministers Conditions of Approval (MCoA) C18. This report presents the findings for the reporting period of March 2024 to August 2024. The report captures the following details:

- The location and description on monitoring undertaken
- A summary of groundwater data collected within the monitoring period
- Summary and analysis of any measurements exceeding the project acceptable ranges.

3 Construction Update

Construction activities undertaken across the AWRC site during the reporting period are provided below. It is noted that there were no works undertaken which required extraction or interaction with groundwater.

- Clearing and grubbing
- Bulk earthworks
- Structure construction works including:
  - Piling works
  - Steel fixing
  - Installation of structural elements
  - Form, reo, pour (FRP) works
- Concrete pours.

4 Groundwater Quality Monitoring

4.1 Monitoring Network

During the reporting period, groundwater quality monitoring was carried out at the locations specified in Table 4-1 at the AWRC. These monitoring locations are also presented in Figure 4-1.

Table 4 - 1: Groundwater Quality Monitoring Locations

Monitoring Well ID	Easting	Northing	Location Description	Screened Material Description	Targeted Hydrostratigraphic Unit
AWRC_ MW01	293922.34	6251905.16	North of the AWRC site, mid-way between South Creek and Kemps Creek	Claystone, sandstone, coal.	Upper Wianamatta Group (weathered/fractured Bringelly Shale)
AWRC_MW03D	294412.94	6251662.78	Well pairing east of the AWRC site, towards Kemps Creek (deeper well).	Claystone, sandstone.	Upper Wianamatta Group (weathered/fractured Bringelly Shale)
AWRC_MW03S	294412.37	6251662.41	Well pairing east of the AWRC site, towards Kemps Creek (shallower well)	Clayey sand, clayey sandy gravel, silty clay.	Unconsolidated Quaternary alluvium and residual / regolith soils
AWRC_MW04	293791.88	6251518.90	Adjacent to the western boundary of the AWRC site.	Gravelly sandy clay, sandy silty clay	Unconsolidated Quaternary alluvium and residual / regolith soils
AWRC_MW04D	293791.88	6251518.90	Adjacent to the western boundary of the AWRC site.	Siltstone, sandstone	Upper Wianamatta Group (weathered/fractured Bringelly Shale)
AWRC_MW05D	293469.19	6251417.88	Well pairing west of the AWRC site, towards South Creek (deeper well).	Claystone	Upper Wianamatta Group (weathered/fractured Bringelly Shale)
AWRC_MW05S	293468.17	6251417.73	Well pairing west of the AWRC site, towards South Creek (shallower well).	Sandy clay, clayey gravel, sandy gravelly clay.	Unconsolidated Quaternary alluvium and residual / regolith soils
AWRC_ MW06	293727.84	6251197.57	Adjacent to the south-western boundary of the AWRC site.	Sandy clay, sandy gravelly clay, gravelly clay	Unconsolidated Quaternary alluvium and residual / regolith soils
AWRC_MW08D	293737.44	3748301.91	Adjacent to the western boundary of the AWRC site.	Siltstone, sandstone	Upper Wianamatta Group (weathered/fractured Bringelly Shale)
AWRC_MW08S	293737.44	3748301.91	Adjacent to the western boundary of the AWRC site.	Sandy clay	Upper Wianamatta Group (weathered/fractured Bringelly Shale)

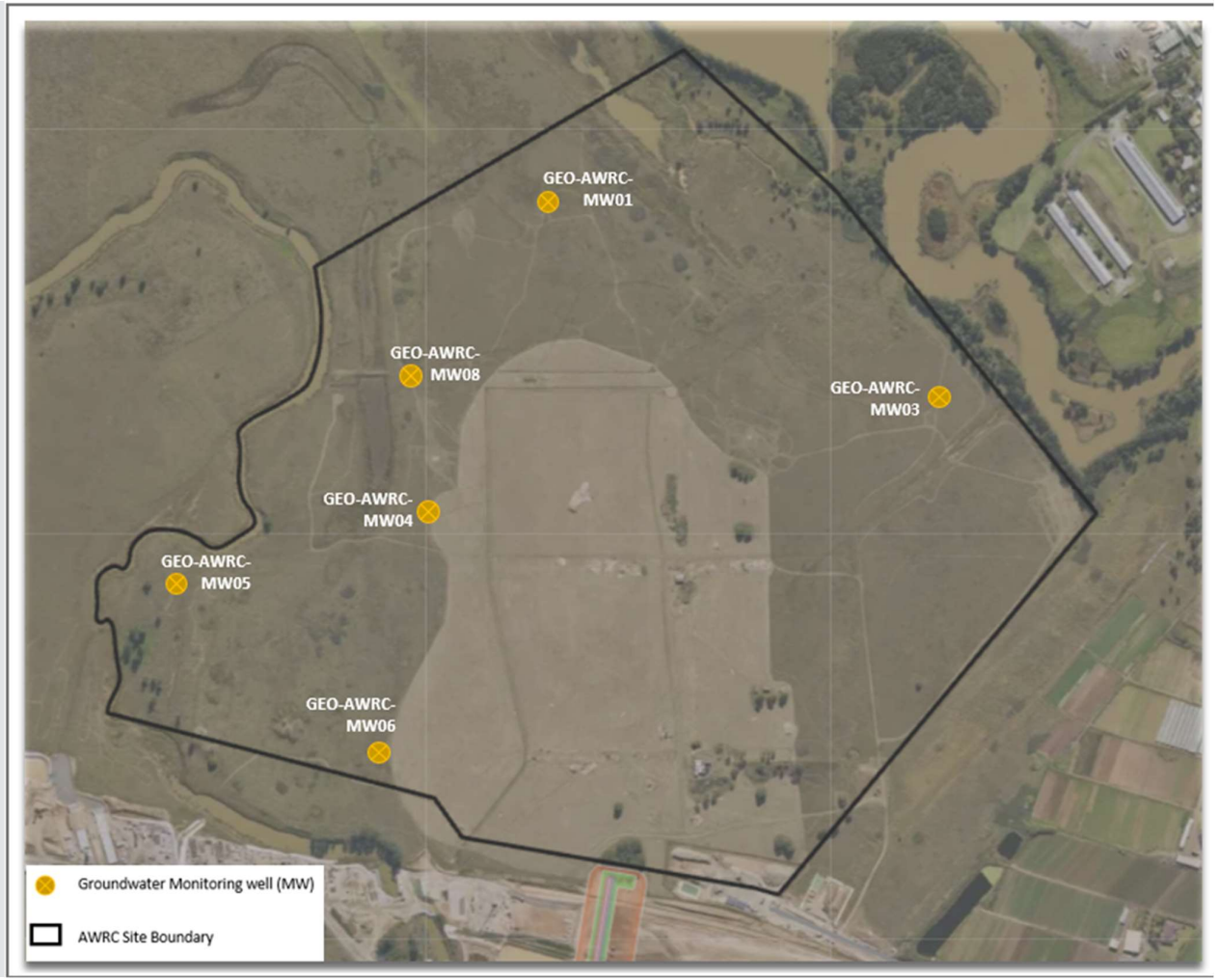

Figure 4 - 1 Groundwater Monitoring Location Map

4.2 Monitored Parameters

Measurements of the following groundwater parameters were taken during the reporting period at each groundwater monitoring location (Section 4.1) using a calibrated water quality meter and interface probe.

- Depth to water (mbTOC);
- Presence/absence of Light Non-Aqueous Phase Liquid (LNAPL) and thickness if present (mbTOC);
- Water Temperature (°C);
- pH;
- Electrical Conductivity (µS/cm);
- Dissolved Oxygen (%);
- Redox Potential;
- Visual and olfactory indicators (colour, turbidity, odour, sheen, discolouration, free phase liquids, foaming waters);
- Evidence of stressed or dead flora and / or fauna (for example, fish kills) in downstream receiving environments.

Representative groundwater samples were obtained and submitted to a NATA laboratory for analysis of the following parameters.

- Total dissolved solids (TDS).
- Total suspended solids (TSS).
- Nutrients (including ammonia, nitrate, nitrite, total nitrogen and total phosphorous).
- Major ions (chloride, sulfate, sodium, potassium, magnesium, calcium, carbonate and bicarbonate); and
- Dissolved heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn) and polycyclic aromatic hydrocarbons (PAHs).

4.3 Monitoring events and timing

Routine groundwater quality monitoring has been completed quarterly throughout the reporting period and upon commencement of construction at the AWRC in accordance with Section 5.4.3 of the GWMoP. Quarterly monitoring was undertaken in March 2024 and June 2024.

Routine water level gauging has been undertaken at groundwater monitoring wells MW04 and MW08 via nested piezometers which continuously log groundwater levels.

There were no incidents or events which occurred during the reporting period with the potential to impact groundwater quality therefore event triggered sampling was not required.

No Project trigger value or acceptable range reporting was undertaken during the reporting period. While there were some exceedances noted, these were not attributable to the Project, as detailed in Section 6.

5 Groundwater Monitoring Results

5.1 March 2024

Groundwater monitoring was carried out on 4 March 2024 by Matt Lemcke – Hydrogeologist and Environmental Scientist from Environment and Natural Resource Solutions (ENRS). Field sampling monitoring results are provided in Table 5-1 while laboratory results are provided in Table 5-2. Monitoring wells which have Bringelly Shale project acceptable ranges are denoted by brown text while monitoring wells with alluvial/residual soil project acceptable ranges are denoted in white text. Exceedances of acceptable ranges are noted in red in Tables 5-1 and 5-2.

Table 5 – 1: Field sampling monitoring results for March2024

Parameter	Project Acceptable Range		Unit	MW1	MW3-D	MW3-S	MW4	MW4-D	MW5-S	MW5-D	MW8-S	MW8-D	MW6
	Alluvial/Residual Soils	Bringelly Shale											
Depth to Water	32.76	32.77	mAHD	34.3	36.92	36.425	36.42	34.31	33.79	34.06	35.14	34.95	35.33
Electrical Conductivity	117.3 – 25974	195.6 – 20241	us/cm	16180	18790	20230	18060	19750	1339	18560	18710	17010	381
Dissolved Oxygen	1.4 – 8.38	0.65 – 6.32	mg/L	0.43	2.4	0	11.7	0	0	0	0.1	0	0
pH	5.74 – 8.04	6.42 – 7.83	-	6.78	6.85	5.87	6.62	6.77	6.55	6.55	5.98	6.75	5.72
ORP (Redox Potential)	-	-	mV	-171	-196	87	105	-129	-158	-113	-76	-128	140
Temperature	-	-	^{0}C	16	17.1	17	20.3	18.9	17.5	17	16.9	17.6	16.3
Light Non-Aqueous Phase Liquid	-	-	Presence/absence	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

Field sampling carried out during March 2024 identified that groundwater monitoring results were largely within the Project acceptable range for each parameter. Some exceedances were identified in several monitoring locations for dissolved oxygen and pH. Analysis of these exceedances are provided in Section 6.

Table 5-2: Laboratory groundwater monitoring results for March 2024

Parameter	Project Acceptable Range		Unit	MW1	MW3-D	MW3-S	MW4	MW4-D	MW5-S	MW5-D	MW8-S	MW8-D	MW6
	Alluvial /Residual Soils	Bringelly Shale											
Total Dissolved Solids (TDS)	59 - 18500	182 – 17100	mg/L	12500	15500	15600	13100	17700	963	16600	14600	13200	248
Total Suspended Solids (TSS)	0 - 50	0 - 50	mg/L	<5	<5	8	21	81	60	13	425	320	<5
Ammonia as N	<0.48	<3.3	mg/L	1.49	1.74	0.09	0.03	4.66	<0.01	3.3	0.11	3.82	<0.01
Nitrate as N	-	-	mg/L	<0.01	<0.01	<0.01	0.49	<0.01	0.03	<0.01	<0.01	<0.01	<0.01
Nitrite as N	-	-	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Nitrogen as N	<11	<11.8	mg/L	1.5	1.7	0.1	0.8	4.7	0.1	3.4	0.4	4.2	0.1
Total Phosphorus as P	<2.15	<0.29	mg/L	0.02	<0.01	0.02	0.01	0.04	0.06	<0.01	0.07	0.11	0.01
Chloride	-	-	mg/L	5910	7070	7660	6860	7490	422	7100	6980	6430	86
Sulfate	-	-	mg/L	268	<1	501	332	5	6	<10	288	<10	21
Calcium	-	-	mg/L	270	251	98	203	575	33	619	90	478	<1
Magnesium	-	-	mg/L	438	468	474	493	488	34	657	479	443	1
Sodium	-	-	mg/L	2830	3430	4110	3410	3320	219	2670	3460	2710	77
Potassium	-	-	mg/L	18	18	4	10	45	<1	36	4	39	<1
Carbonate Alkalinity as CaCO3	-	-	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Parameter	Project Acceptable Range		Unit	MW1	MW3-D	MW3-S	MW4	MW4-D	MW5-S	MW5-D	MW8-S	MW8-D	MW6
	Alluvial /Residual Soils	Bringelly Shale											
Bicarbonate Alkalinity as CaCO3	-	-	mg/L	508	770	182	222	580	107	742	107	616	31
Arsenic	<0.005	<0.015	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
Cadmium	<0.0013	<0.0001	mg/L	<0.001	<0.001	<0.001	0.0002	<0.001	<0.001	<0.001	0.0002	<0.001	<0.0001
Chromium	<0.022	<0.01	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Copper	<0.021	<0.01	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Lead	<0.016	<0.014	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	<0.032	<0.028	mg/L	0.003	<0.001	0.005	0.021	0.009	0.001	<0.001	0.047	0.022	<0.001
Zinc	<0.471	<0.18	mg/L	<0.001	0.006	0.006	0.044	0.021	<0.001	0.021	0.029	0.023	<0.005
Mercury	<0.0001	<0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Polycyclic aromatic hydrocarbons (PAHs)	<0.5	<0.5	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Laboratory samples for monitoring undertaken in March 2024 identified that groundwater monitoring results were largely within the Project acceptable range for each parameter. Some exceedances were identified at several monitoring locations for TDS, TSS, ammonia and Nickel. Analysis of these exceedances is provided in Section 6.

5.2 June 2024

Groundwater monitoring was carried out on 26 June 2024 by Jye Findlay – Hydrogeologist and Environmental Scientist from ENRS. Field sampling monitoring results are provided in Table 5-3 while laboratory results are provided in Table 5-4. Monitoring wells which have Bringelly Shale project acceptable ranges are denoted in brown text while monitoring wells with alluvial/residual soil project acceptable ranges are denoted by white text. Exceedances of acceptable ranges are highlighted red in Tables 5-3 and 5-4. It is noted that monitoring at MW3-D and MW3-S was inaccessible due to significant rainfall and site flooding and therefore monitoring was not undertaken. Monitoring well MW4-D was observed to be damaged during this monitoring event, which impacted some of the results as discussed in Section 6. MW4-D was repaired by ENRS in July 2024.

Table 5–3: Field Sampling Results for June 2024

Parameter	Project Acceptable Range		Unit	MW1	MW3-D	MW3-S	MW4	MW4-D	MW5-S	MW5-D	MW8-S	MW8-D	MW6
	Alluvial/Residual Soils	Bringelly Shale											
Depth to Water	32.76	32.77	mAHD	34.63	-	-	36.42	35.95	34.04	34.48	35.30	35.05	35.55
Electrical Conductivity[1]	117.3 – 25974	195.6 – 20241	us/cm	14,200[1]			27,900[1]	4,550[1]	1,340[1]	20,600[1]	14,100[1]	19,000[1]	285[1]
Dissolved Oxygen[2]	1.4 – 8.38	0.65 – 6.32	mg/L	-	-	-	-	-	-	-	-	-	-
pH	5.74 – 8.04	6.42 – 7.83	-	6.78	-	-	6.46	12.2	6.99	6.68	6.04	6.75	5.77
ORP (Redox Potential)	-	-	mV	-94	-	-	-93	-112	-31	-113	48	-129	135
Temperature	-	-	^{0}C	17.2	-	-	17.7	17.1	13.6	15	16.4	16.4	16.1
Light Non-Aqueous Phase Liquid	-	-	Presence/absence	Absent	-	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent

Notes

[1] electrical conductivity measured at the lab for this round only.

[2] dissolved oxygen not measured this round due to a sensor malfunction.

Field sampling carried out during June 2024 identified that groundwater monitoring results were largely within the Project acceptable range for each parameter. Some exceedances were identified in several monitoring locations for electrical conductivity and pH. Analysis of these exceedances are provided in Section 6.

Table 5-4: Laboratory groundwater monitoring results for June 2024

Parameter	Project Acceptable Range		Unit	MW1	MW3-D	MW3-S	MW4	MW4-D	MW5-S	MW5-D	MW8-S	MW8-D	MW6
	Alluvial /Residual Soils	Bringelly Shale											
Total Dissolved Solids (TDS)	59 - 18500	182 – 17100	mg/L	9210	-	-	19600	2620	785	16800	9080	13900	182
Total Suspended Solids (TSS)	0 - 50	0 - 50	mg/L	20	-	-	768	5020	129	11	12	174	20
Ammonia as N	<0.48	<3.3	mg/L	1.15	-	-	0.92	0.35	0.17	3.51	0.22	3.88	<0.01
Nitrate as N	-	-	mg/L	<0.01	-	-	<0.01	0.09	0.03	<0.01	<0.01	<0.01	0.20
Nitrite as N	-	-	mg/L	<0.01			0.03	0.45	<0.01	<0.01	<0.01	<0.01	<0.01
Total Nitrogen as N	<11	<11.8	mg/L	1.4	-	-	4	10.2	0.5	4	0.4	4.7	0.4
Total Phosphorus as P	<2.15	<0.29	mg/L	0.08	-	-	0.7	0.94	0.14	0.04	0.04	0.12	0.04
Chloride	-	-	mg/L	4750	-	-	9310	1230	377	7190	5050	6730	69
Sulfate	-	-	mg/L	215	-	-	370	80	11	<10	195	<50	11
Calcium	-	-	mg/L	200	-	-	308	38	36	725	62	559	<1
Magnesium	-	-	mg/L	315	-	-	728	68	28	684	323	467	1
Sodium	-	-	mg/L	2280	-	-	4770	747	191	2780	2340	2860	60
Potassium	-	-	mg/L	15	-	-	13	28	2	39	2	42	<1
Carbonate Alkalinity as CaCO3	-	-	mg/L	<1	-	-	<1	<1	<1	<1	<1	<1	<1

Parameter	Project Acceptable Range		Unit	MW1	MW3-D	MW3-S	MW4	MW4-D	MW5-S	MW5-D	MW8-S	MW8-D	MW6
	Alluvial /Residual Soils	Bringelly Shale											
Bicarbonate Alkalinity as CaCO3	-	-	mg/L	357	-	-	581	215	99	655	81	548	28
Arsenic	<0.005	<0.015	mg/L	<0.001	-	-	<0.001	0.003	<0.001	<0.001	<0.001	0.003	<0.001
Cadmium	<0.0013	<0.0001	mg/L	<0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	<0.022	<0.01	mg/L	<0.001	-	-	<0.001	0.069	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	<0.021	<0.01	mg/L	<0.001	-	-	0.001	0.011	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	<0.016	<0.014	mg/L	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	<0.032	<0.028	mg/L	0.007	-	-	0.002	0.004	<0.001	<0.001	0.026	0.026	<0.001
Zinc	<0.471	<0.18	mg/L	0.011	-	-	0.041	<0.005	0.005	0.028	0.02	0.037	<0.005
Mercury	<0.0001	<0.0001	mg/L	<0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Polycyclic aromatic hydrocarbons (PAHs)	<0.5	<0.5	ug/L	<0.1	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05

Laboratory samples for monitoring undertaken in June 2024 identified that groundwater monitoring results were largely within the Project acceptable range for each parameter. Some exceedances were identified in several monitoring locations for TSS, TDS, ammonia, phosphorus, chromium and copper. Analysis of these exceedances is provided in Section 6.

5.3 Groundwater levels

Figure 5-1 below provides the groundwater level/ hydrograph data for each relevant groundwater monitoring well between March 2024 and August 2024. Groundwater levels are monitored by nested piezometers. In accordance with the SWGCSP, nested piezometers are required in MW04 and MW08 however some additional monitoring has been undertaken throughout the monitoring period.

As shown in Figure 5-1, there was one occasion where continuous pressure loggers recorded groundwater levels below the project acceptable range in June 2024. However, this occurred during onsite groundwater monitoring events where purging of the groundwater wells was undertaken. This does not reflect actual groundwater levels. MW04D observed a rapid drop in groundwater levels in July 2024, however this was a result of the monitoring well being repaired/ replaced. A rapid increase in groundwater levels was recorded at MW03S, however this was confirmed to be a pressure logger malfunction and not reflective of actual groundwater levels.

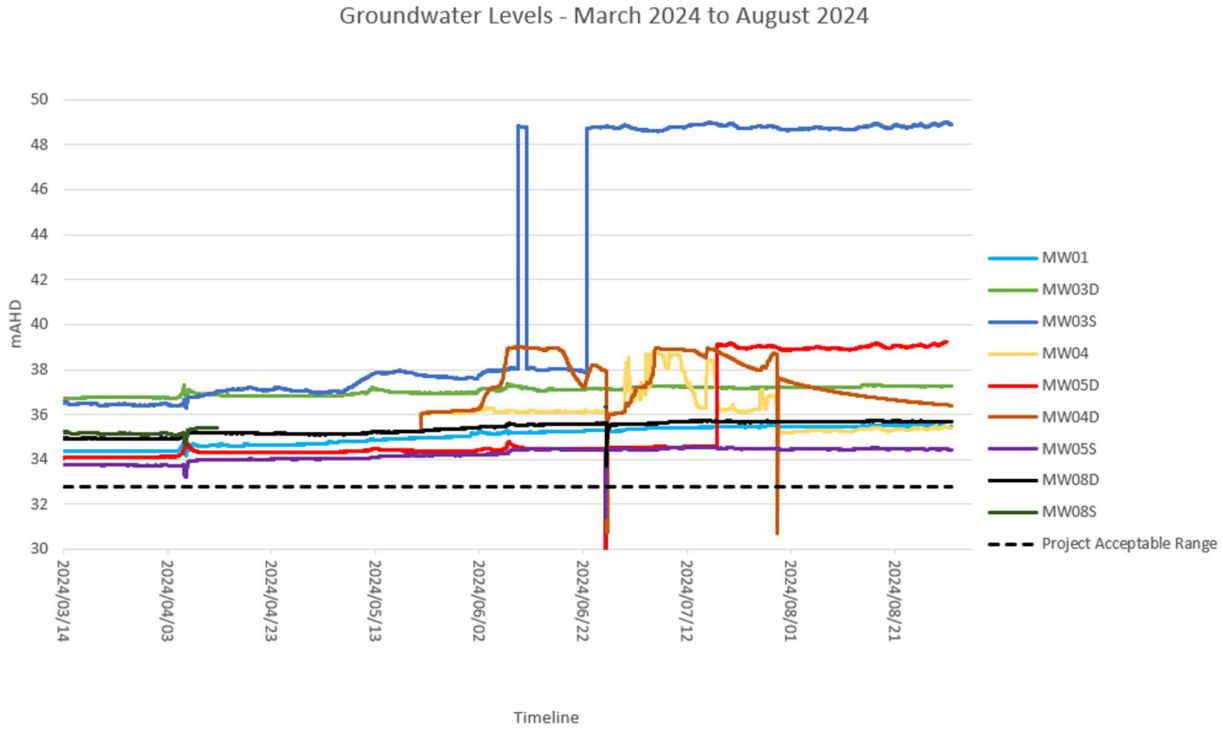

Figure 5-1 – Groundwater level data between March 2024 and August 2024

6 Discussion of exceedances

Exceedances of project acceptable ranges were observed during the reporting period for pH, TSS, TDS, dissolved oxygen, electrical conductivity, ammonia, some heavy metals and phosphorus. An analysis and review of the exceedances was undertaken by ENRS, which is summarised below.

- **pH** – two exceedances for pH were recorded during the reporting period. The first exceedance was measured at MW6 in March 2024 which recorded a pH of 5.72, which is marginally below the project acceptable range of 5.74. Baseline groundwater monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the pH project acceptable ranges at several monitoring locations. This exceedance is not considered significant, however it will continue to be monitored to identify any trends. The second exceedance was measured at MW4-D in June 2024 which recorded a pH of 12.2. It was noted by ENRS that the monitoring well had been damaged by construction activities likely resulting in the influx of surface water flows. Therefore, this exceedance is not considered to reflect the true pH of the groundwater. The damaged monitoring well MW4-D was repaired by ENRS in July 2024.
- **Total suspended solids (TSS)** – TSS for the reporting period was measured at values between the laboratory limit of reporting (LOR) and 5020 mg/L (MW4-D June 2024). The most significant exceedance of 5020 mg/L at MW4-D in June 2024 was due to the monitoring well being damaged by construction activities likely resulting in the influx of surface water flows. Therefore, this exceedance is not considered to reflect the true TSS of the groundwater. The damaged monitoring well MW4-D was repaired by ENRS in July 2024. Baseline groundwater monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the TSS project acceptable ranges at several monitoring locations.
- **Total dissolved solids (TDS)** – Two minor exceedances of TDS were recorded during the reporting period. The first exceedance was measured at MW4-D in March 2024, which recorded a TDS of 17,700 mg/L, which is marginally above the project acceptable range of 17,100 mg/L. The second exceedance was measured at MW4 in June 2024, which recorded a TDS of 19,600, which is also marginally above the project acceptable range of 18,500 mg/L. Baseline groundwater monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the TDS project acceptable ranges at several monitoring locations. Further, there are no works occurring onsite which would result in impacts to TDS.
- **Dissolved oxygen (DO)** – DO for the reporting period was measured at values between 0mg/L (several locations) and 11.7mg/L saturation (MW4-D June 2024). While groundwaters are generally depleted in DO, the multiple measurements of 0mg/L were caused by insufficient flow rates and volumes able to be collected from the groundwater well, which are required to avoid depletion of DO during the testing process. Construction works undertaken during the reporting period would not have an impact on groundwater DO levels. Baseline groundwater monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the DO project acceptable ranges at several monitoring locations. Dissolved oxygen readings were not able to be measured in March 2024 due to a faulty DO probe.
- **Electrical conductivity (EC)** – EC for the reporting period was measured at values between 285 µS/cm (MW6 June 2024) and 27,900 µS/cm (MW4 June 2024). Two minor exceedances of EC were recorded during the reporting period. The first exceedance was measured at MW4 in June 2024, which recorded a EC of 27,900 ug/L, which is marginally above the project acceptable range of 25,974 us/cm. The second exceedance was measured at MW5-D in June 2024, which recorded a EC of 20,600 ug/cm, which is marginally above the project acceptable range of 20,241 us/cm. Baseline groundwater monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the EC project acceptable range at several monitoring locations.
- **Ammonia –** Ammonia for the reporting period was measured at values between the LOR (<0.01 mg/L) and 4.66 mg/L (MW4-D March 2024). Six exceedances of the upper project acceptance range were measured at several monitoring locations in March and June 2024. Baseline groundwater monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the ammonia project acceptable ranges at several monitoring locations.
- **Heavy metals** – Review of heavy metals results for the reporting period generally reports concentrations within the project acceptance range, with exceptions of chromium, copper and nickel, which had three exceedances of the project acceptable range. Construction works undertaken during the reporting period would not have an impact on groundwater heavy metal levels.. Baseline groundwater monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the cadmium and nickel project acceptable ranges at several monitoring locations.
- **Phosphorous** – A single exceedance of phosphorous was measures at MW4-D in June 2024, which recorded 0.94 mg/L, which is above the project acceptable range of 0.29 mg/L. It was noted by ENRS that the monitoring

well had been damaged by construction activities likely resulting in the influx of surface water flows. Therefore, this exceedance is not considered to reflect the true phosphorous levels in the groundwater.

- **Groundwater levels** – There was one occasion where continuous pressure loggers recorded groundwater levels below the project acceptable range in June 2024. However this occurred during onsite groundwater monitoring events where purging of the groundwater wells was undertaken. This does not reflect actual groundwater levels. MW04D observed a rapid drop in groundwater levels in July 2024 however this was a result of the monitoring well being repaired/replaced. A rapid increase in groundwater levels was recorded at MW03S however this was confirmed to be a pressure logger malfunction and not reflective of actual groundwater levels.

Following identification of the above exceedances, an investigation was undertaken in accordance with Section 5.5 of the GWMoP which concluded that these exceedances were not attributed to or caused by the Project for the following reasons:

- As detailed above, baseline groundwater monitoring undertaken throughout 2023 prior to the commencement of construction (pre-August 2023) identified exceedances of project acceptable ranges for various parameters, including most of those parameters listed above i.e. EC, DO, pH, TDS, TSS, heavy metals and ammonia. The exception is the phosphorous exceedance at MW4-D in June 2024, however ENRS noted that the monitoring well had been damaged by construction activities likely resulting in the influx of surface water flows. Therefore, this exceedance is not considered to reflect the true phosphorous levels in the groundwater.
- No excavations undertaken to date have encountered saturated media associated with groundwater. There has been no extraction, abstraction, groundwater dewatering, injection or any other interaction with groundwater to date at the AWRC.
- Construction activities have not reported any release of contamination or spill of a magnitude with the potential to cause groundwater contamination, including those parameters which exceeded the project acceptable ranges.