

New Acland Coal Pty Ltd

New Acland Coal Mine

2022 Annual Groundwater Monitoring Report

31 March 2023

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Signature Page

31 March 2023

New Acland Coal Mine

2022 Annual Groundwater Monitoring Report



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1. INTRODUCTION

New Acland Coal Pty Ltd (NAC) currently operates the NAC open cut coal mine on Mining Lease (ML) 50170 and ML 50216 (NAC Mine). The NAC mine is subject to the Stage 03 Environmental Authority (EA) EPML00335713, which came into effect on 26 August 2022 with the addition of MLs 50232 and 700002. The EA outlines conditions for compliance, monitoring and management of groundwater at the NAC mine. This document has been prepared to detail the results of groundwater monitoring undertaken to meet the requirements of the EA.

ERM Australia Pacific Pty Ltd (ERM) was commissioned by NAC to compile the Annual Groundwater Monitoring Report (AGMR) for the 2022 calendar year. This 2022 Annual Groundwater Monitoring Report represents the first AGMR under the new EA.

Groundwater sampling was conducted in accordance with the EA Conditions stipulated in Schedule D1 to D27. This EA covers groundwater conditions as per the two recognised mining areas, these are ML50170 and ML50216 (also referred to as the Stage 1 and 2 mining areas) and ML50232 (the Stage 3 mining area). ERM undertook the groundwater sampling of the compliance and interpretation monitoring bore network over 2022, consisting of the January, April (noting that this round was undertaken in June due to heavy rainfall in April and May 2022), July and October 2022 monitoring rounds (ERM, 2022a, 2022b, 2023a, 2023b). It should be noted that only a select number of groundwater monitoring bores were sampled during the January (undertaken in February 2022) monitoring round to collect additional data only, these bores were 27PcR, 28PcR, 84PcR, 10PbR, 3316WB and CSMH1Rb. The compliance and interpretation monitoring bore network are shown on *Figure 1, Appendix A*.

2. SCOPE OF WORK

The NAC EA compliance and interpretation monitoring bore network (current to December 2022), as related to Schedule D, Tables D1 (covering ML50232) and D4 (covering ML50170 and ML50216) in the EA are listed in *Table 1* below. There are also an additional 12 EA monitoring bores which had not been installed prior to the October 2022 monitoring round, however these will become part of the EA monitoring bore network once installed, and which is anticipated to be completed in late-2023.

The scope of work for the 2022 AGMR comprised the following:

- Summary of the groundwater monitoring data for 2022;
- Comparison of the groundwater quality and standing water level of all groundwater monitoring bores (including compliance and interpretation) listed within Table D1: Groundwater monitoring locations and frequency (ML50232) and Table D4 – Groundwater Monitoring Bores (ML50216 and ML50170), to the trigger limits listed in Tables D2, D3, and D5;
- An assessment of long-term water quality and water level trends at all groundwater monitoring bores (including compliance and interpretation) listed in Table D1: Groundwater monitoring locations and frequency (ML50232) and Table D4 – Groundwater Monitoring Bores (ML50216 and ML50170);
- Details of review undertaken of the groundwater conceptual model;
- Assessment of differences between the groundwater level impact predicted and actual impacts for the corresponding period; and
- Submission of this report to NAC, outlining the results of the 2022 Annual Groundwater Monitoring. This report is also suitable for submission to the Department of Environment and Science (DES).

Table 1: Summary of NAC EA Monitoring Bore Network (current as of December 2022)

Bore name	Bore Type ⁽¹⁾	Aquifer Monitored ⁽²⁾
27PcR	Interpretation	Balgowan Coal Sequence
28PcR	Interpretation	Balgowan Coal Sequence
84PbR	Compliance	Main Range Volcanics
CSMH1Rb	Compliance	Balgowan Coal Sequence ⁽⁸⁾
10PbR	Compliance	Main Range Volcanics
4517WB	Compliance	Acland Coal Sequence
4518WB	Compliance	Acland Coal Sequence
25PcR	Interpretation	Balgowan Coal Sequence
111PGC Lower ⁽¹⁰⁾	Compliance	Acland Coal Sequence
26PcR	Interpretation	Balgowan Coal Sequence
3316_WB	Compliance	Acland Coal Sequence
2289PcR Lower	Interpretation	Balgowan Coal Sequence
BMH1	Compliance	Main Range Volcanics
2291Pc	Interpretation	Balgowan Coal Sequence
81Pc ⁽⁶⁾	Interpretation	Acland Coal Sequence
109P	Interpretation	Main Range Volcanics
GW05A	Interpretation	Main Range Volcanics
GW05B	Interpretation	Acland Coal Sequence
GW06B	Interpretation	Acland Coal Sequence
GW07B ⁽¹⁰⁾	Interpretation	Acland Coal Sequence
GW09B ⁽³⁾	Interpretation	Acland Coal Sequence
GW08C ⁽⁹⁾	Interpretation	Marburg Sandstone
GW09C ⁽³⁾	Interpretation	Marburg Sandstone
GW09A	Interpretation	Oakey Creek Alluvium
GW10	Interpretation	Acland Coal Sequence
GW11A	Interpretation	Main Range Volcanics
GW11B	Interpretation	Marburg Sandstone
GW13B	Interpretation	Waipanna Coal Sequence
GW16A	Interpretation	Main Range Volcanics
GW15A	Interpretation	Main Range Volcanics
CSMH1Ra ⁽⁴⁾	Compliance	Acland Coal Sequence
112PgC ⁽¹⁰⁾	Interpretation	Acland Coal Sequence
113Pgcb	Interpretation	Acland Coal Sequence
114P	Interpretation	Acland Coal Sequence
116P	Interpretation	Acland Coal Sequence
118P	Interpretation	Acland Coal Sequence
119P ⁽⁷⁾	Interpretation	Acland Coal Sequence
18PcR ⁽¹¹⁾	Interpretation	Balgowan Coal Sequence

Bore name	Bore Type ⁽¹⁾	Aquifer Monitored ⁽²⁾
18PbR ⁽¹¹⁾	Interpretation	Main Range Volcanics
3307WB ⁽¹⁰⁾	Interpretation	Coal Backfill
18PcR2 ⁽⁵⁾	Compliance	Balgowan Coal Sequence
18PbR2 ⁽⁵⁾	Interpretation	Main Range Volcanics
82PcR ⁽⁵⁾	Compliance	Acland Coal Sequence
111PgC Lower_R ⁽⁵⁾	Compliance	Acland Coal Sequence
3307WB_R ⁽⁵⁾	Interpretation	Coal Backfill
112PgC_R ⁽⁵⁾	Interpretation	Acland Coal Sequence
GW11A_R ⁽⁵⁾	Interpretation	Main Range Volcanics
GW07B_R ⁽⁵⁾	Interpretation	Acland Coal Sequence
132WBR ⁽⁵⁾	Interpretation	Balgowan Coal Sequence
133WBR ⁽⁵⁾	Interpretation	Balgowan Coal Sequence
BCS3 ⁽⁵⁾	Compliance	Balgowan Coal Sequence
BCS4 ⁽⁵⁾	Compliance	Balgowan Coal Sequence
LCA1 ⁽⁵⁾	Compliance	Lagoon Creek Alluvium
LCA2 ⁽⁵⁾	Compliance	Lagoon Creek Alluvium

⁽¹⁾ Interpretation and compliance bore type refers to the application of groundwater quality trigger limits i.e. compliance bores have trigger limits designated as per Schedule D, Tables D2 and D5 of the EA and interpretation bores do not have trigger limits assigned.

⁽²⁾ Note that the Main Range Volcanics aquifer is referred to as basalt aquifer in this report.

⁽³⁾ These bores were not sampled in 2022 due to bent casing limiting pump access

⁽⁴⁾ Bore CSMH1Ra historically has been dry.

⁽⁵⁾ These bores had not been installed prior to the October 2022 groundwater monitoring event, however will be added to the monitoring program once commissioned.

⁽⁶⁾ Known as 81P or 81Pc in EA

⁽⁷⁾ Known as 119PGC in the EA

⁽⁸⁾ Table D1 in EA indicates this bore targets Acland Coal Sequence, but Table D4 indicates Balgowan Coal Sequence

⁽⁹⁾ Also known as GW08C(3) by NAC

⁽¹⁰⁾ Bore discontinued from monitoring program. Replacement bore scheduled for installation (DES endorsed)

⁽¹¹⁾ Monitored for standing water levels only as per Table D1 of the EA.

3. 2022 GROUNDWATER MONITORING RESULTS

Groundwater sampling was conducted by ERM in general accordance with the Queensland guidance *DES Monitoring and Sampling Manual – Version 2* (June 2018), and Australian Standard AS/NZS 5667.11:1998 *Water quality - Sampling - Guidance on sampling of groundwaters*.

The results of each groundwater quality sampling monitoring round from 2022 are provided in the quarterly groundwater monitoring reports (ERM, 2022a, 2022b, 2023a, 2023b). These reports outline the following information:

- The methodology for undertaking the groundwater sampling;
- Calibration certificates for field water quality instruments;
- The water quality field forms;
- Quality assurance and quality control assessment of the groundwater sampling data, as well as the laboratory certificates of analysis and laboratory quality assurance reports; and
- Compiled water quality data tables.

The Stage 03 revised project EA took effect on the 26th of August 2022. Groundwater quality monitoring for additional groundwater monitoring bores pertaining to the Stage 03 project was incorporated into the routine groundwater sampling schedule. As a result, one round of sampling was undertaken in 2022 that included groundwater monitoring bores relevant to the Stage 03 project. Stage 2 bores sampled between May and August had results compared to the groundwater quality trigger levels set in the May 2022 revision of the EA.

3.1 Groundwater Analytes

The EA defines the following water parameters for field measurement or laboratory analysis:

- Standing water level,
- pH (field recorded) and electrical conductivity (EC, laboratory analysed),
- Total dissolved solids (TDS), laboratory determined,
- Major ions: bicarbonate (HCO_3^-), sulfate (SO_4^{2-}), chloride (Cl^-), sodium (Na^+), potassium (K^+), magnesium (Mg^{2+}), calcium (Ca^{2+}),
- Minor ions: fluoride (F^-),
- Dissolved metals & metalloids: aluminium (Al), arsenic (As), copper (Cu), iron (Fe), manganese (Mn), selenium (Se), and
- Nutrients nitrite (NO_2^-), nitrate (NO_3^-), and Total nitrogen (N).

3.2 Groundwater Levels

As part of the EA conditions, groundwater level monitoring is conducted in the bores by NAC staff on a monthly basis, with the results of this monitoring shown below in *Tables 2 and 3* and on hydrographs on *Figures 2 -6, Appendix A*.

As per Conditions D8 (for ML50232) and D18 (ML50170 and ML50216) of the EA, groundwater levels are required to be compared to the reference levels and trigger level thresholds in Table D3 of the EA to assess compliance status. This comparison has been undertaken in *Table 4* below. There were no exceedances of the declining groundwater level triggers for the 2022 monitoring period for bores that have trigger level and reference levels developed.

Table 2: Groundwater Level Data (meters Below Top Of Casing)

Bore Name	Surveyed Top of Casing (m AHD)	Date Measured and Groundwater Level (mBTOC)											
		25/01/2022	24/02/2022	17/03/2022	27/04/2022	10/05/2022	21/06/2022	20/07/2022	31/08/2022	27/09/2022	19/10/2022	17/11/2022	7/12/2022
27PcR	484.985	48.756	48.782	48.847	48.825	48.872	48.877	48.993	48.840	48.614	48.658	48.661	48.141
18PcR	460.178	49.997	49.483	48.715	47.080	46.755	45.917	45.456	44.909	44.458	44.298	43.990	43.924
18PbR	460.218	16.394	16.598	14.827	14.335	14.647	13.461	13.340	13.631	13.277	13.581	13.991	14.631
28PcR	457.138	27.045	27.039	27.082	27.080	27.087	27.025	26.967	26.800	26.605	26.519	26.526	26.464
84PbR	448.728	8.874	9.149	8.150	7.270	7.456	6.903	6.845	7.370	6.845	7.251	7.524	7.877
CSMH1Rb	497.472	94.937	94.928	94.928	94.925	94.866	94.780	94.743	94.555	94.450	94.459	94.389	94.483
10PbR	438.175	11.757	11.651	10.455	7.780	7.874	7.767	8.180	8.660	8.530	8.683	9.058	9.433
4517WB	436.7	30.907	30.807	30.721	30.270	30.143	29.743	29.593	29.444	29.296	29.390	29.451	29.398
4518WB	419.99	11.824	11.904	11.996	12.075	12.110	12.165	12.223	12.278	12.223	12.228	12.283	12.335
25PcR	498.710	72.570	72.576	72.595	72.583	72.556	72.452	72.430	72.384	72.230	72.196	72.185	72.251
111PGC Lower	432.144	26.798	26.797	26.871	26.825	26.87	30.47	DEA	DEA	DEA	DEA	DEA	DEA
26PcR	498.197	63.582	63.599	63.703	63.685	63.721	63.702	63.732	63.684	63.530	63.541	63.538	63.589
3316_WB	434.232	23.454	23.481	23.530	23.488	NR	23.441	23.641	23.370	23.353	23.412	23.409	23.419
2289PcR Lower	447.640	15.537	15.551	15.219	15.386	15.564	15.480	15.451	15.441	15.326	15.324	15.306	15.488
BMH1	455.175	14.694	14.690	14.083	12.090	12.087	11.212	11.243	11.664	11.174	11.167	11.731	12.201
2291Pc	461.313	40.080	40.085	40.152	40.135	40.124	40.061	40.040	39.957	39.809	39.787	39.789	39.870
81Pc	450.120	36.737	36.714	36.730	36.722	36.676	36.533	36.440	36.273	36.042	36.180	36.234	35.899
109P ¹	479.167	NR	18.523	NR	NR	17.45	17.119	NR	17.181	16.883	16.06	17.541	17.670
GW05A ¹	461.556	NR	4.079	NR	NR	2.442	1.978	1.966	2.292	1.914	2.270	2.393	2.569
GW05B ¹	461.286	NR	50.504	NR	NR	50.39	50.272	50.191	50.067	49.895	49.85	49.745	49.888
GW06B ¹	429.392	NR	27.58	NR	NR	27.529	27.478	NR	27.395	27.252	27.245	27.255	27.321
GW09B ¹	407.647	NR	15.193	NR	NR	NR	15.135	NR	15.367	15.097	14.989	14.975	15.102

Bore Name	Surveyed Top of Casing (m AHD)	Date Measured and Groundwater Level (mBTOC)											
		25/01/2022	24/02/2022	17/03/2022	27/04/2022	10/05/2022	21/06/2022	20/07/2022	31/08/2022	27/09/2022	19/10/2022	17/11/2022	7/12/2022
GW08C ¹	409.31	NR	78.67	NR	NR	NR	NR	NR	79.564	79.557	79.665	79.788	79.683
GW09C ¹	407.792	NR	15.563	NR	NR	NR	15.495	NR	15.288	15.228	15.384	15.381	15.203
GW09A ¹	407.412	NR	16.142	NR	NR	NR	16.102	NR	15.98	15.953	15.978	15.971	16.198
GW10 ¹	446.902	NR	43.943	NR	NR	NR	43.685	NR	43.575	43.502	43.515	43.611	43.539
GW11A ¹	463.389	NR	10.376	NR	NR	NR	8.406	8.295	9.007	8.38	8.94	9.299	9.811
GW11B ¹	458.796	NR	54.736	NR	NR	NR	54.684	NR	54.601	54.457	54.475	54.419	54.543
GW13B ¹	429.782	NR	29.335	NR	NR	NR	29.325	NR	29.326	29.241	29.261	28.259	29.533
GW16A ¹	466.53	NR	16.371	NR	NR	16.208	16.123	NR	16.012	15.862	15.99	15.759	15.786
GW15A ¹	448.92	NR	29.543	NR	NR	NR	29.691	NR	29.697	29.455	29.471	29.389	29.485
CSMH1Ra ¹	496.973	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
113Pgcb ¹	414.580	NR	6.64	NR	NR	6.862	6.936	NR	7.051	6.998	6.945	7.070	7.212
114P ¹	436.144	NR	54.139	NR	NR	NR	54.122	NR	53.994	53.958	53.979	53.965	53.988
116P ¹	426.076	NR	35.952	NR	NR	NR	36.006	NR	35.872	35.824	35.826	35.797	35.889
118P ¹	407.380	NR	14.407	NR	NR	NR	14.406	NR	14.405	14.283	14.282	14.273	14.298
119P ¹	408.300	NR	16.62	NR	NR	NR	16.58	NR	16.408	16.339	16.343	16.333	16.365

NR: Not Recorded (prior to the EA update, 'Stage 3' bores were measured on a quarterly basis, this is now a monthly frequency). Only bores installed prior to the December 2022 measurement have been shown here.

DEA: Bore discontinued from monitoring program during 2022. Replacement bore scheduled for installation (DES endorsed).

¹ Standing water levels were not required for monitoring until the Revised Project EA commenced on 26 August 2022

mBTOC – metres below top of casing

mAHD – metres above Australian Height Datum

Table 3: Groundwater Level Data (meters Australian Height Datum)

Bore Name	Surveyed Top of Casing (mAHD)	Date Measured and Groundwater Level (mAHD)											
		25/01/2022	24/02/2022	17/03/2022	27/04/2022	10/05/2022	21/06/2022	20/07/2022	31/08/2022	27/09/2022	19/10/2022	17/11/2022	7/12/2022
27PcR	484.985	436.229	436.203	436.138	436.16	436.113	436.108	435.992	436.145	436.371	436.327	436.324	436.844
18PcR	460.178	410.181	410.695	411.463	413.098	413.423	414.261	414.722	415.269	415.72	415.88	416.188	416.254
18PbR	460.218	443.824	443.62	445.391	445.883	445.571	446.757	446.878	446.587	446.941	446.637	446.227	445.587
28PcR	457.138	430.093	430.099	430.056	430.058	430.051	430.113	430.171	430.338	430.533	430.619	430.612	430.674
84PbR	448.728	439.854	439.579	440.578	441.458	441.272	441.825	441.883	441.358	441.883	441.477	441.204	440.851
CSMH1Rb	497.472	402.535	402.544	402.544	402.547	402.606	402.692	402.729	402.917	403.022	403.013	403.083	402.989
10PbR	438.175	426.418	426.524	427.72	430.395	430.301	430.408	429.995	429.515	429.645	429.492	429.117	428.742
4517WB	436.7	405.793	405.893	405.979	406.43	406.557	406.957	407.107	407.256	407.404	407.31	407.249	407.302
4518WB	419.99	408.166	408.086	407.994	407.915	407.88	407.825	407.767	407.712	407.767	407.762	407.707	407.655
25PcR	498.710	426.14	426.134	426.115	426.127	426.154	426.258	426.28	426.326	426.48	426.514	426.525	426.459
111PGC Lower	432.144	405.346	405.347	405.273	405.319	405.274	401.674	DEA	DEA	DEA	DEA	DEA	DEA
26PcR	498.197	434.615	434.598	434.494	434.512	434.476	434.495	434.465	434.513	434.667	434.656	434.659	434.608
3316_WB	434.232	410.778	410.751	410.702	410.744	NR	410.791	410.591	410.862	410.879	410.82	410.823	410.813
2289PcR Lower	447.640	432.103	432.089	432.421	432.254	432.076	432.16	432.189	432.199	432.314	432.316	432.334	432.152
BMH1	455.175	440.481	440.485	441.092	443.085	443.088	443.963	443.932	443.511	444.001	444.008	443.444	442.974
2291Pc	461.313	421.233	421.228	421.161	421.178	421.189	421.252	421.273	421.356	421.504	421.526	421.524	421.443
81Pc	450.120	413.383	413.406	413.39	413.398	413.444	413.587	413.68	413.847	414.078	413.94	413.886	414.221
109P	479.167	NR	460.644	NR	NR	461.717	462.048	NR	461.986	462.284	463.107	461.626	461.497
GW05A	461.556	NR	457.477	NR	NR	459.114	459.578	459.59	459.264	459.642	459.286	459.163	458.987
GW05B	461.286	NR	410.782	NR	NR	410.896	411.014	411.095	411.219	411.391	411.436	411.541	411.398
GW06B	429.392	NR	401.812	NR	NR	401.863	401.914	NR	401.997	402.14	402.147	402.137	402.071
GW09B	407.647	NR	392.454	NR	NR	NR	392.512	NR	392.28	392.55	392.658	392.672	392.545
GW08C	409.31	NR	330.64	NR	NR	NR	NR	NR	329.746	329.753	329.645	329.522	329.627

Bore Name	Surveyed Top of Casing (mAHD)	Date Measured and Groundwater Level (mAHD)											
		25/01/2022	24/02/2022	17/03/2022	27/04/2022	10/05/2022	21/06/2022	20/07/2022	31/08/2022	27/09/2022	19/10/2022	17/11/2022	7/12/2022
GW09C	407.792	NR	392.229	NR	NR	NR	392.297	NR	392.504	392.564	392.408	392.411	392.589
GW09A	407.412	NR	391.27	NR	NR	NR	391.31	NR	391.432	391.459	391.434	391.441	391.214
GW10	446.902	NR	402.959	NR	NR	NR	403.217	NR	403.327	403.4	403.387	403.291	403.363
GW11A	463.389	NR	453.013	NR	NR	NR	454.983	455.094	454.382	455.009	454.449	454.09	453.578
GW11B	458.796	NR	404.06	NR	NR	NR	404.112	NR	404.195	404.339	404.321	404.377	404.253
GW13B	429.782	NR	400.447	NR	NR	NR	400.457	NR	400.456	400.541	400.521	401.523	400.249
GW16A	466.53	NR	450.159	NR	NR	450.322	450.407	NR	450.518	450.668	450.54	450.771	450.744
GW15A	448.92	NR	419.377	NR	NR	NR	419.229	NR	419.223	419.465	419.449	419.531	419.435
CSMH1Ra	496.973	NR	NR	NR	NR	NR	NR	NR	NR	Dry	Dry	Dry	Dry
113Pgcb	414.580	NR	407.94	NR	NR	407.718	407.644	NR	407.529	407.582	407.635	407.51	407.368
114P	436.144	NR	382.005	NR	NR	NR	382.022	NR	382.15	382.186	382.165	382.179	382.156
116P	426.076	NR	390.124	NR	NR	NR	390.07	NR	390.204	390.252	390.25	390.279	390.187
118P	407.380	NR	392.973	NR	NR	NR	392.974	NR	392.975	393.097	393.098	393.107	393.082
119P	408.300	NR	391.68	NR	NR	NR	391.72	NR	391.892	391.961	391.957	391.967	391.935

NR: Not Recorded (prior to the EA update, 'Stage 3' bores were measured on a quarterly basis, this is now a monthly frequency). Only bores installed prior to the December measurement have been shown here.

DEA: Bore discontinued from monitoring program during 2022. Replacement bore scheduled for installation (DES endorsed).

mAHD – metres above Australian Height Datum

Table 4: Groundwater Level Data Compared to EA Groundwater Level Triggers (mAHD)

Bore Name	Level Trigger Threshold (m)	Reference Level (mAHD)	Trigger Limit (mAHD)	Date Measured and Groundwater Level (mAHD)											
				25/01/2022	24/02/2022	17/03/2022	27/04/2022	10/05/2022	21/06/2022	20/07/2022	31/08/2022	27/09/2022	19/10/2022	17/11/2022	7/12/2022
27PcR	0.11	TBA	TBA	436.229	436.203	436.138	436.16	436.113	436.108	435.992	436.145	436.371	436.327	436.324	436.844
18PcR	TBA	408.5	TBA	410.181	410.695	411.463	413.098	413.423	414.261	414.722	415.269	415.72	415.88	416.188	416.254
18PbR	4.57	TBA	TBA	443.824	443.62	445.391	445.883	445.571	446.757	446.878	446.587	446.941	446.637	446.227	445.587
28PcR	0.29	TBA	TBA	430.093	430.099	430.056	430.058	430.051	430.113	430.171	430.338	430.533	430.619	430.612	430.674
84PbR	5.79	TBA	TBA	439.854	439.579	440.578	441.458	441.272	441.825	441.883	441.358	441.883	441.477	441.204	440.851
CSMH1Rb	3.71	TBA	TBA	402.535	402.544	402.544	402.547	402.606	402.692	402.729	402.917	403.022	403.013	403.083	402.989
10PbR	5.79	TBA	TBA	426.418	426.524	427.72	430.395	430.301	430.408	429.995	429.515	429.645	429.492	429.117	428.742
4517WB	TBA	404.5	TBA	405.793	405.893	405.979	406.43	406.557	406.957	407.107	407.256	407.404	407.31	407.249	407.302
4518WB	TBA	409	TBA	408.166	408.086	407.994	407.915	407.88	407.825	407.767	407.712	407.767	407.762	407.707	407.655
25PcR	TBA	TBA	TBA	426.14	426.134	426.115	426.127	426.154	426.258	426.28	426.326	426.48	426.514	426.525	426.459
111PGC Lower	TBA	TBA	TBA	405.346	405.347	405.273	405.319	405.274	401.674	DEA	DEA	DEA	DEA	DEA	DEA
26PcR	0.52	434.5	433.98	434.615	434.598	434.494	434.512	434.476	434.495	434.465	434.513	434.667	434.656	434.659	434.608
3316_WB	TBA	TBA	TBA	410.778	410.751	410.702	410.744	NR	410.791	410.591	410.862	410.879	410.82	410.823	410.813
2289PcR Lower	TBA	TBA	TBA	432.103	432.089	432.421	432.254	432.076	432.16	432.189	432.199	432.314	432.316	432.334	432.152
BMH1	6.14	440	433.86	440.481	440.485	441.092	443.085	443.088	443.963	443.932	443.511	444.001	444.008	443.444	442.974
2291Pc	TBA	TBA	TBA	421.233	421.228	421.161	421.178	421.189	421.252	421.273	421.356	421.504	421.526	421.524	421.443
81Pc	TBA	412.3	TBA	413.383	413.406	413.39	413.398	413.444	413.587	413.68	413.847	414.078	413.94	413.886	414.221
109P	TBA	TBA	TBA	NR	460.644	NR	NR	461.717	462.048	NR	461.986	462.284	463.107	461.626	461.497
GW05A	TBA	TBA	TBA	NR	457.477	NR	NR	459.114	459.578	459.59	459.264	459.642	459.286	459.163	458.987
GW05B	TBA	TBA	TBA	NR	410.782	NR	NR	410.896	411.014	411.095	411.219	411.391	411.436	411.541	411.398
GW06B	TBA	TBA	TBA	NR	401.812	NR	NR	401.863	401.914	NR	401.997	402.14	402.147	402.137	402.071
GW09B	TBA	TBA	TBA	NR	392.454	NR	NR	NR	392.512	NR	392.28	392.55	392.658	392.672	392.545
GW08C	TBA	TBA	TBA	NR	330.64	NR	NR	NR	NR	NR	329.746	329.753	329.645	329.522	329.627

Bore Name	Level Trigger Threshold (m)	Reference Level (mAHD)	Trigger Limit (mAHD)	Date Measured and Groundwater Level (mAHD)											
				25/01/2022	24/02/2022	17/03/2022	27/04/2022	10/05/2022	21/06/2022	20/07/2022	31/08/2022	27/09/2022	19/10/2022	17/11/2022	7/12/2022
GW09C	TBA	TBA	TBA	NR	392.229	NR	NR	NR	392.297	NR	392.504	392.564	392.408	392.411	392.589
GW09A	TBA	TBA	TBA	NR	391.27	NR	NR	NR	391.31	NR	391.432	391.459	391.434	391.441	391.214
GW10	TBA	TBA	TBA	NR	402.959	NR	NR	NR	403.217	NR	403.327	403.4	403.387	403.291	403.363
GW11A	TBA	TBA	TBA	NR	453.013	NR	NR	NR	454.983	455.094	454.382	455.009	454.449	454.09	453.578
GW11B	TBA	TBA	TBA	NR	404.06	NR	NR	NR	404.112	NR	404.195	404.339	404.321	404.377	404.253
GW13B	TBA	TBA	TBA	NR	400.447	NR	NR	NR	400.457	NR	400.456	400.541	400.521	401.523	400.249
GW16A	TBA	TBA	TBA	NR	450.159	NR	NR	450.322	450.407	NR	450.518	450.668	450.54	450.771	450.744
GW15A	TBA	TBA	TBA	NR	419.377	NR	NR	NR	419.229	NR	419.223	419.465	419.449	419.531	419.435
CSMH1Ra	TBA	TBA	TBA	NR	NR	NR	NR	NR	NR	NR	NR	Dry	Dry	Dry	Dry
113Pgcb	TBA	TBA	TBA	NR	407.94	NR	NR	407.718	407.644	NR	407.529	407.582	407.635	407.51	407.368
114P	33.12	381.7	348.58	NR	382.005	NR	NR	NR	382.022	NR	382.15	382.186	382.165	382.179	382.156
116P	23.75	389.6	365.85	NR	390.124	NR	NR	NR	390.07	NR	390.204	390.252	390.25	390.279	390.187
118P	15.79	393	377.21	NR	392.973	NR	NR	NR	392.974	NR	392.975	393.097	393.098	393.107	393.082
119P	14.46	392	377.54	NR	391.68	NR	NR	NR	391.72	NR	391.892	391.961	391.957	391.967	391.935

NR: Not Recorded (prior to the EA update, 'Stage 3' bores were measured on a quarterly basis, this is now a monthly frequency). Only bores installed prior to the December measurement have been shown here.

DEA: Bore discontinued from monitoring program during 2022. Replacement bore scheduled for installation (DES endorsed).

mAHD – metres above Australian Height Datum

3.3 Groundwater Quality

Chemical analyses of groundwater from each monitoring bore, split by their respective aquifer, are presented in Sections 3.3.1 to 3.3.4 below.

The EA groundwater quality trigger limits are outlined in Schedule D, Tables D2 (for compliance bores listed under Table D1 for ML50232) and Table D5 (for compliance bores listed under Table D4 for ML50170 and ML50216).

A comparison against the groundwater quality trigger limits as per Schedule D, Tables D2 and D5, of the EA has also been presented within the data tables in Sections 3.3.1 to 3.3.4 below. Exceedances of the trigger limits have been highlighted in orange within the individual bore chemistry tables (applicable from 26 August 2022 onwards, as per the EA).

3.3.1 Basalt Monitoring Bore Groundwater Quality

A summary table of chemistry results for the basalt monitoring bores is shown in Tables 5 to 12 below. A comparison to the EA trigger limits is shown for monitoring bores 84PbR, 10PbR and BMH1, which have trigger limits derived. There were no results observed above the Table D2 (ML50232) trigger limits for the basalt compliance monitoring bores. Elevated results when compared to the Table D5 (ML50170 and ML50216) trigger limits for 2022 were noted for:

- Nitrate in groundwater from 10PbR (during June, July and October 2022); and
- EC (lab) at BMH1 (during July and October 2022) and dissolved copper (during October 2022).

Table 5: Groundwater Bore No. 84PbR (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	1/02/2022	2/06/2022	20/07/2022	13/10/2022
			10:39:00 AM	9:05:00 AM	3:43:00 PM	3:15:00 PM
pH (Field)	pH units	6.5-7.5	7.15	6.96	7.07	6.99
EC (Lab)	µS/cm	7460, 2568	1960	2020	2030	1900
TDS (Lab)	mg/L	5000	1540	1500	1380	1530
Major Ions						
Ca ²⁺	mg/L	1000	131	140	130	135
Mg ²⁺	mg/L	NA	101	106	105	103
Na ⁺	mg/L	NA	132	142	136	139
K ⁺	mg/L	NA	2	2	2	2
Cl ⁻	mg/L	NA	366	390	398	370
HCO ₃ ⁻	mg/L	NA	368	378	396	435
CaCO ₃	mg/L	NA	302	310	325	357
SO ₄ ²⁻	mg/L	1000, 338	267	263	239	239
Minor Ions						
F ⁻	mg/L	0.2	0.2	0.2	0.2	0.2
Total N	mg/L	NA	0.8	1.4	1.6	1.5
NO ₂ ⁻	mg/L	30	<0.01	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	400, 16.9	0.75	1.24	1.31	1.27
Dissolved Metals & Metalloids						
Al	mg/L	5.0, 0.055	<0.01	<0.01	<0.01	<0.01
As	mg/L	0.05, 0.013	<0.001	<0.001	<0.001	<0.001
Cu	mg/L	1.0, 0.0014	<0.001	<0.001	<0.001	<0.001
Fe	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
Mn	mg/L	0.02	0.004	0.004	0.003	0.006
Se	mg/L	0.02, 0.011	<0.01	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (effective 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5.

Table 6: Groundwater Bore No. 10PbR (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	1/02/2022	2/06/2022	20/07/2022	13/10/2022
			11:45:00 AM	10:14:00 AM	1:26:00 PM	12:30:00 PM
pH (Field)	pH units	6.5-7.5	7.78	6.85	7.00	6.91
EC (Lab)	µS/cm	7460, 3346	3150	3230	3300	3010
TDS (Lab)	mg/L	5000	2520	2280	2300	2560
Major Ions						
Ca ²⁺	mg/L	1000	211	220	206	210
Mg ²⁺	mg/L	NA	166	173	174	166
Na ⁺	mg/L	NA	176	191	181	179
K ⁺	mg/L	NA	2	2	2	2
Cl ⁻	mg/L	NA	770	782	797	796
HCO ₃ ⁻	mg/L	NA	458	438	457	479
CaCO ₃	mg/L	NA	376	359	375	393
SO ₄ ²⁻	mg/L	1000, 57.7	58	56	54	54
Minor Ions						
F ⁻	mg/L	0.5	0.4	0.4	0.5	0.5
Total N	mg/L	NA	68.7	56.5	66.6	71.5
NO ₂ ⁻	mg/L	30	<0.01	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	400, 50.7	68.7	53.2	56.1	64.7 ⁽¹⁾
Dissolved Metals & Metalloids						
Al	mg/L	5.0, 0.055	<0.01	<0.01	<0.01	<0.01
As	mg/L	0.05, 0.013	<0.001	<0.001	<0.001	<0.001
Cu	mg/L	1.0, 0.0014	0.002	<0.001	<0.001	<0.001
Fe	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
Mn	mg/L	0.02	0.001	<0.001	<0.001	<0.001
Se	mg/L	0.02, 0.011	<0.01	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (applicable from 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5.

(1) Investigation report completed per condition D19. Submitted to DES December 2022.

Table 7: Groundwater Bore No. BMH1 (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	1/06/2022n	20/07/2022	13/10/2022
			3:33 PM	3:07 PM	4:10 PM
pH (Field)	pH units	6.0-8.5	6.76	6.81	6.77
EC (Lab)	µS/cm	7460, 1440	1440	1480	1480
TDS (Lab)	mg/L	5000	934	916	901
Major Ions					
Ca ²⁺	mg/L	1000	107	100	107
Mg ²⁺	mg/L	NA	98	99	105
Na ⁺	mg/L	NA	91	88	93
K ⁺	mg/L	NA	1	1	1
Cl ⁻	mg/L	NA	75	79	77
HCO ₃ ⁻	mg/L	NA	733	792	861
CaCO ₃	mg/L	NA	601	650	706
SO ₄ ²⁻	mg/L	1000, 18	14	13	14
Minor Ions					
F ⁻	mg/L	0.4	0.2	0.3	0.3
Total N	mg/L	NA	14.2	15.3	12.8
NO ₂ ⁻	mg/L	30	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	400, 16.9	13.7	12.6	12.8
Dissolved Metals & Metalloids					
Al	mg/L	5.0, 0.055	<0.01	<0.01	<0.01
As	mg/L	0.05, 0.013	<0.001	<0.001	<0.001
Cu	mg/L	1.0, 0.0014	<0.001	<0.001	0.004
Fe	mg/L	0.22	<0.05	<0.05	<0.05
Mn	mg/L	0.02	<0.001	<0.001	<0.001
Se	mg/L	0.02, 0.011	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (applicable from 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5

Table 8: Groundwater Bore No. 109P (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	19/10/2022
			1:05 PM
pH (Field)	pH units	NA	7.87
EC (Lab)	µS/cm	NA	568
TDS (Lab)	mg/L	NA	369
Major Ions			
Ca ²⁺	mg/L	NA	13
Mg ²⁺	mg/L	NA	<1
Na ⁺	mg/L	NA	122
K ⁺	mg/L	NA	1
Cl ⁻	mg/L	NA	22
HCO ₃ ⁻	mg/L	NA	296
CaCO ₃	mg/L	NA	243
SO ₄ ²⁻	mg/L	NA	7
Minor Ions			
F ⁻	mg/L	NA	0.3
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	0.12
Dissolved Metals & Metalloids			
Al	mg/L	NA	0.04
As	mg/L	NA	<0.001
Cu	mg/L	NA	0.015
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	0.006
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 9: Groundwater Bore No. GW05A (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	12/10/2022
			9:45 AM
pH (Field)	pH units	NA	6.85
EC (Lab)	µS/cm	NA	1260
TDS (Lab)	mg/L	NA	815
Major Ions			
Ca ²⁺	mg/L	NA	90
Mg ²⁺	mg/L	NA	62
Na ⁺	mg/L	NA	136
K ⁺	mg/L	NA	1
Cl ⁻	mg/L	NA	70
HCO ₃ ⁻	mg/L	NA	716
CaCO ₃	mg/L	NA	587
SO ₄ ²⁻	mg/L	NA	15
Minor Ions			
F ⁻	mg/L	NA	0.9
Total N	mg/L	NA	15.5
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	12.7
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	<0.001
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 10: Groundwater Bore No. GW11A (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	30/11/2022
			11:05 AM
pH (Field)	pH units	NA	7.19
EC (Lab)	µS/cm	NA	1330
TDS (Lab)	mg/L	NA	791
Major Ions			
Ca ²⁺	mg/L	NA	62
Mg ²⁺	mg/L	NA	14
Na ⁺	mg/L	NA	188
K ⁺	mg/L	NA	7
Cl ⁻	mg/L	NA	284
HCO ₃ ⁻	mg/L	NA	171
CaCO ₃	mg/L	NA	140
SO ₄ ²⁻	mg/L	NA	62
Minor Ions			
F ⁻	mg/L	NA	0.2
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	0.1
Mn	mg/L	NA	0.071
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 11: Groundwater Bore No. GW15A (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	12/10/2022
			1:40 PM
pH (Field)	pH units	NA	7.31
EC (Lab)	µS/cm	NA	1910
TDS (Lab)	mg/L	NA	1240
Major Ions			
Ca ²⁺	mg/L	NA	104
Mg ²⁺	mg/L	NA	74
Na ⁺	mg/L	NA	191
K ⁺	mg/L	NA	14
Cl ⁻	mg/L	NA	441
HCO ₃ ⁻	mg/L	NA	519
CaCO ₃	mg/L	NA	426
SO ₄ ²⁻	mg/L	NA	28
Minor Ions			
F ⁻	mg/L	NA	0.3
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	1.3
Mn	mg/L	NA	0.17
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 12: Groundwater Bore No. GW16A (Basalt, Main Range Volcanics)

Parameter	Units	Groundwater Limits	30/11/2022
			10:09 AM
pH (Field)	pH units	NA	6.63
EC (Lab)	µS/cm	NA	1360
TDS (Lab)	mg/L	NA	1000
Major Ions			
Ca ²⁺	mg/L	NA	109
Mg ²⁺	mg/L	NA	89
Na ⁺	mg/L	NA	155
K ⁺	mg/L	NA	10
Cl ⁻	mg/L	NA	179
HCO ₃ ⁻	mg/L	NA	896
CaCO ₃	mg/L	NA	735
SO ₄ ²⁻	mg/L	NA	11
Minor Ions			
F ⁻	mg/L	NA	0.4
Total N	mg/L	NA	2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	1.78
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	0.005
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

3.3.2 Acland Coal Sequence Monitoring Bore Groundwater Quality

A summary table of chemistry results for the Acland Coal Sequence monitoring bores is shown in *Tables 13 to 25* below. A comparison to the EA trigger limits is shown for monitoring bores 4517WB, 4518WB, 111PgC Lower and 3316WB, which have trigger limits derived. There were no exceedances of the Table D2 (ML50232) trigger limits for the Acland Coal Sequence compliance monitoring bores. Exceedances of the Table D5 (ML50170 and ML50216) trigger limits for 2022 were noted for:

- Dissolved iron in groundwater from 4517WB during June 2022;
- Sulfate in groundwater from 4518WB (during June, July and October 2022), dissolved iron (during June and October 2022) and dissolved manganese (during June 2022);
- Electrical conductivity in groundwater from 111PgC Lower (during July 2022), dissolved iron (during July 2022) and sulfate (during June 2022); and
- pH in groundwater from 3316WB (during June 2022).

Table 13: Groundwater Bore No. 4517WB (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	2/06/2022	20/07/2022	13/10/2022
			11:01 AM	2:03 PM	11:45 AM
pH (Field)	pH units	6.5-7.5	7.1	7.27	7.23
EC (Lab)	µS/cm	7460, 3084	1690	1680	1570
TDS (Lab)	mg/L	5000	963	945	897
Major Ions					
Ca ²⁺	mg/L	1000	38	33	36
Mg ²⁺	mg/L	NA	13	12	12
Na ⁺	mg/L	NA	327	298	301
K ⁺	mg/L	NA	3	3	3
Cl ⁻	mg/L	NA	412	421	406
HCO ₃ ⁻	mg/L	NA	305	312	329
CaCO ₃	mg/L	NA	250	256	270
SO ₄ ²⁻	mg/L	1000, 35	21	20	24
Minor Ions					
F ⁻	mg/L	0.33	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.4	0.5	0.4
NO ₂ ⁻	mg/L	30	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	400, 5	0.03	0.06	<0.01
Dissolved Metals & Metalloids					
Al	mg/L	5.0, 0.055	<0.01	<0.01	<0.01
As	mg/L	0.05, 0.013	0.002	0.002	0.001
Cu	mg/L	1.0, 0.0014	<0.001	<0.001	<0.001
Fe	mg/L	0.8	1.0	0.49	0.44
Mn	mg/L	0.087	0.028	0.025	0.024
Se	mg/L	0.02, 0.011	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (applicable from 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5.

Table 14: Groundwater Bore No. 4518WB (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	2/06/2022	20/07/2022	18/10/2022
			12:10 PM	12:16 PM	1:50 PM
pH (Field)	pH units	6.5-7.5	7.07	7.3	6.98
EC (Lab)	µS/cm	7460, 4065	3540	3700	3980
TDS (Lab)	mg/L	5000	2190	2240	2590
Major Ions					
Ca ²⁺	mg/L	1000	127	128	143
Mg ²⁺	mg/L	NA	101	101	102
Na ⁺	mg/L	NA	532	505	504
K ⁺	mg/L	NA	4	4	4
Cl ⁻	mg/L	NA	922	999	982
HCO ₃ ⁻	mg/L	NA	532	552	444
CaCO ₃	mg/L	NA	436	453	364
SO ₄ ²⁻	mg/L	1000, 48	81	88	95
Minor Ions					
F ⁻	mg/L	0.4	0.3	0.4	0.4
Total N	mg/L	NA	0.5	0.4	0.5
NO ₂ ⁻	mg/L	30	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	400, 5	<0.01	<0.01	<0.01
Dissolved Metals & Metalloids					
Al	mg/L	5.0, 0.055	<0.01	<0.01	<0.01
As	mg/L	0.05, 0.013	<0.001	<0.001	<0.001
Cu	mg/L	1.0, 0.0033	<0.001	<0.001	<0.001
Fe	mg/L	1.6	2.4	0.09	2.09
Mn	mg/L	0.087	0.1	0.042	0.052
Se	mg/L	0.02, 0.011	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (applicable from 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5.

Table 15: Groundwater Bore No. 111PgC Lower (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	2/06/2022	20/07/2022
			1:50 PM	9:20 AM
pH (Field)	pH units	6.5-7.5	6.92	7.08
EC (Lab)	µS/cm	6937	6680	7200
TDS (Lab)	mg/L	NA	4600	4760
Major Ions				
Ca ²⁺	mg/L	NA	269	284
Mg ²⁺	mg/L	NA	178	203
Na ⁺	mg/L	NA	926	934
K ⁺	mg/L	NA	10	11
Cl ⁻	mg/L	NA	1800	2190
HCO ₃ ⁻	mg/L	NA	538	555
CaCO ₃	mg/L	NA	441	455
SO ₄ ²⁻	mg/L	309	312	306
Minor Ions				
F ⁻	mg/L	0.1	<0.1	<0.1
Total N	mg/L	NA	<0.01	<0.01
NO ₂ ⁻	mg/L	NA	<0.01	<0.01
NO ₃ ⁻	mg/L	5	<0.01	<0.01
Dissolved Metals & Metalloids				
Al	mg/L	0.055	<0.01	<0.01
As	mg/L	0.013	<0.001	<0.001
Cu	mg/L	0.0024	<0.001	<0.001
Fe	mg/L	4.9	4.46	4.91
Mn	mg/L	0.087	0.023	0.031
Se	mg/L	0.011	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (applicable from 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5.

Table 16: Groundwater Bore No. 3316 WB (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	1/02/2022	3/06/2022	19/07/2022	18/10/2022
			1:10 PM	9:40 AM	8:30 AM	3:40 PM
pH (Field)	pH units	6.5-7.5	7.70	7.53	7.00	7.34
EC (Lab)	µS/cm	7460, 5629	5100	5310	5450	5510
TDS (Lab)	mg/L	5000	3600	3450	3450	3580
Major Ions						
Ca ²⁺	mg/L	1000	204	193	191	220
Mg ²⁺	mg/L	NA	37	38	40	33
Na ⁺	mg/L	NA	796	833	824	794
K ⁺	mg/L	NA	7	8	8	8
Cl ⁻	mg/L	NA	1710	1660	1770	1660
HCO ₃ ⁻	mg/L	NA	104	79	77	73
CaCO ₃	mg/L	NA	85	65	63	60
SO ₄ ²⁻	mg/L	1000, 31	2	2	3	<1
Minor Ions						
F ⁻	mg/L	0.2	0.1	0.1	0.1	0.1
Total N	mg/L	NA	1.7	1.7	1.6	1.8
NO ₂ ⁻	mg/L	30	<0.01	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	400, 5	<0.01	<0.01	0.16	0.02
Dissolved Metals & Metalloids						
Al	mg/L	5.0, 0.055	0.04	<0.01	<0.01	<0.01
As	mg/L	0.05, 0.013	0.002	0.002	0.002	<0.001
Cu	mg/L	1.0, 0.0033	<0.001	<0.001	<0.001	<0.001
Fe	mg/L	1.6	0.53	0.46	0.3	0.13
Mn	mg/L	0.087	0.235	0.223	0.182	0.226
Se	mg/L	0.02, 0.011	<0.01	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (applicable from 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5

Table 17: Groundwater Bore No. 81Pc (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	3/06/2022	19/07/2022	11/10/2022
			8:35 AM	10:44 AM	1:30 PM
pH (Field)	pH units	NA	7.04	6.50	7.02
EC (Lab)	µS/cm	NA	5780	6070	5940
TDS (Lab)	mg/L	NA	3930	3920	3840
Major Ions					
Ca ²⁺	mg/L	NA	188	187	197
Mg ²⁺	mg/L	NA	92	95	96
Na ⁺	mg/L	NA	950	936	956
K ⁺	mg/L	NA	13	14	14
Cl ⁻	mg/L	NA	1650	1760	1760
HCO ₃ ⁻	mg/L	NA	317	307	333
CaCO ₃	mg/L	NA	260	252	273
SO ₄ ²⁻	mg/L	NA	260	257	269
Minor Ions					
F ⁻	mg/L	NA	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.6	0.6	0.5
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	NA	<0.01	<0.01	<0.01
Dissolved Metals & Metalloids					
Al	mg/L	NA	<0.01	<0.01	<0.01
As	mg/L	NA	<0.001	<0.001	<0.001
Cu	mg/L	NA	<0.001	<0.001	<0.001
Fe	mg/L	NA	0.21	0.14	0.12
Mn	mg/L	NA	0.085	0.098	0.1
Se	mg/L	NA	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 18: Groundwater Bore No. 113Pgcb (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	29/11/2022
			8:41 AM
pH (Field)	pH units	NA	6.83
EC (Lab)	µS/cm	NA	5860
TDS (Lab)	mg/L	NA	3710
Major Ions			
Ca ²⁺	mg/L	NA	181
Mg ²⁺	mg/L	NA	178
Na ⁺	mg/L	NA	823
K ⁺	mg/L	NA	6
Cl ⁻	mg/L	NA	1480
HCO ₃ ⁻	mg/L	NA	477
CaCO ₃	mg/L	NA	391
SO ₄ ²⁻	mg/L	NA	304
Minor Ions			
F ⁻	mg/L	NA	0.6
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	2.49
Mn	mg/L	NA	0.033
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 19: Groundwater Bore No. 118P (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	29/11/2022
			12:36 PM
pH (Field)	pH units	NA	6.58
EC (Lab)	µS/cm	NA	15200
TDS (Lab)	mg/L	NA	11000
Major Ions			
Ca ²⁺	mg/L	NA	538
Mg ²⁺	mg/L	NA	324
Na ⁺	mg/L	NA	2290
K ⁺	mg/L	NA	12
Cl ⁻	mg/L	NA	4980
HCO ₃ ⁻	mg/L	NA	284
CaCO ₃	mg/L	NA	233
SO ₄ ²⁻	mg/L	NA	601
Minor Ions			
F ⁻	mg/L	NA	<0.1
Total N	mg/L	NA	2.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	5.1
Mn	mg/L	NA	0.237
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 20: Groundwater Bore No. 119P (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	29/11/2022
			3:24 PM
pH (Field)	pH units	NA	7.28
EC (Lab)	µS/cm	NA	2440
TDS (Lab)	mg/L	NA	1370
Major Ions			
Ca ²⁺	mg/L	NA	39
Mg ²⁺	mg/L	NA	19
Na ⁺	mg/L	NA	476
K ⁺	mg/L	NA	4
Cl ⁻	mg/L	NA	636
HCO ₃ ⁻	mg/L	NA	328
CaCO ₃	mg/L	NA	269
SO ₄ ²⁻	mg/L	NA	57
Minor Ions			
F ⁻	mg/L	NA	<0.1
Total N	mg/L	NA	0.4
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	0.08
Mn	mg/L	NA	0.033
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 21: Groundwater Bore No. 114P (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	11/10/2022
			11:00 AM
pH (Field)	pH units	NA	7.33
EC (Lab)	µS/cm	NA	6130
TDS (Lab)	mg/L	NA	3420
Major Ions			
Ca ²⁺	mg/L	NA	125
Mg ²⁺	mg/L	NA	38
Na ⁺	mg/L	NA	1100
K ⁺	mg/L	NA	8
Cl ⁻	mg/L	NA	2050
HCO ₃ ⁻	mg/L	NA	367
CaCO ₃	mg/L	NA	301
SO ₄ ²⁻	mg/L	NA	231
Minor Ions			
F ⁻	mg/L	NA	<0.1
Total N	mg/L	NA	1.6
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	1.06
Mn	mg/L	NA	0.049
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 22: Groundwater Bore No. 116P (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	11/10/2022
			3:24 PM
pH (Field)	pH units	NA	7.60
EC (Lab)	µS/cm	NA	5330
TDS (Lab)	mg/L	NA	3700
Major Ions			
Ca ²⁺	mg/L	NA	196
Mg ²⁺	mg/L	NA	40
Na ⁺	mg/L	NA	820
K ⁺	mg/L	NA	8
Cl ⁻	mg/L	NA	2000
HCO ₃ ⁻	mg/L	NA	101
CaCO ₃	mg/L	NA	83
SO ₄ ²⁻	mg/L	NA	3
Minor Ions			
F ⁻	mg/L	NA	0.1
Total N	mg/L	NA	1.7
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	0.002
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	0.08
Mn	mg/L	NA	0.204
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 23: Groundwater Bore No. GW05B (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	12/10/2022
			9:00 AM
pH (Field)	pH units	NA	7.81
EC (Lab)	µS/cm	NA	1080
TDS (Lab)	mg/L	NA	639
Major Ions			
Ca ²⁺	mg/L	NA	22
Mg ²⁺	mg/L	NA	4
Na ⁺	mg/L	NA	236
K ⁺	mg/L	NA	3
Cl ⁻	mg/L	NA	129
HCO ₃ ⁻	mg/L	NA	447
CaCO ₃	mg/L	NA	367
SO ₄ ²⁻	mg/L	NA	26
Minor Ions			
F ⁻	mg/L	NA	0.2
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	0.011
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 24: Groundwater Bore No. GW06B (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	30/11/2022
			9:23 AM
pH (Field)	pH units	NA	8.77
EC (Lab)	µS/cm	NA	1090
TDS (Lab)	mg/L	NA	617
Major Ions			
Ca ²⁺	mg/L	NA	2
Mg ²⁺	mg/L	NA	<1
Na ⁺	mg/L	NA	246
K ⁺	mg/L	NA	1
Cl ⁻	mg/L	NA	156
HCO ₃ ⁻	mg/L	NA	361
CaCO ₃	mg/L	NA	296
SO ₄ ²⁻	mg/L	NA	<1
Minor Ions			
F ⁻	mg/L	NA	0.5
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	0.003
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 25: Groundwater Bore No. GW10 (Acland Coal Sequence)

Parameter	Units	Groundwater Limits	12/10/2022
			3:00 PM
pH (Field)	pH units	NA	7.58
EC (Lab)	µS/cm	NA	2780
TDS (Lab)	mg/L	NA	1560
Major Ions			
Ca ²⁺	mg/L	NA	51
Mg ²⁺	mg/L	NA	13
Na ⁺	mg/L	NA	530
K ⁺	mg/L	NA	5
Cl ⁻	mg/L	NA	829
HCO ₃ ⁻	mg/L	NA	326
CaCO ₃	mg/L	NA	267
SO ₄ ²⁻	mg/L	NA	16
Minor Ions			
F ⁻	mg/L	NA	<0.1
Total N	mg/L	NA	0.9
NO ₂	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	0.31
Mn	mg/L	NA	0.007
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

3.3.3 Balgowan Coal Sequence Monitoring Bore Groundwater Quality

A summary table of chemistry results for the Balgowan Coal Sequence monitoring bores is shown in *Tables 26 to 32* below. A comparison to the EA trigger limits is shown for monitoring bore CSMH1Rb, which has trigger limits derived. There were no exceedances of the Table D2 (ML50232) trigger limits for the Balgowan Coal Sequence compliance monitoring bores and no exceedances of the Table D5 (ML50170 and ML50216) trigger limits for 2022.

Table 26: Groundwater Bore No. 27PcR (Balgowan Coal Sequence)

Parameter	Units	Groundwater Limits	1/02/2022	1/06/2022	19/07/2022	13/10/2022
			14:31:00 PM	1:12:00 PM	2:21:00 PM	9:45:00 AM
pH (Field)	pH units	NA	6.96	6.90	6.49	6.98
EC (Lab)	µS/cm	NA	11200	11600	12300	12400
TDS (Lab)	mg/L	NA	9610	8940	9040	9240
Major Ions						
Ca ²⁺	mg/L	NA	716	708	649	685
Mg ²⁺	mg/L	NA	283	288	288	292
Na ⁺	mg/L	NA	1420	1570	1500	1560
K ⁺	mg/L	NA	25	26	26	26
Cl ⁻	mg/L	NA	4290	3920	4110	4190
HCO ₃ ⁻	mg/L	NA	104	151	134	141
CaCO ₃	mg/L	NA	85	124	110	116
SO ₄ ²⁻	mg/L	NA	730	780	765	813
Minor Ions						
F ⁻	mg/L	NA	<0.1	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.6	0.5	0.5	0.5
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	NA	<0.01	0.02	0.02	0.02
Dissolved Metals & Metalloids						
Al	mg/L	NA	<0.01	<0.01	<0.01	<0.01
As	mg/L	NA	0.003	0.003	0.004	0.003
Cu	mg/L	NA	<0.001	<0.001	<0.001	0.004
Fe	mg/L	NA	1.95	2.23	1.69	2.1
Mn	mg/L	NA	0.353	0.318	0.354	0.296
Se	mg/L	NA	<0.01	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 27: Groundwater Bore No. 28PcR (Balgowan Coal Sequence)

Parameter	Units	Groundwater Limits	1/02/2022	1/06/2022	18/07/2022	13/10/2022
			9:40:00 AM	2:22:00 PM	4:15:00 PM	10:45:00 AM
pH (Field)	pH units	NA	7.89	7.38	6.69	7.1
EC (Lab)	µS/cm	NA	9250	9660	10000	9810
TDS (Lab)	mg/L	NA	7710	7480	7330	7710
Major Ions						
Ca ²⁺	mg/L	NA	544	573	551	574
Mg ²⁺	mg/L	NA	212	223	230	226
Na ⁺	mg/L	NA	1140	1260	1220	1240
K ⁺	mg/L	NA	22	24	25	24
Cl ⁻	mg/L	NA	3360	3180	3400	3470
HCO ₃ ⁻	mg/L	NA	94	77	69	72
CaCO ₃	mg/L	NA	77	63	57	59
SO ₄ ²⁻	mg/L	NA	557	602	590	622
Minor Ions						
F ⁻	mg/L	NA	<0.1	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.4	0.4	0.5	0.5
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	NA	<0.01	<0.01	<0.01	<0.01
Dissolved Metals & Metalloids						
Al	mg/L	NA	<0.01	<0.01	<0.01	<0.01
As	mg/L	NA	<0.001	<0.001	<0.001	<0.001
Cu	mg/L	NA	0.002	<0.001	<0.001	<0.001
Fe	mg/L	NA	2.02	2.16	2.06	2.1
Mn	mg/L	NA	0.283	0.302	0.311	0.317
Se	mg/L	NA	<0.01	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 28: Groundwater Bore No. CSMH1Rb (Balgowan Coal Sequence)

Parameter	Units	Groundwater Limits	1/02/2022	3/06/2022	19/07/2022	13/10/2022
			15:30:00 PM	11:15:00 AM	9:40:00 AM	2:00:00 PM
pH (Field)	pH units	6.0-8.5	7.62	8.12	7.48	8.03
EC (Lab)	µS/cm	1703	1630	1650	1670	1550
TDS (Lab)	mg/L	NA	904	920	909	882
Major Ions						
Ca ²⁺	mg/L	NA	33	29	29	31
Mg ²⁺	mg/L	NA	5	5	5	5
Na ⁺	mg/L	NA	285	305	292	308
K ⁺	mg/L	NA	4	4	4	4
Cl ⁻	mg/L	NA	467	468	489	497
HCO ₃ ⁻	mg/L	NA	118	106	111	113
CaCO ₃	mg/L	NA	97	87	91	93
SO ₄ ²⁻	mg/L	134	65	64	62	66
Minor Ions						
F ⁻	mg/L	0.8	<0.1	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.4	0.4	0.4	0.4
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	5	<0.01	<0.01	<0.01	<0.01
Dissolved Metals & Metalloids						
Al	mg/L	0.055	0.02	0.02	0.01	0.01
As	mg/L	0.013	0.004	0.005	0.004	0.004
Cu	mg/L	0.0014	<0.001	<0.001	<0.001	<0.001
Fe	mg/L	0.2	<0.05	<0.05	<0.05	<0.05
Mn	mg/L	0.087	0.033	0.035	0.038	0.038
Se	mg/L	0.011	<0.01	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5. Exceedances of the Groundwater Limits as per Schedule D, Tables D2 and D5 have been highlighted in orange (applicable from 26 August 2022). Dark Orange indicates Table D2 Trigger Level, light orange indicates Table D5 Trigger Level, where two numbers are indicated, the first is from Table D2, the second is from Table D5.

Table 29: Groundwater Bore No. 25PcR (Balgowan Coal Sequence)

Parameter	Units	Groundwater Limits	1/06/2022	19/07/2022	11/10/2022
			11:06 AM	12:32 PM	3:15 PM
pH (Field)	pH units	NA	7.02	6.59	5.76
EC (Lab)	µS/cm	NA	9700	10000	9510
TDS (Lab)	mg/L	NA	7420	7350	7810
Major Ions					
Ca ²⁺	mg/L	NA	572	516	552
Mg ²⁺	mg/L	NA	201	196	197
Na ⁺	mg/L	NA	1300	1210	1250
K ⁺	mg/L	NA	24	23	23
Cl ⁻	mg/L	NA	3360	3370	3480
HCO ₃ ⁻	mg/L	NA	119	123	129
CaCO ₃	mg/L	NA	98	101	106
SO ₄ ²⁻	mg/L	NA	385	380	386
Minor Ions					
F ⁻	mg/L	NA	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.5	0.5	0.6
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	NA	<0.01	<0.01	<0.01
Dissolved Metals & Metalloids					
Al	mg/L	NA	<0.01	<0.01	<0.01
As	mg/L	NA	<0.001	<0.001	<0.001
Cu	mg/L	NA	<0.001	<0.001	<0.001
Fe	mg/L	NA	3.43	3.32	3.34
Mn	mg/L	NA	0.121	0.118	0.122
Se	mg/L	NA	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 30: Groundwater Bore No. 26PcR (Balgowan Coal Sequence)

Parameter	Units	Groundwater Limits	1/06/2022	19/07/2022	13/10/2022
			12:16 PM	1:32 PM	8:50 AM
pH (Field)	pH units	NA	7.10	6.65	7.11
EC (Lab)	µS/cm	NA	11800	12300	12000
TDS (Lab)	mg/L	NA	9150	9050	9270
Major Ions					
Ca ²⁺	mg/L	NA	544	547	569
Mg ²⁺	mg/L	NA	260	272	271
Na ⁺	mg/L	NA	1710	1700	1720
K ⁺	mg/L	NA	28	29	29
Cl ⁻	mg/L	NA	3870	4030	4140
HCO ₃ ⁻	mg/L	NA	217	223	246
CaCO ₃	mg/L	NA	178	183	202
SO ₄ ²⁻	mg/L	NA	929	915	971
Minor Ions					
F ⁻	mg/L	NA	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.4	0.5	0.6
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	NA	<0.01	<0.01	<0.01
Dissolved Metals & Metalloids					
Al	mg/L	NA	<0.01	<0.01	<0.01
As	mg/L	NA	<0.001	<0.001	<0.001
Cu	mg/L	NA	<0.001	<0.001	<0.001
Fe	mg/L	NA	3.98	4.07	4.19
Mn	mg/L	NA	0.021	0.022	0.022
Se	mg/L	NA	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 31: Groundwater Bore No. 2289PcR Lower (Balgowan Coal Sequence)

Parameter	Units	Groundwater Limits	1/06/2022	21/07/2022	19/10/2022
			8:47 AM	8:29 AM	10:08 AM
pH (Field)	pH units	NA	7.44	7.49	7.32
EC (Lab)	µS/cm	NA	4420	4580	4770
TDS (Lab)	mg/L	NA	3120	3150	3100
Major Ions					
Ca ²⁺	mg/L	NA	207	198	233
Mg ²⁺	mg/L	NA	72	73	67
Na ⁺	mg/L	NA	617	597	579
K ⁺	mg/L	NA	13	13	14
Cl ⁻	mg/L	NA	1300	1350	1340
HCO ₃ ⁻	mg/L	NA	122	126	141
CaCO ₃	mg/L	NA	100	103	116
SO ₄ ²⁻	mg/L	NA	263	253	259
Minor Ions					
F ⁻	mg/L	NA	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.5	0.6	0.6
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	NA	<0.01	<0.01	<0.01
Dissolved Metals & Metalloids					
Al	mg/L	NA	<0.01	<0.01	<0.01
As	mg/L	NA	<0.001	<0.001	<0.001
Cu	mg/L	NA	0.002	<0.001	<0.001
Fe	mg/L	NA	0.97	1.03	1.03
Mn	mg/L	NA	0.061	0.062	0.065
Se	mg/L	NA	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 32: Groundwater Bore No. 2291Pc (Balgowan Coal Sequence)

Parameter	Units	Groundwater Limits	1/06/2022	19/07/2022	11/10/2022
			9:54 AM	11:32 AM	2:40 PM
pH (Field)	pH units	NA	6.94	6.48	6.93
EC (Lab)	µS/cm	NA	7870	8120	7820
TDS (Lab)	mg/L	NA	5430	5530	5590
Major Ions					
Ca ²⁺	mg/L	NA	261	256	258
Mg ²⁺	mg/L	NA	144	151	147
Na ⁺	mg/L	NA	1260	1250	1240
K ⁺	mg/L	NA	15	15	15
Cl ⁻	mg/L	NA	2420	2550	2620
HCO ₃ ⁻	mg/L	NA	421	426	452
CaCO ₃	mg/L	NA	345	349	371
SO ₄ ²⁻	mg/L	NA	353	335	341
Minor Ions					
F ⁻	mg/L	NA	<0.1	<0.1	<0.1
Total N	mg/L	NA	0.7	0.8	0.8
NO ₂ ⁻	mg/L	NA	<0.01	<0.01	<0.01
NO ₃ ⁻	mg/L	NA	<0.01	0.01	<0.01
Dissolved Metals & Metalloids					
Al	mg/L	NA	<0.01	<0.01	<0.01
As	mg/L	NA	<0.001	<0.001	<0.001
Cu	mg/L	NA	<0.001	<0.001	<0.001
Fe	mg/L	NA	2.71	2.86	2.86
Mn	mg/L	NA	0.047	0.05	0.05
Se	mg/L	NA	<0.01	<0.01	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

3.3.4 Marburg Sandstone, Oakey Creek Alluvium, and Waipanna Coal Seam Monitoring Bore Groundwater Quality

The remaining NAC borefield consists of three Marburg Sandstone monitoring bores (GW08C and GW11B and GW09C), one monitoring bore within the Oakey Creek Alluvial aquifer (GW09A) and one monitoring bore within the Waipanna Coal Sequence aquifer (GW13B), and one bore within the coal backfill material (3307WB). Monitoring Bore 3307WB cannot be sampled due to bent casing and is scheduled to be replaced (see *Table 1*). A summary table of chemistry results for these monitoring bores is shown in *Tables 33 to 36* below.

No monitoring bores in this group have trigger limits set as per Tables D2 (ML50232) and Table D5 (ML50170 and ML50216) of the EA, as these are not compliance bores.

GW09C was unable to be sampled during the October 2022 monitoring round due to equipment issues in accessing the bore. A suitable pump to sample this bore will be sourced for future rounds.

Table 33: Groundwater Bore No. GW08C (Marburg Sandstone)

Parameter	Units	Groundwater Limits	29/11/2022
			11:07 AM
pH (Field)	pH units	NA	8.45
EC (Lab)	µS/cm	NA	2280
TDS (Lab)	mg/L	NA	1330
Major Ions			
Ca ²⁺	mg/L	NA	7
Mg ²⁺	mg/L	NA	<1
Na ⁺	mg/L	NA	518
K ⁺	mg/L	NA	3
Cl ⁻	mg/L	NA	619
HCO ₃ ⁻	mg/L	NA	318
CaCO ₃	mg/L	NA	261
SO ₄ ²⁻	mg/L	NA	12
Minor Ions			
F ⁻	mg/L	NA	0.2
Total N	mg/L	NA	0.3
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	0.05
As	mg/L	NA	0.01
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	0.012
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 34: Groundwater Bore No. GW09A (Oakey Creek Alluvium)

Parameter	Units	Groundwater Limits	30/11/2022
			7:38 AM
pH (Field)	pH units	NA	7.06
EC (Lab)	µS/cm	NA	2560
TDS (Lab)	mg/L	NA	1720
Major Ions			
Ca ²⁺	mg/L	NA	97
Mg ²⁺	mg/L	NA	98
Na ⁺	mg/L	NA	347
K ⁺	mg/L	NA	3
Cl ⁻	mg/L	NA	697
HCO ₃ ⁻	mg/L	NA	445
CaCO ₃	mg/L	NA	365
SO ₄ ²⁻	mg/L	NA	19
Minor Ions			
F ⁻	mg/L	NA	0.3
Total N	mg/L	NA	2.5
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	2.27
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	0.003
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 35: Groundwater Bore No. GW11B (Marburg Sandstone)

Parameter	Units	Groundwater Limits	12/10/2022
			11:30 AM
pH (Field)	pH units	NA	6.48
EC (Lab)	µS/cm	NA	3150
TDS (Lab)	mg/L	NA	2070
Major Ions			
Ca ²⁺	mg/L	NA	104
Mg ²⁺	mg/L	NA	61
Na ⁺	mg/L	NA	441
K ⁺	mg/L	NA	19
Cl ⁻	mg/L	NA	945
HCO ₃ ⁻	mg/L	NA	229
CaCO ₃	mg/L	NA	188
SO ₄ ²⁻	mg/L	NA	93
Minor Ions			
F ⁻	mg/L	NA	0.2
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	0.016
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	1.1
Mn	mg/L	NA	0.162
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

Table 36: Groundwater Bore No. GW13B (Waipanna Coal Sequence)

Parameter	Units	Groundwater Limits	12/10/2022
			12:50 PM
pH (Field)	pH units	NA	8.18
EC (Lab)	µS/cm	NA	829
TDS (Lab)	mg/L	NA	498
Major Ions			
Ca ²⁺	mg/L	NA	6
Mg ²⁺	mg/L	NA	2
Na ⁺	mg/L	NA	200
K ⁺	mg/L	NA	2
Cl ⁻	mg/L	NA	71
HCO ₃ ⁻	mg/L	NA	400
CaCO ₃	mg/L	NA	328
SO ₄ ²⁻	mg/L	NA	<1
Minor Ions			
F ⁻	mg/L	NA	0.8
Total N	mg/L	NA	0.2
NO ₂ ⁻	mg/L	NA	<0.01
NO ₃ ⁻	mg/L	NA	<0.01
Dissolved Metals & Metalloids			
Al	mg/L	NA	<0.01
As	mg/L	NA	<0.001
Cu	mg/L	NA	<0.001
Fe	mg/L	NA	<0.05
Mn	mg/L	NA	0.006
Se	mg/L	NA	<0.01

Note: NA, monitoring bores or analytes do not have Groundwater Limits as per Schedule D, Tables D2 and D5.

3.4 Review of the Conceptual or Numerical Groundwater model

There were no reviews undertaken of the conceptual or numerical groundwater model for the NAC site over the 2022 reporting period.

3.5 Assessment of groundwater level impacts

The NAC stage 03 expansion has not commenced, as of December 2022. Therefore, there are no potential groundwater drawdowns of the Stage 3 area to be compared to modelled drawdowns. It is expected that NAC will commence the Stage 03 expansion in May 2023 with further impact assessments to be provided in future AGMRs.

4. CONCLUSIONS

Groundwater monitoring was carried out across the NAC site on a quarterly frequency for 2022 across ML50170 and ML50216 (also referred to as the Stage 1 and 2 mining areas) and ML50232 (the Stage 3 mining area). As the updated EA took effect on 26 August 2022, comprehensive groundwater monitoring of the NAC03 relevant bores commenced during the October 2022 monitoring round. From October 2022, groundwater monitoring will be undertaken as per the frequencies listed in Tables D1 and D2, considering the specific conditions of D13 and D14 of the EA.

As per Conditions D8 (for ML50232) and D18 (ML50170 and ML50216) of the EA, groundwater levels are required to be compared to the reference levels and trigger level thresholds in Table D3 of the EA to assess compliance status. There were no exceedances of the drawdown groundwater level triggers for the 2022 monitoring period for bores that have trigger level and reference levels developed.

There were no elevated results comparing to the Table D2 (ML50232) trigger limits for any of the compliance monitoring bores. Results above trigger limits shown in Table D5 (ML50170 and ML50216) for 2022 were noted for the following:

- Nitrate in groundwater from 10PbR (during June, July and October 2022);
- EC (lab) at BMH1 (during July and October 2022) and dissolved copper (during October 2022);
- Dissolved iron in groundwater from 4517WB during June 2022;
- Sulfate in groundwater from 4518WB (during June, July and October 2022), dissolved iron (during June and October 2022) and dissolved manganese (during June 2022);
- Electrical conductivity in groundwater from 111PgC Lower (during July 2022), dissolved iron (during July 2022) and sulfate (during June 2022); and
- pH in groundwater from 3316WB (during June 2022).

Investigations relevant to the above elevated results have been completed by NAC, with all relevant notifications made to DES by NAC.

5. STATEMENT OF LIMITATIONS

1. This report is based solely on the scope of work described in Proposal P0671913 dated 21st March 2023 and performed by ERM Australia Pacific Pty Ltd (ERM) for New Acland Coal P/L (the Client). The Scope of Work was governed by a Purchase Order (PO) between ERM and the Client.
2. No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the PO.
3. The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.
4. This report was prepared using data gathered by ERM and NAC between January and December 2022 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.
5. Unless this report expressly states to the contrary, ERM's Scope of Work was limited strictly to identifying typical environmental conditions associated with the subject site(s) and does not evaluate the condition of any structure on the subject site nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials or any identified impacted soil or groundwater on the site(s) should not be interpreted as a guarantee that such materials or impacts do not exist.
6. This report is based on one or more site inspections conducted by ERM personnel, the sampling and analyses described in the report, and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:
7. did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by; and
8. assumes no responsibility or liability for errors in data obtained from, the Client, any third parties or external sources (including regulatory agencies).
9. Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.
10. Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:
11. the suitability of the site(s) for any purpose or the permissibility of any use;
12. the presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or
13. the presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).

14. Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.
15. The ongoing use of the site or use of the site for a different purpose may require the management of or remediation of site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.
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6. REFERENCES

Australian / New Zealand Standard (1998) AS/NZS 5667.11:1998 *Water quality - Sampling - Guidance on sampling of groundwaters.*

Department of Environment and Science (DES) *Monitoring and Sampling Manual – Version 2* (June 2018).

ERM (2022a) *January 2022 Groundwater Monitoring Report, Compliance and Groundwater Monitoring and Impact Management Plan - Groundwater Monitoring Bores, New Acland Coal Mine*, March 2022

ERM (2022b) *New Acland Coal Mine, Compliance Groundwater Monitoring Report, June 2022, July 2022*

ERM (2023a) *New Acland Coal Mine, Quarterly Groundwater Monitoring Report, July 2022, March 2023*

ERM (2023b) *New Acland Coal Mine, Groundwater Monitoring Report, October 2022, March 2023*

APPENDIX A FIGURES

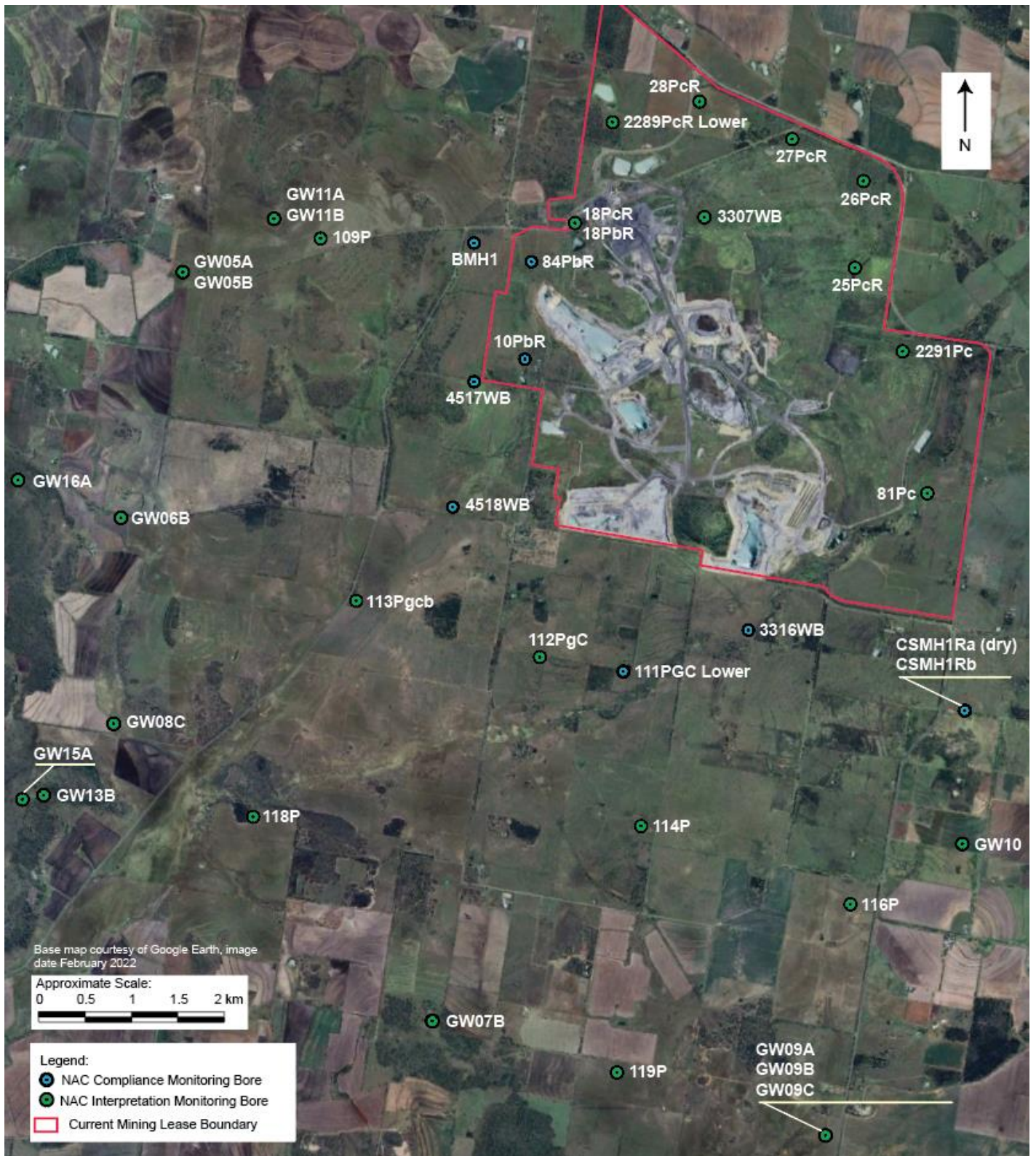


Figure 1: NAC EA Compliance and Interpretation Borefield Map

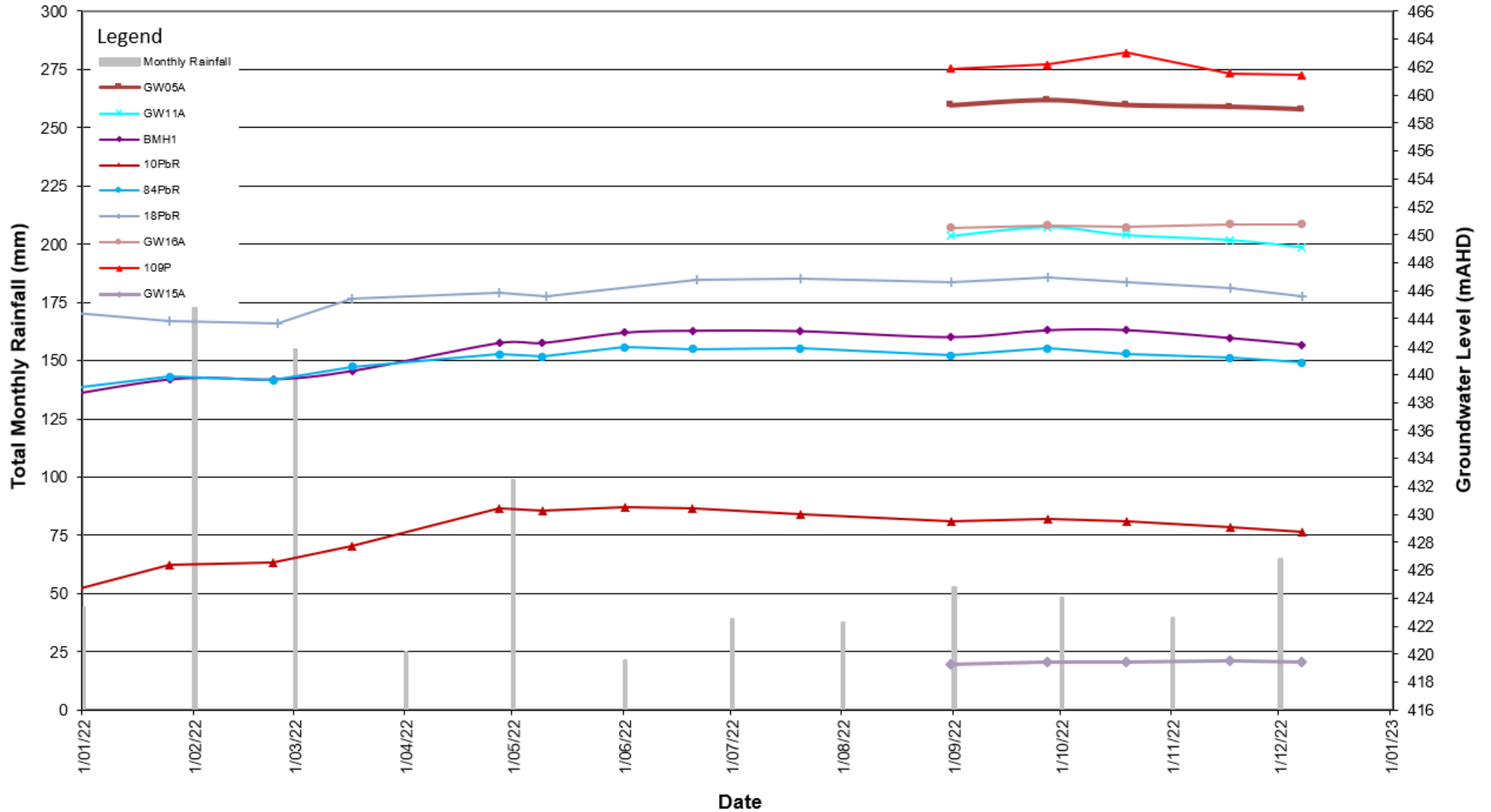


Figure 2: Time series plot of groundwater levels from the Basalt Monitoring Bores and monthly rainfall (data from BOM and NAC)

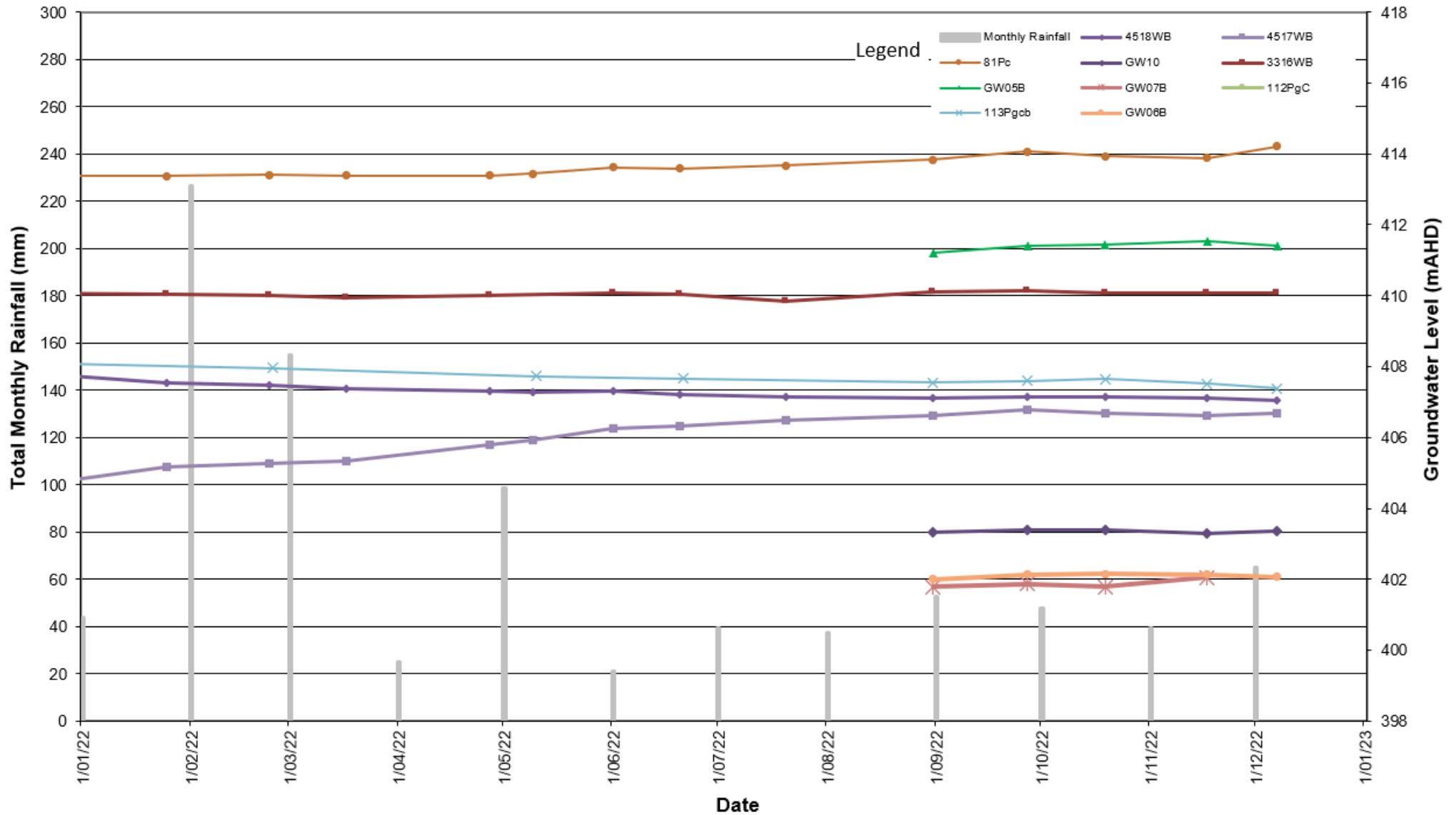


Figure 3: Time series plot of groundwater levels from the Acland Coal Seam Monitoring Bores and monthly rainfall (data from BOM and NAC). Groundwater levels between 418 – 398 mAHD.

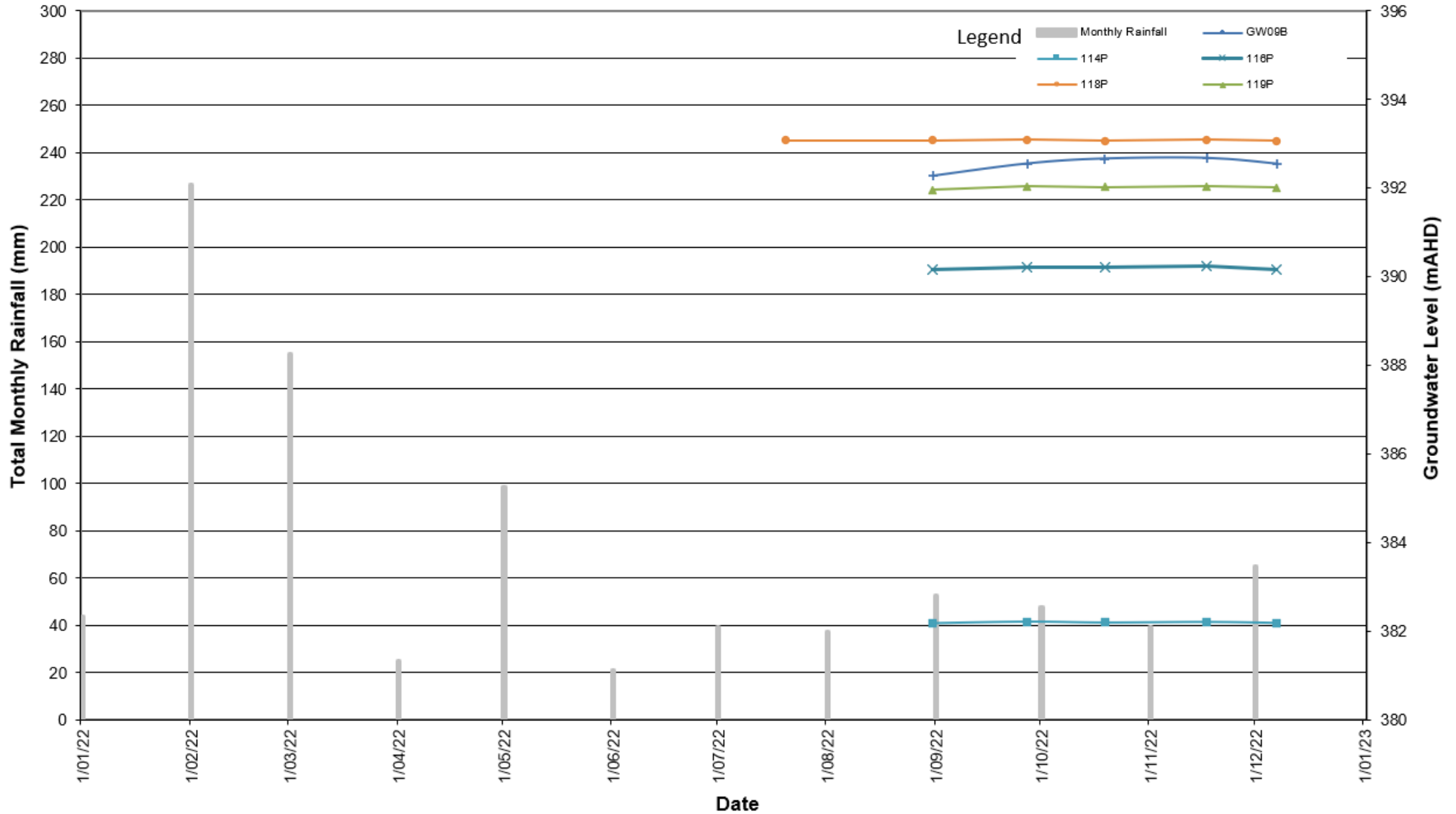


Figure 4: Time series plot of groundwater levels from the Acland Coal Seam Monitoring Bores and monthly rainfall (data from BOM and NAC). Groundwater levels between 406 – 380 mAHd.i

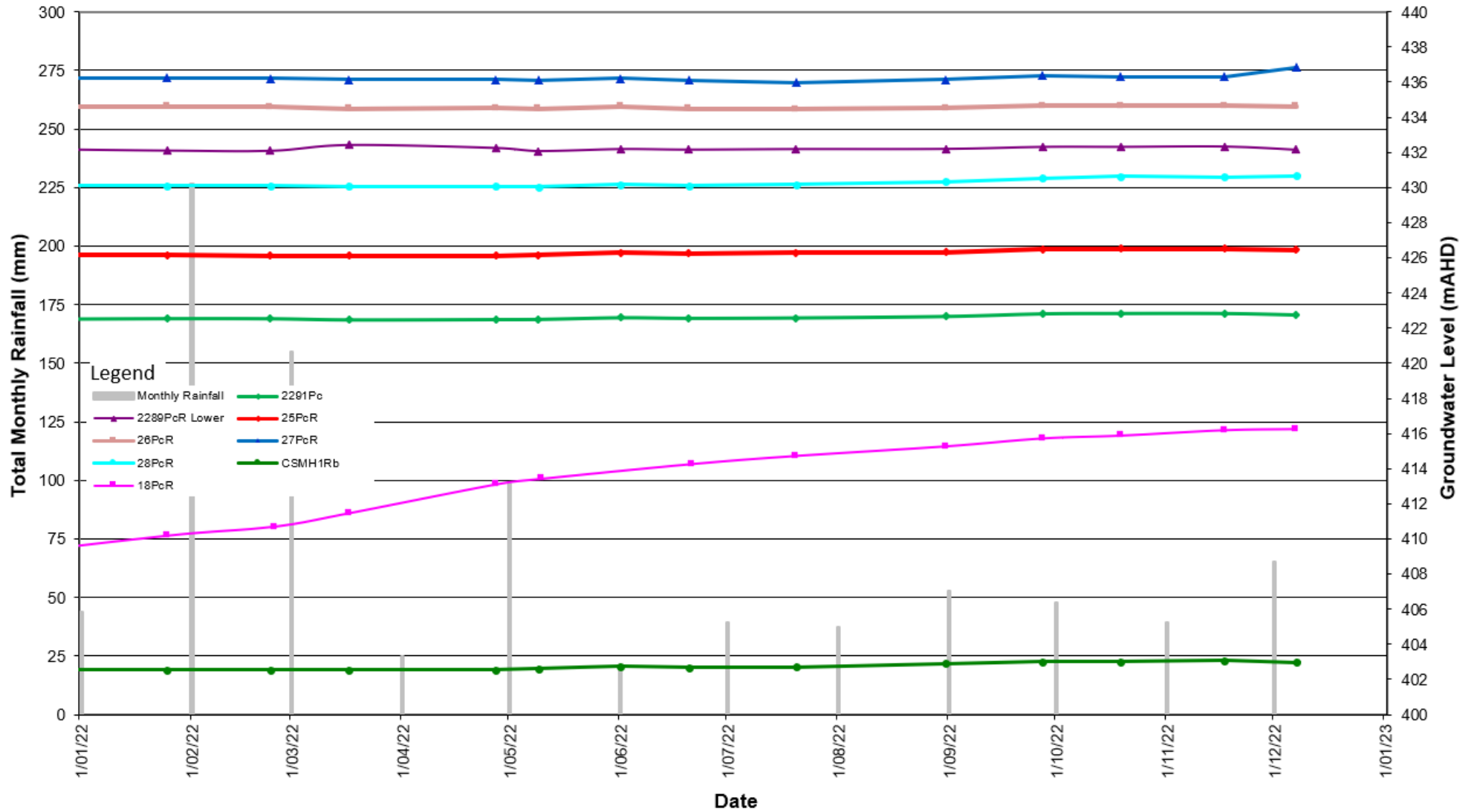


Figure 5: Time series plot of groundwater levels from the Balgowan Coal Seams and monthly rainfall (data from BOM and NAC)

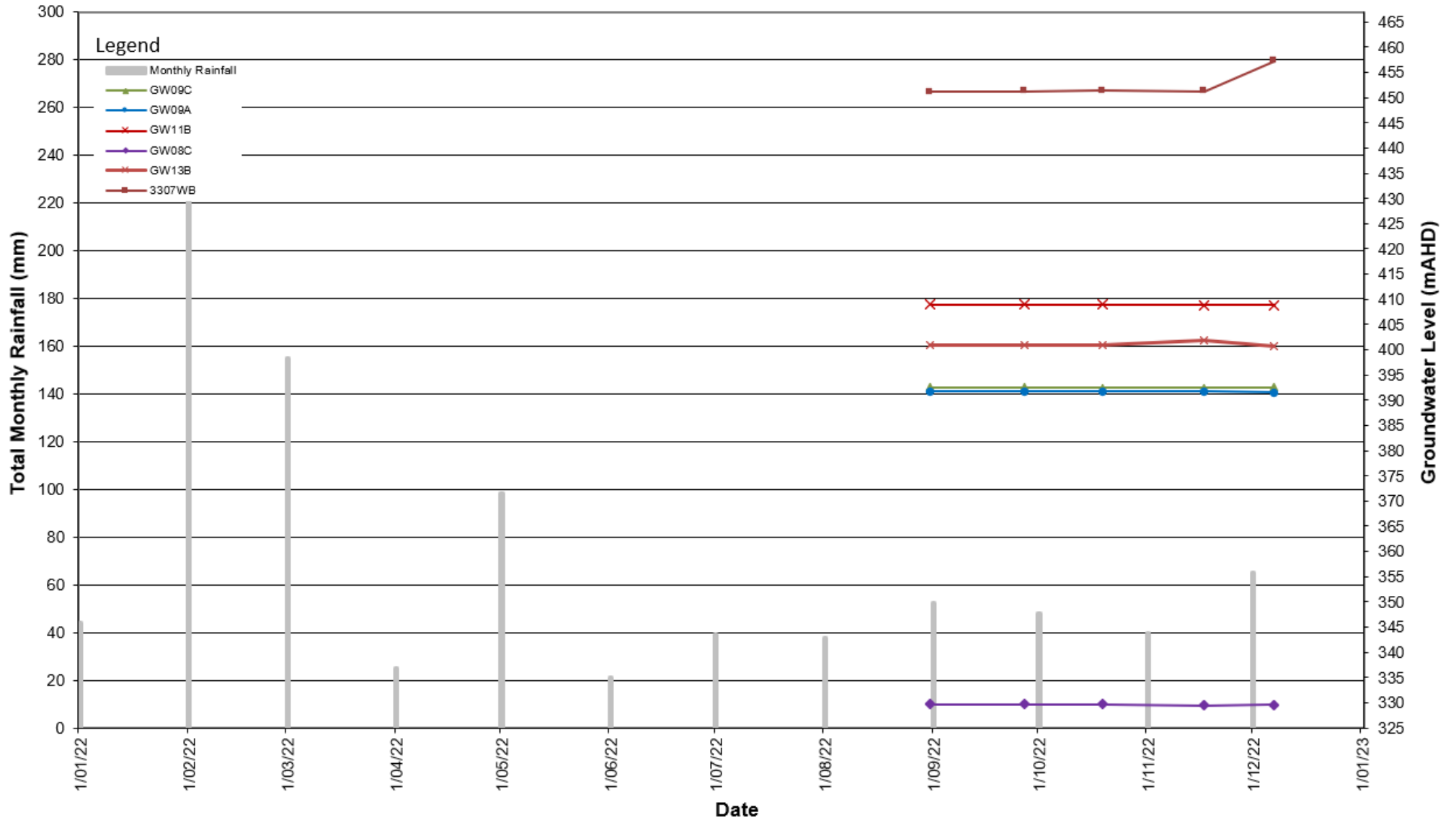


Figure 6: Time series plot of groundwater levels from the Marburg Sandstone, Waipanna Coal Seam (GW13B), Oakey Alluvial Aquifer (GW09A), coal spoil backfill (3307WB) and monthly rainfall (data from BOM and NAC)

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