

29 August 2025

Ms Sally Strohmayer
Acting Executive Director
Environmental Regulation
Department of Lands, Planning and Environment
PO Box 3675
Darwin NT 0801
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Dear Ms Strohmayer

Re: Annual Interpretative Groundwater Quality Report - Beetaloo Basin Shenandoah South E&A Program EMP, EP98 and EP117 TAM1-3 (the EMP) Shenandoah South 2 (S2) well site

Ministerial condition 14(V) of the conditions of approval for the above EMP requires “... *an interpretative report of groundwater quality based on the groundwater monitoring required to be conducted at the well site(s) in accordance with Table 6 of the Code. The interpretative report must be provided annually within 3 months of the anniversary of the approval date of the EMP and include:*

- *identification of any change to groundwater quality or level attributable to conduct of the regulated activity at the well site(s) and discussion of the significance and cause of any such observed change*
- *interpretation of any statistical outliers observed from baseline measured values for each of the analytes.*
- *discussion of any trends observed.*
- *a summary of the results including descriptive statistics.*
- *description of the layout of the groundwater monitoring bores and wells, indicative groundwater flow directions and levels in accordance with the Preliminary Guideline Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin.”*

The Code refers to the *Code of Practice: Onshore petroleum activities in the Northern Territory* (DENR, 2019). It is referred to as the “Code” throughout this report.

This letter constitutes the annual interpretative groundwater quality report for the TAM1-3 EMP. This interpretive groundwater quality report has been produced by Mr Peter Evans, Senior Hydrogeologist on behalf of Tamboran B2 Pty Ltd (Tamboran).

Site layout and groundwater flow direction

Figure 1 shows the location of the Kyalla 117 N2 well site in relation to the Shenandoah South 2 (S2) well site (located 4.4 km to the northwest). The indicative groundwater flow direction, based on the SREBA (DEPWS, 2022) and monitoring results collected on site, is from the southeast to the northwest in the vicinity of the two development sites (Figure 1).

For the purposes of this report, which focusses on the groundwater quality of the Shenandoah S2 site, comparison is made with control monitoring bores (CMBs) located up groundwater flow gradient on the Kyalla 117 N2 well site.

Figure 2 shows the locations of the Kyalla 117 N2-1H and Shenandoah S-1H appraisal well locations and the locations of the control monitoring bores:

- CMB – ALB: RN040896 (BET-MB021)
- CMB – GRF: RN041132 (BET-MB022).

The indicative groundwater flow direction, based on the SREBA (DEPWS, 2022) and monitoring results collected on site, is from the southeast to the northwest in the vicinity of the Kyalla 117 N2 well site (Figure 1 and 2). The CMBs are between 75 m and 85 m to the southeast of Kyalla 117 N2-1H wellhead.

The impact monitoring bores (IMBs) are GRF RN043874 (BET-MB031) and ALB RN043873 (BET-MB030). Figure 3 indicates the locations of the IMBs on the Shenandoah S2 well site, together with the three other production bores RN043872 (BET-MB029), RN043875 (BET-MB032) and RN043876 (BET-MB033).

The CMBs and IMBs are up hydraulic gradient and down hydraulic gradient of the gas wellheads respectively, based on the regional groundwater flow direction (Figure 1, after DEPWS, 2022). The CMBs and IMBs are fully penetrating of their target aquifers.

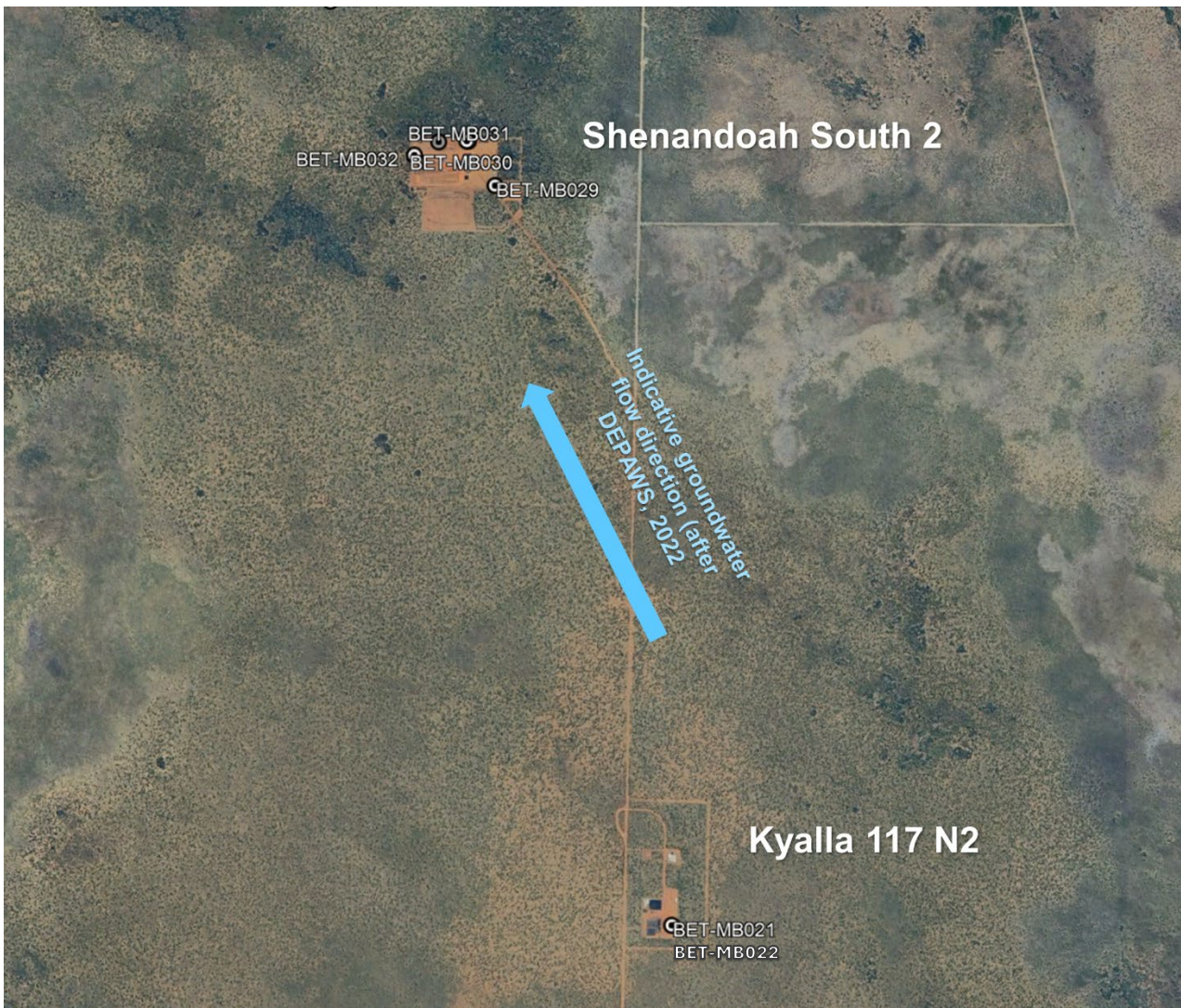


Figure 1 Location of Kyalla 117 N2 well site in relation to Shenandoah S2 well site and indicative groundwater flow direction



Figure 2 Kyalla 117 N2 site layout and indicative groundwater flow direction



Figure 3 Shenandoah S2 site layout and indicative groundwater flow direction, including locations for the Shenandoah S2-1H – Shenandoah S2-5H wells

Water level trends

Continuous water level monitoring using InSitu® LevelTroll automatic water level sensors commenced at the sites prior the start of activities. Figure 4 presents daily averaged barometrically adjusted time series water level data the Anthony Lagoon Beds (ALB) (blue lines) and the Gum Ridge Formation (GRF) (orange/red/brown lines). Figure 5 presents all of the barometrically adjusted water level data including high frequency observation data.

The data shows:

- There was no significant change in the water levels from before to after the exploration activities at Kyalla 117 N2 or at Shenandoah S2.
- Differences in the depths of the presented water levels related to the differing heights of the reference points (above ground level) from which the water levels are measured.
- The short periods of deeper water levels relate to groundwater extraction for the authorised activities.
- Notwithstanding the fluctuations related to groundwater extraction, the water levels in both monitored zones at Kyalla 117 N2 show a marginally rising in water level trend (broadly 0.2 m over three years) with an overprinted seasonal fluctuation of approximately 0.1 m.
- The water levels in the monitored zones move in concert and by a very similar magnitude, suggesting a high likelihood of direct hydraulic connection at the site between the two aquifer units monitored.

There has been no significant and ongoing change to the water levels in either the ALB or the GRF due to the regulated activities.

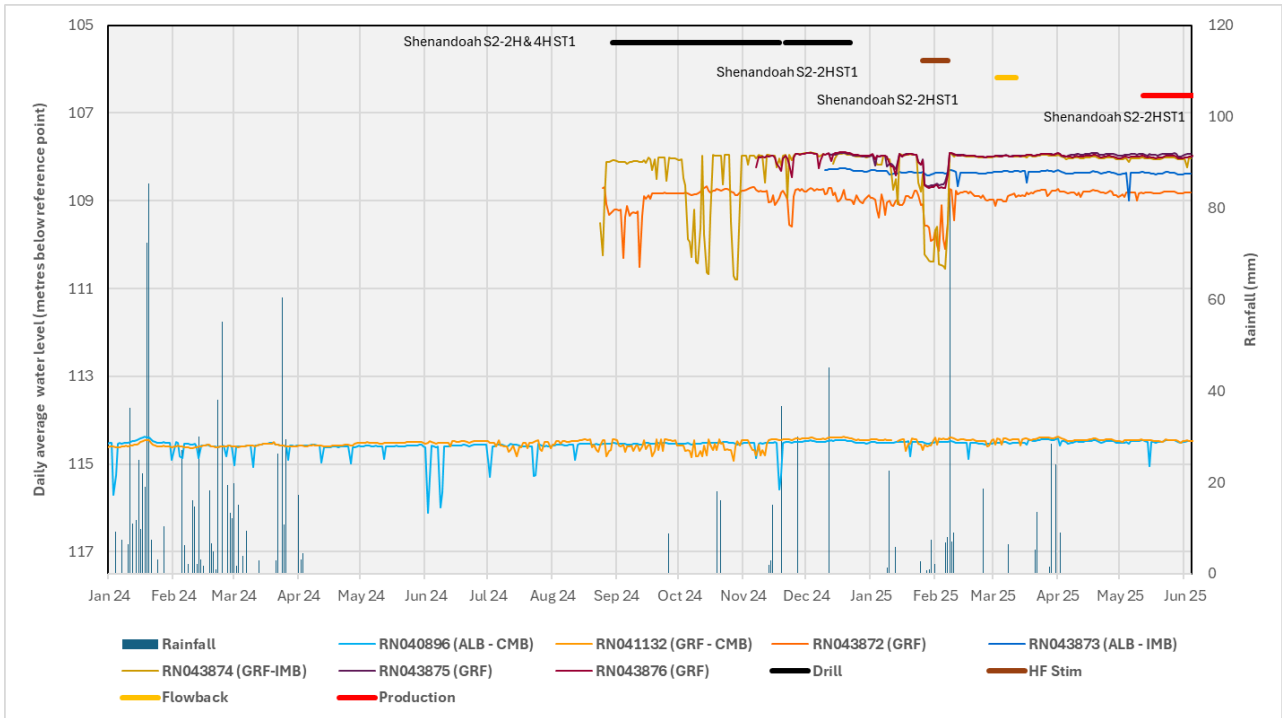


Figure 4 CMB and IMB daily average water levels

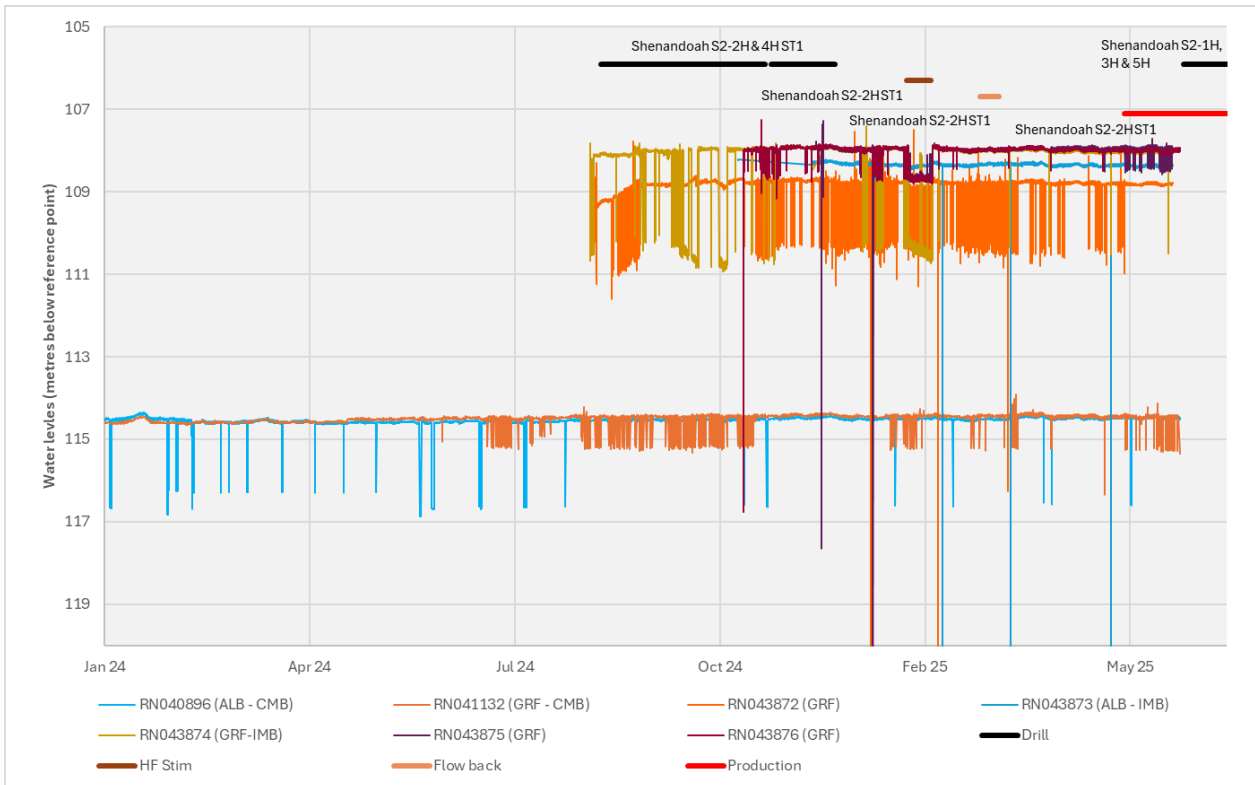


Figure 5 All logger water level data including high temporal frequency data

Water quality trends

Groundwater from the CMBs and IMBs has been sampled for the suite of analytes listed in Table 6 of Section B.4.17 of the Code. Water quality monitoring of the CMBs commenced on 1 February 2019 and 17 August 2019 for the ALF and GRF, respectively. Water quality monitoring of the ALB IMB commenced on 26 September 2024, and the water quality monitoring of the GRF IMB commenced on 19 September 2024. The last samples included in this reporting period were collected on 4 June 2025. This includes sampling during the hydraulic fracturing of the Shenandoah S2-2H ST1 well on the Shenandoah S2 well pad.

Summary statistics of the analytical results for each of the CMBs and IMBs are provided in Table 1 to Table 4. Where an analyte concentration was reported as less than the effective quantification limit (EQL), it was assumed to be 0.5 times the EQL for the calculation of the statistic.

In addition to the collection of samples from the Shenandoah S2 IMBs, water quality samples were also collected from the three other GRF production bores located on the Shenandoah S2 well pad, namely RN043872 (BET-MB029), RN043875 (BET-MB032); and RN043876 (BET-MB033).

Tables 5, 6 and 7 provide summary statistics for the analytical results for these additional GRF production bores. Table 8 provides a summary of average values for the GRF at Shenandoah S2.

To identify whether there has been any change in water quality due to the regulated activities, a statistical assessment was made using a Student T-Test to test whether there was a significant difference in the results between the CMB (upgradient) and the IMB (downgradient). An F-Test was used to determine whether the homoscedastic (statistically similar variance) or heteroscedastic (statistically different variance) formula for the T-Test was used. Where a concentration was reported as less than the limit of reporting (LOR = EQL), the limit of reporting was assumed as the sample concentration. The statistical significance was assessed to a 95% confidence. The results of the analysis are provided in Table 9 and Table 10.

The analytes where the P-value was less 0.05 (95% confidence that there is a significant different between the CMB and IMB data) are identified and described in Tables 9 & 10. Time series control charts for these analytes provided in Attachment A and Attachment B for the GRF and ALB, respectively.

Table 11 provides summary descriptions of water quality trends for the GRF for those analytes where there was a statistically significant difference between the CMB and IMB. Table 12 provides summary descriptions of water quality trends for the ALB for those analytes where there was a statistically significant difference between the CMB and IMB.

There are few statistically significant differences in groundwater chemistry between the CMBs and the IMBs.

The analytes which show significant differences and interpretation of their trends, as outlined above and discussed in Tables 11 and 12, indicate subtle changes to the groundwater quality in the immediate vicinity of the wells probably relating to the loss of drilling fluid while drilling through the highly permeable ALB and GRF. Lost circulation is commonly noted on Statements of Bore for registered groundwater bores drilled in the limestone aquifers. The changes in chemistry are likely to be localised and are expected to reduce over time as the groundwater chemistry returns to background conditions.

Conclusions

No significant persistent changes have been observed in the groundwater quality or the groundwater level at the Shenandoah S2 well site that can be attributed to the regulated activities.

Tamboran will continue to monitor the groundwater at the Shenandoah S22 well site in accordance with Ministerial conditions of approval of the EMP.

If you require any further information, please do not hesitate to email me.

Kind regards



Linda Pugh
Senior Environmental Approvals Advisor

E: [Redacted]

M: [Redacted]

References

DENR (2018) Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin. Department of Environment and Natural Resources, November 2018.

DENR (2019) Code of Practice: Onshore Petroleum Activities in the Northern Territory. May 2019.

DEPWS (2022) Regional Report: Strategic Regional Environmental and Baseline Assessment for the Beetaloo Sub-basin. DEPWS Technical Report 41/2022. Department of Environment, Parks and Water Security, Northern Territory Government. Berrimah, Northern Territory.

Table 1 Kyalla 117 Gum Ridge Formation CMB (BET-MB022/RN041132) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH units	0.01	38	6.7	7.81	7.00	6.83	6.98	7.15
Electrical Conductivity (Field)	µS/cm	1	34	955	1,634	1,456	1,279	1,522	1,561
pH (Lab)	pH units	0.01	36	7.3	7.82	7.56	7.39	7.58	7.71
Electrical Conductivity (Lab)	µS/cm	1	36	1,120	1,380	1,198	1,155	1,190	1,260
Total Dissolved Solids	mg/L	10	36	626	808	709	653.5	708.5	775.5
Suspended Solids	mg/L	5	35	5	17.0	5.7	5.0	8.0	14.0
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	36	260	393	307	288	305	322
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	36	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	36	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	36	260	393.00	307.00	288.00	305.00	322.00
Chloride	mg/L	1	36	149	180	163	154.5	164.0	171.5
Sulphate as SO ₄	mg/L	1	34	102	183.0	122.0	105.6	117.0	137.4
Sodium	mg/L	1	36	87	107	98	92	99	105
Potassium	mg/L	1	36	13	18	15	14	16	17
Calcium	mg/L	1	36	72	109	88	80	88	95
Magnesium	mg/L	1	36	33	49	38	35	38	41
Fluoride	mg/L	0.1	36	1.1	1.60	1.30	1.30	1.35	1.40
Nitrate (as N)	mg/L	0.01	36	0.01	0.11	0.01	0.01	0.02	0.03
Nitrite (as N)	mg/L	0.01	36	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	30	0.09	2.23	1.40	1.12	1.46	1.69
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	30	0.24	0.87	0.52	0.35	0.52	0.74
Methane	mg/L	0.01	35	0.01	0.05	0.02	0.01	0.02	0.04
Ethane	µg/L	10	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	35	0.001	0.01	0.003	0.001	0.003	0.005
Barium	mg/L	0.001	35	0.046	0.07	0.06	0.05	0.06	0.06
Boron	mg/L	0.05	35	0.16	0.28	0.21	0.19	0.21	0.24
Cadmium	mg/L	0.0001	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.001	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Iron	mg/L	0.05	35	0.38	3.58	2.00	0.57	2.17	3.36
Lead	mg/L	0.001	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Lithium	mg/L	0.001	35	0.033	0.05	0.04	0.04	0.04	0.05
Manganese	mg/L	0.001	35	0.015	0.07	0.03	0.02	0.03	0.04
Mercury	mg/L	0.0001	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	33	8.68	11.70	10.19	9.54	10.20	10.78
Silver	mg/L	0.001	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	35	0.634	0.85	0.75	0.69	0.76	0.81
Zinc	mg/L	0.005	35	0.005	0.04	0.01	0.01	0.01	0.01
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	35	<100	190	54	190	190	190
Sum of BTEX	µg/L	1	35	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	29	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 2 Kyalla 117 N2 Gum Ridge Formation IMB (BET-MB031/RN043874) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH_Units	0.01	10	6.82	7.17	6.95	6.85	6.92	7.13
Electrical Conductivity (Field)	µS/cm	1	9	1,445	1,580	1,527.0	1,508.2	1,528.0	1,560.8
pH (Lab)	pH_Units	0.01	10	7.16	7.64	7.46	7.30	7.51	7.60
Electrical Conductivity (Lab)	µS/cm	1	10	1,140	1,270	1,189.0	1,140.0	1,200.0	1,216.0
Total Dissolved Solids	mg/L	10	11	690	796	748.00	706.00	757.00	788.00
Suspended Solids	mg/L	5	11	<LOR	20	7.60	9.20	14.00	18.00
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	11	299	311	306.00	302.00	308.00	310.00
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	11	299	311	306.00	302.00	308.00	310.00
Chloride	mg/L	1	11	156	179	166.00	158.00	165.00	172.00
Sulphate as SO ₄	mg/L	1	11	124	187	140.00	125.00	137.00	145.00
Sodium	mg/L	1	11	97	117	105.00	98.00	106.00	108.00
Potassium	mg/L	1	11	13	16	14.00	13.00	14.00	15.00
Calcium	mg/L	1	11	86	102	93.00	86.00	93.00	98.00
Magnesium	mg/L	1	11	37	45	39.00	38.00	39.00	41.00
Fluoride	mg/L	0.1	11	1.2	1.4	1.30	1.20	1.30	1.30
Nitrate (as N)	mg/L	0.01	11	<0.002	0.1	0.02	0.01	0.04	0.09
Nitrite (as N)	mg/L	0.01	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	10	0.35	1.66	1.00	0.58	1.13	1.31
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	10	0.11	0.59	0.40	0.21	0.45	0.53
Methane	mg/L	0.01	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Ethane	µg/L	10	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	11	0.008	0.017	0.01	0.01	0.01	0.02
Barium	mg/L	0.001	11	0.054	0.064	0.06	0.06	0.06	0.06
Boron	mg/L	0.05	11	0.19	0.3	0.23	0.21	0.22	0.25
Cadmium	mg/L	0.0001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Iron	mg/L	0.05	11	0.09	0.96	0.55	0.16	0.50	0.89
Lead	mg/L	0.001	11	0.0005	0.014	0.00	0.00	0.00	0.01
Lithium	mg/L	0.001	10	0.034	0.047	0.04	0.04	0.04	0.05
Manganese	mg/L	0.001	11	0.011	0.021	0.01	0.01	0.01	0.01
Mercury	mg/L	0.0001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	9	9.36	11.60	10.51	9.87	10.30	11.60
Silver	mg/L	0.001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	11	0.685	0.842	0.79	0.74	0.79	0.84
Zinc	mg/L	0.005	11	0.031	0.391	0.17	0.05	0.07	0.36
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 3 Kyalla 117 N2 Anthony Lagoon Beds CMB (BET-MB021/ RN040896) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH units	0.01	53	6.8	7.83	7.12	6.87	7.10	7.29
Electrical Conductivity (Field)	µS/cm	1	38	945	1,746	1,407	1,223	1,426	1,516
pH (Lab)	pH units	0.01	49	7.14	8.03	7.62	7.42	7.61	7.87
Electrical Conductivity (Lab)	µS/cm	1	49	1,090	1,380	1,190	1,140	1,180	1,254
Total Dissolved Solids	mg/L	10	49	650	826	706	662	698	760
Suspended Solids	mg/L	5	47	1	73	7.1	4.5	7.0	34.9
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	49	224	423	284	248	288	301
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	49	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	49	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	49	224	423	284	248	288	301
Chloride	mg/L	1	49	111	192	168	157	169	179
Sulphate as SO ₄	mg/L	1	44	98	167	124	105	119	148
Sodium	mg/L	1	49	73	120	105	99	106	113
Potassium	mg/L	1	49	9	18	14	12	14	17
Calcium	mg/L	1	49	64	118	80	70.8	80.0	88.6
Magnesium	mg/L	1	49	34	51	39	36.0	40.0	42.0
Fluoride	mg/L	0.1	49	0.6	1.2	1.1	1.00	1.10	1.20
Nitrate (as N)	mg/L	0.01	49	0.01	0.19	0.025	0.01	0.02	0.04
Nitrite (as N)	mg/L	0.01	49	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	40	0.19	0.62	0.33	0.26	0.32	0.42
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	40	<0.1	0.65	0.2	0.14	0.19	0.30
Methane	mg/L	0.01	46	0.01	0.072	0.017	0.01	0.03	0.05
Ethane	µg/L	10	46	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	46	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	47	0.001	0.006	0.0013	0.00	0.00	0.01
Barium	mg/L	0.001	47	0.043	0.105	0.06	0.05	0.06	0.08
Boron	mg/L	0.05	47	0.15	0.31	0.22	0.19	0.21	0.24
Cadmium	mg/L	0.0001	47	<LOR	0.0002	0.000053	0.0002	0.0002	0.0002
Chromium (III+VI)	mg/L	0.001	47	0.001	0.001	0.00051	0.0010	0.0010	0.0010
Copper	mg/L	0.001	47	<LOR	0.002	0.00053	0.0020	0.0020	0.0020
Iron	mg/L	0.05	47	<LOR	2.12	0.73	0.32	0.62	1.20
Lead	mg/L	0.001	47	<LOR	0.003	0.00055	0.003	0.003	0.003
Lithium	mg/L	0.001	47	0.036	0.063	0.047	0.04	0.05	0.05
Manganese	mg/L	0.001	47	0.002	0.078	0.035	0.02	0.03	0.06
Mercury	mg/L	0.0001	47	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	47	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	43	9.16	13.40	10.15	9.48	10.00	10.80
Silver	mg/L	0.001	47	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	47	0.512	0.725	0.64	0.59	0.64	0.69
Zinc	mg/L	0.005	47	<LOR	0.135	0.031	0.01	0.03	0.06
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	46	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	46	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	46	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	39	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 4 Kyalla 117 N2 Anthony Lagoon Beds IMB (BET-MB030/RN043873) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH units	0.01	9	6.88	7.20	7.04	6.94	7.04	7.13
Electrical Conductivity (Field)	µS/cm	1	9	1,476	1838.00	1,551	1478.4	1526.0	1615.6
pH (Lab)	pH units	0.01	10	7.24	7.67	7.49	7.31	7.54	7.61
Electrical Conductivity (Lab)	µS/cm	1	10	1,120	1220.00	1,170	1120	1180	1211
Total Dissolved Solids	mg/L	10	13	654	887.00	742.00	683.00	736.00	805.60
Suspended Solids	mg/L	5	13	5	40.00	16.00	6.80	16.50	36.40
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	13	268	299.00	288.00	278.40	291.00	296.00
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	13	268	299.00	288.00	278.40	291.00	296.00
Chloride	mg/L	1	13	149	170.00	163.00	157.20	164.00	168.80
Sulphate as SO ₄	mg/L	1	13	130	194.00	153.00	137.20	142.00	184.20
Sodium	mg/L	1	13	100	117.00	108.00	105.00	106.00	113.80
Potassium	mg/L	1	13	13	19.00	15.00	14.00	14.00	16.00
Calcium	mg/L	1	13	83	98.00	89.00	84.20	88.00	96.00
Magnesium	mg/L	1	13	36	44.00	39.00	37.00	39.00	43.60
Fluoride	mg/L	0.1	13	1.1	1.30	1.20	1.12	1.20	1.20
Nitrate (as N)	mg/L	0.01	13	<LOR	0.02	0.01	0.01	0.01	0.02
Nitrite (as N)	mg/L	0.01	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	11	0.48	1.21	0.76	0.52	0.74	0.98
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	11	0.17	0.63	0.34	0.21	0.32	0.47
Methane	mg/L	0.01	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Ethane	µg/L	10	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	13	0.0033	0.03	0.02	0.01	0.02	0.02
Barium	mg/L	0.001	13	0.05	0.07	0.06	0.05	0.05	0.06
Boron	mg/L	0.05	13	0.197	0.25	0.22	0.20	0.23	0.24
Cadmium	mg/L	0.0001	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.0005 - 0.001	13	<LOR	0.001	0.000	0.001	0.001	0.001
Iron	mg/L	0.05	13	0.24	1.68	0.61	0.30	0.51	0.87
Lead	mg/L	0.001	13	<LOR	0.0005	0.0005	0.0003	0.0004	0.0005
Lithium	mg/L	0.001	10	0.037	0.06	0.05	0.04	0.04	0.05
Manganese	mg/L	0.001	13	0.0139	0.07	0.03	0.02	0.03	0.04
Mercury	mg/L	0.0001	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	9	6.76	10.70	9.31	8.28	9.28	10.62
Silver	mg/L	0.001	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	13	0.671	0.79	0.73	0.69	0.74	0.78
Zinc	mg/L	0.005	13	0.006	0.03	0.02	0.01	0.02	0.02
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	12	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	12	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	12	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 5 Shenandoah S2 Gum Ridge Formation production bore (BET-MB029/RN043872) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH units	0.01	10	6.75	7.12	6.99	6.88	6.99	7.11
Electrical Conductivity (Field)	µS/cm	1	10	1,511	1,543	1,524	1,511.00	1,521.00	1,540.30
pH (Lab)	pH units	0.01	7	7.28	7.61	7.48	7.29	7.54	7.60
Electrical Conductivity (Lab)	µS/cm	1	7	1,130	1,260	1,196	1,160.00	1,200.00	1,236.00
Total Dissolved Solids	mg/L	10	10	683	910	778	717.20	764.00	905.50
Suspended Solids	mg/L	5	10	5	14	3.9	5.90	9.50	13.10
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	10	292	313	304	296.50	305.00	312.10
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	10	<LOR	<LOR	0.5	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	10	<LOR	<LOR	0.5	<LOR	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	10	292	313	304	296.50	305.00	312.10
Chloride	mg/L	1	10	159	176	167	163.50	165.50	172.40
Sulphate as SO ₄	mg/L	1	10	116	156	135	117.80	136.00	150.60
Sodium	mg/L	1	10	103	118	108	104.80	108.00	110.80
Potassium	mg/L	1	10	14	16	15	14.00	15.00	16.00
Calcium	mg/L	1	10	90	101	94	90.90	94.00	99.20
Magnesium	mg/L	1	10	38	46	41	38.00	40.50	45.10
Fluoride	mg/L	0.1	10	1.2	1.4	1.3	1.20	1.30	1.40
Nitrate (as N)	mg/L	0.01	10	<LOR	0.04	0.0088	0.02	0.03	0.04
Nitrite (as N)	mg/L	0.01	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	9	0.74	1.53	1.1	0.80	1.01	1.35
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	9	0.34	0.82	0.47	0.34	0.39	0.63
Methane	mg/L	0.01	8	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Ethane	µg/L	10	8	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	8	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	10	0.002	0.004	0.0028	0.002	0.003	0.003
Barium	mg/L	0.001	10	0.0555	0.07	0.062	0.06	0.06	0.07
Boron	mg/L	0.05	10	0.184	0.24	0.22	0.19	0.22	0.24
Cadmium	mg/L	0.0001	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.001	10	<LOR	0.002	0.00068	0.001	0.001	0.002
Iron	mg/L	0.05	10	<LOR	0.23	0.086	0.04	0.08	0.21
Lead	mg/L	0.001	10	0.0019	0.032	0.013	0.01	0.01	0.02
Lithium	mg/L	0.001	7	0.033	0.045	0.042	0.04	0.04	0.05
Manganese	mg/L	0.001	10	0.019	0.053	0.03	0.02	0.03	0.04
Mercury	mg/L	0.0001	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	10	<LOR	<LOR	0.0037	0.00	0.00	0.00
Silicon as Si	mg/L	0.05	6	8.78	11.50	10.20	9.44	10.20	10.95
Silver	mg/L	0.001	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	10	0.699	0.86	0.79	0.74	0.80	0.86
Zinc	mg/L	0.005	4	0.0003	<0.01	0.0017	0.00	0.00	0.00
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	10	<100	190	64	190.00	190.00	190.00
Sum of BTEX	µg/L	1	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 6 Shenandoah S2 Gum Ridge Formation production bore (BET-MB032/RN043875) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH units	0.01	10	6.81	7.12	6.99	6.87	6.97	7.10
Electrical Conductivity (Field)	µS/cm	1	9	1,479	1,506	1,494.0	1,483.8	1,495.0	1,504.4
pH (Lab)	pH units	0.01	6	7.27	7.64	7.50	7.37	7.51	7.62
Electrical Conductivity (Lab)	µS/cm	1	6	1,100	1,170	1,152.0	1,130.0	1,160.0	1,165.0
Total Dissolved Solids	mg/L	10	9	629	820	723.0	676.2	724.0	767.2
Suspended Solids	mg/L	5	9	5.0	5.0	2.8	5.0	5.0	5.0
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	9	286	308	300.0	295.6	301.0	306.4
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	9	286	308	300.0	295.6	301.0	306.4
Chloride	mg/L	1	9	154.0	179.0	167.0	158.8	165.0	175.8
Sulphate as SO ₄	mg/L	1	9	99.0	143.0	122.0	107.8	125.0	131.0
Sodium	mg/L	1	9	99.0	112.0	103.0	100.6	102.0	108.0
Potassium	mg/L	1	9	13.0	16.0	14.0	13.0	14.0	16.0
Calcium	mg/L	1	9	81.0	97.0	89.0	84.2	89.0	95.4
Magnesium	mg/L	1	9	36.0	42.0	38.0	36.8	38.0	40.4
Fluoride	mg/L	0.1	9	1.10	1.30	1.20	1.18	1.20	1.30
Nitrate (as N)	mg/L	0.01	9	<LOR	0.020	0.007	0.020	0.020	0.020
Nitrite (as N)	mg/L	0.01	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	8	0.730	1.260	0.940	0.779	0.910	1.113
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	8	0.27	0.85	0.46	0.27	0.42	0.64
Methane	mg/L	0.01	7	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Ethane	µg/L	10	7	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	7	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	9	0.0030	0.0057	0.0042	0.0032	0.0040	0.0051
Barium	mg/L	0.001	9	0.057	0.067	0.062	0.058	0.062	0.065
Boron	mg/L	0.05	9	0.190	0.230	0.210	0.192	0.217	0.230
Cadmium	mg/L	0.0001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.001	9	<LOR	0.0010	0.0005	0.0010	0.0010	0.0010
Iron	mg/L	0.05	9	0.174	0.660	0.370	0.187	0.310	0.644
Lead	mg/L	0.001	9	<LOR	0.017	0.006	0.009	0.015	0.017
Lithium	mg/L	0.001	6	0.033	0.046	0.042	0.038	0.043	0.045
Manganese	mg/L	0.001	9	0.008	0.011	0.010	0.009	0.010	0.011
Mercury	mg/L	0.0001	9	<LOR	<LOR	0.0	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	9	<LOR	<LOR	0.0	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	5	10.3	11.9	10.72	10.30	10.50	11.38
Silver	mg/L	0.001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	9	1	1	0.7	0.7	0.8	0.8
Zinc	mg/L	0.005	9	0.016	0.068	0.036	0.018	0.038	0.048
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 7 Shenandoah S2 Gum Ridge Formation production bore (BET-MB033/RN043876) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH units	0.01	10	6.89	7.17	7.07	6.92	7.07	7.17
Electrical Conductivity (Field)	µS/cm	1	10	1,559	1,582	1574.50	1563.50	1574.50	1581.10
pH (Lab)	pH units	0.01	6	7.24	7.58	7.47	7.33	7.47	7.57
Electrical Conductivity (Lab)	µS/cm	1	6	1,140	1,200	1185.00	1155.00	1185.00	1195.00
Total Dissolved Solids	mg/L	10	9	659	904	714.00	669.40	714.00	787.20
Suspended Solids	mg/L	5	9	<LOR	11	2.50	6.30	8.00	10.40
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	9	274	302	297.00	287.60	297.00	299.60
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	9	274	302	297.00	287.60	297.00	299.60
Chloride	mg/L	1	9	164	179	171.00	165.60	171.00	178.20
Sulphate as SO ₄	mg/L	1	9	116	168	137.00	130.40	137.00	148.80
Sodium	mg/L	1	9	101	117	108.00	102.60	108.00	113.80
Potassium	mg/L	1	9	12	16	15.00	12.80	15.00	16.00
Calcium	mg/L	1	9	80	96	91.00	82.40	91.00	95.20
Magnesium	mg/L	1	9	33	42	38.00	34.60	38.00	40.40
Fluoride	mg/L	0.1	9	1.1	1.3	1.20	1.10	1.20	1.22
Nitrate (as N)	mg/L	0.01	9	<LOR	0.01	0.01	0.01	0.01	0.01
Nitrite (as N)	mg/L	0.01	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	8	0.72	1.45	1.10	0.93	1.10	1.41
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	8	<LOR	0.53	0.36	0.29	0.36	0.53
Methane	mg/L	0.01	7	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Ethane	µg/L	10	7	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	7	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	9	0.0016	0.0218	0.00	0.00	0.00	0.01
Barium	mg/L	0.001	9	0.05	0.062	0.06	0.05	0.06	0.06
Boron	mg/L	0.05	9	0.18	0.24	0.23	0.20	0.23	0.23
Cadmium	mg/L	0.0001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Iron	mg/L	0.05	9	0.15	1.72	1.09	0.29	1.09	1.51
Lead	mg/L	0.001	9	0.0001	<0.001	0.00	0.00	0.00	0.00
Lithium	mg/L	0.001	6	0.033	0.046	0.04	0.04	0.04	0.05
Manganese	mg/L	0.001	9	0.0121	0.0451	0.02	0.01	0.02	0.03
Mercury	mg/L	0.0001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	9	0.0002	<0.01	0.01	0.00	0.00	0.00
Silicon as Si	mg/L	0.05	0	10.2	10.9	10.50	10.28	10.50	10.74
Silver	mg/L	0.001	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	9	0.649	0.781	0.76	0.65	0.76	0.78
Zinc	mg/L	0.005	9	0.006	0.016	0.01	0.01	0.01	0.02
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	9	<LOR	10	0.50	10.00	10.00	10.00
Total Reportable PAH	µg/L	0.5	9	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 8 Gum Ridge Formation summary of average values for Shenandoah S2

Analyte	Output unit	EQL	Number of Samples					Average Concentration				
			Kyalla 117 / Shenandoah Sth 2 CMB (BET-MB022 / RN041132)	Shenandoah Sth 2 IMB (BET-MB031 / RN043874)	Shenandoah Sth 2 (BET-MB029 / RN043872)	Shenandoah Sth 2 (BET-MB032 / RN043875)	Shenandoah Sth 2 (BET-MB033 / RN043876)	Shenandoah Sth 2 Gum Ridge Formation CMB (BET-MB022 / RN041132)	Shenandoah Sth 2 Gum Ridge Formation IMB (BET-MB031 / RN043874)	Shenandoah Sth 2 (BET-MB029 / RN043872)	Shenandoah Sth 2 (BET-MB032 / RN043875)	Shenandoah Sth 2 (BET-MB033 / RN043876)
pH (Field)	pH units	0.01	38	10	10	10	10	7.00	6.95	6.99	6.99	7.07
Electrical Conductivity (Field)	µS/cm	1	34	9	10	9	10	1,456	1,527	1,524	1,494	1,575
pH (Lab)	pH units	0.01	36	10	7	6	6	7.56	7.46	7.48	7.50	7.45
Electrical Conductivity (Lab)	µS/cm	1	36	10	7	6	6	1,198	1,189	1,196	1,152	1185
Total Dissolved Solids	mg/L	10	36	11	10	9	9	709	748	778	723	714
Suspended Solids	mg/L	5	35	11	10	9	9	5.7	7.6	3.9	2.8	2.5
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	36	11	10	9	9	307	306	304	300	297
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	36	11	10	9	9	<LOR	<LOR	0.5	<LOR	<LOR
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	36	11	10	9	9	<LOR	<LOR	0.5	<LOR	<LOR
Alkalinity (Total as CaCO ₃)	mg/L	1	36	11	10	9	9	307	306	304	300	297
Chloride	mg/L	1	36	11	10	9	9	163	166	167	167	171
Sulphate as SO ₄	mg/L	1	34	11	10	9	9	122	140	135	122	137
Sodium	mg/L	1	36	11	10	9	9	98	105	108	103	108
Potassium	mg/L	1	36	11	10	9	9	15	14	15	14	15
Calcium	mg/L	1	36	11	10	9	9	88	93	94	89	91
Magnesium	mg/L	1	36	11	10	9	9	38	39	41	38	38
Fluoride	mg/L	0.1	36	11	10	9	9	1.3	1.3	1.3	1.2	1.2
Nitrate (as N)	mg/L	0.01	36	11	10	9	9	0.01	0.02	0.0088	0.007	0.01
Nitrite (as N)	mg/L	0.01	36	11	10	9	9	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	30	10	9	8	8	1.4	1	1.1	0.94	1.1
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	30	10	9	8	8	0.52	0.4	0.47	0.46	0.36
Methane	mg/L	0.01	35	9	8	7	7	0.02	<LOR	<LOR	<LOR	<LOR
Ethane	µg/L	10	35	9	8	7	7	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	35	9	8	7	7	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	35	11	10	9	9	0.003	0.01	0.0028	0.0042	0
Barium	mg/L	0.001	35	11	10	9	9	0.06	0.06	0.062	0.062	0.06
Boron	mg/L	0.05	35	11	10	9	9	0.21	0.23	0.22	0.21	0.23
Cadmium	mg/L	0.0001	35	11	10	9	9	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	35	11	10	9	9	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.005 - 0.00	35	11	10	9	9	<LOR	<LOR	0.00068	0.0005	<LOR
Iron	mg/L	0.05	35	11	10	9	9	2	0.55	0.086	0.37	1.09
Lead	mg/L	0.001	35	11	10	9	9	<LOR	0	0.013	0.006	0
Lithium	mg/L	0.001	35	10	7	6	6	0.04	0.04	0.042	0.042	0.04
Manganese	mg/L	0.001	35	11	10	9	9	0.03	0.01	0.03	0.01	0.02
Mercury	mg/L	0.0001	35	11	10	9	9	<LOR	<LOR	<LOR	0	<LOR
Selenium	mg/L	0.01	35	11	10	9	9	<LOR	<LOR	0.0037	0	0.01
Silicon as Si	mg/L	0.05	33	9	6	5	0	10.19	10.51	10.2	10.72	10.5
Silver	mg/L	0.001	35	11	10	9	9	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	35	11	10	9	9	0.75	0.79	0.79	0.7	0.76
Zinc	mg/L	0.005	35	11	4	9	9	0.01	0.17	0.0017	0.036	0.01
TRH C ₆ -C ₁₀ fraction (sum)	µg/L	20	35	10	10	9	9	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C ₁₀ -C ₄₀ fraction (sum)	µg/L	100	35	10	10	9	9	54	<LOR	64	<LOR	<LOR
Sum of BTEX	µg/L	1	35	10	10	9	9	<LOR	<LOR	<LOR	<LOR	0.5
Total Reportable PAH	µg/L	0.5	29	9	10	9	9	<LOR	<LOR	<LOR	<LOR	<LOR

Table 9 Shenandoah S2 vs Kyalla 117 N2 Statistical Assessment for the Gum Ridge Formation

Analyte	Output unit	EQL	Sample size		Average Concentration		Statistics	
			Gum Ridge Formation CMB (BET-MB022)	Gum Ridge Formation IMB (BET-MB031)	Gum Ridge Formation CMB (BET-MB022)	Gum Ridge Formation IMB (BET-MB031)	F-Test Statistic	T-Test - P-value
pH (Field)	pH Units	0.1	38	10	7.00	7.00	2.22	0.216
Electrical Conductivity (Field)	µS/cm	1	34	9	1,456	1,527.0	114.32	0.005
pH (Lab)	pH Units	0.01	36	10	7.60	7.50	1.19	0.021
Electrical Conductivity (Lab)	µS/cm	1	36	10	1,198	1,189.0	1.55	0.296
Total Dissolved Solids	mg/L	10	36	11	709.0	748.0	1.83	0.009
Suspended Solids	mg/L	5	35	11	5.70	7.60	2.10	0.008
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	36	11	307.0	306.0	31.17	0.452
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	36	11	<LOR	<LOR	-	-
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	36	11	<LOR	<LOR	-	-
Alkalinity (Total as CaCO ₃)	mg/L	1	36	11	307.00	306.0	31.17	0.452
Chloride	mg/L	1	36	11	163.0	166.0	2210.79	0.116
Sulphate as SO ₄	mg/L	1	34	11	122.0	140.0	1.03	0.002
Sodium	mg/L	1	36	11	98.0	105.0	1.03	0.0002
Potassium	mg/L	1	36	11	15.0	14.0	1.76	0.007
Calcium	mg/L	1	36	11	88.0	93.0	2.50	0.026
Magnesium	mg/L	1	36	11	38.0	39.0	1.87	0.114
Fluoride	mg/L	0.1	36	11	1.30	1.30	2.85	0.006
Nitrate (as N)	mg/L	0.01	36	11	0.011	0.020	2.57	0.186
Nitrite (as N)	mg/L	0.01	36	11	<LOR	<LOR	-	-
Gross alpha activity	Bq/L	0.05	30	10	1.40	1.000	1.00	0.004
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	30	10	0.52	0.400	1.18	0.017
Methane	mg/L	0.01	35	9	0.021	<LOR	-	-
Ethane	µg/L	10	35	9	<LOR	<LOR	-	-
Propane	mg/L	0.01	35	9	<LOR	<LOR	-	-
Arsenic	mg/L	0.001	35	11	0.0032	0.011	4.38	0.000001
Barium	mg/L	0.001	35	11	0.059	0.06	2.52	0.224
Boron	mg/L	0.05	35	11	0.21	0.23	1.33	0.030
Cadmium	mg/L	0.0001	35	11	<LOR	<LOR	-	-
Chromium (III+VI)	mg/L	0.001	35	11	<LOR	<LOR	-	-
Copper	mg/L	0.001	35	11	0.00054	<LOR	-	-
Iron	mg/L	0.05	35	11	2.00	0.55	15.39	0.00000001
Lead	mg/L	0.001	35	11	<LOR	0.002	-	-
Lithium	mg/L	0.001	35	10	0.042	0.043	1.04	0.291
Manganese	mg/L	0.001	35	11	0.031	0.013	17.82	0.0000000003
Mercury	mg/L	0.0001	35	11	<LOR	<LOR	-	-
Selenium	mg/L	0.01	35	11	<LOR	<LOR	-	-
Silicon as Si	mg/L	0.05	33	9	10.19	10.51	1.97	0.077
Silver	mg/L	0.001	35	11	<LOR	<LOR	-	-
Strontium	mg/L	0.001	35	11	0.75	0.790	1.13	0.030
Zinc	mg/L	0.005	35	11	0.0069	0.170	21.96	0.027
TRH C ₆ - C ₁₀ fraction (Sum)	µg/L	20	35	10	<LOR	<LOR	-	-
TRH C ₁₀ - C ₄₀ fraction (Sum)	µg/L	100	35	10	<LOR	<LOR	-	-
Sum of BTEX	µg/L	1	35	10	<LOR	<LOR	-	-
Total Reportable PAH	µg/L	0.5	29	9	<LOR	<LOR	-	-

Table 10 Shenandoah South 2 vs Kyalla 117 N2 Statistical Assessment for Gum Ridge Formation

Analyte	Output unit	EQL	Sample size		Average Concentration		Statistics
			Anthony Lagoon Beds CMB (BFT-MB021)	Anthony Lagoon Beds IMB (BFT-MB030)	Anthony Lagoon Beds CMB (BFT-MB021)	Anthony Lagoon Beds IMB (BFT-MB030)	T-Test - P-value
pH (Field)	pH Units	0.1	53	9	7.10	7.00	0.032
Electrical Conductivity (Field)	µS/cm	1	38	9	1,407	1,551	0.004
pH (Lab)	pH Units	0.01	49	10	7.6	7.50	0.024
Electrical Conductivity (Lab)	µS/cm	1	49	10	1,190	1,170	0.150
Total Dissolved Solids	mg/L	10	49	13	706	742.00	0.307
Suspended Solids	mg/L	5	47	13	7.1	16.0	0.222
Alkalinity (Bicarbonate as CaCO ₃)	mg/L	1	49	13	284	288	0.1234
Alkalinity (Carbonate as CaCO ₃)	mg/L	1	49	13	<LOR	<LOR	-
Alkalinity (Hydroxide as CaCO ₃)	mg/L	1	49	13	<LOR	<LOR	-
Alkalinity (Total as CaCO ₃)	mg/L	1	49	13	284	288	0.123
Chloride	mg/L	1	49	13	168	163	0.029
Sulphate as SO ₄	mg/L	1	44	13	124	153	0.016
Sodium	mg/L	1	49	13	105	108	0.1648650191
Potassium	mg/L	1	49	13	14	15	0.090
Calcium	mg/L	1	49	13	80	89	0.337
Magnesium	mg/L	1	49	13	39	39	0.032
Fluoride	mg/L	0.1	49	13	1.1	1.2	0.059
Nitrate (as N)	mg/L	0.01	49	13	0.025	0.01	0.107
Nitrite (as N)	mg/L	0.01	49	13	<LOR	<LOR	-
Gross alpha activity	Bq/L	0.05	40	11	0.33	0.76	0.026
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	40	11	0.2	0.34	0.016
Methane	mg/L	0.01	46	9	0.017	<LOR	-
Ethane	µg/L	10	46	9	<LOR	<LOR	-
Propane	mg/L	0.01	46	9	<LOR	<LOR	-
Arsenic	mg/L	0.001	47	13	0.0013	0.02	0.079
Barium	mg/L	0.001	47	13	0.060	0.056	0.082
Boron	mg/L	0.05	47	13	0.22	0.22	0.080
Cadmium	mg/L	0.0001	47	13	0.000053	<LOR	-
Chromium (III+VI)	mg/L	0.001	47	13	0.00051	<LOR	-
Copper	mg/L	0.001	47	13	0.00053	0.00048	-
Iron	mg/L	0.05	47	13	0.73	0.61	0.037
Lead	mg/L	0.001	47	13	0.00055	0.00045	-
Lithium	mg/L	0.001	47	10	0.047	0.045	0.012
Manganese	mg/L	0.001	47	13	0.035	0.030	0.018
Mercury	mg/L	0.0001	47	13	<LOR	<LOR	-
Selenium	mg/L	0.01	47	13	<LOR	<LOR	-
Silicon as Si	mg/L	0.05	43	9	10.148	9.314	0.009
Silver	mg/L	0.001	47	13	<LOR	<LOR	-
Strontium	mg/L	0.001	47	13	0.64	0.73	0.012
Zinc	mg/L	0.005	47	13	0.031	0.016	0.08
TRH C ₆ - C ₁₀ fraction (Sum)	µg/L	20	46	12	<LOR	<LOR	-
TRH C ₁₀ - C ₄₀ fraction (Sum)	µg/L	100	46	12	<LOR	<LOR	-
Sum of BTEX	µg/L	1	46	12	<LOR	<LOR	-
Total Reportable PAH	µg/L	0.5	39	11	<LOR	<LOR	-

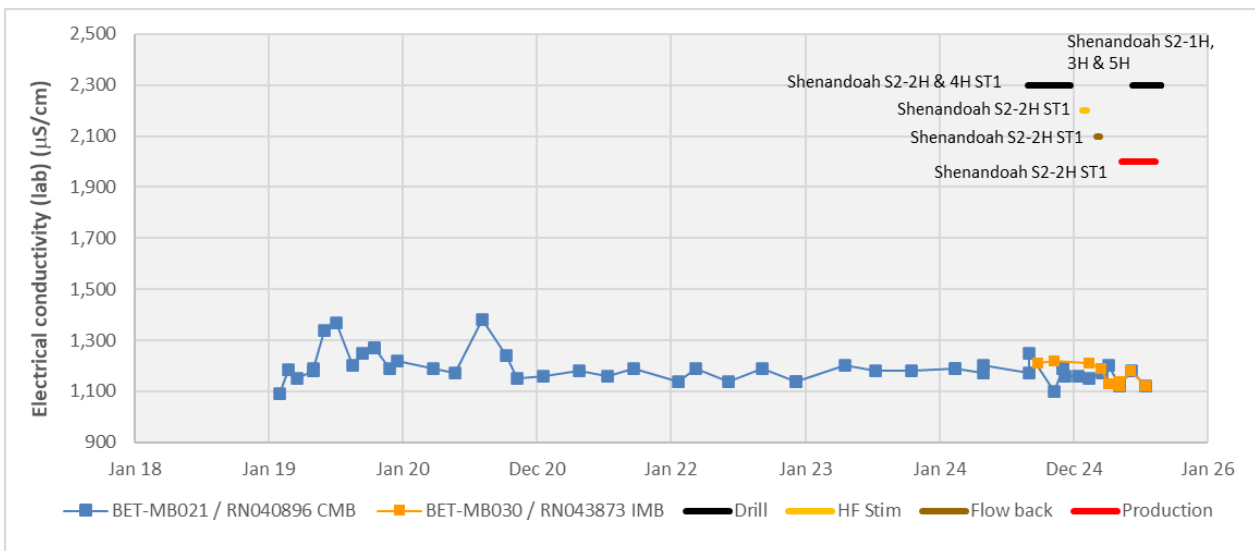
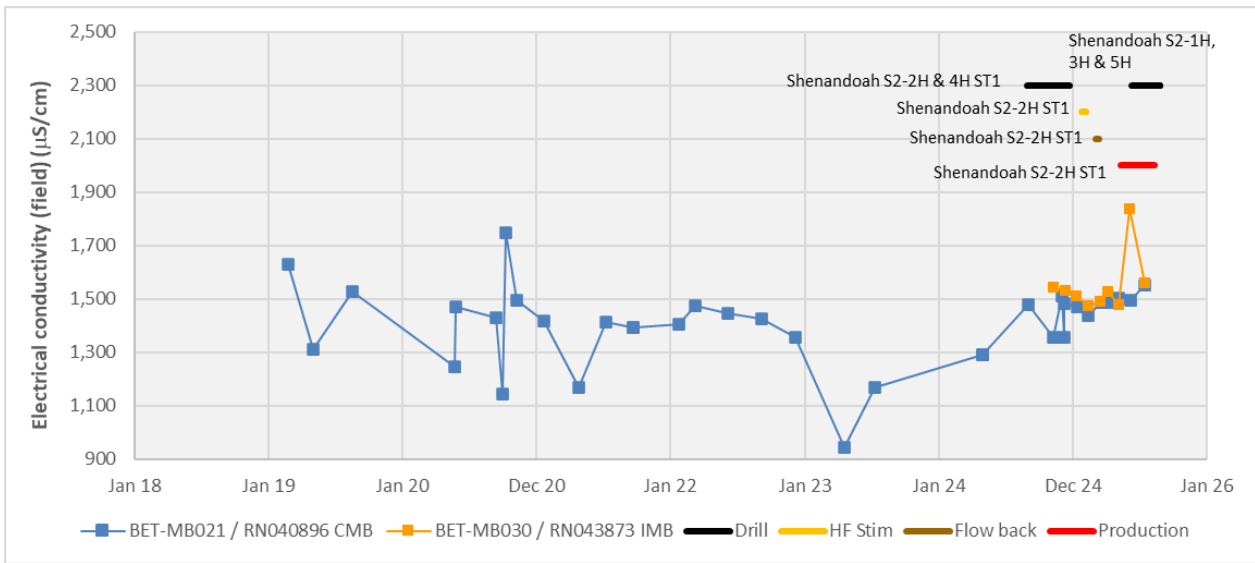
Table 11 Description of water quality trends for the Gum Ridge Formation for those analytes where there is a statistically significant difference between the CMB and IMB

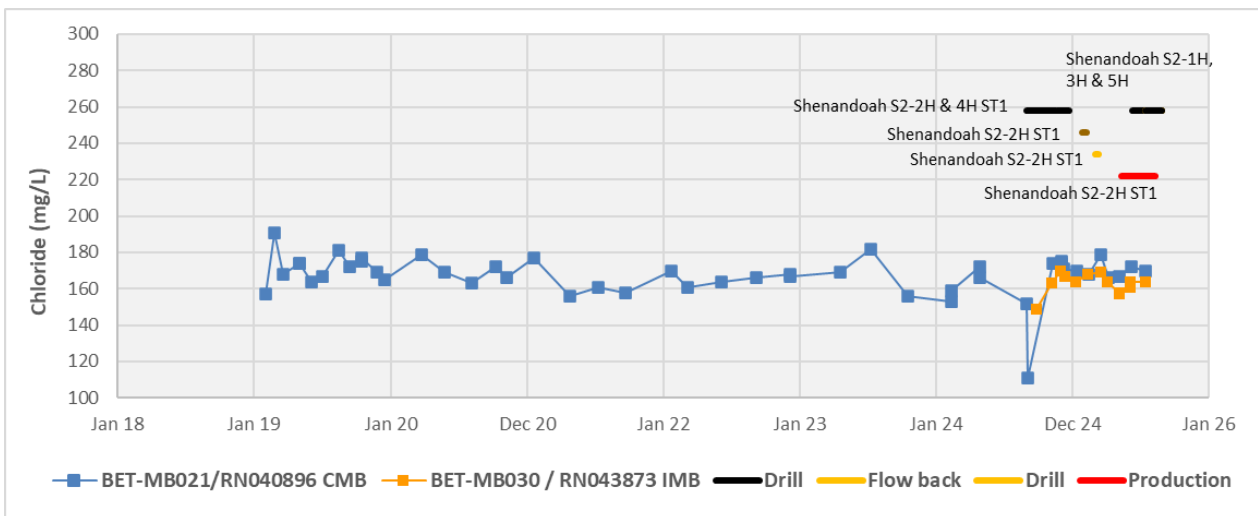
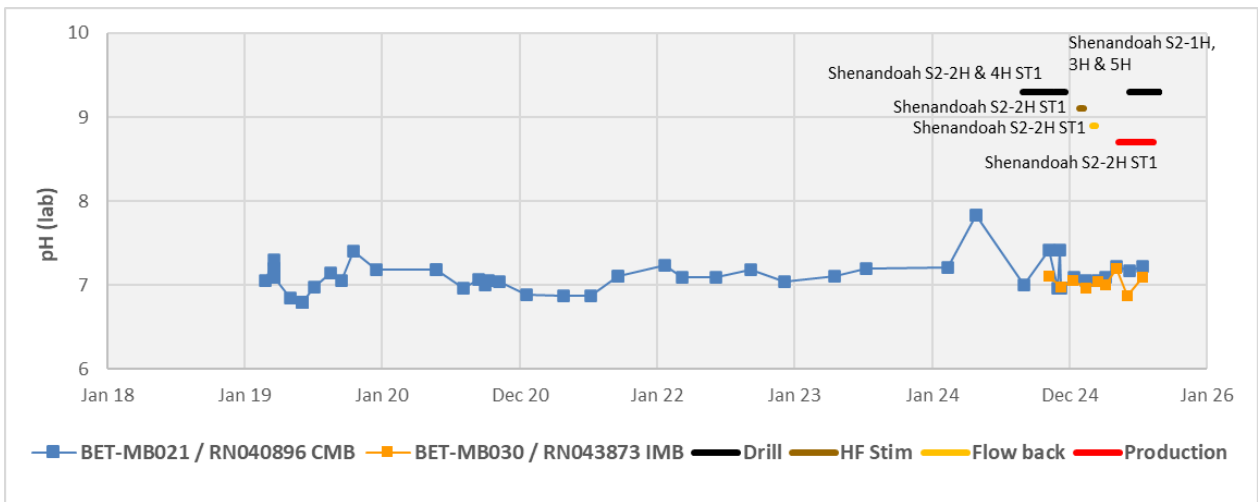
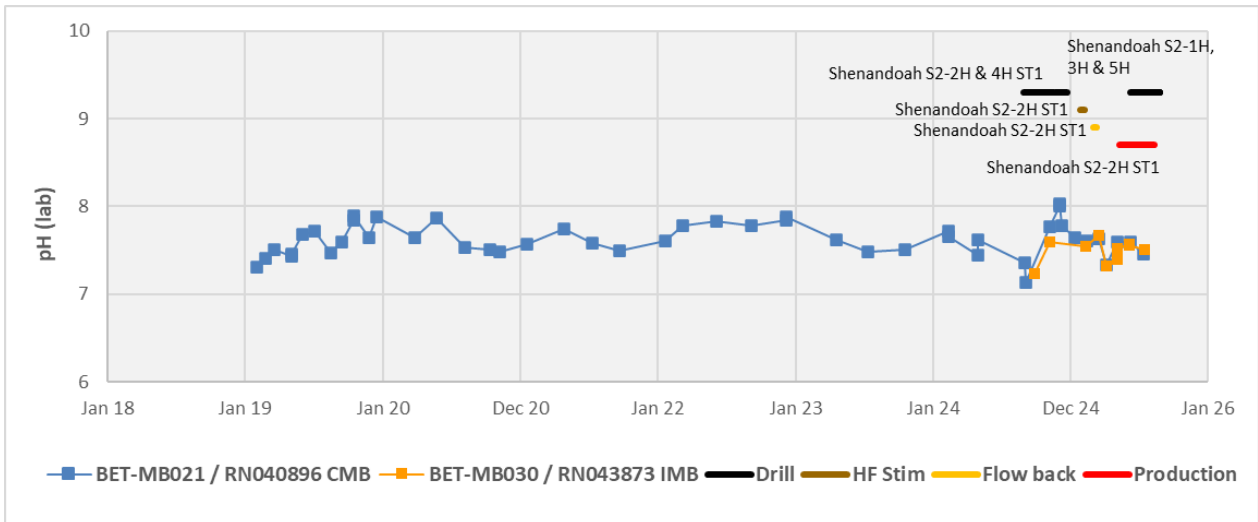
Analyte	Monitoring bore with highest reported concentration	Description of concentrations/trends
		Gum Ridge Formation
Electrical conductivity (field)	CMB	There have been some minor fluctuations in concentrations with the IMB and CMB tending to move in concert therefore most likely related to, or changes in overall concentrations. Overall, the data for the CMB is noisy, however recent values have largely been closely correlating with the IMB. However, the most recent IMB field EC value of 1,445 $\mu\text{S}/\text{cm}$ shows a declining value, at variance with the most recent slightly upward trend in the CMB. The laboratory determined EC in contrast is far less temporally variable, probably reflecting the identical 25 degree C sample temperature. The lab EC shows close correlation between the CMB & IMB values with there being a possible long-term slow decline in overall salinity with recharge to the system.
pH (lab)	CMB	Apart from an initial slightly low pH outlier in the IMB, subsequent lab pH values have been similar and temporally correlated. Lab pH values are greater than field pH values due to both lower temperature of observation and the likely exsolution of dissolved carbon dioxide. The field pH data largely shows a relatively close correlation between the CMB and IMB data since September 2024. The field pH data for the IMB has a high value outlier of 7.81 in April 2024 the reason for which is unclear, possibly an instrument issue.
Total dissolved solids	CMB	There have been some minor fluctuations in concentrations with the IMB and CMB tending to largely move in concert therefore most likely related to changes in overall concentrations. No real trend evident.
Bicarbonate alkalinity (also total alkalinity)	CMB	The IMB concentration is generally marginally greater than the CMB. The CMB & IMB concentrations anomalously increased in March 2022, after production ended, but reduced to follow pre-existing concentrations. Some minor fluctuation in concentrations with the IMB and CMB tending to move in concert therefore most likely related to analytical techniques or natural variability. No real trends or changes in overall concentrations other than the bicarbonate alkalinity in both the Gum Ridge Formation CMB and IMB are now close to equal and very strongly correlated,
Total suspended solids	CMB	The IMB concentration is generally greater than the CMB over the record excepting the most recent slightly elevated IMB values which may well reflect corroded casing materials dislodged through pumping. There are no long-term trends evident.
Sulphate	IMB	Overall, a marginally declining sulphate concentration is evident in CMB. The IMB has shown some slightly elevated sulphate probably reflecting oxidization of trace pyrite the presence of which was noted during drilling. Recently the IMB generally has a slightly higher concentration to 187 mg/L and the reason for this is not obvious.
Sodium	IMB	The IMB concentration is generally greater than IMB. Both CMB and IMB sodium concentrations show some temporal variability however there appears to be some correlation. The reason for an IMB high outlier of 117 mg/L in January 2025 is not obvious. Results in the IMB would be expected to be greater than the CMB if the main contribution was from the E&A wells. No real trends or changes in overall concentrations are evident.
Potassium	CMB	The IMB potassium values are generally less than the CMB values. There is some temporal variation in both the potassium values in the CMB and IMB, but there are no long-term trends evident.
Calcium	IMB	The CMB calcium values are generally less than the IMB values excepting the early record CMB values. There is some temporal variation in both the calcium values in the CMB and IMB, but there are no long-term trends evident.
Fluoride	CMB	The CMB fluoride values are generally greater than the IMB values. There is some minor temporal variation in both the fluoride values in the CMB and IMB, but there are no long-term trends evident.
Gross alpha activity	CMB	Gross alpha activity data for both the CMB and IMB show temporal variability with reasonable correlation in the temporal pattern of variability.
Gross beta activity less ^{40}K	CMB	The CMB gross beta activity less potassium-40 is generally greater than for the IMB. Gross beta activity less potassium-40, data for both the CMB and IMB show temporal variability with improving correlation in the temporal pattern of variability with time.
Methane	CMB	It is of some note that although the CMB has show temporally variable low-level methane detects to 0.05 mg/L, there have been no methane detects in the IMB so far.
Arsenic	IMB	Arsenic values in the IMB are much higher than those recorded in the CMB. However, the arsenic in the IMB which peaked at 0.017 mg/L in November 2024 has shown a variable but overall declining trend since with the most recent value being 0.008 mg/L. The initially elevated arsenic values in the early time data for both bores may potentially reflect the impact of drilling the monitoring bores with the increase in oxygen potentially liberating arsenic initially bound to aquifer materials.
Boron	IMB	Both the CMB and IMB data show temporally variable but largely similar boron concentrations. The most recent IMB boron value 0.3 mg/L represents a high outlier for which there is no obvious cause. No real long-term trends are evident.
Iron	CMB	Iron concentrations in the CMB have shown considerable temporal variability with no obvious overall trend. The CMB iron levels are generally well above those of the IMB, although it is possible that there is a rising tend in IMB iron levels, albeit from a very low level, which might be associated with pyrite oxidation due to the introduction of oxygen during drilling of the monitoring bore.
Manganese	CMB	Manganese concentrations in the CMB have shown considerable temporal variability with no obvious overall trend other than a rapid decline immediately after initial sampling. The CMB manganese levels are generally well above those of the IMB. The IMB manganese concentrations also declined after the initial sample, again albeit from a very low level,
Strontium	CMB	Strontium concentrations in both the CMB and IMB show some temporal fluctuations although they are relatively similar in concentration. No long-term trends are obvious.
Zinc	IMB	The zinc values in the IMB are generally higher than in the CMB. The zinc concentrations in the CMB declined quickly after sampling commenced and subsequent data has been slightly temporally variant with no trend. In contrast the zinc concentrations in the IMB have declined sharply since initial sampling and although higher than the CMB value they appear to be trending towards similar, low levels. The reason for this is not obvious, however again oxidization of sulphides in the aquifer due to oxygen introduced during may be responsible.

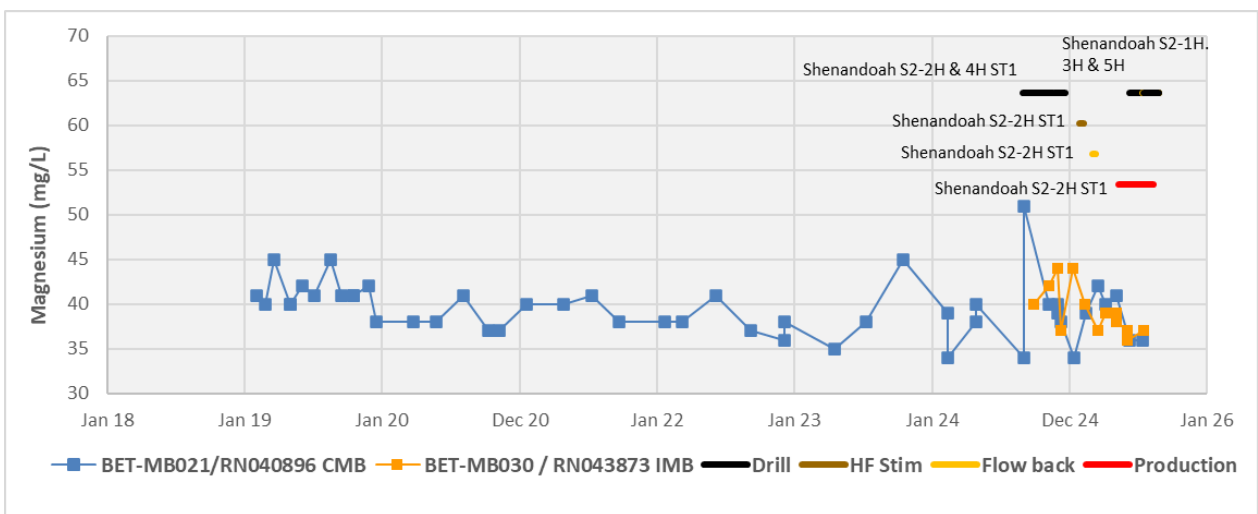
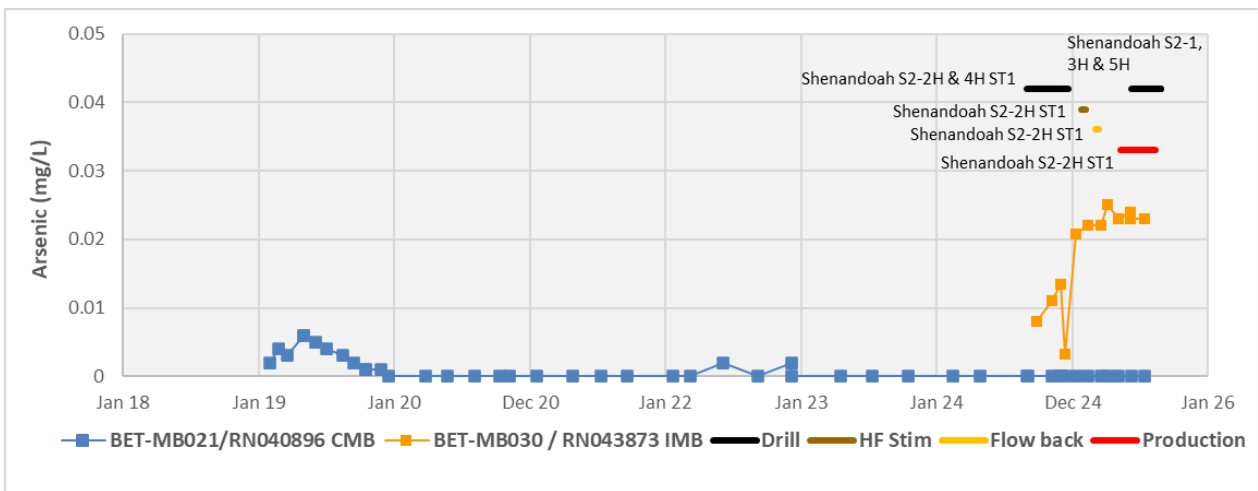
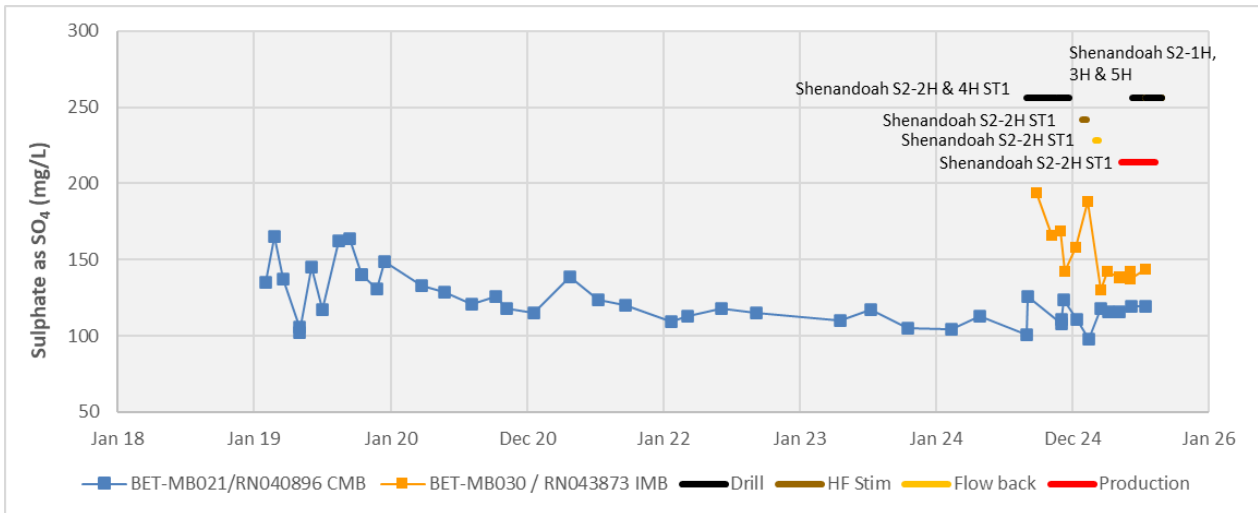
Table 12 Description of water quality trends for the Anthony Lagoon Beds for those analytes where there is a statistically significant difference between the CMB and IMB

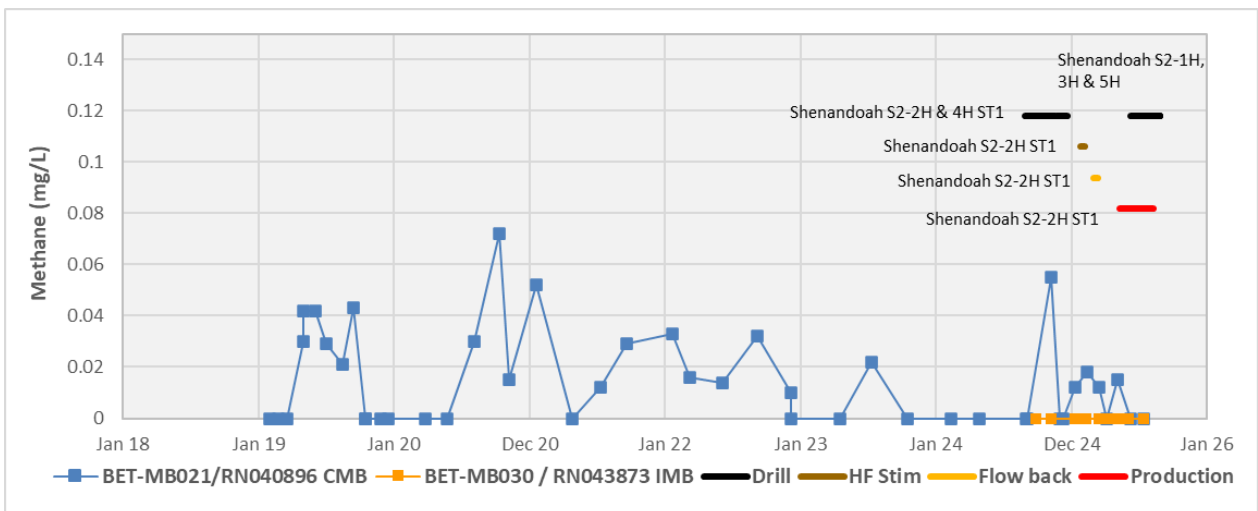
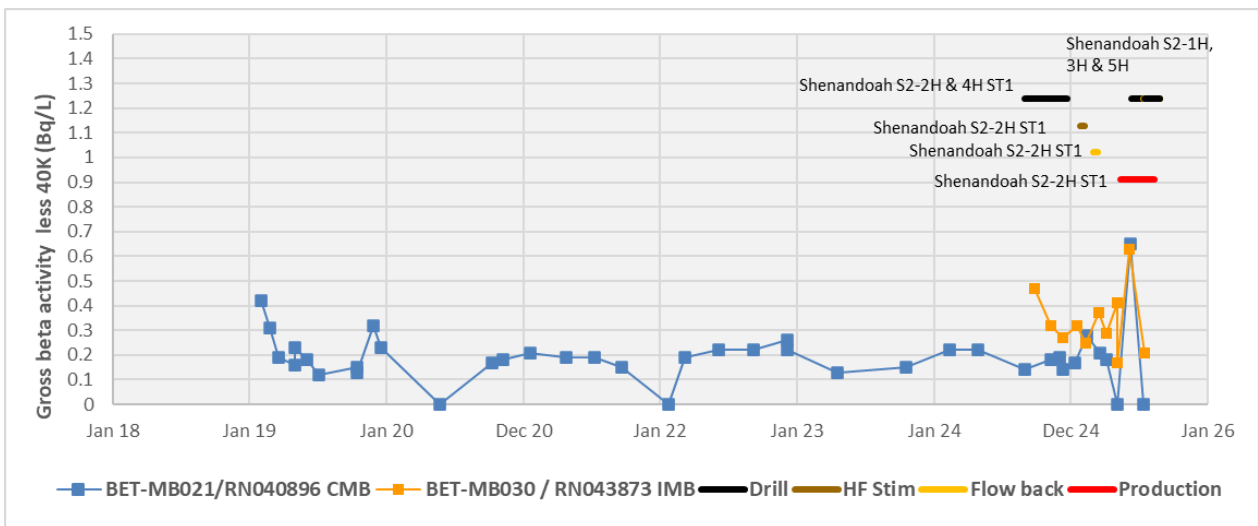
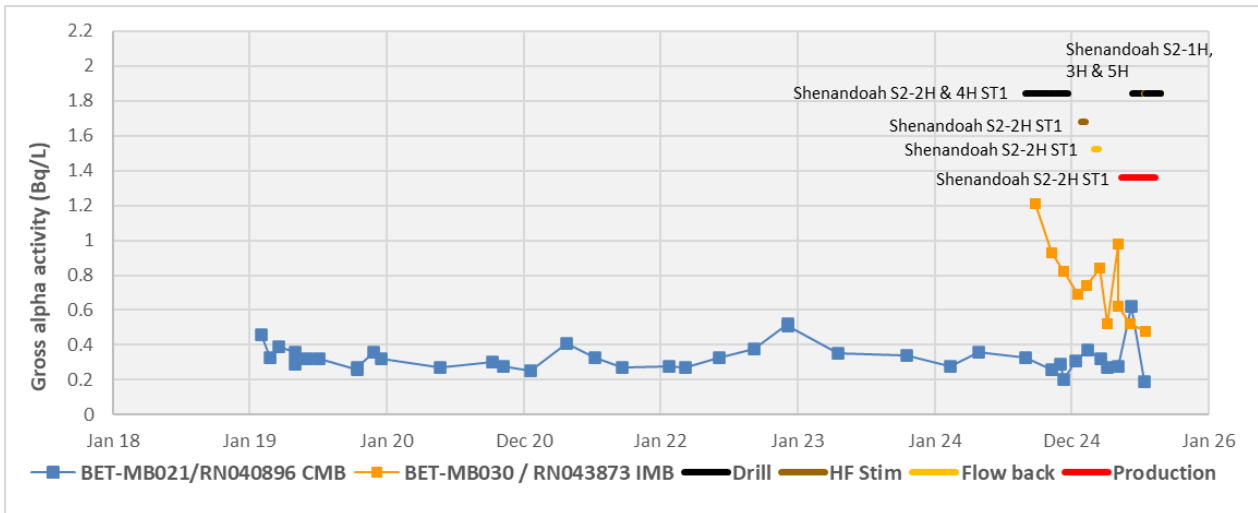
Analyte	Monitoring bore with highest reported concentration	Description of concentrations/trends
		Anthony Lagoon Beds
Electrical conductivity (field)	IMB	Historically the field EC values for the CMB have shown significant temporal variability. Since the commencement of IMB monitoring the field EC values have been temporally similar, excepting a single high IMB outlier of 1,838 microsiemens/cm which was not repeated and probably reflects an instrument error. The lab electrical conductivity data is not influenced by sample temperature and is far more consistent with a possible slightly declining trend in the CMB data which may reflect recharge.
pH (lab)	CMB	The lab pH data shows reasonable correlation between the CMB and IMB with the exception of early December 2024 with a CMB high outlier of 8 pH units. The field data for this period is slightly elevated also. The field data has a marked IMB high outlier of 7.83 in April 2024 and these outliers would be the reason for the T test flag. Overall, there appears to be no trend in pH data.
Chloride	CMB	In general, the CMB chloride data is slightly higher than the IMB data. The CMB long-term data shows moderate temporal variability with one marked low value outlier (111 mg/L in September 2024). The reason for the T test flag is most likely this outlier and there appears to be no real chloride trends evident in the data for either bore.
Sulphate	IMB	Overall, a temporally variable but declining sulphate concentration is evident in CMB. The IMB has shown elevated sulphate (to 194 mg/L in September 2024) probably reflecting oxidization of trace pyrite the presence of which was noted during drilling. The sulphate in the IMB has subsequently declined in recent time data but is still above concentrations in the CMB.
Magnesium	CMB	There is a significant CMB high outlier value of 51 mg/L in September 2024 and it is this value that is probably responsible for the T test flag. This data point may be an incorrectly attributed field duplicate sample, and the value is likely to be spurious. The low values in the CMB data seem to show declining values with time, possibly reflecting dilution from recharge. The IMB values show some temporal variation but a possible declining trend.
Gross alpha activity	IMB	The IMB gross alpha activity values are nearly always above the CMB values. IMB gross alpha activity values peaked at 1.21 Bq/L in the first sample and then generally declined thereafter, albeit to generally higher values than the CMB. It is possible that this reflects impact of temporary cross connection between the Gum Ridge IMB and adjacent Anthony Lagoon Beds bore, before a workover could be undertaken to isolate the Gum Ridge Formation out of the IMB.
Gross beta activity less ⁴⁰ K	IMB	The IMB gross beta activity less 40K values are generally above the CMB values. There is a CMB high outlier of 0.65 Bq/L in June 2025 with sharply lower values immediately bore and after this outlier. Similarly there is a sharp IMB high outlier for that same round, again with sharply lower values immediately bore and after this outlier. These two high outliers are likely laboratory instrument error. There appears to be no long-term trend in the CMB data set, however again overall declining IMB concentrations likely reflect impact of temporary cross connection between the Gum Ridge IMB and adjacent Anthony Lagoon Beds bore before a workover could be undertaken to isolate the Gum Ridge Formation out of the IMB.
Methane	CMB	It is of some note that although the CMB has experienced temporally variable, but low level methane detects to 0.072 mg/L, to date the IMB has not detected methane above the limit of reporting.
Arsenic	CMB	The long-term CMB data has shown an initial rise to a peak of 0.006 mg/L in May 2019 and a generally long slow decline thereafter. This is probably attributable to liberation of arsenic from aquifer materials in response to oxygen introduced during water bore construction.
Iron	IMB	Generally, the iron levels in the IMB are greater than those in the CMB. Iron values rose in the IMB from 1.06 mg/L in August 2020 to a peak of 3.92 mg/L in April 2021. This was not reflected in the CMB data but does not seem to correlate with site E&A drilling, stimulation or production activities. There appears to be no consistent trend in either the CMB or IMB iron data.
Lithium	CMB	The long-term CMB lithium data show somewhat temporally variable data, but a likely long-term slightly declining trend. This might reflect dilution associated with recharge to the Anthony Lagoon Beds. The initial sample from the IMB is a high outlier (a possible cause of the T test flag) and this might reflect the impact of water bore construction and work over. Otherwise, the CMB and IMB reflect similar lithium values.
Manganese	CMB	The long-term CMB data is temporally variable. There is a significant CMB low outlier value of 0.002 mg/L in September 2024. This data point may be an incorrectly attributed field duplicate sample, and the value is likely to be spurious. The initial sample from the IMB was a high outlier of 0.069 mg/L with manganese levels declining sharply thereafter again this might reflect the impact of water bore construction and work over.
Silicon	CMB	There is a significant CMB high outlier value of 13.4 mg/L in September 2024. This data point may be an incorrectly attributed field duplicate sample, and the value is likely to be spurious. There is a significant IMB low outlier of 6.76 mg/L in late September 2024 which is likely to be spurious (perhaps a laboratory error). These matters aside, the long-term CMB data shows moderate temporal variability with no real trend. Aside from the low outlier in the IMB data, the IMB data shows moderate correlation with the CMB data, albeit that it has slightly lower concentration.
Zinc	IMB	The long-term CMB strontium data shows some temporal variability but no obvious long-term trend. The IMB strontium data is temporally variable and generally slightly higher than the CMB data. There is no evidence of adverse impacts from E&A activities.

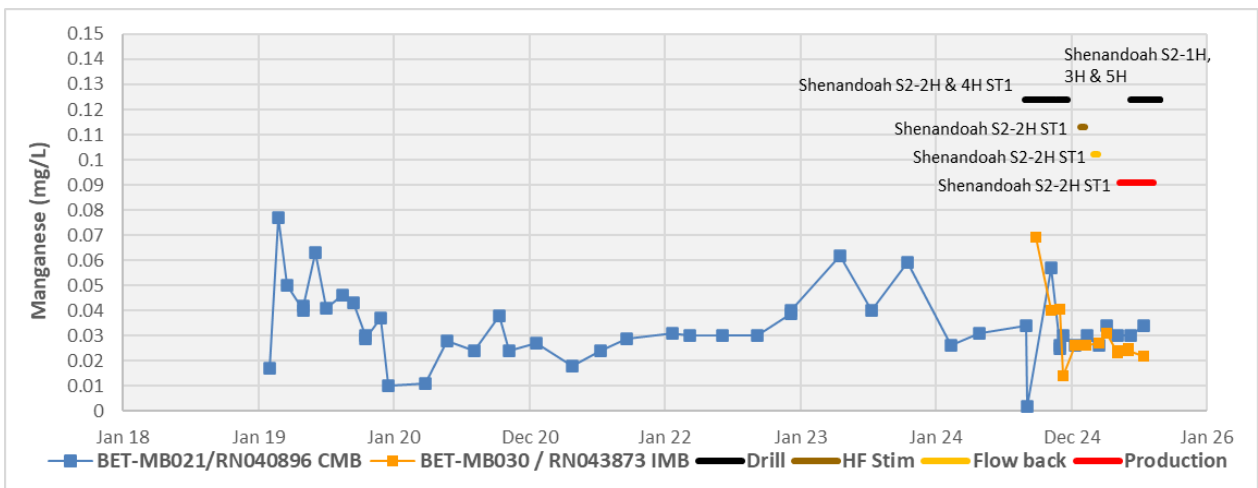
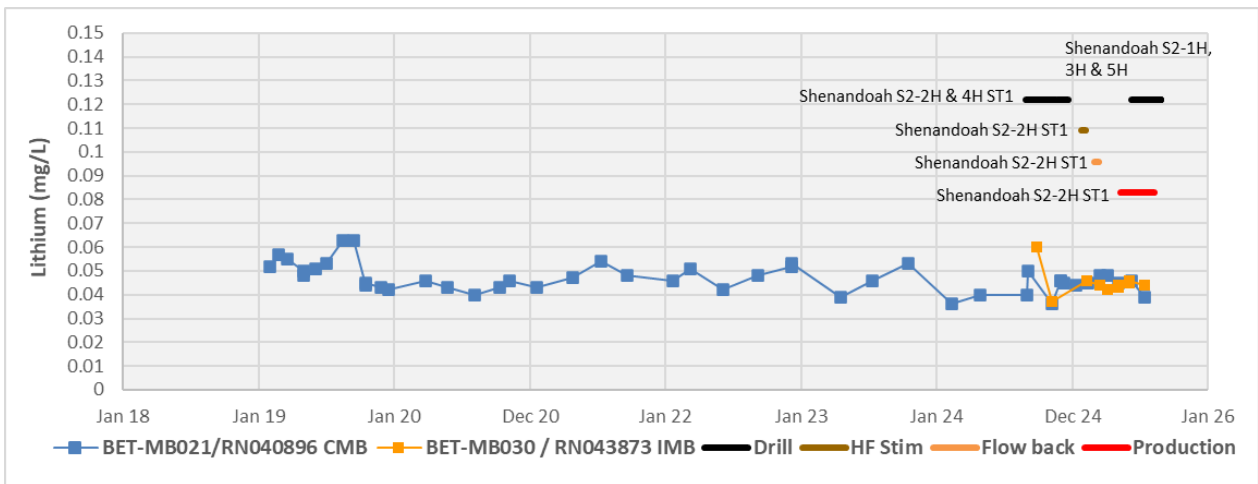
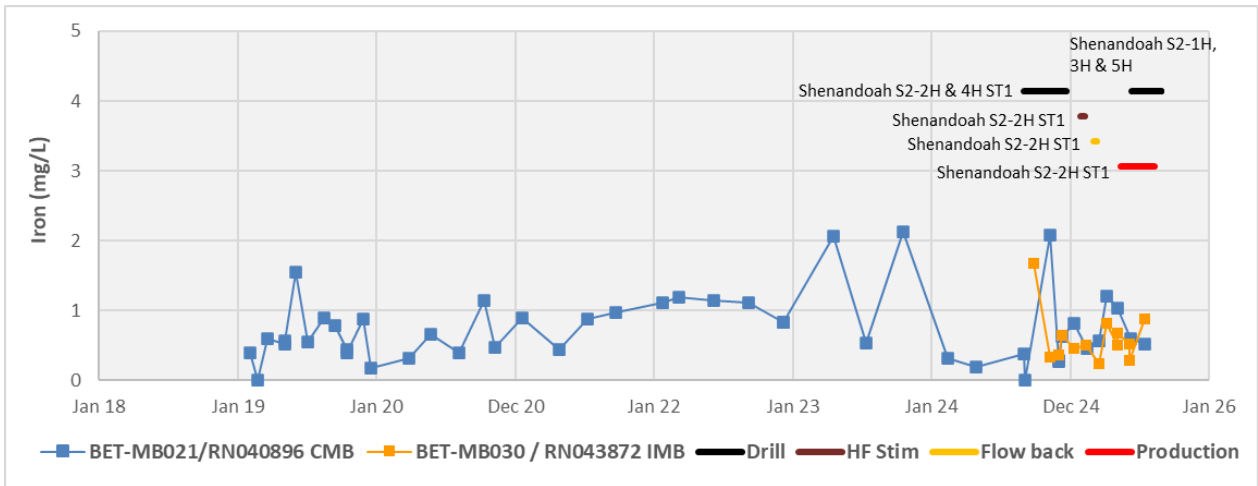
Attachment A - Timeseries chemistry charts – Gum Ridge Formation

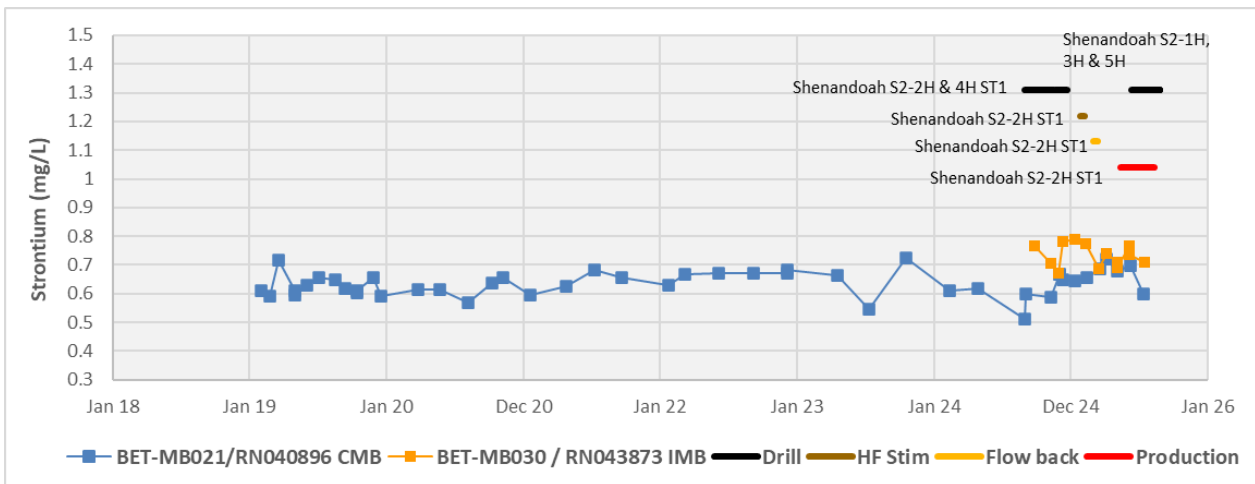
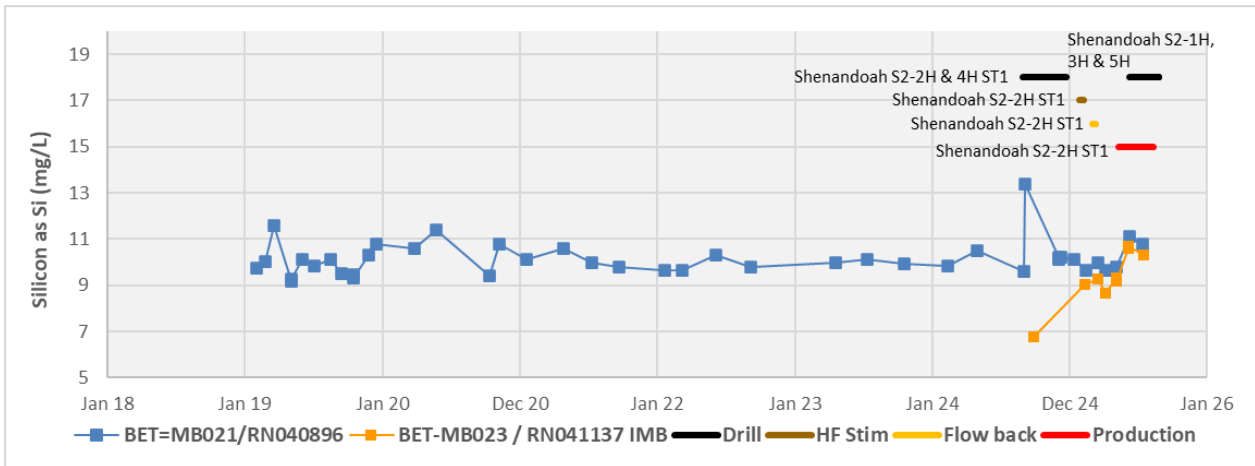












Attachment B - Timeseries chemistry charts – Anthony Lagoon Beds

