25 August 2025

Ms Sally Strohmayr
Acting Executive Director
Environmental Regulation
Department of Lands, Planning and Environment
PO Box 3675
Darwin NT 0801
E: onshoregas.dlpe@nt.gov.au

Dear Ms Strohmayr

Re: Annual Interpretative Groundwater Quality Report - Beetaloo Basin Shenandoah South E&A Program EMP, EP98 and EP117 TAM1-3 (the EMP) for Kyalla 117 N2 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).

Activities involving drilling and hydraulic fracturing (and all other activities where groundwater monitoring is required) is restricted to the following sites:

- Kyalla 117 N2 well site:
    - Kyalla 117 N2-1 wells - Drilling of the Kyalla 117 N2-1 well commenced on the 8 October 2019 and was completed on 28 November 2019. Two side tracked horizontal wells were also drilled over the period of 30 November 2019 through 13 February 2020.
    - Hydraulic fracture stimulation (frac) of the horizontal well started on 2 September 2020 and ended on 2 October 2020. A period of production testing ran from 14 September 2021 to 3 October 2021.
    - Shenandoah S-1H well - Drilling of the Shenandoah S -1H well commenced on the 01 August 2023 and was completed on 23 September 2023. Hydraulic fracture stimulation of the horizontal well started on 9 November 2023 and ended on 5 December 2023. A period of production testing ran from 25 January 2024 to 24 April 2024.

Site layout and groundwater flow direction

Kyalla 117 N2 well site

Figure 1 presents the layout of the Kyalla 117 N2 well site, showing the locations of the Kyalla 117 N2-1H and Shenandoah S-1H appraisal wells and the locations of the control monitoring bores (CMB – ALB: RN040896; GRF: RN041132) and the impact monitoring bores (IMB - ALB: RN041137; GRF: RN041136).

The indicative groundwater flow direction, based on the SREBA (DEPWS, 2022) is from the southwest to the northeast in the vicinity of the Kyalla 117 N2 well site (Figure 1).

The CMBs are between 75 m and 85 m to the southeast of Kyalla 117 N2 wellhead and the IMBs are between 19 m and 22 m to the northwest of the wellhead. The CMBs and IMBs are up hydraulic gradient and down hydraulic gradient of the wellhead 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 Kyalla 117 N2 site layout and indicative groundwater flow direction

Water level trends

Kyalla 117 N2 well site

Continuous water level monitoring using InSitu® LevelTroll automatic water level sensors commenced at the site prior the start of activities. Figure 2 presents daily averaged barometrically corrected time series water level data the Anthony Lagoon Beds (ALB) (blue lines) and the Gum Ridge Formation (GRF) (orange/red lines). Figure 3 presents high resolution data (including 4-minute monitoring) since 2019. The periods of activities at the well site are also shown on Figure 3.

The data shows:

- There was no significant change in the water levels from before to after the exploration activities at Kyalla 117 N2.
- 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 show a marginal 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 change to the water levels in either the Anthony Lagoon Beds or the Gum Ridge Formation due to the regulated activities.

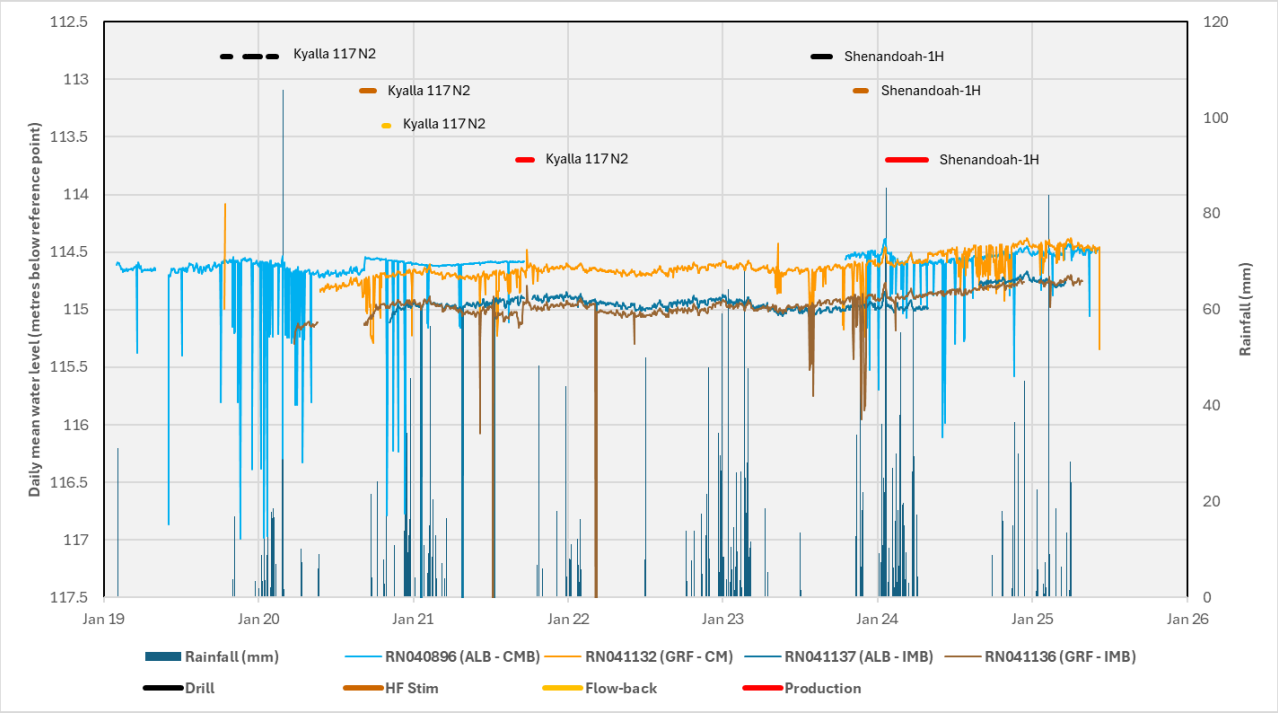


Figure 2 CMB and IMB daily average water levels

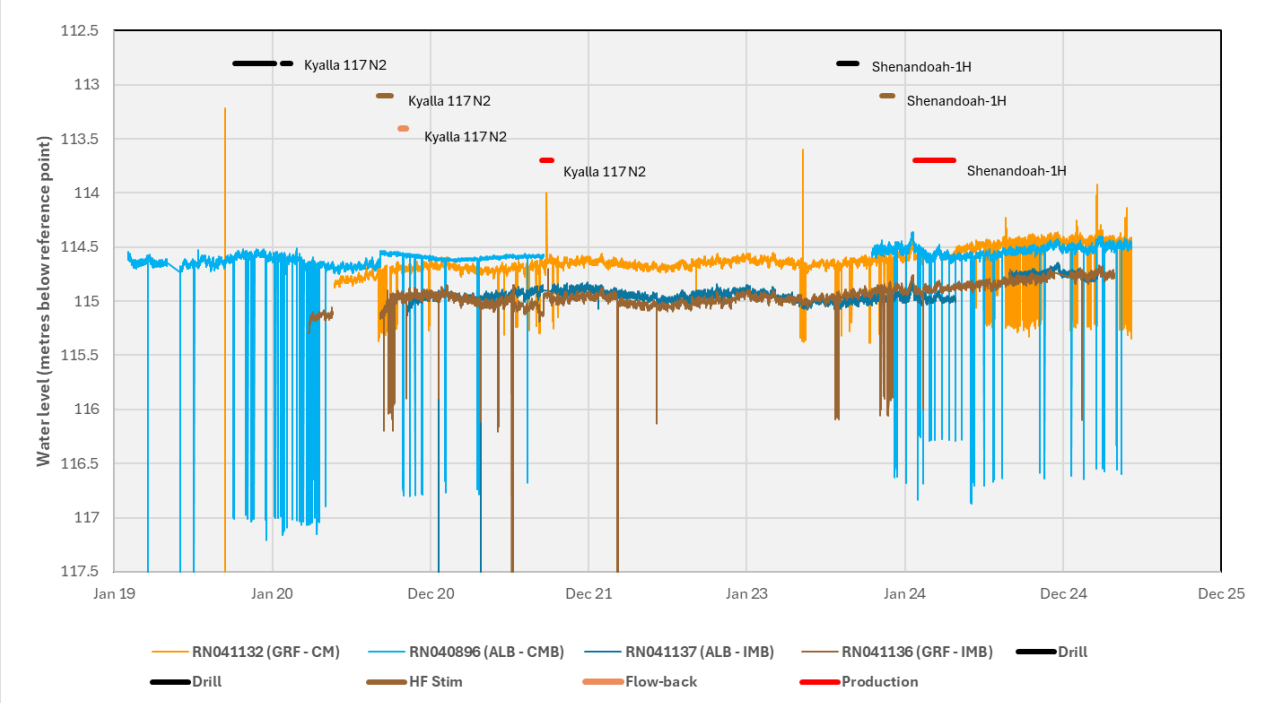


Figure 3 All logger data including high temporal resolution data

Water quality trends

Groundwater from the CMBs and IMBs has been sampled for the suite of analytes listed in Table 6 of clause B.4.17 of the Code. Water quality monitoring of the CMBs commenced on 1 February 2019 and 17 August 2019 for the ALB and GRF, respectively. Water quality monitoring of both IMBs commenced on 25 March 2020, prior to the stimulation of Kyalla 117 N2-1H. Sampling has been conducted quarterly since the hydraulic fracturing was performed, with the last samples included in this reporting period collected on 8 June 2025. This includes sampling during the hydraulic fracturing of the Shenandoah S-1H well on the Kyalla 117 N2 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.

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 5 and Table 6.

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 7 & 8. Timeseries control charts for these analytes is provided in Attachment A and Attachment B for the Gum Ridge Formation and Anthony Lagoon Beds, respectively.

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 discussed above, 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 Anthony Lagoon Beds and Gum Ridge Formation. 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 Kyalla 117 N2 well site that can be attributed to the regulated activities.

Tamboran will continue to monitor the groundwater at the Kyalla 117 N2 well site in accordance with the ministerial conditions of approval of the EMP.

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

Kind regards

[redacted]
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	50	6.73	7.71	7.00	6.80	6.91	7.15
Electrical Conductivity (Field)	µS/cm	1	47	960	1,720	1,253.0	1,334.8	1,600.0	1,630.0
pH (Lab)	pH_Units	0.01	27	7.34	7.88	7.60	7.43	7.51	7.76
Electrical Conductivity (Lab)	µS/cm	1	27	1,140	1,690	1,266.0	1,160.0	1,220.0	1,384.0
Total Dissolved Solids	mg/L	10	27	628	1020	737.0	665.2	724.0	808.2
Suspended Solids	mg/L	5	27	5	13	6.6	6.0	9.0	12.4
Alkalinity (Bicarbonate as $CaCO_3$)	mg/L	1	27	264	372	316	293.0	313.0	342.0
Alkalinity (Carbonate as $CaCO_3$)	mg/L	1	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as $CaCO_3$)	mg/L	1	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as $CaCO_3$)	mg/L	1	27	264	372	316.0	293.0	313.0	342.0
Chloride	mg/L	1	27	153	198	169	160.4	170.0	179.0
Sulphate as SO_4	mg/L	1	26	103	295	143	105.5	123.0	202.5
Sodium	mg/L	1	27	85	112	100	93.6	99.0	106.4
Potassium	mg/L	1	27	14	25	18	15.0	17.0	22.4
Calcium	mg/L	1	27	72	147	97	82.80	96.00	108.00
Magnesium	mg/L	1	27	33	61	41	34.60	39.00	49.40
Fluoride	mg/L	0.1	27	1.2	1.50	1.40	1.26	1.40	1.40
Nitrate (as N)	mg/L	0.01	27	0.01	0.03	0.01	0.01	0.02	0.03
Nitrite (as N)	mg/L	0.01	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	24	0.83	2.31	1.50	1.27	1.55	1.67
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	24	0.21	0.98	0.55	0.42	0.57	0.69
Methane	mg/L	0.01	27	<0.01	0.058	0.0120	0.0120	0.0140	0.0462
Ethane	µg/L	10	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	27	0.001	0.01	0.0028	0.0010	0.0030	0.0050
Barium	mg/L	0.001	27	0.045	0.07	0.06	0.05	0.06	0.07
Boron	mg/L	0.05	27	0.16	0.26	0.21	0.19	0.20	0.24
Cadmium	mg/L	0.0001	27	<LOR	0.0002	0.00	0.00	0.00	0.00
Chromium (III+VI)	mg/L	0.001	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.0005 - 0.001	27	<0.001	0.01	<LOR	<LOR	<LOR	<LOR
Iron	mg/L	0.05	27	0.08	6.01	1.90	0.77	1.59	3.59
Lead	mg/L	0.001	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Lithium	mg/L	0.001	27	0.034	0.05	0.04	0.04	0.04	0.05
Manganese	mg/L	0.001	27	0.024	0.19	0.05	0.03	0.04	0.07
Mercury	mg/L	0.0001	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	27	<LOR	<LOR	0.01	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	24	7.08	10.80	10.06	9.67	10.10	10.60
Silver	mg/L	0.001	27	<LOR	<LOR	0.001	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	27	0.651	0.86	0.76	0.72	0.76	0.81
Zinc	mg/L	0.005	27	0.005	0.05	0.01	0.01	0.01	0.03
TRH C_6-C_{10} fraction (sum)	µg/L	20	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C_{10}-C_{40} fraction (sum)	µg/L	100	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 2 Kyalla 117 N2 Gum Ridge Formation IMB (BET-MB024/RN041136) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH_Units	0.01	50	6.73	7.71	7.00	6.80	6.91	7.15
Electrical Conductivity (Field)	µS/cm	1	47	960	1,720	1,253.0	1,334.8	1,600.0	1,630.0
pH (Lab)	pH_Units	0.01	27	7.34	7.88	7.60	7.43	7.51	7.76
Electrical Conductivity (Lab)	µS/cm	1	27	1,140	1,690	1,266.0	1,160.0	1,220.0	1,384.0
Total Dissolved Solids	mg/L	10	27	628	1020	737.0	665.2	724.0	808.2
Suspended Solids	mg/L	5	27	5	13	6.6	6.0	9.0	12.4
Alkalinity (Bicarbonate as $CaCO_3$)	mg/L	1	27	264	372	316	293.0	313.0	342.0
Alkalinity (Carbonate as $CaCO_3$)	mg/L	1	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as $CaCO_3$)	mg/L	1	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as $CaCO_3$)	mg/L	1	27	264	372	316.0	293.0	313.0	342.0
Chloride	mg/L	1	27	153	198	169	160.4	170.0	179.0
Sulphate as SO_4	mg/L	1	26	103	295	143	105.5	123.0	202.5
Sodium	mg/L	1	27	85	112	100	93.6	99.0	106.4
Potassium	mg/L	1	27	14	25	18	15.0	17.0	22.4
Calcium	mg/L	1	27	72	147	97	82.80	96.00	108.00
Magnesium	mg/L	1	27	33	61	41	34.60	39.00	49.40
Fluoride	mg/L	0.1	27	1.2	1.50	1.40	1.26	1.40	1.40
Nitrate (as N)	mg/L	0.01	27	0.01	0.03	0.01	0.01	0.02	0.03
Nitrite (as N)	mg/L	0.01	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	24	0.83	2.31	1.50	1.27	1.55	1.67
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	24	0.21	0.98	0.55	0.42	0.57	0.69
Methane	mg/L	0.01	27	<0.01	0.058	0.0120	0.0120	0.0140	0.0462
Ethane	µg/L	10	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	27	0.001	0.01	0.0028	0.0010	0.0030	0.0050
Barium	mg/L	0.001	27	0.045	0.07	0.06	0.05	0.06	0.07
Boron	mg/L	0.05	27	0.16	0.26	0.21	0.19	0.20	0.24
Cadmium	mg/L	0.0001	27	<LOR	0.0002	0.00	0.00	0.00	0.00
Chromium (III+VI)	mg/L	0.001	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.0005 - 0.001	27	<0.001	0.01	<LOR	<LOR	<LOR	<LOR
Iron	mg/L	0.05	27	0.08	6.01	1.90	0.77	1.59	3.59
Lead	mg/L	0.001	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Lithium	mg/L	0.001	27	0.034	0.05	0.04	0.04	0.04	0.05
Manganese	mg/L	0.001	27	0.024	0.19	0.05	0.03	0.04	0.07
Mercury	mg/L	0.0001	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	27	<LOR	<LOR	0.01	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	24	7.08	10.80	10.06	9.67	10.10	10.60
Silver	mg/L	0.001	27	<LOR	<LOR	0.001	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	27	0.651	0.86	0.76	0.72	0.76	0.81
Zinc	mg/L	0.005	27	0.005	0.05	0.01	0.01	0.01	0.03
TRH C_6-C_{10} fraction (sum)	µg/L	20	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C_{10}-C_{40} fraction (sum)	µg/L	100	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	27	<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	7.1	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	7.6	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-MB023/RN041137) Statistical Summary

Analyte	Output Unit	EQL	Count	Min	Max	Average	P10	P50	P90
pH (Field)	pH_Units	0.01	21	6.81	7.9	7.1	6.86	6.99	7.77
Electrical Conductivity (Field)	µS/cm	1	19	911	1,457	1,310	1,104	1,350	1,429
pH (Lab)	pH_Units	0.01	20	7.31	7.87	7.6	7.38	7.57	7.75
Electrical Conductivity (Lab)	µS/cm	1	20	1,060	1,350	1,123	1,069	1,105	1,188
Total Dissolved Solids	mg/L	10	20	619	754	664	634	663	696
Suspended Solids	mg/L	5	20	4	24	6.2	4.7	10.0	21.9
Alkalinity (Bicarbonate as $CaCO_3$)	mg/L	1	20	264	384	309	289	309	320
Alkalinity (Carbonate as $CaCO_3$)	mg/L	1	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Hydroxide as $CaCO_3$)	mg/L	1	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Alkalinity (Total as $CaCO_3$)	mg/L	1	20	264	384	309	289	309	320
Chloride	mg/L	1	20	131	165	144	134	143	159
Sulphate as SO_4	mg/L	1	19	84	122	100	89	100	109
Sodium	mg/L	1	20	80	100	88	83	87	97
Potassium	mg/L	1	20	13	18	15	14	15	16
Calcium	mg/L	1	20	66	96	83	76.9	83.5	89.0
Magnesium	mg/L	1	20	34	41	38	35.8	37.5	40.1
Fluoride	mg/L	0.1	20	0.9	1.2	1.1	0.99	1.05	1.20
Nitrate (as N)	mg/L	0.01	20	0.01	0.22	0.023	0.01	0.02	0.04
Nitrite (as N)	mg/L	0.01	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Gross alpha activity	Bq/L	0.05	17	0.19	0.93	0.57	0.33	0.60	0.73
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	17	<LOR	0.47	0.27	0.21	0.29	0.39
Methane	mg/L	0.01	20	<LOR	0.021	0.015	0.01	0.02	0.02
Ethane	µg/L	10	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Propane	mg/L	0.01	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Arsenic	mg/L	0.001	20	0.004	0.016	0.0097	0.01	0.01	0.01
Barium	mg/L	0.001	20	0.06	0.09	0.075	0.06	0.08	0.09
Boron	mg/L	0.05	20	0.14	0.34	0.21	0.18	0.19	0.26
Cadmium	mg/L	0.0001	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Chromium (III+VI)	mg/L	0.001	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	mg/L	0.001	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Iron	mg/L	0.05	21	0.52	3.92	1.8	0.64	1.88	2.59
Lead	mg/L	0.001	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Lithium	mg/L	0.001	21	0.033	0.051	0.042	0.04	0.04	0.05
Manganese	mg/L	0.001	21	0.022	0.097	0.071	0.06	0.07	0.09
Mercury	mg/L	0.0001	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Selenium	mg/L	0.01	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Silicon as Si	mg/L	0.05	21	10.10	11.60	10.75	10.20	10.60	11.40
Silver	mg/L	0.001	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Strontium	mg/L	0.001	21	0.544	0.735	0.63	0.56	0.62	0.69
Zinc	mg/L	0.005	21	<LOR	0.115	0.011	0.01	0.01	0.01
TRH C_6-C_{10} fraction (sum)	µg/L	20	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
TRH C_{10}-C_{40} fraction (sum)	µg/L	100	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Sum of BTEX	µg/L	1	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total Reportable PAH	µg/L	0.5	21	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

Table 5 Kyalla 117 N2 Statistical Assessment for Gum Ridge Formation

Analyte	Output unit	EQL	Sample size		Average Concentration		Statistics	
			Gum Ridge Formation CMB (BET-MB022)	Gum Ridge Formation IMB (BET-MB024)	Gum Ridge Formation CMB (BET-MB022)	Gum Ridge Formation IMB (BET-MB024)	F.Test Statistic	T-Test - P-value
pH (Field)	pH Units	0.1	38	50	7.00	7.00	1.23	0.390
Electrical Conductivity (Field)	µS/cm	1	34	47	1,456	1,253	1.20	0.010
pH (Lab)	pH Units	0.01	36	27	7.60	7.60	1.16	0.181
Electrical Conductivity (Lab)	µS/cm	1	36	27	1,198	1,266	5.95	0.00038
Total Dissolved Solids	mg/L	10	36	27	709.0	737.0	2.65	0.0000129
Suspended Solids	mg/L	5	35	27	5.70	6.60	1.79	0.356
Alkalinity (Bicarbonate as $CaCO_3$)	mg/L	1	36	27	307.0	316.0	1.37	0.0004
Alkalinity (Carbonate as $CaCO_3$)	mg/L	1	36	27	<LOR	<LOR	-	-
Alkalinity (Hydroxide as $CaCO_3$)	mg/L	1	36	27	<LOR	<LOR	-	-
Alkalinity (Total as $CaCO_3$)	mg/L	1	36	27	307.00	316.00	1.37	0.0004
Chloride	mg/L	1	36	27	163.0	169.0	1101.02	0.00000000027
Sulphate as SO_4	mg/L	1	34	26	122.0	143.0	6.99	0.0000000021
Sodium	mg/L	1	36	27	98.0	100.0	1.20	0.0000000000
Potassium	mg/L	1	36	27	15.0	18.0	7.05	0.009
Calcium	mg/L	1	36	27	88.0	97.0	3.46	0.070
Magnesium	mg/L	1	36	27	38.0	41.0	4.74	0.008
Fluoride	mg/L	0.1	36	27	1.30	1.40	1.29	0.437
Nitrate (as N)	mg/L	0.01	36	27	0.011	0.009	10.03	0.366
Nitrite (as N)	mg/L	0.01	36	27	<LOR	<LOR	-	-
Gross alpha activity	Bq/L	0.05	30	24	1.40	1.50	2.05	0.00002
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	30	24	0.52	0.55	1.10	0.009
Methane	mg/L	0.01	35	27	0.021	0.012	2.12	0.001
Ethane	µg/L	10	35	27	<LOR	<LOR	-	-
Propane	mg/L	0.01	35	27	<LOR	<LOR	-	-
Arsenic	mg/L	0.001	35	27	0.0032	0.0028	1.28	0.000000014
Barium	mg/L	0.001	35	27	0.059	0.059	2.03	0.00000044
Boron	mg/L	0.05	35	27	0.21	0.21	1.08	0.133
Cadmium	mg/L	0.0001	35	27	<LOR	<LOR	-	-
Chromium (III+VI)	mg/L	0.001	35	27	<LOR	<LOR	-	-
Copper	mg/L	0.001	35	27	0.00054	0.00096	-	-
Iron	mg/L	0.05	35	27	2.00	1.90	1.64	0.0000001
Lead	mg/L	0.001	35	27	<LOR	<LOR	-	-
Lithium	mg/L	0.001	35	27	0.042	0.042	1.31	0.0002
Manganese	mg/L	0.001	35	27	0.031	0.049	7.61	0.000000001
Mercury	mg/L	0.0001	35	27	<LOR	<LOR	-	-
Selenium	mg/L	0.01	35	27	<LOR	<LOR	-	-
Silicon as Si	mg/L	0.05	33	24	10.19	10.06	1.77	0.0016
Silver	mg/L	0.001	35	27	<LOR	<LOR	-	-
Strontium	mg/L	0.001	35	27	0.75	0.76	1.33	0.301
Zinc	mg/L	0.005	35	27	0.0069	0.0082	2.66	0.02
TRH C_6 - C_{10} fraction (Sum)	µg/L	20	35	27	<LOR	<LOR	-	-
TRH C_{10} - C_{40} fraction (Sum)	µg/L	100	35	27	<LOR	<LOR	-	-
Sum of BTEX	µg/L	1	35	27	<LOR	<LOR	-	-
Total Reportable PAH	µg/L	0.5	29	27	<LOR	<LOR	-	-

Table 6 Kyalla 117 N2 Statistical Assessment for Anthony Lagoon Beds

Analyte	Output unit	EQL	Sample size		Average Concentration		Statistics	
			Anthony Lagoon Beds CMB (BET-MB021)	Anthony Lagoon Beds IMB (BET-MB023)	Anthony Lagoon Beds CMB (BET-MB021)	Anthony Lagoon Beds IMB (BET-MB023)	F.Test Statistic	T-Test - P-value
pH (Field)	pH Units	0.1	53	21	7.10	7.10	2.42	0.409
Electrical Conductivity (Field)	µS/cm	1	38	19	1,407	1310.00	1.05	0.010
pH (Lab)	pH Units	0.01	49	20	7.6	7.60	1.32	0.181
Electrical Conductivity (Lab)	µS/cm	1	49	20	1,190	1123.00	1.48	0.00006
Total Dissolved Solids	mg/L	10	49	20	706	664.00	1.73	0.0000450
Suspended Solids	mg/L	5	47	20	7.1	6.20	5.97	0.311
Alkalinity (Bicarbonate as $CaCO_3$)	mg/L	1	49	20	284	309.00	1.62	0.0004
Alkalinity (Carbonate as $CaCO_3$)	mg/L	1	49	20	<LOR	<LOR	-	-
Alkalinity (Hydroxide as $CaCO_3$)	mg/L	1	49	20	<LOR	<LOR	-	-
Alkalinity (Total as $CaCO_3$)	mg/L	1	49	20	284	309.00	1.62	0.0004
Chloride	mg/L	1	49	20	168	144.00	1.26	0.00000000003
Sulphate as SO_4	mg/L	1	44	19	124	100.00	3.42	0.0000000021
Sodium	mg/L	1	49	20	105	88.00	1.66	0.0000000000
Potassium	mg/L	1	49	20	14	15.00	2.40	0.009
Calcium	mg/L	1	49	20	80	83.00	1.82	0.095
Magnesium	mg/L	1	49	20	39	38.00	2.37	0.008
Fluoride	mg/L	0.1	49	20	1.1	1.10	1.37	0.437
Nitrate (as N)	mg/L	0.01	49	20	0.025	0.02	4.37	0.366
Nitrite (as N)	mg/L	0.01	49	20	<LOR	<LOR	-	-
Gross alpha activity	Bq/L	0.05	40	17	0.33	0.57	4.61	0.00002
Gross beta activity (excluding activity of K-40)	Bq/L	0.1	40	17	0.2	0.27	1.43	0.009
Methane	mg/L	0.01	46	20	0.017	0.02	32.22	0.001
Ethane	µg/L	10	46	20	<LOR	<LOR	-	-
Propane	mg/L	0.01	46	20	<LOR	<LOR	-	-
Arsenic	mg/L	0.001	47	20	0.0013	0.01	3.50	0.000000005
Barium	mg/L	0.001	47	20	0.06	0.08	2.26	0.00000044
Boron	mg/L	0.05	47	20	0.22	0.21	3.00	0.186
Cadmium	mg/L	0.0001	47	20	0.000053	<LOR	-	-
Chromium (III+VI)	mg/L	0.001	47	20	0.00051	<LOR	-	-
Copper	mg/L	0.001	47	20	0.00053	<LOR	-	-
Iron	mg/L	0.05	47	21	0.73	1.80	3.41	0.00005
Lead	mg/L	0.001	47	21	0.00055	<LOR	-	-
Lithium	mg/L	0.001	47	21	0.047	0.04	2.60	0.000023
Manganese	mg/L	0.001	47	21	0.035	0.07	1.27	0.000000000002
Mercury	mg/L	0.0001	47	21	<LOR	<LOR	-	-
Selenium	mg/L	0.01	47	21	<LOR	<LOR	-	-
Silicon as Si	mg/L	0.05	43	21	10.148	10.75	2.26	0.0004
Silver	mg/L	0.001	47	21	<LOR	<LOR	-	-
Strontium	mg/L	0.001	47	21	0.64	0.63	1.26	0.301
Zinc	mg/L	0.005	47	21	0.031	0.01	1.60	0.01
TRH C_6 - C_{10} fraction (Sum)	µg/L	20	46	21	<LOR	<LOR	-	-
TRH C_{10} - C_{40} fraction (Sum)	µg/L	100	46	21	<LOR	<LOR	-	-
Sum of BTEX	µg/L	1	46	21	<LOR	<LOR	-	-
TotGH Reportable PAH	µg/L	0.5	39	21	<LOR	<LOR	-	-

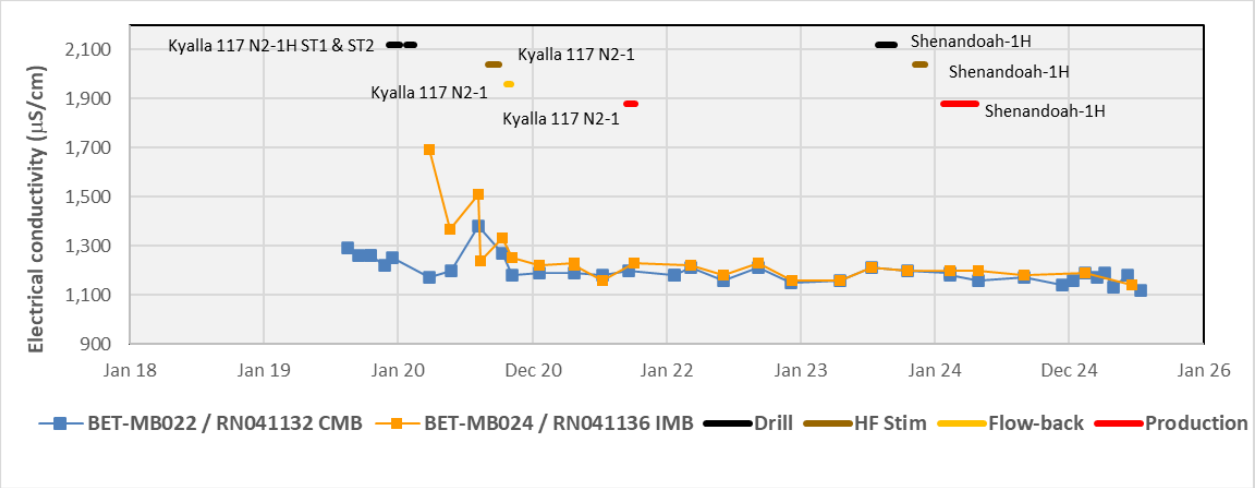
Table 7 Description of water quality trends for the Gum Ridge Formation for those analytes where there is a statistically significant difference between the CMB and IMB

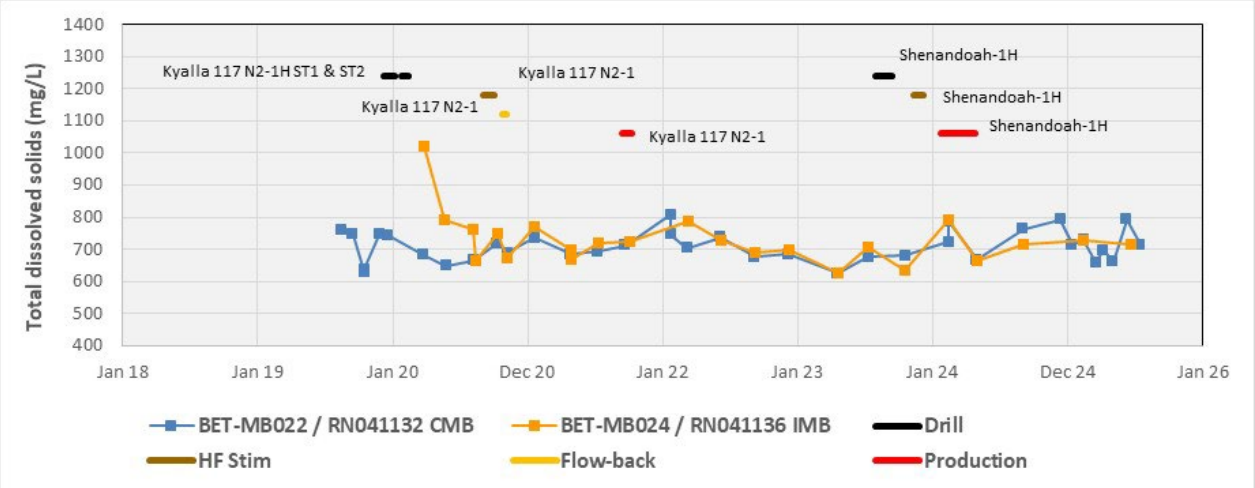
Analyte	Monitoring bore with highest reported concentration	Description of concentrations/trends
		Gum Ridge Formation
Electrical conductivity (laboratory)	IMB	The IMB has a very slightly higher electrical conductivity although both Gum Ridge Formation bores show a steady and temporally very similar long-term decline from initially slightly elevated values most likely associated with the construction of the individual monitoring bores. 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
Total dissolved solids	IMB	The IMB has a very slightly higher total dissolved solids although both Gum Ridge Formation bores show a steady and temporally very similar long-term decline from initially slightly elevated values most likely associated with the construction of the individual monitoring bores. There have been some minor fluctuations in concentrations with the IMB and CMB tending to move in concert therefore most likely related to changes in overall concentrations. Perhaps a slightly declining trend in both bores with time, perhaps reflecting recharge impacts.
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 alkalinity	CMB	Directly related to Alkalinity (Bicarbonate) as this is dominant alkalinity species.
Chloride	IMB	The IMB concentrations are generally greater than IMB. The initial IMB result was slightly elevated probably reflecting the impact of the construction of this monitoring bore. Results in the IMB would be expected to be greater than the CMB if the main contribution was from the E&A wells but this is not consistently the case. There have been some minor fluctuations 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
Sulphate	IMB	Overall, marginally declining sulphate concentrations are evident in both the IMB and CMB. IMB generally has a slightly higher concentration. Both bores showed higher values after their initial construction and this might be related to sulphide mineral oxidation during the drilling of the monitoring bores through the introduction of compressed air into the formation.
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. 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 is evident.
Potassium	IMB	The IMB potassium concentration increased after the start of E&A drilling to ~12 mg/L to 15 mg/L, with some minor fluctuations throughout the monitoring record. The IMB potassium concentrations declined from August 2020 and by November 2020 were very close to those of the CMB. Although temporally variable, the potassium concentrations from the CMB and IMB are now relatively closely correlated. The increase in the IMB potassium concentration after E&A drilling suggests the potential for localised influence on the water quality due to drilling fluids.
Magnesium	IMB	The IMB has a very slightly higher magnesium concentration although both Gum Ridge Formation bores show a steady and temporally very similar long-term decline from initially slightly elevated values most likely associated with the construction of the individual monitoring bores. There have been some minor fluctuations in concentrations with the IMB and CMB tending to move in concert therefore most likely related to changes in overall concentrations. Perhaps a slightly declining trend in both bores with time, perhaps reflecting recharge impacts.
Gross alpha activity	IMB	Overall, the IMB concentration has been generally greater than that of the CMB, but not consistently. Although concentrations observed in both the CMB & IMB were strongly correlated between approximately October 2020 and February 2024 subsequently there has been greater variability, with perhaps a slightly declining trend in both bores after approximately April 2025 with time, perhaps reflecting a dilution with recharge impacts.
Gross beta activity less ^{40}K	IMB	Overall, the IMB concentration has been generally greater than that of the CMB, but not consistently. Although concentrations observed in both the CMB & IMB were correlated between approximately May 2020 and August 2024 subsequently there has been greater variability, with perhaps a slightly declining trend in both bores after approximately Narch 2025 with time, perhaps reflecting a dilution with recharge impacts.
Methane	CMB	Although generally the methane concentrations in the CMB are above those of the IMB, the methane concentrations in both the CMB and IMB show considerable temporal variability from below detection limits to peaks of 0.05 to 0.06 mg/L. The peak methane values do not seem to correlate with E&A well construction. There is no evident long-term trend in the methane data in either bore.
Arsenic	CMB	Arsenic values are generally but not exclusively greater than those in the IMB. There is a relatively strong long-term trend in both bores for declining arsenic levels. The initially elevated arsenic values in the early time data my potentially reflect the impact of drilling the monitoring bores with the increase in oxygen potentially liberating arsenic initially bound to aquifer materials.
Barium	CMB	Apart from an isolated below detection limit outlier in the IMP in August 2020 the barium concentration in the CMB and IMB show long-term temporal variability with limited correlation and no obvious trend.
Iron	IMB	Generally, the iron levels in the CMB are greater than those in the IMB. Iron values rose in the IMB from 3.29 mg/L December 2020 to a peak of 6.01 mg/L in July 2023. 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	IMB	The barium concentration in the CMB and IMB show long-term temporal variability with moderate to good correlation and no obvious trend.
Manganese	IMB	The initial reported manganese value for the IMB was an elevated outlier of 0.186 mg/L. Similarly the initial reported manganese value for the CMB was also an elevated outlier of 0.072 mg/L. The manganese concentration in the IMB is nearly always greater to that in the CMB although since approximately mid-2025 the manganese values in both the CMB and IMB have converged, albeit at a very low level (0.03 to 0.035 mg/L). This suggests that the construction of the water bores causes some transient elevation in manganese values in the Gum Ridge Formation. It is also possible that the drilling E&A drilling activities contributed to the initial outlier value in the IMB through possible introduction of oxygen during drilling through the Gum Ridge Formation. Since the subsidence of these initial impacts the manganese values in both the CMB and IMB have shown temporal variability with no real trend.
Silicon	CMB	The CMB silicon values are generally slightly higher than the IMB values. Having said that, apart from an early low value outlier of 7.08 mg/L in the records for the CMB, the silicon levels in the CMB and IMB are similar with no evident long-term trend
Zinc	IMB	The initial reported zinc value for the IMB was an elevated outlier of 0.052 mg/L. Similarly the initial reported zinc value for the CMB was also an elevated outlier of 0.44 mg/L. The manganese concentration in the IMB is often greater to that in the CMB although since approximately April 2024 the zinc values in the IMB have declined towards the detection limit. This suggests that the construction of the water bores causes some transient elevation in zinc values in the Gum Ridge Formation. It is also possible that the drilling E&A drilling activities contributed to the initial outlier value in the IMB through possible introduction of oxygen during drilling through the Gum Ridge Formation. Although the IMB zinc data shows a long-term declining trend, the CMB zinc data shows no long-term trend.

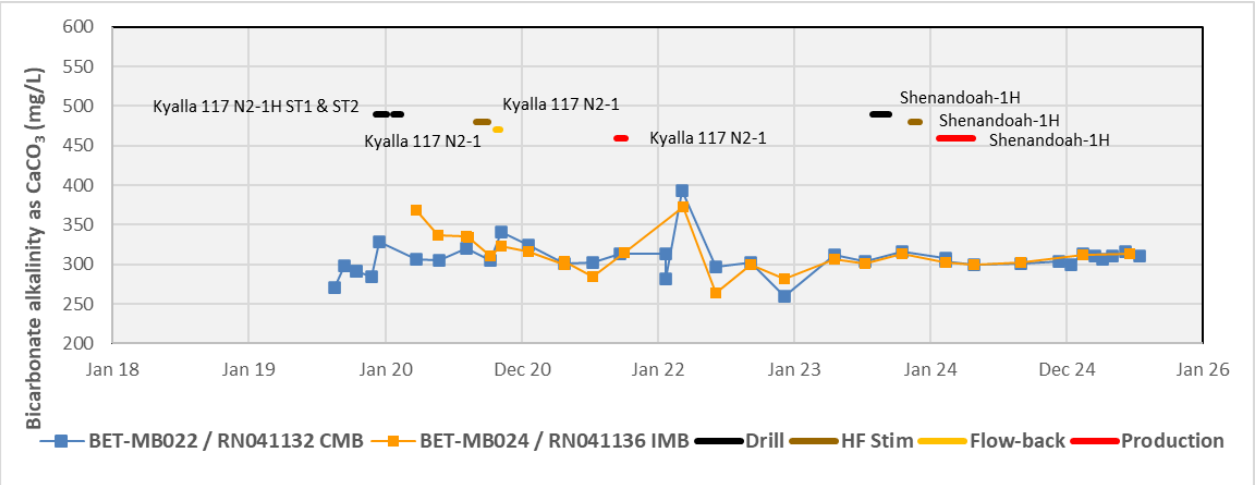
Table 8 Description of water quality trends for the Anthony Lagoon Beds for those analytes where there is a statistically significant difference between the CMB and IMB

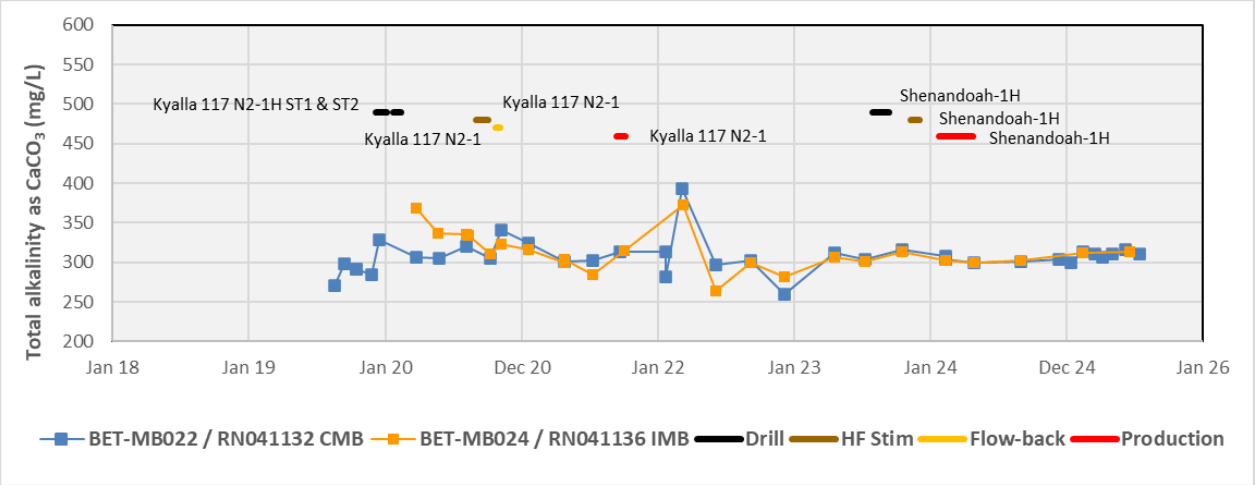
Analyte	Monitoring bore with highest reported concentration	Description of concentrations/trends
		Anthony Lagoon Beds
Electrical conductivity (laboratory)	CMB	The CMB has a higher electrical conductivity although both Anthony Lagoon Beds bores show a temporally variable EC pattern with moderate correlation. There is a possible declining trend in both bore since peak values at August 2020.
Total dissolved solids	CMB	The CMB has a higher total dissolved solids concentrations although both Anthony Lagoon Beds bores show a temporally variable EC pattern with moderate correlation. Since February 2024 the CMB data has shown much more temporally variable TDS data with a peal TDS value of 826 mg/L being observed in early May 2025. It is of some note that since February 2024 the IMB TDS values have not displayed the degree of wide temporal variation noted in the CMB. The period of increased temporal variability in CMB TDS commenced during the early stages of production from Shenandoah-1H however it seems to be unlikely that these are related. There appears to be no long-term trends evident in both bores.
Bicarbonate alkalinity (also total alkalinity)	CMB	With the exception of a CMB high value outlier of 423 mg/L in September 2023, the IMB concentration is generally marginally greater than the CMB. Apart from this and another isolated IMB high value outlier of 384 mg/L in March 2022, the CMB & IMB data show moderate correlation. No real trends or changes in overall concentrations in bicarbonate alkalinity are evident in both the Anthony Lagoon Beds bores.
Total alkalinity	CMB	Directly related to Alkalinity (Bicarbonate) as this is dominant alkalinity species.
Chloride	CMB	The CMB concentrations are generally greater than IMB. Results in the IMB would be expected to be greater than the CMB if the main contribution was from the E&A wells but this is not the case. There have been some minor fluctuations in concentrations with the IMB and CMB tending to move somewhat in concert and therefore most likely related to analytical techniques or natural variability. A CMB low outlier of 111 mg/L in September 2024 is isolated and does not appear to correlate with site E&A activities. No real trends or changes in overall concentrations are evident.
Sulphate	CMB	Overall, marginally declining sulphate concentrations with reasonable correlation are evident in both the IMB and CMB. CMB generally has a slightly higher concentration.
Sodium	CMB	The CMB concentration is generally greater than IMB. Both CMB and IMB sodium concentrations show some temporal variability however there appears to be some correlation. 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 is evident.
Potassium	IMB	The IMB potassium concentration is generally slightly greater IMB. Both CMB and IMB potassium concentrations show some temporal variability and there appears to be moderate correlation. No real trends or changes in overall concentrations is evident and the most recent values are very similar.
Magnesium	CMB	The CMB and IMB had relatively similar magnesium concentrations until April 2023 after which the CMB magnesium values exhibited a much larger temporal variation. This change in temporal behaviour does not appear to coincide with key E&A development activities. There is no real long-term trend obvious for the record for the CMB and IMB.
Gross alpha activity	CMB	Overall, the CMB concentration has been generally greater than that of the IMB, but not consistently. Gross alpha activity observed in both the CMB & IMB showed some reasonable correlation of temporal pattern between March 2022 and August 2024, albeit that the amplitude of fluctuation and the absolute gross alpha activity values observed in the CMB were significantly greater. Over the period of record there does not appear to be any discernible long-term trend in values in either the CMB of IMB and the greater alpha activity values do not correlate with key wellsite E&A activities.
Gross beta activity less ^{40}K	IMB	Overall, the CMB concentration has been generally greater than that of the CMB, but not consistently. A CMB high outlier value of 0.65 Bq/L in June 2025 does not correlate with any key E&A site activity. There is perhaps a slightly declining trend in the IMB but this is not certain.
Methane	CMB	Although generally the methane concentrations in the CMB are nearly always above those of the IMB, the methane concentrations in CMB show greater temporal variability from below detection limits to a peak of 0.072 in October 2020. The peak methane value does correlate with the end of the Kyalla 117 N2-1 wells however the other peaks do not correlate with key E&A activities. There is no evident long-term trend in the methane data in either bore.
Arsenic	IMB	Arsenic values are significantly greater than those in the IMB. There is a relatively strong long-term trend in both bores for declining arsenic levels. The initially elevated arsenic values in the early time data my potentially reflect the impact of drilling the monitoring bores with the increase in oxygen potentially liberating arsenic initially bound to aquifer materials although this appears to take some time after initial construction to peak.
Barium	CMB	Although the initial peak in barium in the CMB was greater than that for the IMB, the overall barium values exceed those for the CMB for the remainder of the record. The initial peak in the CMB barium probably reflects a liberation of barium from the aquifer during water bore drilling with this subsequently declining and then stabilising. There is also a slight long-term declining trend in the IMB barium data. There appears to be no correlation with key well site E&A activities.
Boron	IMB	Overall the boron values in the IMB are slightly greater than those in the CMB. Both bores show considerable temporal variability with moderate correlation. There appears to be no long-term trend in either bore.
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 barium concentration in the CMB and IMB show long-term temporal variability with moderate to good correlation. As possible long-term declining trend exists for bore bores, but is more obvious for the IMB .
Manganese	IMB	The manganese concentration in the IMB has always been greater to that in the CMB. Both bores show temporally variable data with poor correlation and no obvious trend.
Silicon	CMB	Overall the IMB silicon values are generally slightly higher than the IMB values. Having said that, apart from a CMB high value outlier of 13.4 mg/L in September 2024, the silicon levels in the CMB and IMB are similar with no evident long-term trend
Zinc	CMB	An early reported elevated CMB outlier zinc value was 0.135 mg/L in November 2019. Similarly the initial reported zinc value for the IMB was also an elevated outlier of 0.115 mg/L in March 2020. The zinc manganese concentration in the CMB is generally significantly greater than the IMB values which rapidly declined to close to detection limit. This suggests that the construction of the water bores causes some transient elevation in zinc values in the Anthony Lagoon Beds. Both the CMB and IMB zinc data show a long-term declining trend.

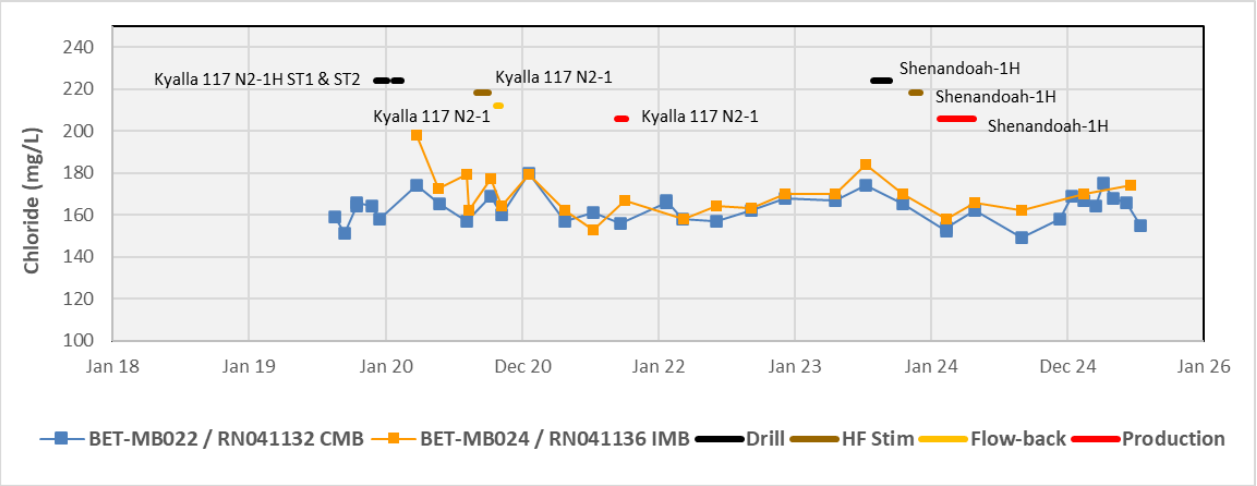
Attachment A - Timeseries chemistry charts – Gum Ridge Formation

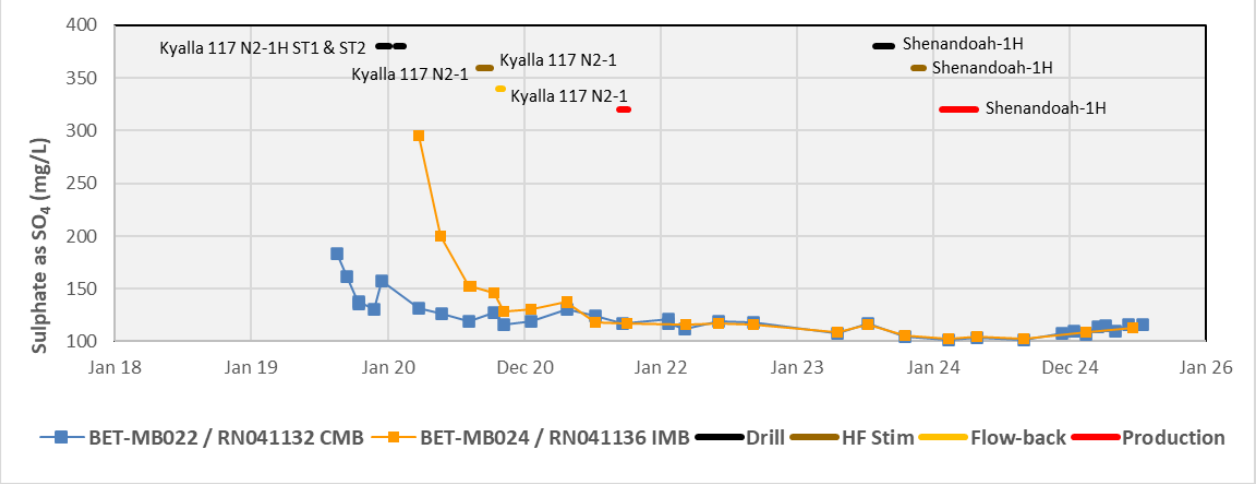


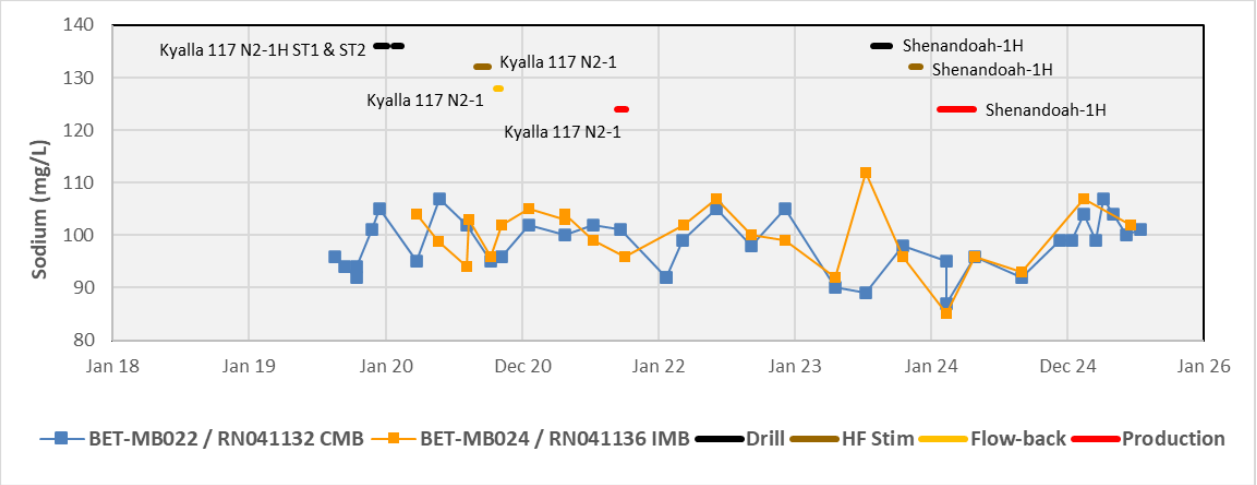


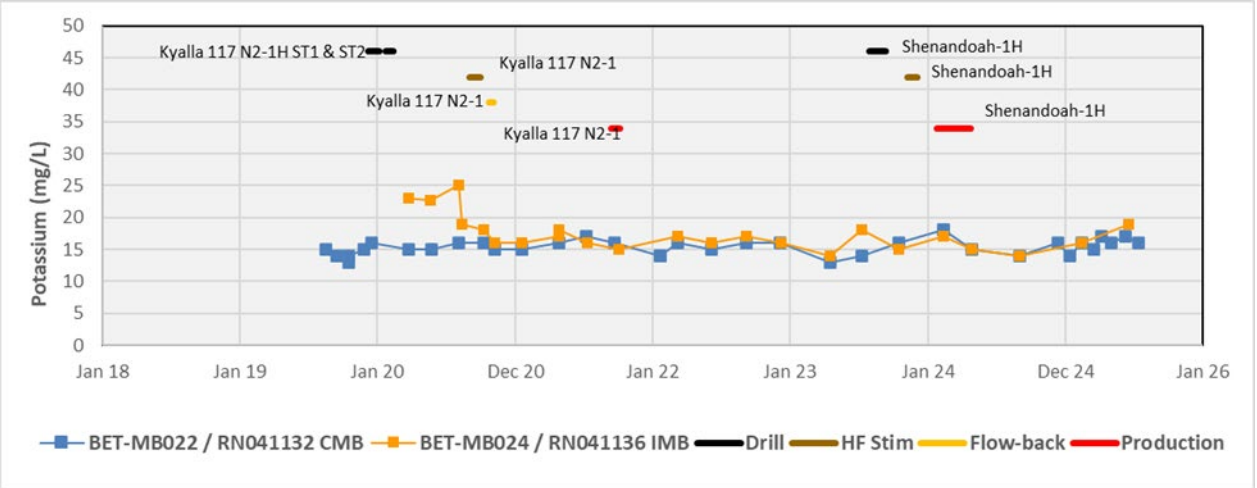


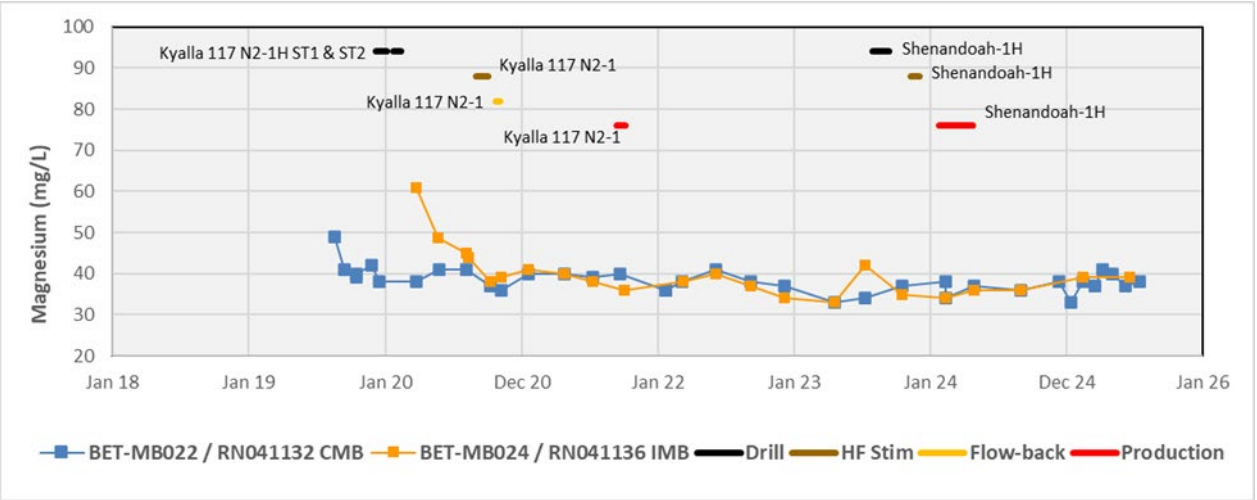

Total alkalinity as $CaCO_3$ (mg/L)
600
550
500
450
400
350
300
250
200
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

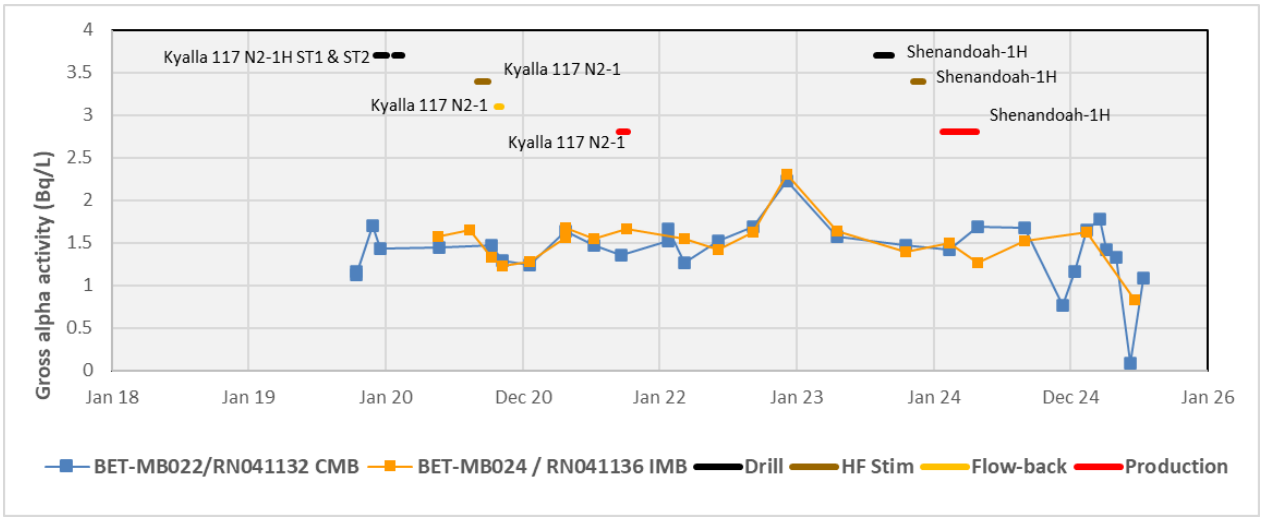

Chloride (mg/L)
240
220
200
180
160
140
120
100
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

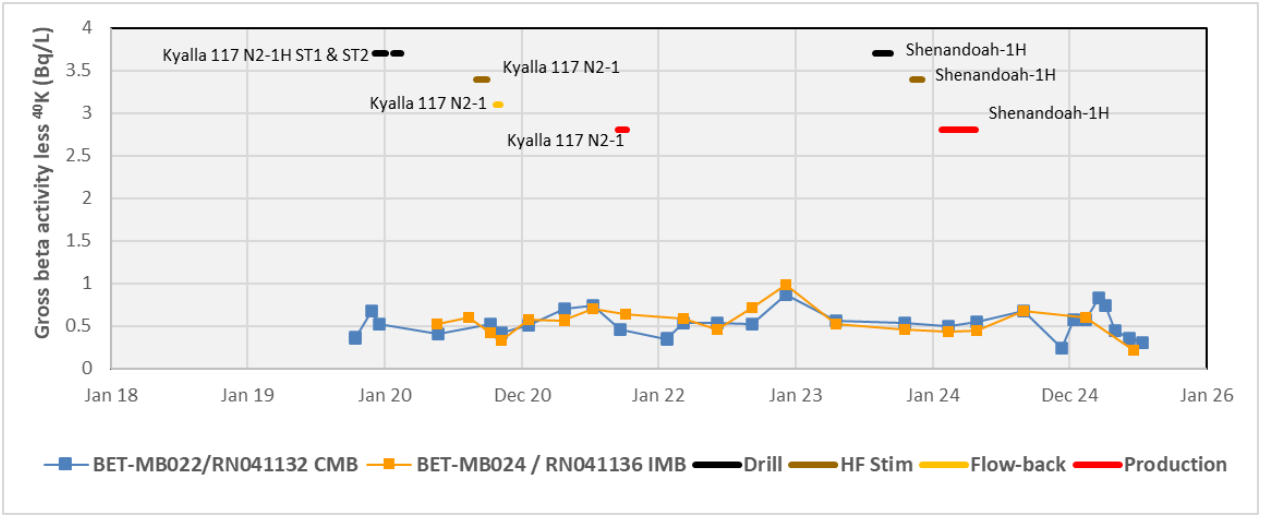

Sulphate as SO_4 (mg/L)
400
350
300
250
200
150
100
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

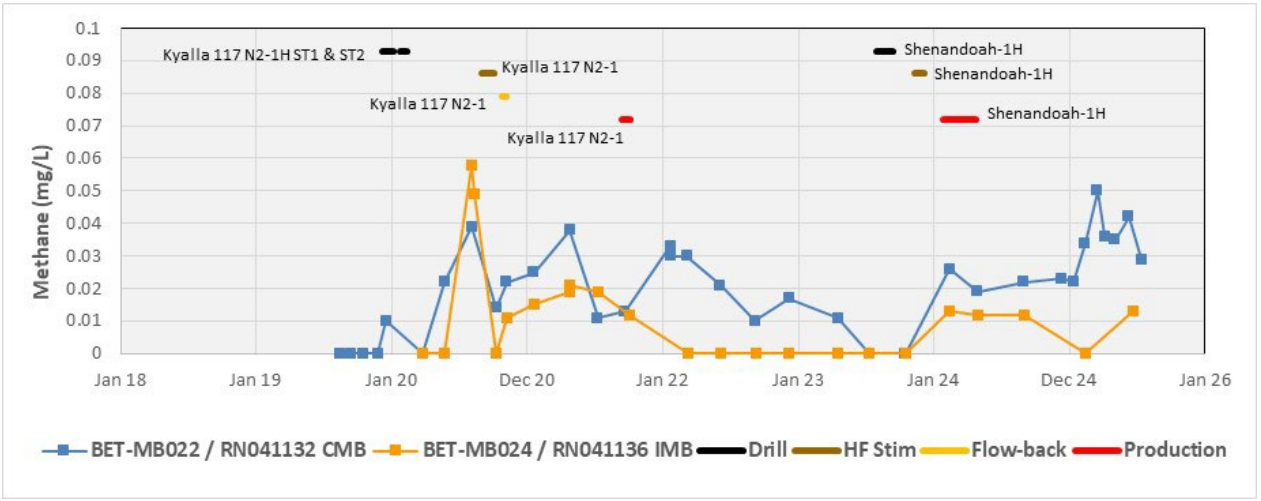

Sodium (mg/L)
140
130
120
110
100
90
80
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

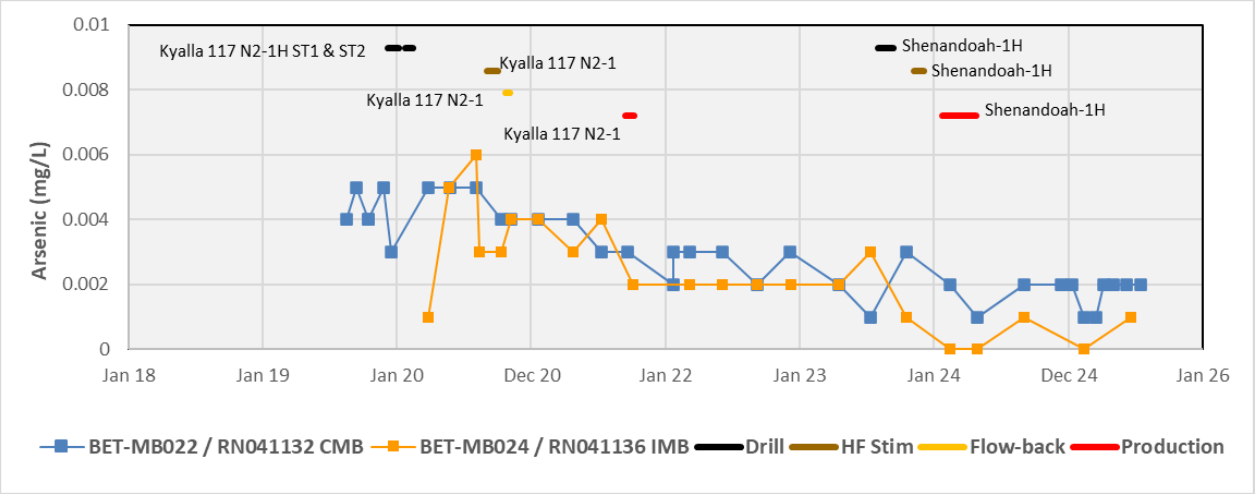

Potassium (mg/L)
50
45
40
35
30
25
20
15
10
5
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

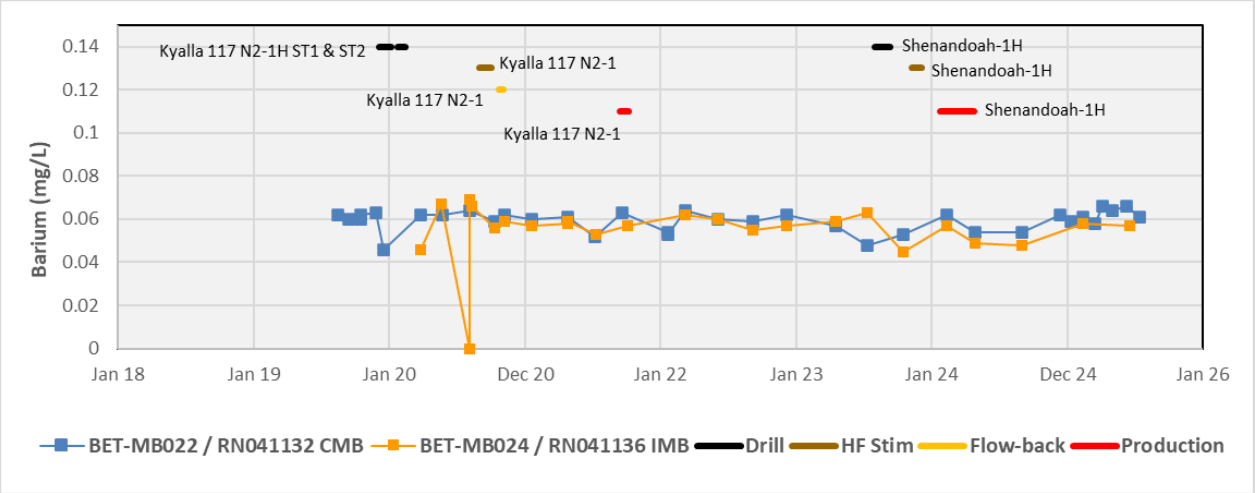

Magnesium (mg/L)
100
90
80
70
60
50
40
30
20
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

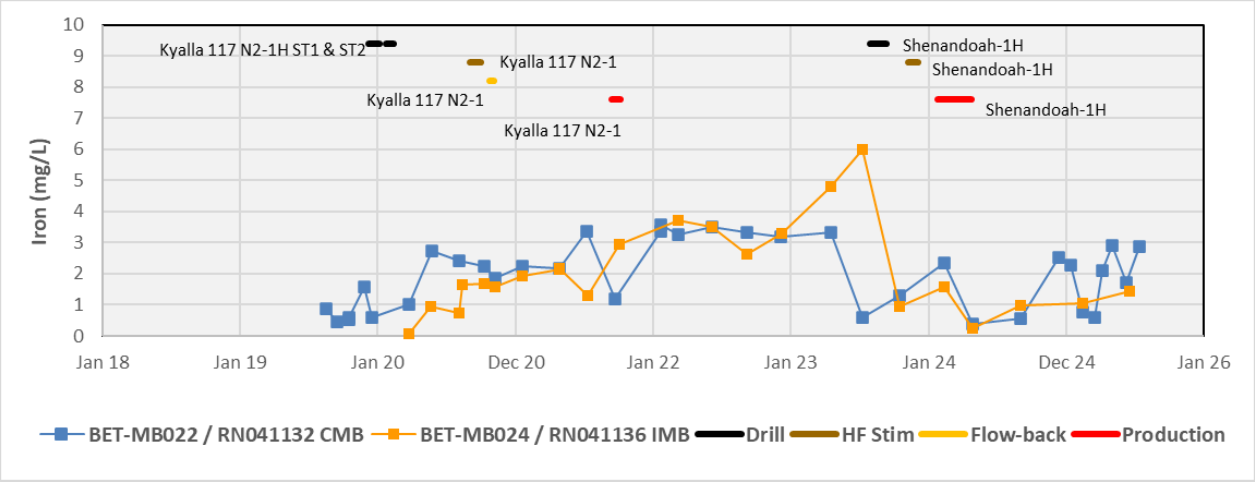

Gross alpha activity (Bq/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022/RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

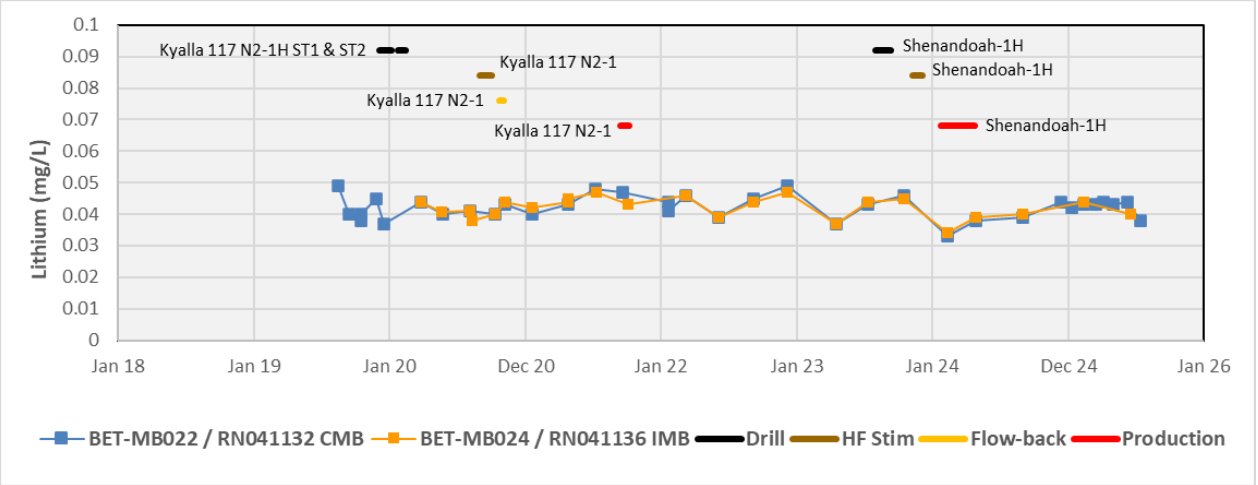

Gross beta activity less ⁴⁰K (Bq/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022/RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

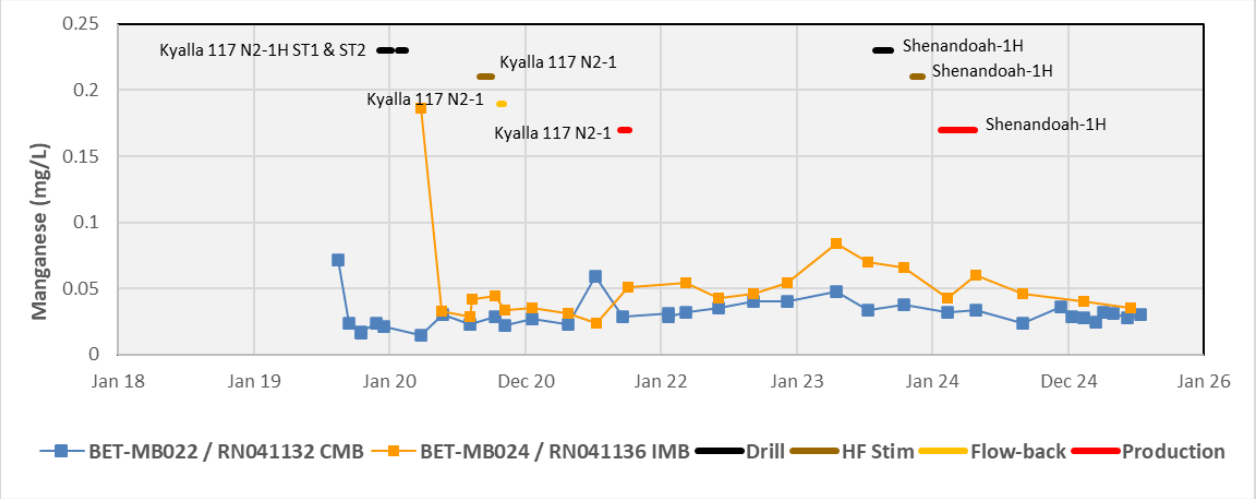

Methane (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

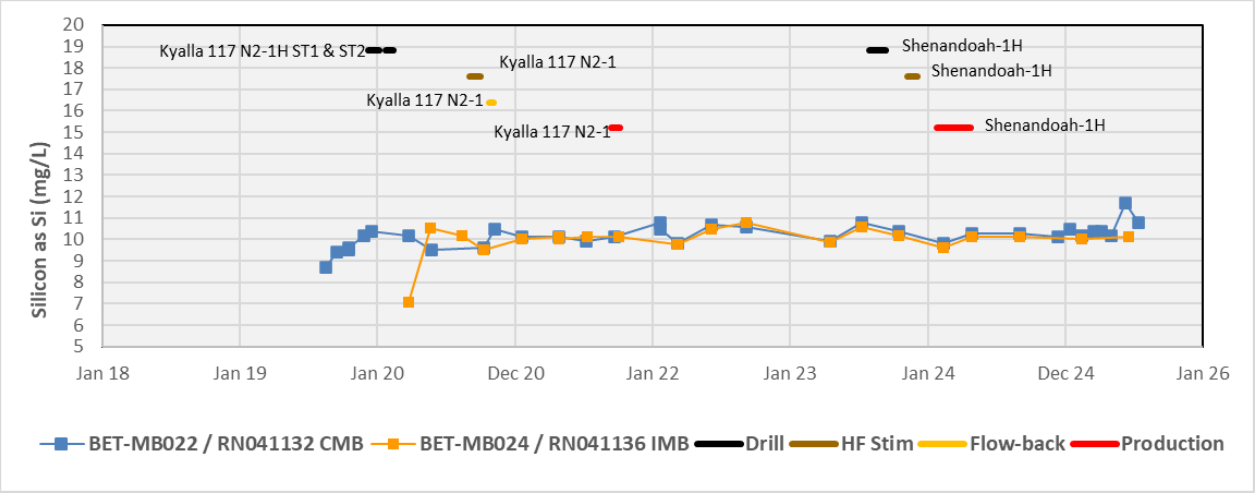

Arsenic (mg/L)
0.01
0.008
0.006
0.004
0.002
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

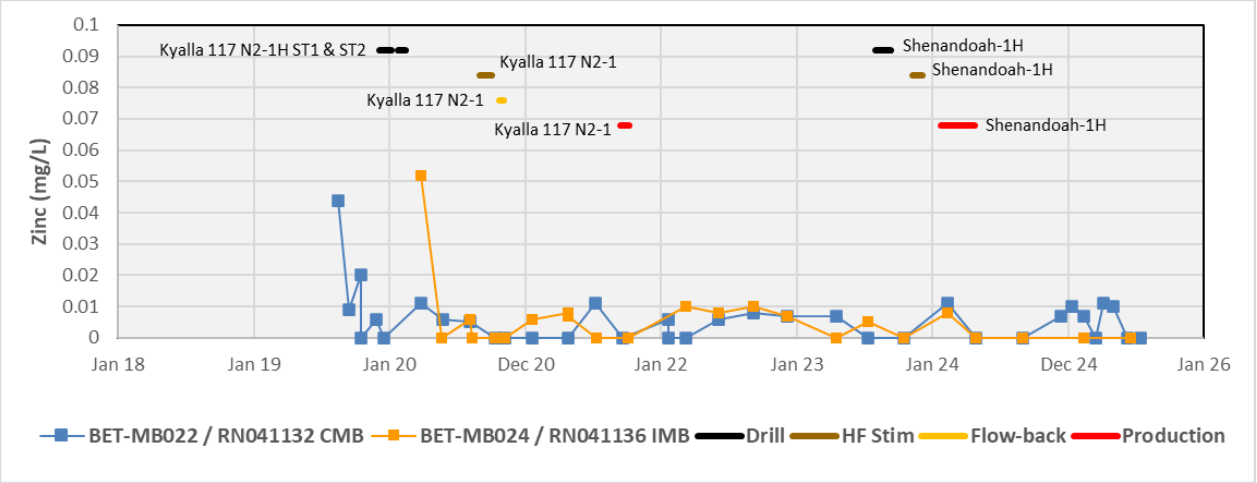

Barium (mg/L)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production


Iron (mg/L)
10
9
8
7
6
5
4
3
2
1
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

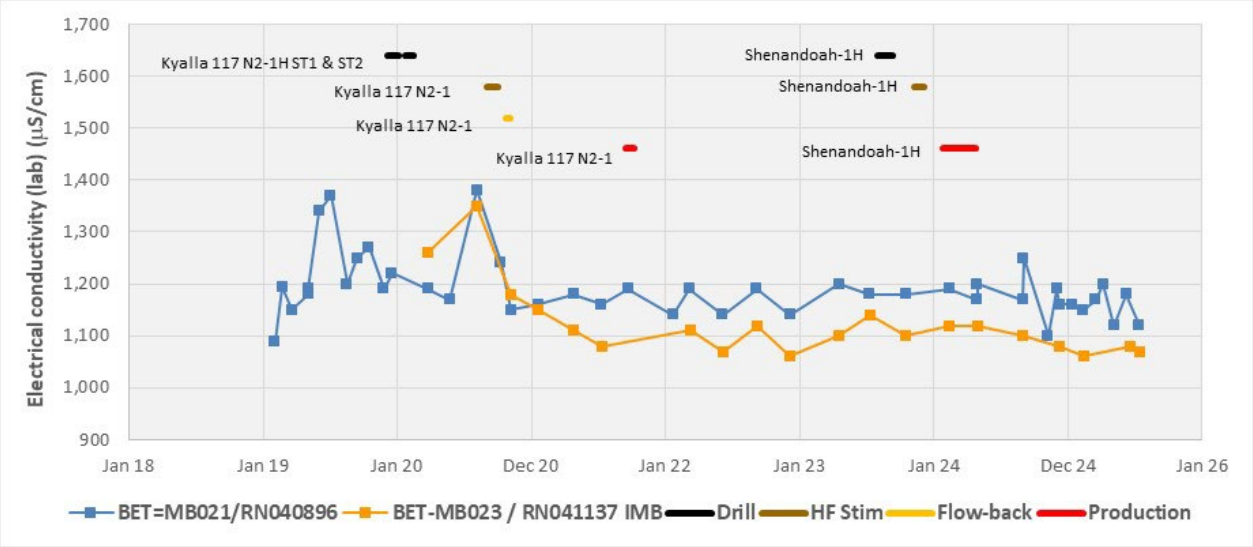

Lithium (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

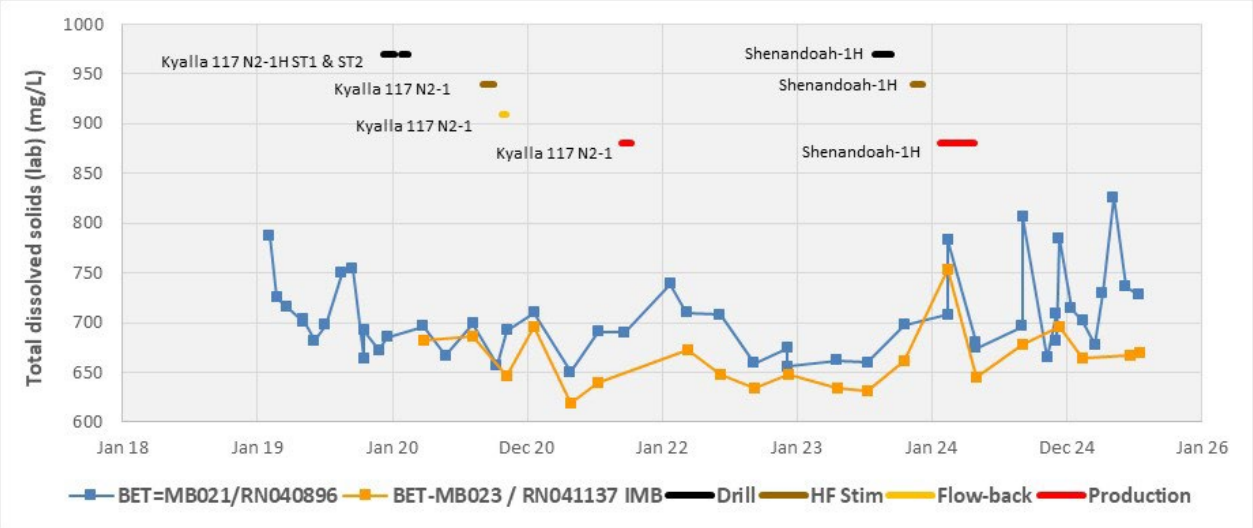

Manganese (mg/L)
0.25
0.2
0.15
0.1
0.05
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

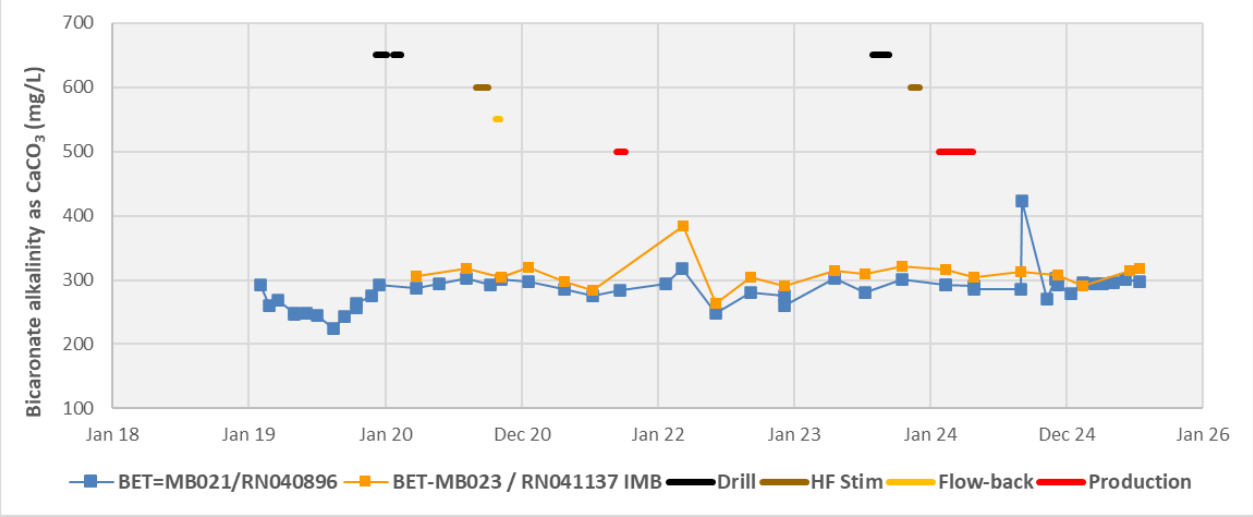

Silicon as Si (mg/L)
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

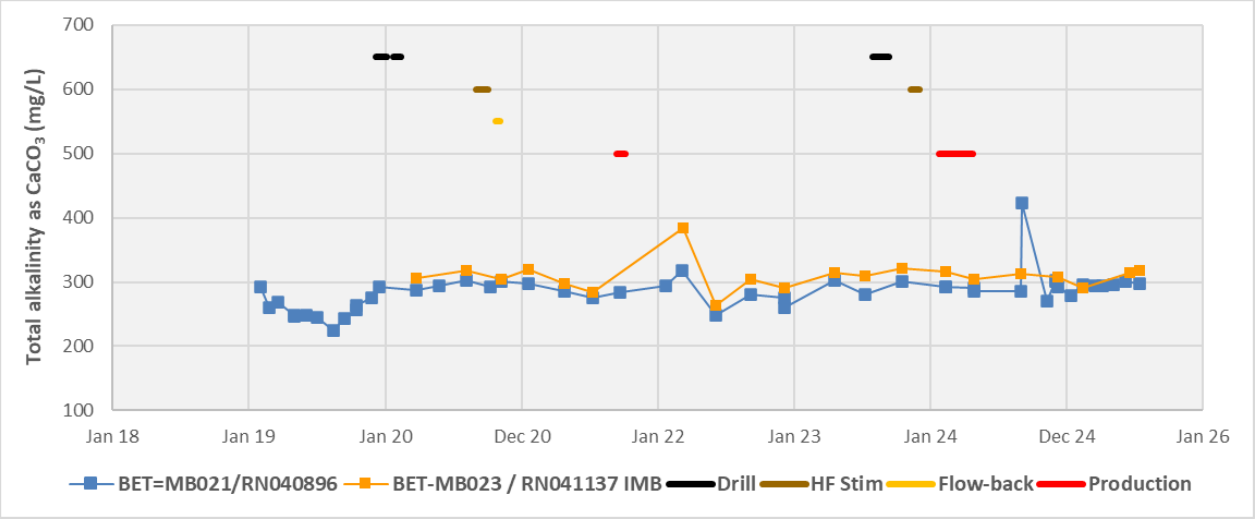

Zinc (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
BET-MB022 / RN041132 CMB
BET-MB024 / RN041136 IMB
Drill
HF Stim
Flow-back
Production

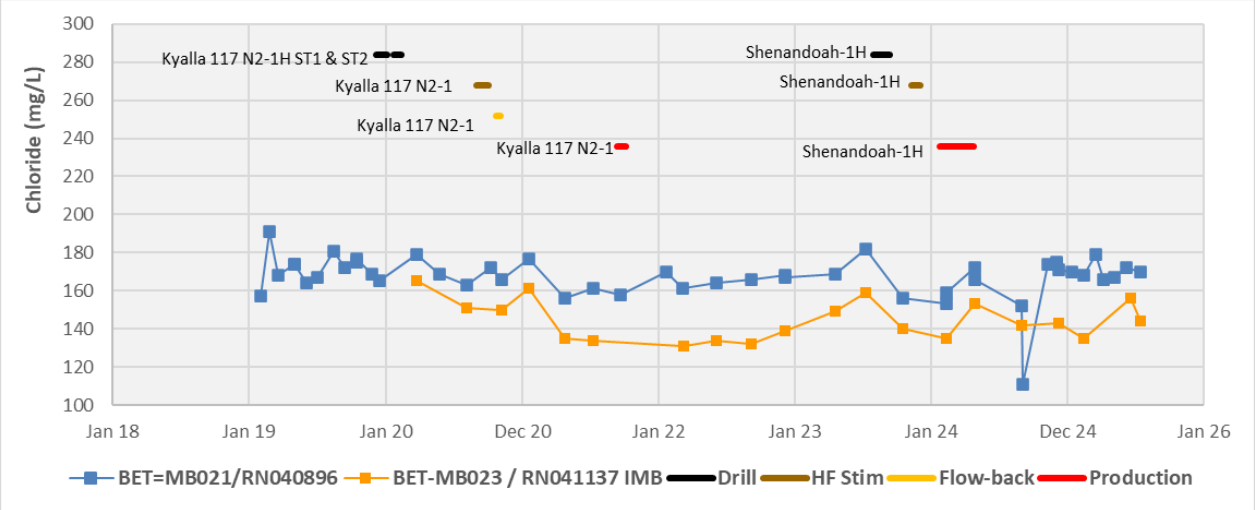
Attachment B - Timeseries chemistry charts – Anthony Lagoon Beds

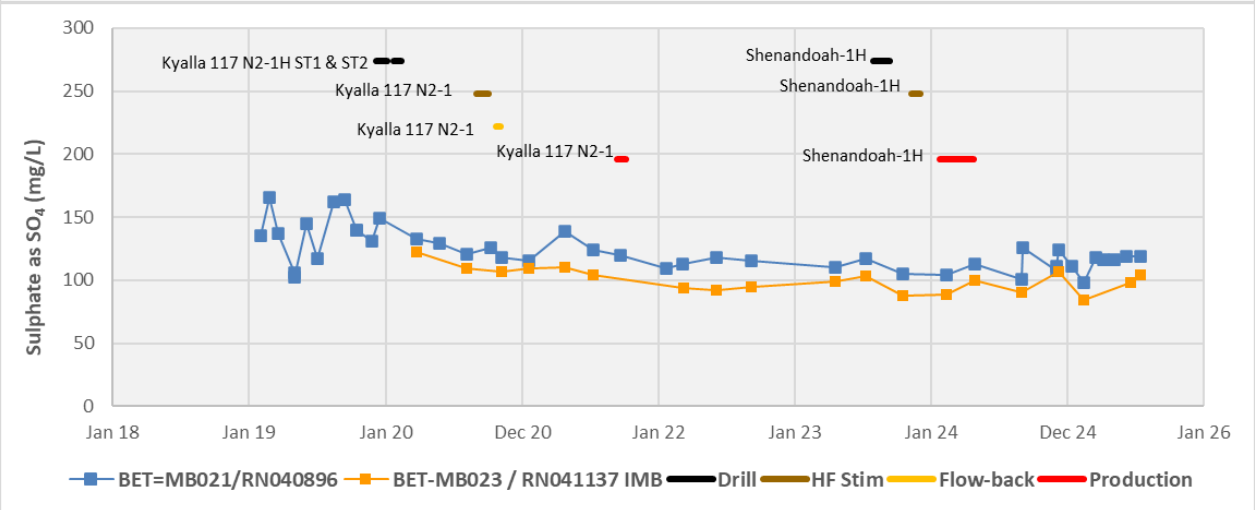


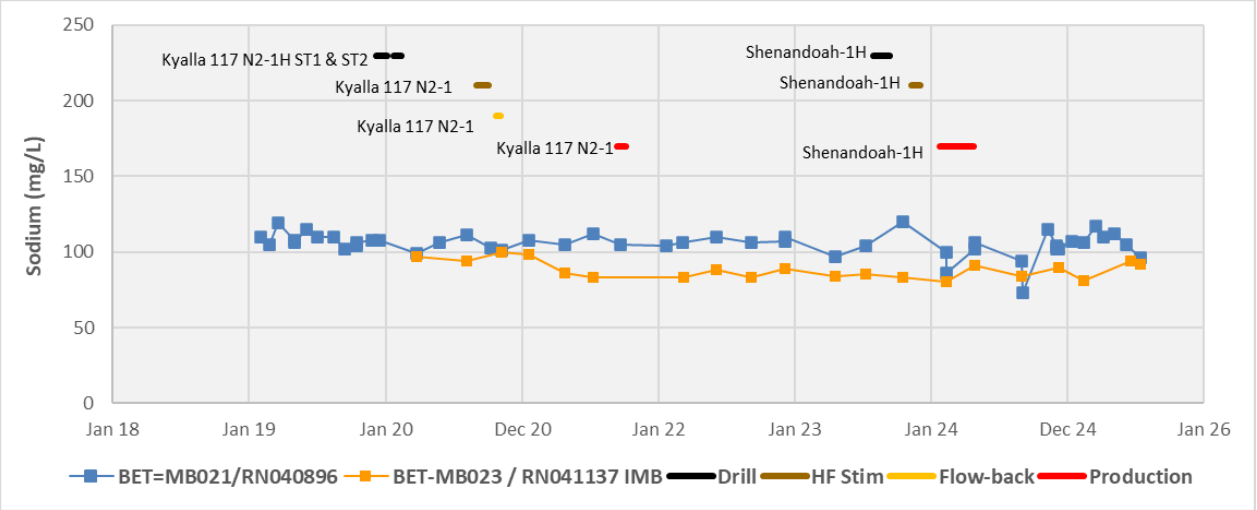


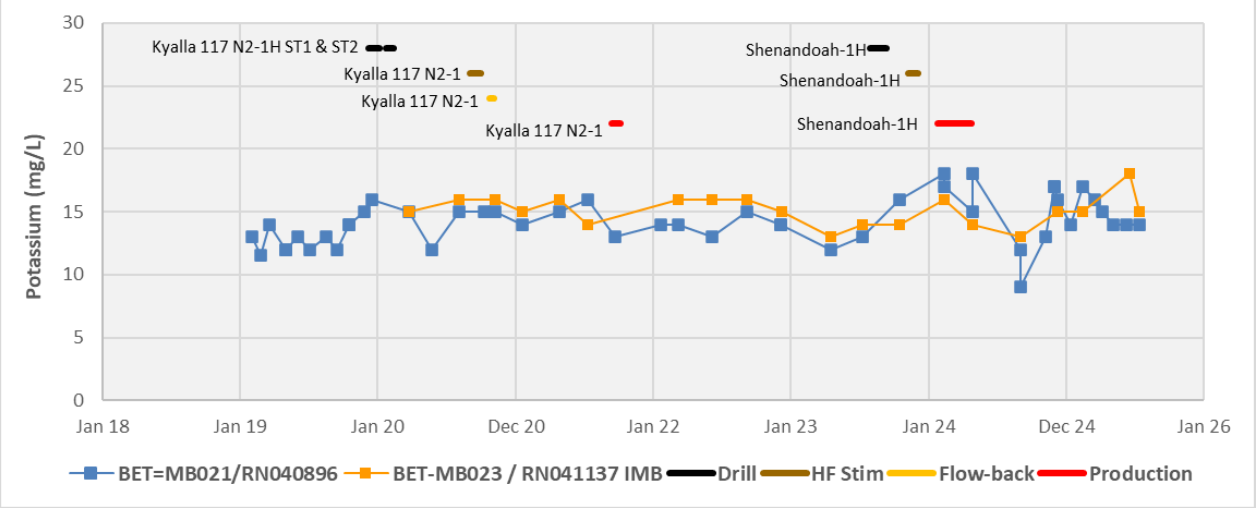


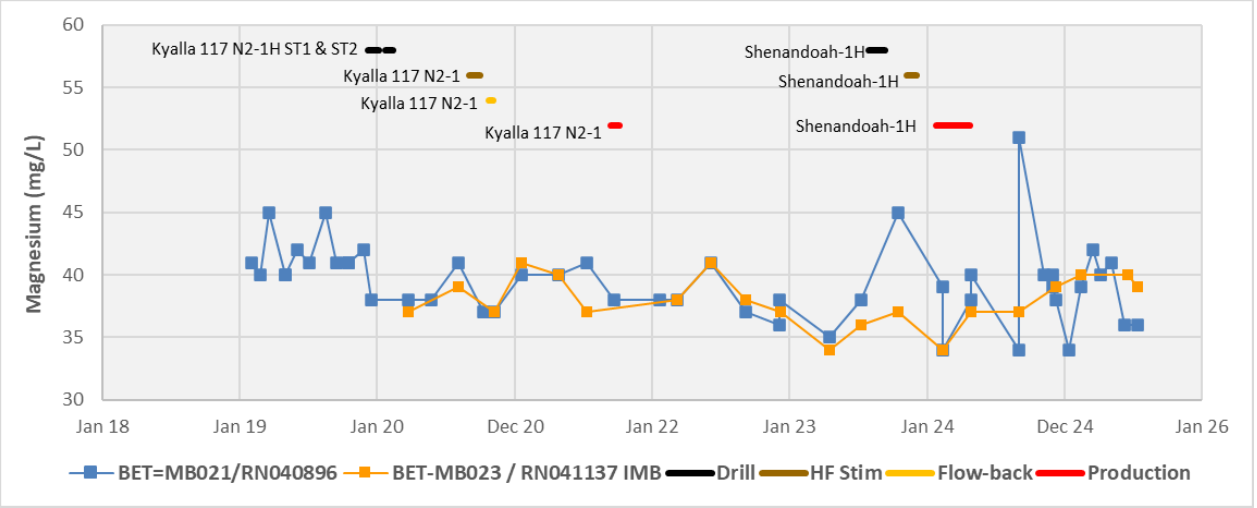

Total alkalinity as $CaCO_3$ (mg/L)
700
600
500
400
300
200
100
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

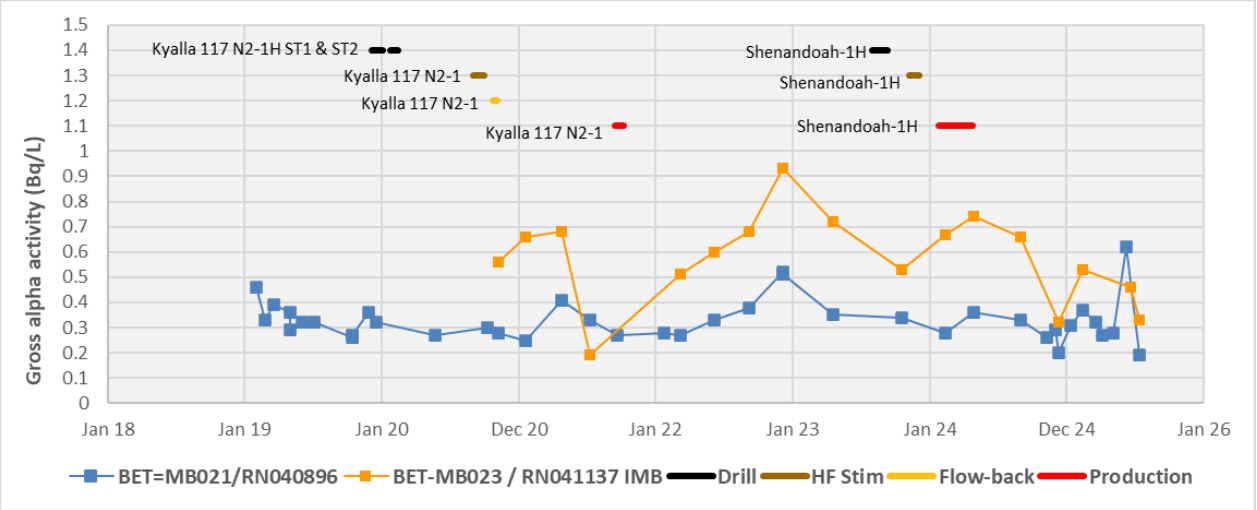

Chloride (mg/L)
300
280
260
240
220
200
180
160
140
120
100
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

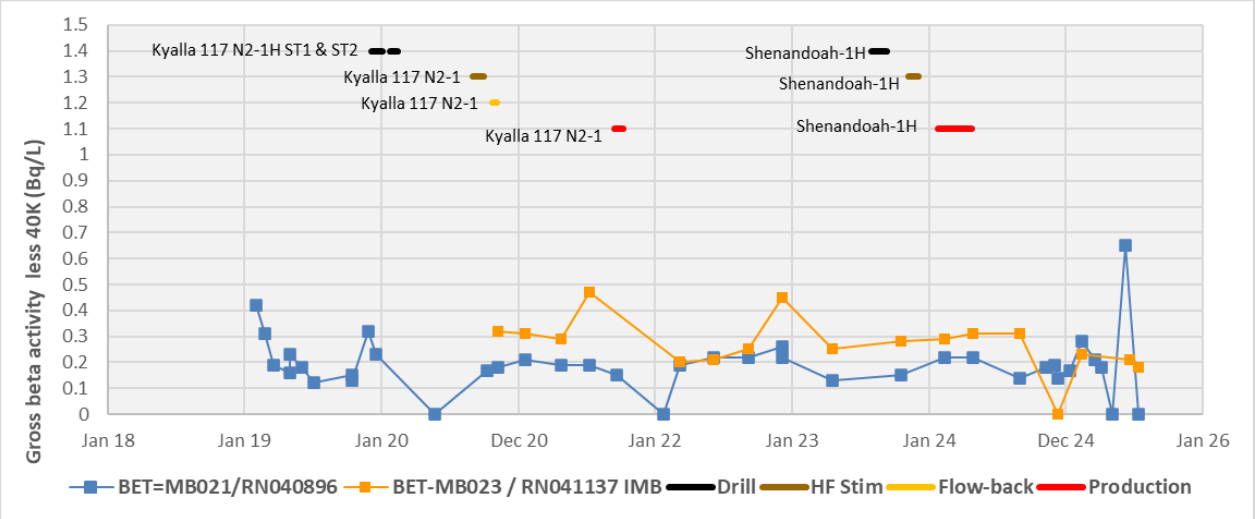

Sulphate as SO_4 (mg/L)
300
250
200
150
100
50
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

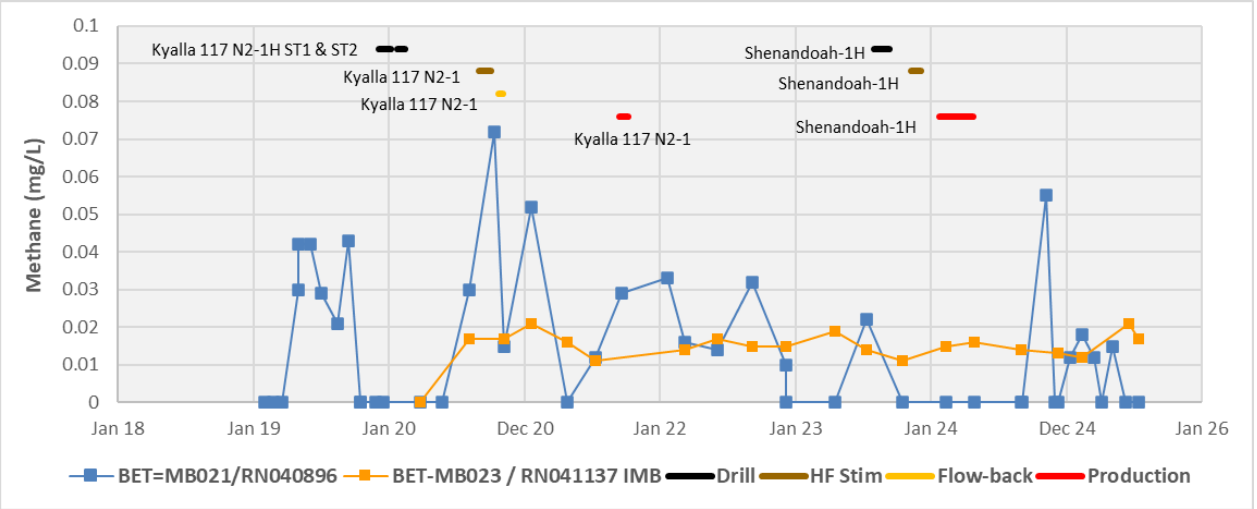

Sodium (mg/L)
250
200
150
100
50
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

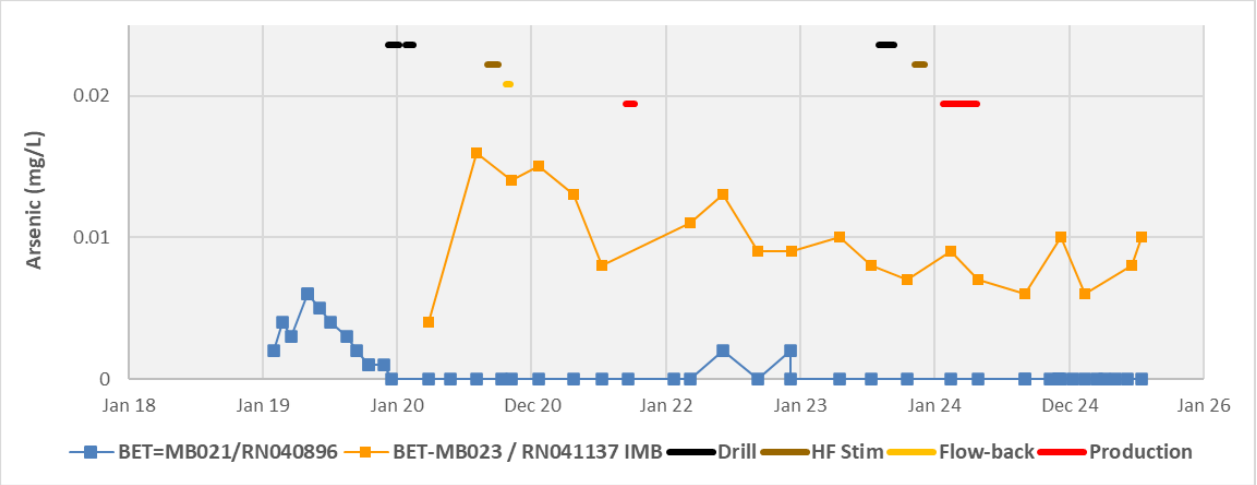

Potassium (mg/L)
30
25
20
15
10
5
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

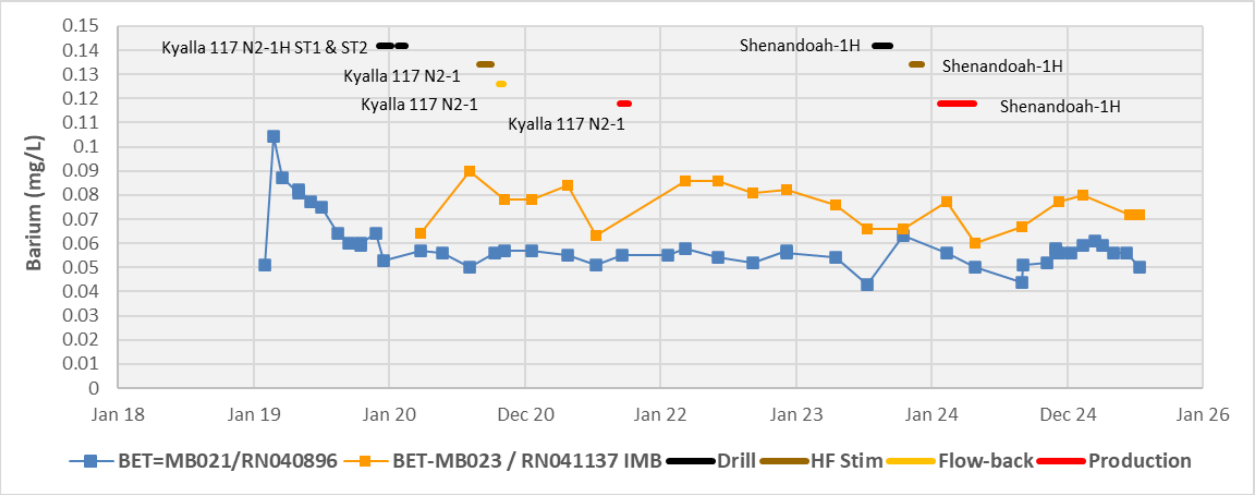

Magnesium (mg/L)
60
55
50
45
40
35
30
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

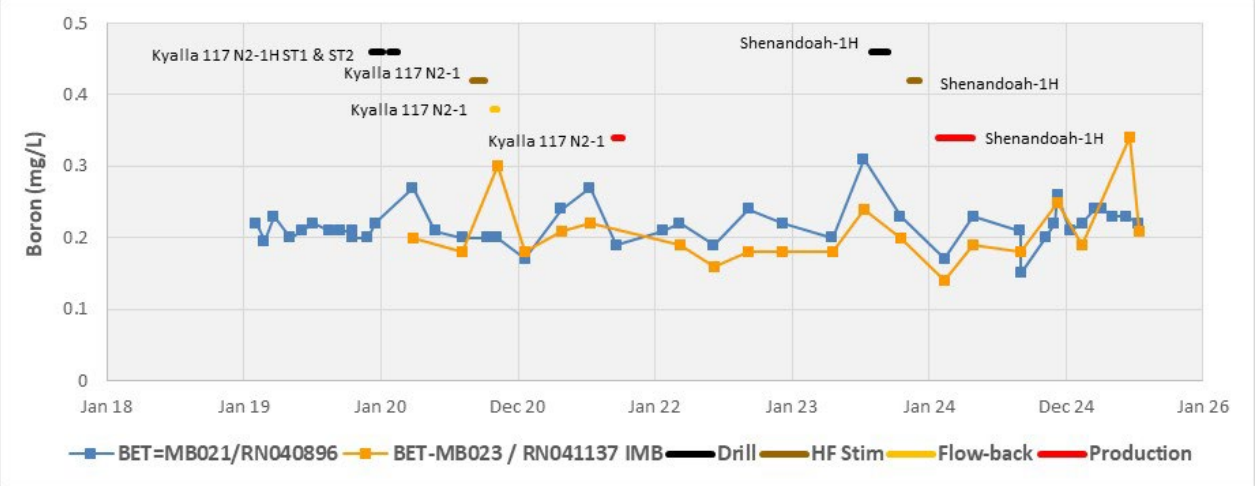

Gross alpha activity (Bq/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

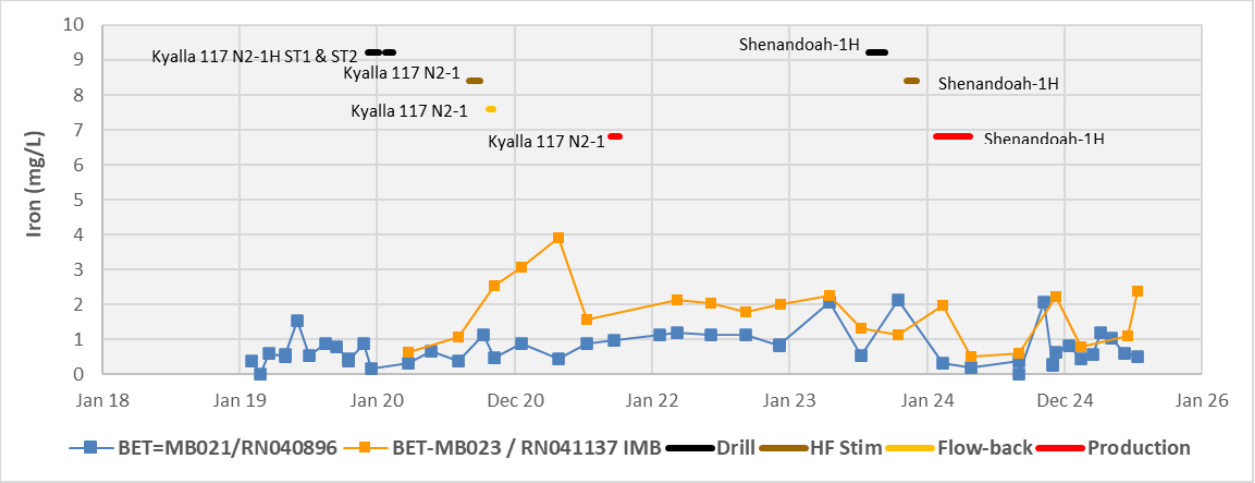

Gross beta activity less 40K (Bq/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

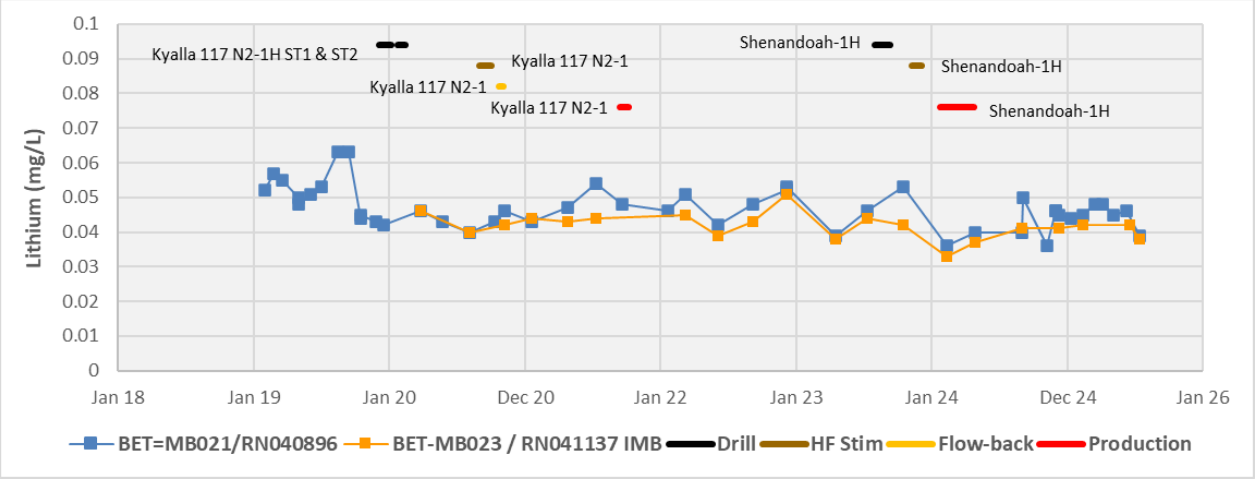

Methane (mg/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

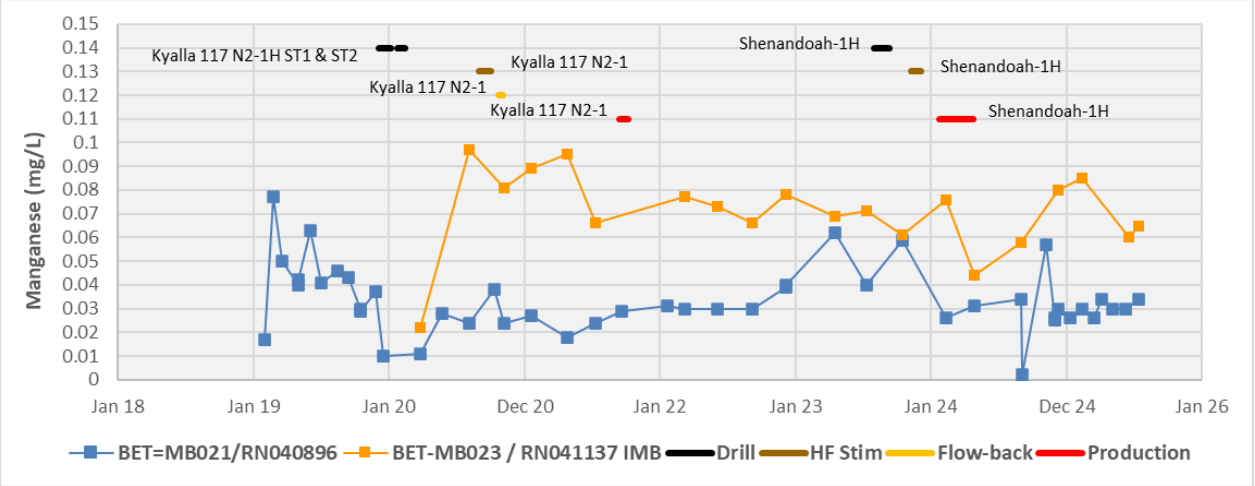

Arsenic (mg/L)
0.02
0.01
0
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

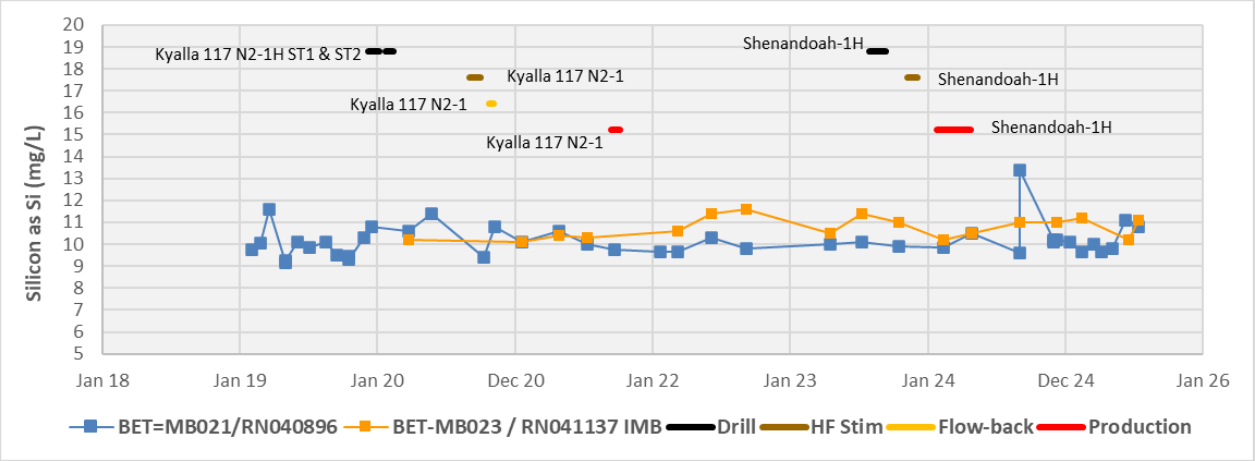

Barium (mg/L)
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production

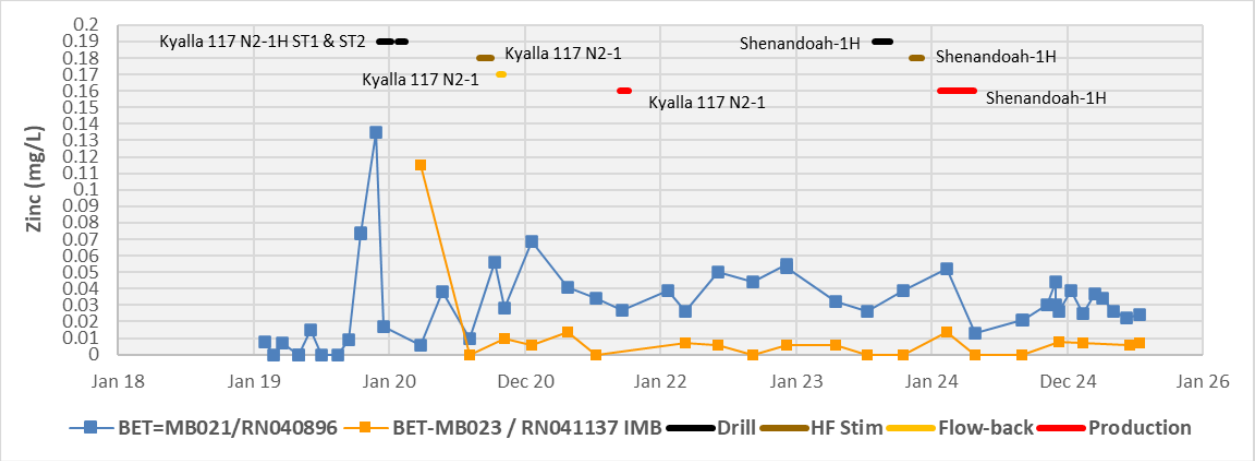

Boron (mg/L)
0.5
0.4
0.3
0.2
0.1
0
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production


Iron (mg/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production


Lithium (mg/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production


Manganese (mg/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production


Silicon as Si (mg/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production


Zinc (mg/L)
Kyalla 117 N2-1H ST1 & ST2
Kyalla 117 N2-1
Kyalla 117 N2-1
Kyalla 117 N2-1
Shenandoah-1H
Shenandoah-1H
Shenandoah-1H
Jan 18
Jan 19
Jan 20
Dec 20
Jan 22
Jan 23
Jan 24
Dec 24
Jan 26
BET=MB021/RN040896
BET-MB023 / RN041137 IMB
Drill
HF Stim
Flow-back
Production