Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

March 2023

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Revision History

Version No.	Version Details	Date
1.0	Final	14/08/23

1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mount Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1 March to 31 March 2023.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**. The year-to-date monthly rainfall totals, 2023 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2023	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
March	83.6	213.0

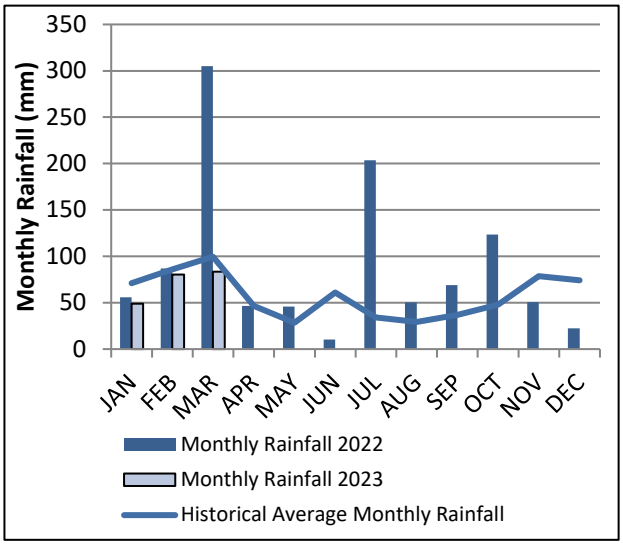

Figure 1: Rainfall Trend YTD

Note: The historical average monthly rainfall is calculated from 2007 to 2022 monthly totals

2.1.2 Wind Speed and Direction

Winds from the Northwest and South were dominant during the reporting period as shown in **Figure 2.**

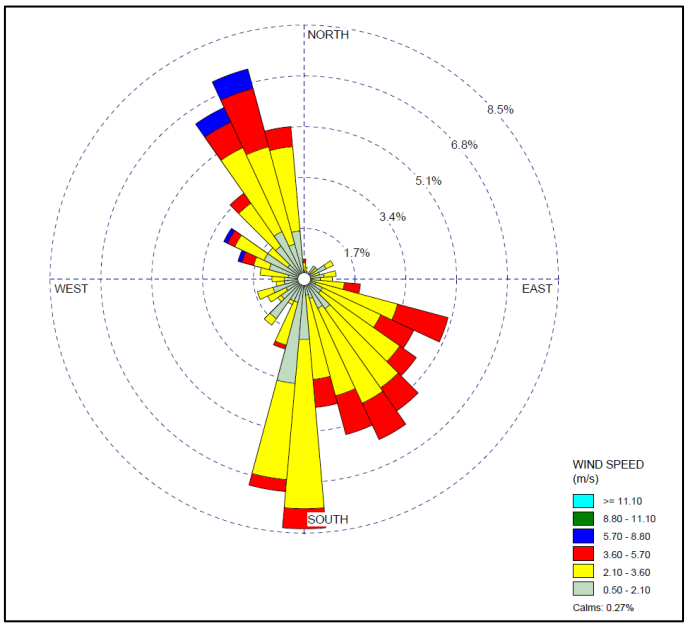

Figure 2: Charlton Ridge Wind Rose – March 2023

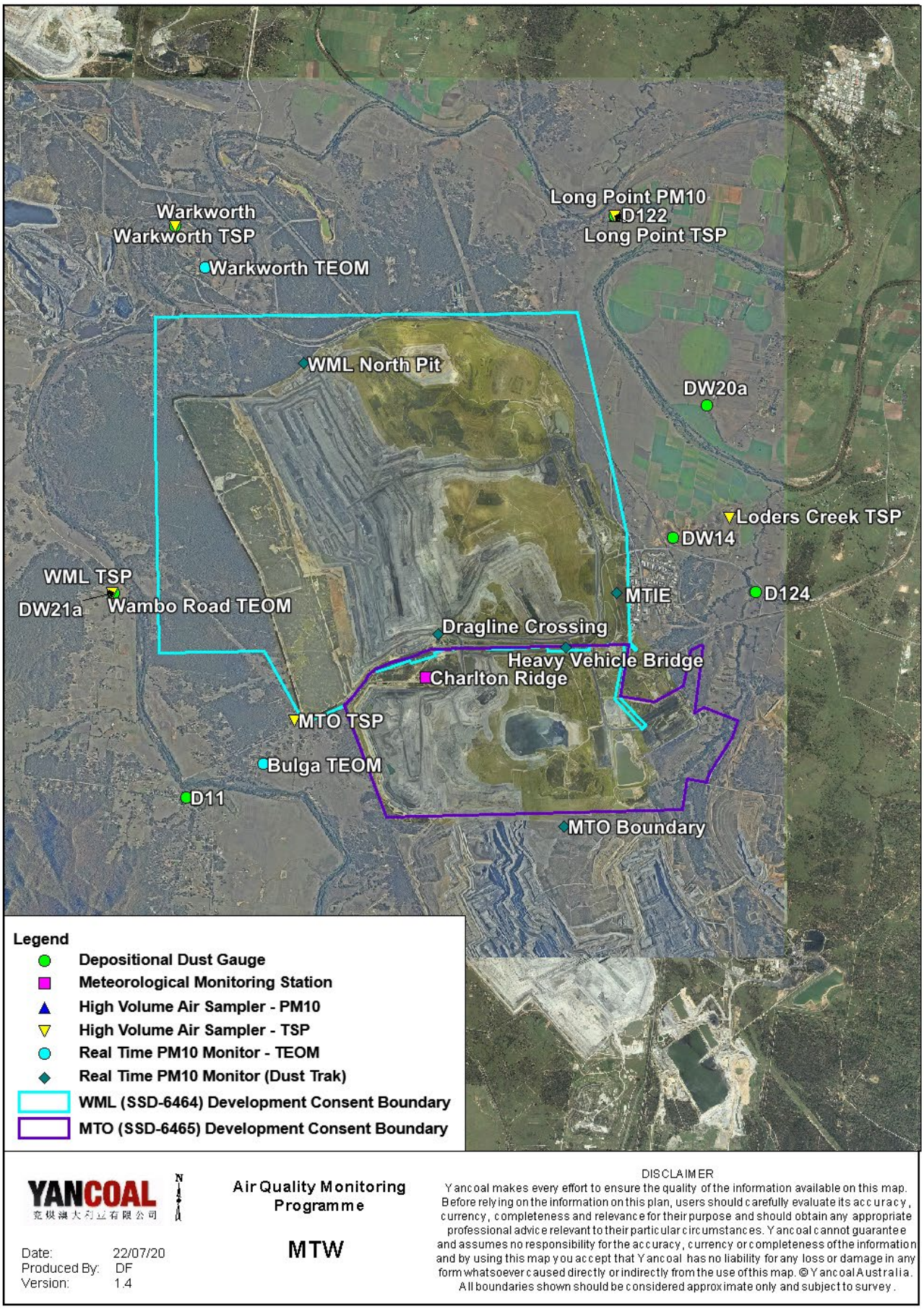

Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

To monitor air quality, MTW operates and maintains a network of seven depositional dust gauges, situated on private and mine owned land surrounding MTW.

During the reporting period the Warkworth monitor recorded a monthly result above the long-term impact assessment criteria of 4.0 g/m^2 per month. There is no evidence to suggest that the Warkworth result is contaminated. Accordingly, the result will be included in the annual average calculation.

Figure 4 displays insoluble solids results from depositional dust gauges during the reporting period compared against the year-to-date average and the annual impact assessment criteria.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2023 Annual Review Report.

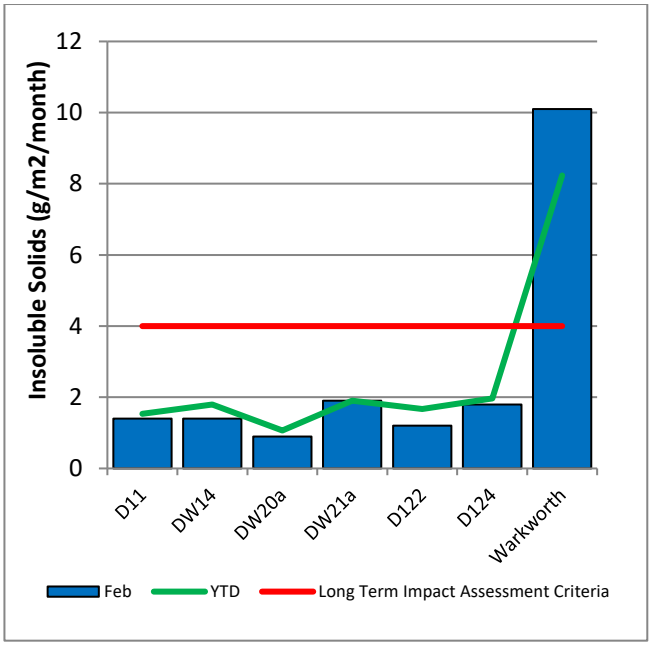

Figure 4: Depositional Dust – March 2023

2.3 Suspended Particulates

Suspended particulates are measured by a network of High Volume Air Samplers (HVAS) measuring Total Suspended Particulates (TSP) and Particulate Matter <10µm (PM_{10}). The location of these monitors can be found in **Figure 3**. Each HVAS was run for 24 hours on a six-day cycle in accordance with EPA requirements.

2.3.1 HVAS PM_{10} Results

Figure 5 shows the individual PM_{10} results at each monitoring station against the short-term impact assessment criteria of 50µg/m^3.

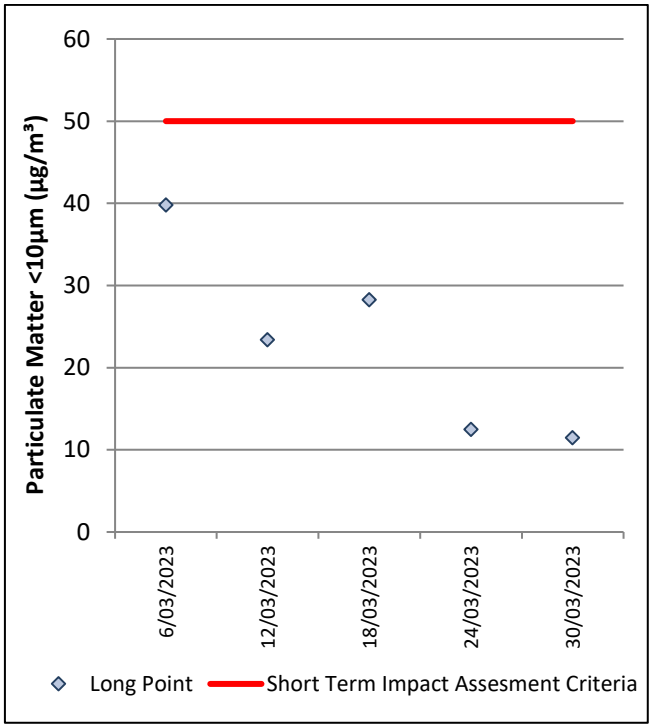

Figure 5: Individual PM10 Results – March 2023

Figure 6 shows the annual average PM10 result against the long term impact assessment criteria.

An assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2023 Annual Review Report.

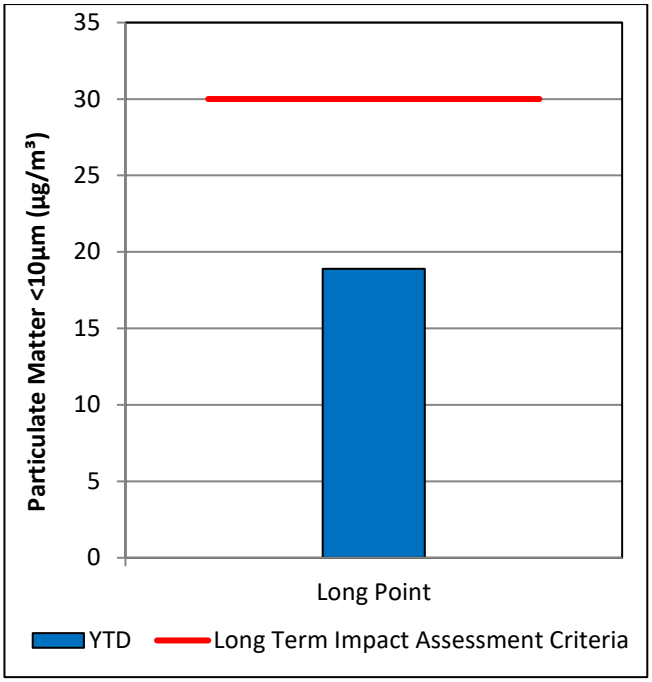

Figure 6: Annual Average PM_{10} – March 2023

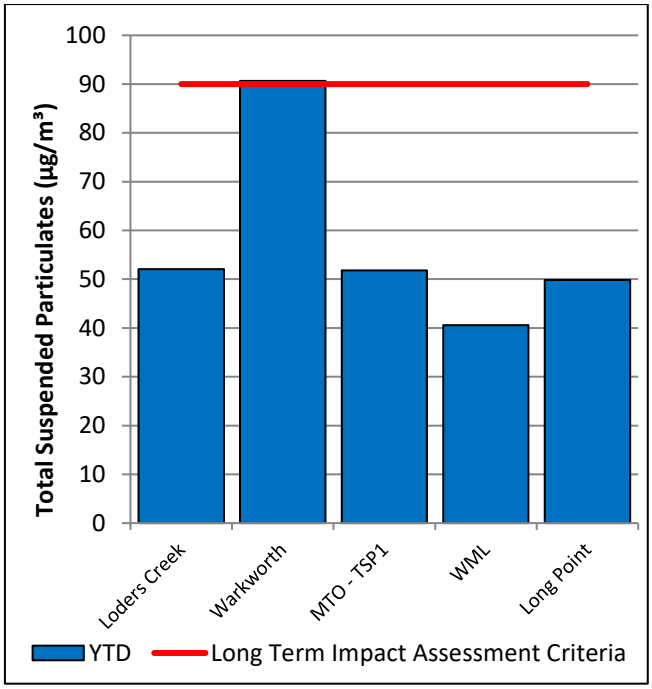

Figure 7: Annual Average Total Suspended Particulates – March 2023

2.3.2 TSP Results

Figure 7 shows the annual average TSP results compared against the long-term impact assessment criteria of 90µg/m³.

An assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2023 Annual Review Report.

Data was not available on 12 and 18 March from the Warkworth monitor due to equipment issues.

2.3.3 Real Time PM_{10} Results

MTW maintains a network of real time PM_{10} monitors. The real time air quality monitoring stations continuously log information and transmit data to a central database, generating internal alerts when particulate matter levels exceed internal trigger limits.

Results for real time dust sampling are shown in **Figure 8**, including the daily 24-hour average PM_{10} result and the annual PM_{10} average.

On 6 March 2023, the Warkworth OEH TEOM (54.1µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions on this day resulting in a maximum estimated contribution of 12.3 µg/m³, less than a 29% contribution to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 7 March 2023, the Warkworth OEH TEOM (63.1µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions on this day. It was determined that the wind direction was not from MTW's angle of influence and so that MTW was not a contributor to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 8 March 2023, the Warkworth OEH TEOM (56.5µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions on this day. It was determined that the wind direction was not from MTW's angle of influence and so that MTW was not a contributor to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 20 March 2023, the Warkworth OEH TEOM (60.7µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions and background PM_{10} levels on this day resulting in a maximum estimated contribution of 33.3 µg/m³, less than a 60% contribution to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

Data was not available on 7 and 8 from the Wambo Road monitor or on 13, 14 and 28 March from the Warkworth monitor due to equipment issues.

2.3.4 Real Time Alarms for Air Quality

During March, the real time monitoring system generated 156 automated air quality related alerts, including 9 alerts for adverse meteorological conditions and 147 alerts for elevated PM_{10} levels.

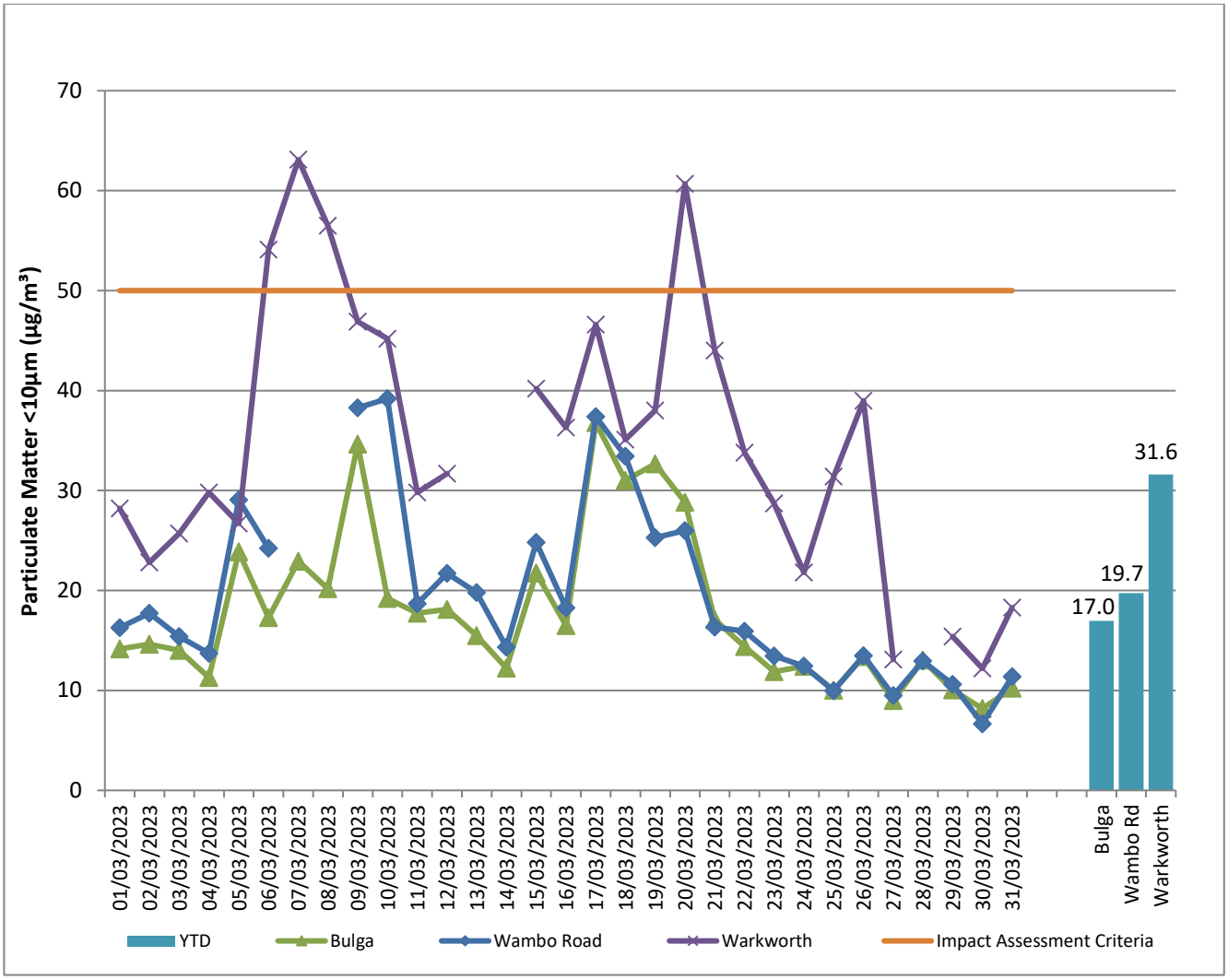

Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – March 2023

3.0 WATER QUALITY

MTW maintains a network of surface water and groundwater monitoring sites.

3.1 Surface Water

Monitoring is conducted at mine site dams and surrounding natural watercourses. The surface water monitoring locations are outlined in **Figure 15**.

Surface water courses are sampled on a monthly or quarterly sampling regime. Water quality is evaluated through the parameters of pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS). The Hunter River and the Wollombi Brook are sampled both upstream and downstream of mining operations, to record background water quality and to monitor the potential impact of mining on the river system. Other Hunter River tributaries are also monitored.

3.1.1 Surface Water Monitoring results

Figure 9 to **Figure 11** show the long-term surface waste trend (2020 – current) within MTW mine dams. **Figure 12** to **Figure 14** show the long-term surface water trend (2020 – current) in surrounding watercourses.

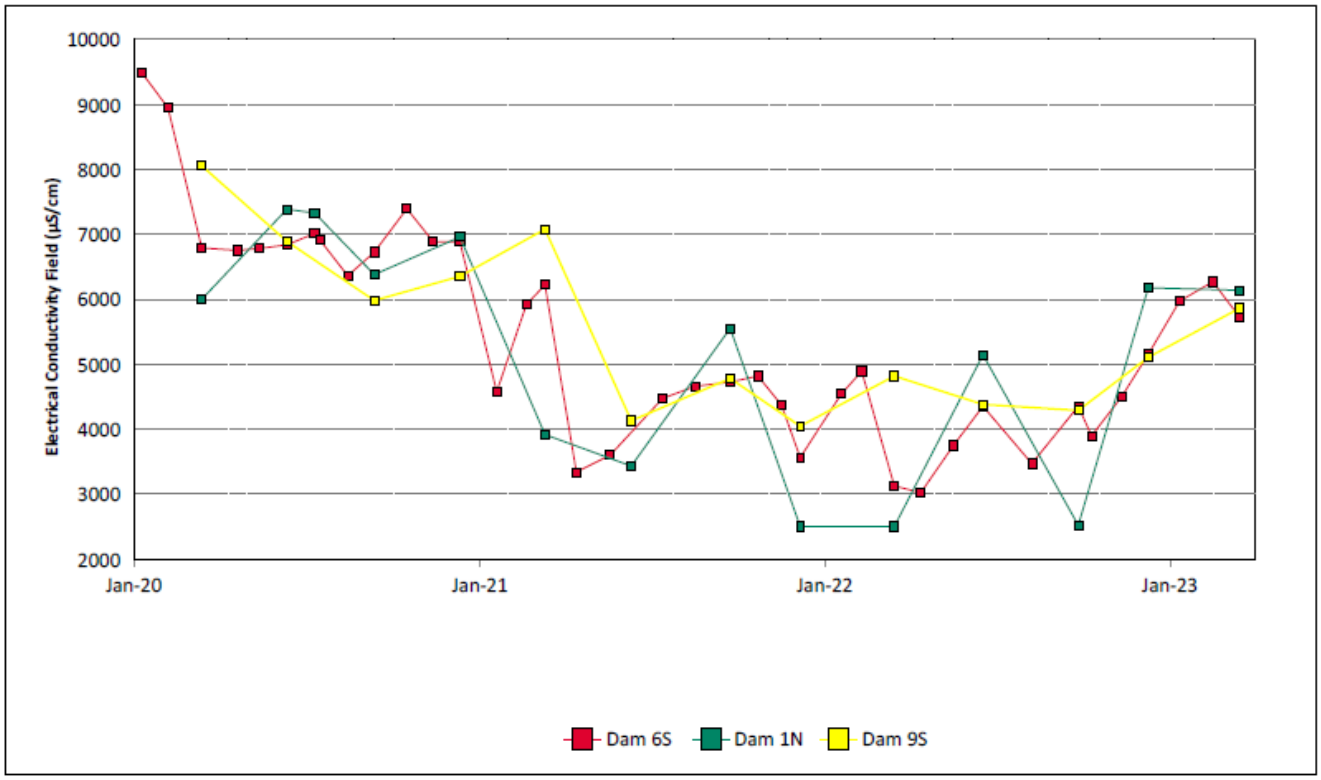

Figure 9: Site Dams Electrical Conductivity Field Trend – March 2023

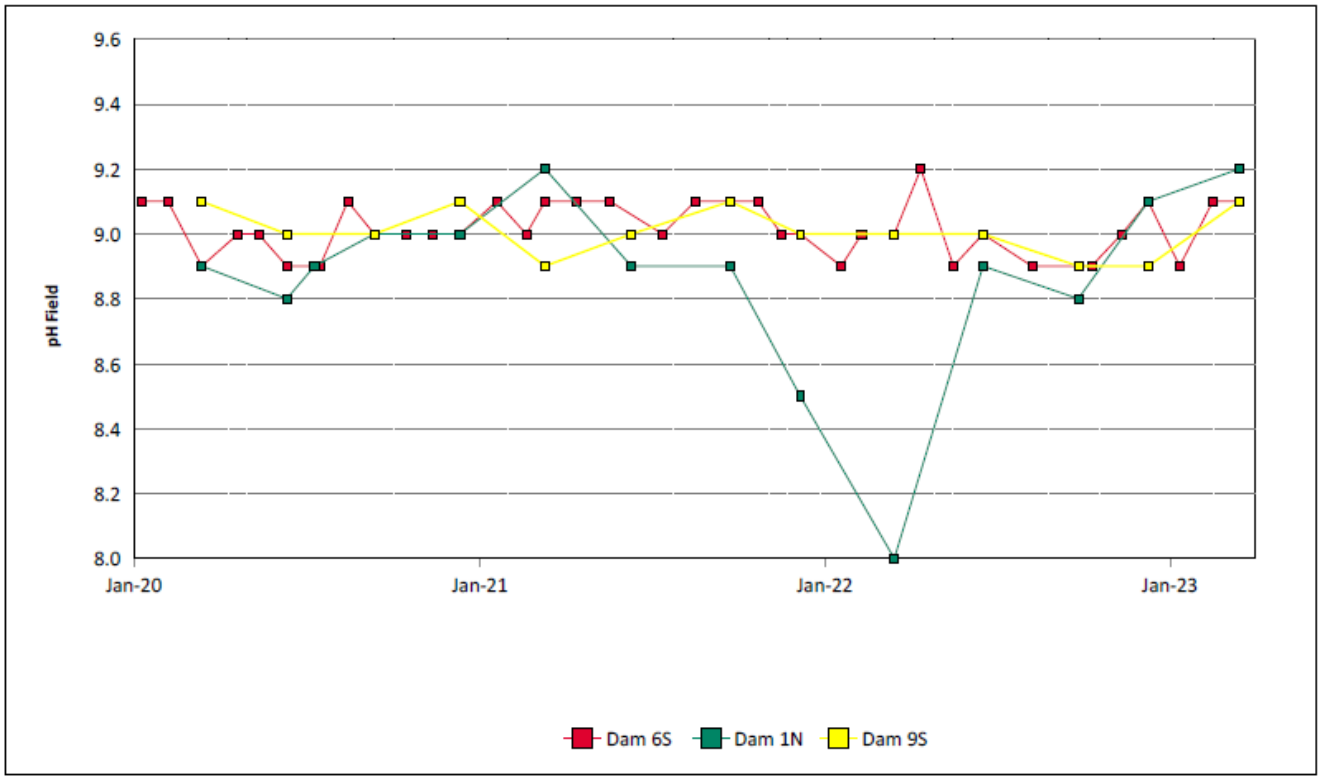

Figure 10: Site Dams pH Field Trend – March 2023

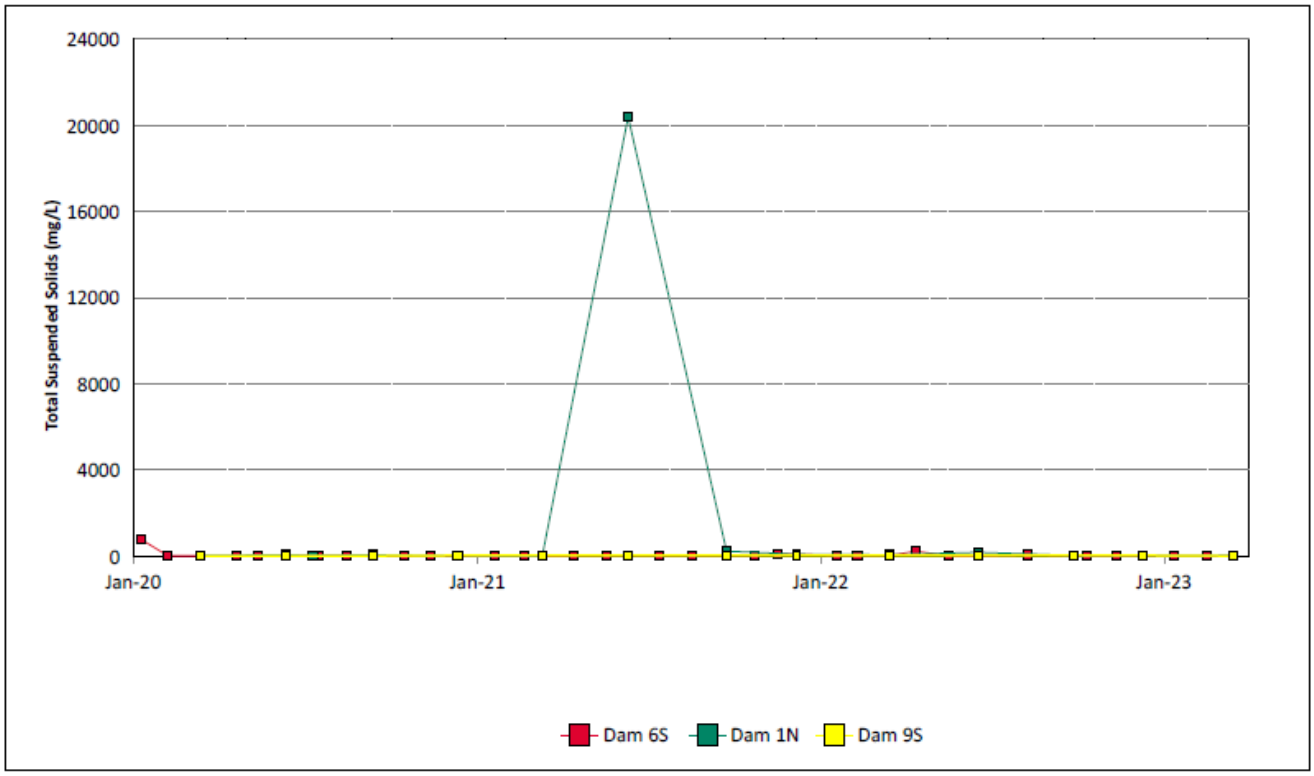

Figure 11: Site Dams Total Suspended Solids Trend – March 2023

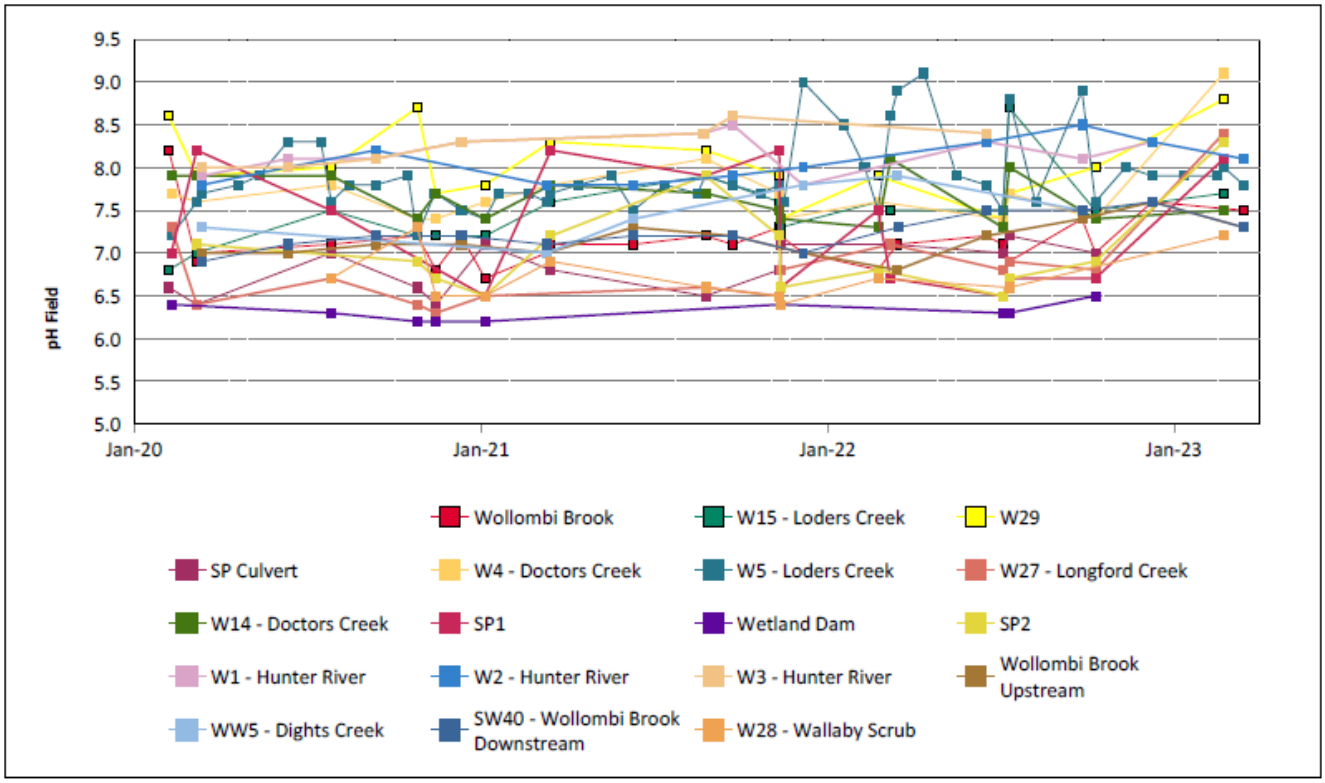

Figure 12: Watercourse pH Field Trend – March 2023

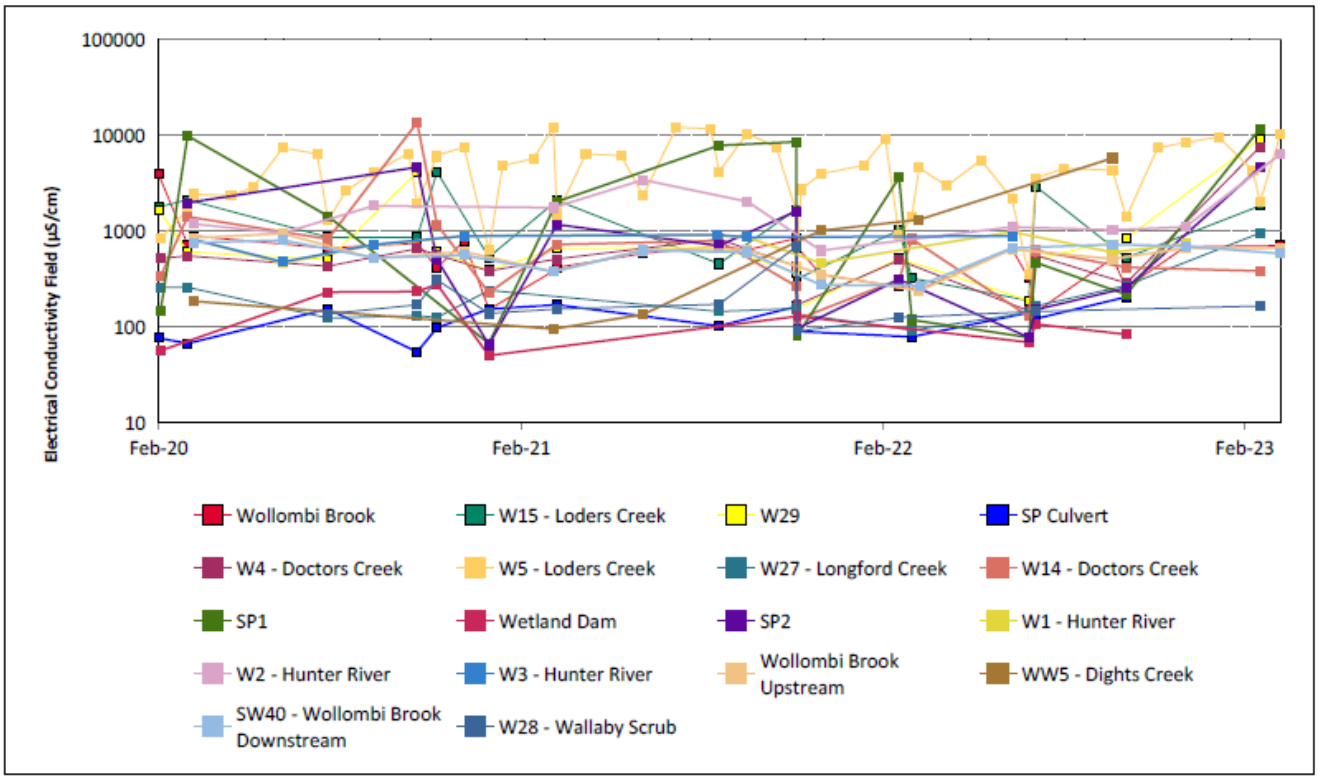

Figure 13: Watercourse Electrical Conductivity Field Trend – March 2023

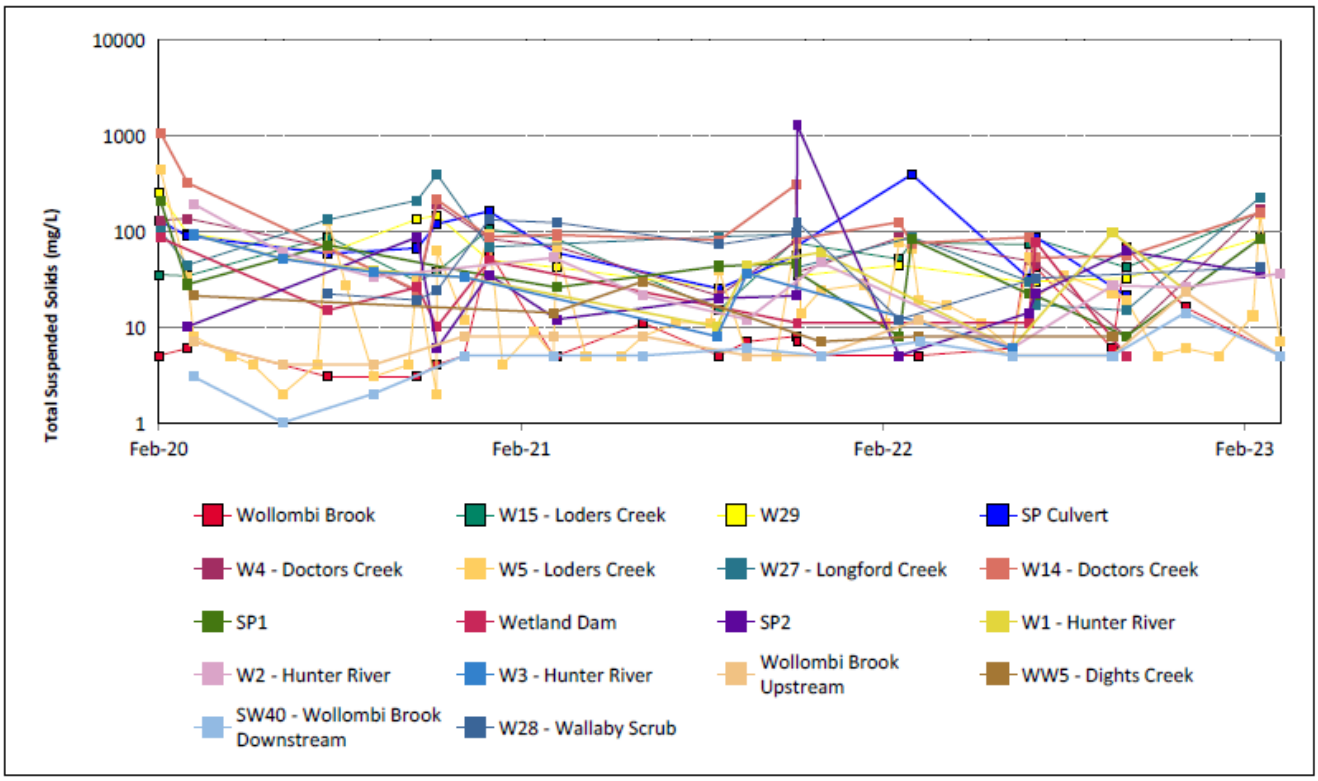

Figure 14: Watercourse Total Suspended Solids Trend – March 2023

3.1.2 Surface Water Trigger Tracking

Internal trigger limits have been developed to assess monitoring data on an on-going basis, and to highlight potentially adverse surface water impacts. The process for evaluating monitoring results against the internal triggers and subsequent responses are outlined in the MTW Water Management Plan.

Current internal surface water trigger limit breaches are summarised in **Table 2**.

Table 2: Surface Water Trigger Tracking – March 2023

Site	Date	Trigger Limit Breached	Action Taken in Response
W2	15/03/2023	EC – 95th Percentile	Watching Brief*
W27	22/02/2023	EC – 95th Percentile	Watching Brief*
W4	22/02/2023	pH – 95th Percentile	Watching Brief*
W27	22/02/2023	pH – 95th Percentile	Watching Brief*
W4	22/02/2023	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (53.2mm on 22/02/2023), resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
W14	22/02/2023	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (53.2mm on 22/02/2023), resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
W15	22/02/2023	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (53.2mm on 22/02/2023), resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
W27	22/02/2023	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (53.2mm on 22/02/2023), resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
W29	22/02/2023	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (53.2mm on 22/02/2023), resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
SP1	22/02/2023	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (53.2mm on 22/02/2023), resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
* = Watching brief established pending outcomes of subsequent monitoring events. No specific actions required.			

3.2 HRSTS Discharge

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points located at Dam 1N and Dam 9S. Discharges can only take place subject to HRSTS regulations.

No HRSTS discharge occurred during the reporting period.

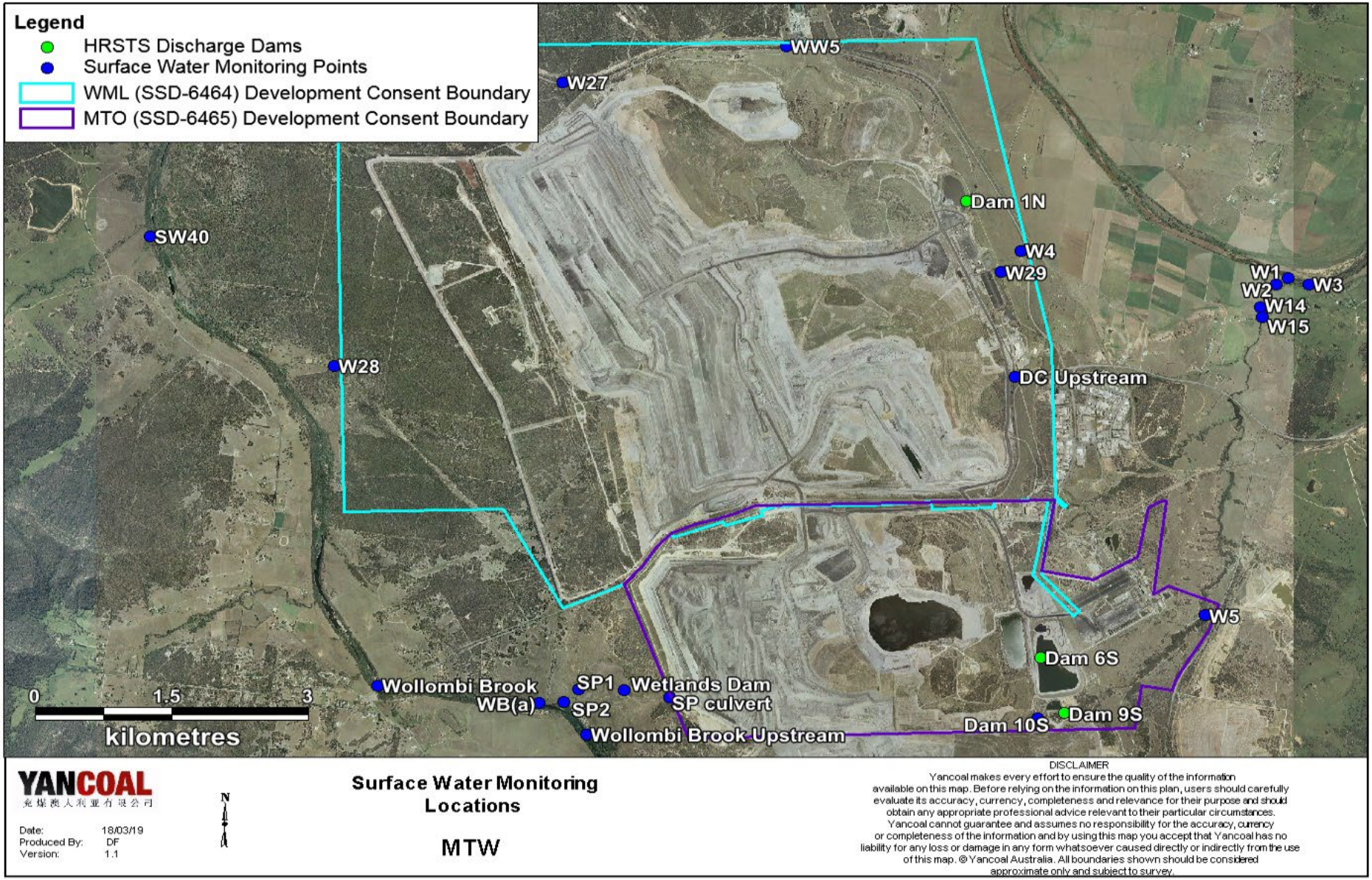

Figure 15: Surface Water Monitoring Location Plan

3.3 Groundwater Monitoring

Groundwater monitoring is undertaken on a quarterly basis in accordance with the MTW Groundwater Monitoring Programme.

Figure 16 to **Figure 64** show the long-term water quality trends (2020 - current) for groundwater bores monitored at MTW.

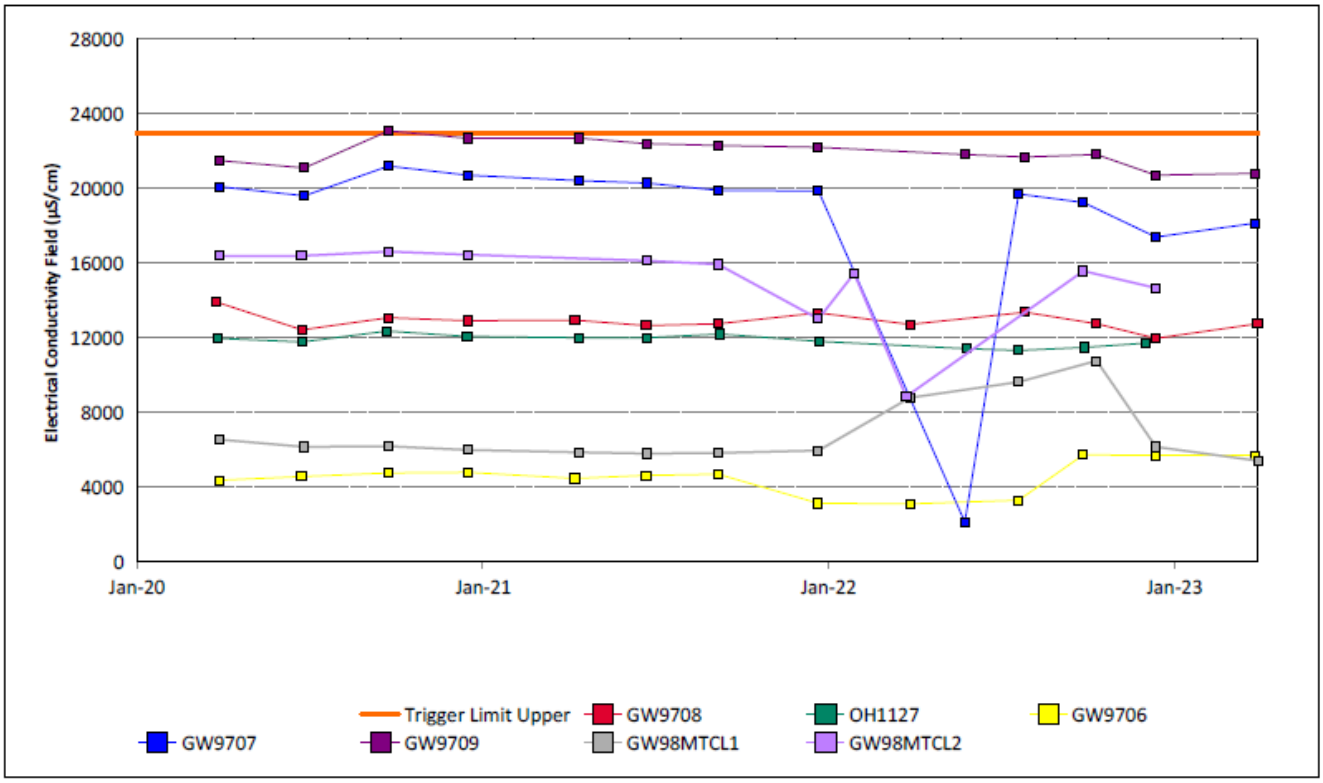

Figure 16: Bayswater Seam Electrical Conductivity Field Trend – March 2023

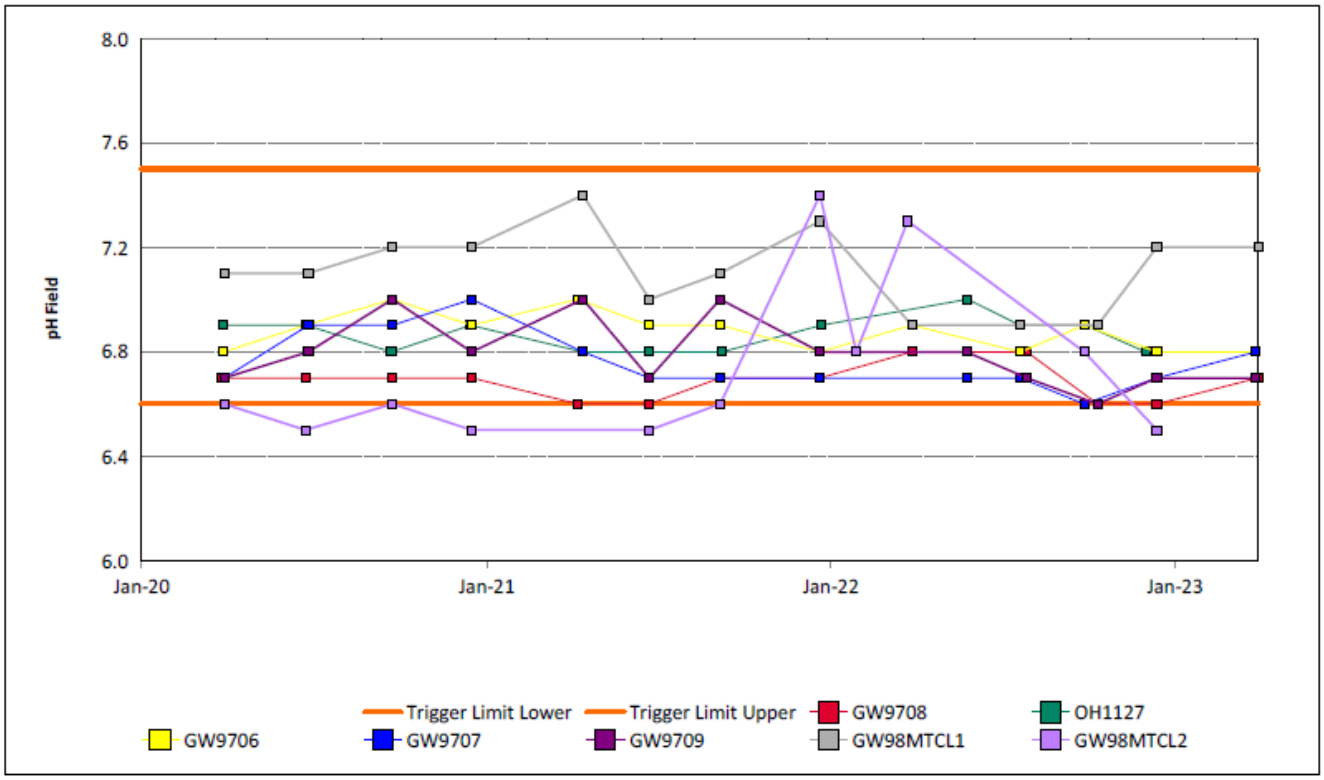

Figure 17: Bayswater Seam pH Field Trend – March 2023

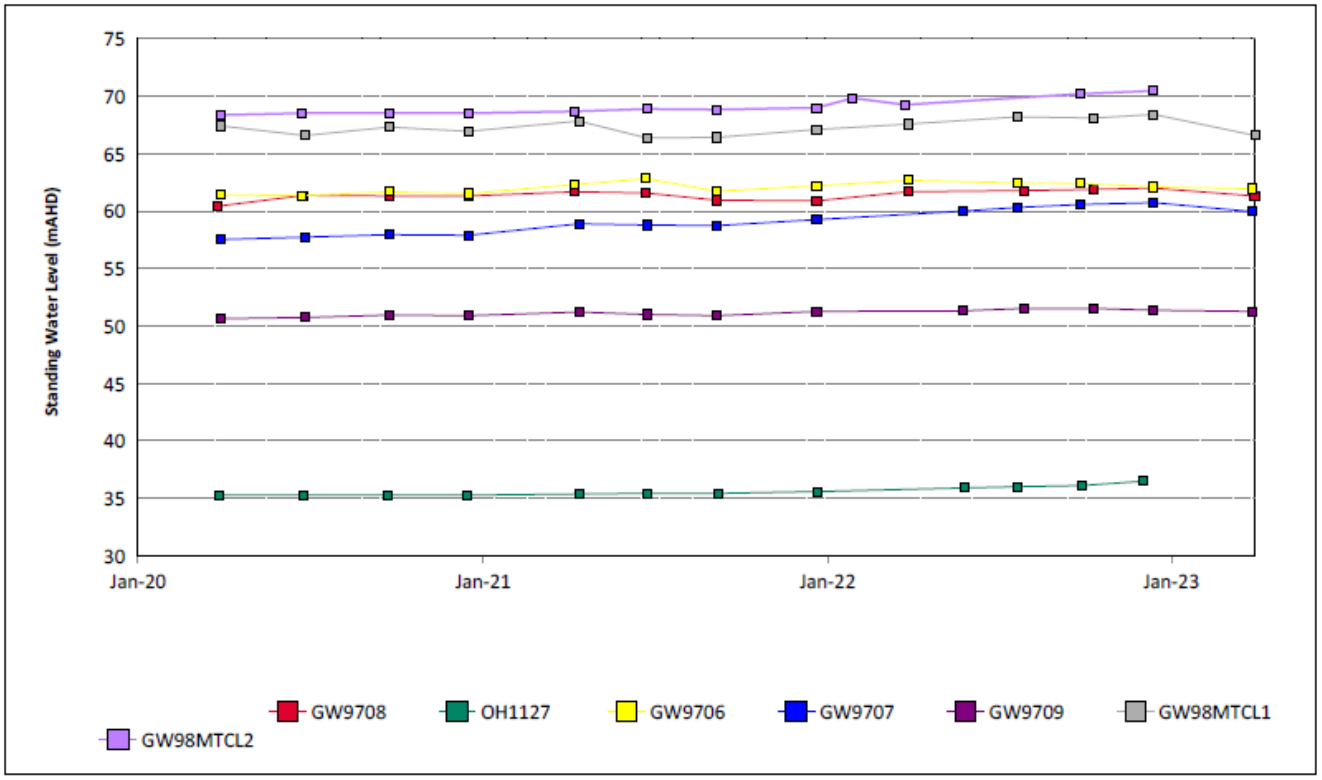

Figure 18: Bayswater Seam Standing Water Level Trend – March 2023

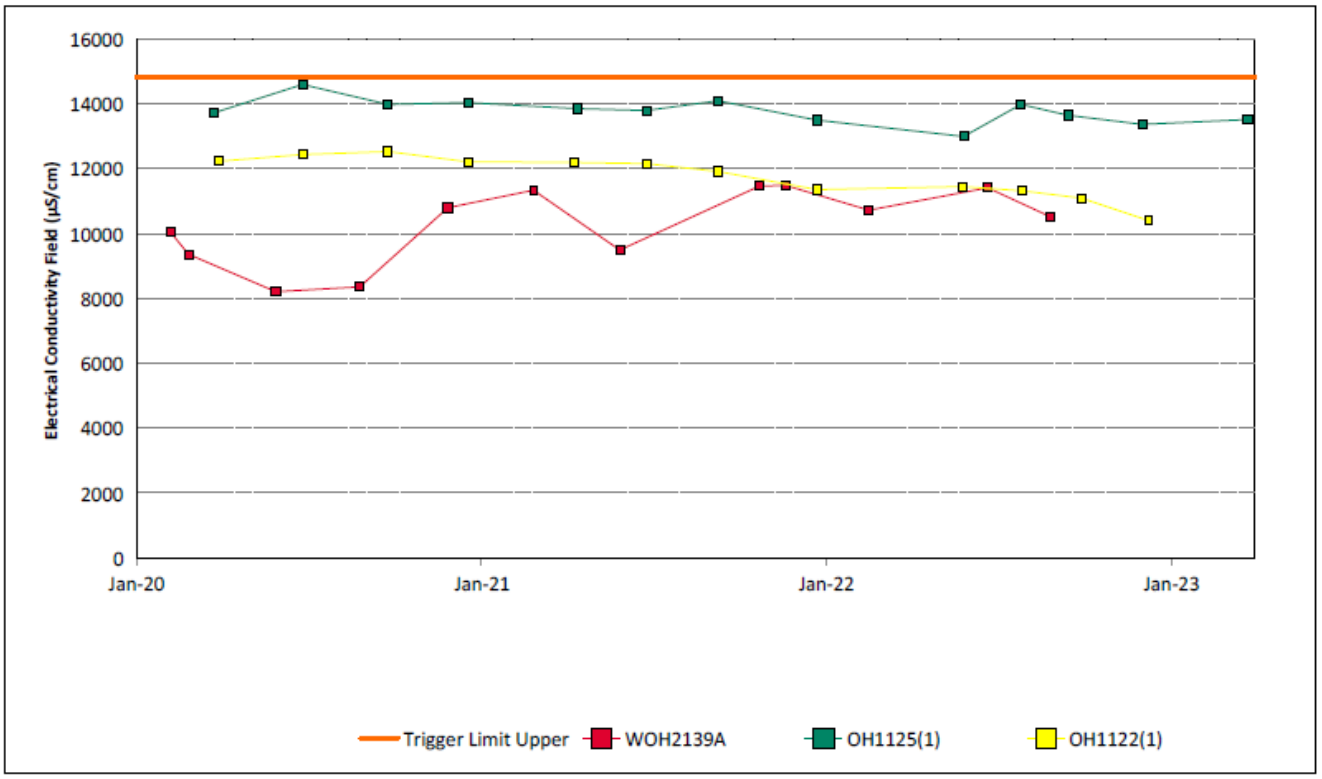

Figure 19: Blakefield Seam Electrical Conductivity Field Trend – March 2023

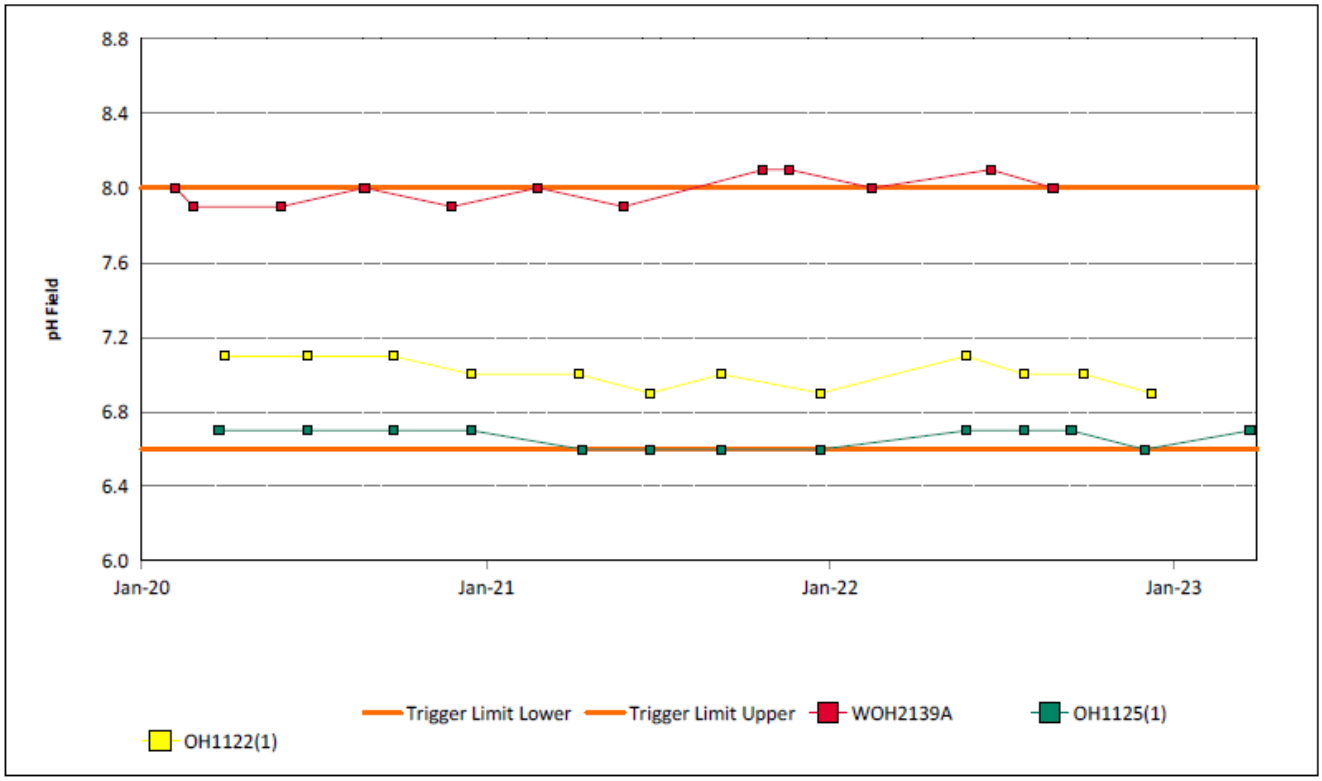

Figure 20: Blakefield Seam pH Field Trend – March 2023

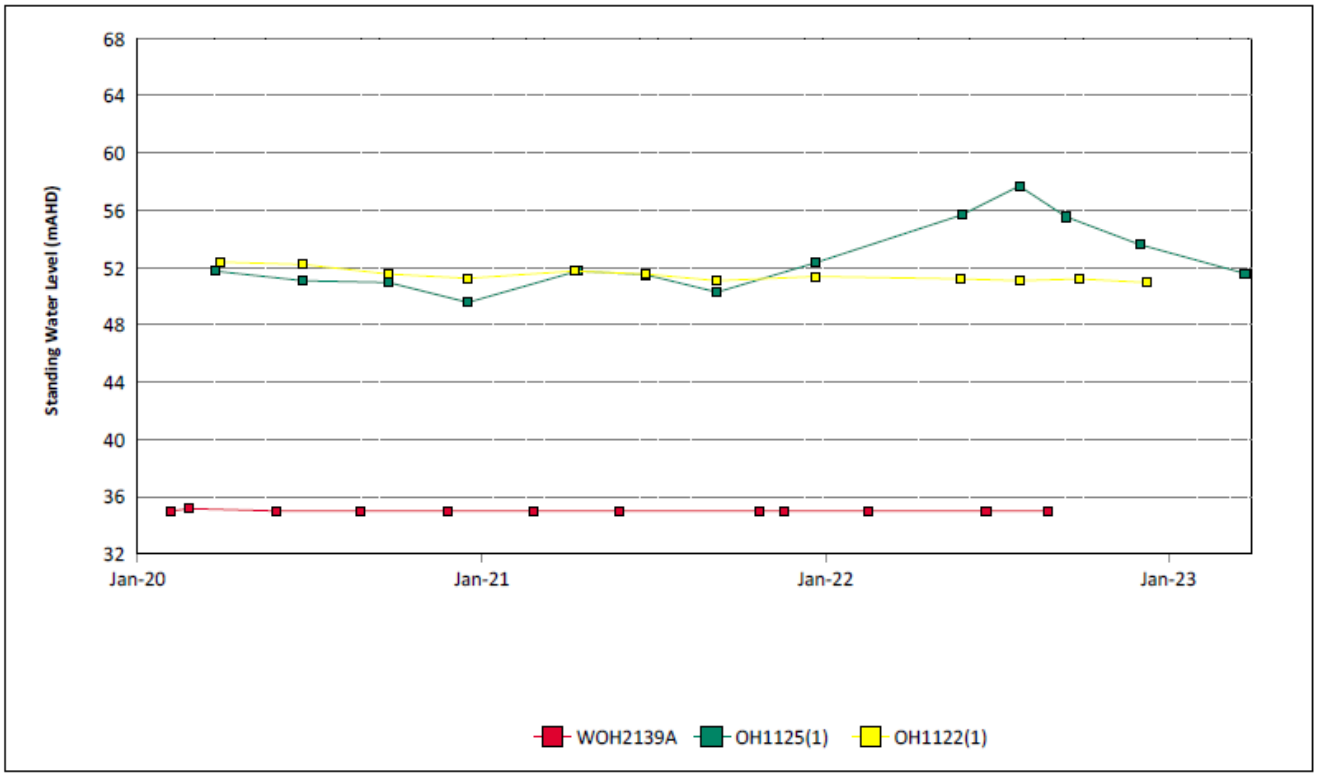

Figure 21: Blakefield Seam Standing Water Level Trend – March 2023

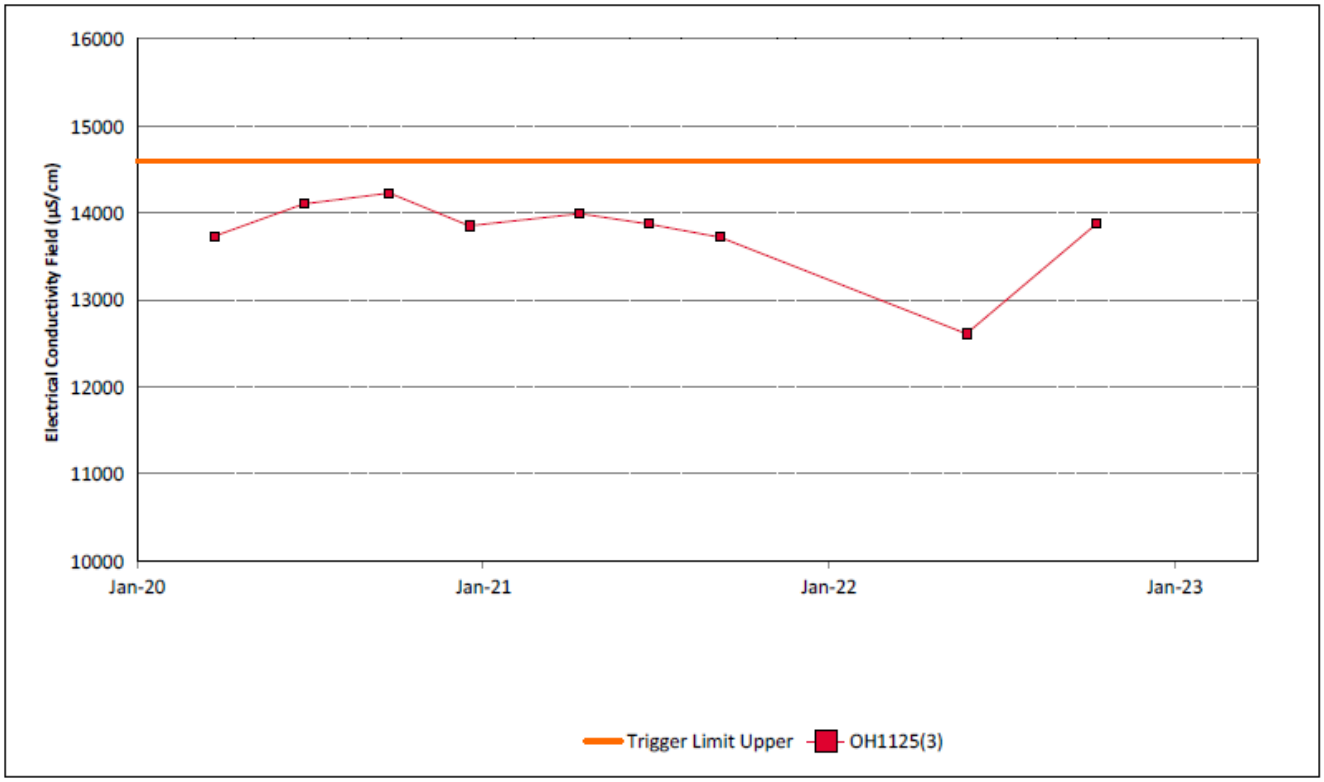

Figure 22: Bowfield Seam Electrical Conductivity Field Trend – March 2023

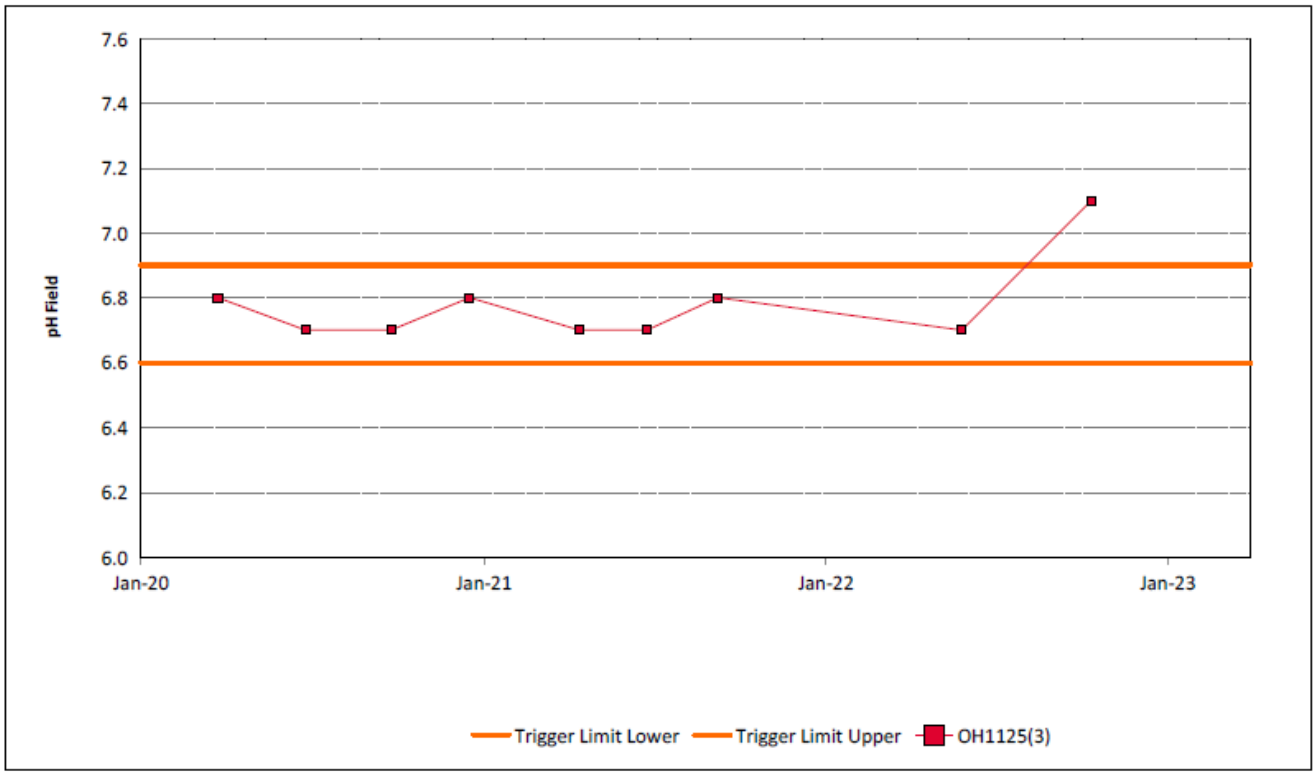

Figure 23: Bowfield Seam pH Field Trend - March 2023

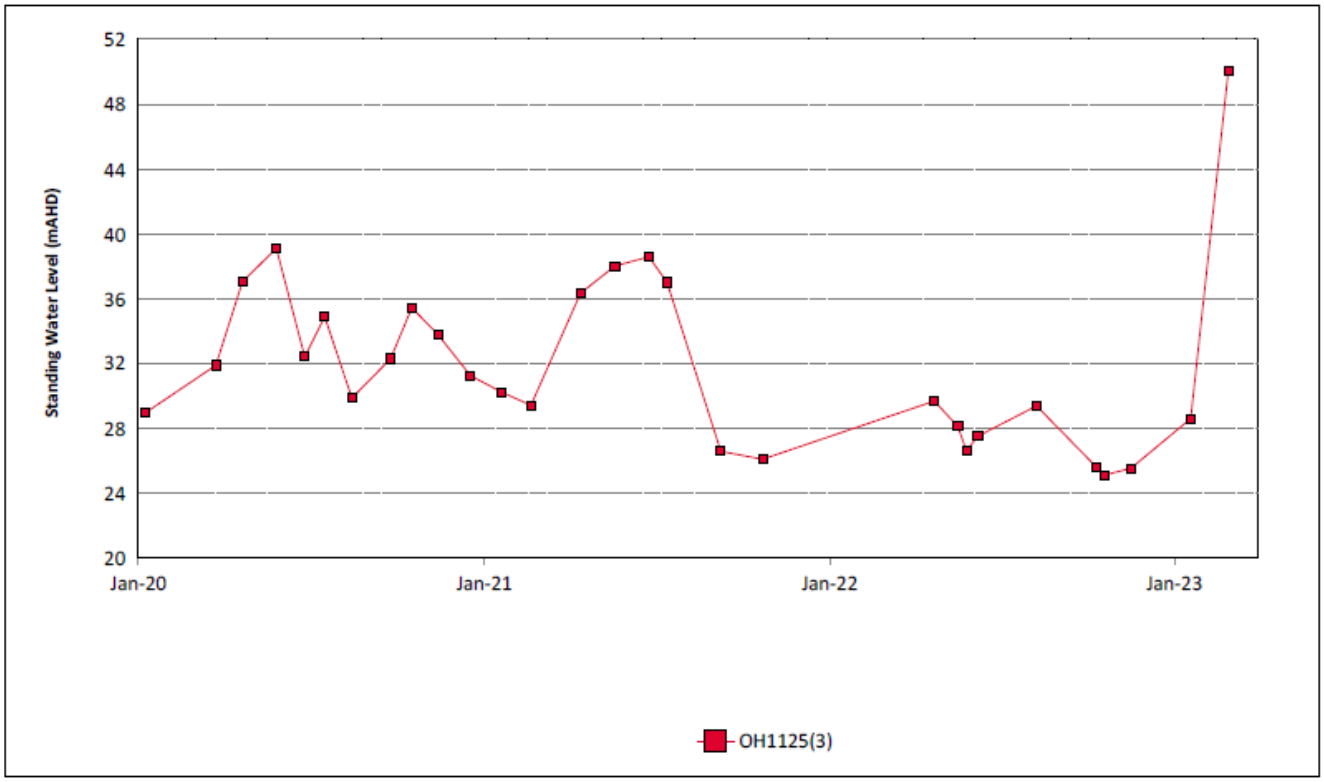

Figure 24: Bowfield Seam Standing Water Level Trend – March 2023

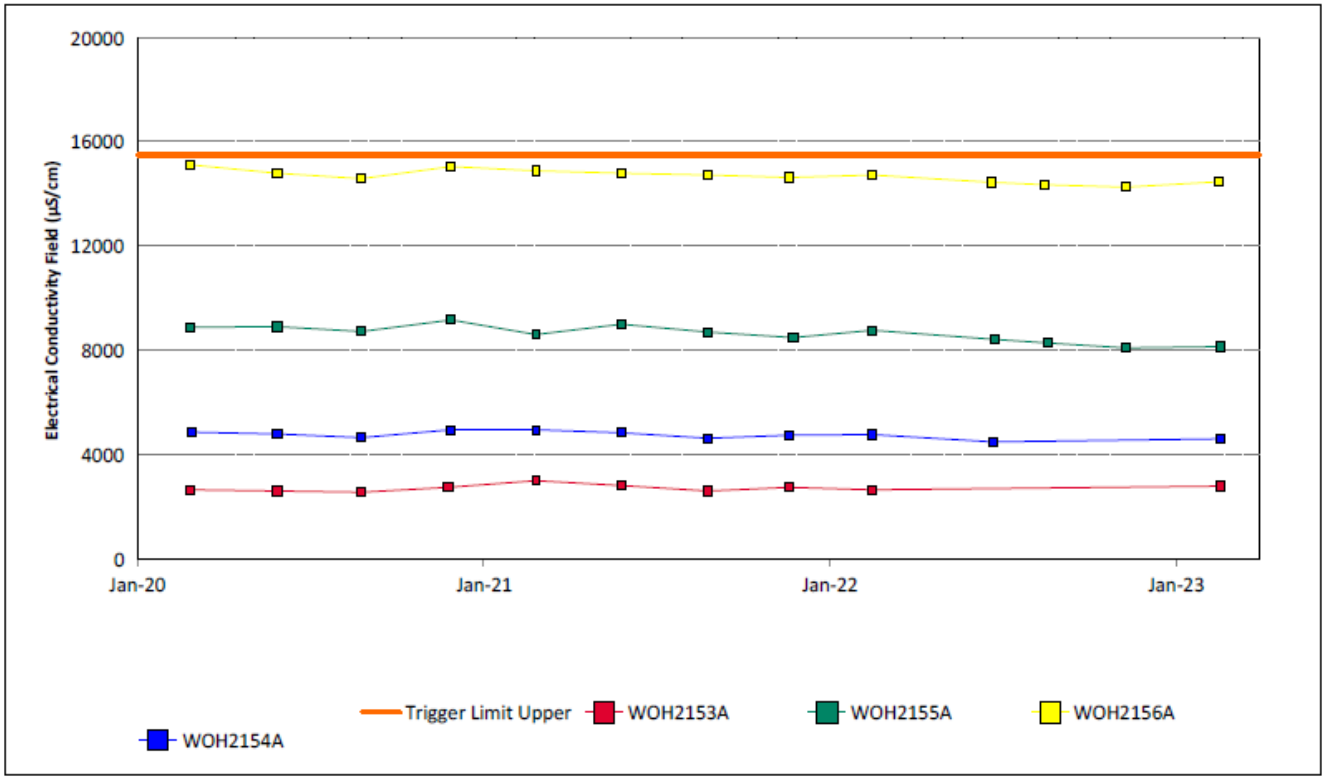

Figure 25: Redbank Seam Electrical Conductivity Field Trend – March 2023

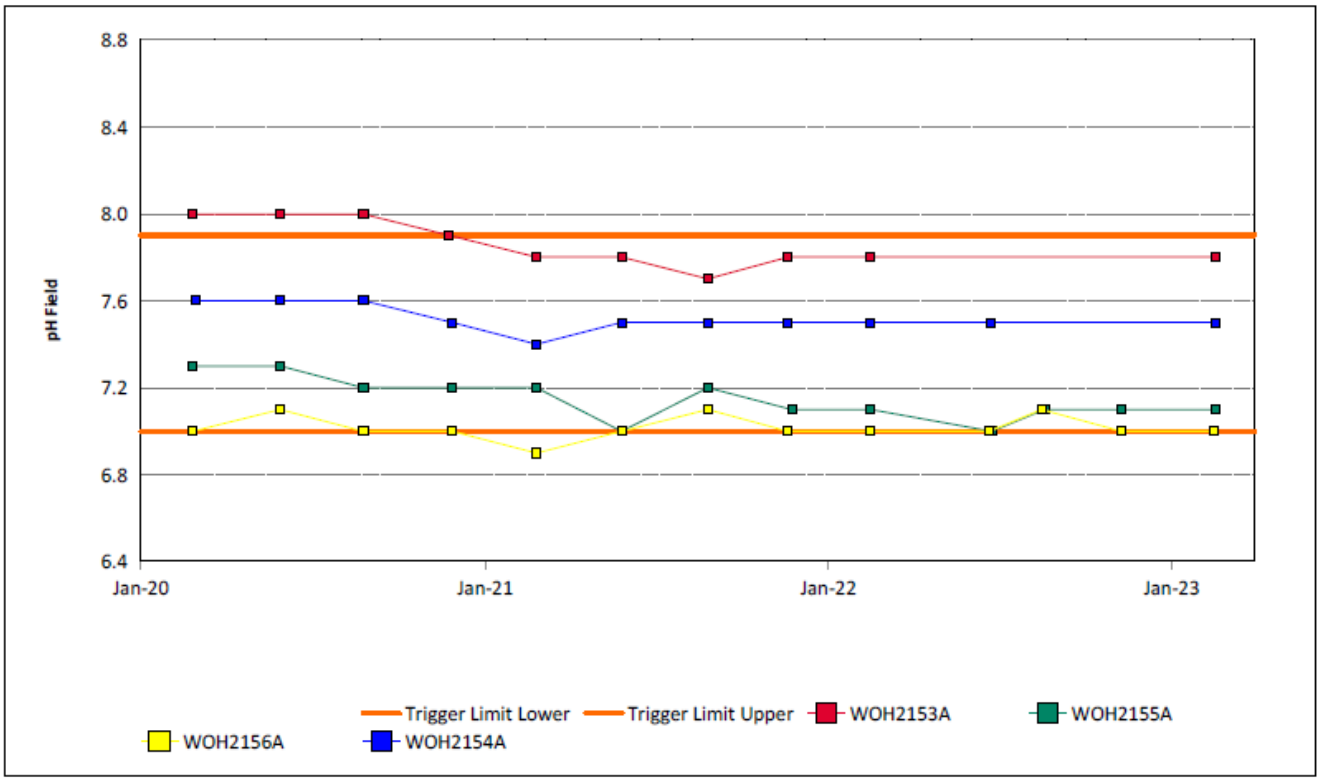

Figure 26: Redbank Seam pH Field Trend – March 2023

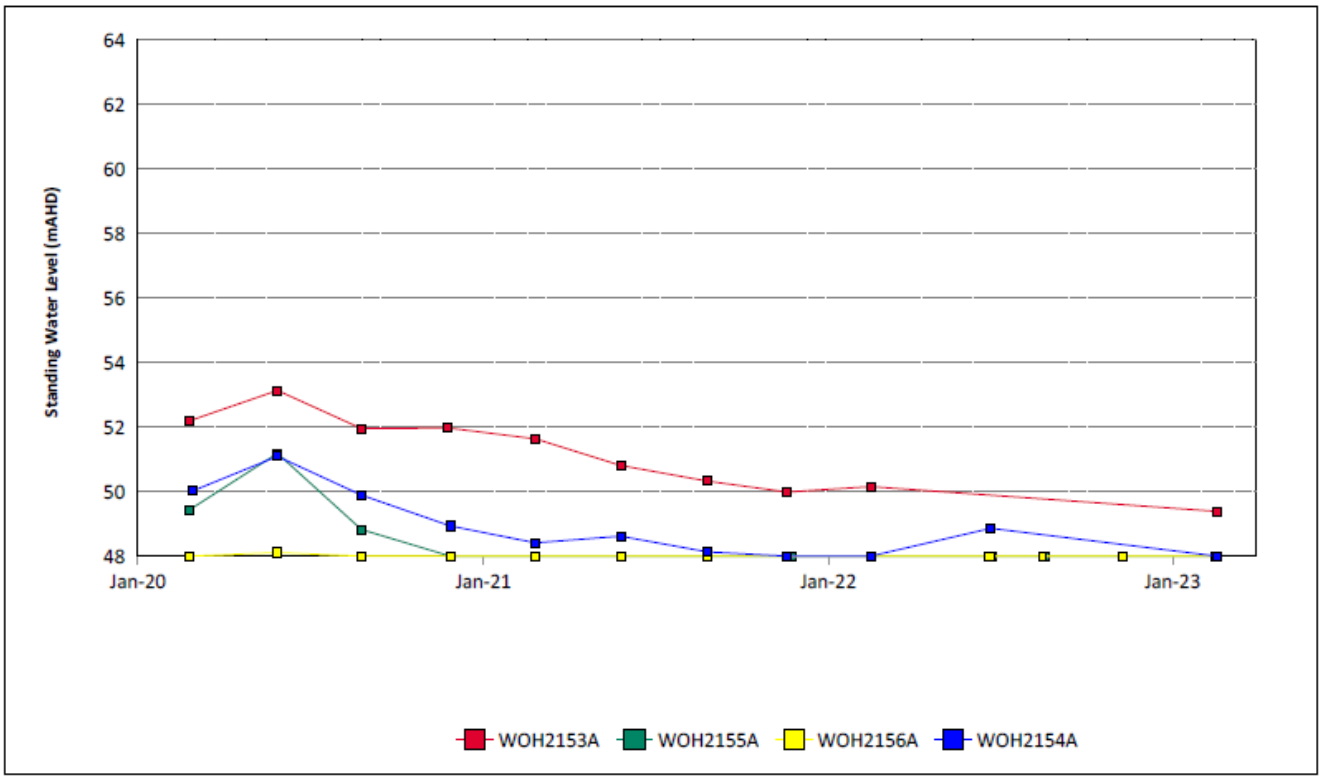

Figure 27: Redbank Seam Standing Water Level Trend – March 2023

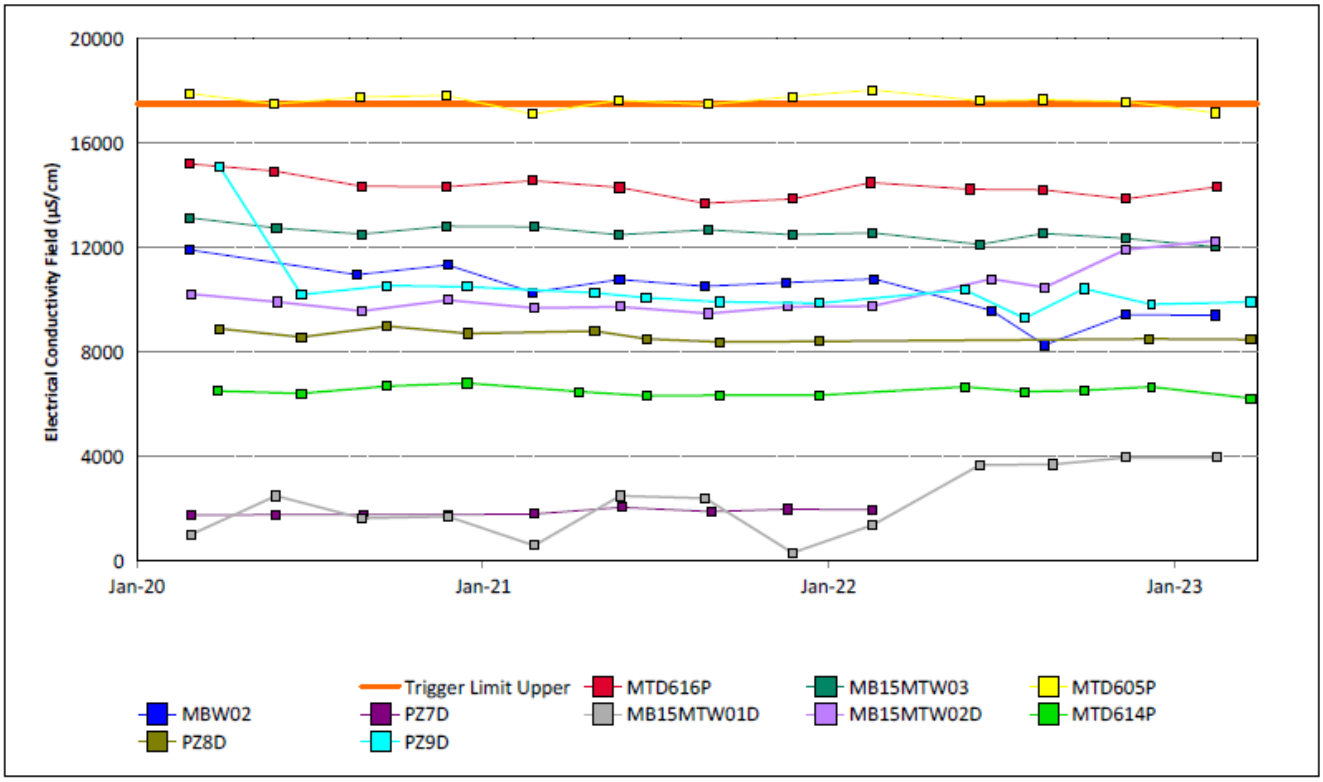

Figure 28: Shallow Overburden Electrical Conductivity Field Trend – March 2023

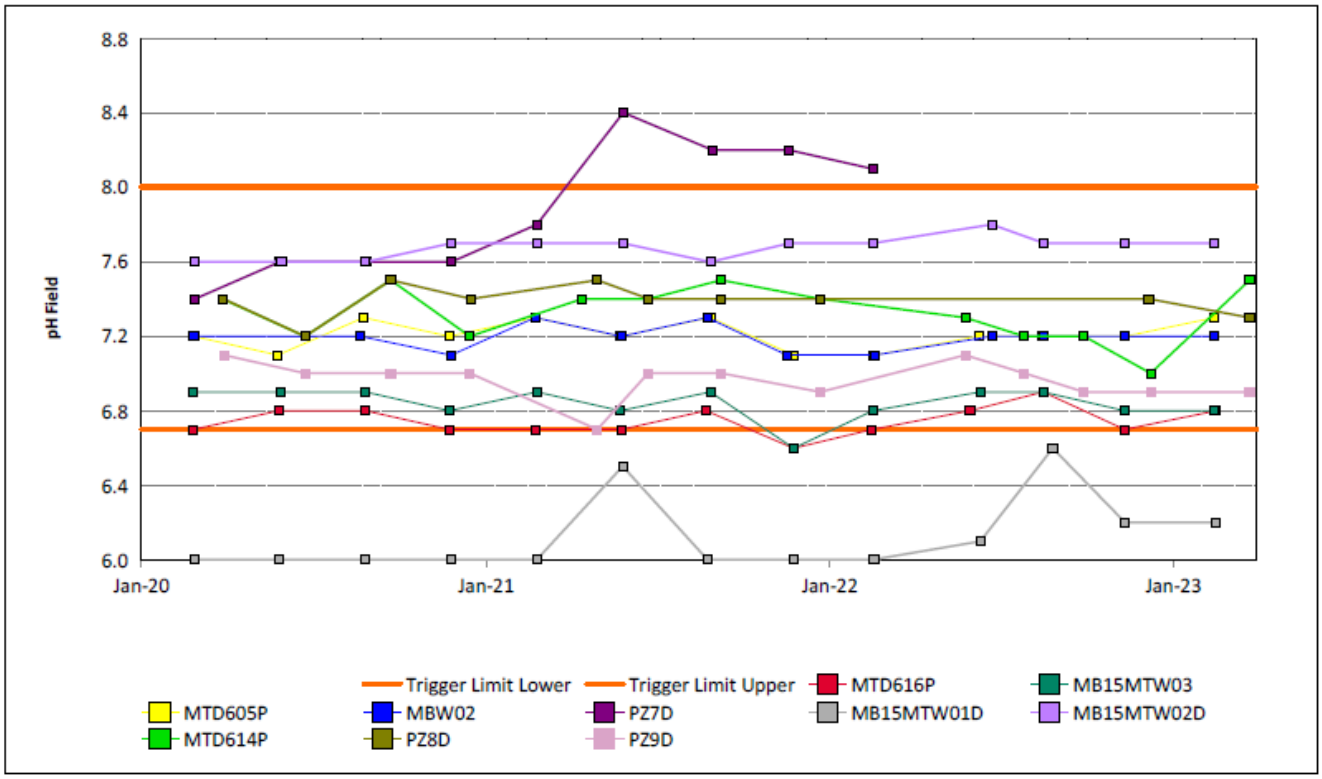

Figure 29: Shallow Overburden pH Field Trend – March 2023

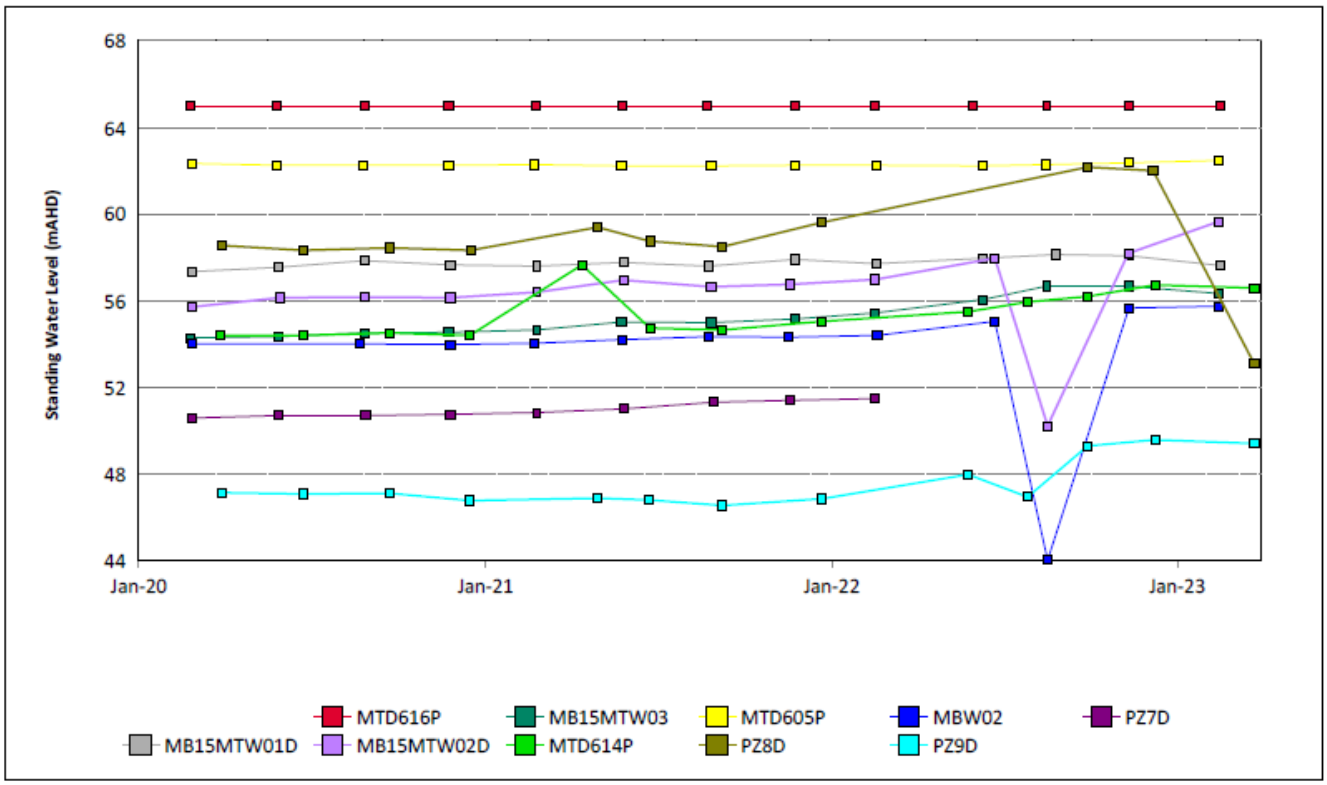

Figure 30: Shallow Overburden Standing Water Level Trend – March 2023

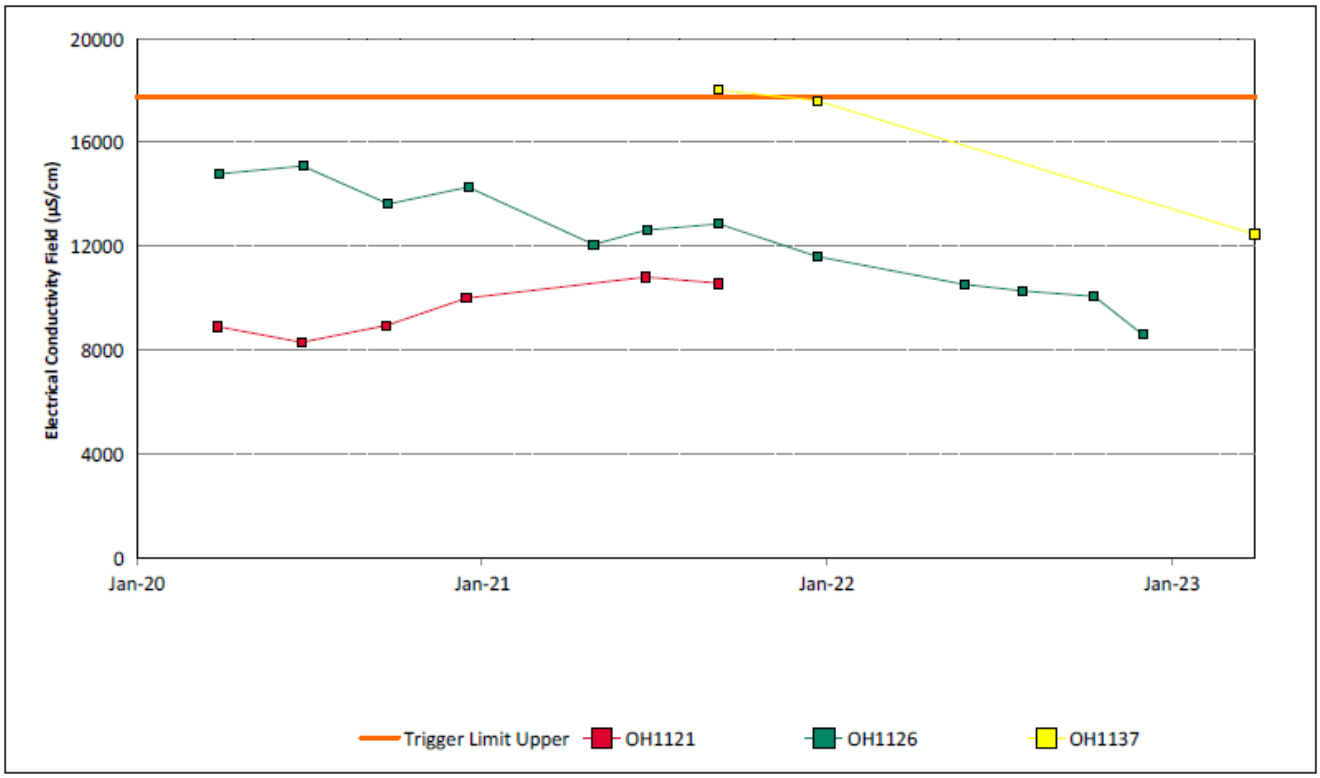

Figure 31: Vaux Seam Electrical Conductivity Field Trend – March 2023

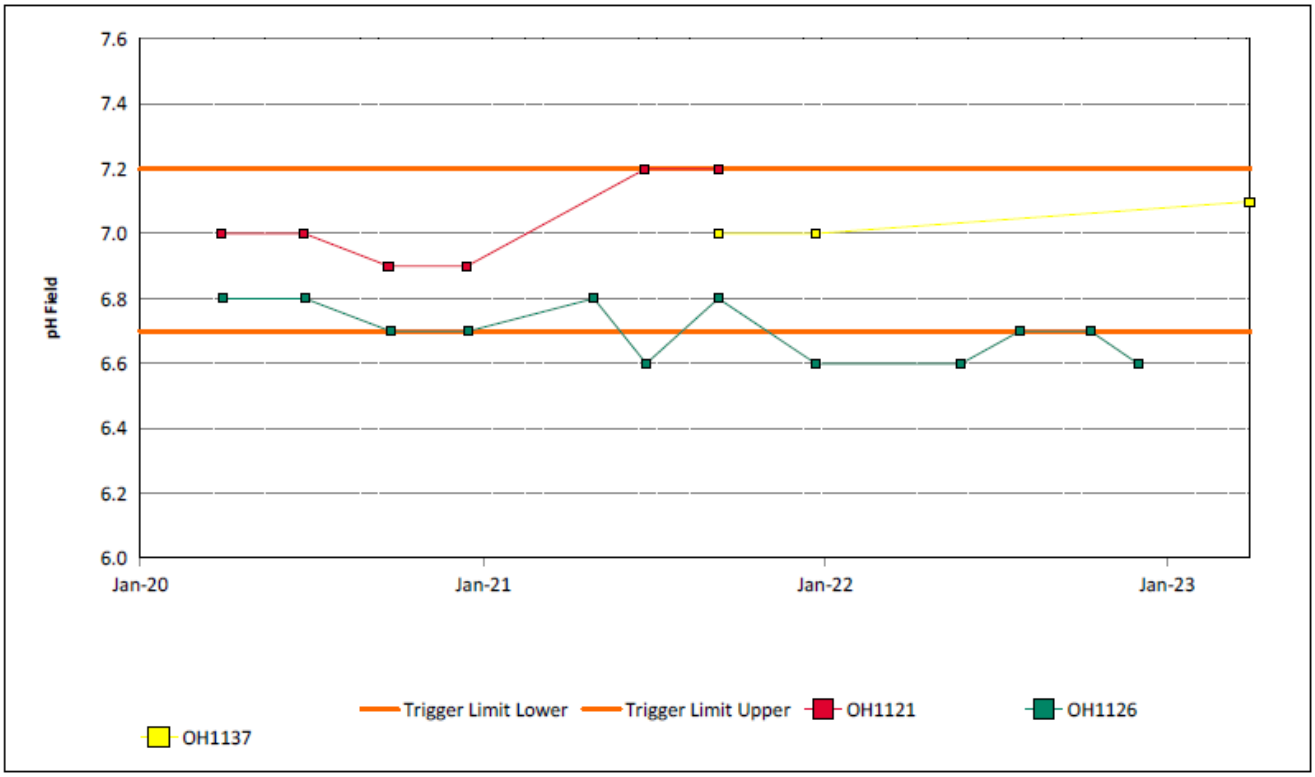

Figure 32: Vaux Seam pH Field Trend – March 2023

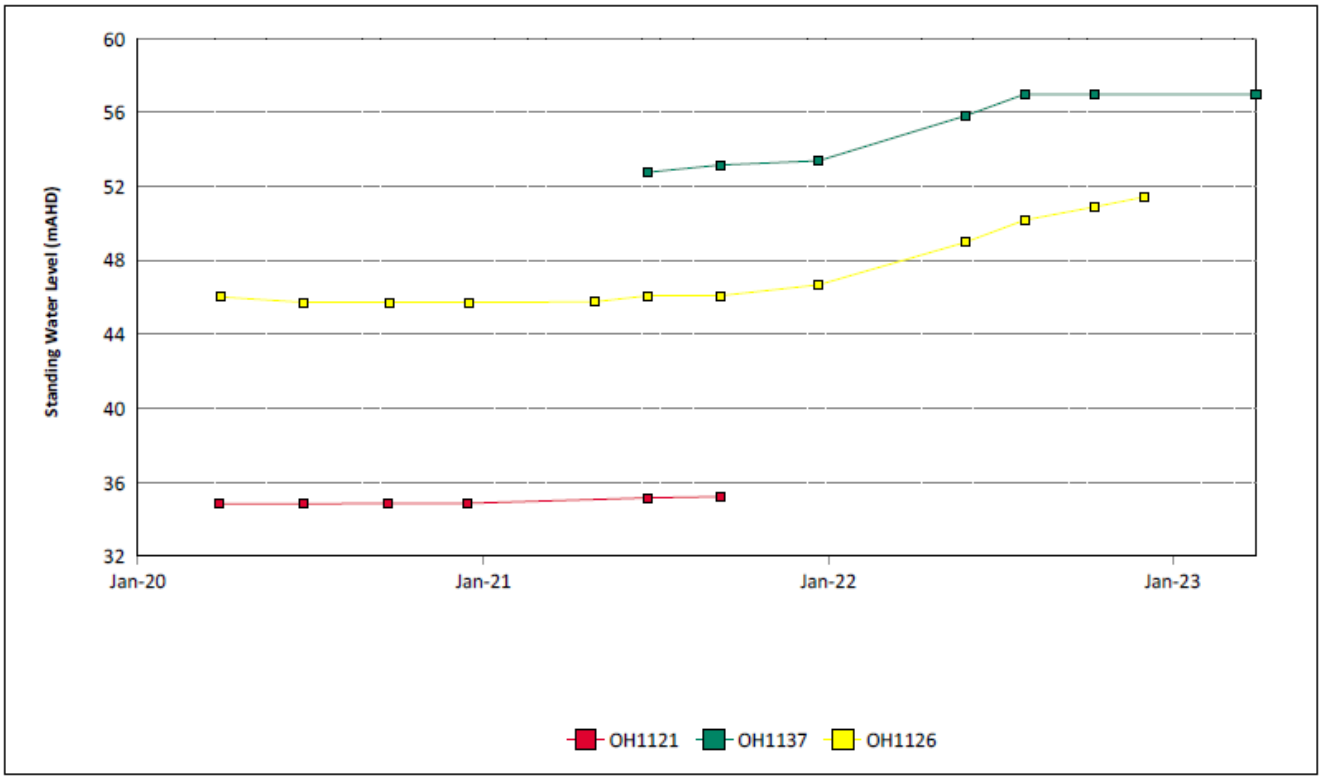

Figure 33: Vaux Seam Standing Water Level Trend – March 2023

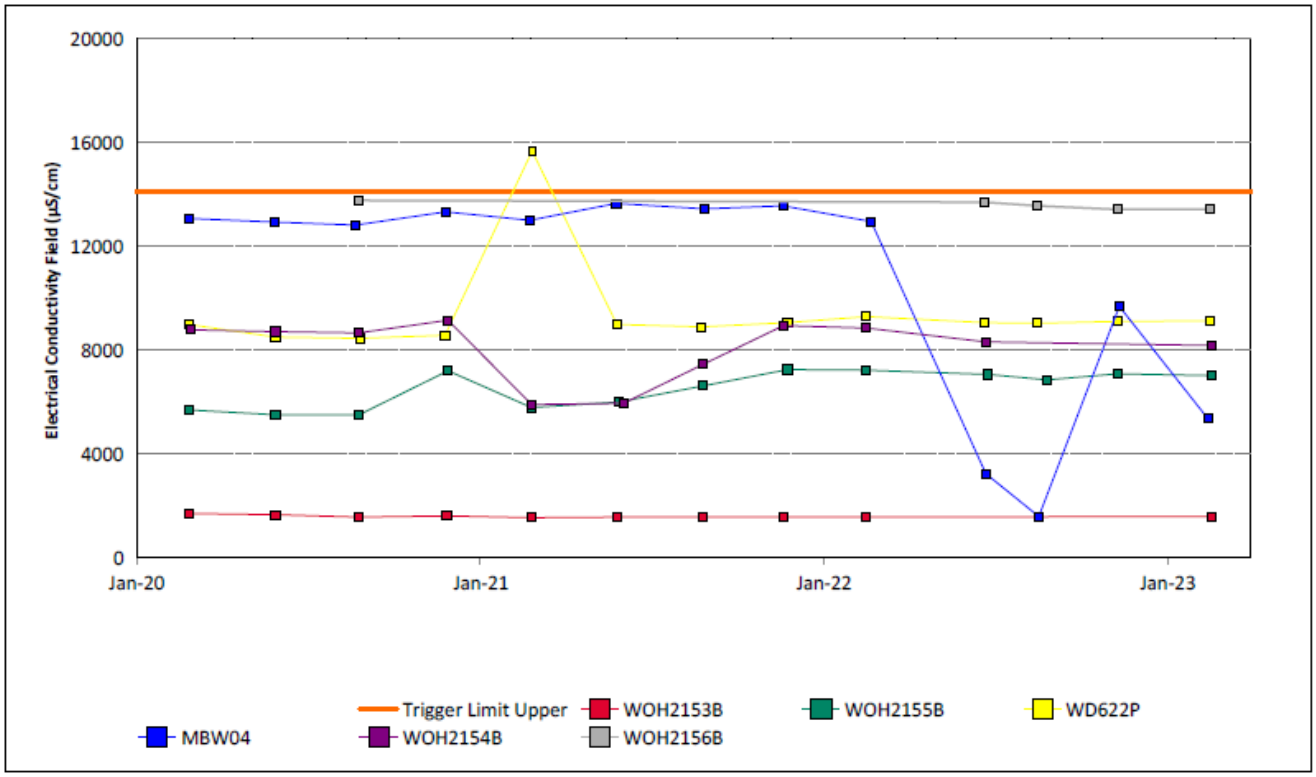

Figure 34: Wambo Seam Electrical Conductivity Field Trend – March 2023

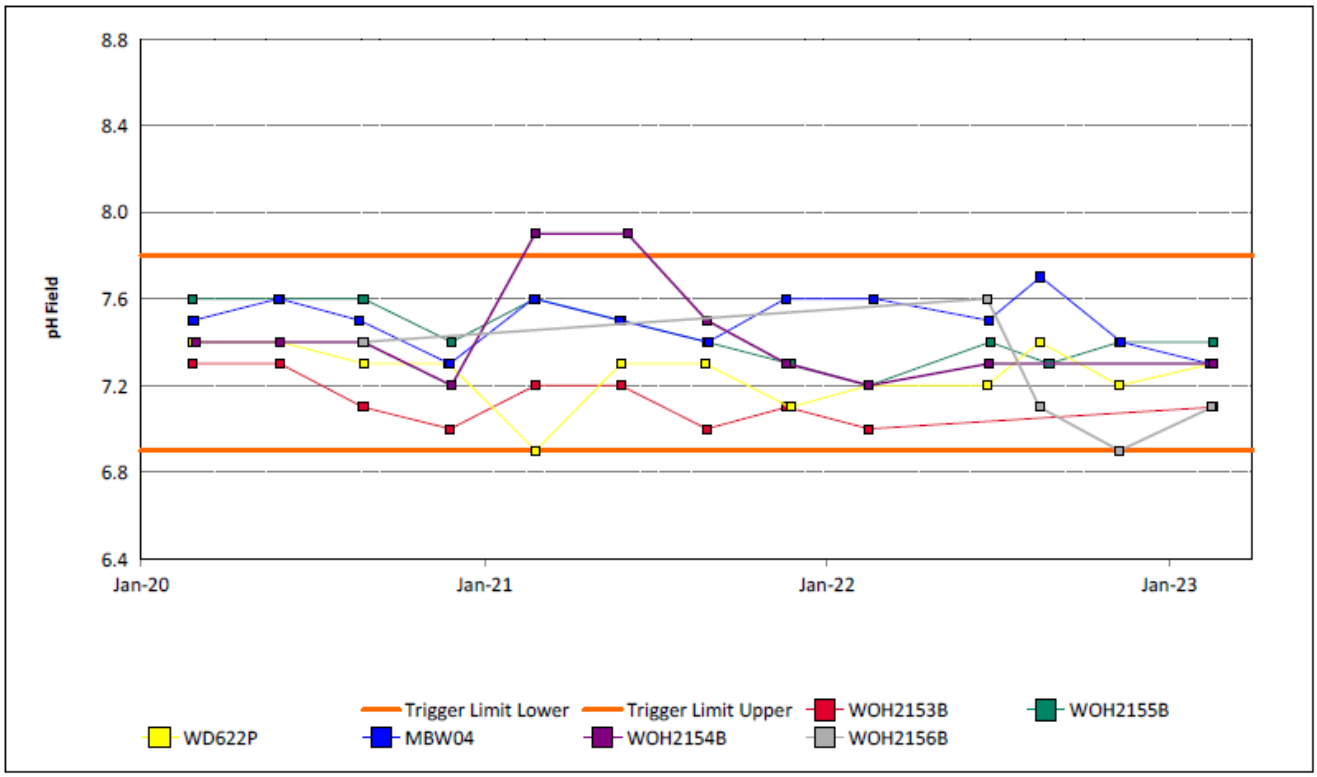

Figure 35: Wambo Seam pH Field Trend – March 2023

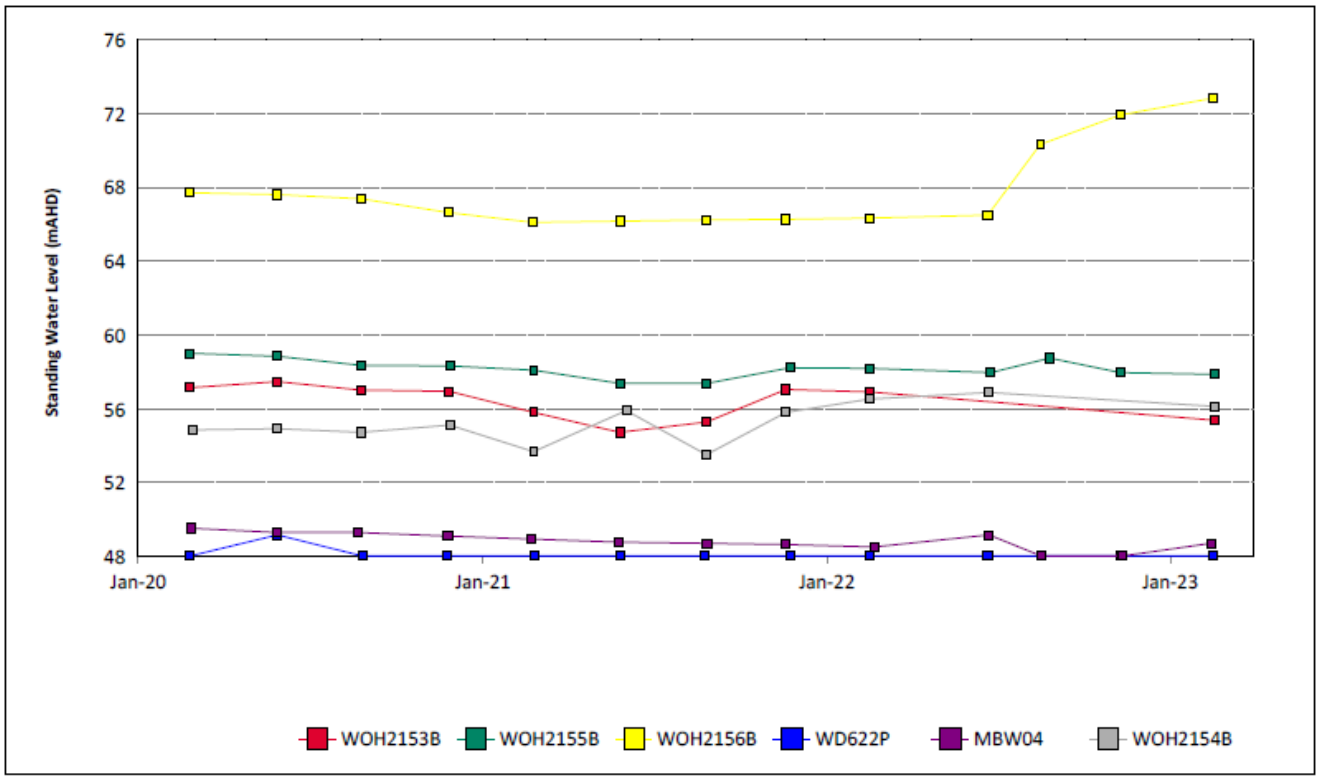

Figure 36: Wambo Seam Standing Water Level Trend – March 2023

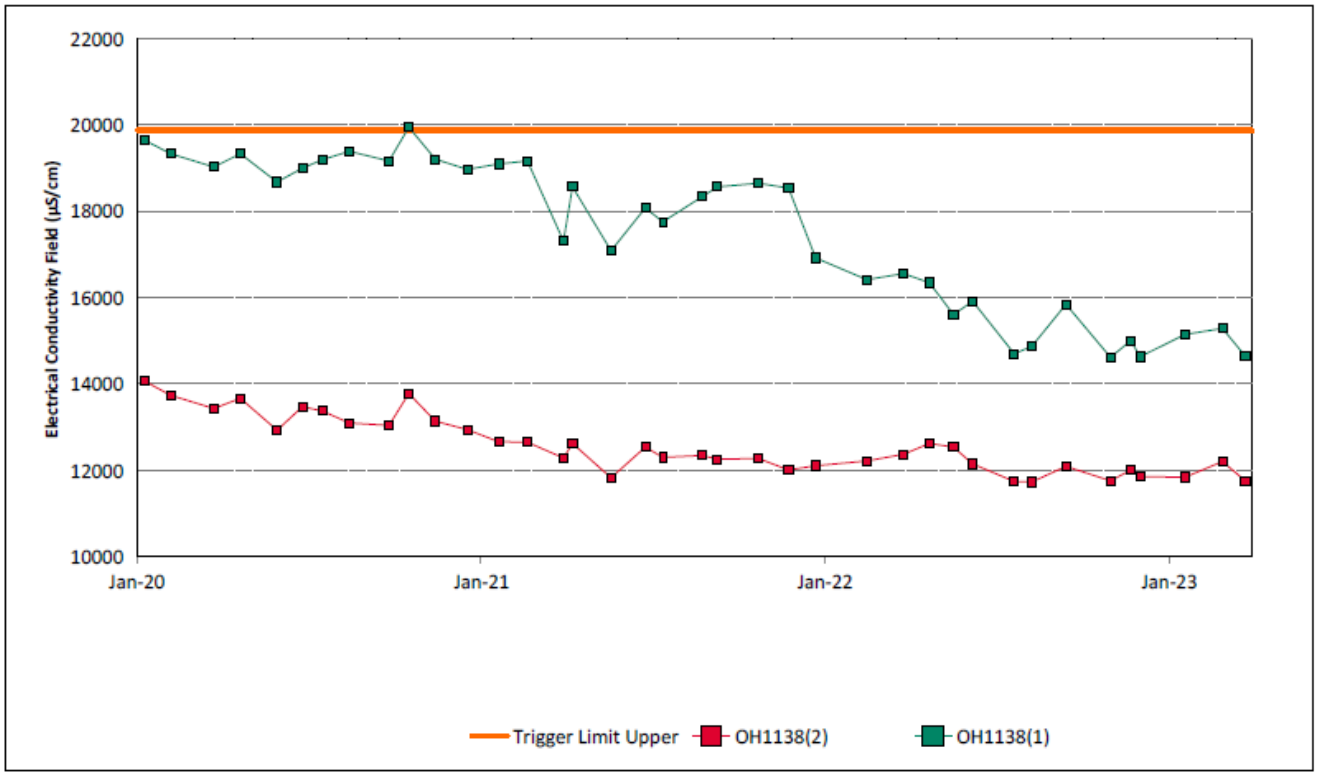

Figure 37: Warkworth Seam Electrical Conductivity Field Trend – March 2023

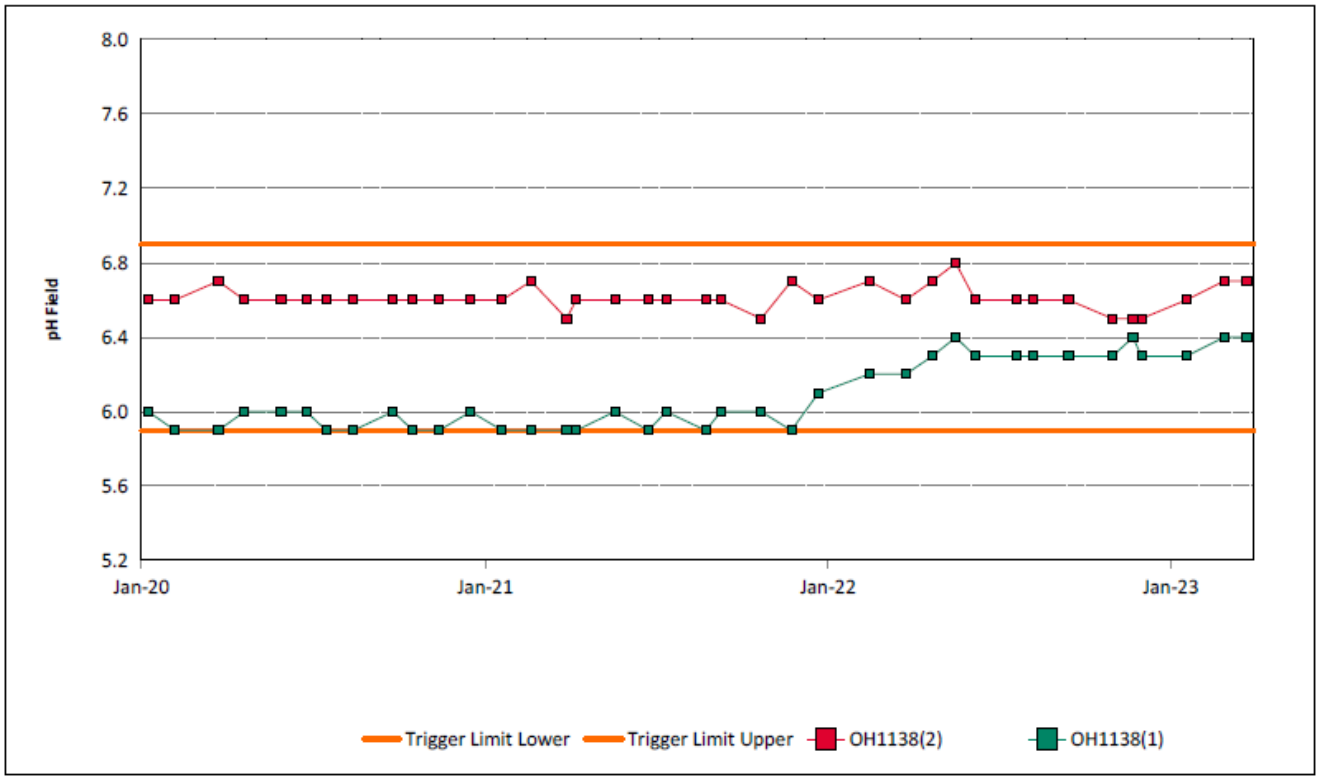

Figure 38: Warkworth Seam pH Field Trend – March 2023

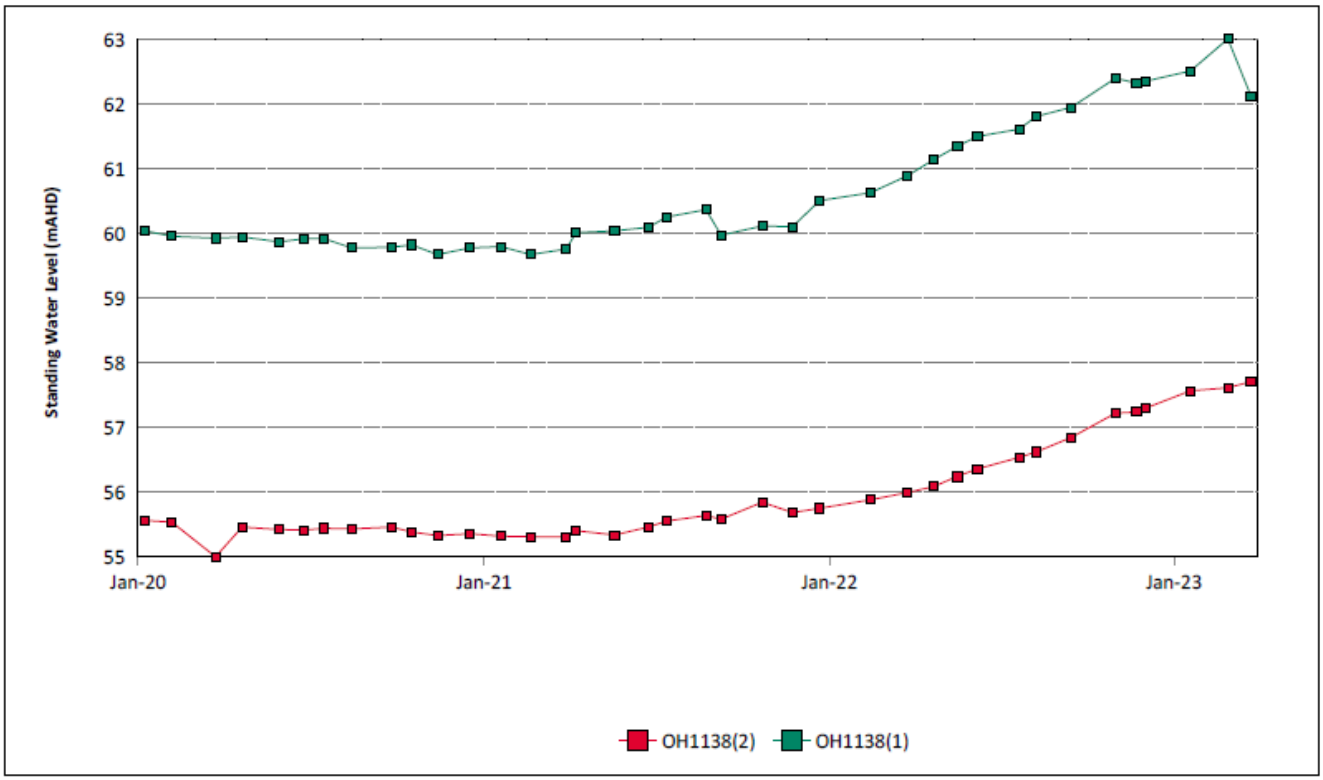

Figure 39: Warkworth Seam Standing Water Level Trend – March 2023

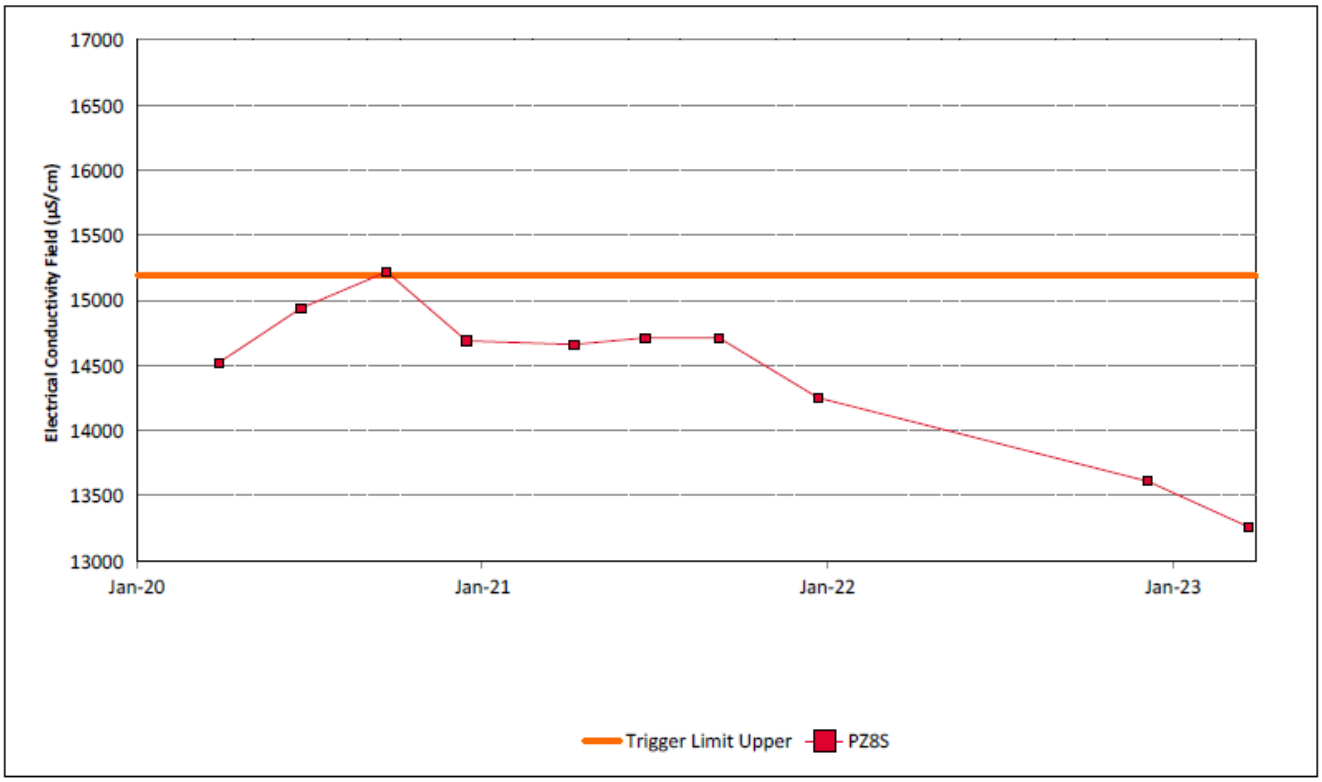

Figure 40: Wollombi Alluvium 1 Electrical Conductivity Field Trend – March 2023

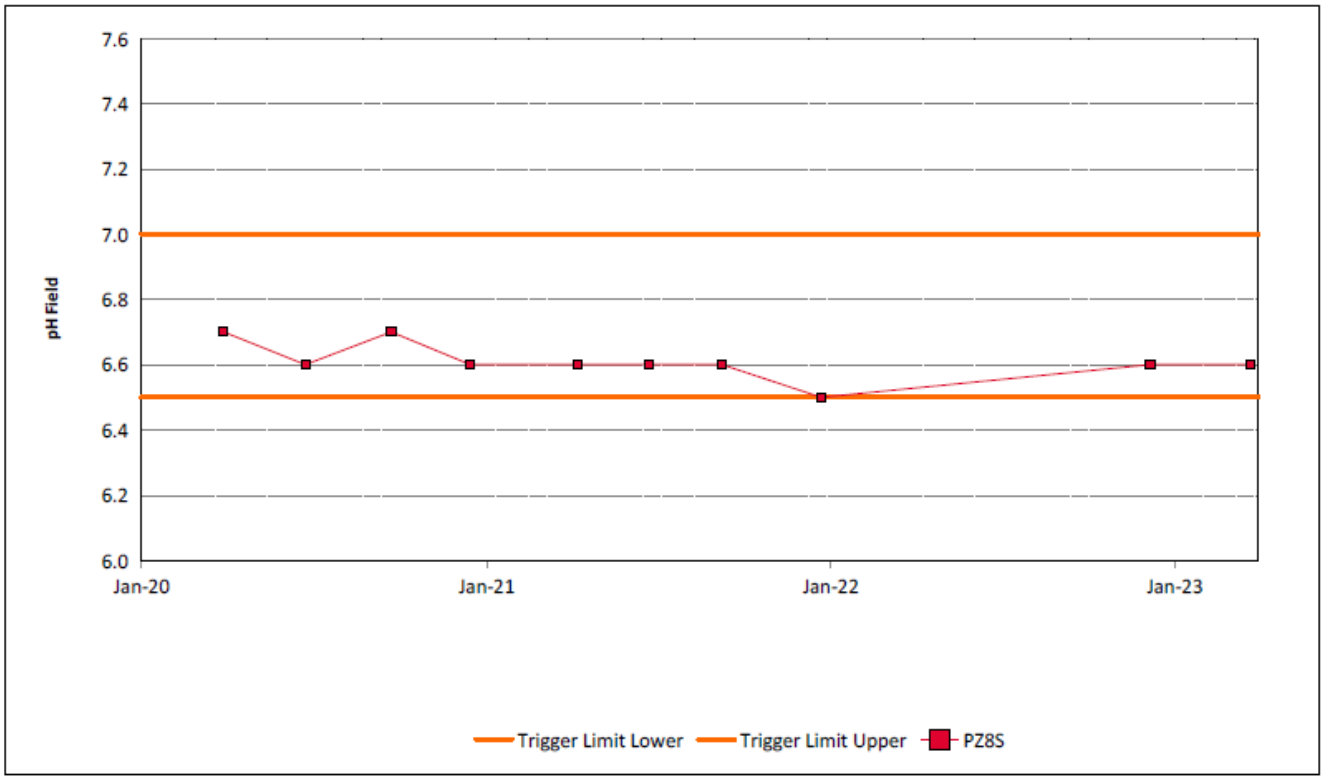

Figure 41: Wollombi Alluvium 1 pH Field Trend – March 2023

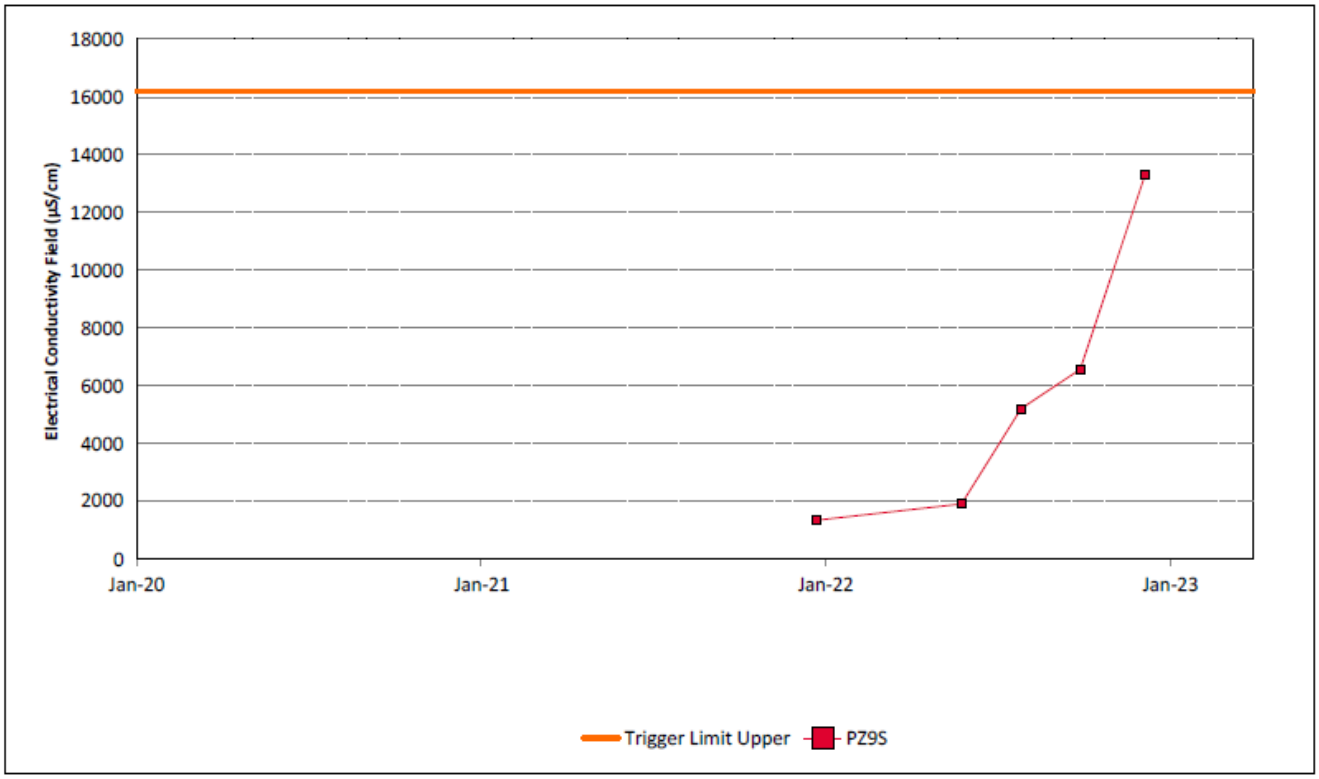

Figure 42: Wollombi Alluvium 2 Electrical Conductivity Field Trend – March 2023

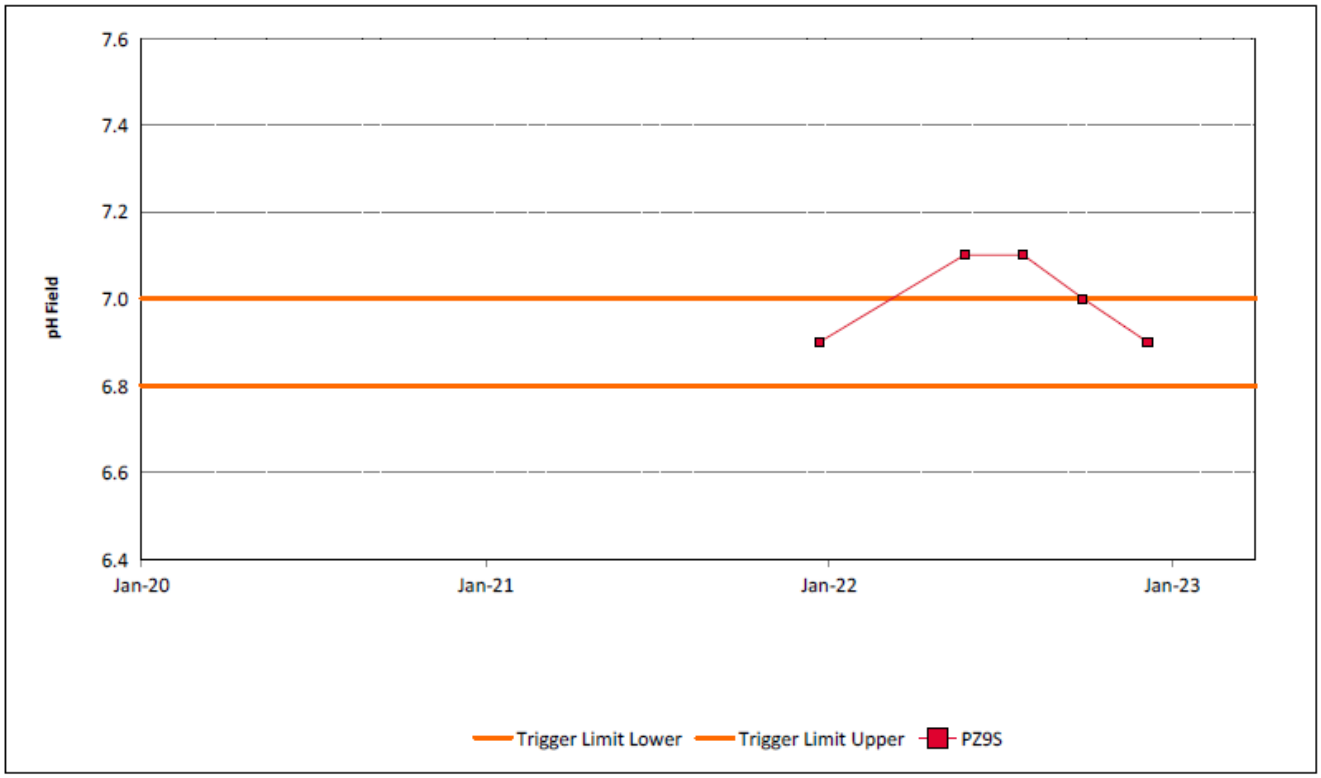

Figure 43: Wollombi Alluvium 2 pH Field Trend – March 2023

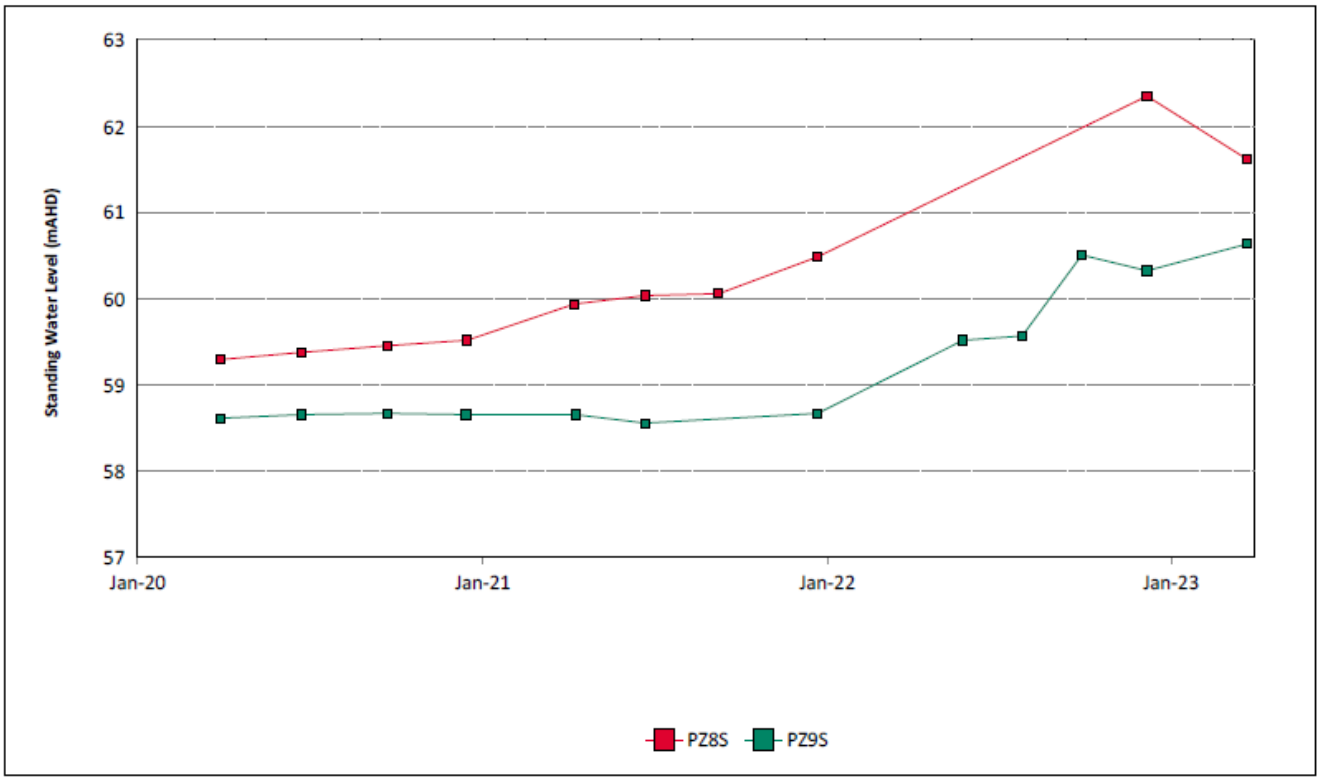

Figure 44: Wollombi Alluvium Standing Water Level Trend – March 2023

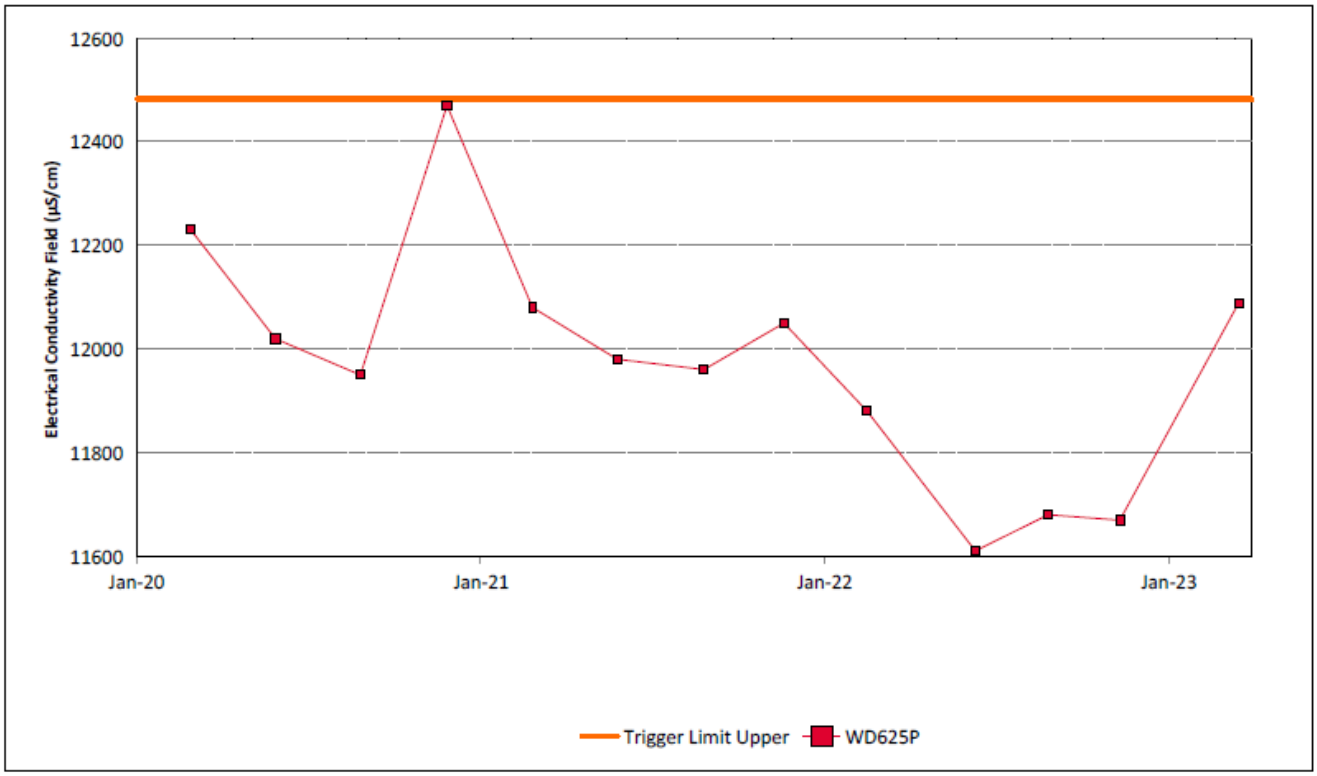

Figure 45: Woodlands Hill Seam Electrical Conductivity Field Trend – March 2023

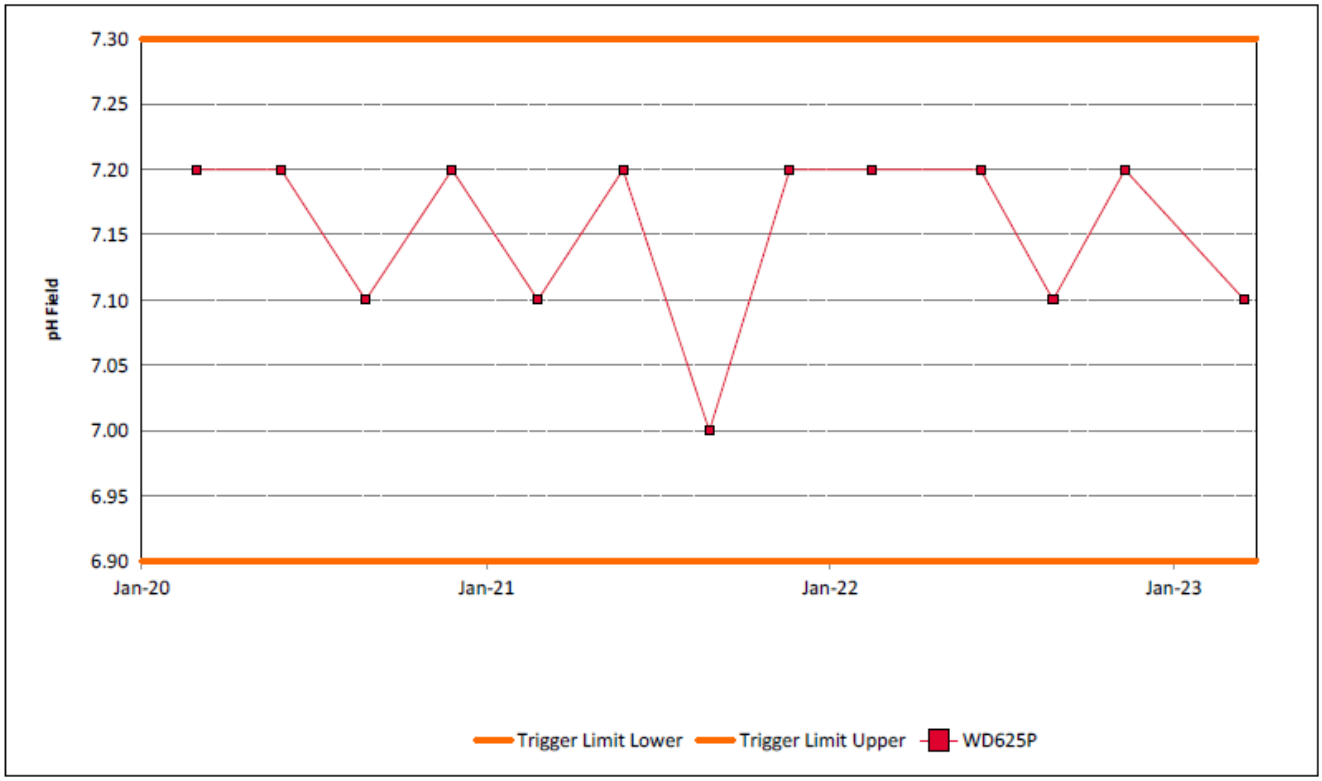

Figure 46: Woodlands Hill Seam pH Field Trend – March 2023

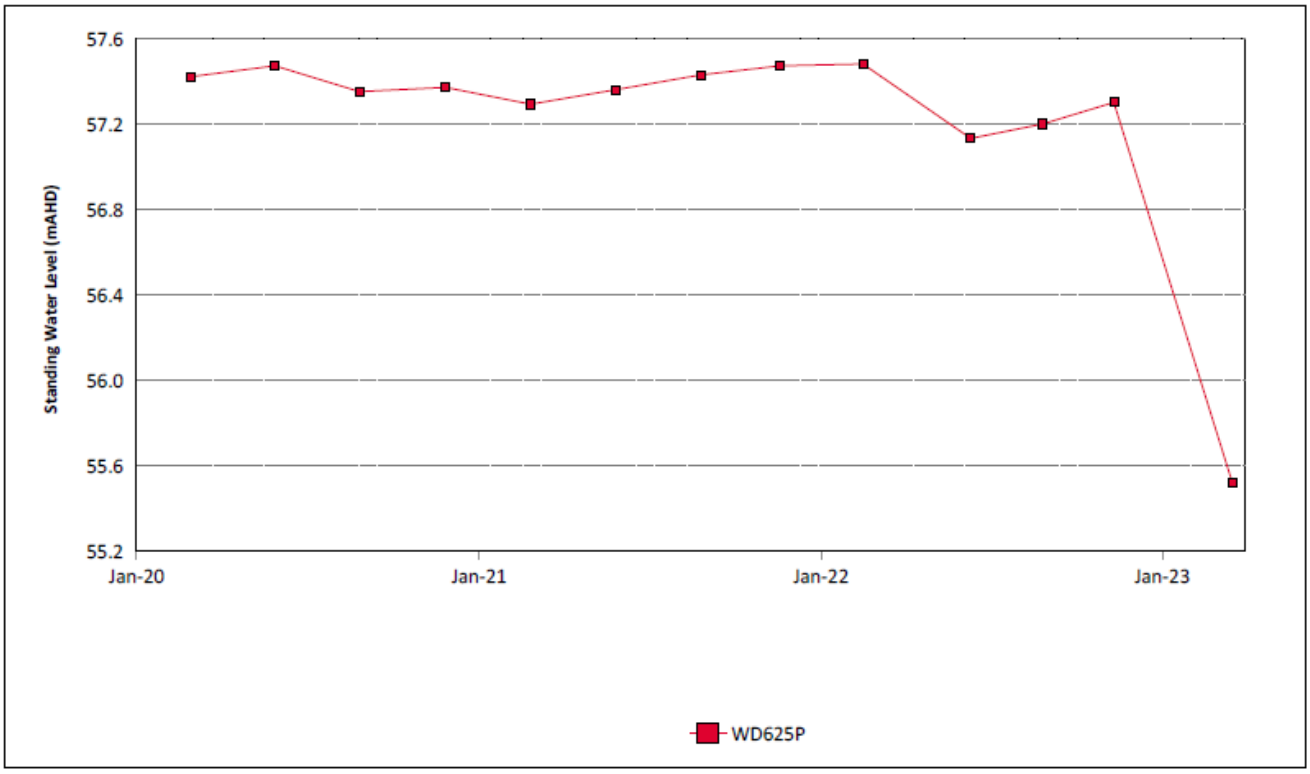

Figure 47: Woodlands Hill Seam Standing Water Level Trend - March 2023

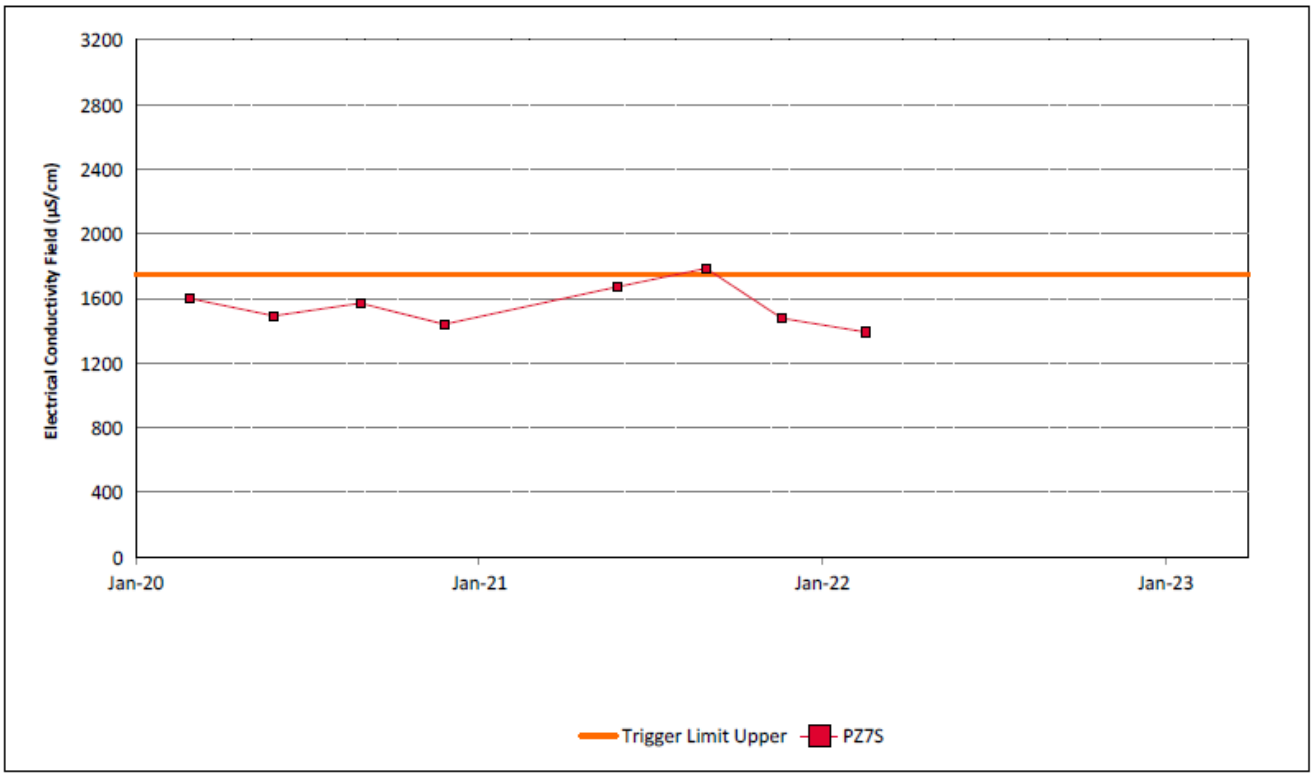

Figure 48: Aeolian Warkworth Sands Electrical Conductivity Field Trend – March 2023

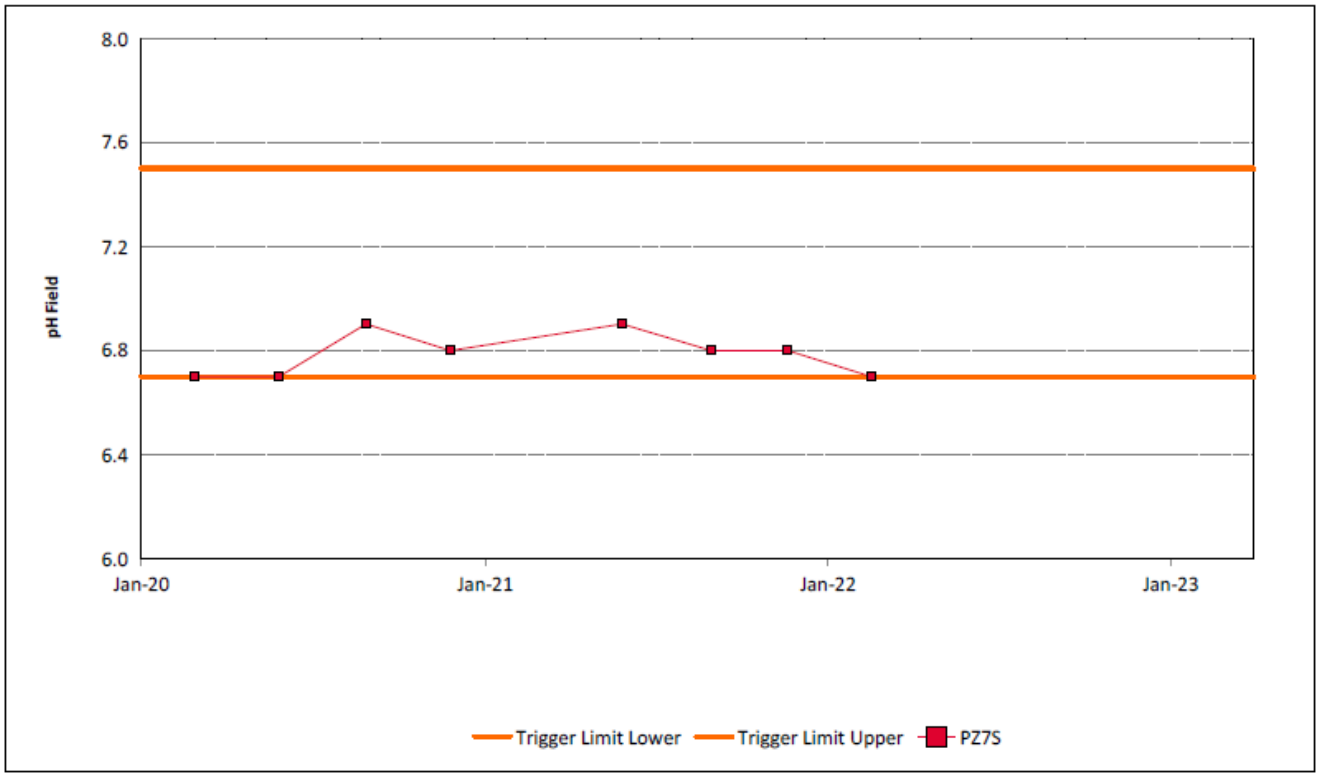

Figure 49: Aeolian Warkworth Sands pH Field Trend - March 2023

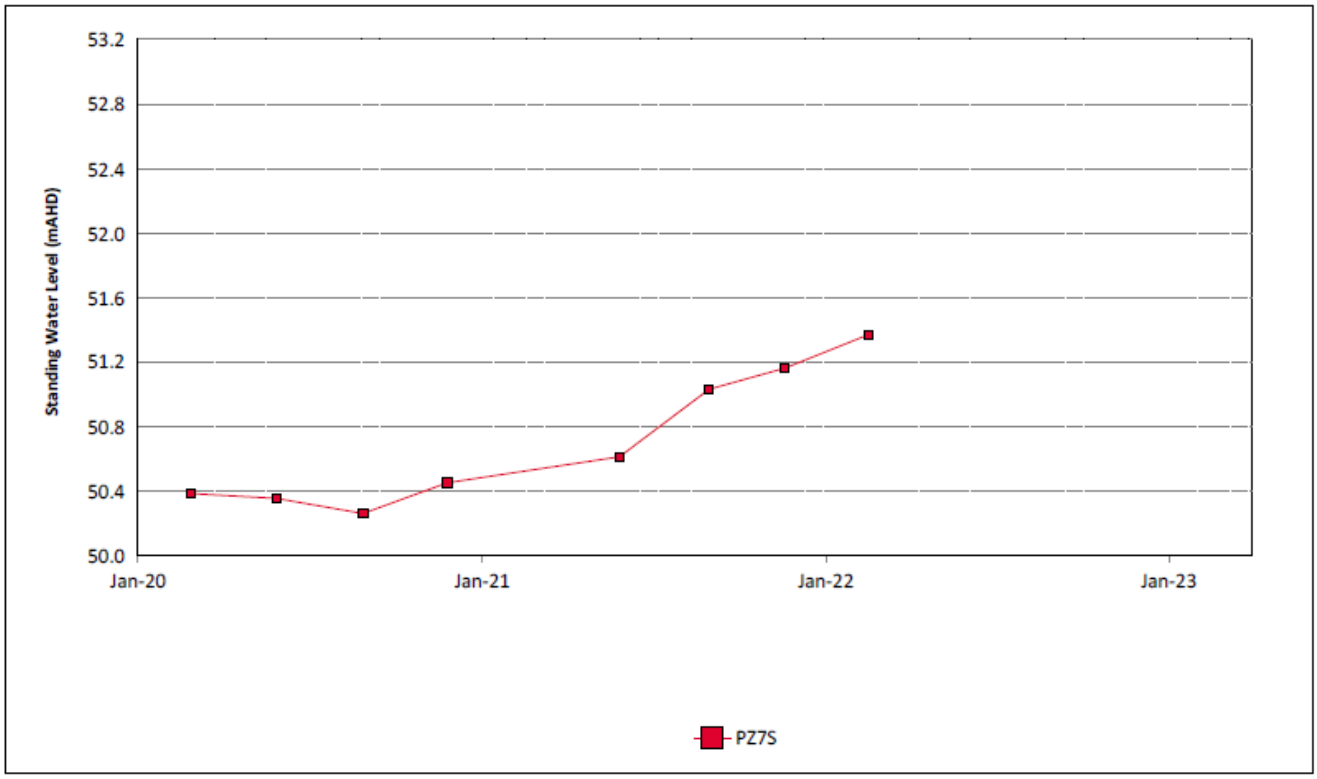

Figure 50: Aeolian Warkworth Sands Standing Water Level Trend – March 2023

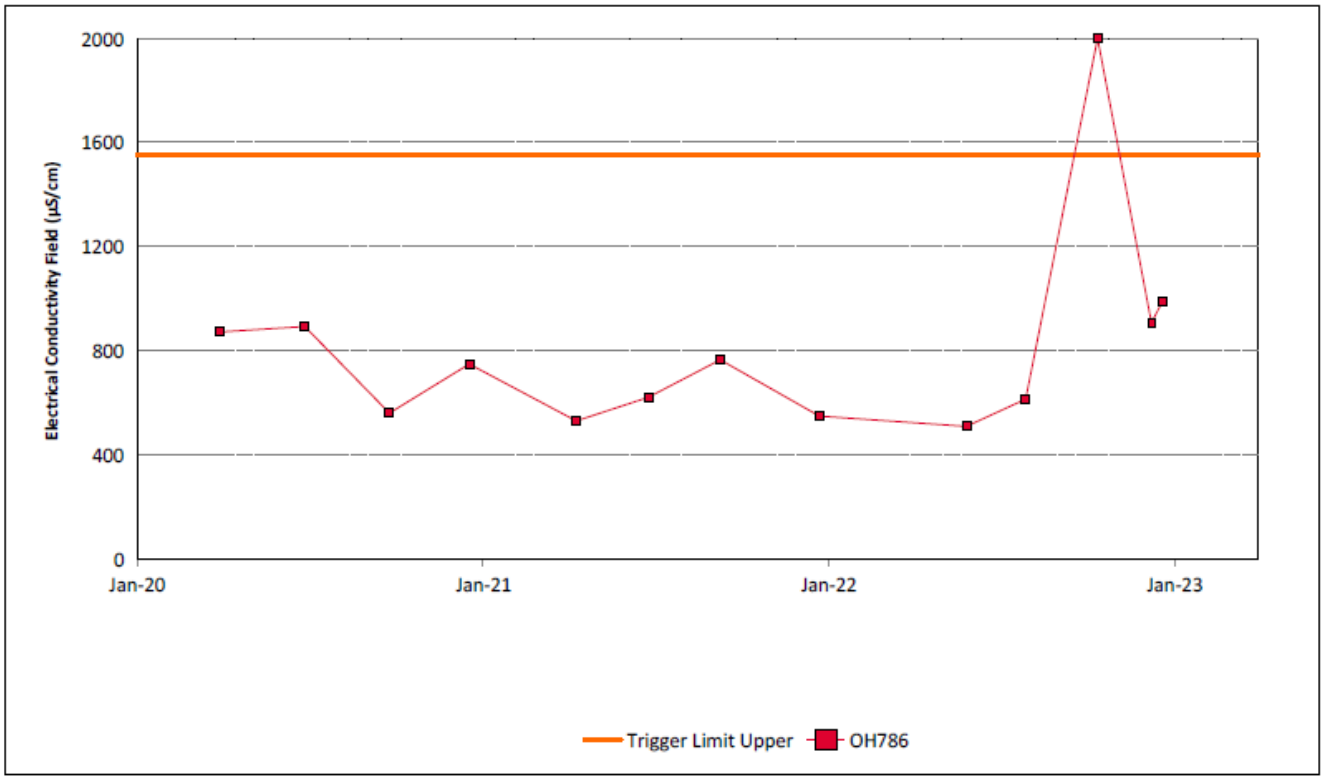

Figure 51: Hunter River Alluvium 1 Electrical Conductivity Field Trend – March 2023

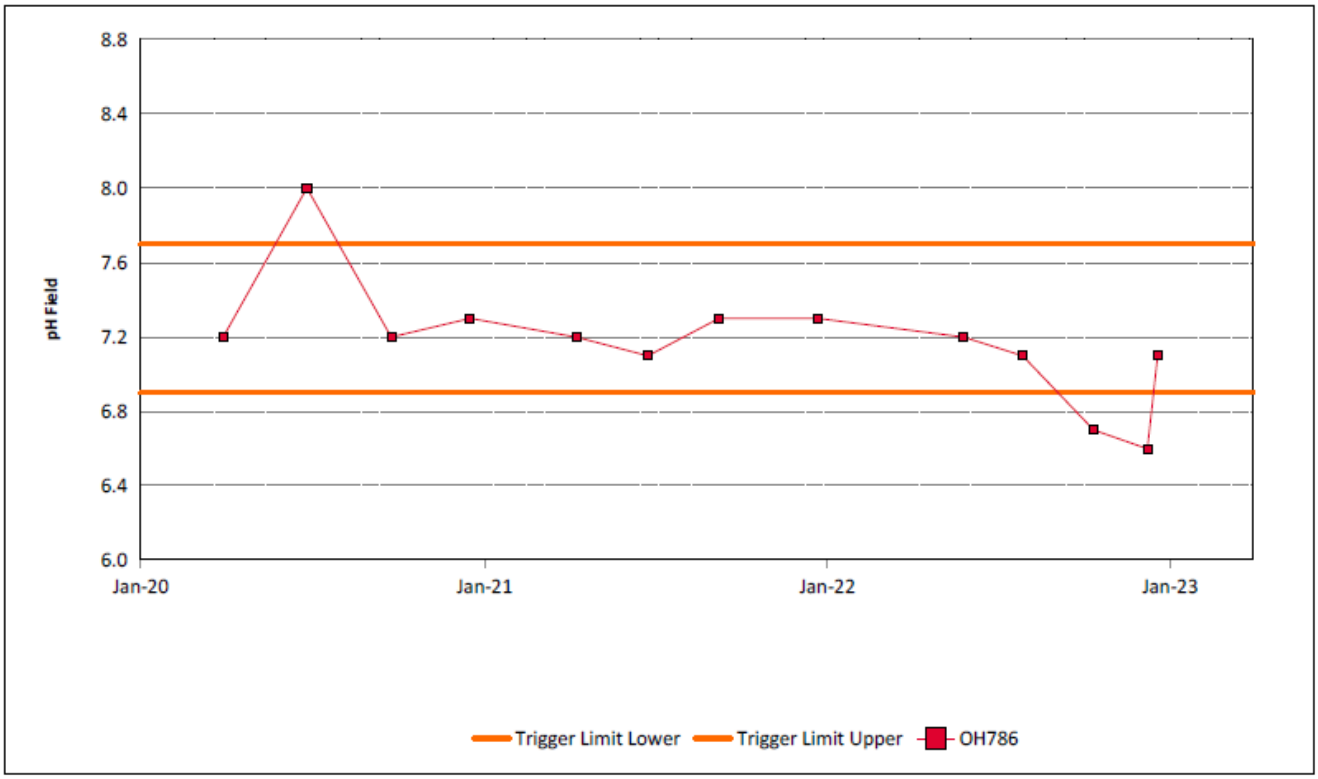

Figure 52: Hunter River Alluvium 1 pH Field Trend – March 2023

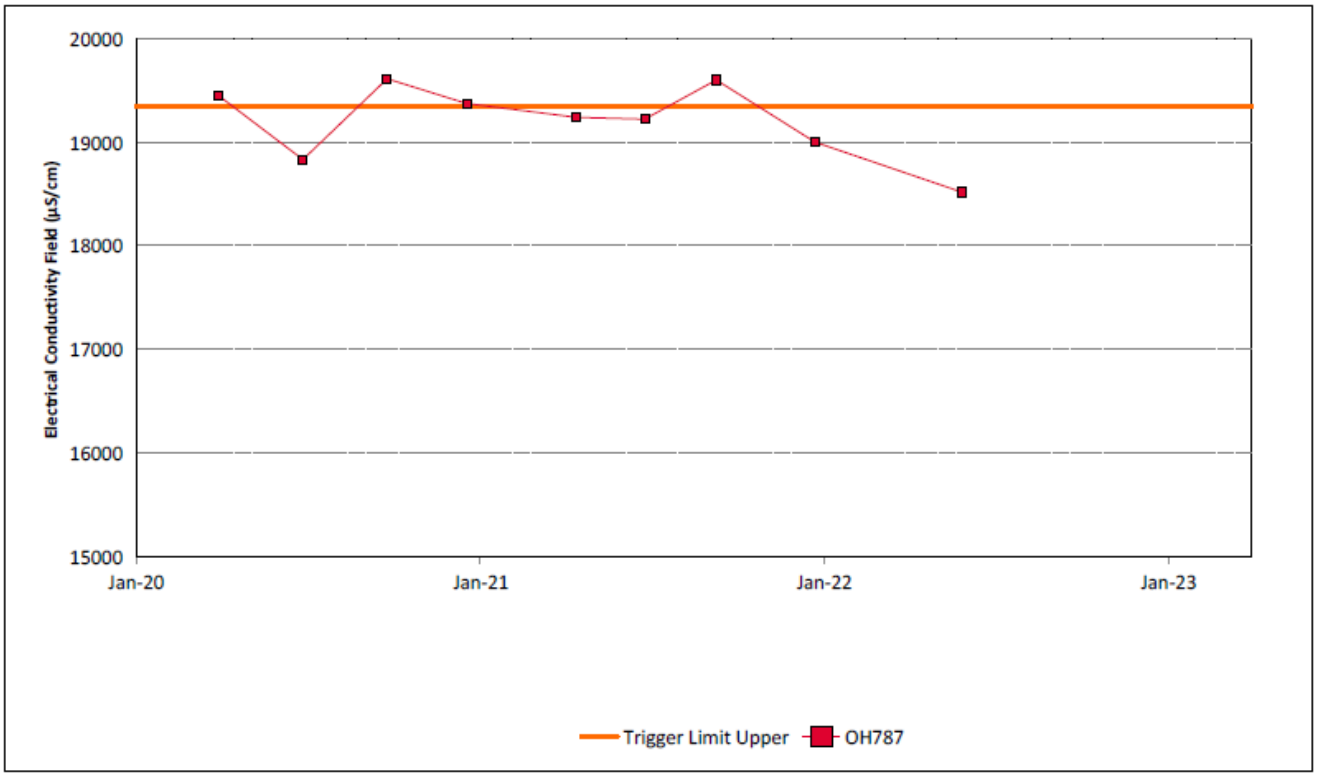

Figure 53: Hunter River Alluvium 2 Electrical Conductivity Field Trend - March 2023

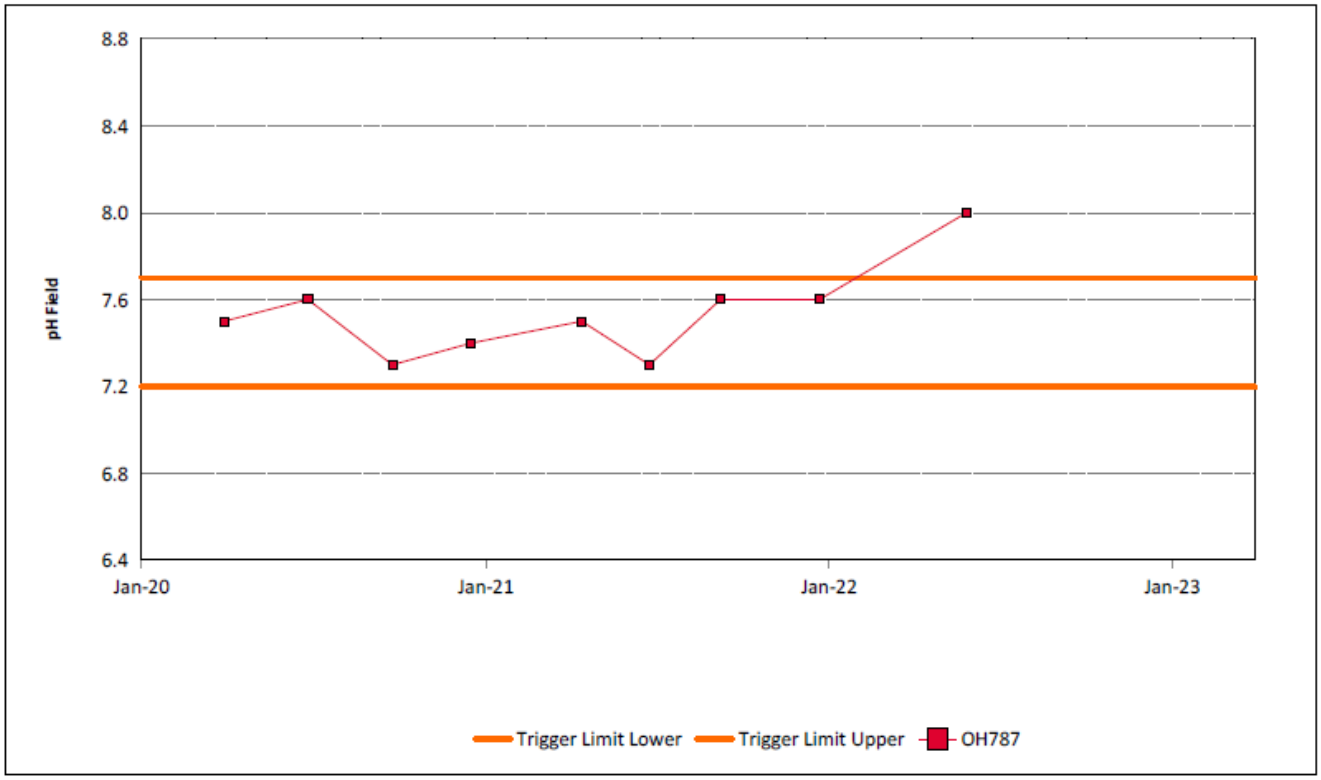

Figure 54: Hunter River Alluvium 2 pH Field Trend – March 2023

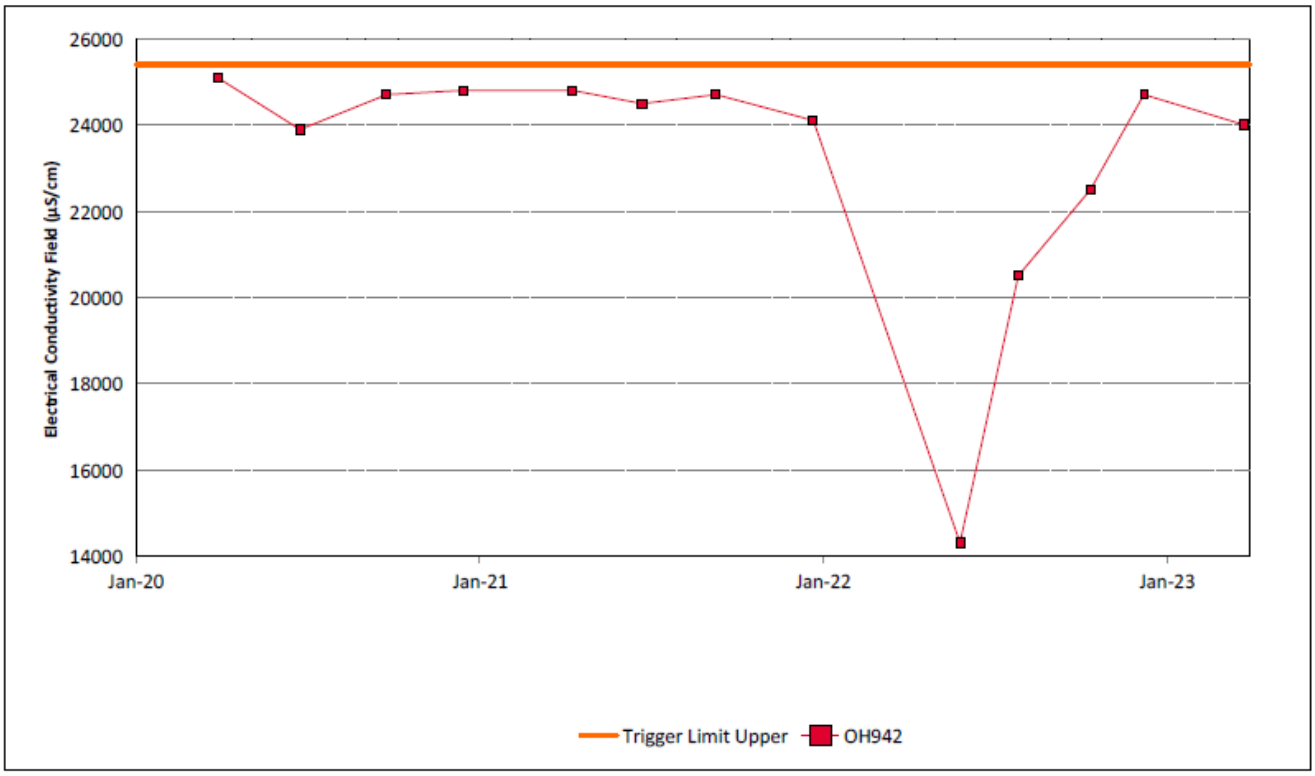

Figure 55: Hunter River Alluvium 3 Electrical Conductivity Field Trend – March 2023

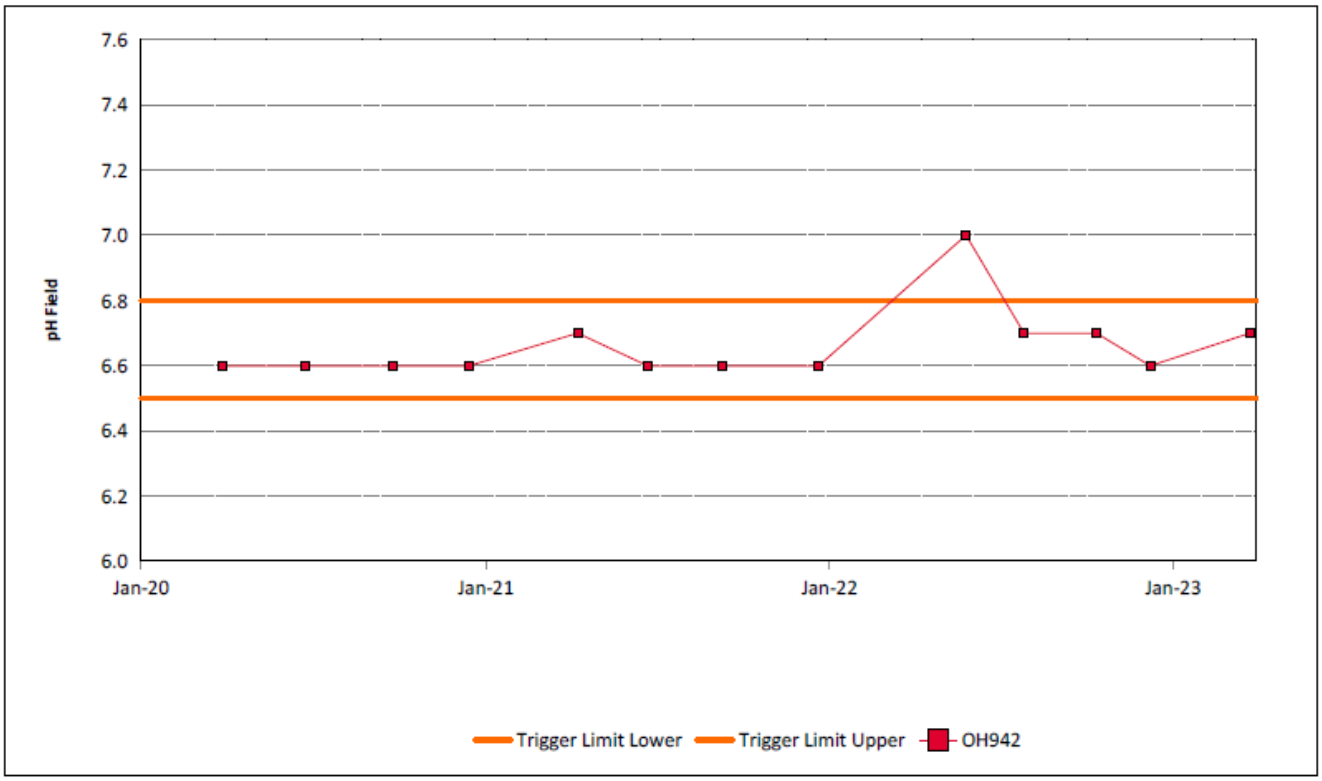

Figure 56: Hunter River Alluvium 3 pH Field Trend – March 2023

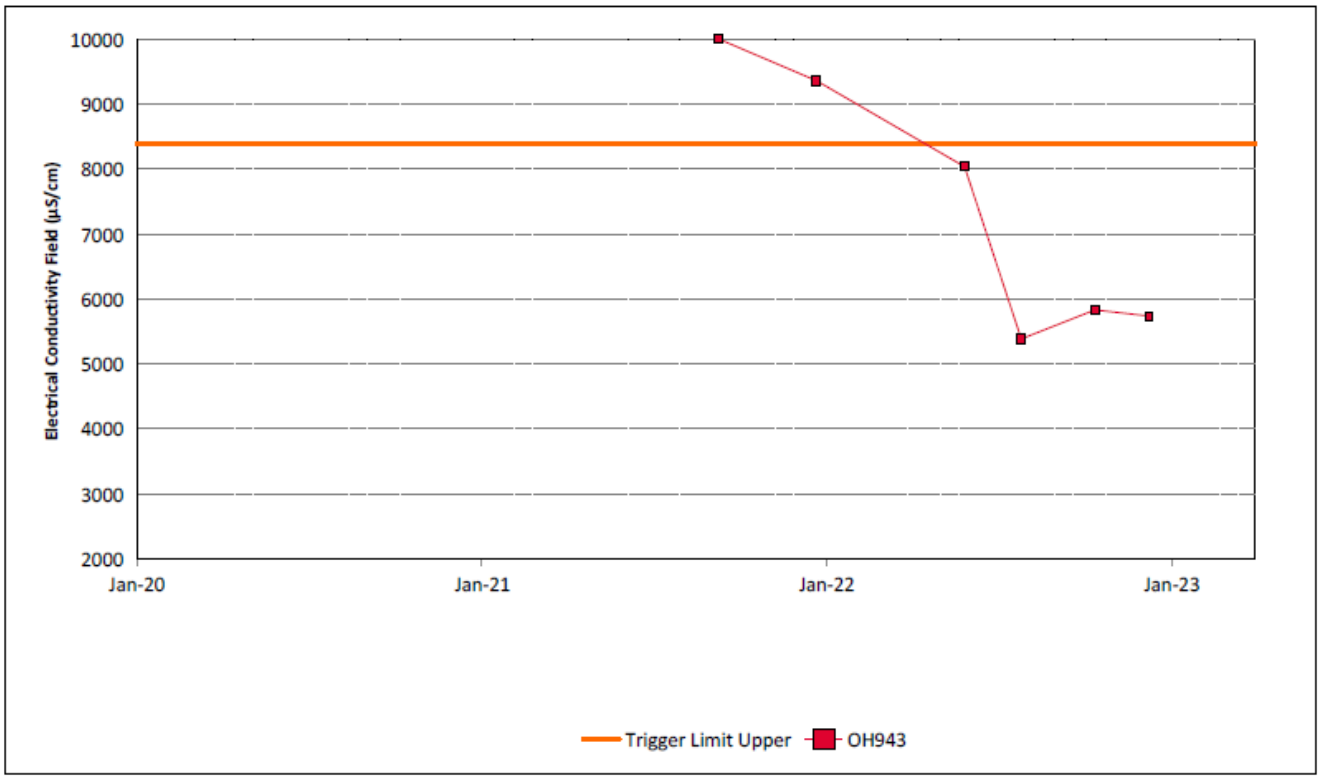

Figure 57: Hunter River Alluvium 4 Electrical Conductivity Field Trend – March 2023

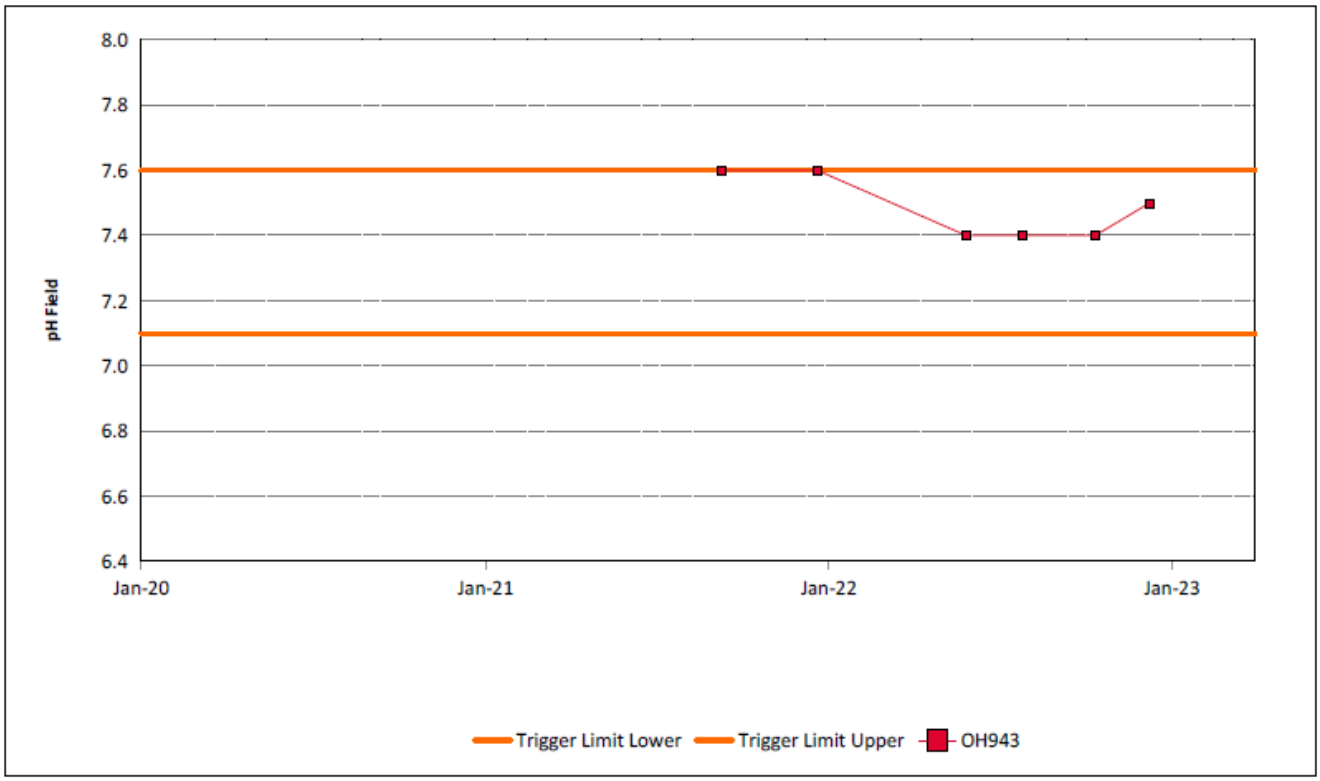

Figure 58: Hunter River Alluvium 4 pH Field Trend – March 2023

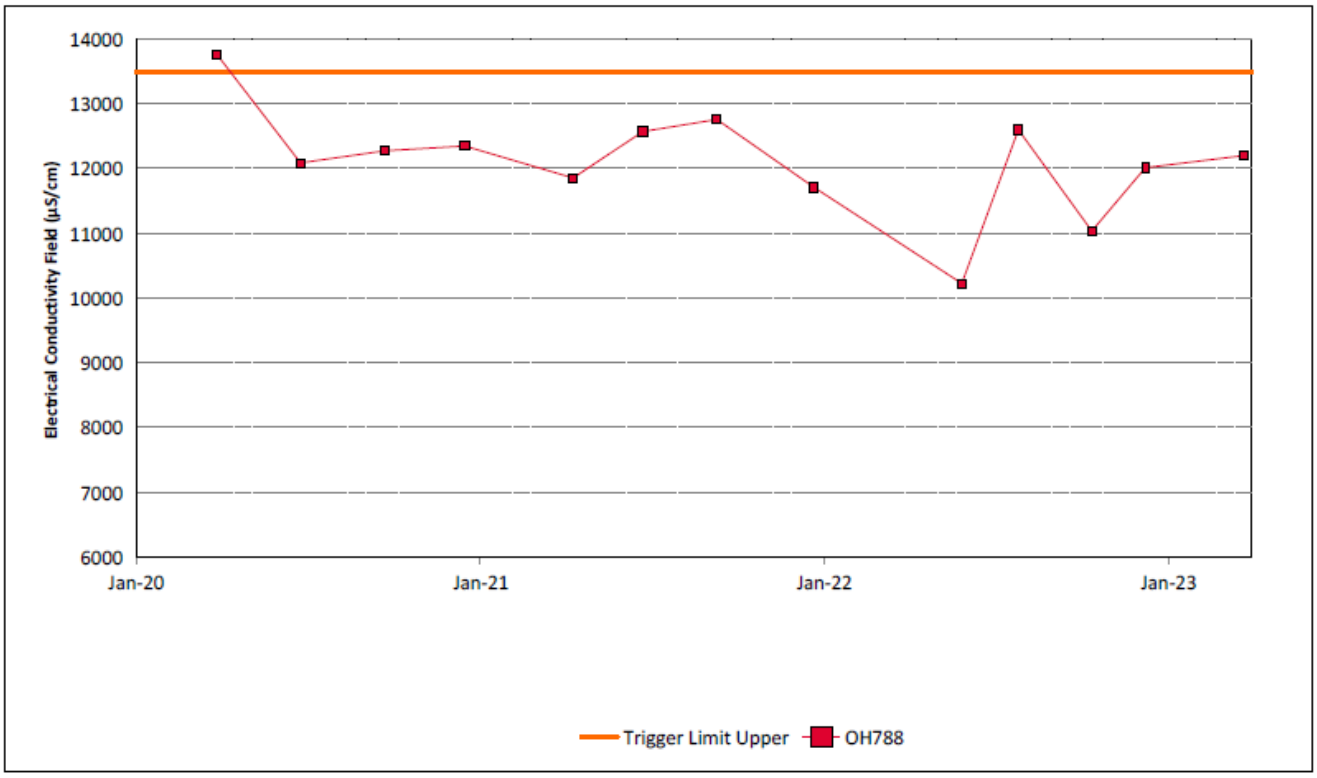

Figure 59: Hunter River Alluvium 5 Electrical Conductivity Field Trend – March 2023

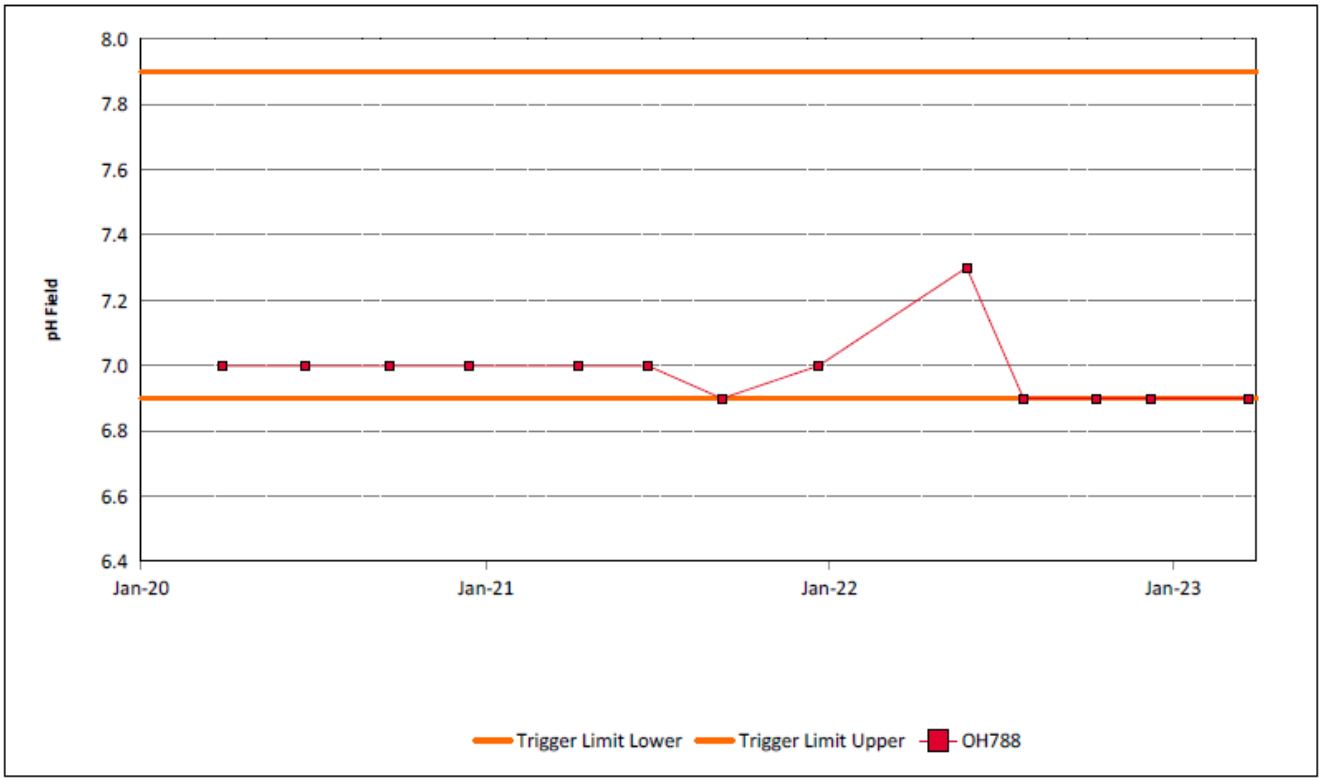

Figure 60: Hunter River Alluvium 5 pH Field Trend – March 2023

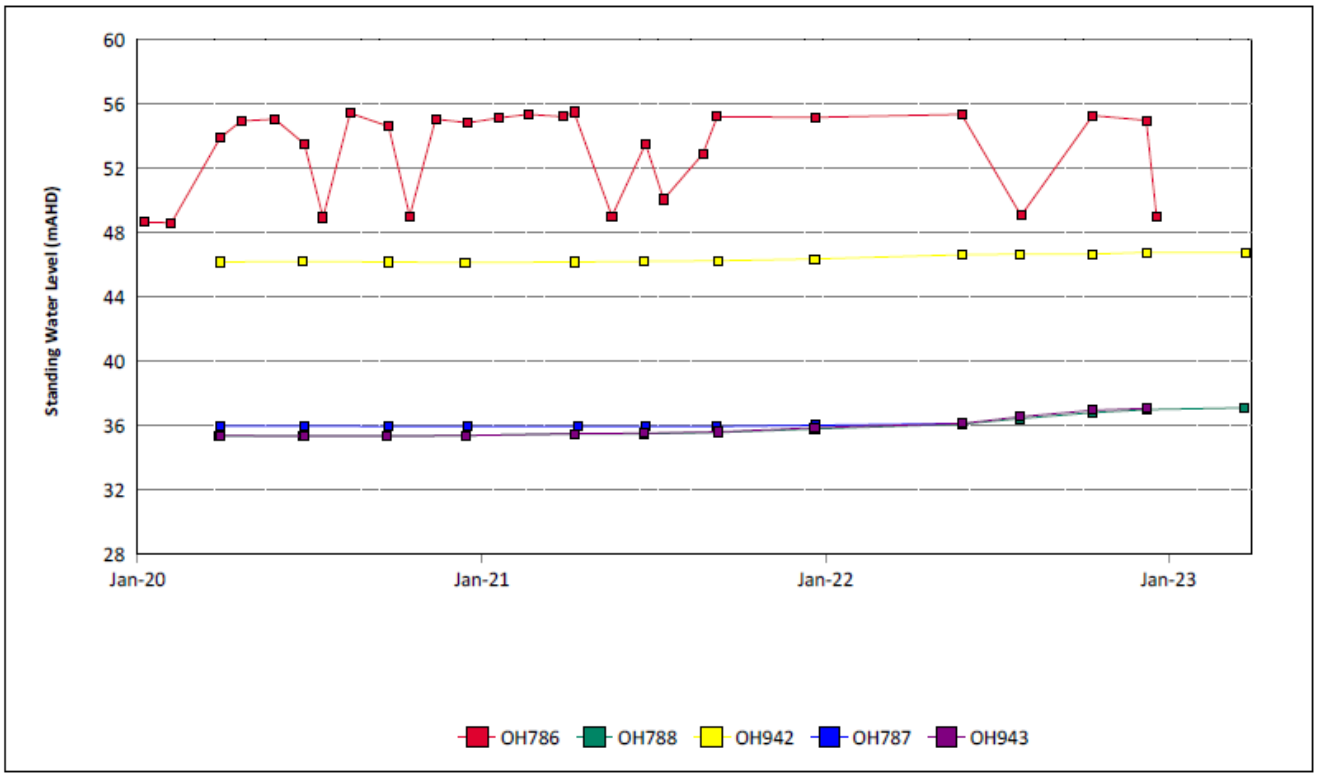

Figure 61: Hunter River Alluvium Standing Water Level Trend – March 2023

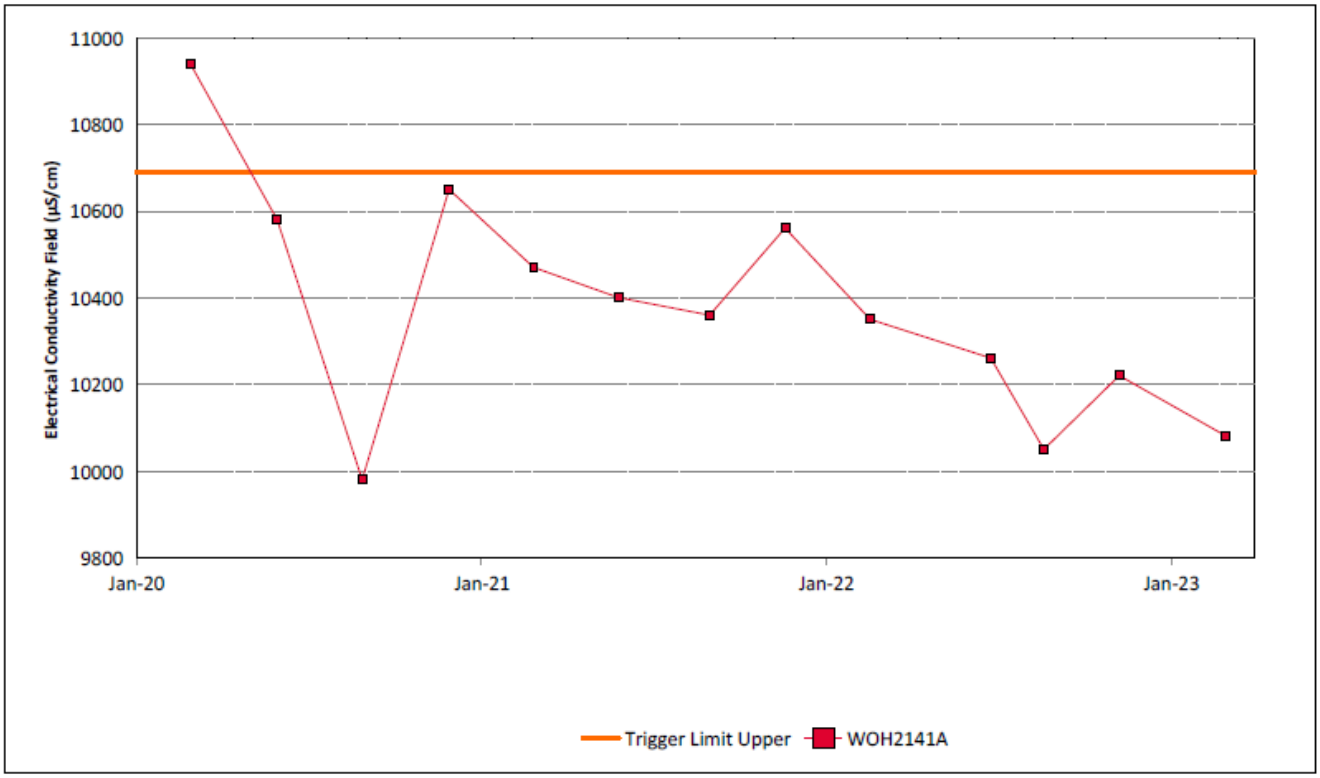

Figure 62: Whynot Seam Electrical Conductivity Field Trend – March 2023

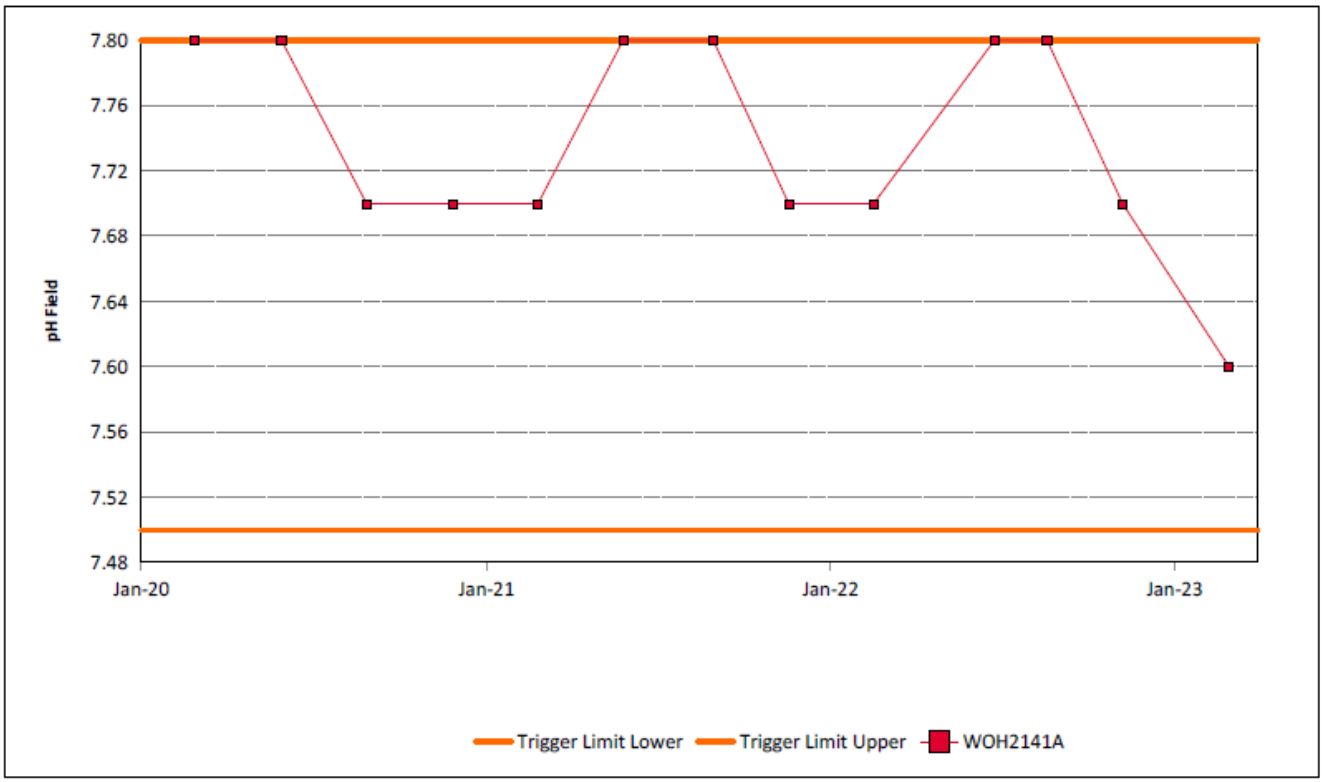

Figure 63: Whynot Seam pH Field Trend – March 2023

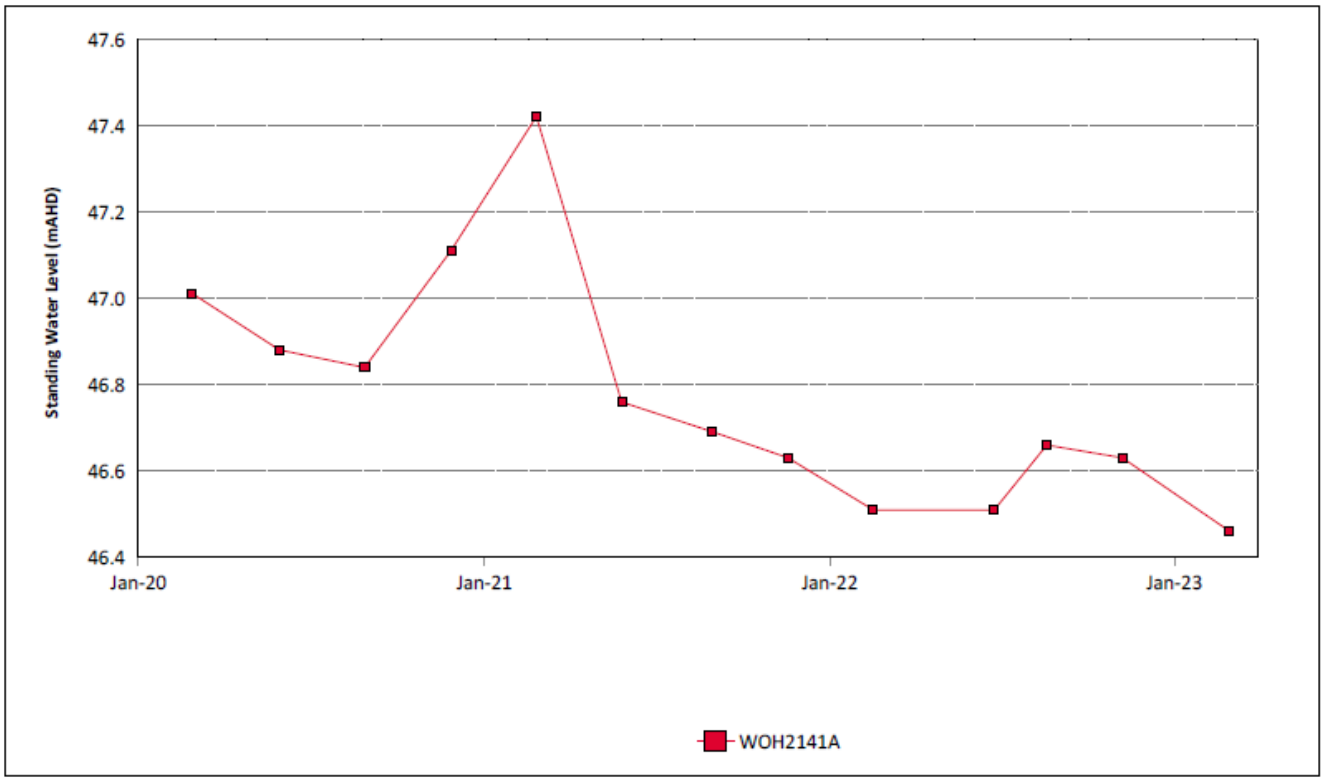

Figure 64: Whynot Seam Standing Water Level Trend – March 2023

3.3.1 Groundwater Trigger Tracking

Internal trigger limits have been developed to assess monitoring data on an on-going basis, and to highlight potentially adverse groundwater impacts. The process for evaluating monitoring results against the internal triggers and subsequent responses are outlined in the MTW Water Management Plan. Locations of groundwater bores are shown in **Figure 56**.

Current internal groundwater trigger limit breaches are summarised in **Table 3**

Table 3: Groundwater Trigger Tracking – March 2023

Site	Date	Trigger Limit Breached	Action Taken in Response
MB15MTW01D	15/02/2023	pH –5th Percentile	Investigation previously completed. The consultant identified in their report that "it is likely the trigger values derived for shallow overburden bores do not accurately represent in-situ groundwater water quality for MB15MTW01D". MB15MTW01D is part of a larger dataset from the shallow overburden seam. The 5th percentile of the seam is currently 6.7 while the 5th percentile of MB15MTW01D is 5.4. The result is consistent with previous results and within sample location trigger levels. No further investigation required.
* = Watching brief established pending outcomes of subsequent monitoring events. No specific actions required.			

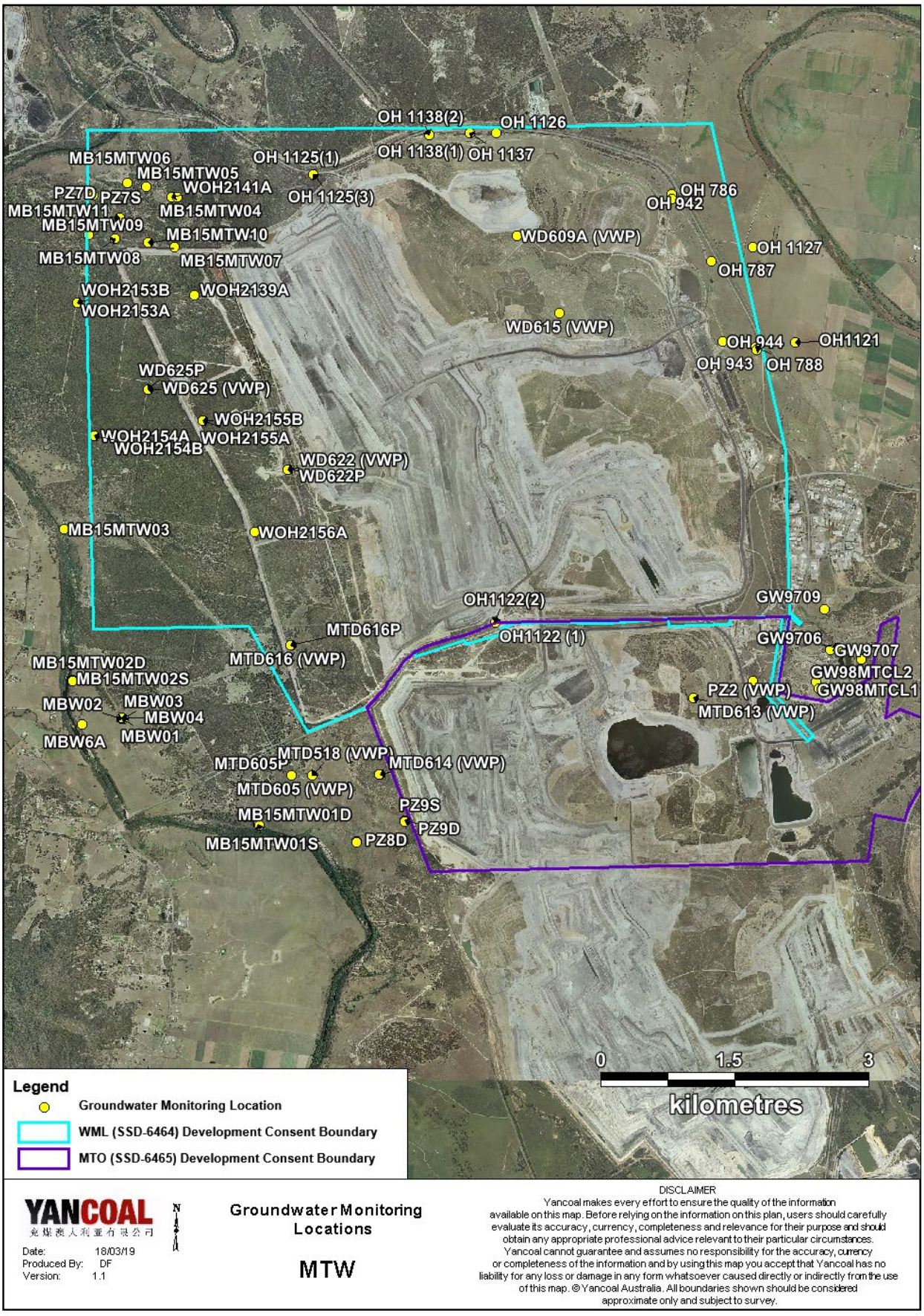

Figure 65: Groundwater Monitoring Location Plan

4.0 BLAST MONITORING

MTW have a network of six blast monitoring units. These are located at nearby privately owned residences and function as regulatory compliance monitors.

The location of these monitors can be found in **Figure 72**.

4.1 Blast Monitoring Results

During March 2023, 16 blasts were initiated at MTW. **Figure 66** to **Figure 71** show the blast monitoring results for the reporting period against the impact assessment criteria. The criteria are summarised in **Table 4**.

Table 4: Blasting Limits

Airblast Overpressure (dB(L))	Comments
115	5% of the total number of blasts in a 12 month period at WML or MTO
120	0%
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12 month period at WML or MTO
10	0%

During the reporting period one blast exceeded the 115 dB(L) threshold for airblast overpressure at the MTIE and Abbey Green monitoring locations. No blast exceeded the 5mm/s criteria for ground vibration.

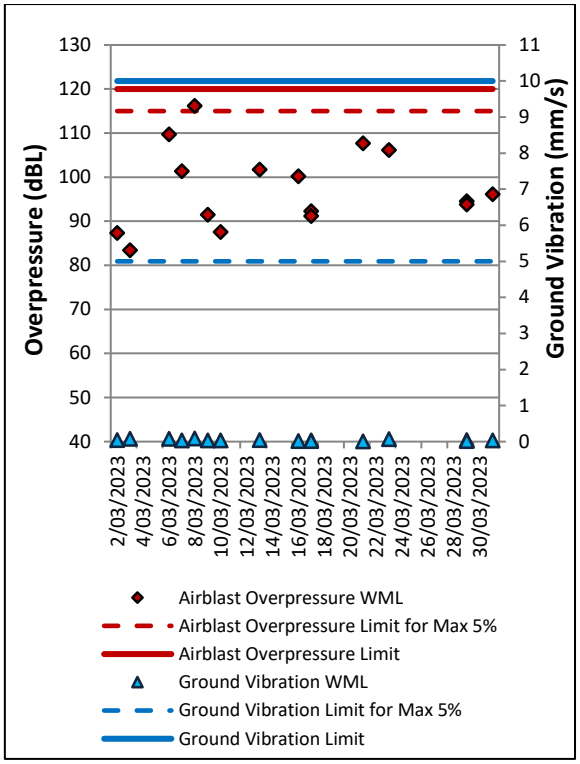

Figure 66: Abbey Green Blast Monitoring Results – March 2023

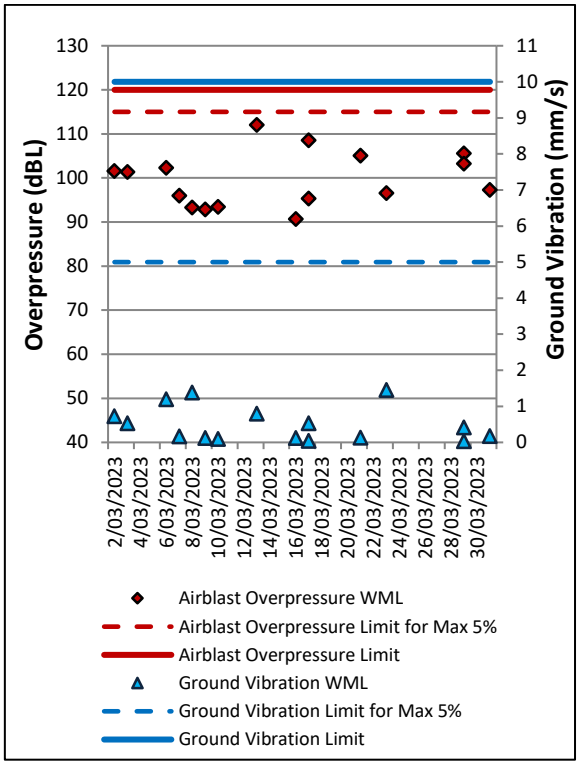

Figure 67: Bulga Village Blast Monitoring Results – March 2023

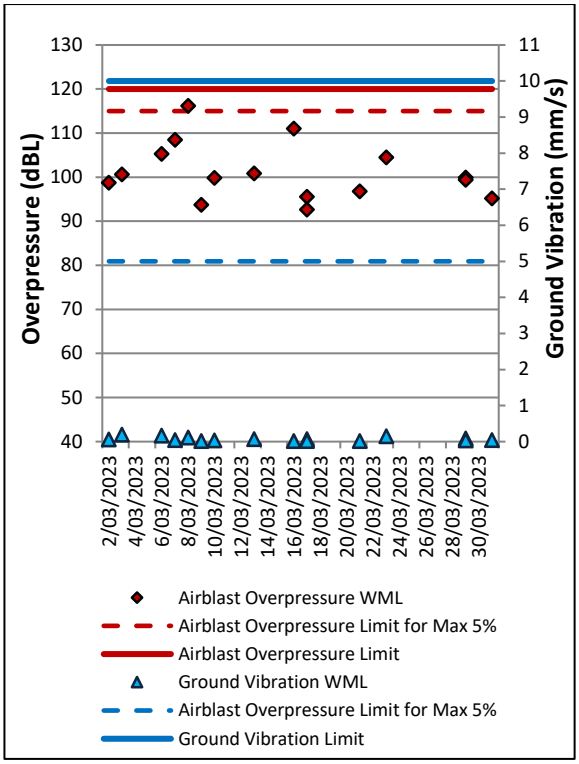

Figure 68: MTIE Blast Monitoring Results – March 2023

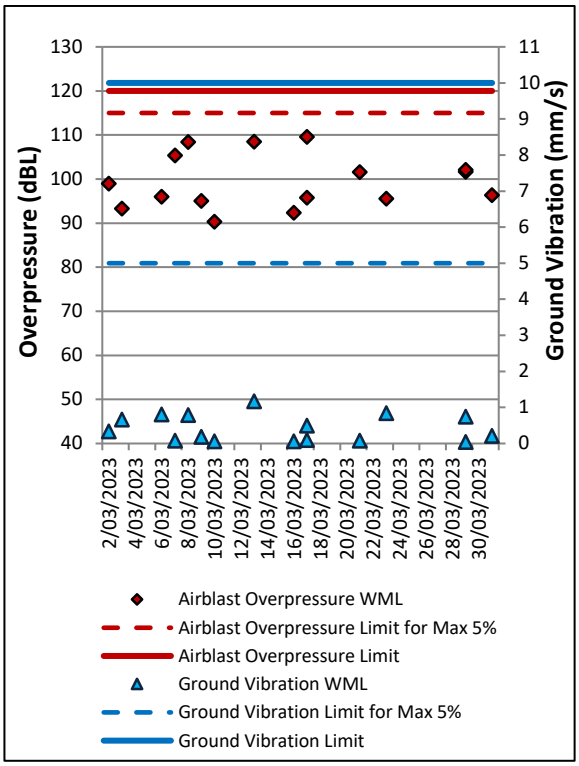

Figure 69: Wambo Road Blast Monitoring Results - March 2023

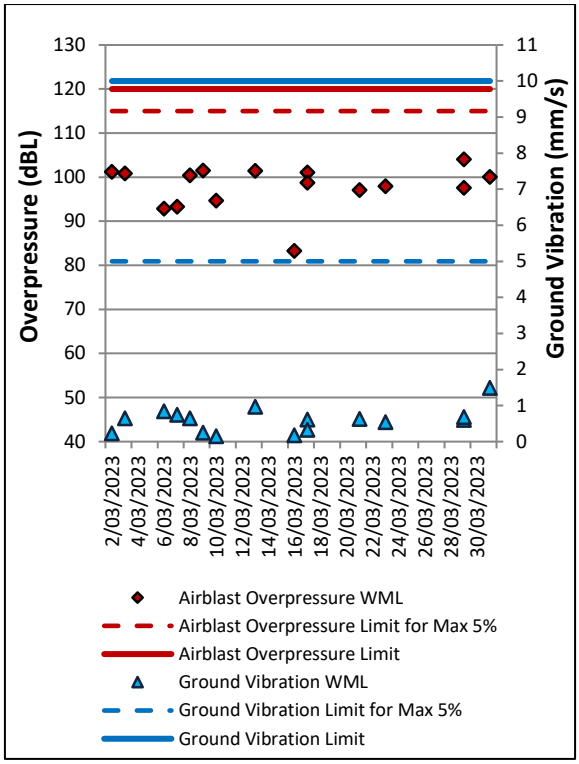

Figure 70: Warkworth Blast Monitoring Results – March 2023

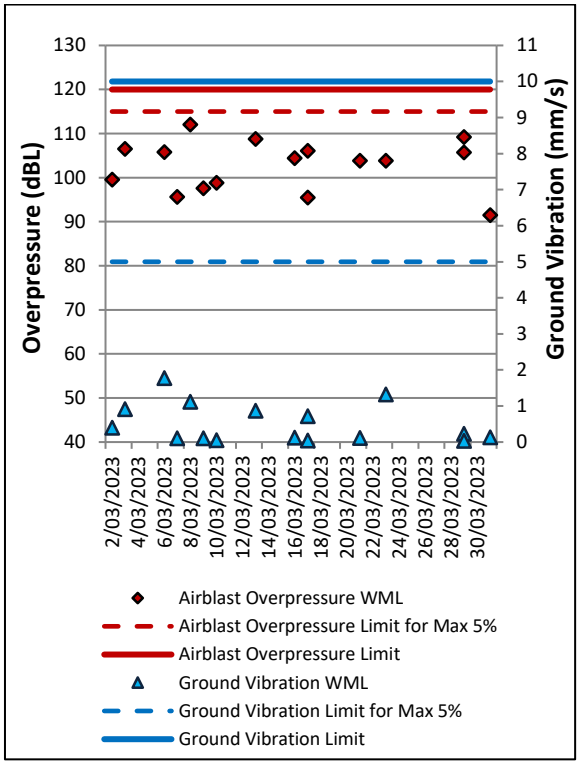

Figure 71: Wollemi Peak Road Blast Monitoring Results – March 2023

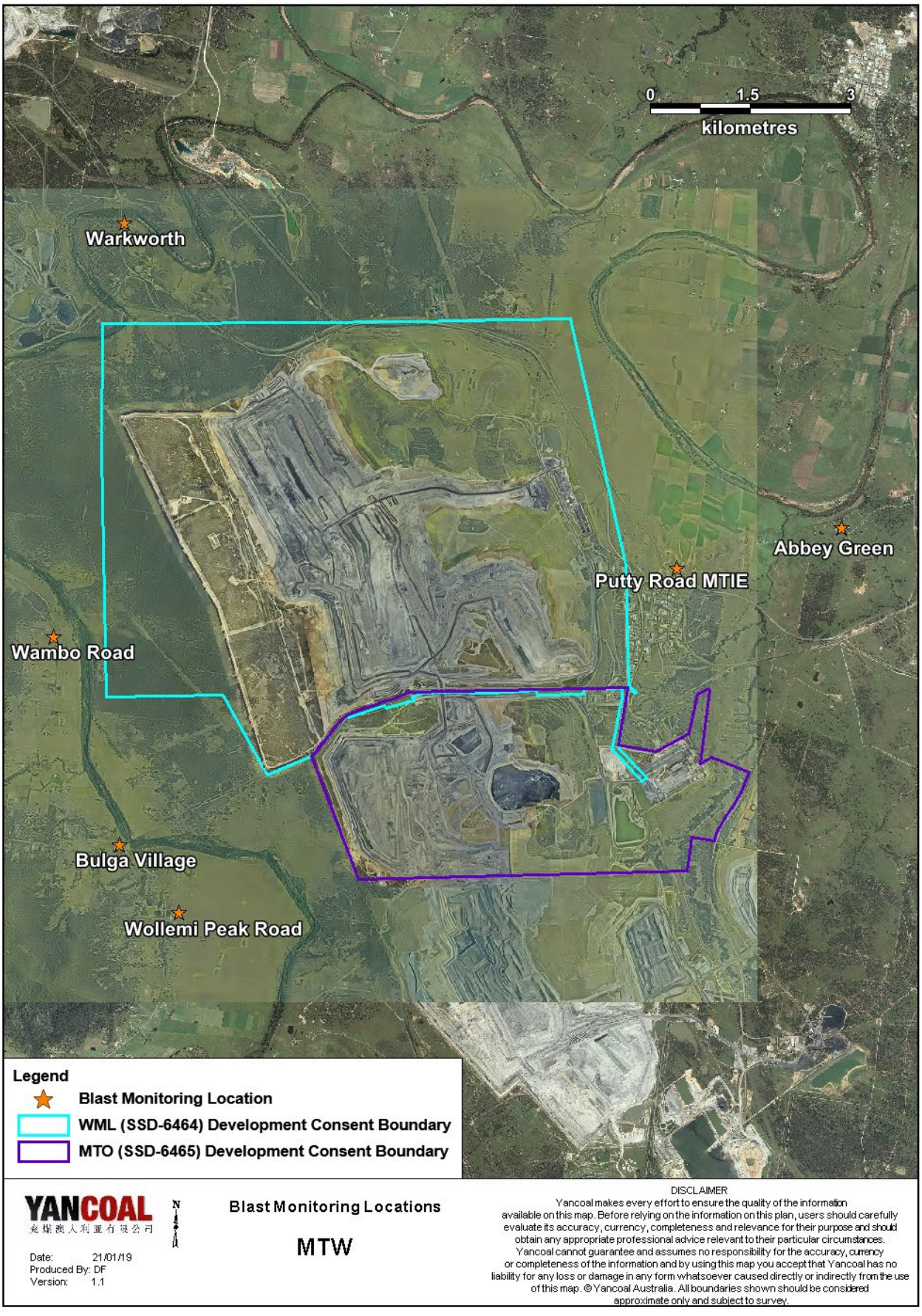

Figure 72: MTW Blast Monitoring Location Plan

5.0 NOISE

Routine attended noise monitoring is carried out in accordance with the MTW Noise Management Plan. A review against EIS predictions will be reported in the Annual Review. The purpose of the noise surveys is to quantify and describe the acoustic environment around the site and compare results with specified limits. Real time noise monitoring also occurs at five sites surrounding MTW. Noise monitoring locations are displayed in **Figure 73**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 16 March 2023. All measurements complied with the relevant criteria. Results are detailed in **Table 5 to Table 8.**

5.1.1 WML Noise Assessment

Compliance assessments undertaken against the WML noise criteria are presented in **Tables 5** and **6**.

Table 5: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – March 2023

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3,4]	Exceedance[3,4]
Bulga RFS	16/03/2023 23:02	1.4	F	37	Yes	IA	Nil
Bulga Village	16/03/2023 22:17	1.7	F	38	Yes	IA	Nil
Gouldsville	16/03/2023 21:26	2.2	D	38	Yes	26	Nil
Inlet Rd	16/03/2023 21:31	2.2	D	37	Yes	<20	Nil
Inlet Rd West	16/03/2023 21:09	2.2	D	35	Yes	IA	Nil
Long Point	16/03/2023 21:00	1.9	F	35	Yes	IA	Nil
South Bulga	16/03/2023 22:41	1.5	F	35	Yes	IA	Nil
Wambo Road	16/03/2023 21:56	1.8	D	38	Yes	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LAeq,15minute attributed to WML, including modifying factors if applicable;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

Table 6: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – March 2023

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1,\ 1min}$ dB[2,3,4]	Exceedance[3,4]
Bulga RFS	16/03/2023 23:02	1.4	F	47	Yes	IA	Nil
Bulga Village	16/03/2023 22:17	1.7	F	48	Yes	IA	Nil
Gouldsville	16/03/2023 21:26	2.2	D	48	Yes	30	Nil
Inlet Rd	16/03/2023 21:31	2.2	D	47	Yes	21	Nil
Inlet Rd West	16/03/2023 21:09	2.2	D	45	Yes	IA	Nil
Long Point	16/03/2023 21:00	1.9	F	45	Yes	IA	Nil
South Bulga	16/03/2023 22:41	1.5	F	45	Yes	IA	Nil
Wambo Road	16/03/2023 21:56	1.8	D	48	Yes	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LA1,1minute attributed to WML;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

5.1.2 MTO Noise Assessment

Compliance assessments undertaken against the MTO noise criteria are presented in **Table 7** and **8**.

Table 7: $L_{Aeq, 15minute}$ Mount Thorley - Impact Assessment Criteria – March 2023

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3,4]	Exceedance[3,4]
Bulga RFS	16/03/2023 23:02	1.4	F	37	Yes	27	Nil
Bulga Village	16/03/2023 22:17	1.7	F	38	Yes	IA	Nil
Gouldsville	16/03/2023 21:26	2.2	D	35	Yes	IA	Nil
Inlet Rd	16/03/2023 21:31	2.2	D	37	Yes	IA	Nil
Inlet Rd West	16/03/2023 21:09	2.2	D	35	Yes	IA	Nil
Long Point	16/03/2023 21:00	1.9	F	35	Yes	23	Nil
South Bulga	16/03/2023 22:41	1.5	F	36	Yes	26	Nil
Wambo Road	16/03/2023 21:56	1.8	D	38	Yes	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LAeq,15minute attributed to MTO, including modifying factors if applicable;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

Table 8: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – March 2023

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3,4]	Exceedance[3,4]
Bulga RFS	16/03/2023 23:02	1.4	F	47	Yes	30	Nil
Bulga Village	16/03/2023 22:17	1.7	F	48	Yes	IA	Nil
Gouldsville	16/03/2023 21:26	2.2	D	45	Yes	IA	Nil
Inlet Rd	16/03/2023 21:31	2.2	D	47	Yes	IA	Nil
Inlet Rd West	16/03/2023 21:09	2.2	D	45	Yes	IA	Nil
Long Point	16/03/2023 21:00	1.9	F	45	Yes	25	Nil
South Bulga	16/03/2023 22:41	1.5	F	46	Yes	30	Nil
Wambo Road	16/03/2023 21:56	1.8	D	48	Yes	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LA1,1minute attributed to MTO;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

5.1.3 NPfI Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification factor corrections has been assessed. There were no noise measurements taken during the reporting period which required the penalty to be applied. The WML assessment for low frequency noise is shown in **Table 9** and the MTO assessment for low frequency noise is shown in **Table 10**. **.**

Table 9: Warkworth Low Frequency Noise Assessment – March 2023

Location	Date and Time	Measured WML LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB[2]
Bulga RFS	16/03/2023 23:02	IA	Yes	No	No	NA	No	NA	Nil
Bulga Village	16/03/2023 22:17	IA	Yes	No	No	NA	No	NA	Nil
Gouldsville	16/03/2023 21:26	26	Yes	No	No	NA	No	NA	Nil
Inlet Rd	16/03/2023 21:31	<20	Yes	No	No	NA	No	NA	Nil
Inlet Rd West	16/03/2023 21:09	IA	Yes	No	No	NA	No	NA	Nil
Long Point	16/03/2023 21:00	IA	Yes	No	No	NA	No	NA	Nil
South Bulga	16/03/2023 22:41	IA	Yes	No	No	NA	No	NA	Nil
Wambo Road	16/03/2023 21:56	IA	Yes	No	No	NA	No	NA	Nil

Notes:
1. NA denotes 'not applicable'; and
2. Bold results indicate that application of NPfI modifying factor/s is required.

Table 10: Mount Thorley Operations Low Frequency Noise Assessment – March 2023

Location	Date and Time	Measured WML LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB[2]
Bulga RFS	16/03/2023 23:02	27	Yes	No	No	NA	No	NA	Nil
Bulga Village	16/03/2023 22:17	IA	Yes	No	No	NA	No	NA	Nil
Gouldsville	16/03/2023 21:26	IA	Yes	No	No	NA	No	NA	Nil
Inlet Rd	16/03/2023 21:31	IA	Yes	No	No	NA	No	NA	Nil
Inlet Rd West	16/03/2023 21:09	IA	Yes	No	No	NA	No	NA	Nil
Long Point	16/03/2023 21:00	23	Yes	No	No	NA	No	NA	Nil
South Bulga	16/03/2023 22:41	26	Yes	No	No	NA	No	NA	Nil
Wambo Road	16/03/2023 21:56	IA	Yes	No	No	NA	No	NA	Nil

Notes:
1. NA denotes 'not applicable'; and
2. Bold results indicate that application of NPfI modifying factor/s is required.

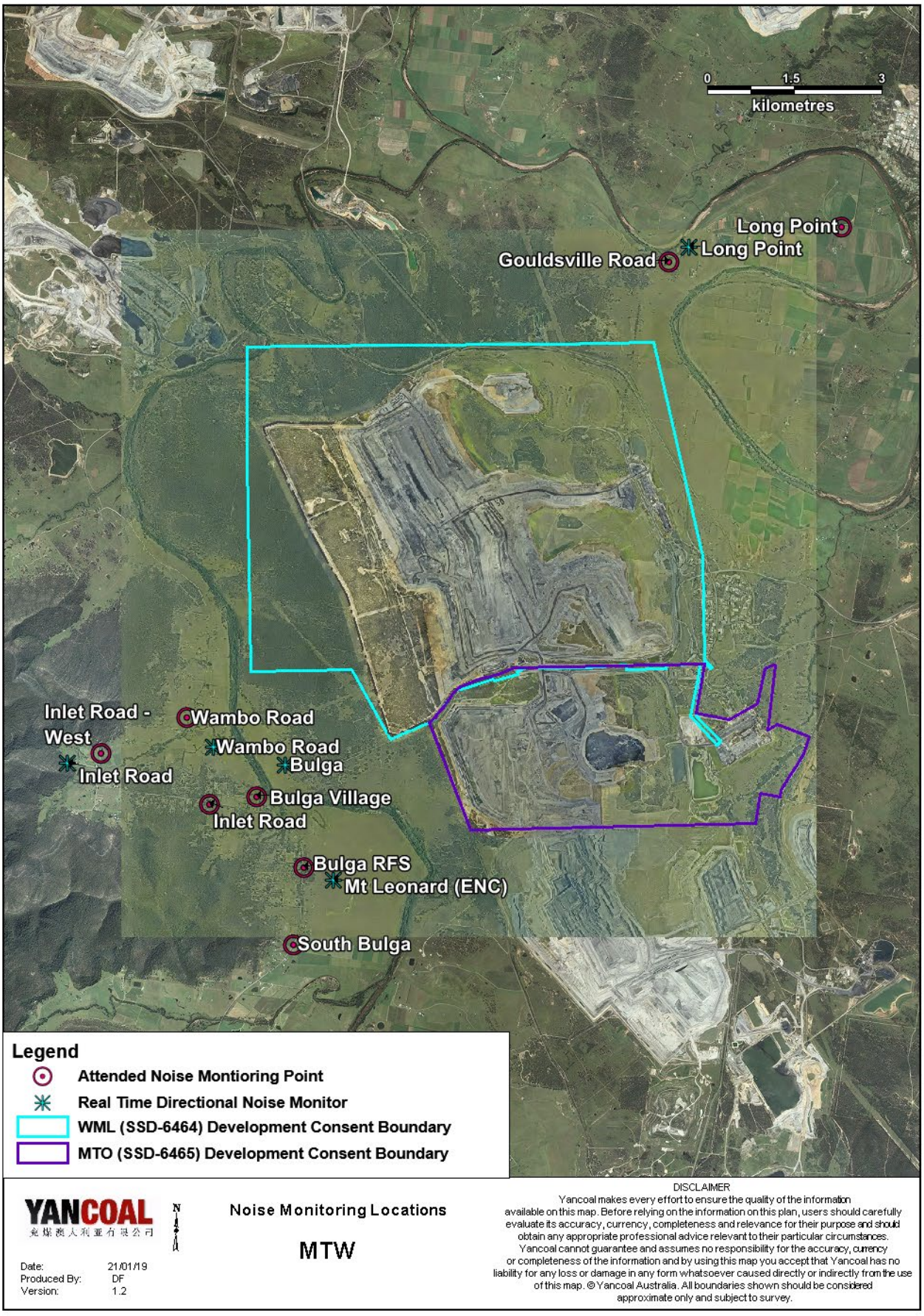

Figure 73: Noise Monitoring Location Plan

5.2 Noise Management Measures

A program of targeted supplementary attended noise monitoring is in place at MTW, supported by the real-time directional monitoring network and ensuring the highest level of noise management is maintained. The supplementary program is undertaken by MTW personnel and involves:

- Routine inspections from both inside and outside the mine boundary;
- Routine and as-required handheld noise assessments (undertaken in response to noise alarm and/or community complaint), comparing measured levels against consent noise limits; and
- Validation monitoring following operational modifications to assess the adequacy of the modifications.

Where a noise assessment identifies noise emissions which are exceeding the relevant noise limit(s) for any particular residence, modifications will be made to ensure that the noise event is resolved within 75 minutes of identification. The actions taken are commensurate with the nature and severity of the noise event, but can include:

- Changing the haul route to a less noise sensitive haul;
- Changing dump locations (in-pit or less exposed dump option);
- Reducing equipment numbers;
- Shut down of task; or
- Site shut down.

A summary of these assessments undertaken are provided in **Table 11**.

Table 11: Supplementary Attended Noise Monitoring Data – March 2023

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
644	10	6	1.55

Note: Measurements are taken under all meteorological conditions, including conditions under which the consent noise criteria do not apply.

6.0 OPERATIONAL DOWNTIME

During March, a total of 437.5 hours of equipment downtime was logged in response to environmental events such as dust, noise and adverse meteorological conditions. Operational downtime by equipment type is shown in **Figure 74**.

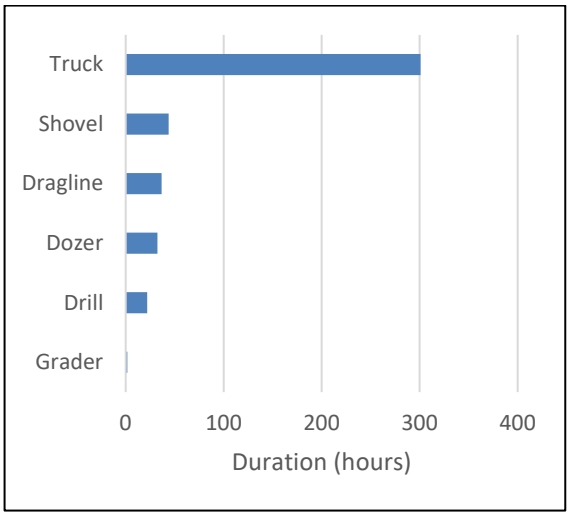

Figure 74: Operational Downtime by Equipment Type – March 2023

7.0 REHABILITATION

During March 2023, 15.83 Ha of land was released, 6.4 Ha was bulk shaped and 6.1 Ha was top soiled.

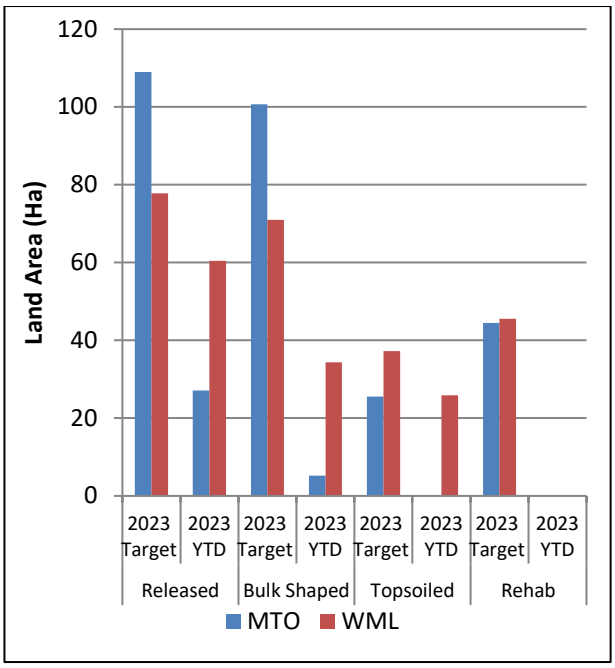

Figure 75: Rehabilitation YTD – March 2023

8.0 ENVIRONMENTAL INCIDENTS

There were no environmental incidents during the reporting period.

9.0 COMPLAINTS

14 complaints were received during the reporting period. Details of these complaints are shown in **Table 12** below.

Table 12: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	1	2	2	3	0	8
February	4	5	4	0	0	13
March	4	6	0	4	0	14
April						
May						
June						
July						
August						
September						
October						
November						
December						
Total	9	13	6	7	0	35

Appendix A: Meteorological Data

Table 13: Meteorological Data – Charlton Ridge Meteorological Station – March 2023

Date	Air Temperature		Relative Humidity		Wind Direction	Wind Speed	Rainfall
	Maximum (°C)	Minimum (°C)	Maximum (%)	Minimum (%)	Average (°)	Average (m/sec)	total (mm)
1/03/2022	26	-	94	-	204	2.6	0.0
2/03/2023	20	-	87	-	129	2.4	0.0
3/03/2023	30	-	80	-	117	3.3	0.0
4/03/2023	29	18	95	43	144	2.5	0.0
5/03/2023	32	15	95	36	150	2.0	0.0
6/03/2023	39	19	86	14	254	3.5	0.0
7/03/2023	38	26	63	19	274	3.6	0.0
8/03/2023	34	16	62	8	280	3.3	0.0
9/03/2023	31	15	67	20	219	2.7	0.0
10/03/2023	31	17	74	32	146	3.1	0.0
11/03/2023	34	16	97	32	217	2.2	4.4
12/03/2023	31	18	98	45	185	2.6	0.2
13/03/2023	24	18	99	70	157	3.2	9.4
14/03/2023	26	17	97	68	167	3.1	1.4
15/03/2023	31	17	98	43	172	1.7	0.0
16/03/2023	37	17	99	19	270	2.5	0.0
17/03/2023	35	19	85	21	212	3.0	0.0
18/03/2023	34	19	94	32	171	1.8	0.0
19/03/2023	41	16	94	15	200	1.9	0.0
20/03/2023	28	20	90	56	166	3.7	0.0
21/03/2023	24	19	76	56	137	2.8	0.0
22/03/2023	30	16	94	42	163	2.2	0.4
23/03/2023	34	18	99	35	232	2.5	21.6
24/03/2023	28	17	99	54	177	2.6	0.6
25/03/2023	24	18	98	70	142	2.8	0.0
26/03/2023	26	18	91	57	133	2.7	0.0
27/03/2023	21	16	100	89	242	1.8	29.4
28/03/2023	26	18	99	61	208	1.7	10.4
29/03/2023	27	17	99	49	255	2.3	5.8
30/03/2023	25	13	92	31	272	2.6	0.0
31/03/2023	26	10	82	33	260	2.5	0.0

"-" Indicates that data was not available due to technical issues.