Monthly Environmental Monitoring Report

Yancoal Mt Thorley Warkworth

December 2017

CONTENTS

Figures

Tables

Revision History

Version No.	Person Responsible	Document Status	Date
1.0	**Environmental Advisor**	**Draft**	**05/02/2018**
1.1	**Environmental Specialist**	**Final**	**7/02/2018**

1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mt Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1 December to 31 December 2017.

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 period is summarised in Table 1, the year-to-date trend and historical trend are shown in **Error! Reference source not found.**.

Table 1: Monthly Rainfall MTW

2017	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
December	42.6	444.4

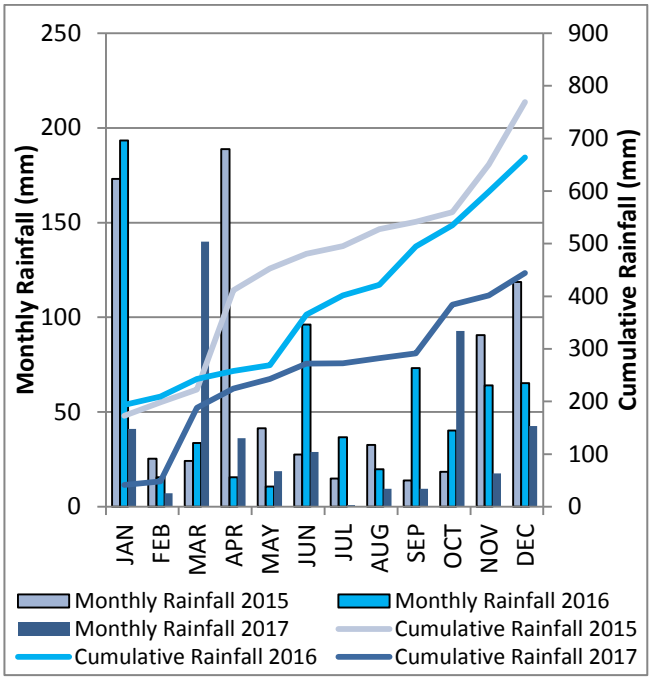


Figure 1: Rainfall Trends YTD

2.1.2 Wind Speed and Direction

Winds from the South East were dominant throughout the reporting period as shown in Figure 2.

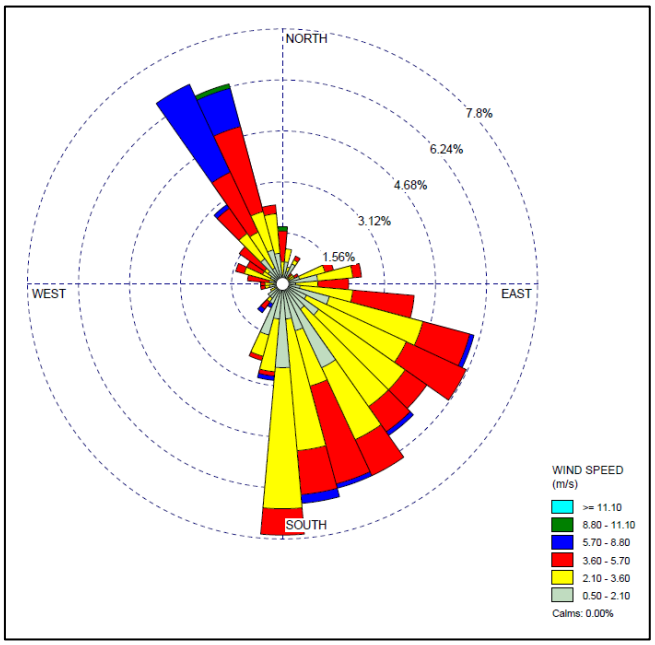


Figure 2: Charlton Ridge Wind Rose – December 2017

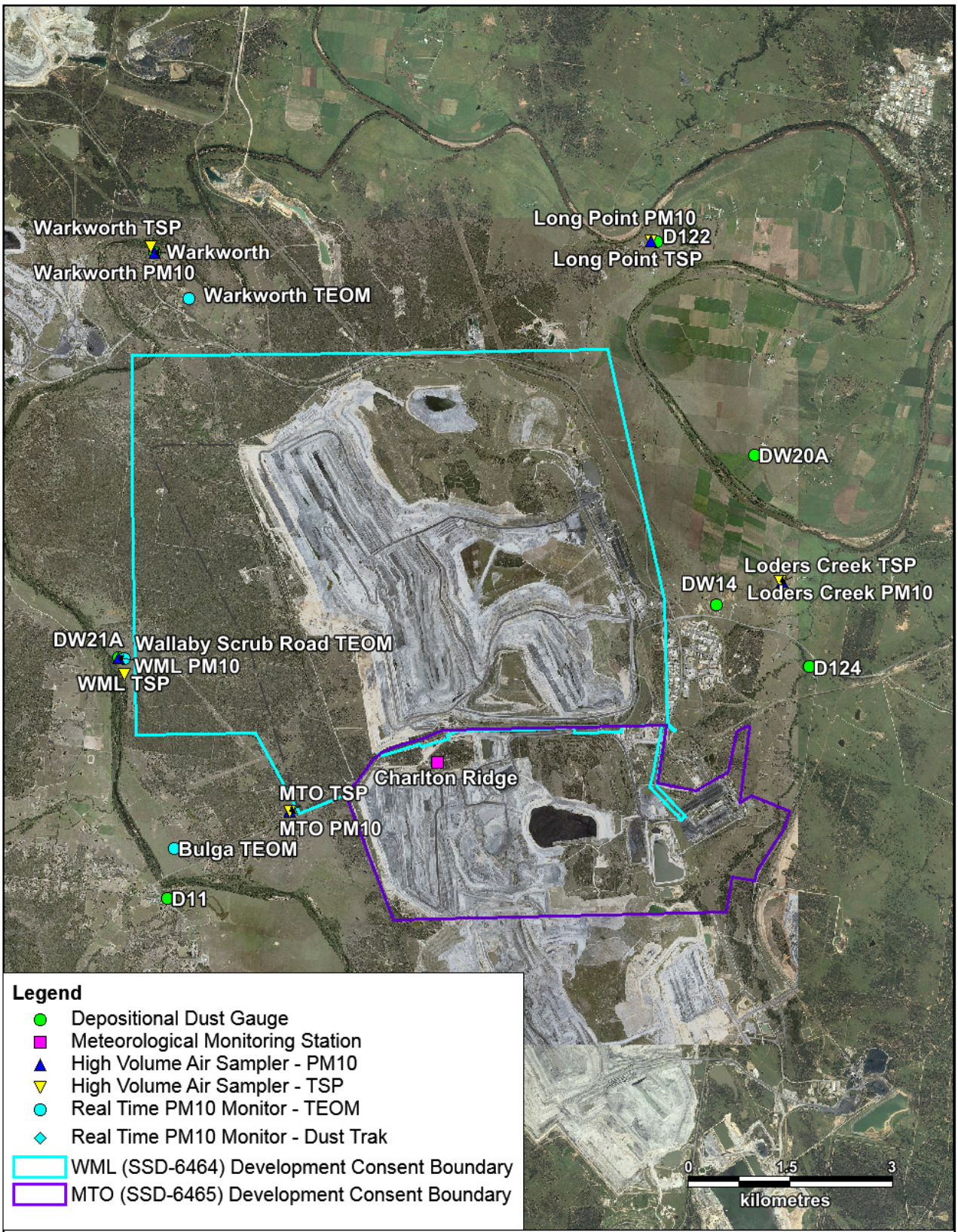


Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

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

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.

During the reporting period the DW20a, DW21a, D122 and Warkworth monitors recorded monthly results above the long term impact assessment criteria of 4.0 g/m^2 per month. Field notes associated with monitor D122 results confirm the presence of bird droppings and/or insects. As such the results are considered contaminated and will be excluded from calculation of the annual average.

There is no evidence to suggest that the DW20a, DW21a and Warkworth results are contaminated. Accordingly, the results will be included in the annual average calculation.

An annual assessment of MTW's compliance with the Long Term Impact Assessment Criteria will be provided in the 2017 Annual Review.

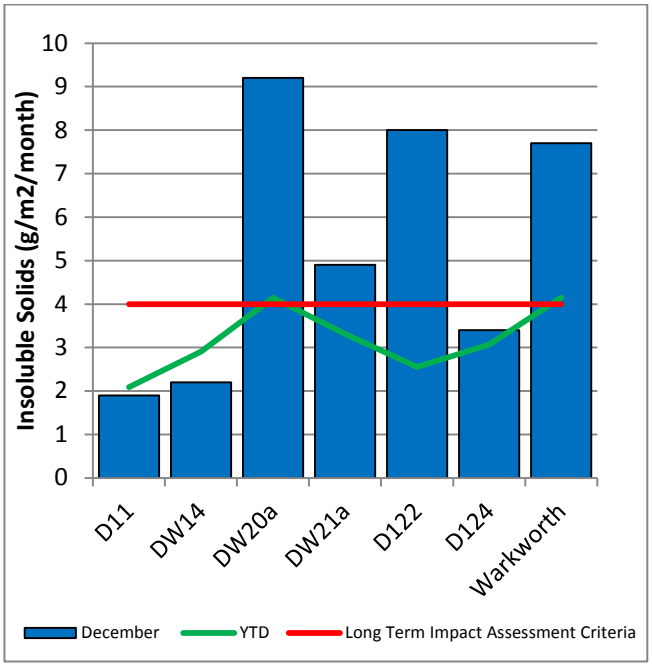


Figure 4: Depositional Dust – December 2017

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.

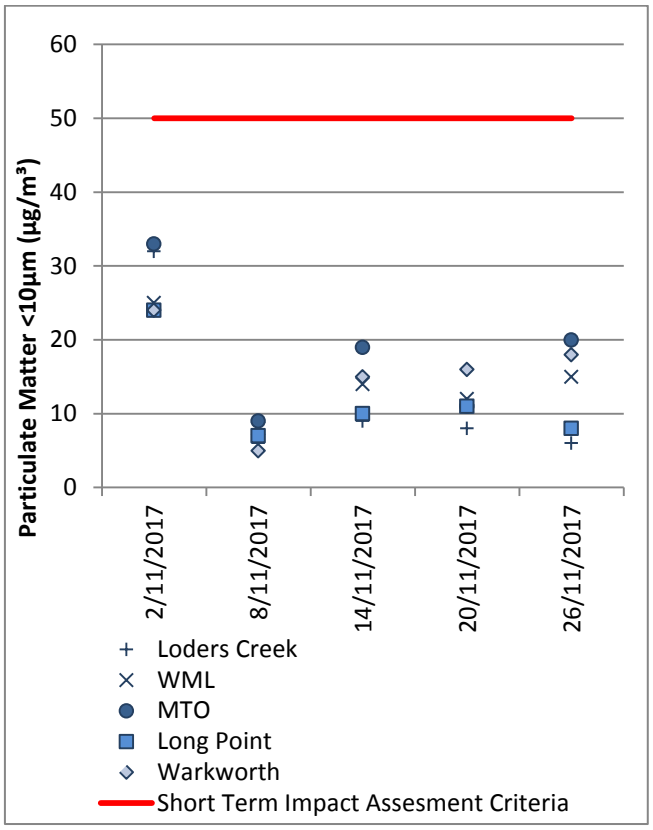


Figure 5: Individual PM_{10} Results – December 2017

Figure 6 shows the annual average PM_{10} results against the long term impact assessment criteria. An annual assessment of MTW's compliance with the Long Term Impact Assessment Criteria will be provided in the 2017 Annual Review.

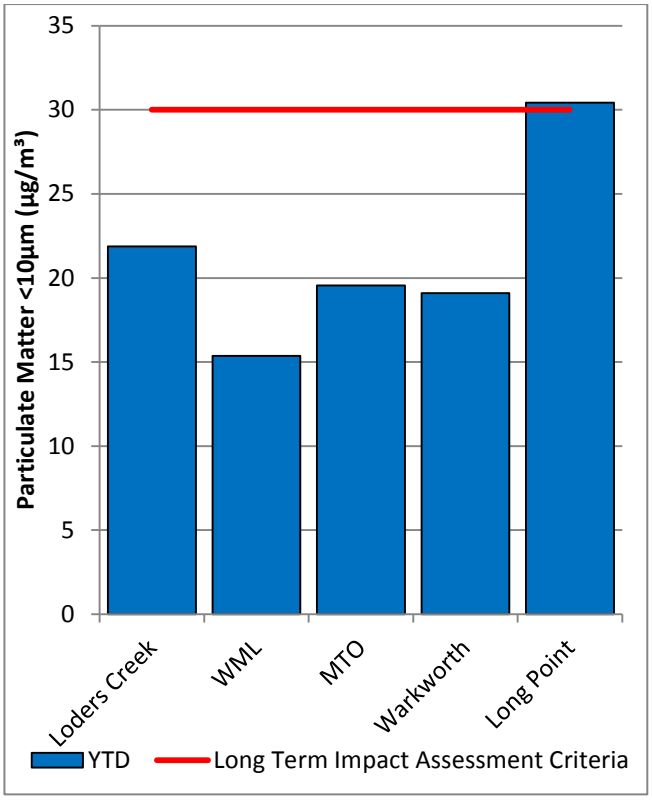


Figure 6: Annual Average PM_{10} –December 2017

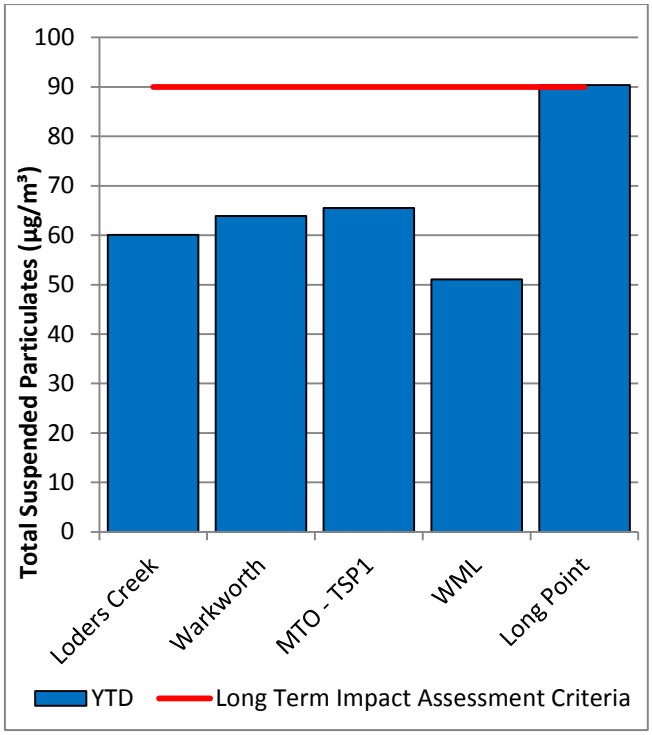


Figure 7: Annual Average Total Suspended Particulates – December 2017

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 annual assessment of MTW's compliance with the Long Term Impact Assessment Criteria will be provided in the 2017 Annual Review.

2.3.3 Real Time PM_{10} Results

Mt Thorley Warkworth 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 alarms 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 year to date annual average PM_{10} result.

Ten 24 hour average PM_{10} results recorded at the Bulga TEOM which exceeded the short term (24hr) criteria during December 2017. An internal investigation determined that these elevated results had been heavily influenced by a local source to the monitor. As such data from the nearby Bulga OEH Air Quality Monitor has been used as representative data points for these days (15-19 December, 23-24 December and 28-30 December inclusive).

2.3.4 Real Time Alarms for Air Quality

During December, the real time monitoring system generated 118 automated air quality related alerts, including 11 alerts for adverse meteorological conditions and 107 alerts for elevated PM_{10} levels.

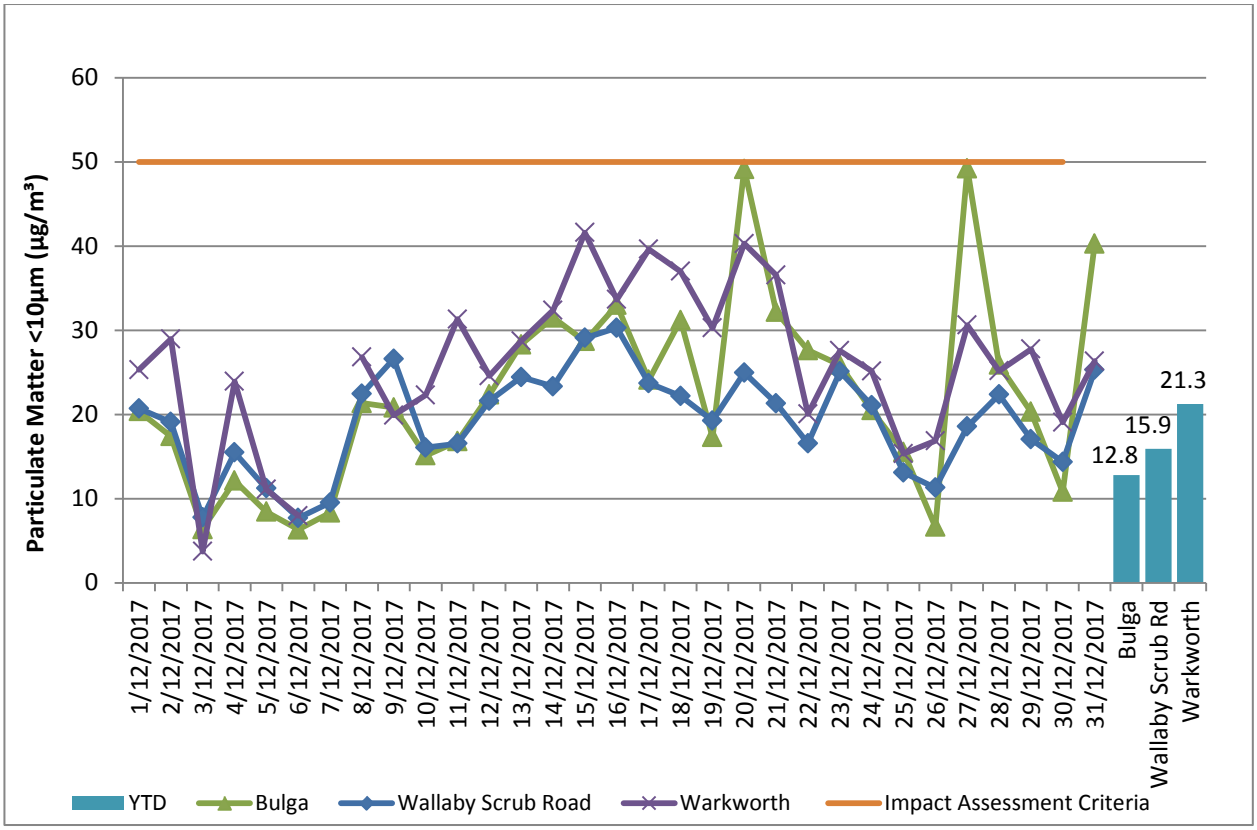


Figure 8: Real Time PM_{10} 24hr average and Year-to-date average – December 2017

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 monitor the potential impact of mining. Other Hunter River tributaries are also monitored.

3.1.1 Surface Water Monitoring Results

Figure 9 to Figure 11 show the long term surface water trend (2014 – current) within MTW mine dams. Figure 12 to Figure 14 show the long term surface water trend (2014 - current) in surrounding watercourses.

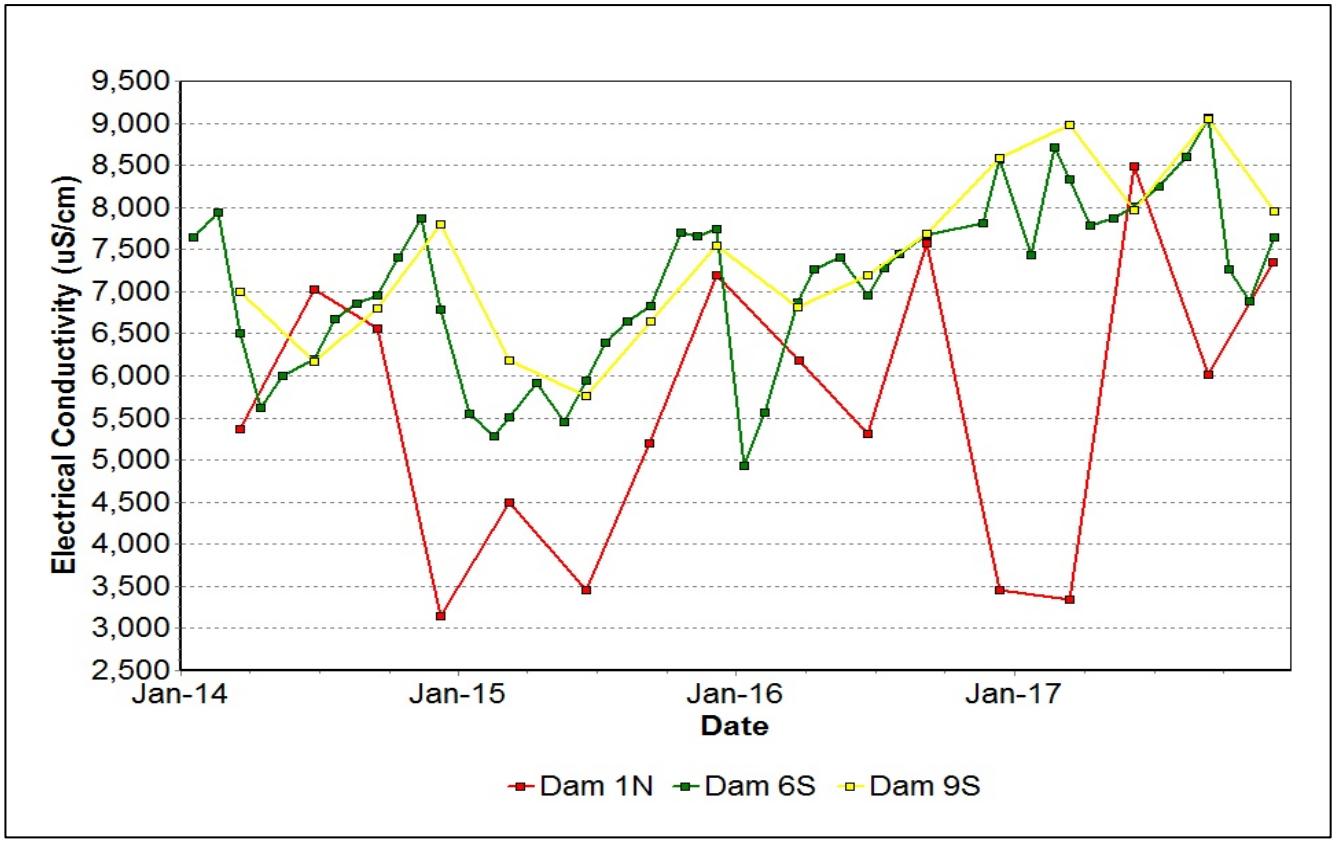


Figure 9: Site Dams Electrical Conductivity Trend – December 2017

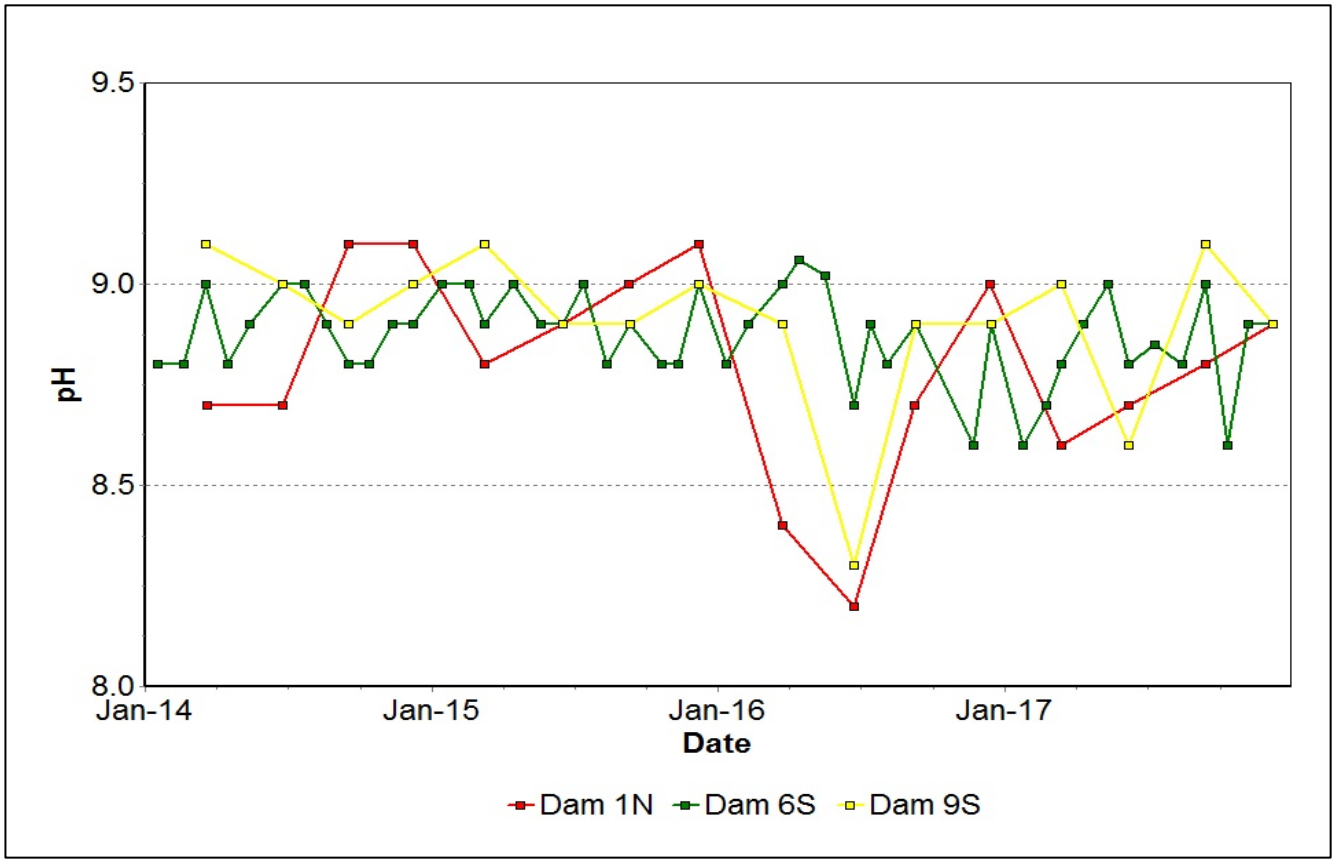


Figure 10: Site Dams pH Trend – December 2017

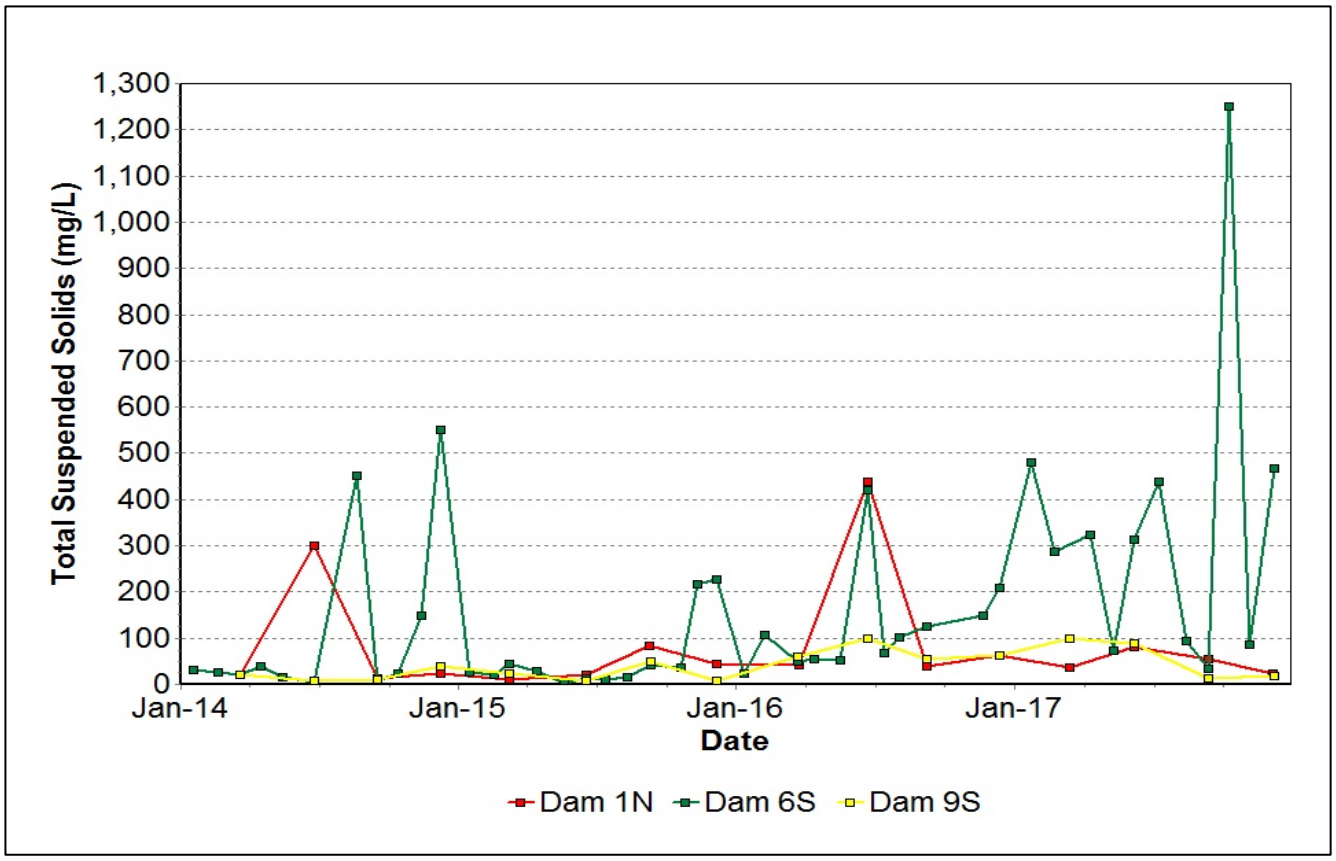


Figure 11: Site Dams Total Suspended Solids Trend – December 2017

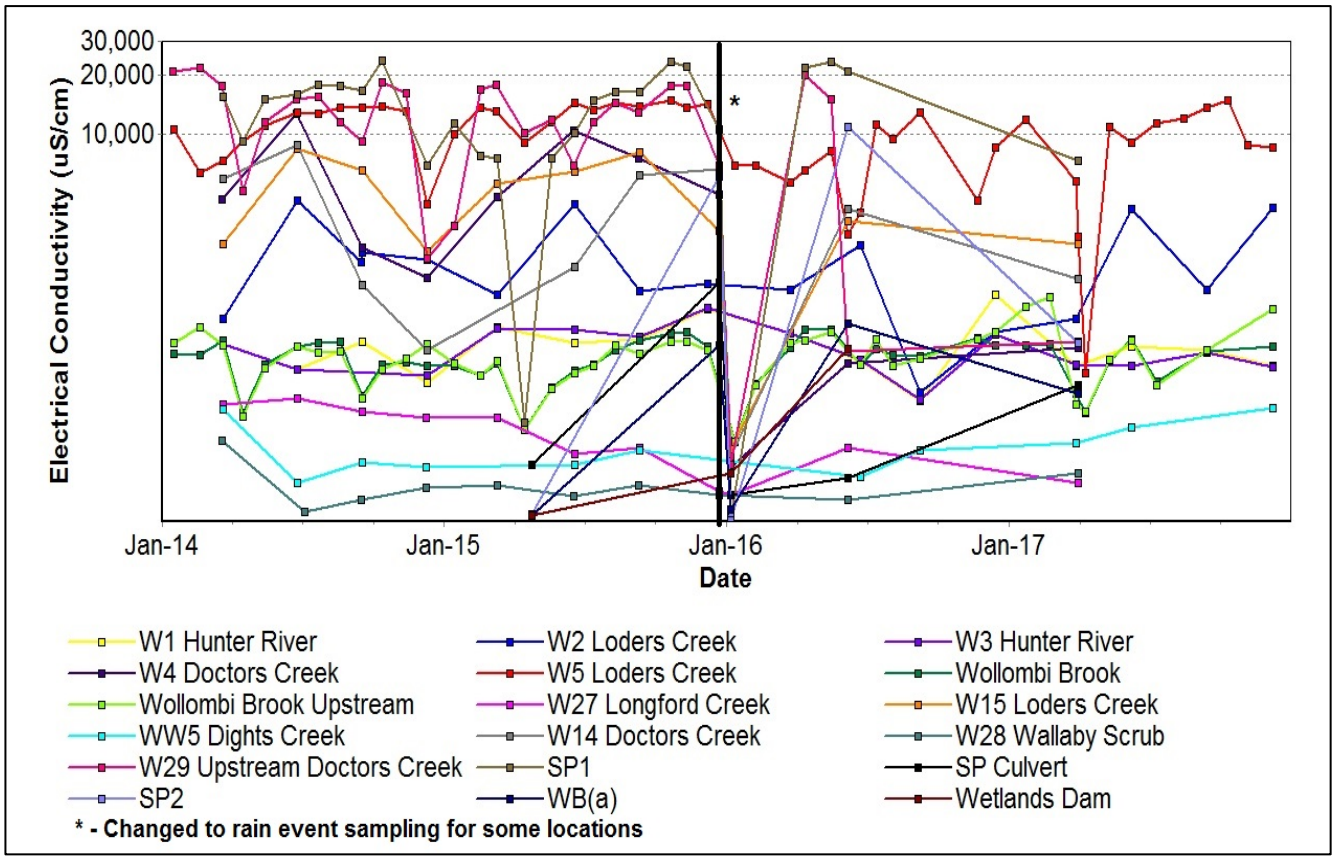


Figure 12: Watercourse Electrical Conductivity Trend – December 2017

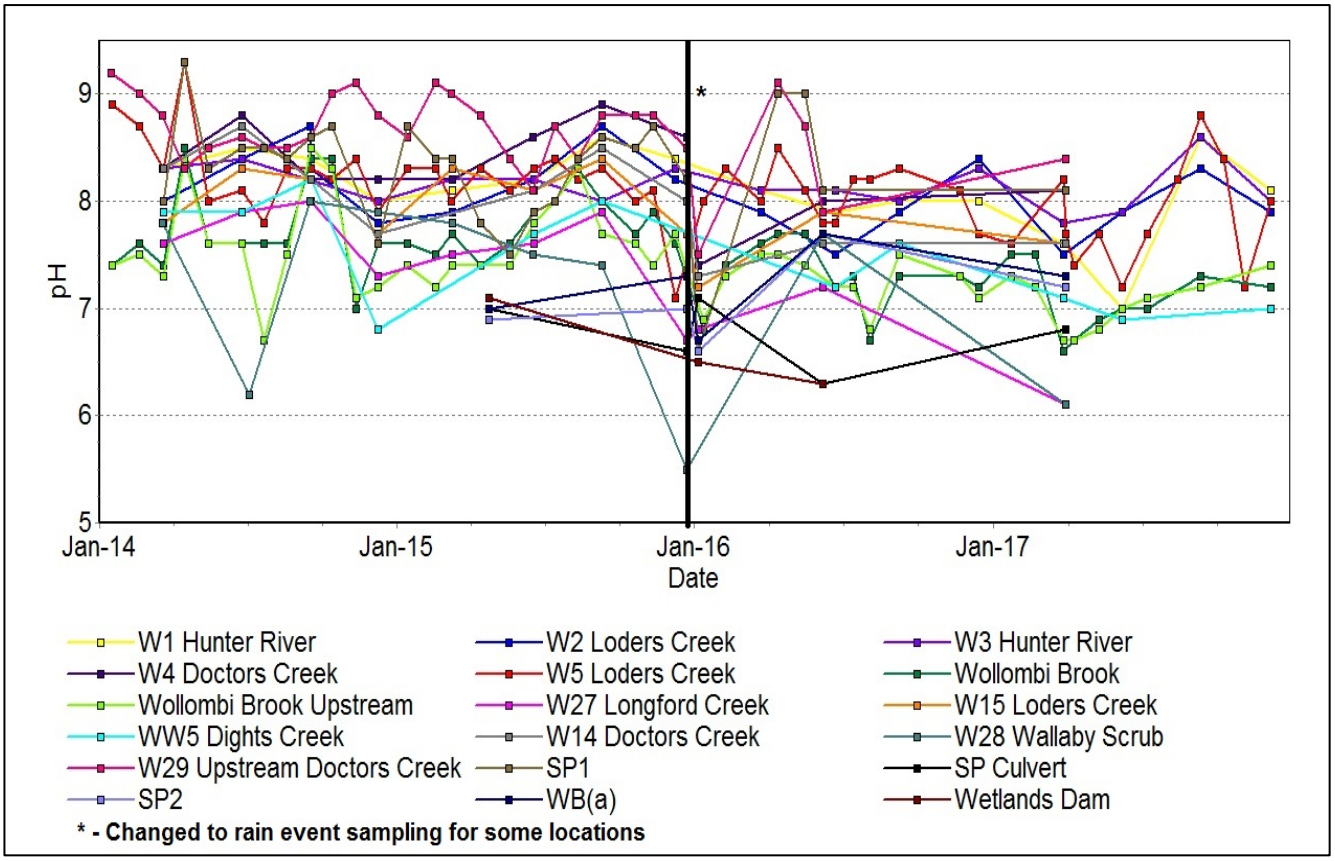


Figure 13: Watercourse pH Trend – December 2017

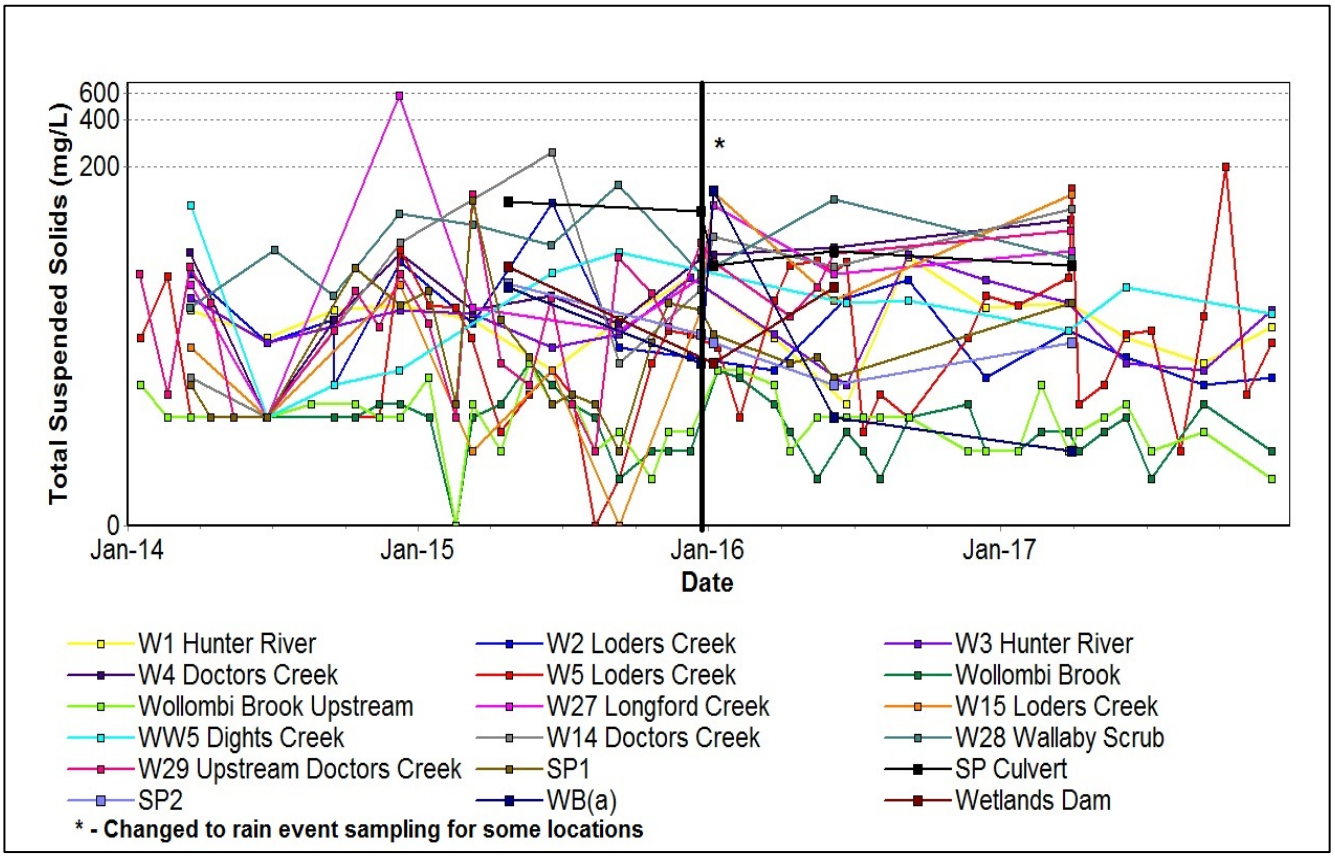


Figure 14: Watercourse Total Suspended Solids Trend – December 2017

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 – December YTD 2017

Site	Date	Trigger Limit Breached	Action Taken in Response
W5	15/08/2017	EC –95th Percentile	Watching Brief*
W5	13/09/2017	EC –95th Percentile	Watching Brief*
W5	11/10/2017	EC –95th Percentile	Dry weather conditions and lack of surface flow in preceding months likely to have resulted in elevated EC reading, unlikely to be anthropogenic impact. Watching Brief to continue*
W1	28/03/2017	pH –5th Percentile	Watching Brief*
W1	08/06/2017	pH –5th Percentile	Watching Brief*
W1	13/09/2017	pH –95th Percentile	Natural Variability, watching brief.
W2	28/03/2017	pH –5th Percentile	Watching Brief*
W3	13/09/2017	pH –95th Percentile	Watching Brief*
W4	31/03/2017	pH –5th Percentile	Watching Brief*
W5	06/11/2017	pH –5th Percentile	Watching Brief*
W15	31/03/2017	pH –5th Percentile	Watching Brief*
W27	31/03/2017	pH –5th Percentile	Watching Brief*
W28	31/03/2017	pH –5th Percentile	Watching Brief*

* = Watching brief established pending outcomes of subsequent monitoring events. No specific actions required.

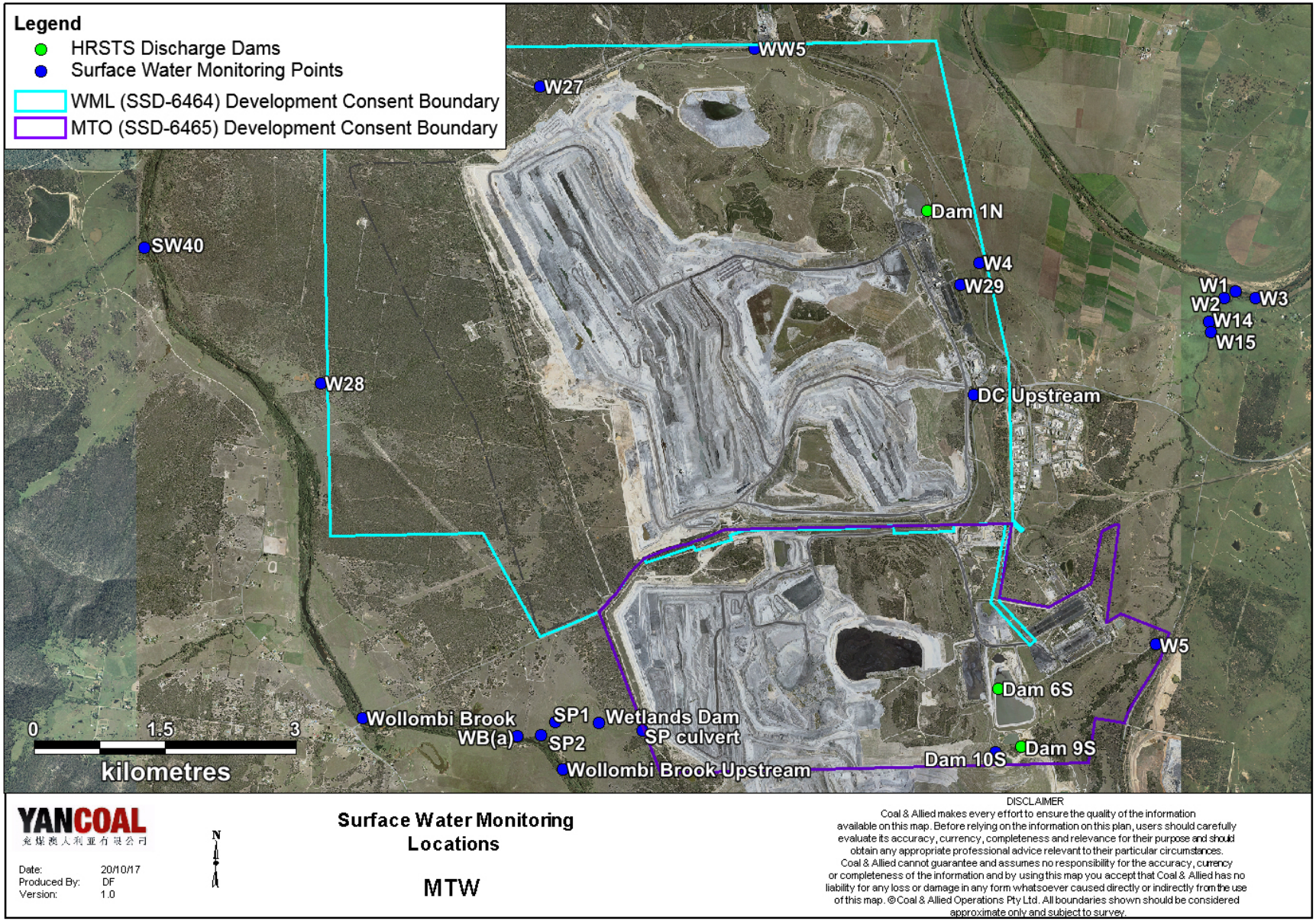


Figure 15: Surface Water Monitoring Location Plan

3.2 Groundwater Monitoring

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

Figure 16 to Figure 58 show the long term water quality trends (2014 – current) for groundwater bores monitored at MTW.

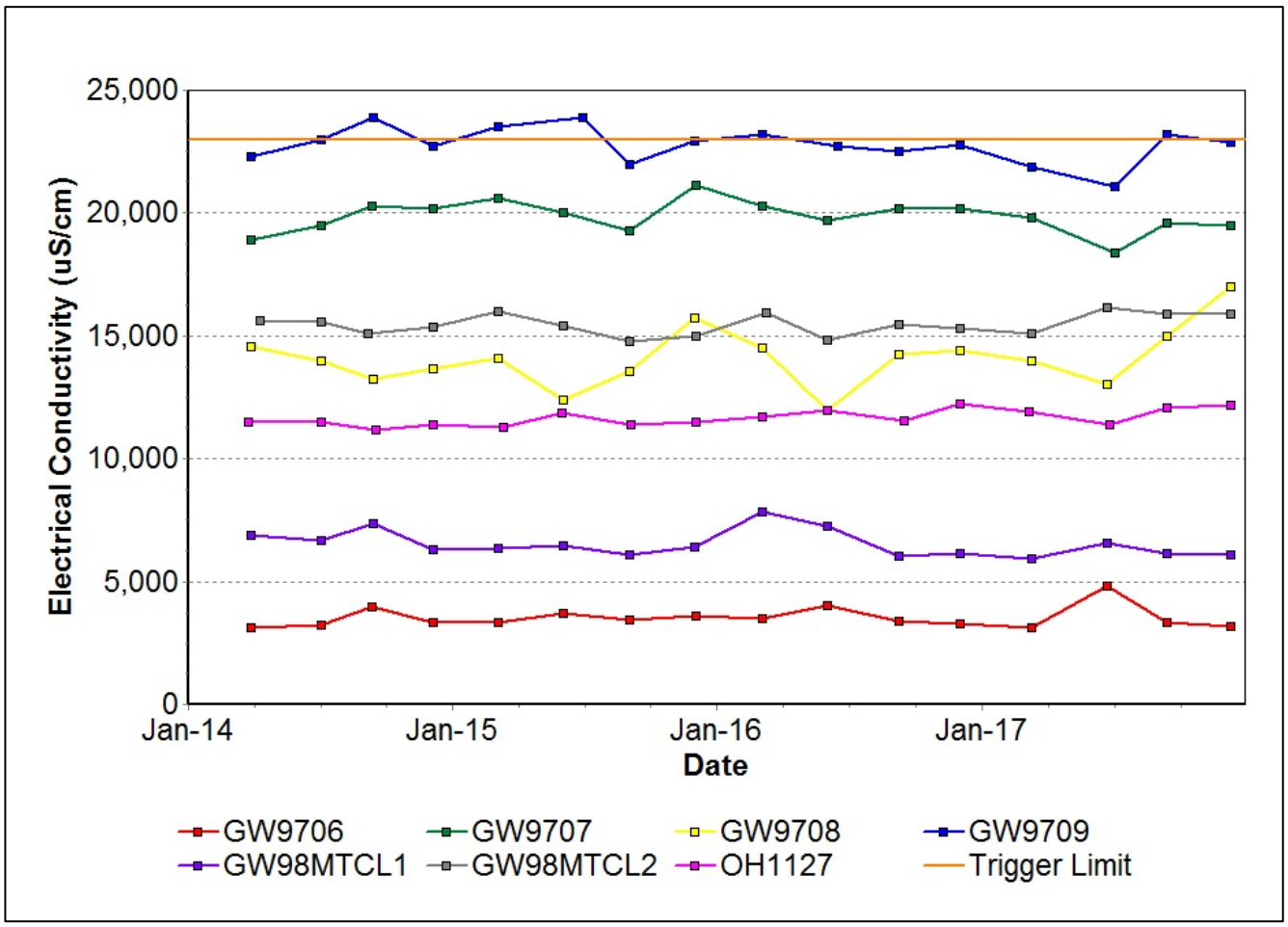


Figure 16: Bayswater Seam Electrical Conductivity Trend – December 2017

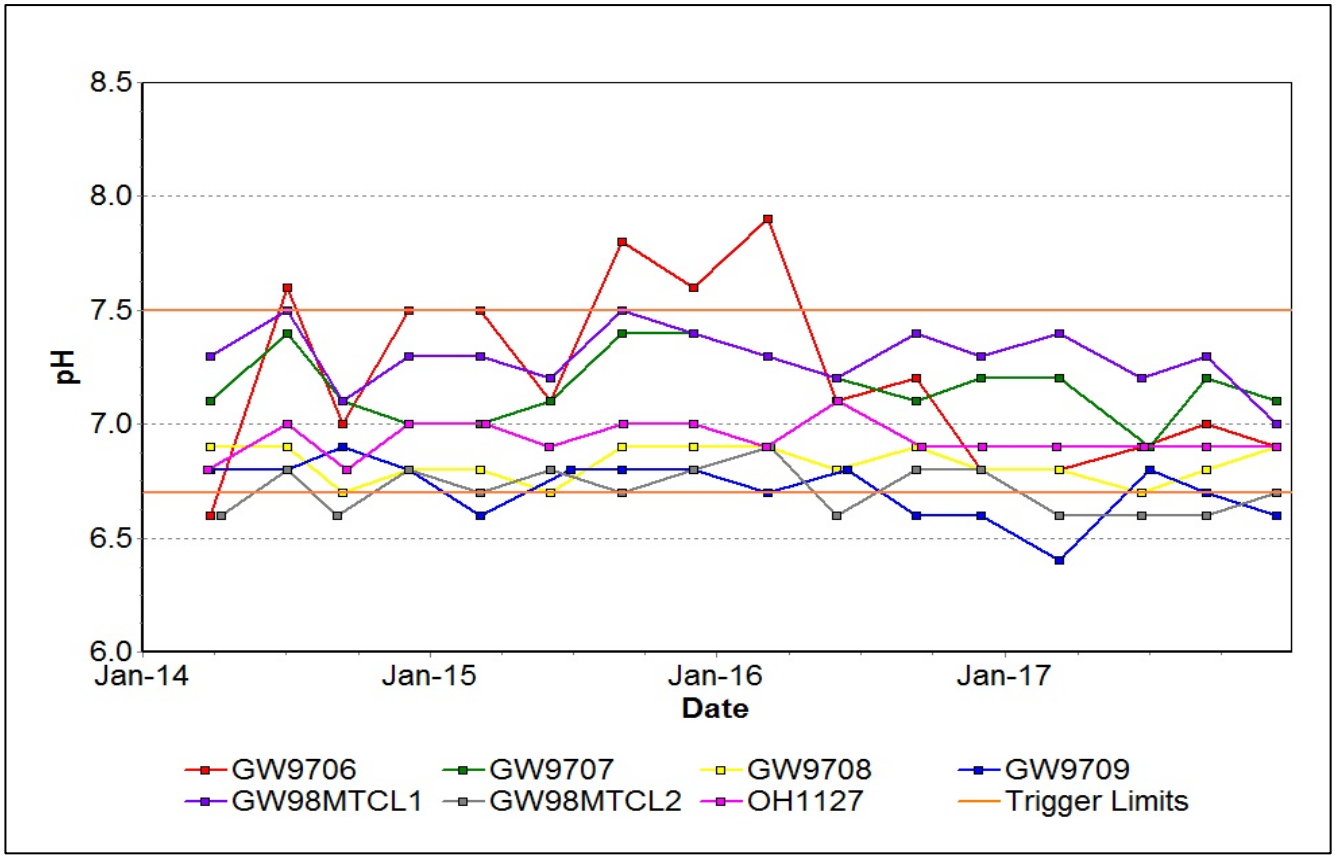


Figure 17: Bayswater Seam pH Trend – December 2017

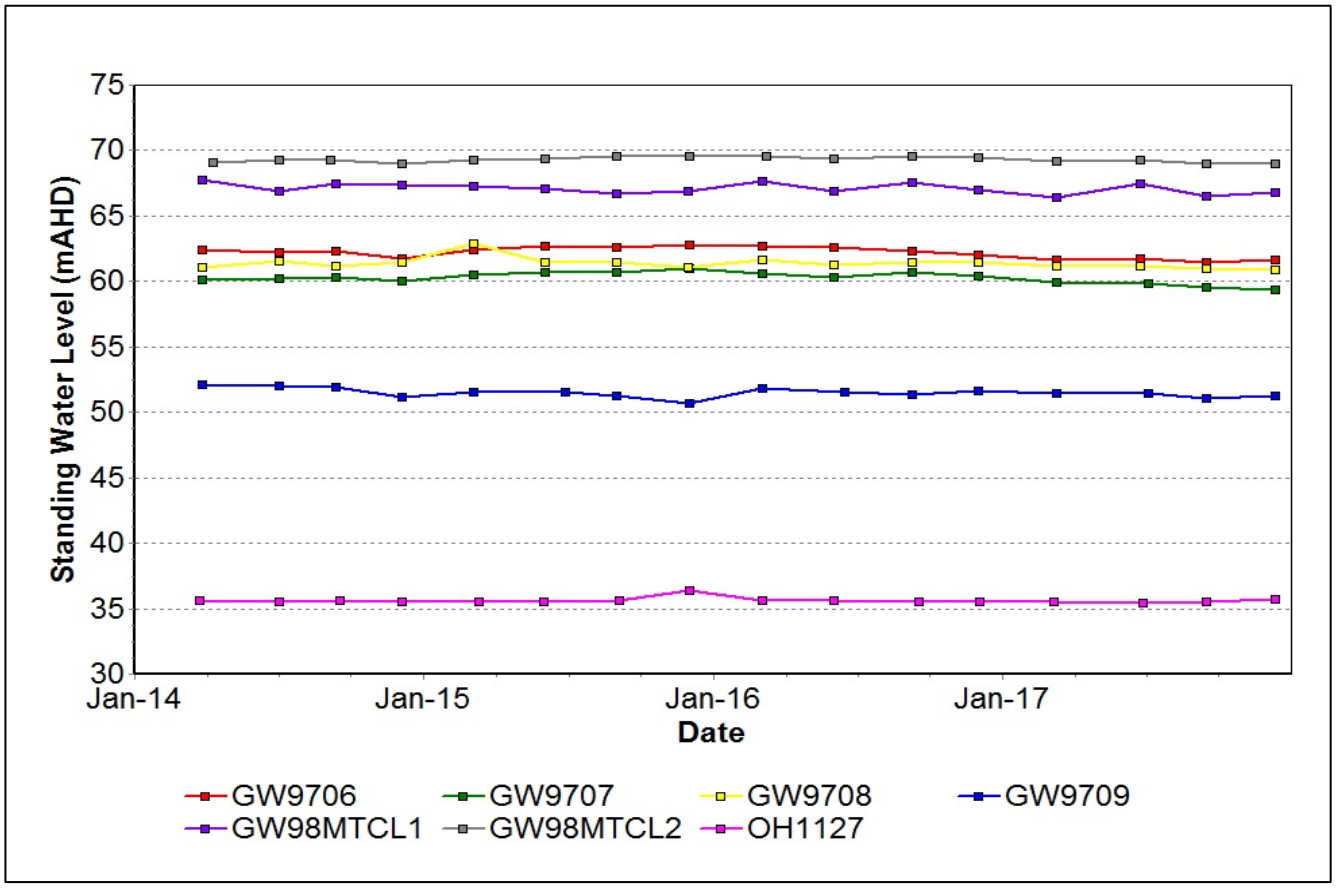


Figure 18: Bayswater Seam Standing Water Level Trend – December 2017

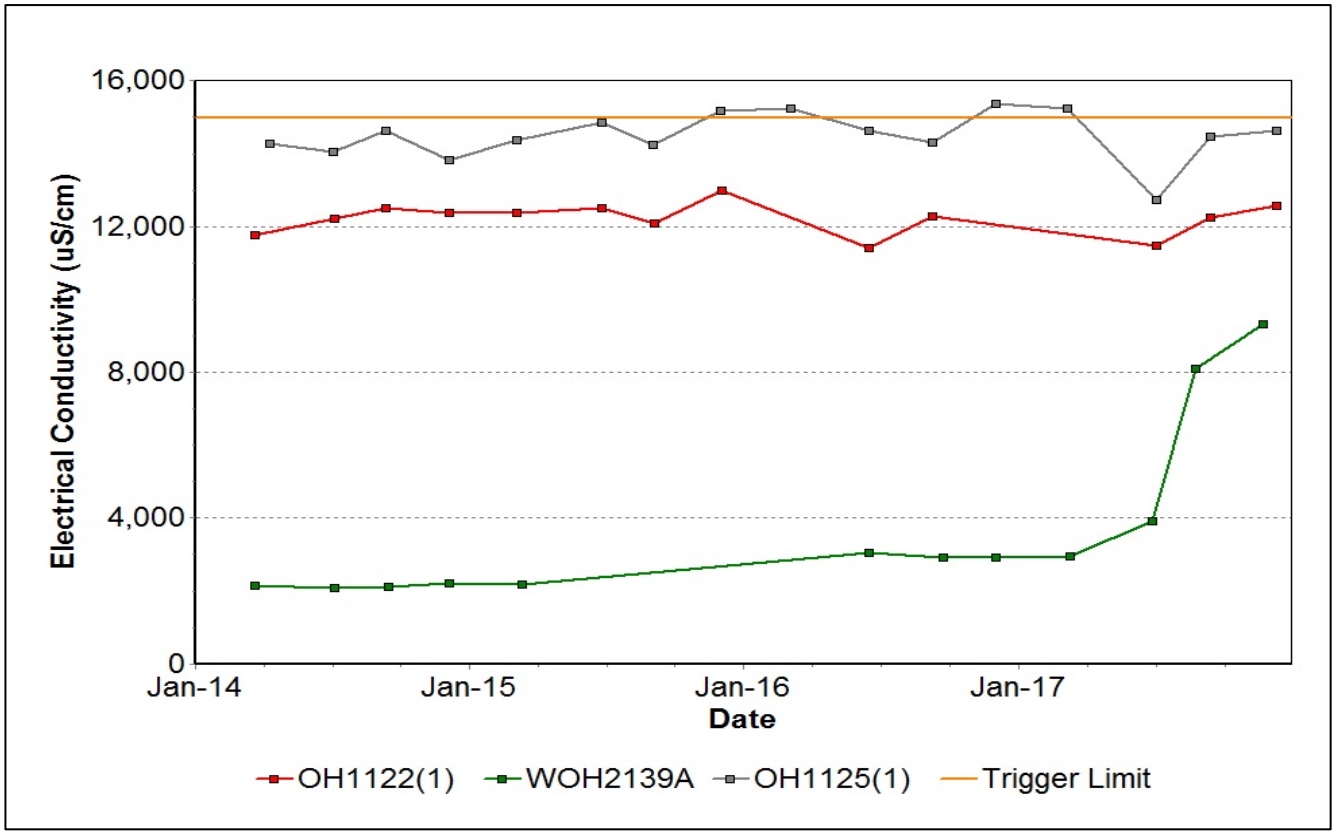


Figure 19: Blakefield Seam Electrical Conductivity Trend – December 2017

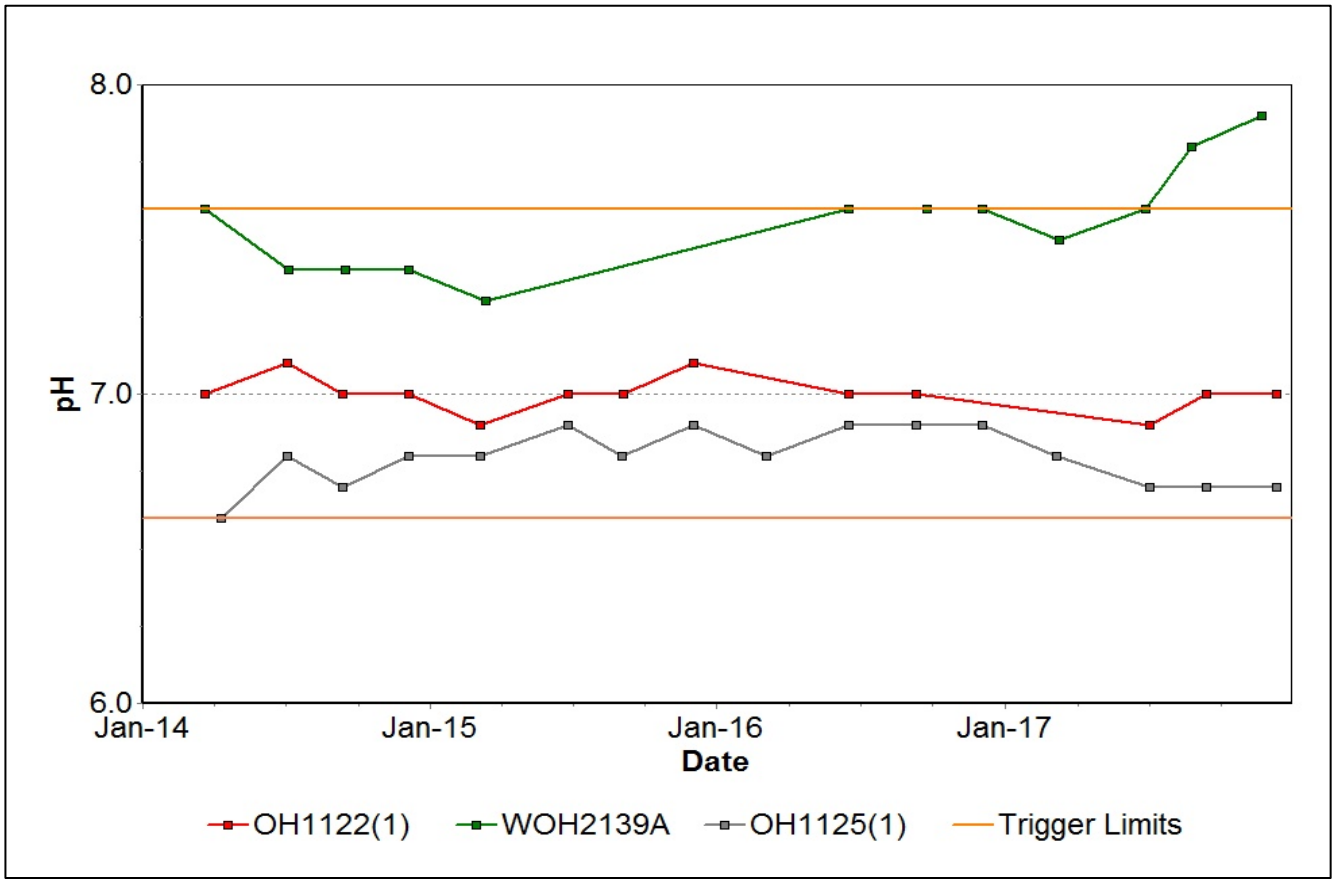


Figure 20: Blakefield Seam pH Trend – December 2017

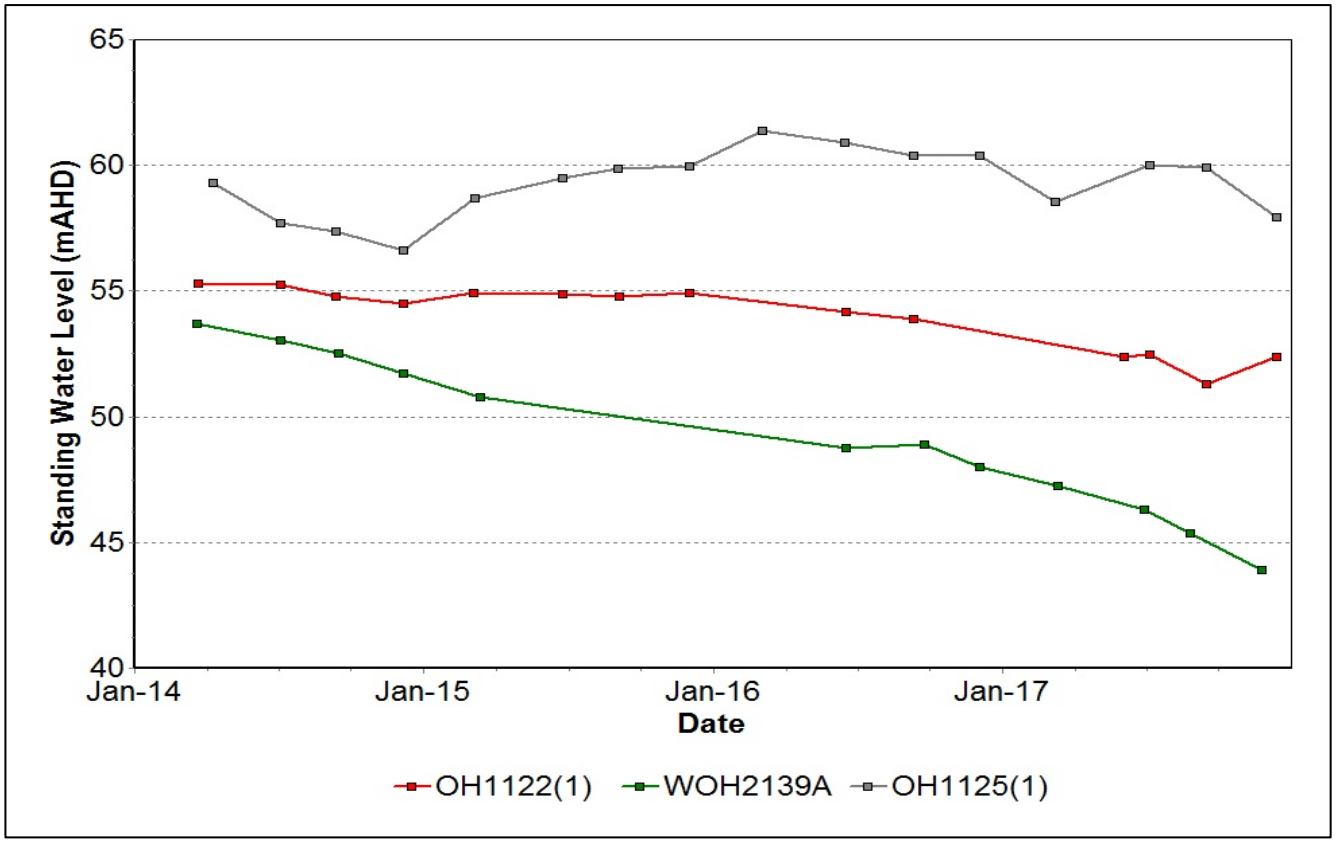


Figure 21: Blakefield Seam Standing Water Level Trend – December 2017

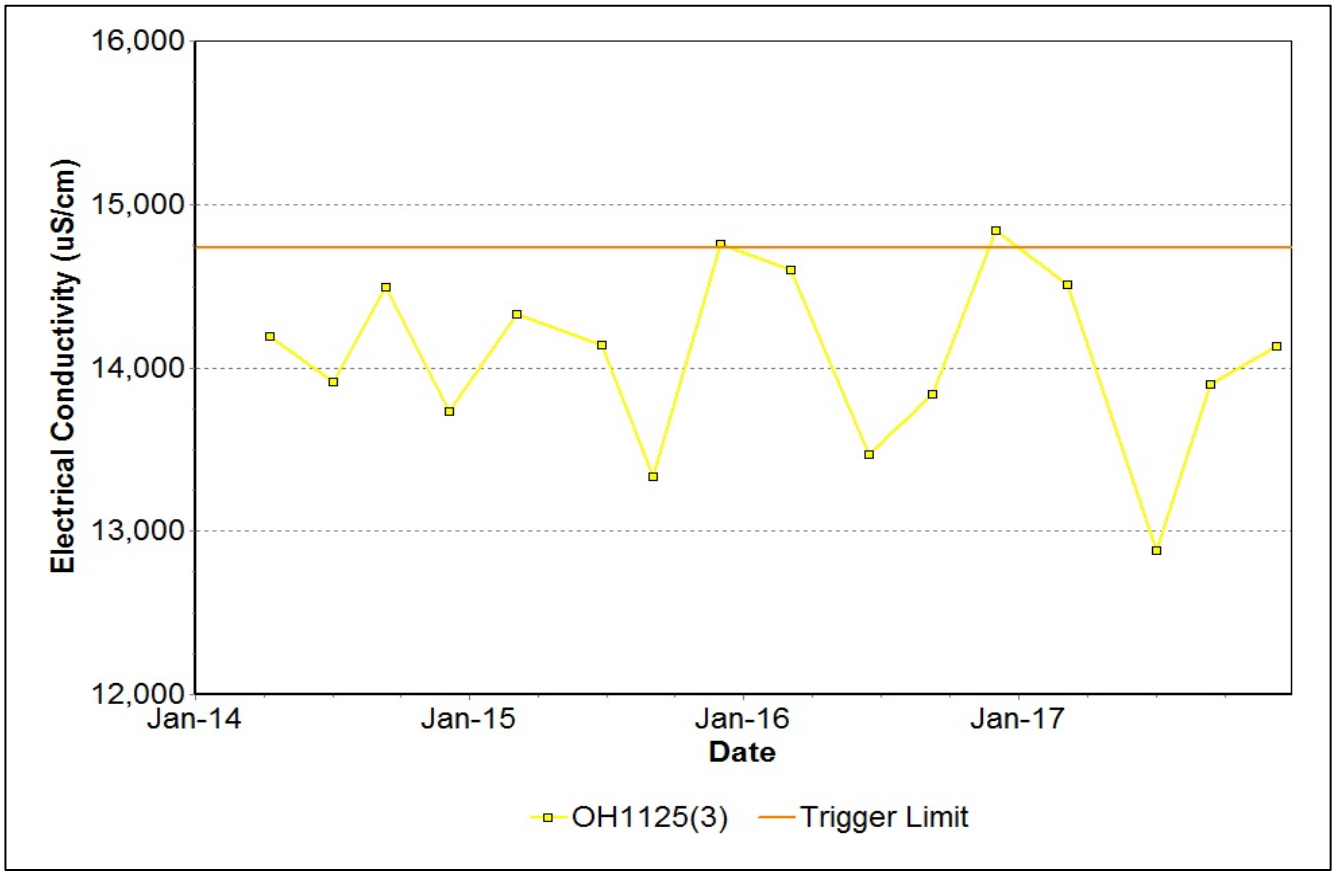


Figure 22: Bowfield Seam Electrical Conductivity Trend – December 2017

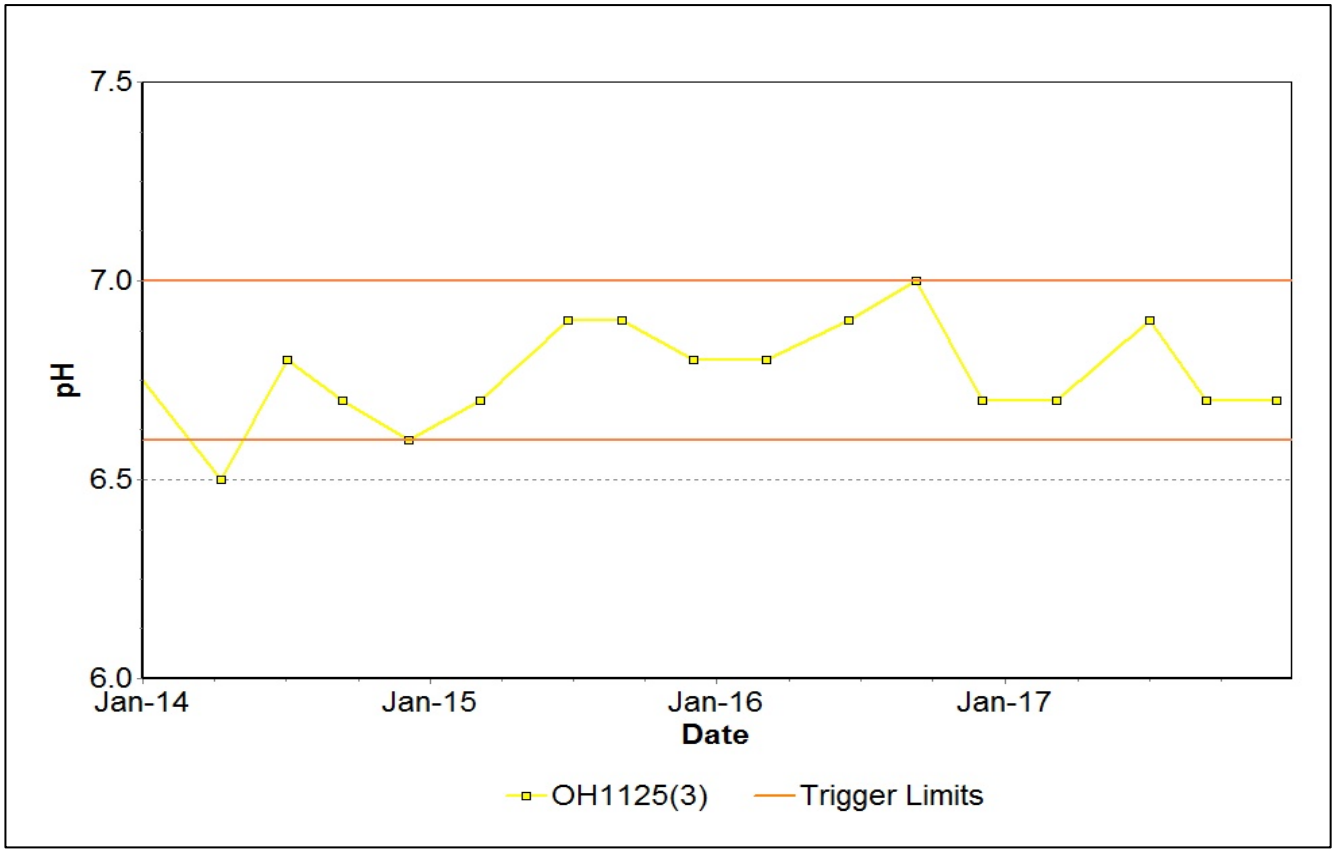


Figure 23: Bowfield Seam pH Trend – December 2017

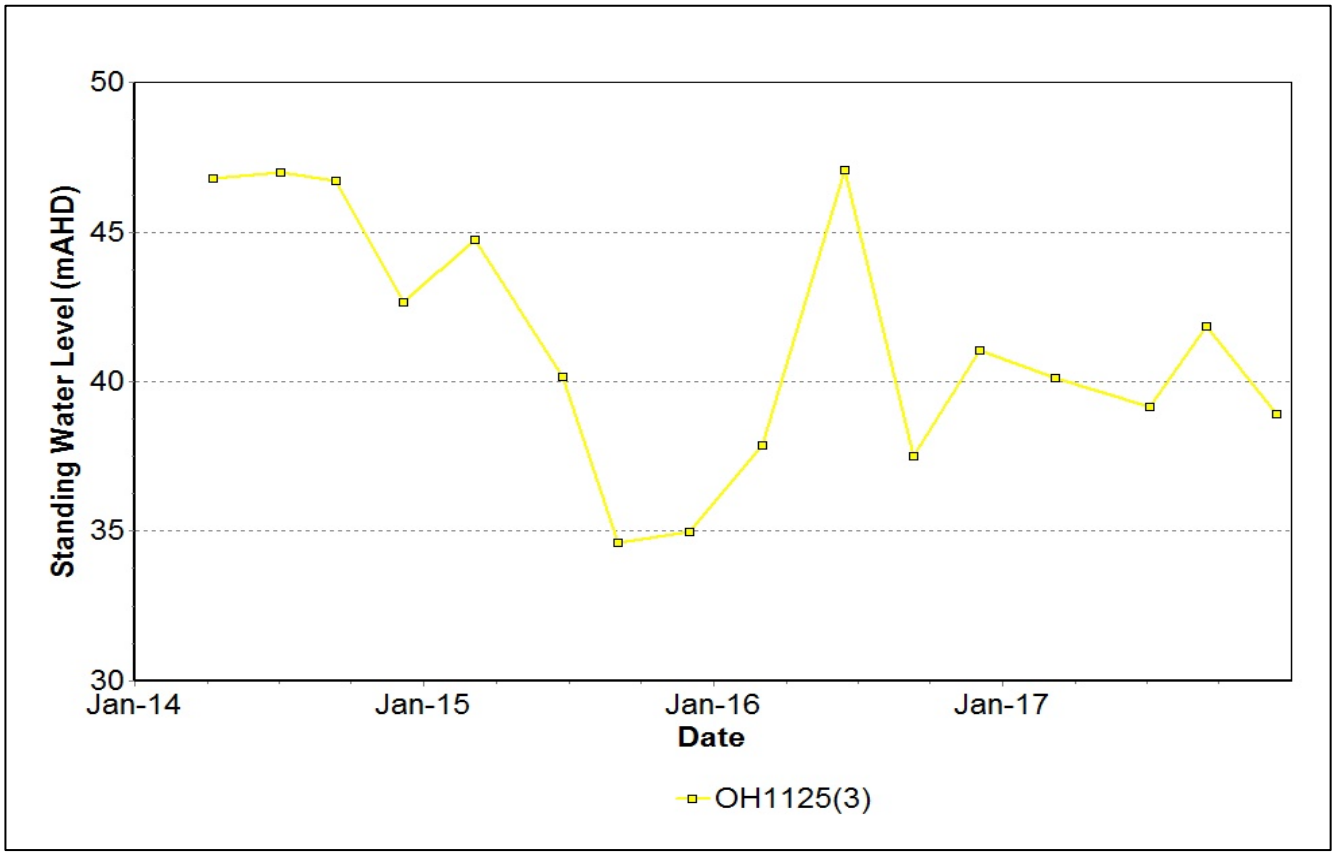


Figure 24: Bowfield Seam Standing Water Level Trend – December 2017

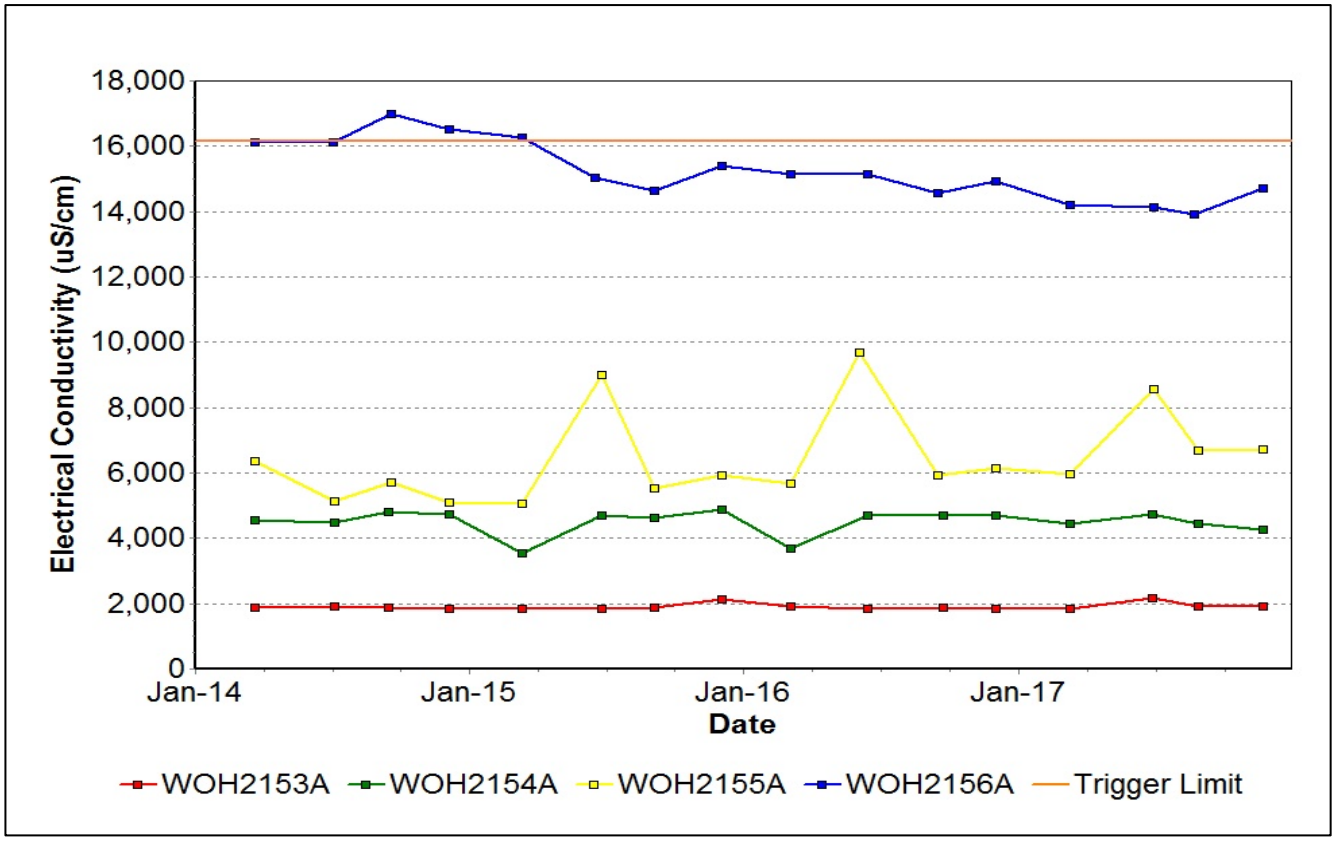


Figure 25: Redbank Seam Electrical Conductivity Trend – December 2017

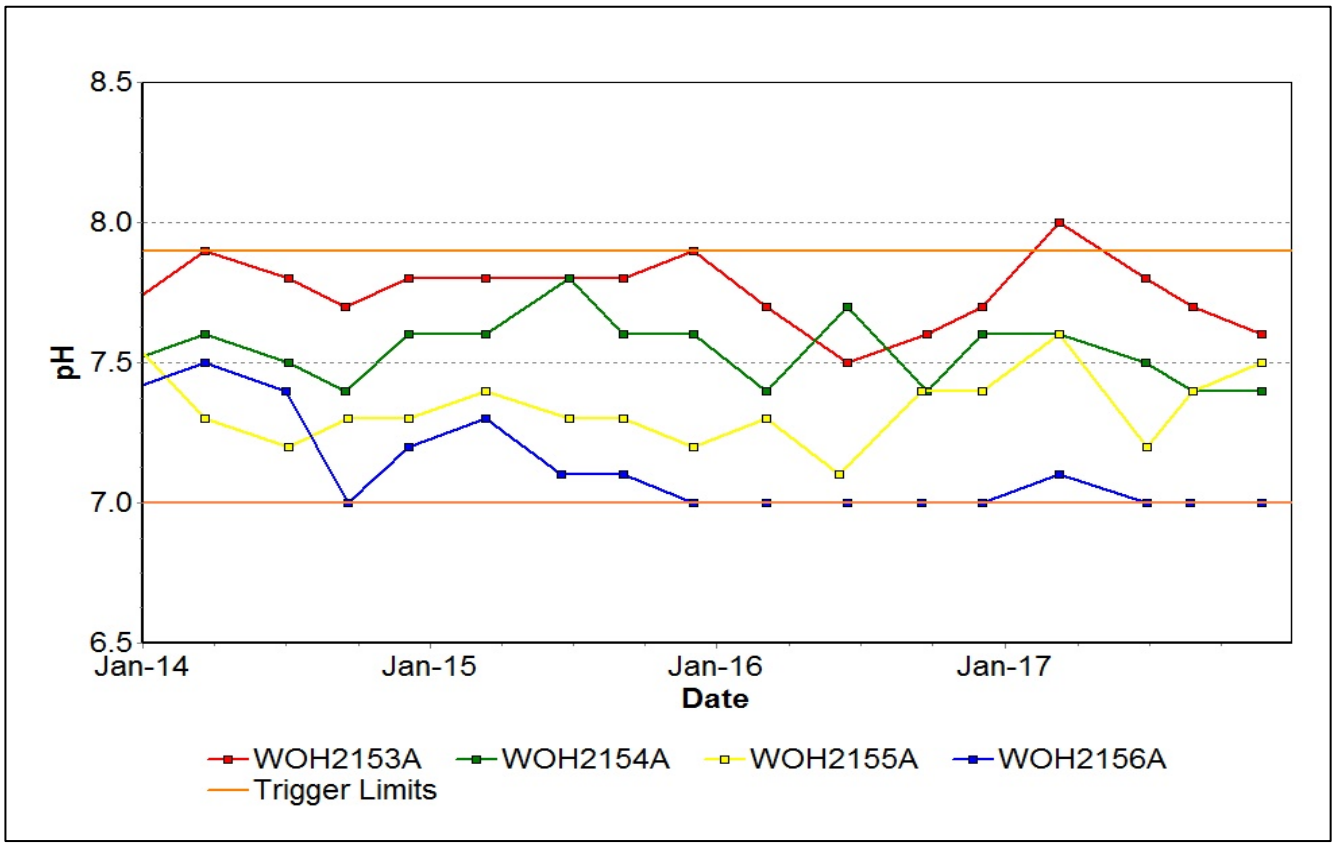


Figure 26: Redbank Seam pH Trend – December 2017

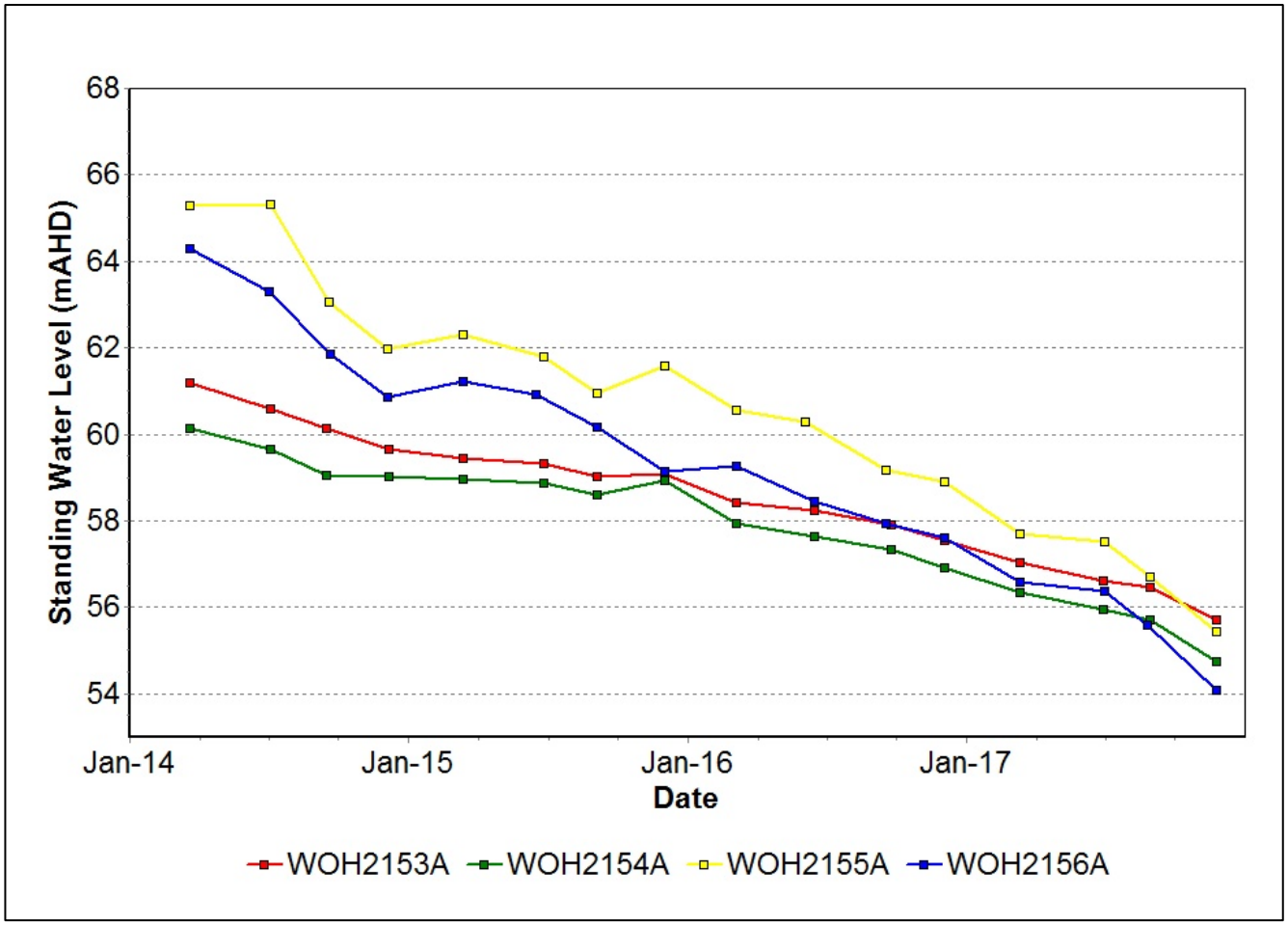


Figure 27: Redbank Seam Standing Water Level Trend – December 2017

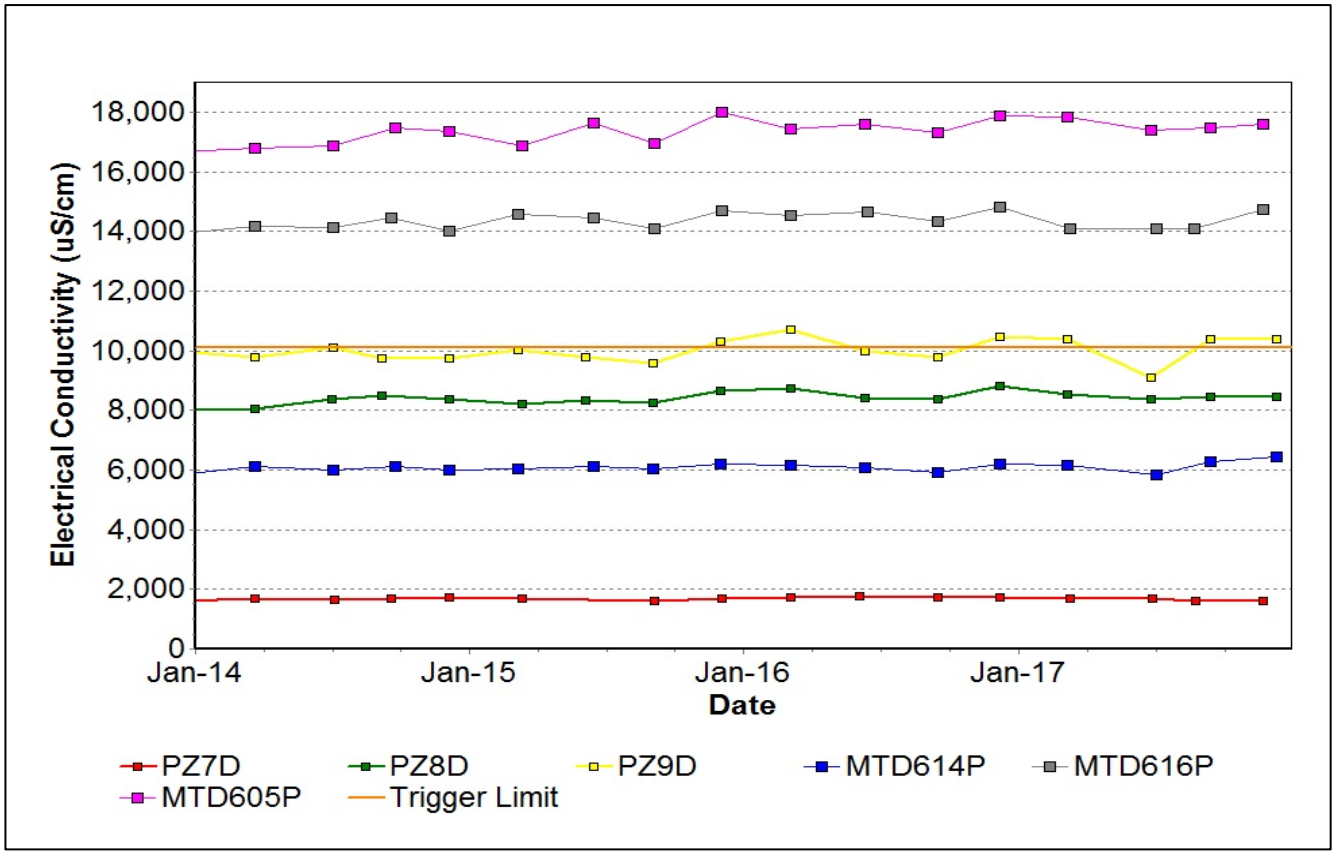


Figure 28: Shallow Overburden Seam Electrical Conductivity Trend – December 2017

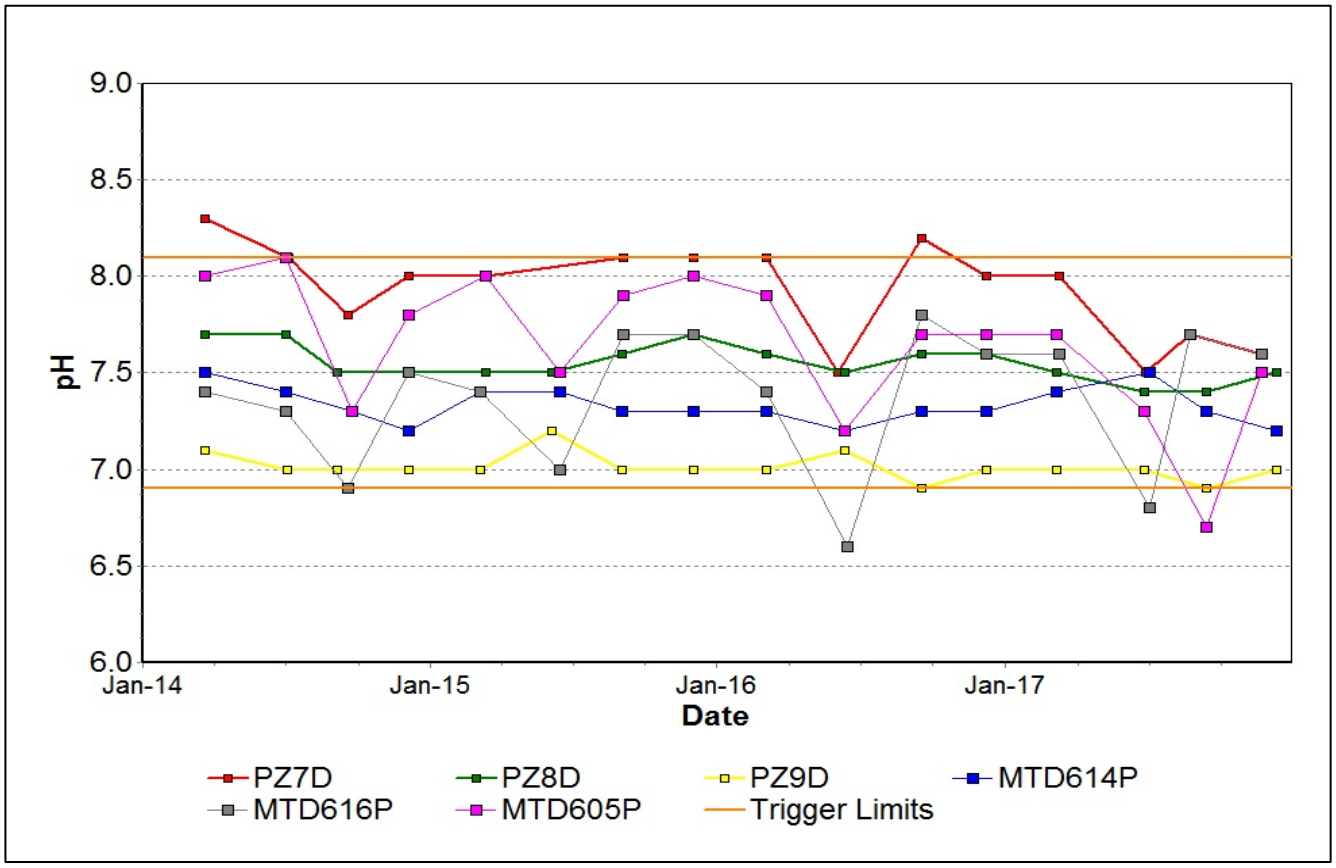


Figure 29: Shallow Overburden Seam pH Trend – December 2017

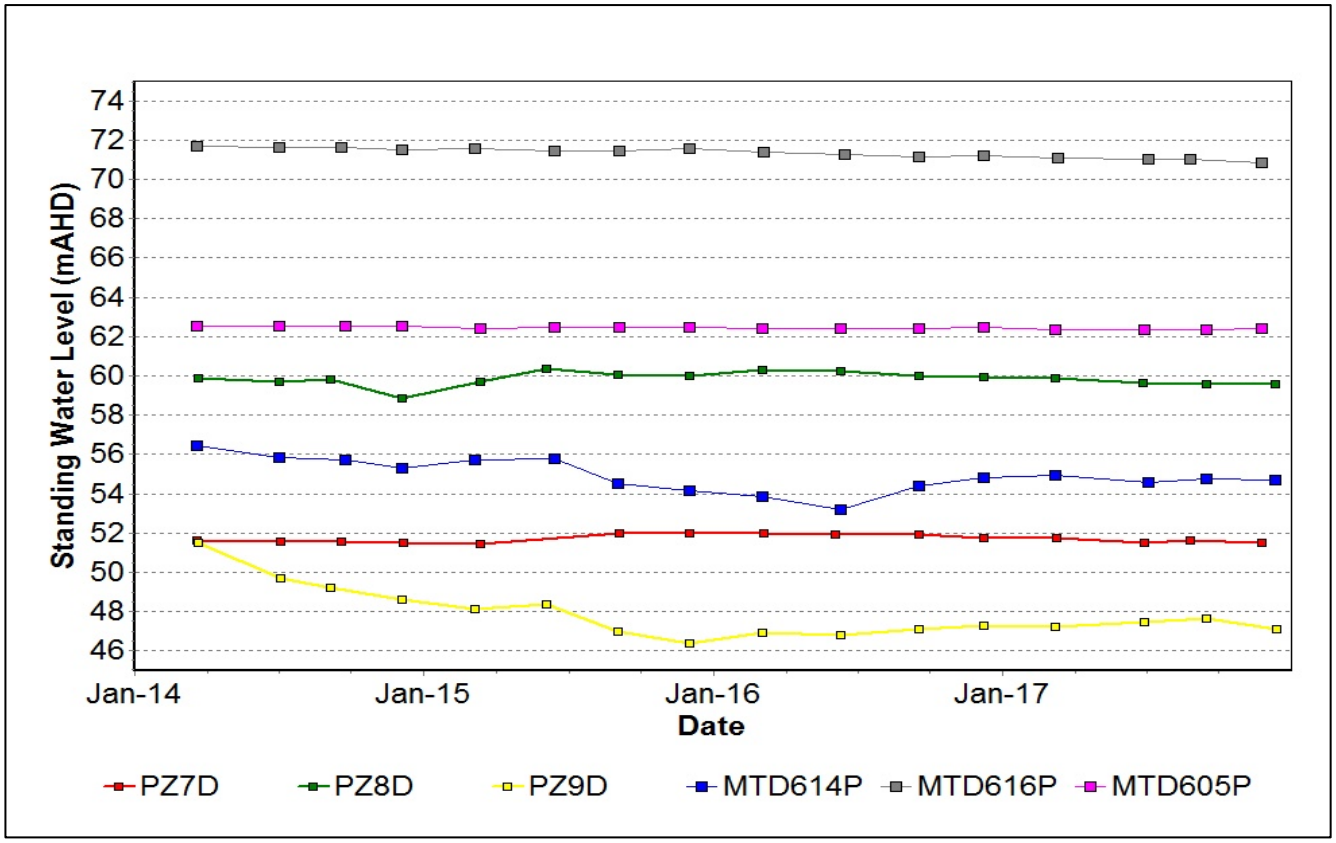


Figure 30: Shallow Overburden Seam Standing Water Level Trend – December 2017

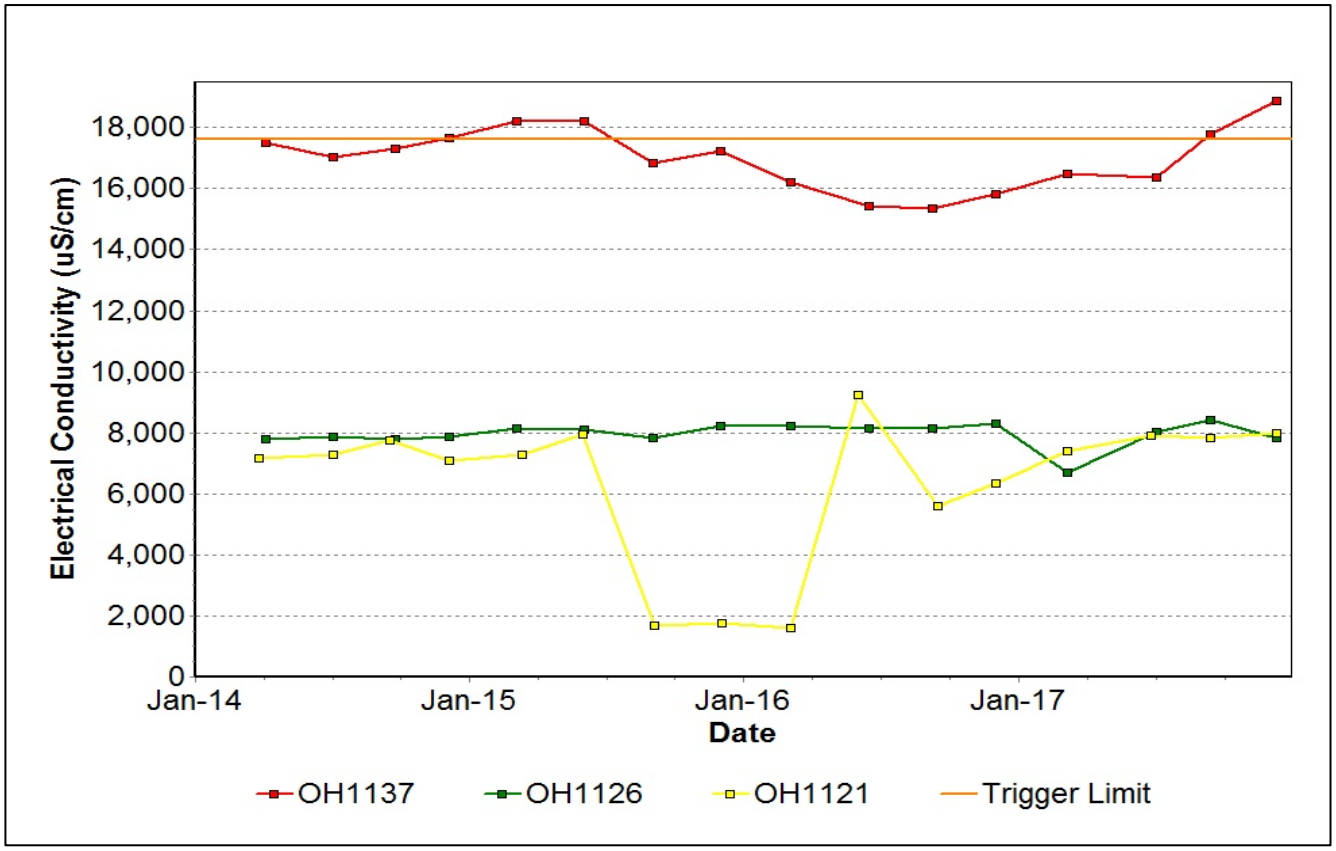


Figure 31: Vaux Seam Electrical Conductivity Trend – December 2017

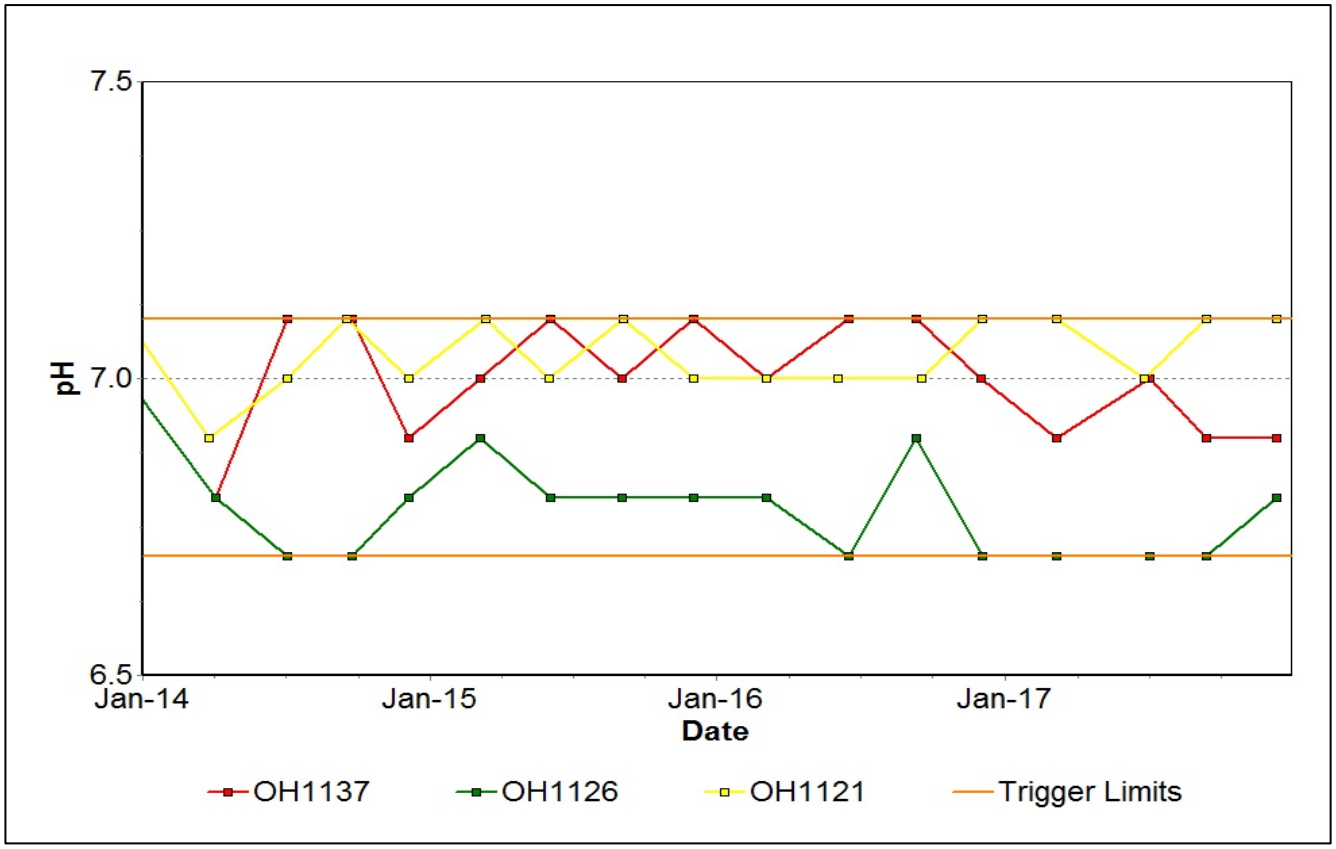


Figure 32: Vaux Seam pH Trend – December 2017

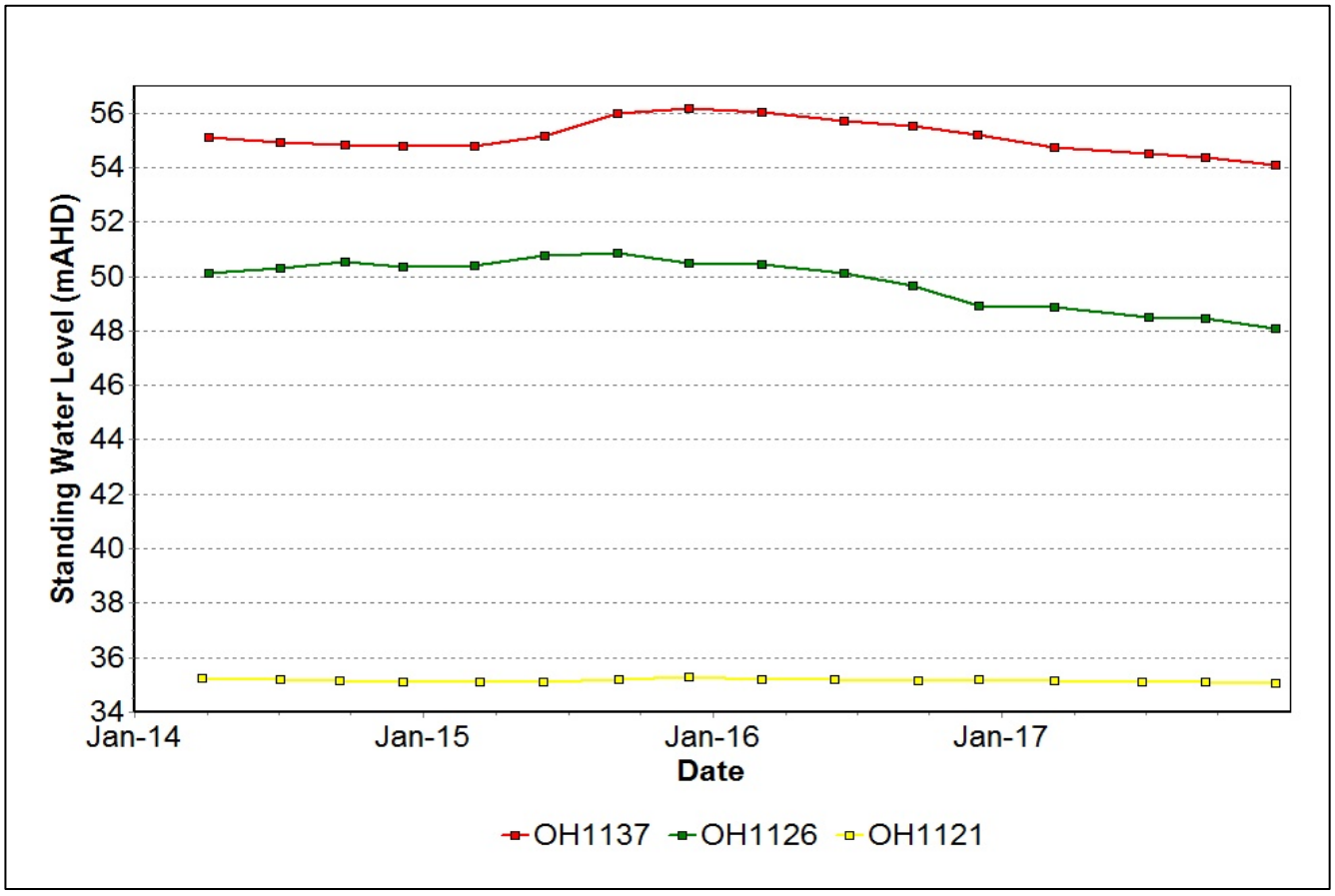


Figure 33: Vaux Seam Standing Water Level Trend – December 2017

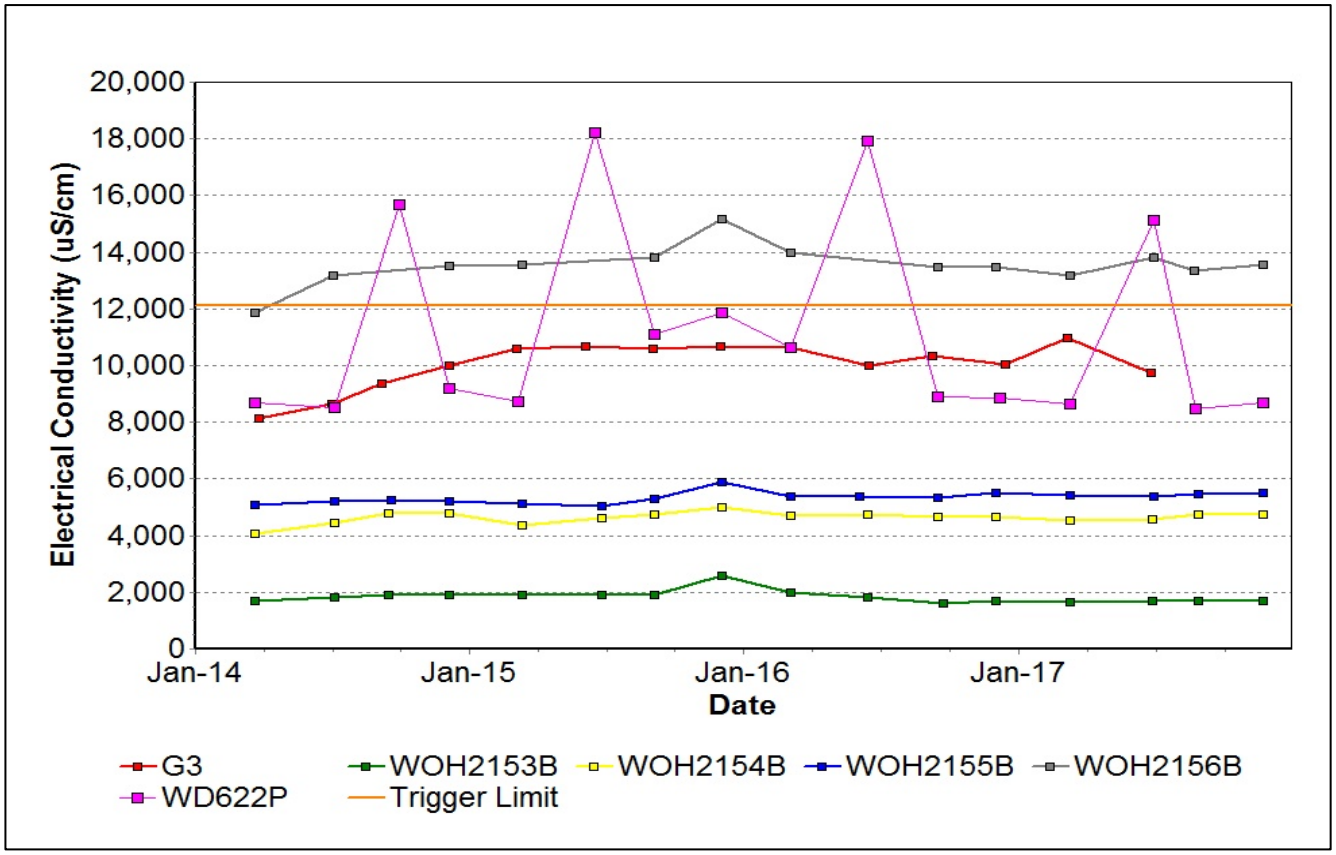


Figure 34: Wambo Seam Electrical Conductivity Trend – December 2017

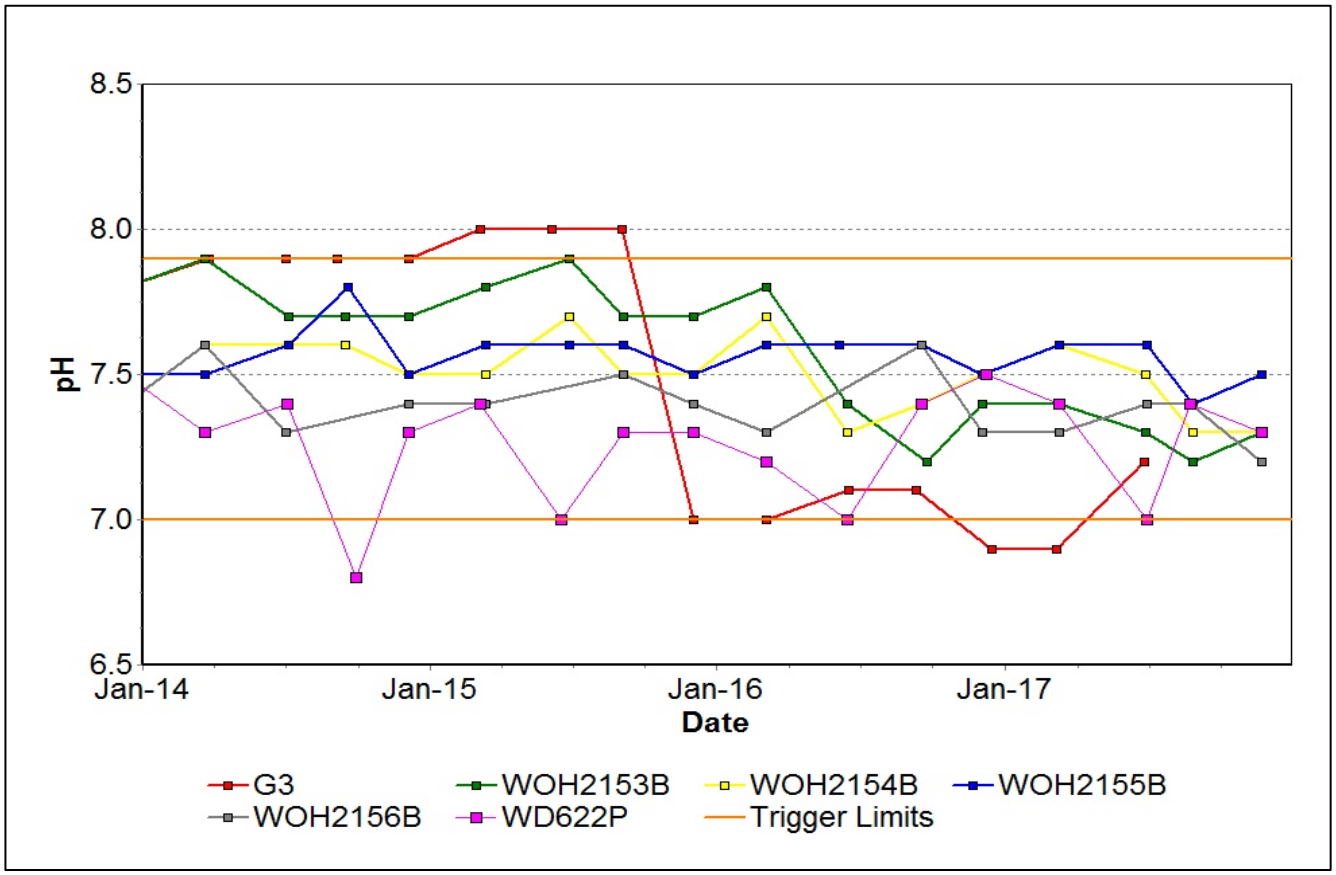


Figure 35: Wambo Seam pH Trend – December 2017

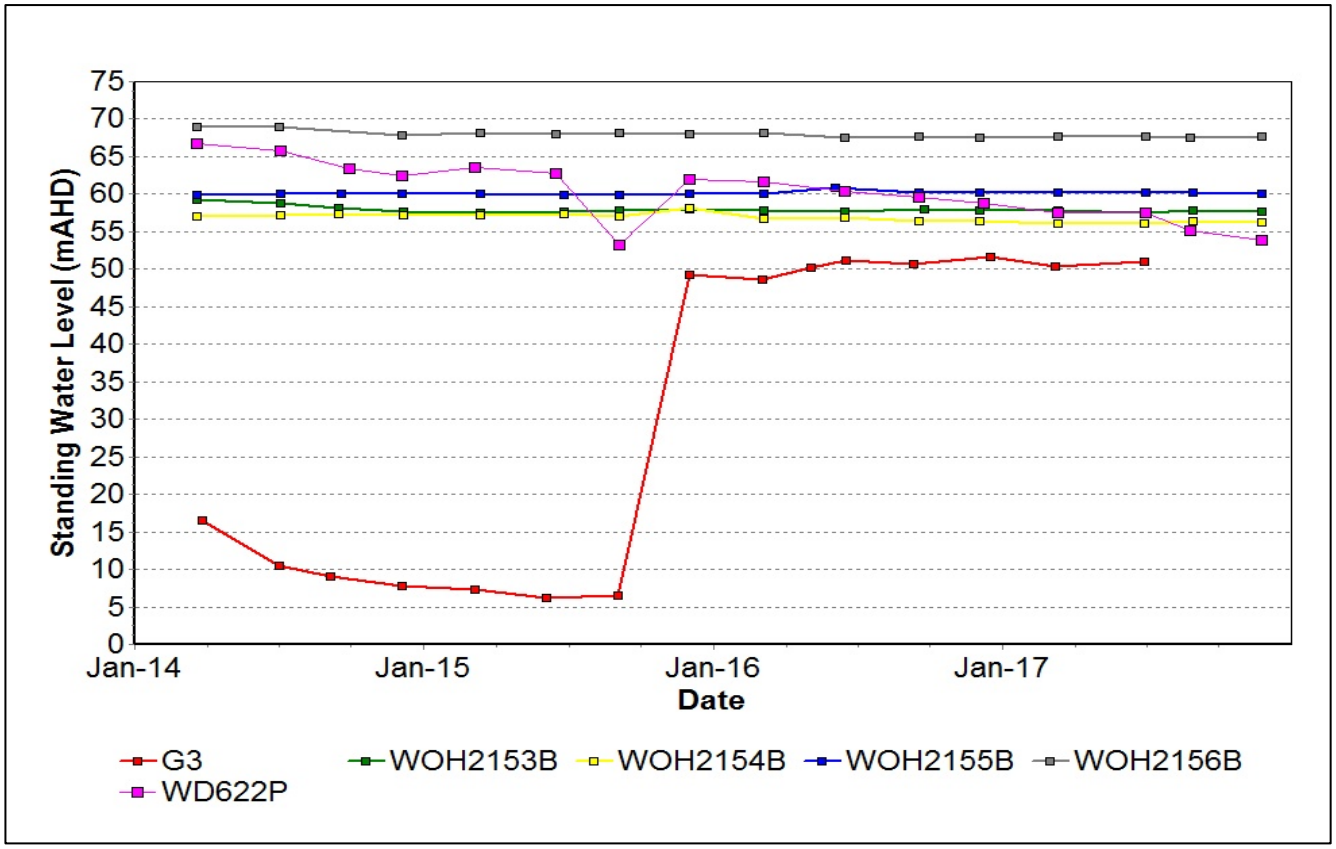


Figure 36: Wambo Seam Standing Water Level Trend – December 2017

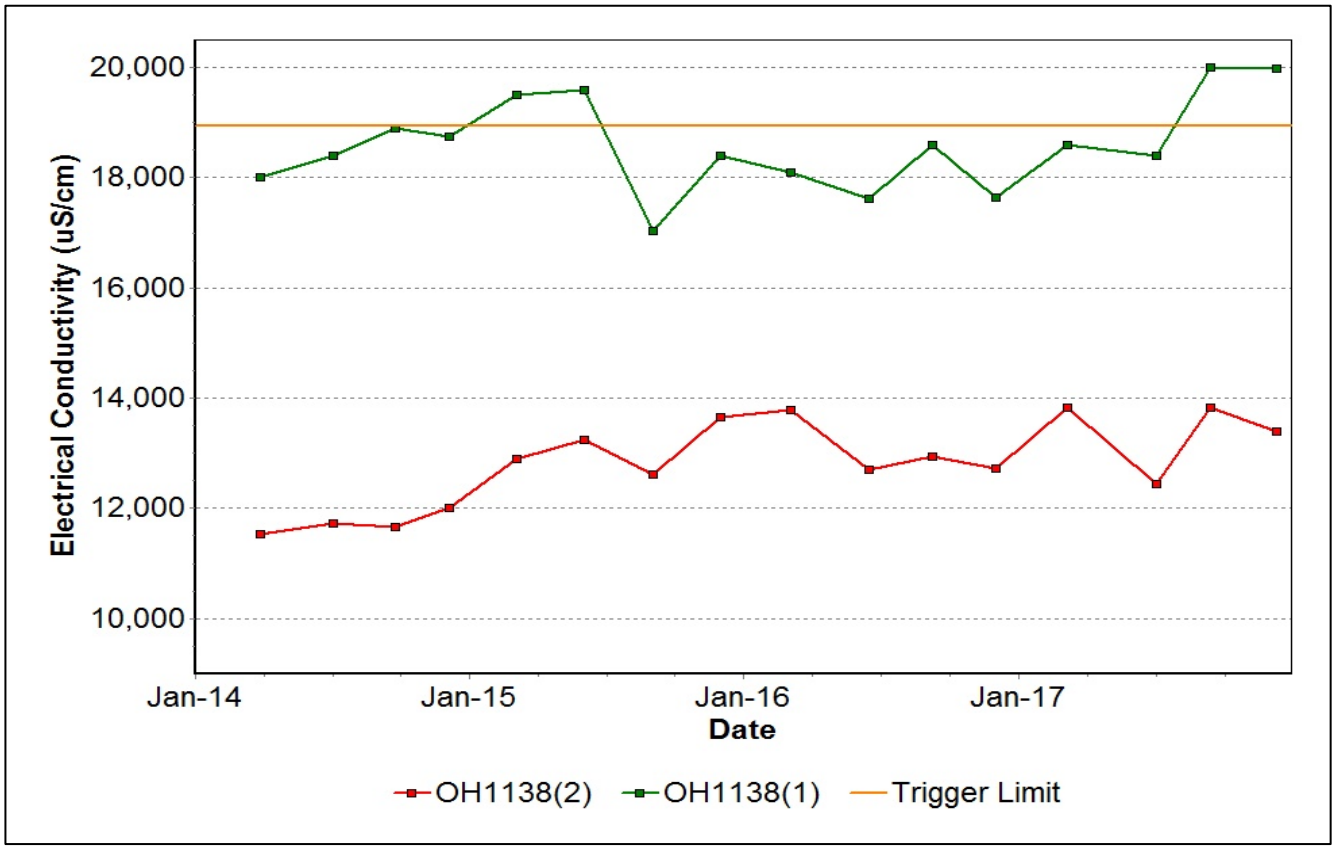


Figure 37: Warkworth Seam Electrical Conductivity Trend – December 2017

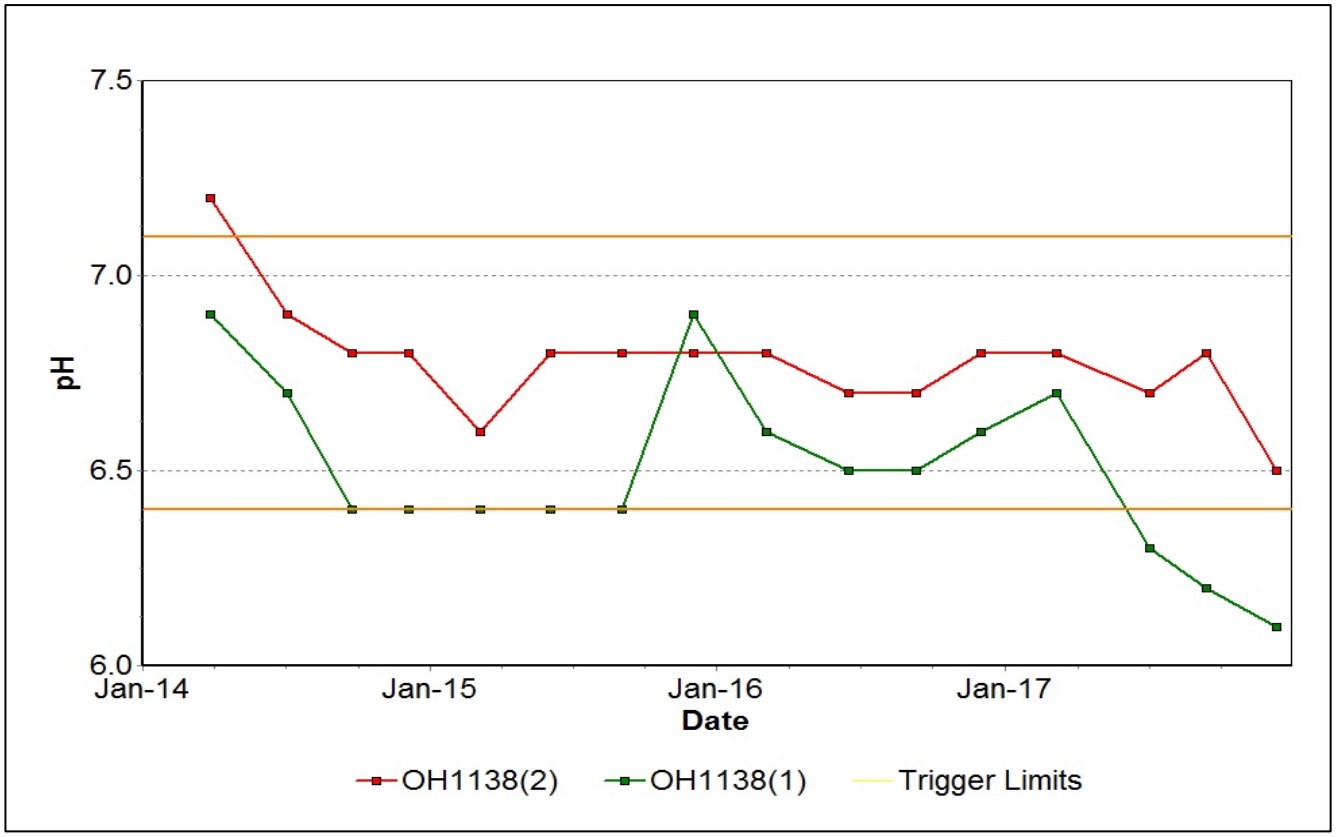


Figure 38: Warkworth Seam pH Trend – December 2017

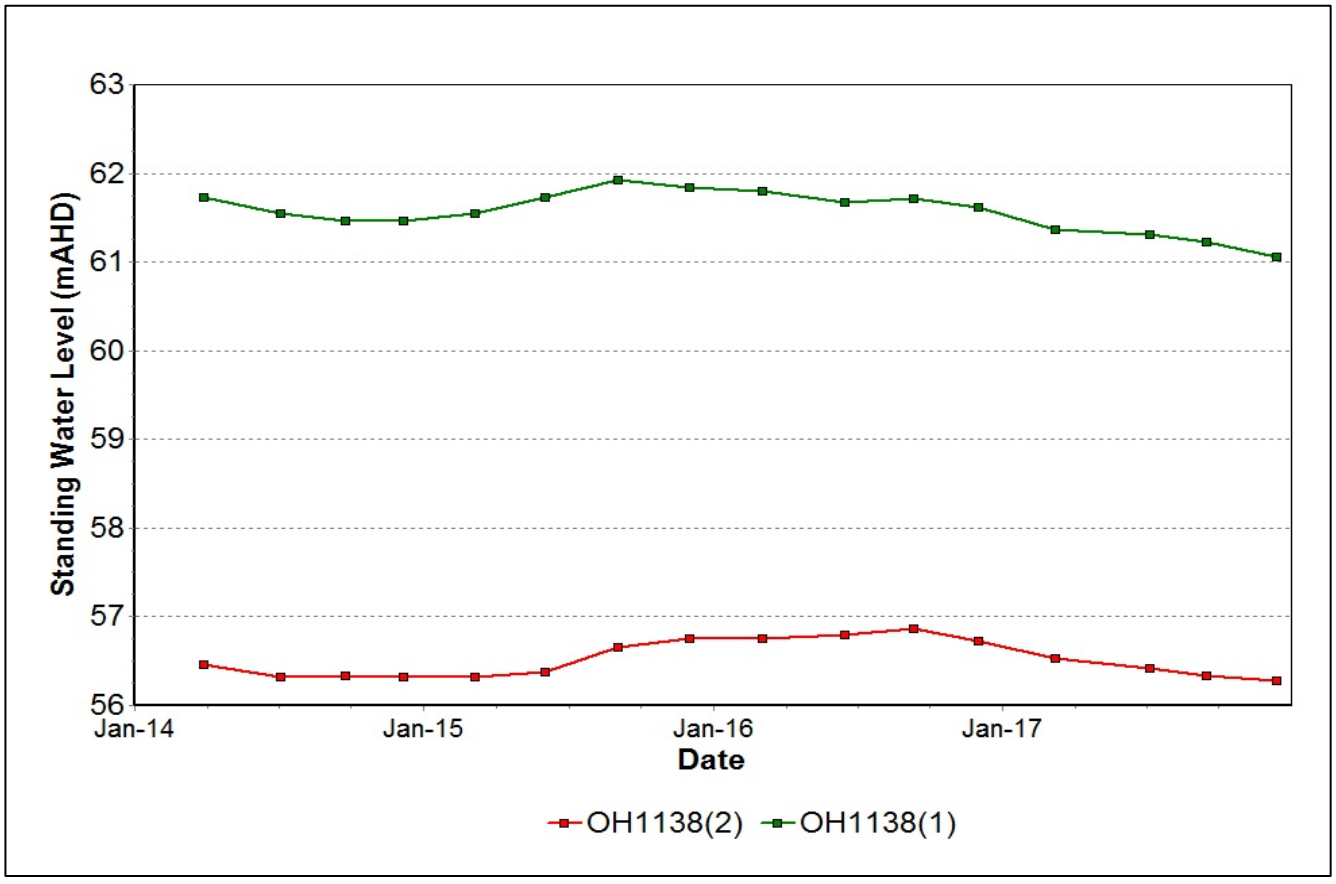


Figure 39: Warkworth Seam Standing Water Level Trend – December 2017

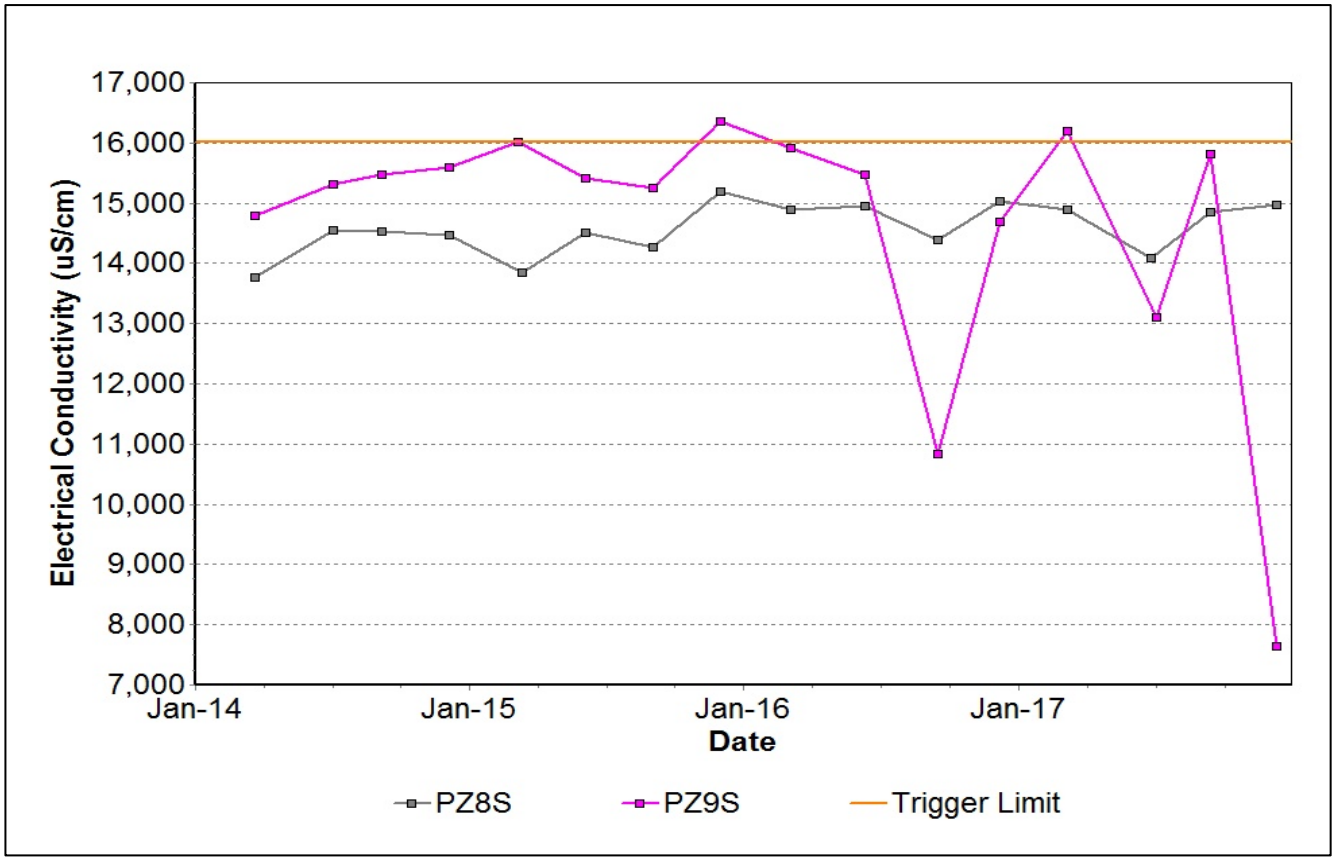


Figure 40: Wollombi Alluvium Electrical Conductivity Trend – December 2017

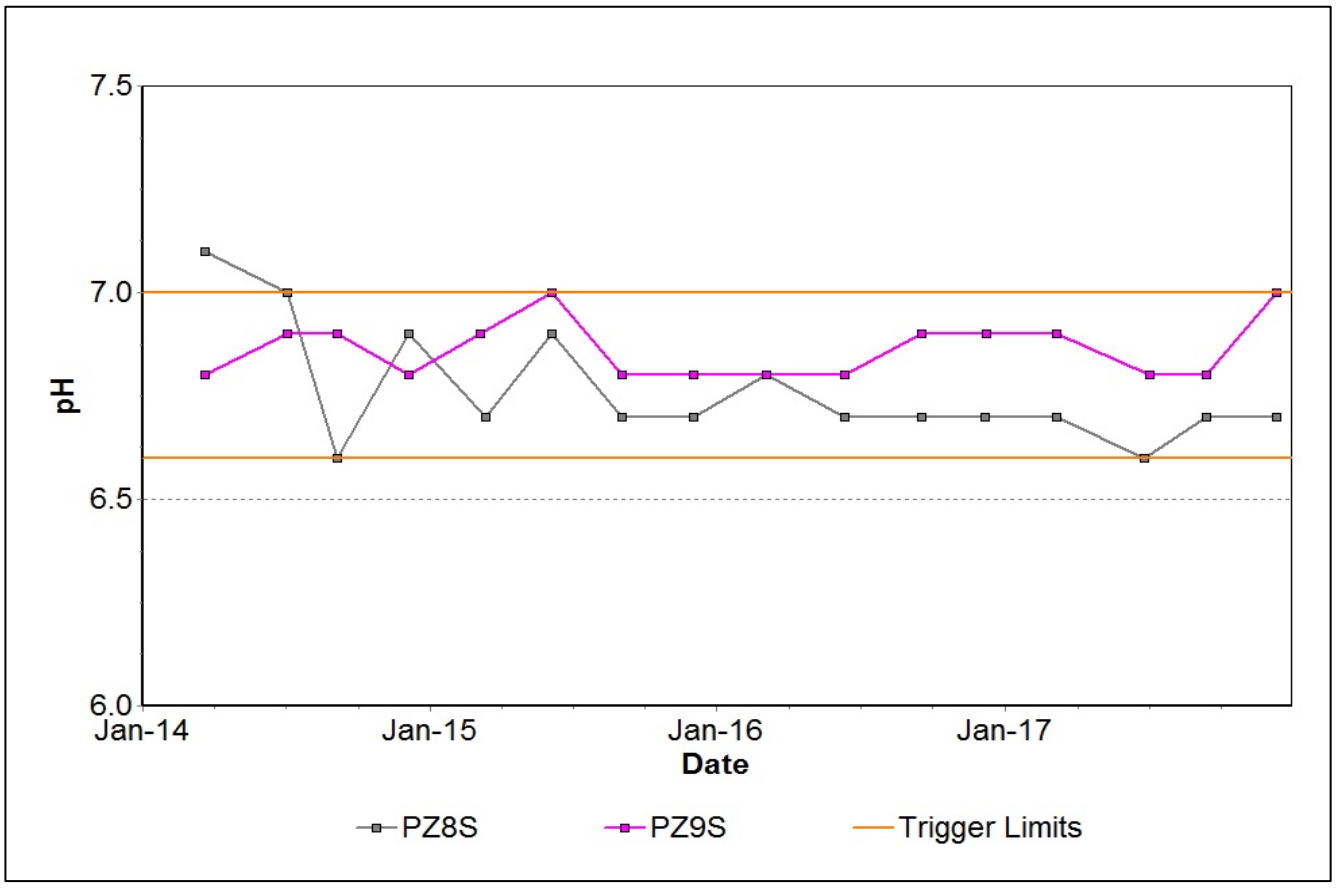


Figure 41: Wollombi Alluvium pH Trend – December 2017

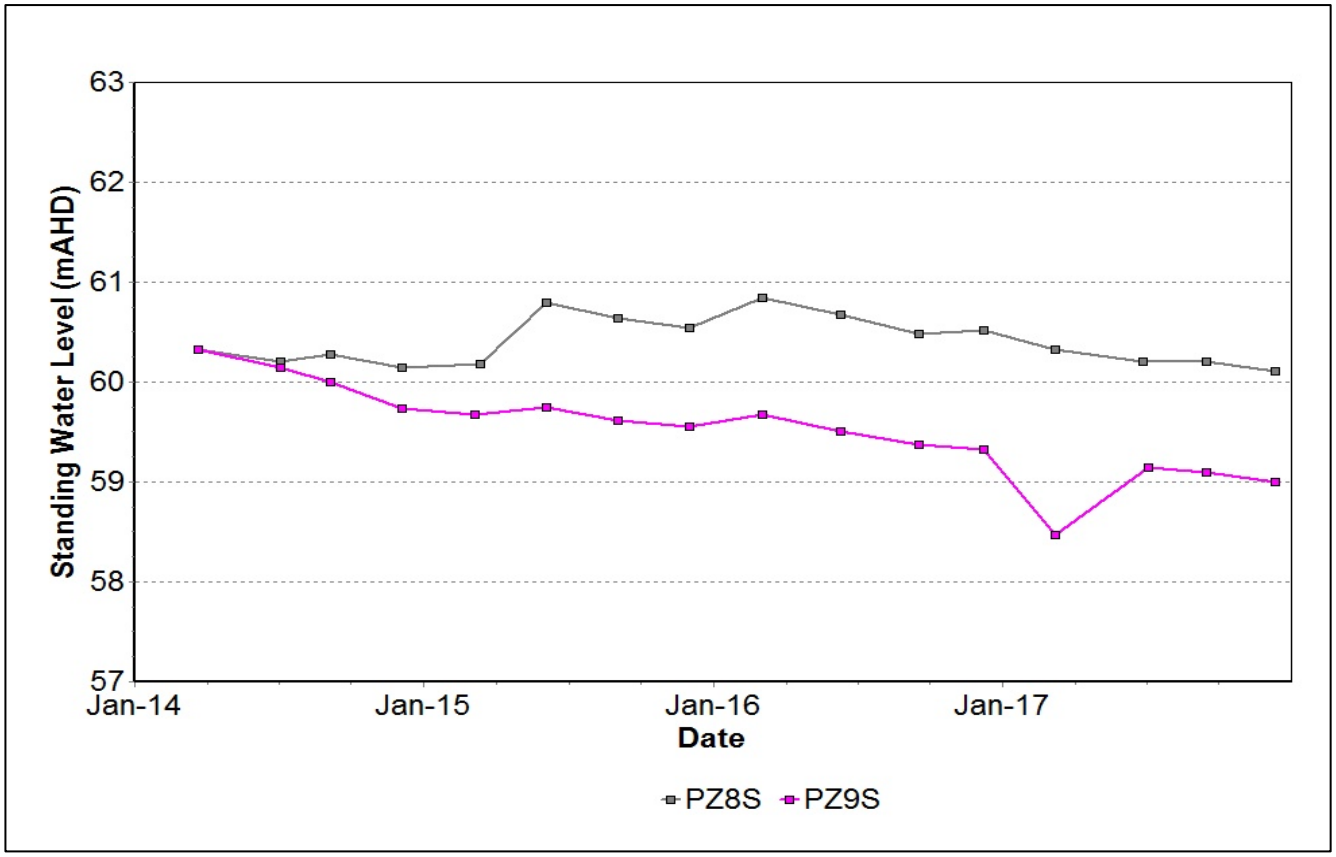


Figure 42: Wollombi Alluvium Standing Water Level Trend – December 2017

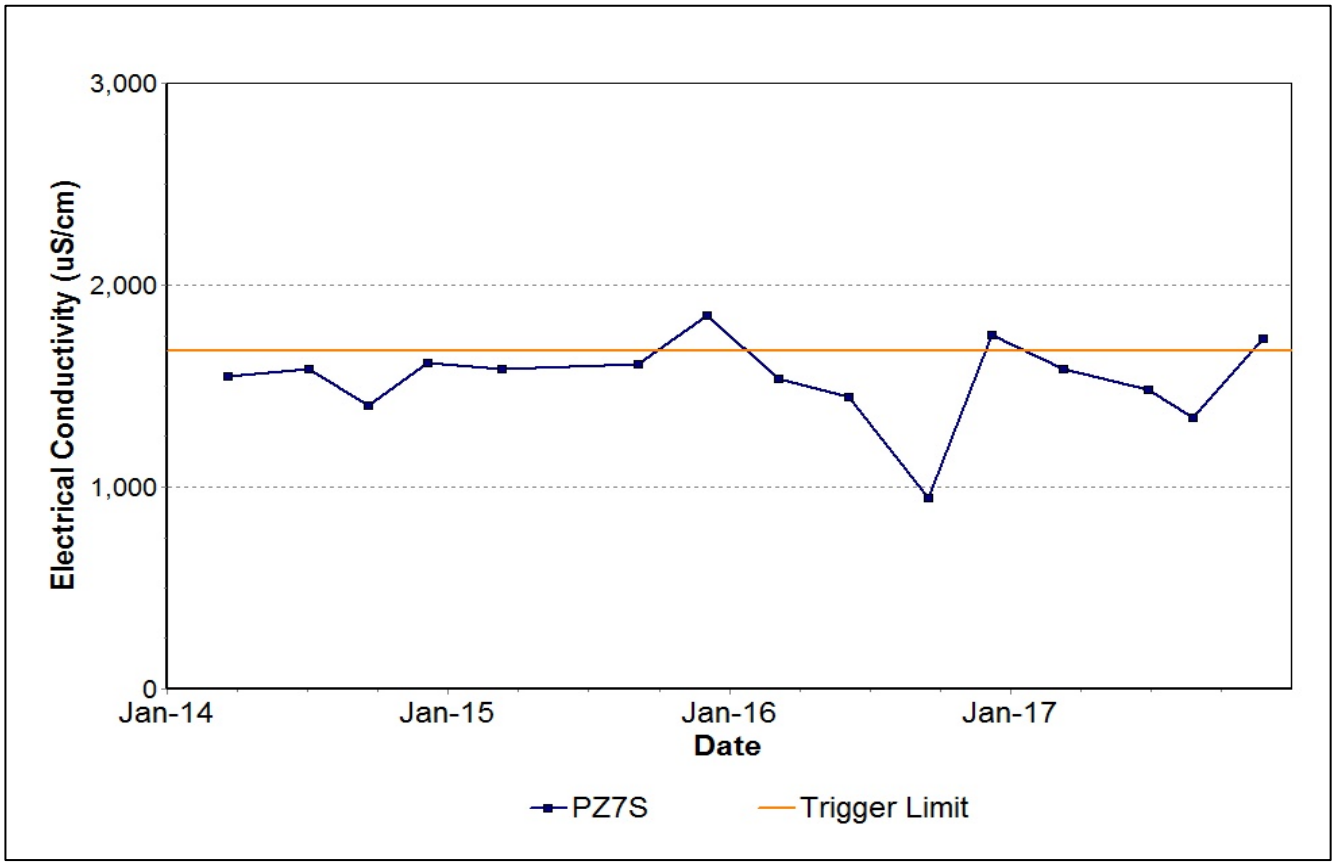


Figure 43: Aeolian Warkworth Sands Electrical Conductivity Trend – December 2017

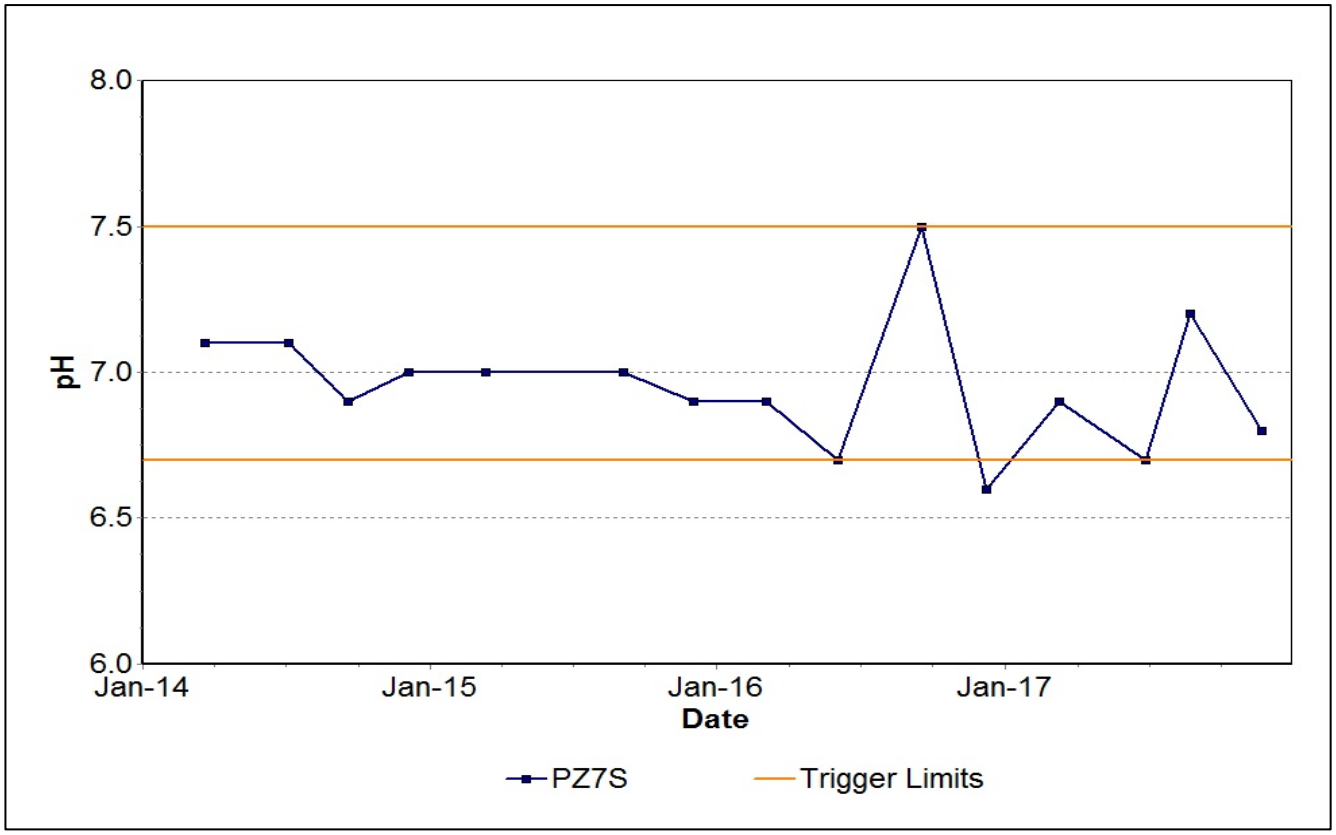


Figure 44: Aeolian Warkworth Sands pH Trend – December 2017

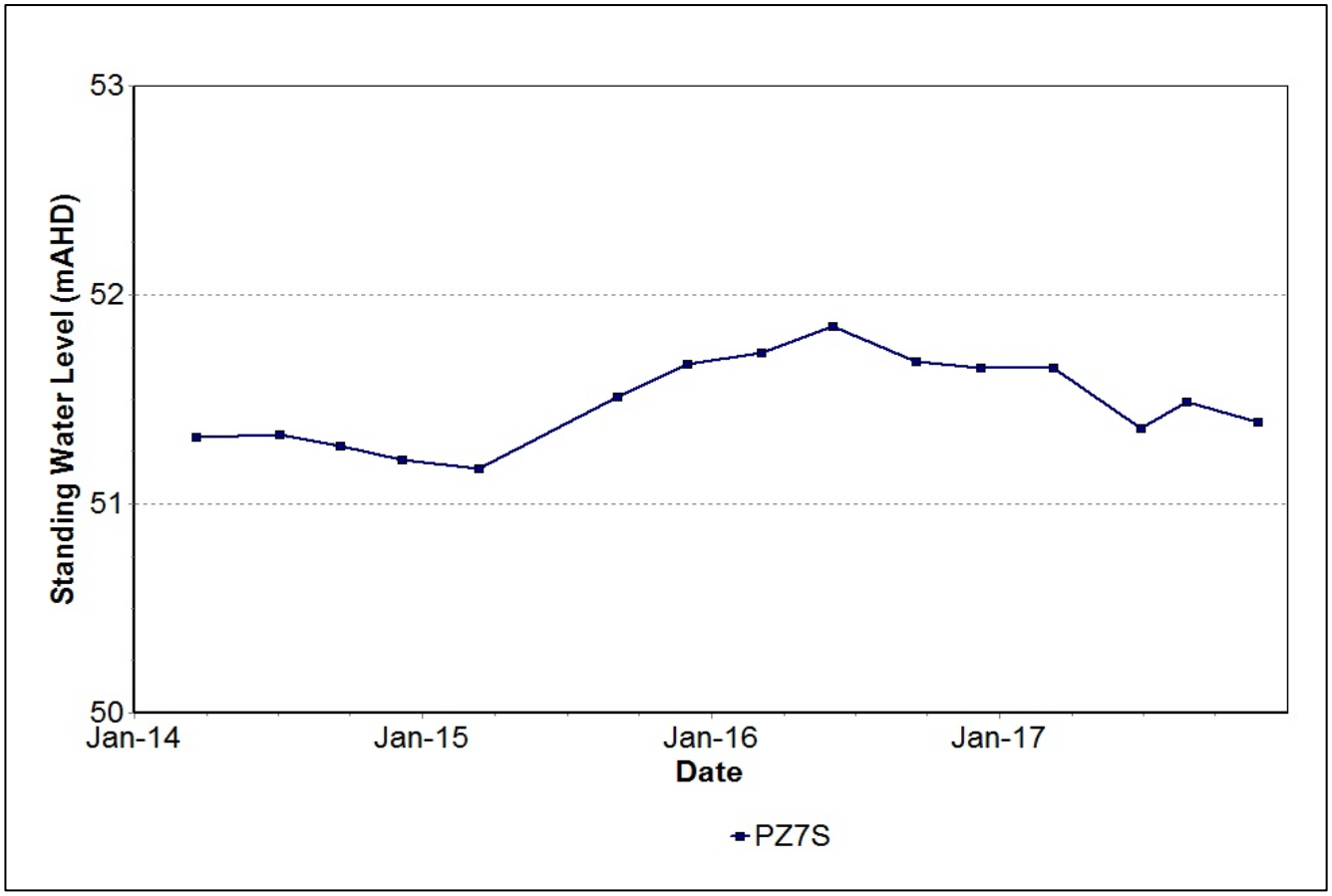


Figure 45: Aeolian Warkworth Sands Standing Water Level Trend – December 2017

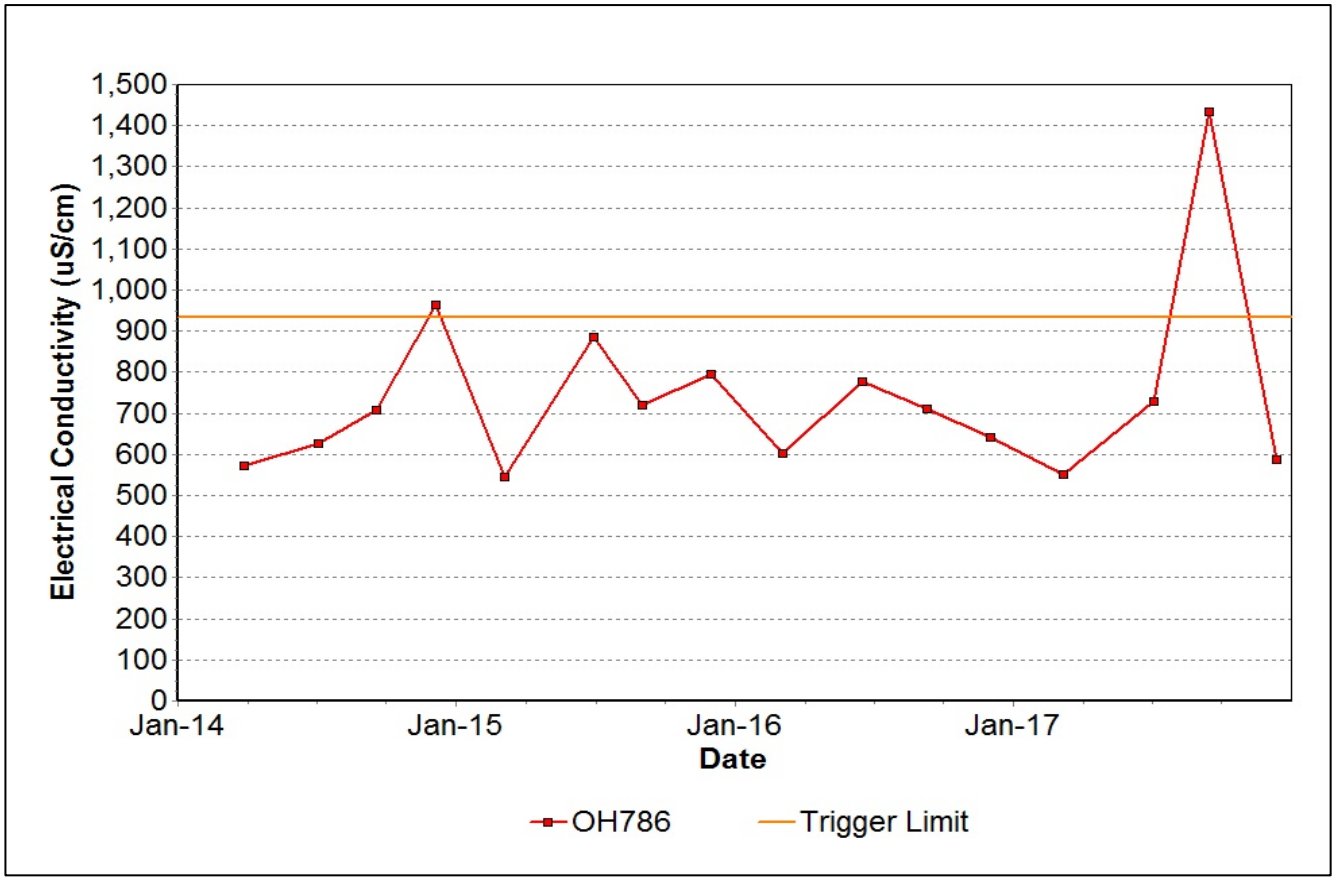


Figure 46: Hunter River Alluvium 1 Seam Electrical Conductivity Trend – December 2017

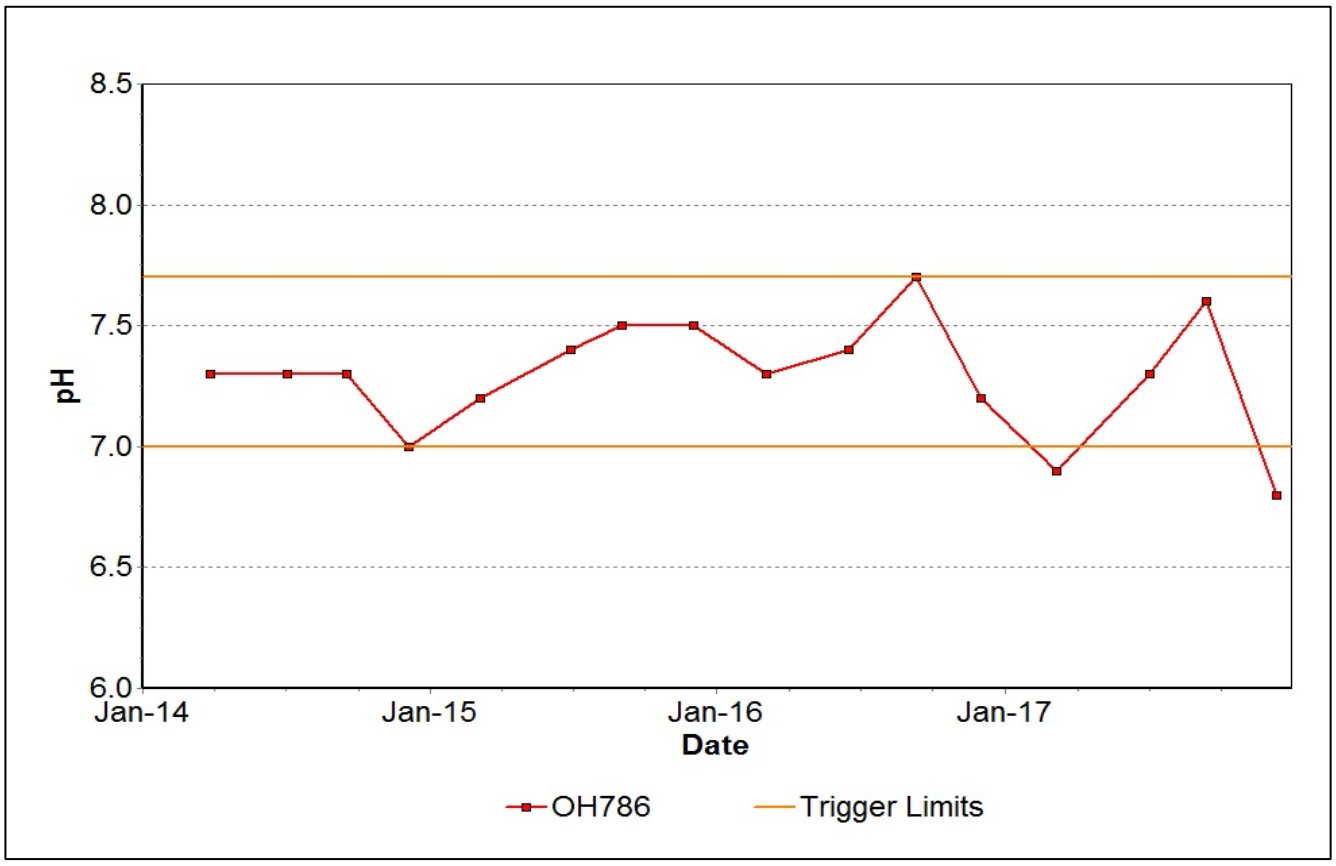


Figure 47: Hunter River Alluvium 1 Seam pH Trend – December 2017

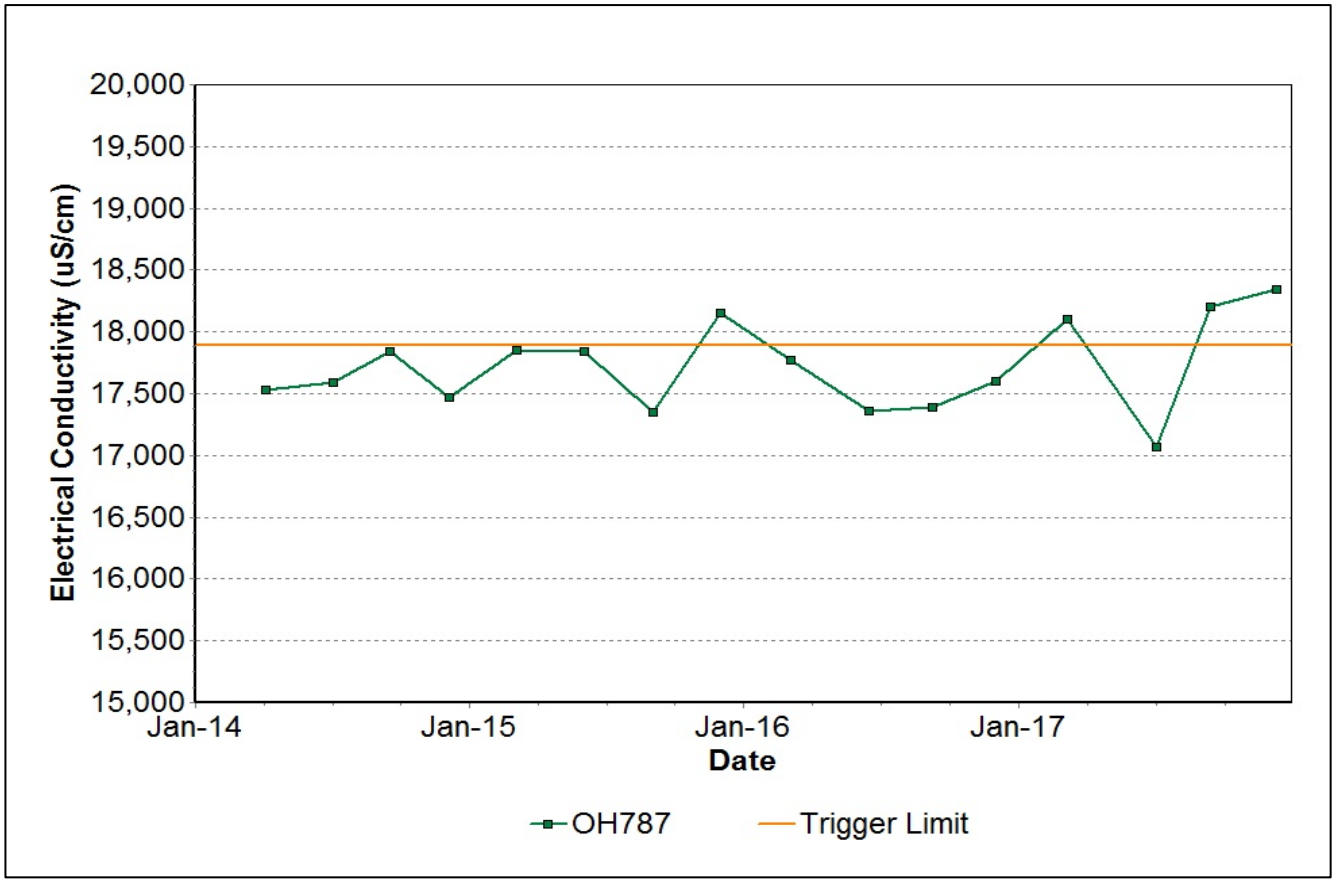


Figure 48: Hunter River Alluvium 2 Seam Electrical Conductivity Trend – December 2017

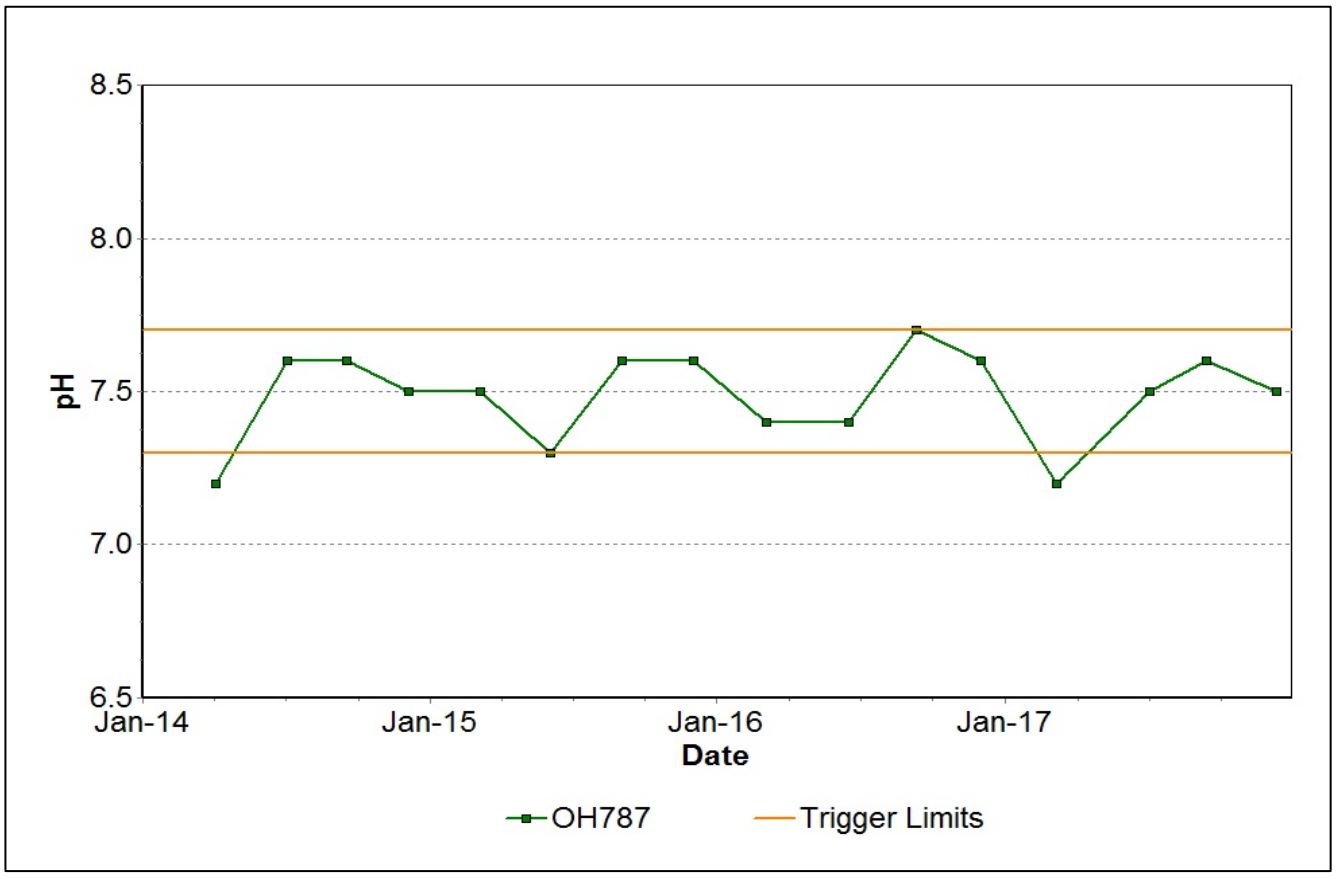


Figure 49: Hunter River Alluvium 2 Seam pH Trend – December 2017

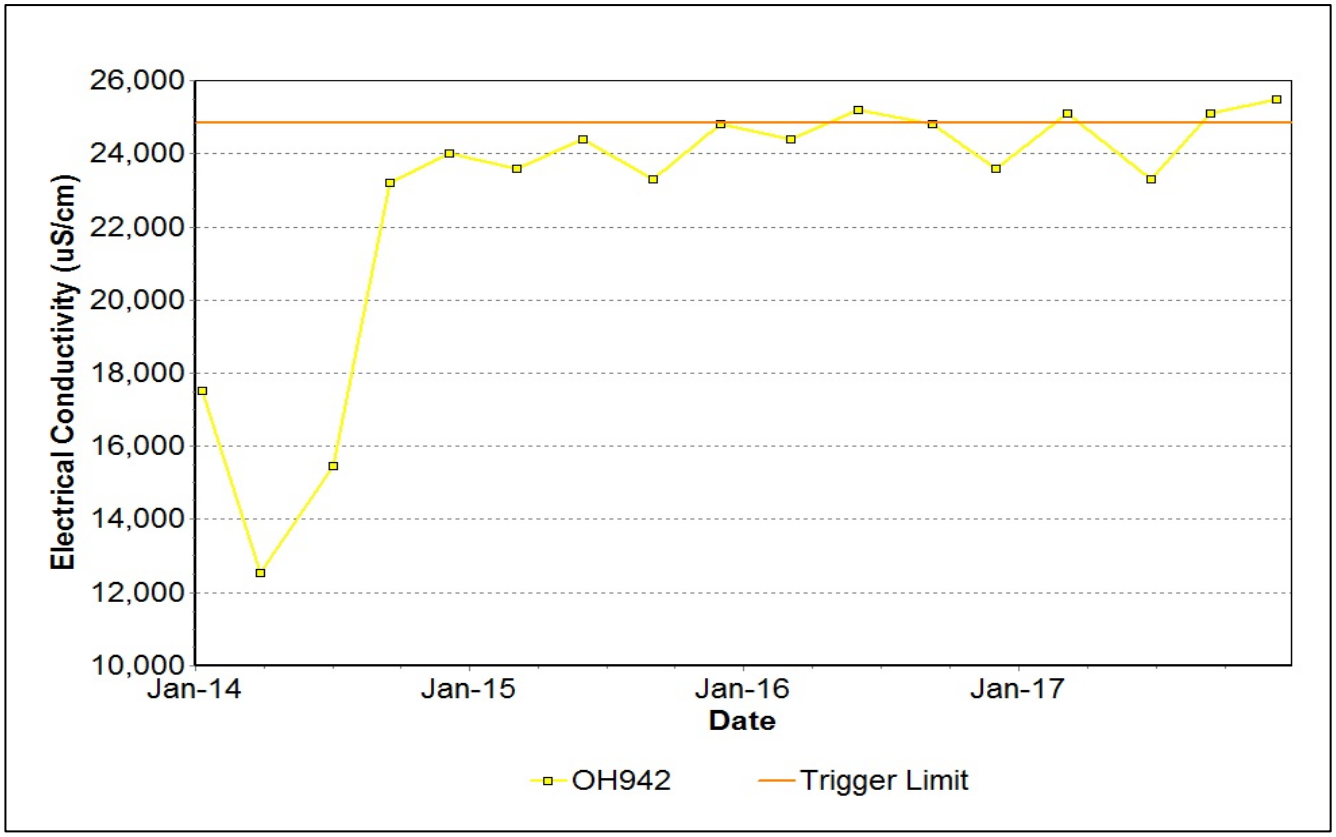


Figure 50: Hunter River Alluvium 3 Seam Electrical Conductivity Trend – December 2017

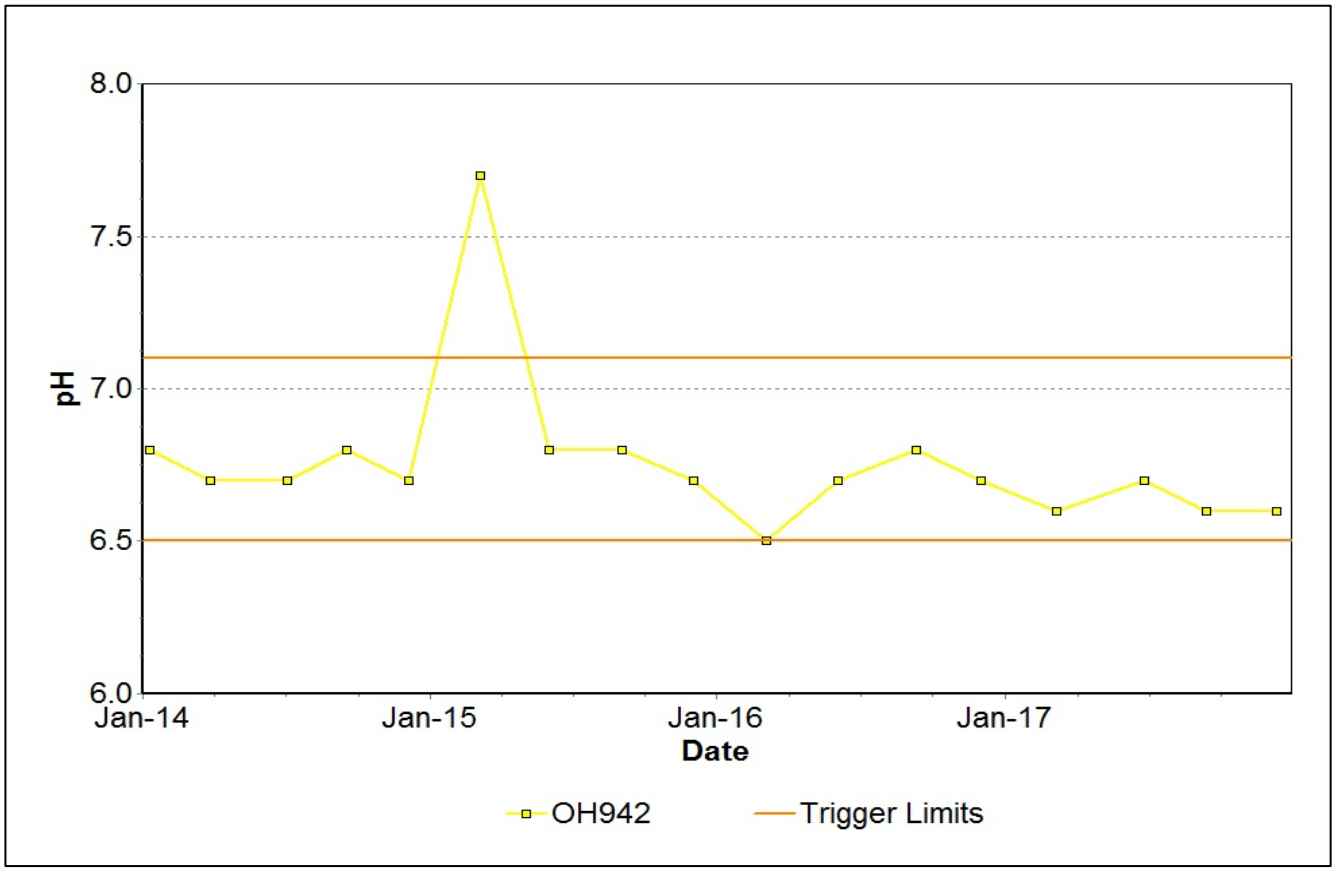


Figure 51: Hunter River Alluvium 3 Seam pH Trend – December 2017

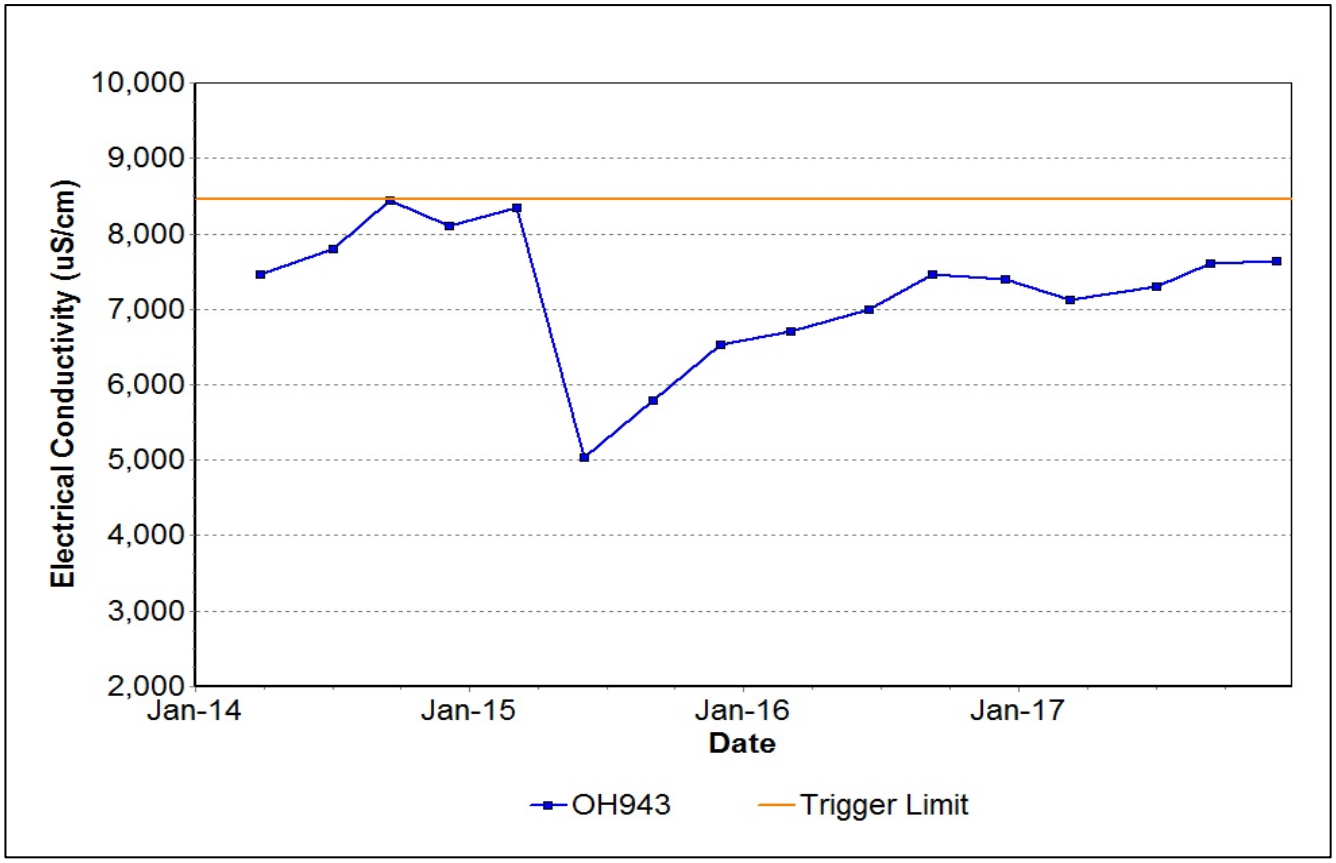


Figure 52: Hunter River Alluvium 4 Seam Electrical Conductivity Trend – December 2017

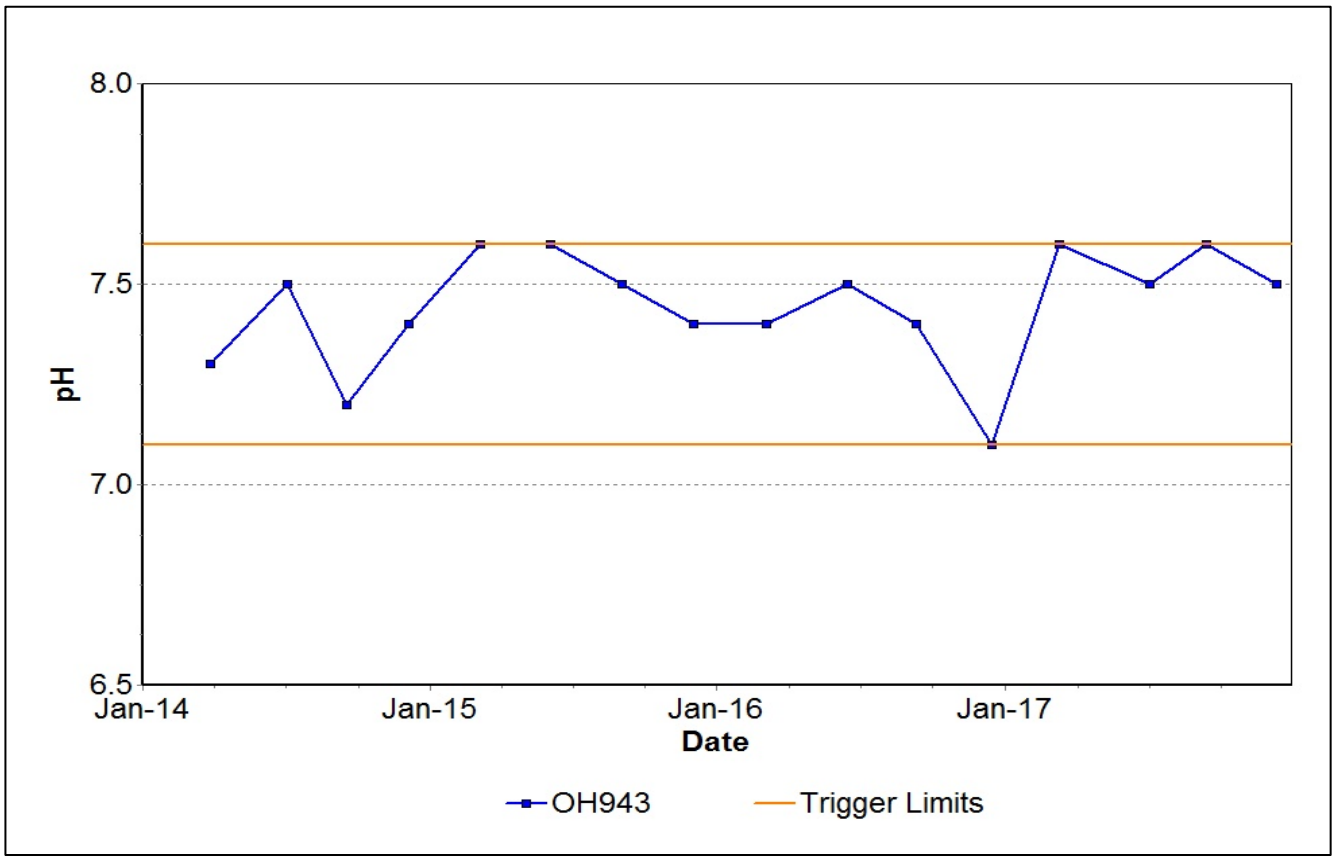
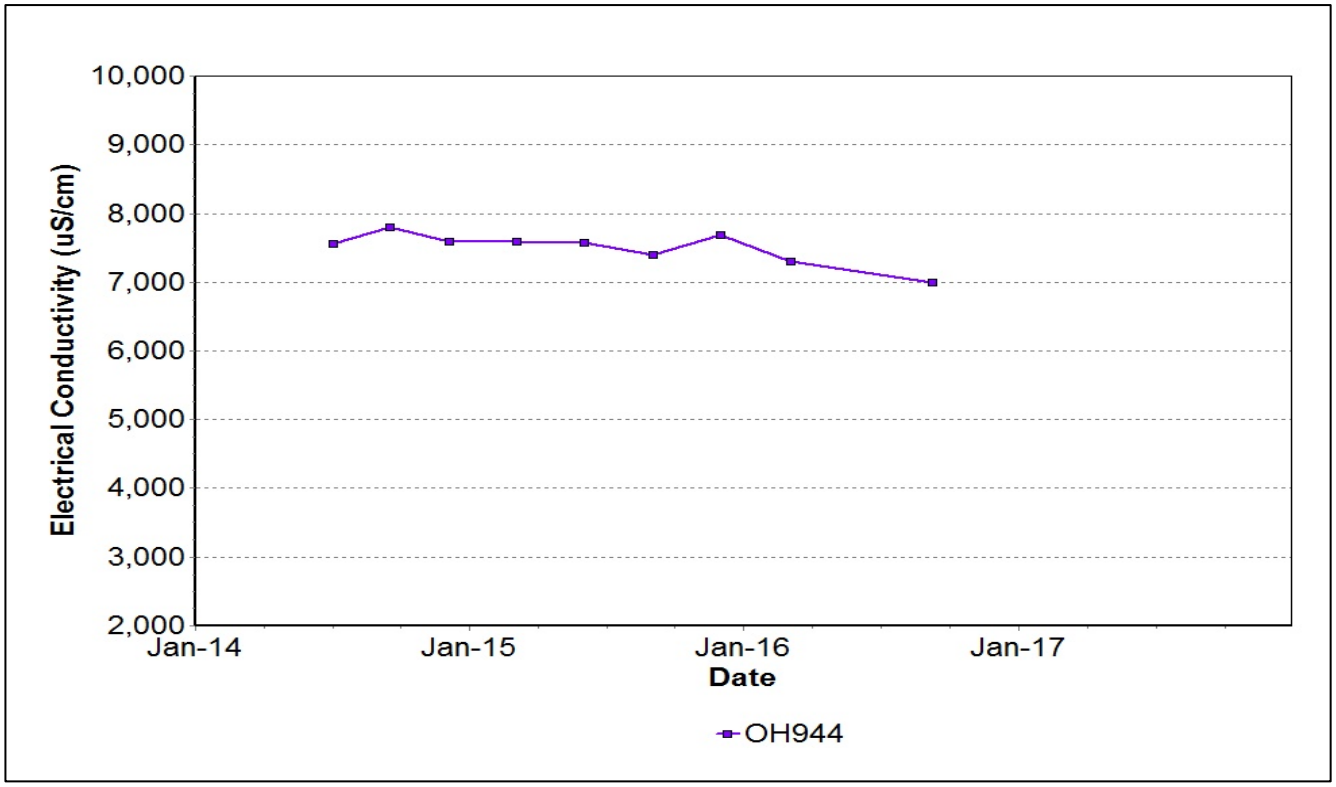


Figure 53: Hunter River Alluvium 4 Seam pH Trend – December 2017



Note: There has been insufficient water to sample since September 2016.

Figure 54: Hunter River Alluvium 5 Seam Electrical Conductivity Trend – December 2017

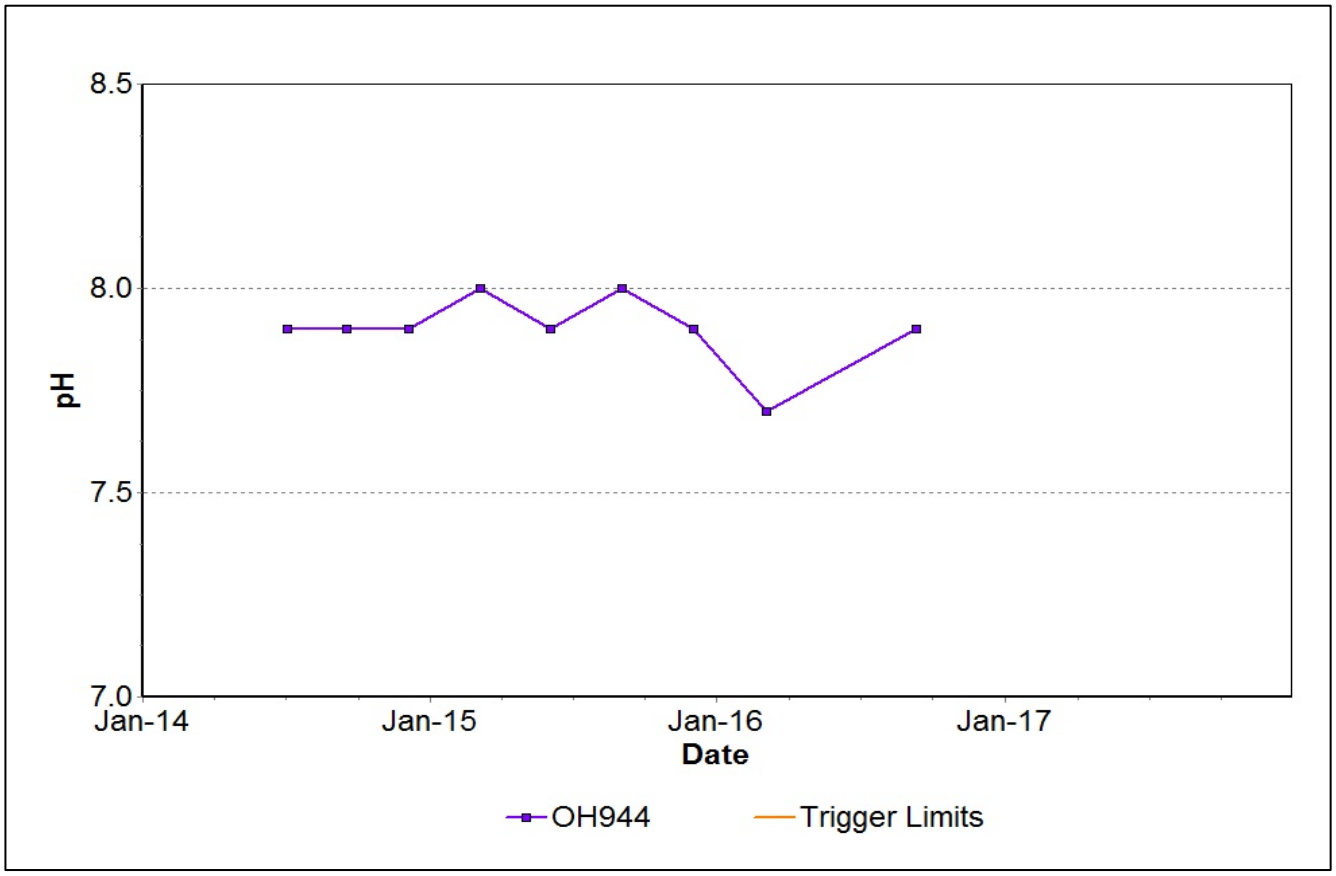


Figure 55: Hunter River Alluvium 5 Seam pH Trend – December 2017

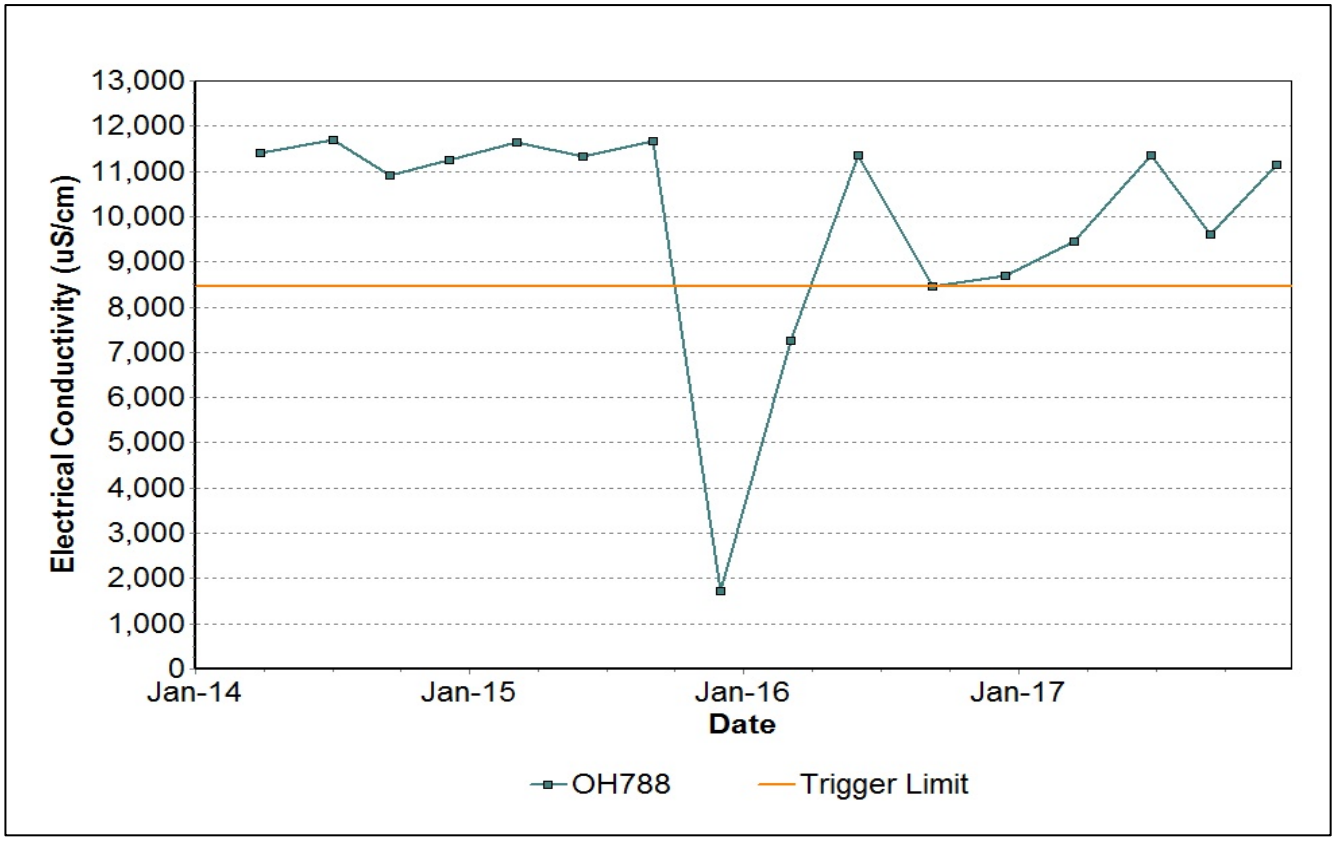


Figure 56: Hunter River Alluvium 6 Seam Electrical Conductivity – December 2017

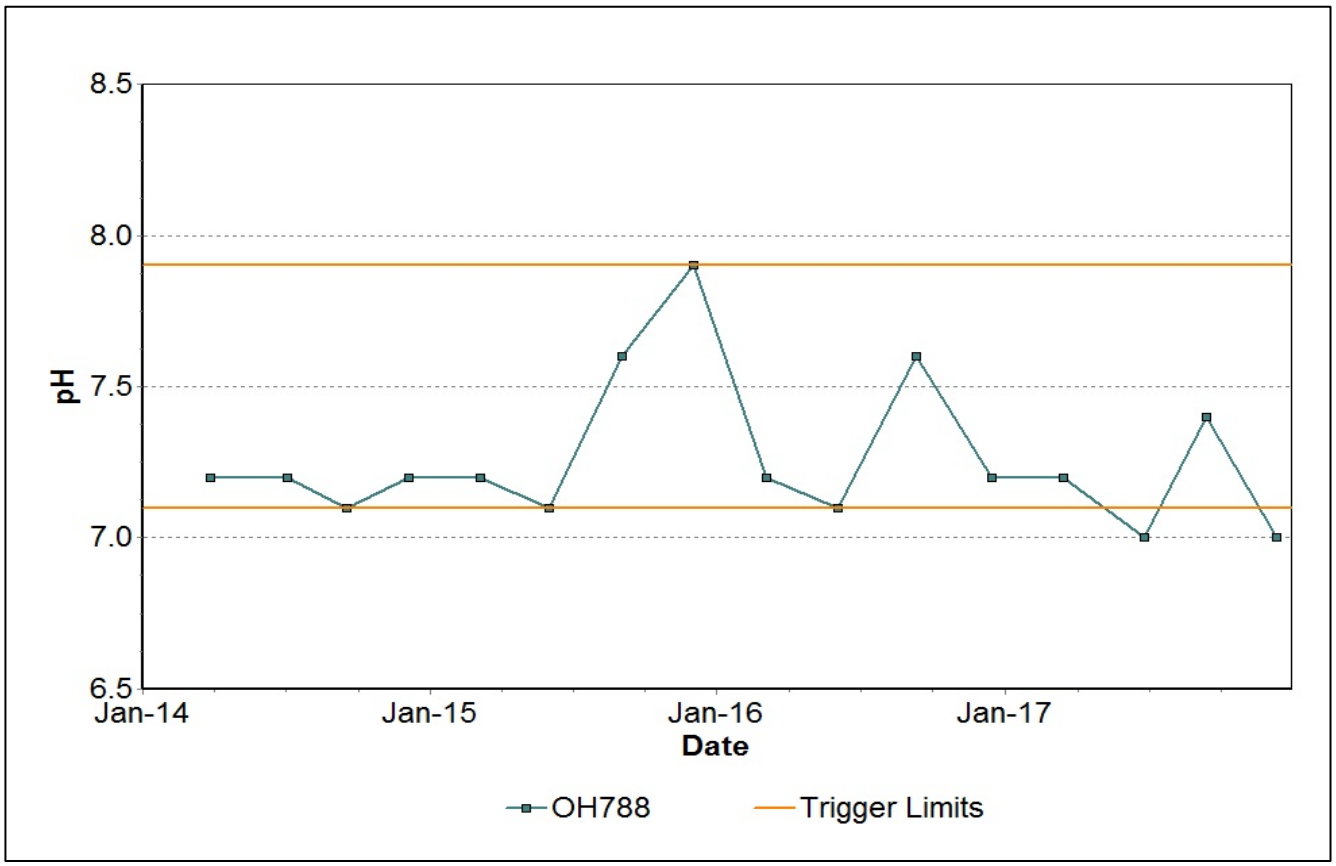


Figure 57: Hunter River Alluvium 6 Seam pH Trend – December 2017

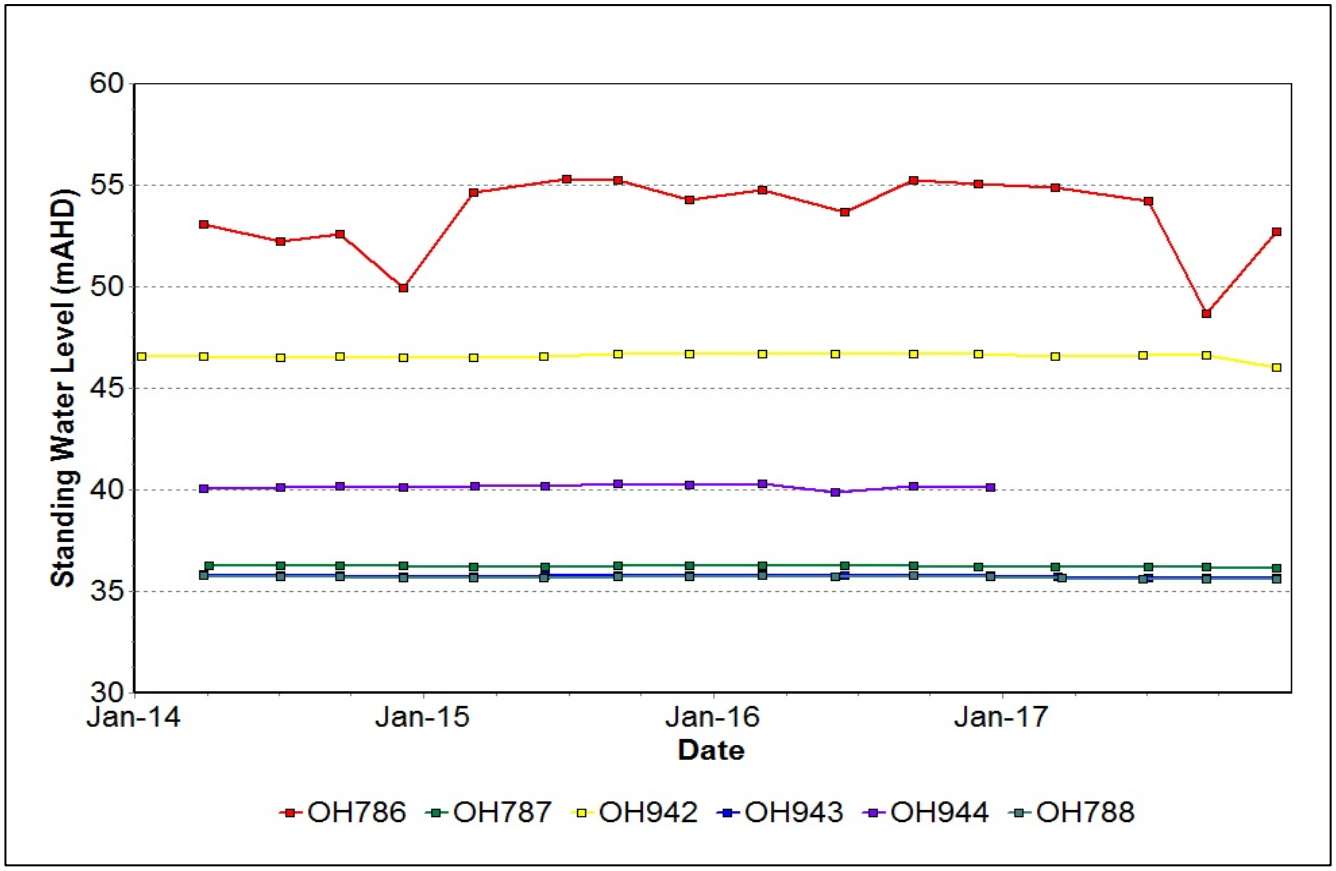


Figure 58: Hunter River Alluvium Standing Water Level Trend – December 2017

3.2.1 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 59.

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

Table 3: Groundwater Triggers - 2017

Site	Date	Trigger Limit Breached	Action Taken in Response
OH 786	14/09/2017	EC – 95th Percentile	Watching Brief*
OH 787	07/03/2017	EC – 95th Percentile	Watching Brief*
OH 787	14/09/2017	EC – 95th Percentile	Watching Brief*
OH 787	11/12/2017	EC – 95th Percentile	Watching Brief*
OH942	07/03/2017	EC – 95th Percentile	Watching Brief*
OH942	14/09/2017	EC – 95th Percentile	Watching Brief*
PZ7S	23/11/2017	EC – 95th Percentile	Watching Brief*
GW 9709	14/09/2017	EC – 95th Percentile	Watching Brief*
MTD616P	10/03/2017	EC – 95th Percentile	Data is stable and consistent with historical trend; significant natural variability in water quality is typical of low-conductivity shallow overburden material. No further action.
MTD616P	03/07/2017	EC – 95th Percentile	Watching Brief*
MTD616P	24/08/2017	EC – 95th Percentile	Data is stable and consistent with historical trend; significant natural variability in water quality is typical of low-conductivity shallow overburden material. No further action
MTD616P	23/11/2017	EC – 95th Percentile	Watching Brief*
MB15MTW02D	25/08/2017	EC – 95th Percentile	Watching Brief*
MBW02	01/09/2017	EC – 95th Percentile	Watching Brief*
MB15MTW03	28/08/2017	EC – 95th Percentile	Watching Brief*
MTD605P	07/03/2017	EC – 95th Percentile	Data is stable and consistent with historical trend; significant natural variability in water quality is typical of low-conductivity shallow overburden material. No further action.
MTD605P	27/06/2017	EC – 95th Percentile	Watching Brief*
MTD605P	14/09/2017	EC – 95th Percentile	Data is stable and consistent with historical trend; significant natural variability in water quality is typical of low-conductivity shallow overburden material. No further action.

MTD605P	23/11/2017	EC – 95th Percentile	Watching Brief*
MB15MTW03	25/08/2017	EC – 95th Percentile	Watching Brief*
MB15MTW03	23/11/2017	EC – 95th Percentile	Watching Brief*
PZ9D	07/03/2017	EC – 95th Percentile	Watching Brief*
PZ9D	14/09/2017	EC – 95th Percentile	Watching Brief*
PZ9D	11/12/2017	EC – 95th Percentile	Watching Brief*
OH1137	14/09/2017	EC – 95th Percentile	Watching Brief*
OH1137	11/12/2017	EC – 95th Percentile	Watching Brief*
WD622P	30/06/2017	EC – 95th Percentile	Watching Brief*
MBW04	01/09/2017	EC – 95th Percentile	Watching Brief*
MBW04	24/11/2017	EC – 95th Percentile	Watching Brief*
WOH2156B	10/03/2017	EC – 95th Percentile	Data is stable and consistent with historical trend; no further action.
WOH2156B	30/06/2017	EC – 95th Percentile	Watching Brief*
WOH2156B	24/08/2017	EC – 95th Percentile	Data is stable and consistent with historical trend; no further action.
WOH2156B	23/11/2017	EC – 95th Percentile	Watching Brief*
OH1138(1)	14/09/2017	EC – 95th Percentile	Watching Brief*
OH1138(2)	11/12/2017	EC – 95th Percentile	Watching Brief*
OH786	07/03/2017	PH –5th Percentile	Watching Brief*
OH786	11/12/2017	PH –5th Percentile	Watching Brief*
OH787	07/03/2017	PH –5th Percentile	Watching Brief*
OH943	11/12/2017	PH –5th Percentile	Watching Brief*
OH788	26/06/2017	PH –5th Percentile	Watching Brief*
GW9709	10/03/2017	PH –5th Percentile	Data broadly in line with historical range; EC or water level do not show a rising or falling trend. Watching brief to be maintained.

GW9709	11/12/2017	PH –5th Percentile	Watching Brief*
GW98MTCL2	10/03/2017	PH –5th Percentile	Watching Brief*
GW98MTCL2	23/07/2017	PH –5th Percentile	Watching Brief*
GW98MTCL2	14/09/2017	PH –5th Percentile	Results in line with historical data, continue to watch and monitor.
MTD616P	03/07/2017	PH –5th Percentile	Watching Brief*
MTD605P	14/09/2017	PH –5th Percentile	Watching Brief*
G3	07/03/2017	PH –5th Percentile	Bore partially collapsed in early 2016 so data may not be representative of aquifer. Removal from monitoring programme has been recommended following review of data from nearby bores.
OH1138(1)	04/07/2017	PH –5th Percentile	Watching Brief*
OH1138(1)	14/09/2017	PH –5th Percentile	Watching Brief*
OH1138(1)	11/12/2017	PH –5th Percentile	Investigation into pH trend commenced. Results to be reported in Annual Review
MB15MTW03	23/11/2017	PH –5th Percentile	Watching Brief*
WOH2139A	25/08/2017	PH –95th Percentile	Watching Brief*
WOH2139A	23/11/2017	PH –95th Percentile	Watching Brief*

* = Watching brief established pending outcomes of subsequent monitoring events. No specific actions required.

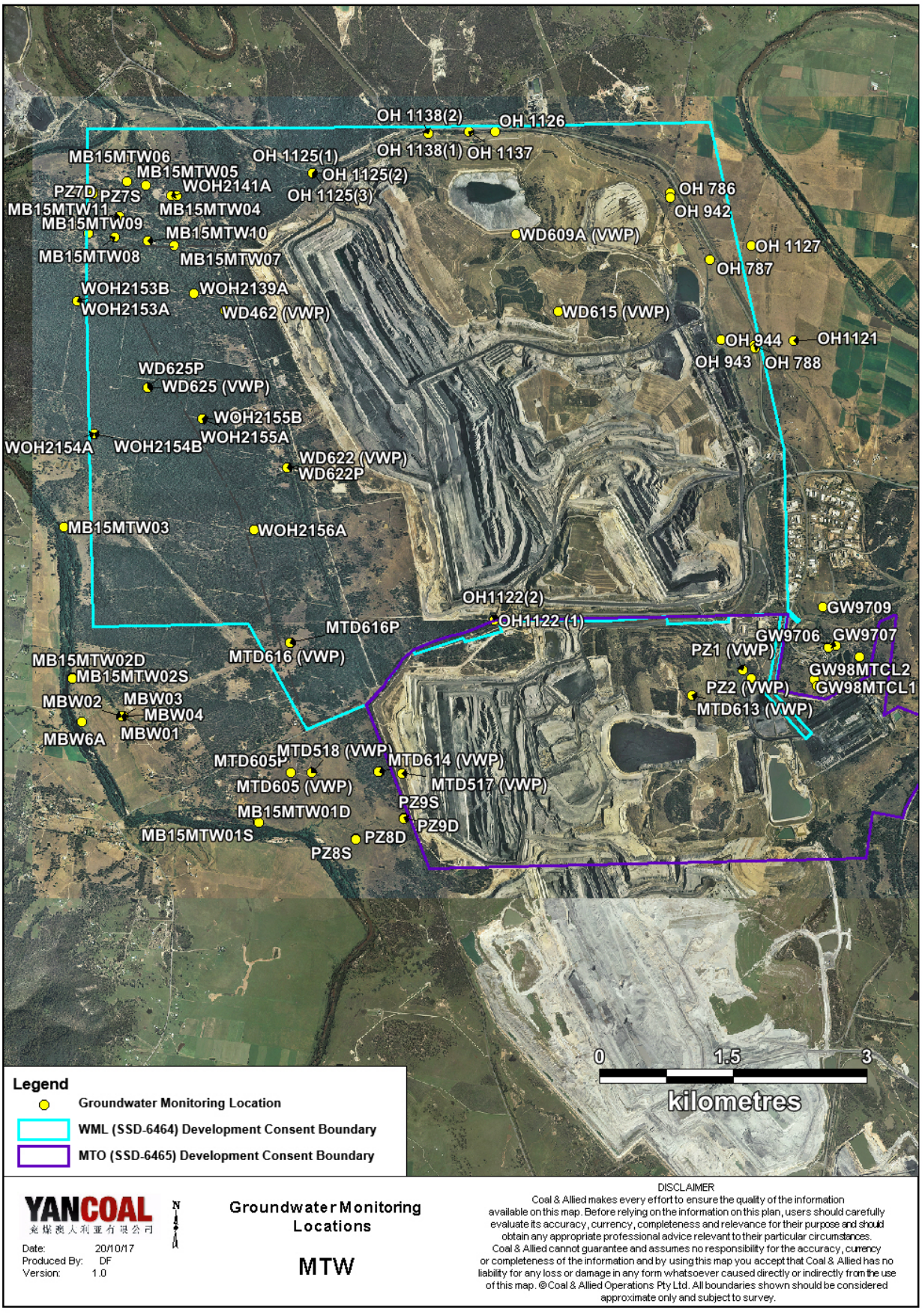


Figure 59: Groundwater Monitoring Location Plan

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 66.

4.1 Blast Monitoring Results

During December 2017, 22 blasts were initiated at MTW. Figure 60 to Figure 65 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
120	0%
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12 month period
10	0%

During the reporting period no blasts exceeded the 115 dB(L) 5% threshold for airblast overpressure or 5mm/s-5% threshold for ground vibration

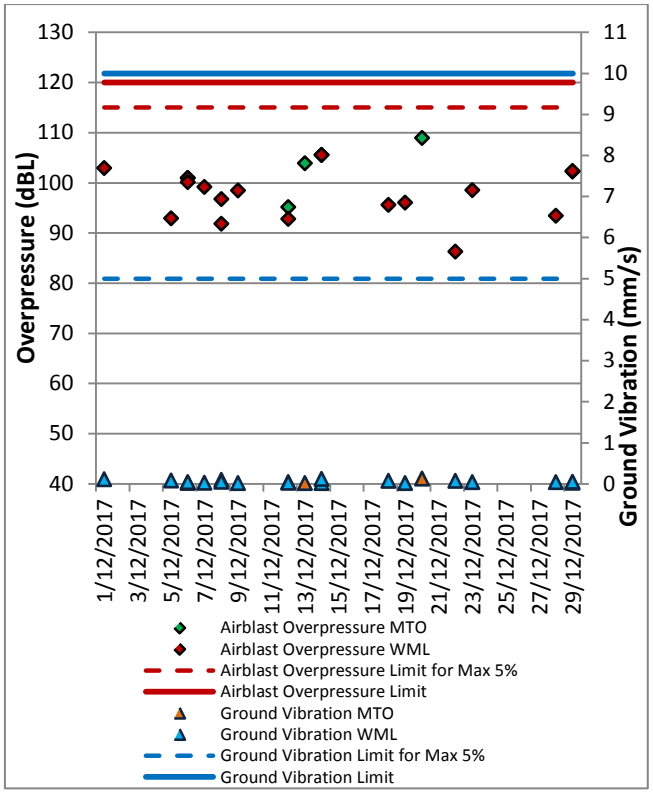


Figure 60: Abbey Green Blast Monitoring Results – December 2017

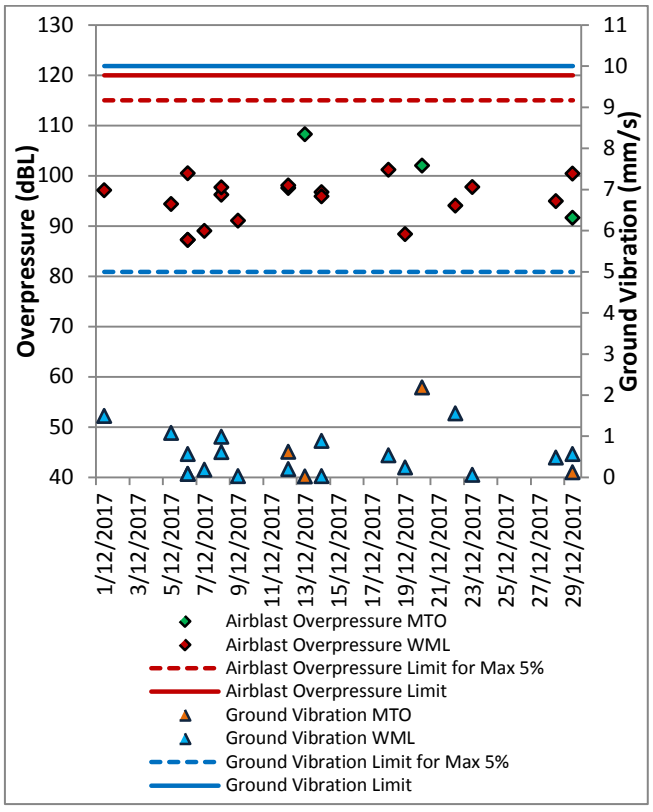


Figure 61: Bulga Village Blast Monitoring Results – December 2017

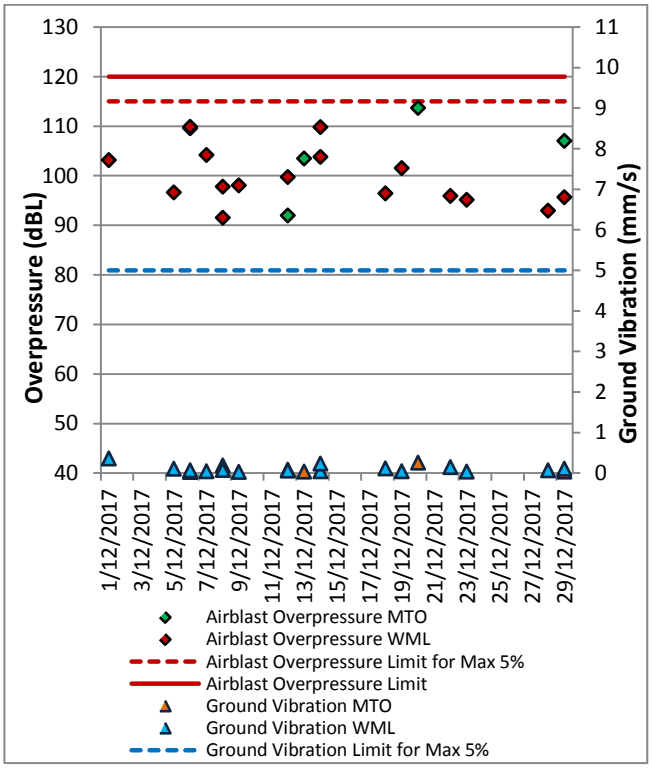


Figure 62: MTIE Blast Monitoring Results – December 2017

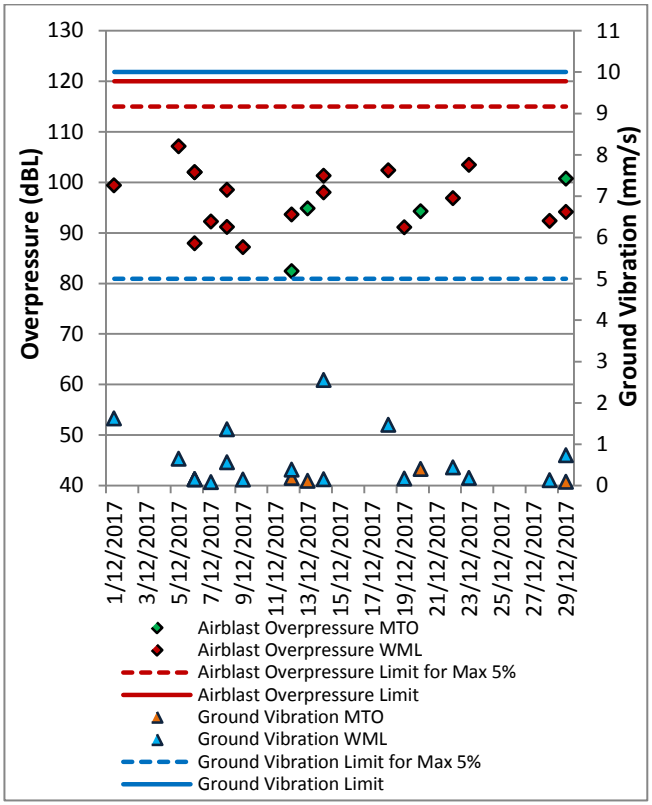


Figure 63: Warkworth Blast Monitoring Results - December 2017

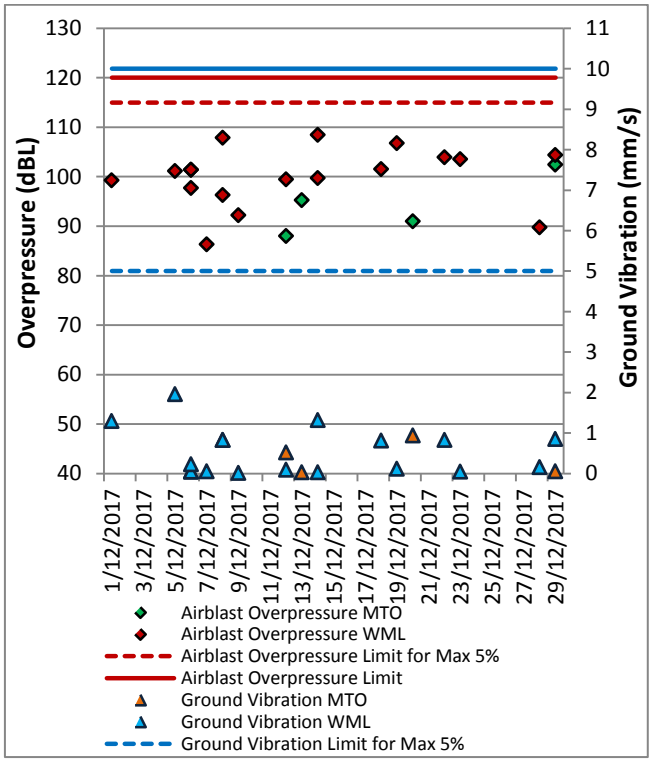


Figure 64: Wambo Road Blast Monitoring Results – December 2017

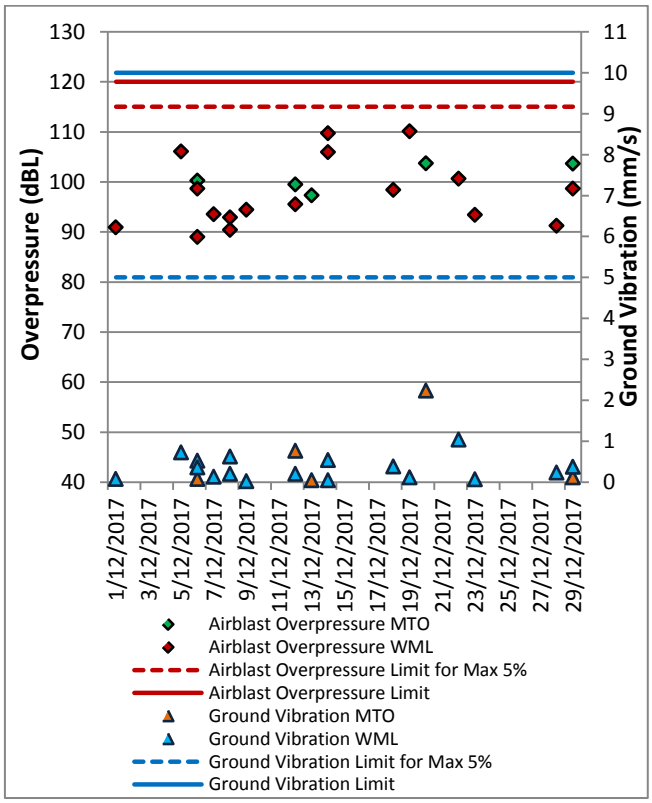


Figure 65: Wollemi Peak Road Blast Monitoring Results - December 2017

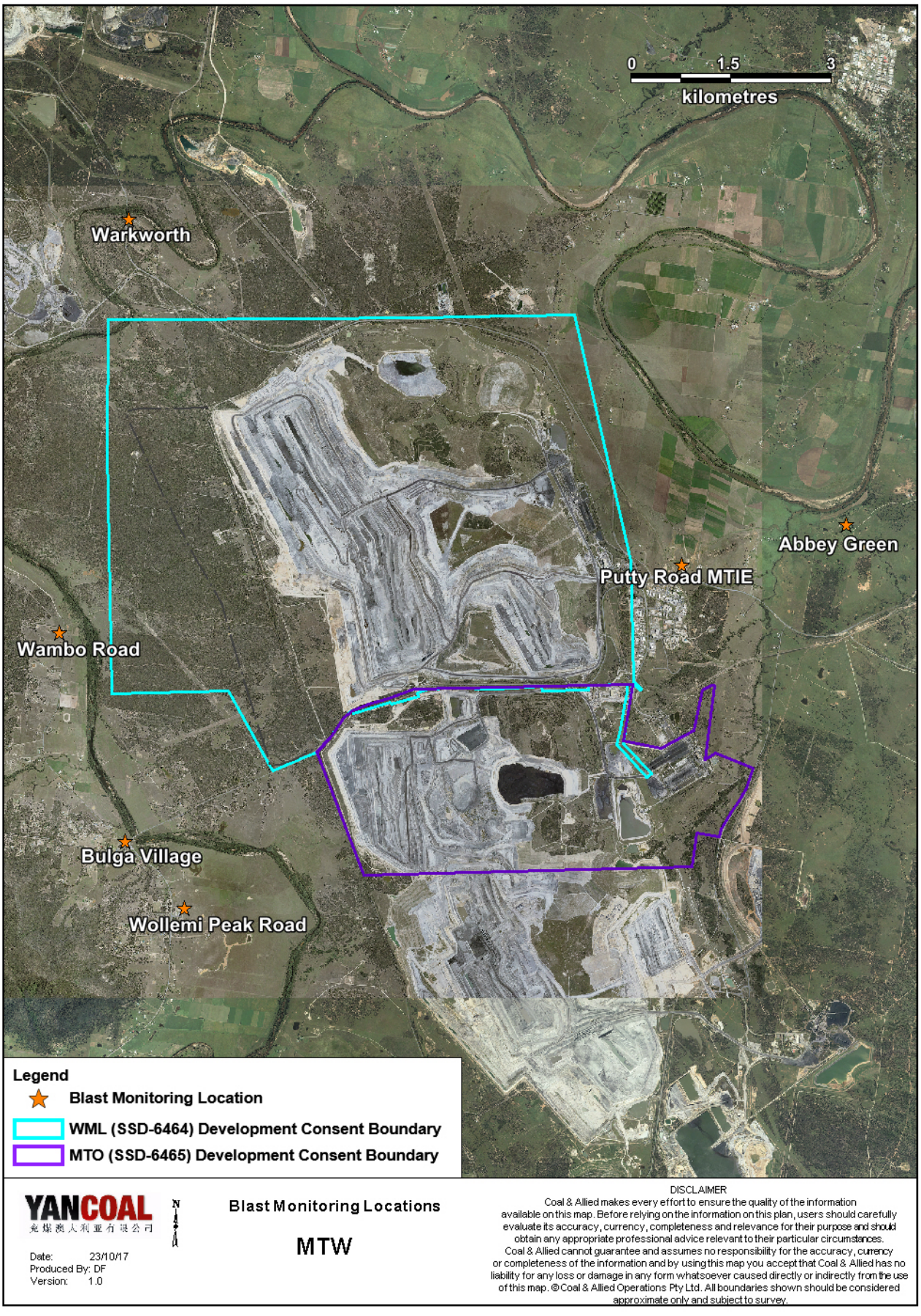


Figure 66: Blast and Vibration Monitoring Location Plan

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. Unattended monitoring (real time noise monitoring) also occurs at five sites surrounding MTW. The attended noise monitoring locations are displayed in Figure 67.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 4 December 2017. 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 Table 5 and Table 6.

Table 5: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – December 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion (dB(A))	Criterion Applies?[1,5]	WML L_{Aeq} dB[2,4]	Exceedance[3]
Bulga RFS	4/12/2017 21:02	3.7	D	37	No	IA	NA
Bulga Village	4/12/2017 21:59	3.7	D	38	No	IA	NA
Gouldsville	4/12/2017 22:53	3.9	D	38	No	<30	NA
Inlet Rd	4/12/2017 21:09	3.7	D	37	No	IA	NA
Inlet Rd West	4/12/2017 21:32	3.5	D	35	No	IA	NA
Long Point	4/12/2017 22:29	4.4	D	35	No	IA	NA
South Bulga	4/12/2017 21:40	4.6	D	35	No	IA	NA
Wambo Road	4/12/2017 22:22	4.1	D	38	No	IA	NA

Notes:
1. Noise emission limits 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;
2. Estimated or measured LAeq,15minute attributed to WML;
3. NA means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

Table 6: $L_{A1,\ 1\ minute}$ Warkworth Impact Assessment Criteria – December 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion (dB(A))	Criterion Applies?[1,5]	WML L_{Aeq} dB[2,4]	Exceedance[3]
Bulga RFS	4/12/2017 21:02	3.7	D	47	No	IA	NA
Bulga Village	4/12/2017 21:59	3.7	D	48	No	IA	NA
Gouldsville	4/12/2017 22:53	3.9	D	48	No	<30	NA
Inlet Rd	4/12/2017 21:09	3.7	D	47	No	IA	NA
Inlet Rd West	4/12/2017 21:32	3.5	D	45	No	IA	NA
Long Point	4/12/2017 22:29	4.4	D	45	No	IA	NA
South Bulga	4/12/2017 21:40	4.6	D	45	No	IA	NA
Wambo Road	4/12/2017 22:22	4.1	D	48	No	IA	NA

Notes:
1. Noise emission limits 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;
2. Estimated or measured LA1,1minute attributed to Warkworth mine (WML);
3. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable.
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

5.1.2 MTO Noise Assessment

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

Table 7: $L_{Aeq, 15minute}$ Mount Thorley Operations - Impact Assessment Criteria – December 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB	Criterion Applies?[1,5]	MTO L_{Aeq} dB[2,4]	Exceedance[3]
Bulga RFS	4/12/2017 21:02	3.7	D	37	No	25	NA
Bulga Village	4/12/2017 21:59	3.7	D	38	No	28	NA
Gouldsville	4/12/2017 22:53	3.9	D	35	No	IA	NA
Inlet Rd	4/12/2017 21:09	3.7	D	37	No	<25	NA
Inlet Rd West	4/12/2017 21:32	3.5	D	35	No	26	NA
Long Point	4/12/2017 22:29	4.4	D	35	No	IA	NA
South Bulga	4/12/2017 21:40	4.6	D	36	No	25	NA
Wambo Road	4/12/2017 22:22	4.1	D	38	No	30	NA

Notes:
1. Noise emission limits 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;
2. Estimated or measured LAeq,15minute attributed to MTO;
3. NA means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

Table 8: $L_{A1, 1Minute}$ Mount Thorley Operations - Impact Assessment Criteria – December 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB	Criterion Applies?[1,5]	MTO $L_{A1, 1min}$ dB[2,4]	Exceedance[3]
Bulga RFS	4/12/2017 21:02	3.7	D	47	No	30	NA
Bulga Village	4/12/2017 21:59	3.7	D	48	No	32	NA
Gouldsville	4/12/2017 22:53	3.9	D	45	No	IA	NA
Inlet Rd	4/12/2017 21:09	3.7	D	47	No	NM	NA
Inlet Rd West	4/12/2017 21:32	3.5	D	45	No	NM	NA
Long Point	4/12/2017 22:29	4.4	D	45	No	IA	NA
South Bulga	4/12/2017 21:40	4.6	D	46	No	33	NA
Wambo Road	4/12/2017 22:22	4.1	D	48	No	33	NA

Notes
1. Noise emission limits 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;
2. Estimated or measured LA1,1minute attributed to MTO;
3. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable.
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

5.1.3 Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification penalty has been assessed. During December 2017 no measurements required the penalty to be applied. The assessment for low frequency noise is shown in Table 9

Table 9: Low Frequency Noise Assessment - December 2017

Location	Date and Time	Measured Site Only LA_{eq} dB (WML/MTO)	Site Only LC_{eq} dB[4] (WML/MTO)	Site Only LC_{eq}-LA_{eq} dB $_{1,4}$ (WML/MTO)	Result Max exceedance of ref spectrum dB[2,3,4] (WML/MTO)	Penalty dB(A) (WML/MTO)	Exceedance
Bulga RFS	4/12/2017 21:02	IA/25	NA/NA	NA/NA	NA/NA	NA/NA	NA
Bulga Village	4/12/2017 21:59	IA/28	NA/55	NA/27	NA/Nil	NA/0	NA
Gouldsville	4/12/2017 22:53	<30/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	4/12/2017 21:09	IA/<25	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd West	4/12/2017 21:32	IA/26	NA/52	NA/26	NA/Nil	NA/0	NA
Long Point	4/12/2017 22:29	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	4/12/2017 21:40	IA/25	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	4/12/2017 22:22	IA/30	NA/54	NA/24	NA/Nil	NA/0	NA

Notes:
1. As per NPfI, if LCeq – LAeq >= 15 dB further assessment of low frequency noise required.
2. As per NPfI, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;
3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded; and
4. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement, or where criteria were not applicable due to meteorological conditions, this is noted as NA (not available) and no further assessment has been undertaken.

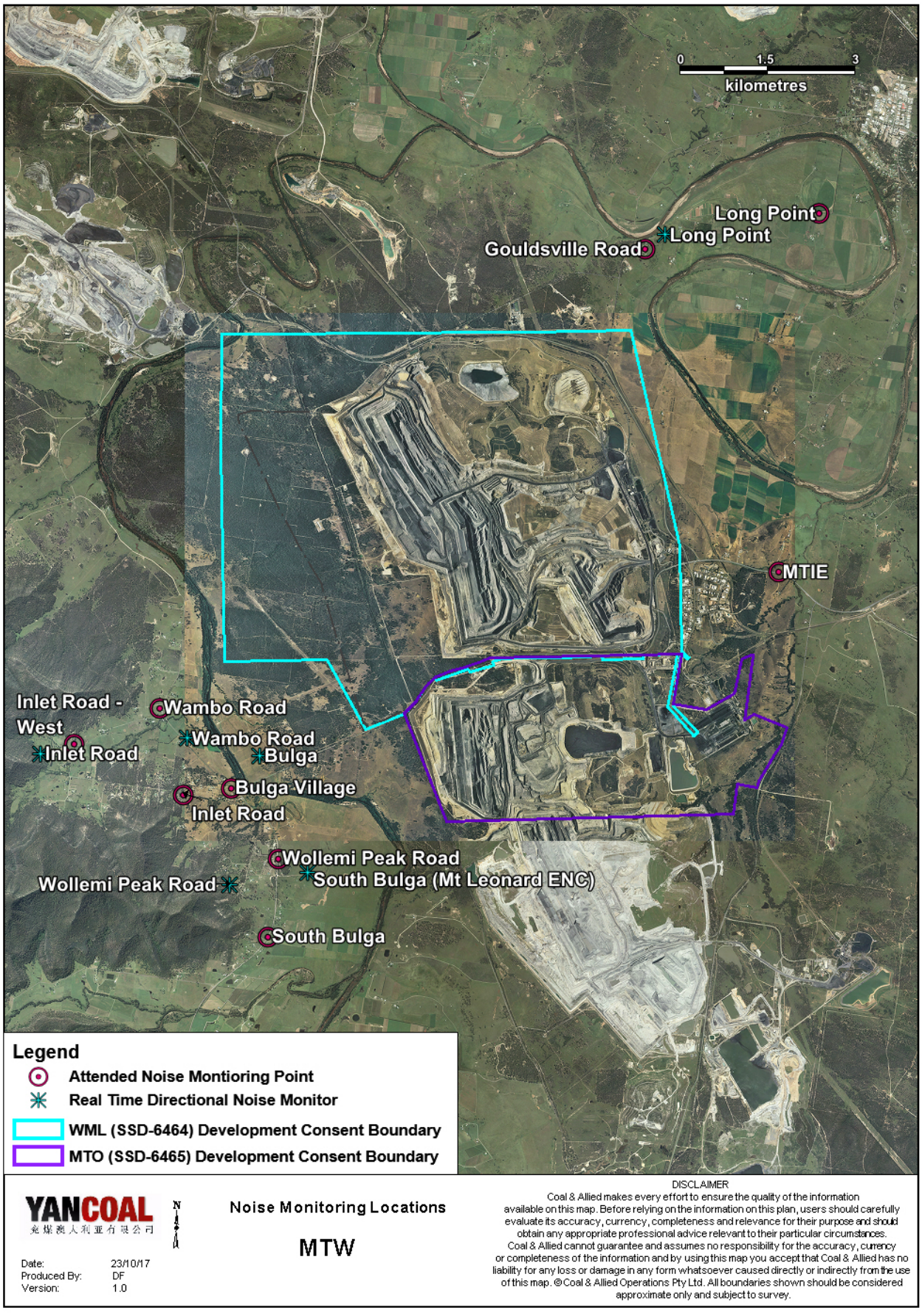


Figure 67: Noise Monitoring Location Plan

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 so as 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 during December are provided in Table 10.

Table 10: Supplementary Attended Noise Monitoring Data –December 2017

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
525	3	2	0.6

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

6.0 OPERATIONAL DOWNTIME

During December a total of 1520 hours of equipment downtime was logged in response to environmental events such as dust, noise and elevated wind impacts. Operational downtime by equipment type is shown in Figure 68.

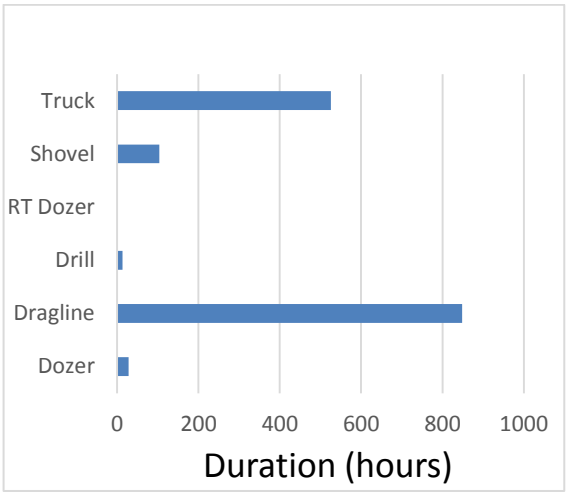


Figure 68: Operational Downtime by Equipment Type – December 2017

7.0 REHABILITATION

During December, 0.8Ha of land was released, 2.0Ha was bulk shaped, 5.2Ha was top soiled, 2.8Ha was composted and 5.5Ha was rehabilitated. Year-to-date progress can be viewed in Figure 69

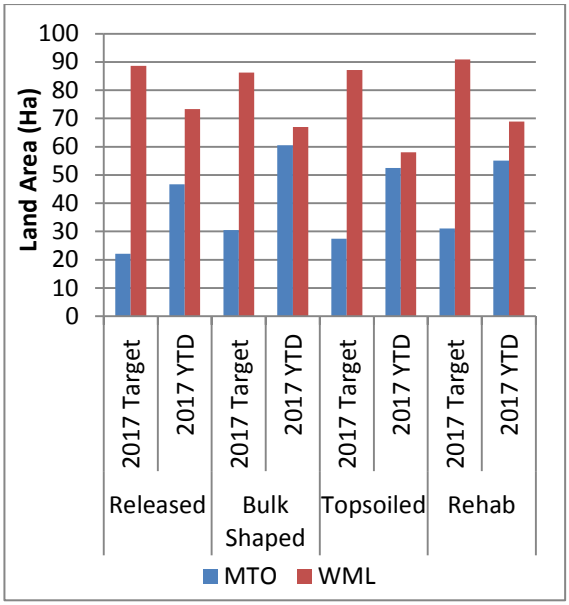


Figure 69: Rehabilitation YTD - December 2017

8.0 ENVIRONMENTAL INCIDENTS

There were no reportable environmental incidents during the reporting period.

9.0 COMPLAINTS

During the reporting period 32 complaints were received, details of these complaints are displayed in Figure 70 below.

	Noise	Dust	Blast	Lighting	Other	Total
January	5	6	3	1	0	15
February	25	3	10	3	0	41
March	14	1	1	2	0	18
April	27	1	7	2	0	37
May	18	4	7	10	3	42
June	10	3	4	3	0	20
July	10	10	8	0	2	30
August	8	18	5	4	1	36
September	21	15	6	2	3	47
October	21	8	6	2	2	39
November	12	5	5	2	1	25
December	17	6	3	2	4	32
Total	188	80	65	33	16	382

Figure 70: Complaints Summary - YTD December 2017

Appendix A: Meteorological Data

Table 11: Meteorological Data – Charlton Ridge Meteorological Station – December 2017

Date	Air Temperature Maximum (°C)	Air Temperature Minimum (°C)	Relative Humidity Maximum (%)	Relative Humidity Minimum (%)	Solar Radiation Maximum (W/Sq. M)	Wind Direction Average (°)	Wind Speed Average (m/sec)	Rainfall(mm)
1/12/2017	36	17	88	22	1208	162	2.5	0.0
2/12/2017	30	15	96	38	1144	237	4.3	13.8
3/12/2017	27	15	89	32	1223	299	5.0	0.2
4/12/2017	25	15	84	47	1455	164	3.2	0.0
5/12/2017	28	14	94	38	1478	159	2.8	16.2
6/12/2017	25	18	67	35	1003	277	2.6	0.0
7/12/2017	33	14	82	12	1271	253	2.5	0.0
8/12/2017	35	15	82	13	1417	173	2.9	0.0
9/12/2017	27	15	90	35	1561	141	2.7	0.8
10/12/2017	30	13	85	27	1396	140	2.5	0.0
11/12/2017	32	13	83	24	1124	142	2.8	0.0
12/12/2017	34	16	81	22	1108	136	2.9	0.0
13/12/2017	37	17	83	15	1171	182	2.4	0.0
14/12/2017	40	19	63	9	1119	221	3.1	0.0
15/12/2017	34	21	80	32	1207	150	3.4	0.4
16/12/2017	39	19	93	12	1302	141	2.2	3.0
17/12/2017	34	20	80	35	1098	156	3.2	0.0
18/12/2017	36	19	86	26	1181	166	2.3	0.6
19/12/2017	39	20	89	19	1328	256	3.1	3.2
20/12/2017	42	20	89	12	1228	240	4.0	0.0
21/12/2017	25	17	91	54	402	130	2.9	0.0
22/12/2017	27	17	96	49	1270	133	2.1	0.6
23/12/2017	36	18	87	22	1248	150	2.1	0.0
24/12/2017	40	19	81	7	1271	222	3.5	0.0
25/12/2017	23	16	88	64	550	155	3.7	0.0
26/12/2017	21	15	97	67	604	145	3.0	2.8
27/12/2017	30	16	96	41	1606	122	3.5	0.2
28/12/2017	36	15	91	15	1251	137	2.1	0.0
29/12/2017	39	20	84	15	1210	209	2.5	0.0
30/12/2017	36	20	88	23	1385	276	4.3	0.8
31/12/2017	28	19	86	50	1558	117	3.4	0.0

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