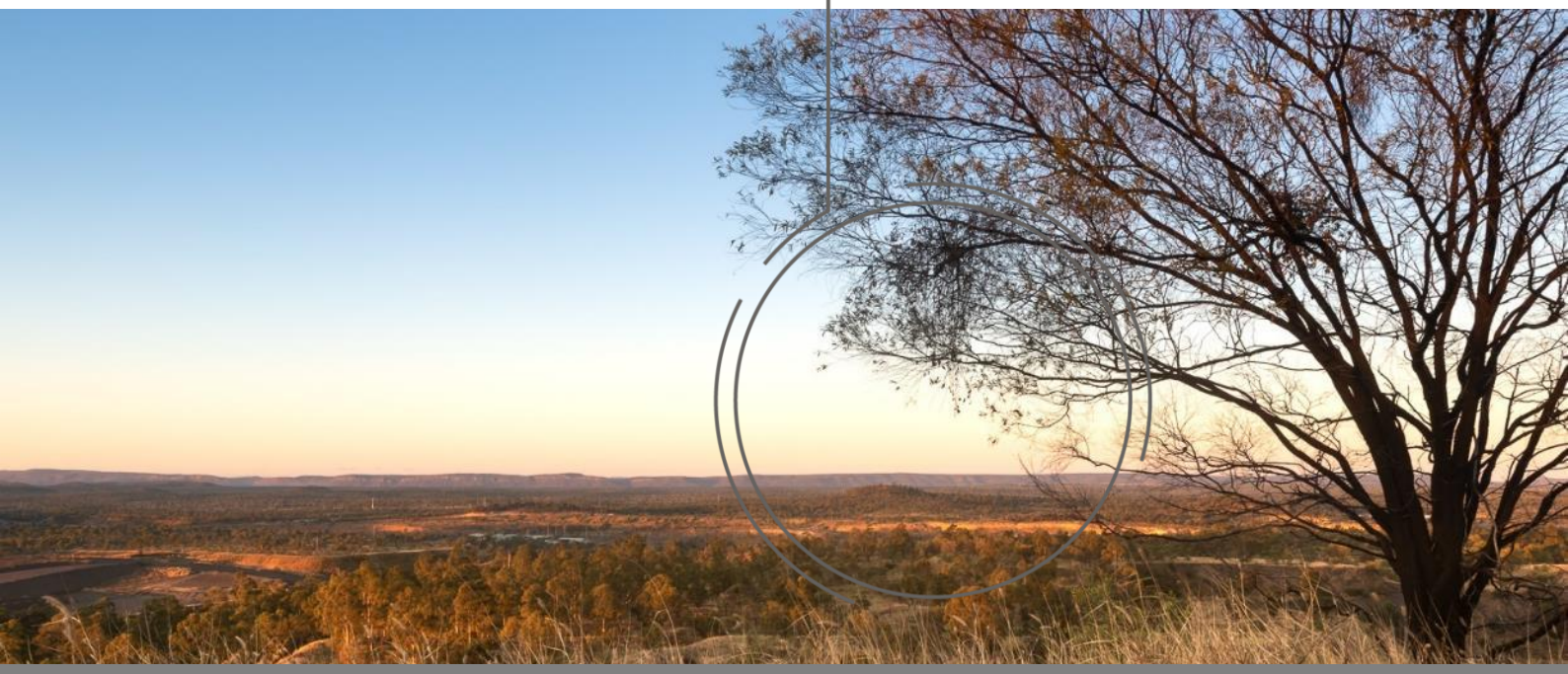
HUNTER VALLEY OPERATIONS

Monthly Environmental Monitoring Report – September 2022

Report



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1 Introduction

This report has been compiled to provide a monthly summary of environmental monitoring results for Hunter Valley Operations (HVO). This report includes all monitoring data collected for the period 1st to 30th September 2022 (the 'Reporting Period').

2 Air Quality

2.1 Meteorological Monitoring

HVO maintains two meteorological stations: 'HVO Corporate' and 'Cheshunt' (refer to **Figure 4**).

2.1.1 Rainfall

Rainfall for the period is summarised in **Table 1**. The 2020, 2021 and 2022 trends are shown in **Figure 1**.

Table 1 - Rainfall data for the reporting period

2022	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
September	85.8	817.0

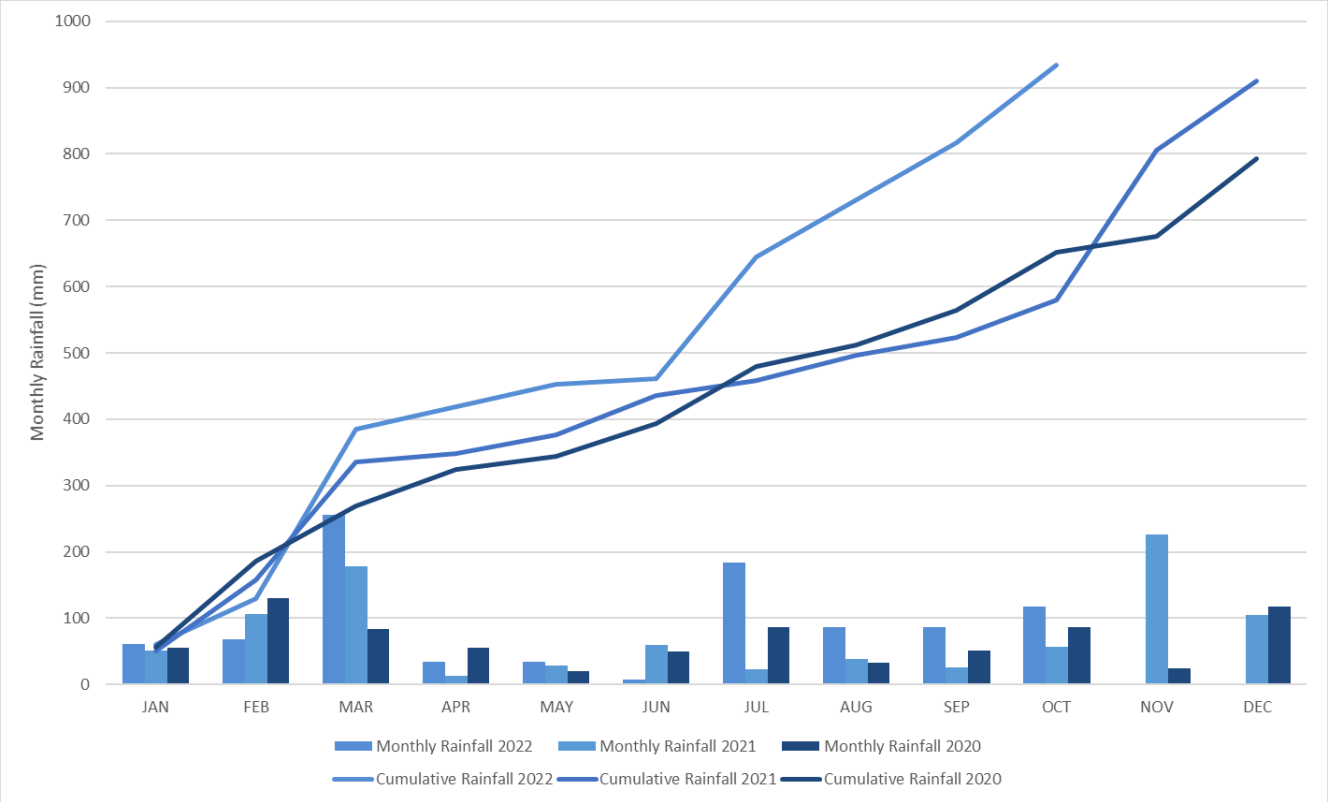

Figure 1 - Rainfall Summary 2022

2.1.2 Wind Speed and Direction

North-westerly to westerly winds were prevailing during the reporting period as shown in **Figure 2** (HVO Corporate) and **Figure 3** (HVO Cheshunt).

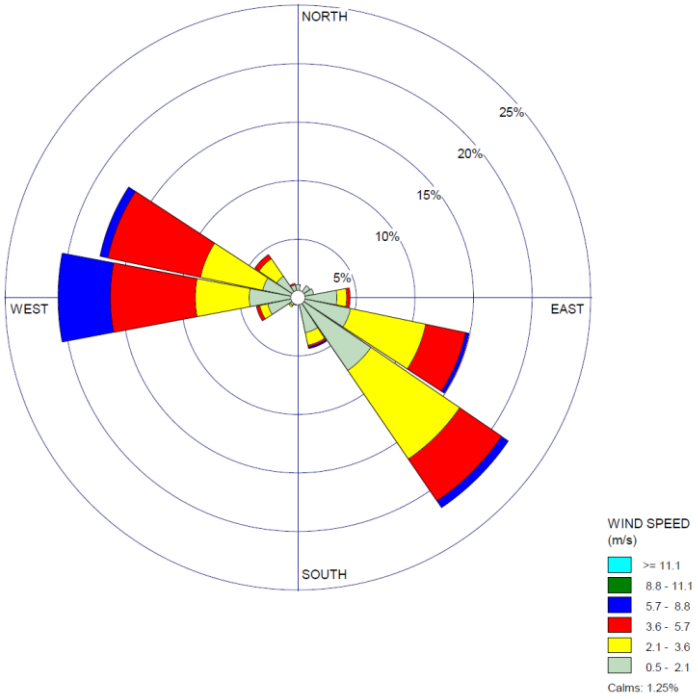

Figure 2 - HVO Corporate Wind Rose for the Reporting Period

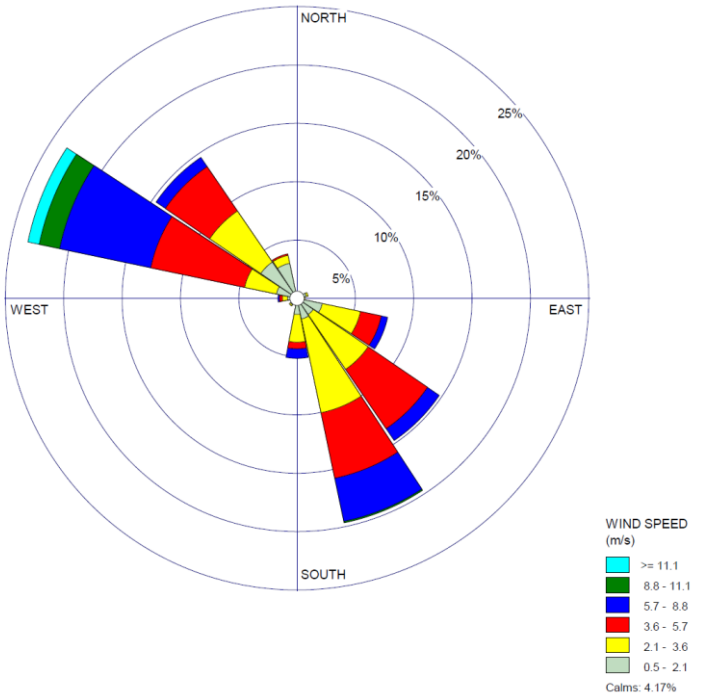

Figure 3 - HVO Cheshunt Wind Rose for the Reporting Period

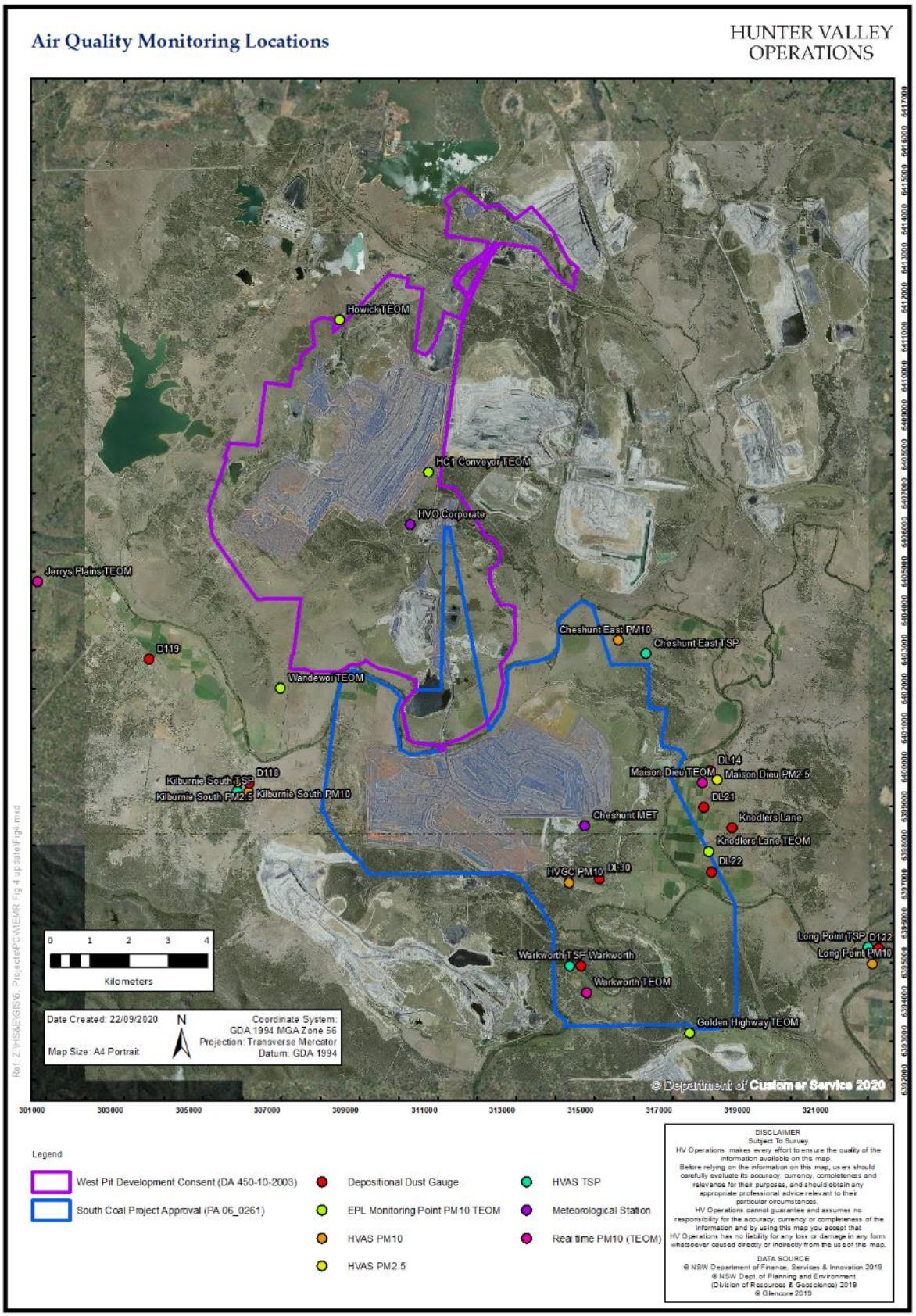

Figure 4 - Air Quality Monitoring Location Plan

2.2 Depositional Dust

HVO operates and maintains a network of nine depositional dust gauges situated on private and mine owned land surrounding HVO to monitor regional air quality.

Figure 5 displays insoluble solids results from depositional dust gauges during the reporting period compared against the annual impact assessment criteria. Any monthly results deemed to be contaminated (due to presence of bird droppings, insects, etc.) are not displayed. An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2022 Annual Review.

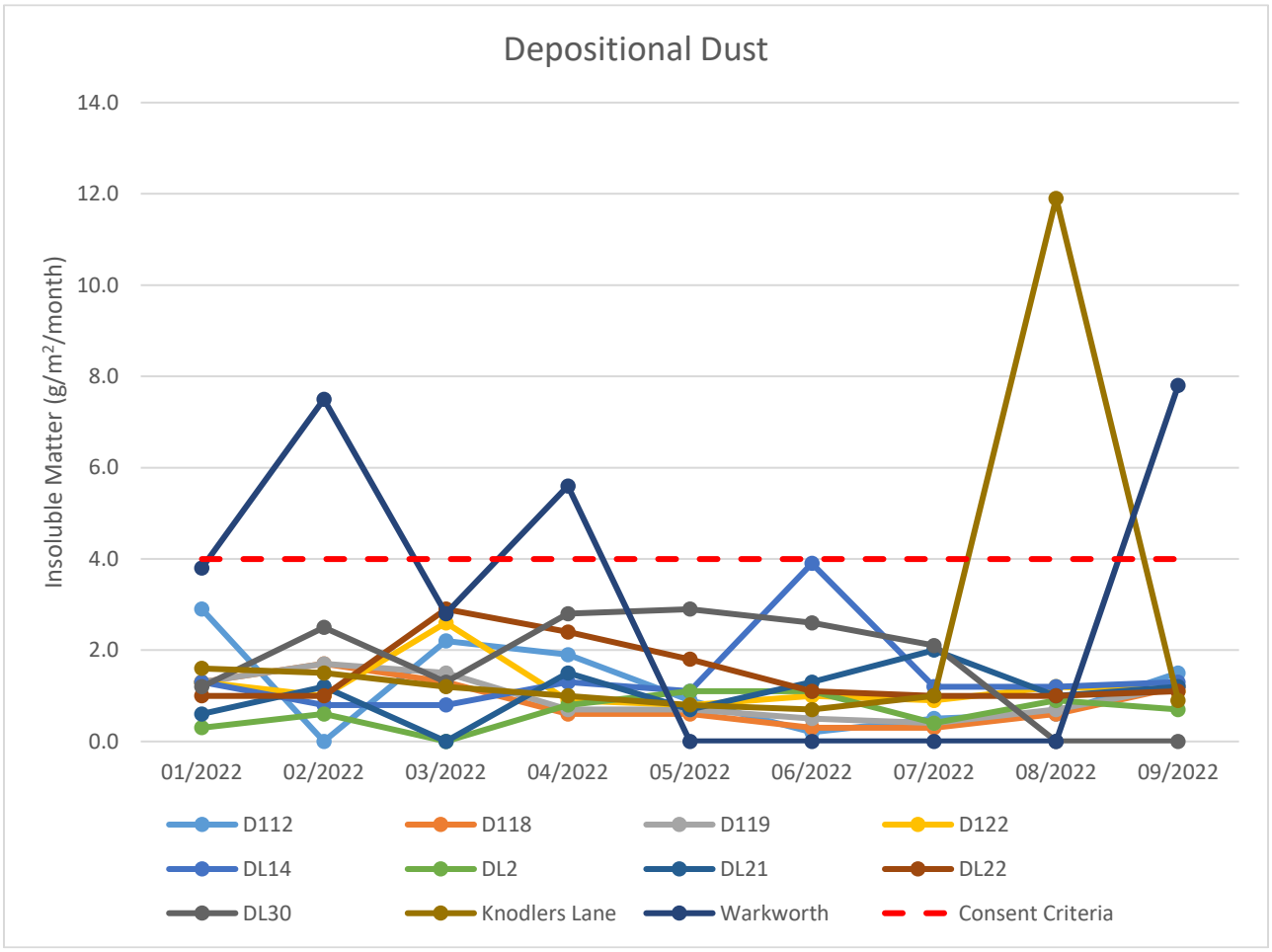

Figure 5 - Depositional Dust Results for the Reporting Period

2.3 Suspended Particles

Suspended particles are measured by a network of High Volume Air Samplers (HVAS) measuring Total Suspended Particulates (TSP) and Particulate Matter <10µm (PM_{10}). The Kilburnie South and Maison Dieu HVAS also monitor Particulate Matter <2.5µm ($PM_{2.5}$). The location of these monitors is presented in **Figure 4**. Each HVAS runs for 24-hours on a six-day cycle.

2.3.1 HVAS PM_{10} Results

2.3.1.1 Performance against short term impact assessment criteria

Figure 6 shows individual PM_{10} results at each monitoring station against the short-term impact assessment criteria of 50µg/m^3. No exceedances were recorded.

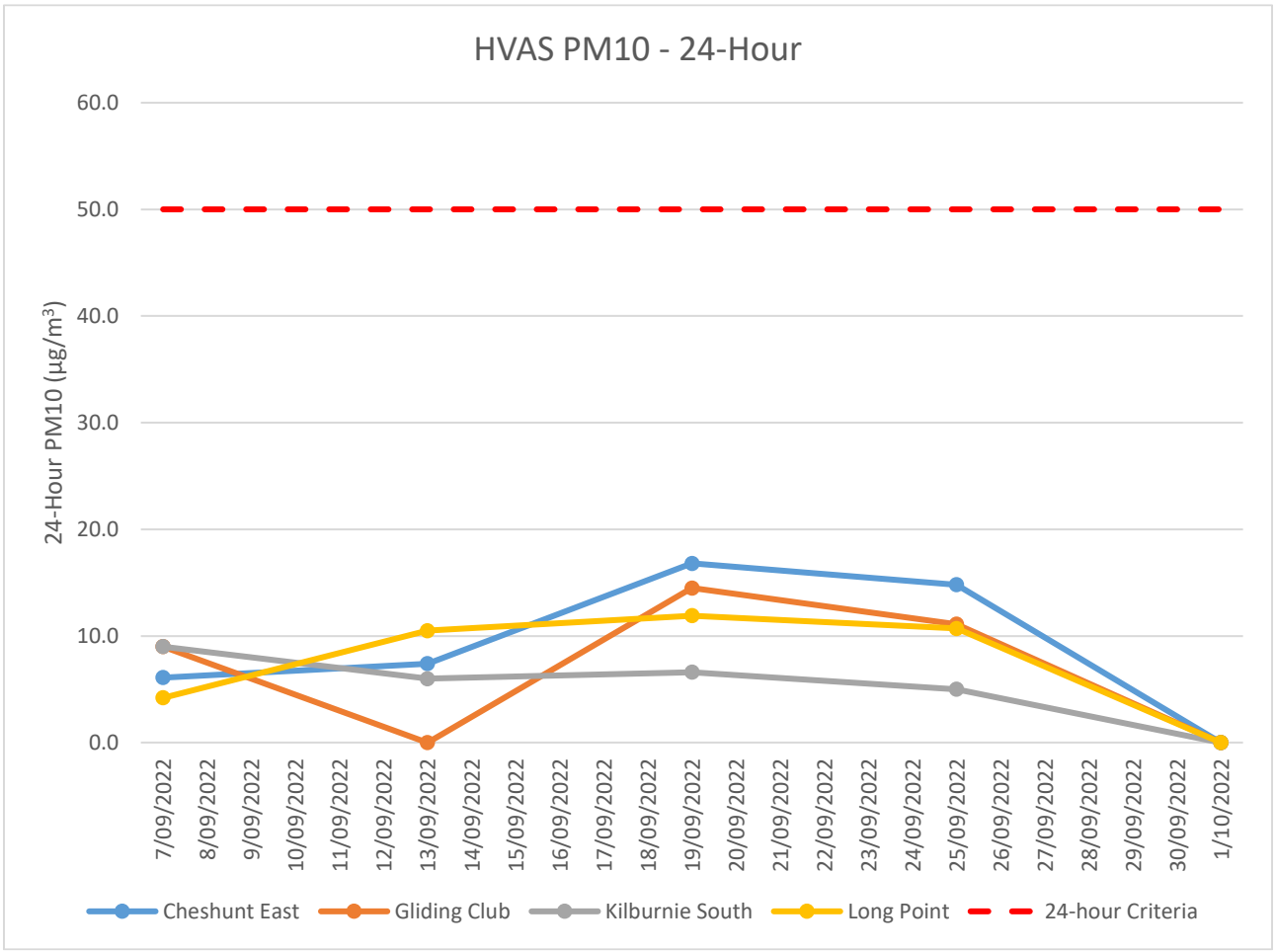

Figure 6 - Individual PM_{10} Results for the Reporting Period

2.3.1.2 Performance against long term impact assessment criteria

Figure 7 shows the year to date annual average PM_{10} results. All monitors were below the relevant long term impact assessment criteria during the reporting period. An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2022 Annual Review.

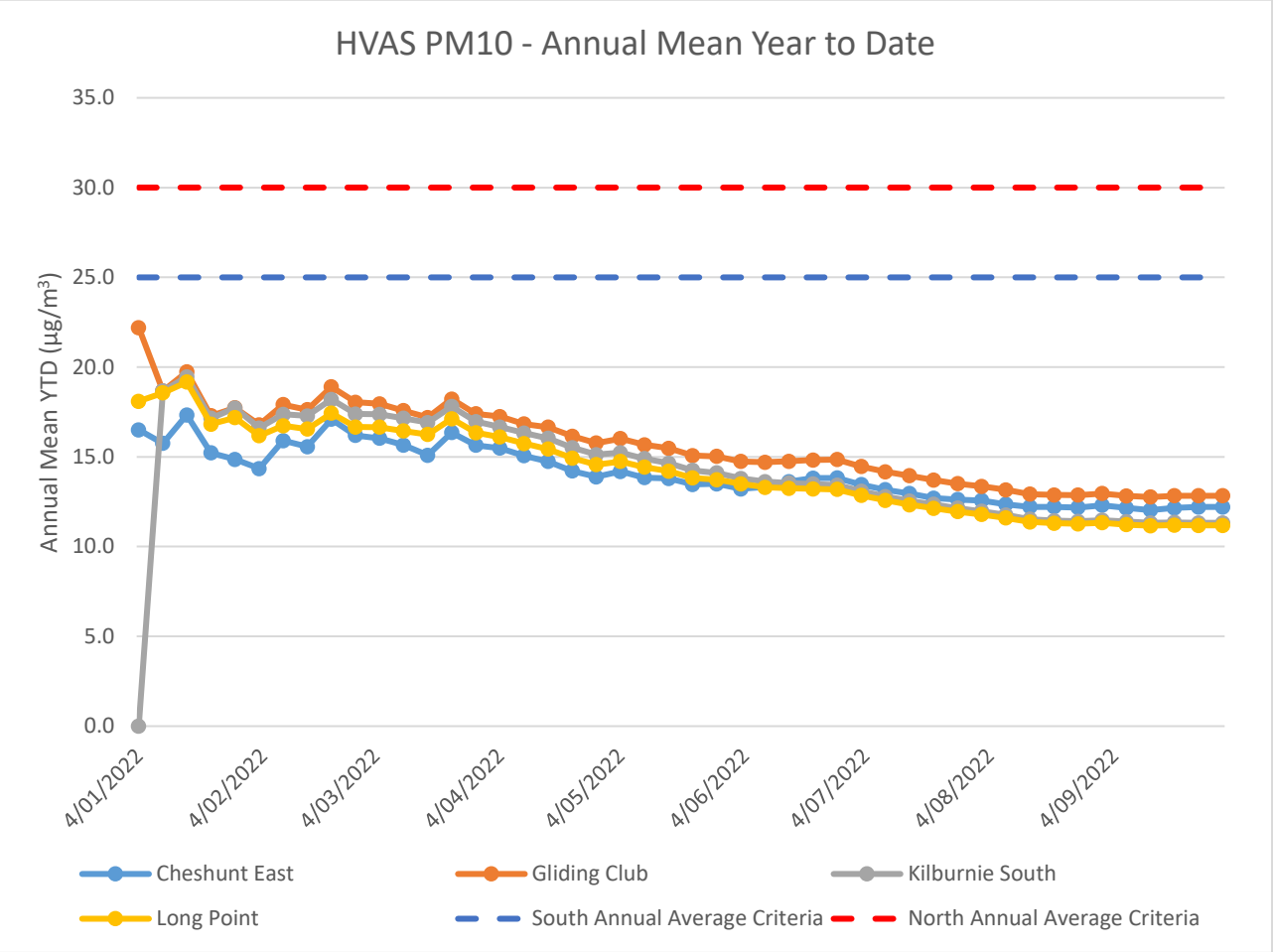

Figure 7 - Year to Date Average PM_{10} as at end of the Reporting Period

2.3.2 HVAS $PM_{2.5}$ Results

HVO monitors $PM_{2.5}$ at two HVAS locations, Kilburnie South and Maison Dieu.

2.3.2.1 Performance against short term impact assessment criteria

Figure 8 shows individual $PM_{2.5}$ results at each monitoring station against the HVO South short-term impact assessment criteria of 25µg/m^3.

All monitors were below the relevant short-term impact assessment criteria during the reporting period.

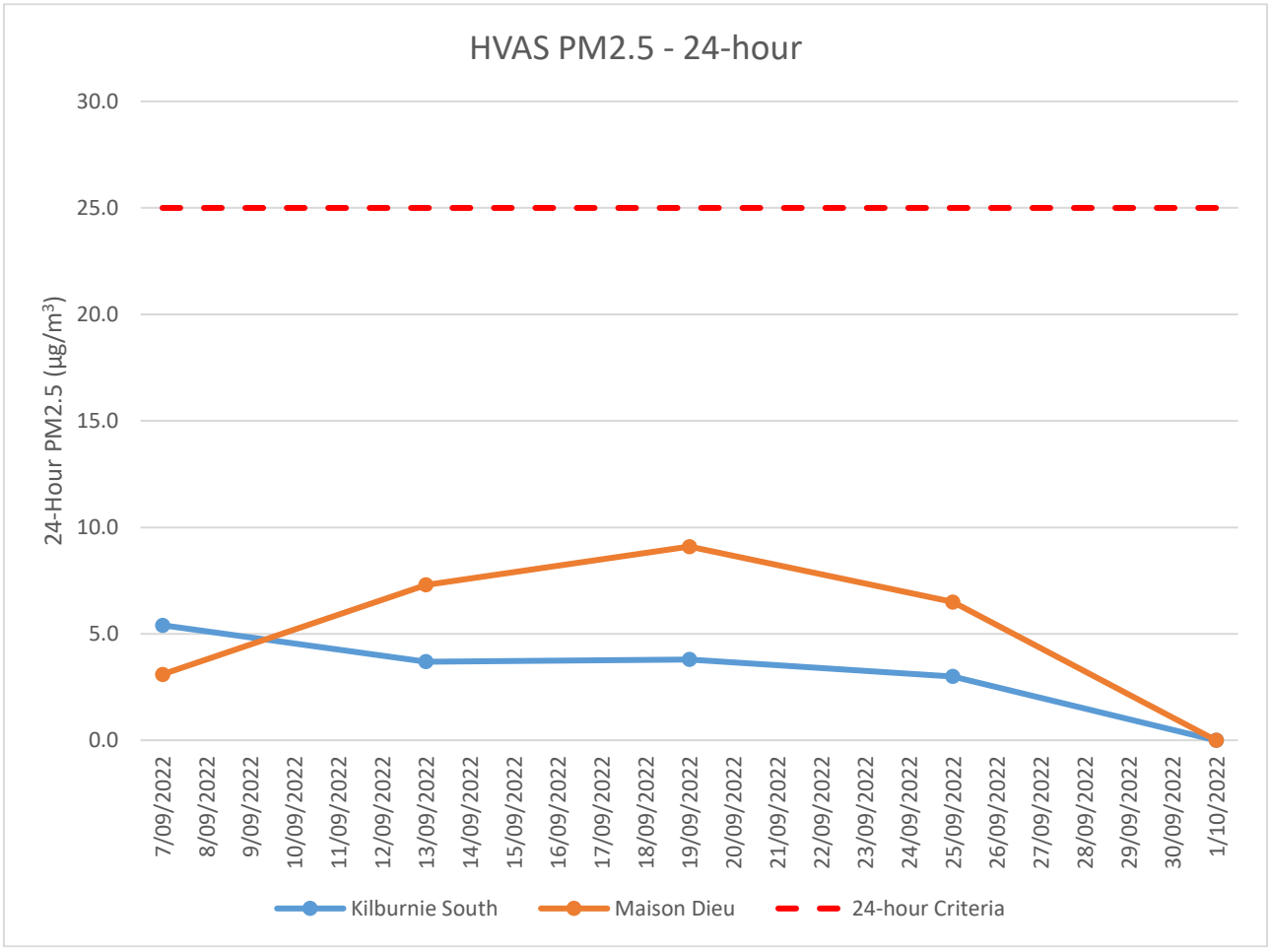

Figure 8 - Individual $PM_{2.5}$ Results for the Reporting Period

2.3.2.2 Performance against long term impact assessment criteria

Figure 9 shows the year to date annual average $PM_{2.5}$ results. During the reporting period, the Maison Dieu monitor and Kilburnie South monitor annual average year to date were below the $PM_{2.5}$ Annual Rolling Mean criteria of 8µg/m^3.

An assessment of HVO's contribution against the long term impact assessment criteria will be provided in the 2022 Annual Review.

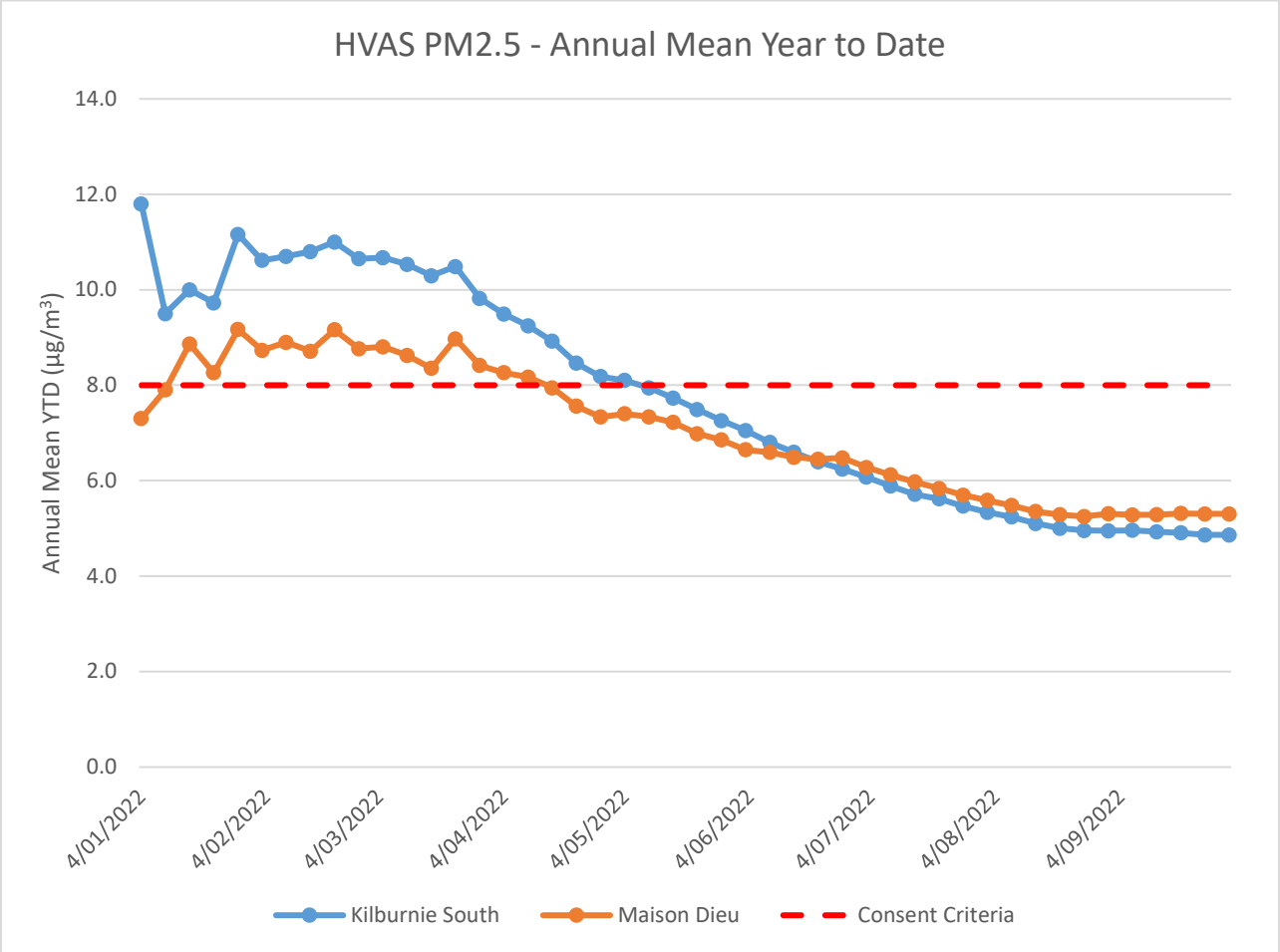

Figure 9 - Year to Date Average $PM_{2.5}$ as at end of the Reporting Period

2.3.3 TSP Results

2.3.3.1 Performance against long term impact assessment criteria

Figure 10 shows the annual average TSP results compared against the long-term impact assessment criteria of 90µg/m^3.

All monitors were below the relevant long-term impact assessment criteria during the reporting period.

An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2022 Annual Review.

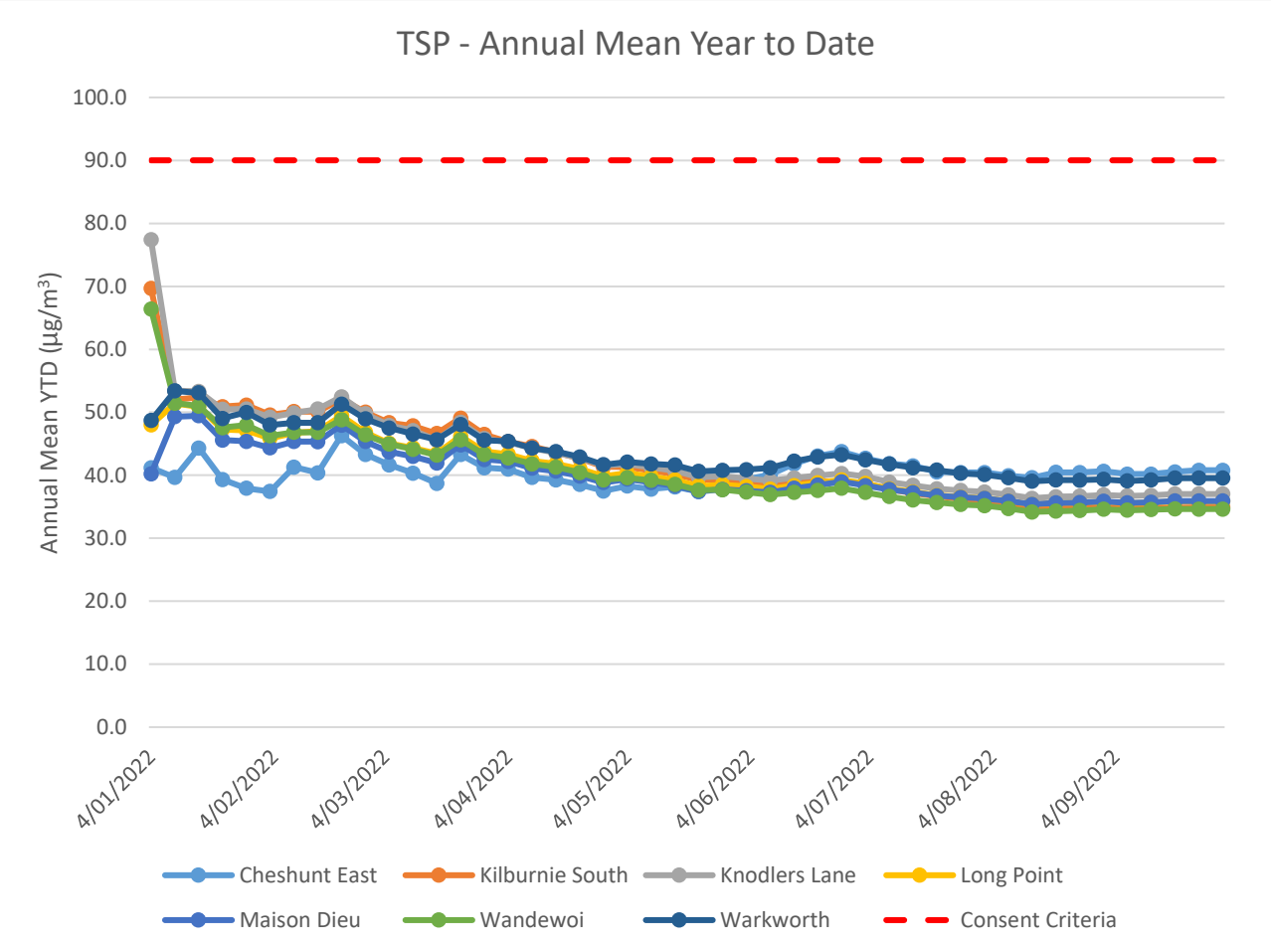

Figure 10 - Year to Date Average Total Suspended Particulates as at end of the Reporting Period

2.3.4 Real Time PM_{10} Results

HVO maintains a network of real time PM_{10} monitors. The real time air quality monitoring stations continuously record information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger levels. Results from real time PM_{10} monitoring are used as a reactive measure to guide mining operations to help achieve compliance with the relevant conditions of the project approval.

Figure 11 shows the daily 24-hour average PM_{10} result from the real time monitoring sites which shows no exceedances reported for the period.

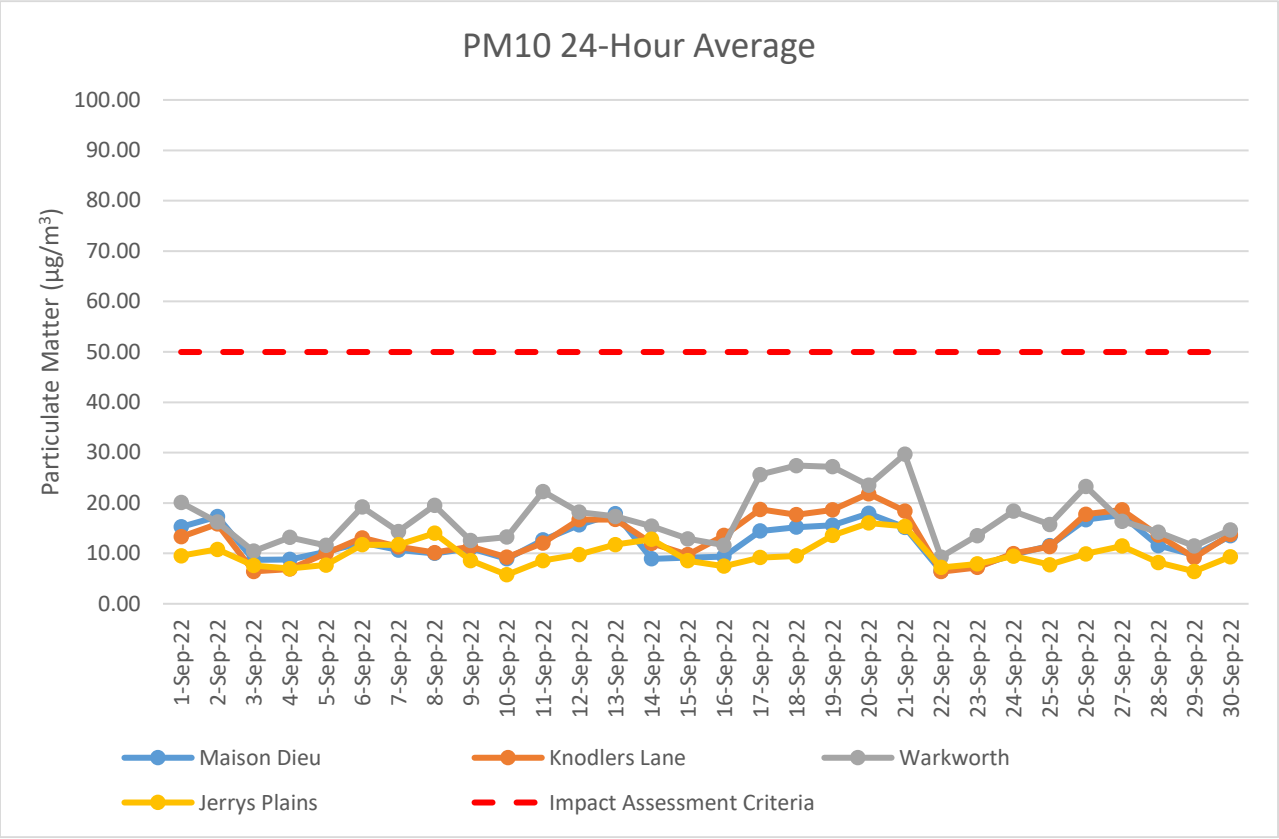

Figure 11 - Real Time PM_{10} 24hr for the Reporting Period

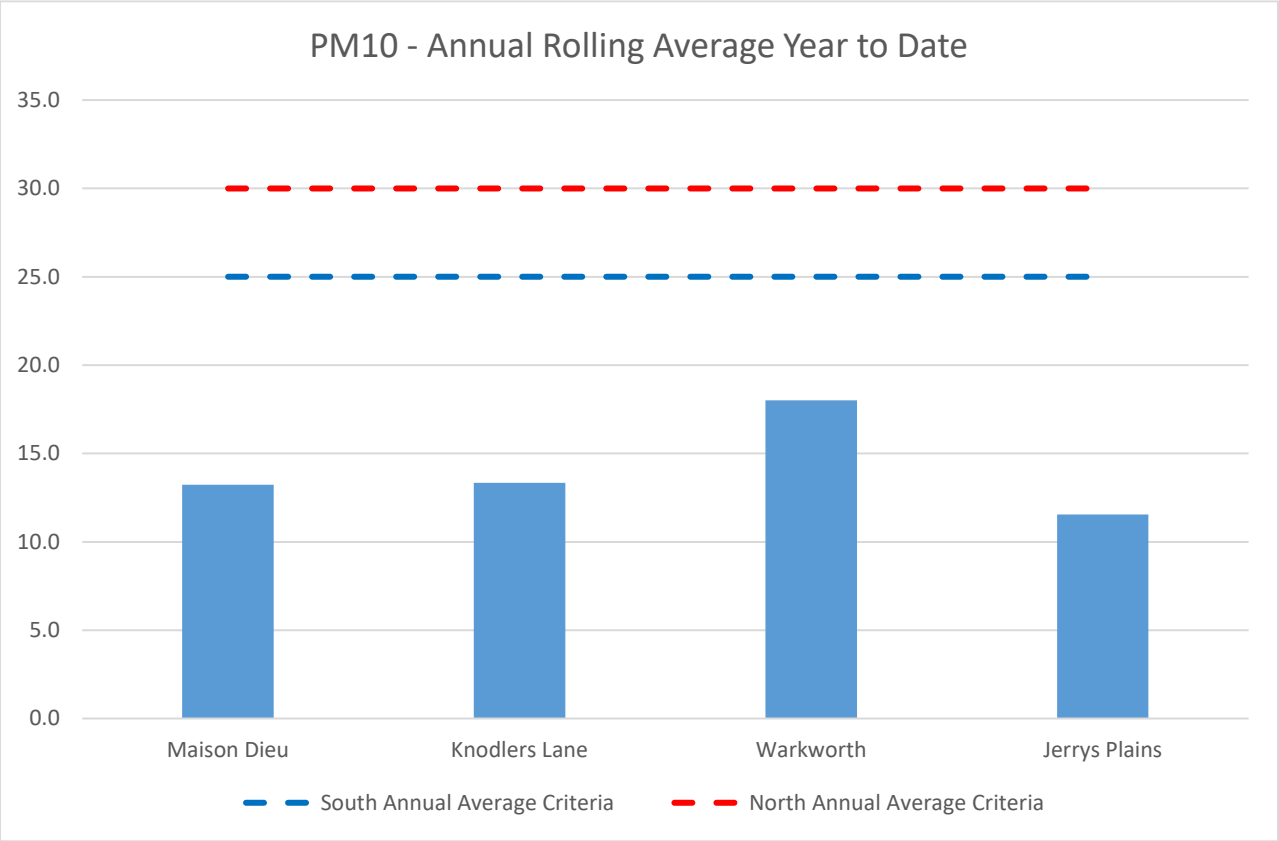

Figure 12 - Real Time PM_{10} Annual Average September 2022

2.3.5 Real Time Alarms for Air Quality

The real time monitoring system generated 87 automated air quality related alarms during the reporting period; 83 alarms related to adverse weather conditions and 4 alarms related to dust conditions.

3 Water Quality

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

3.1 Surface Water

Surface watercourses are sampled on a quarterly sampling regime. Water quality is assessed through the parameters of pH, electrical conductivity (EC) and Total Suspended Solids (TSS). The location of surface water monitoring points across HVO is shown in **Figure 13**.

Results from monitoring site dams, the Hunter River and other natural tributaries are provided in **Figure 14** to **Figure 25**.

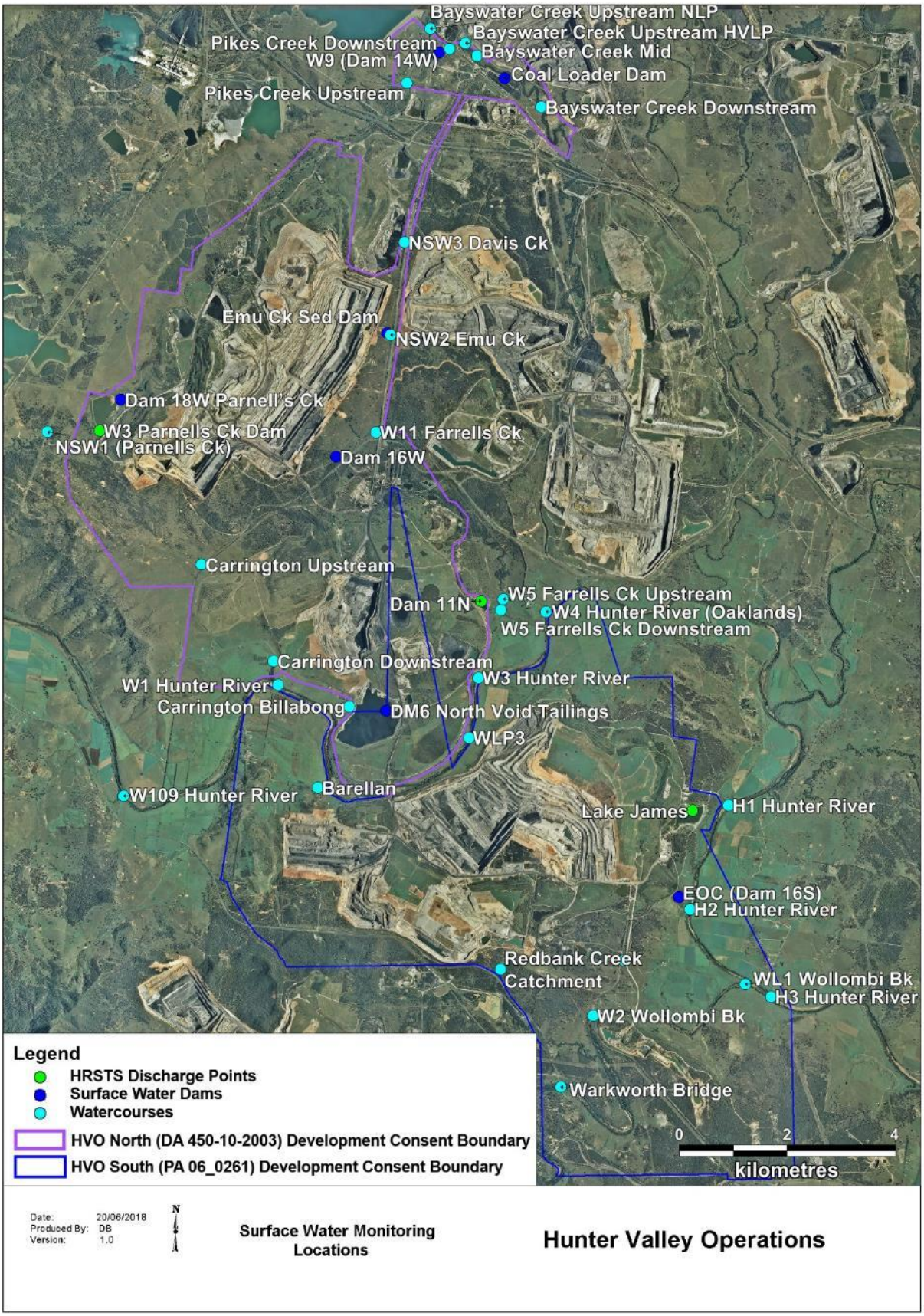

Figure 13 - HVO Surface Water Monitoring Locations

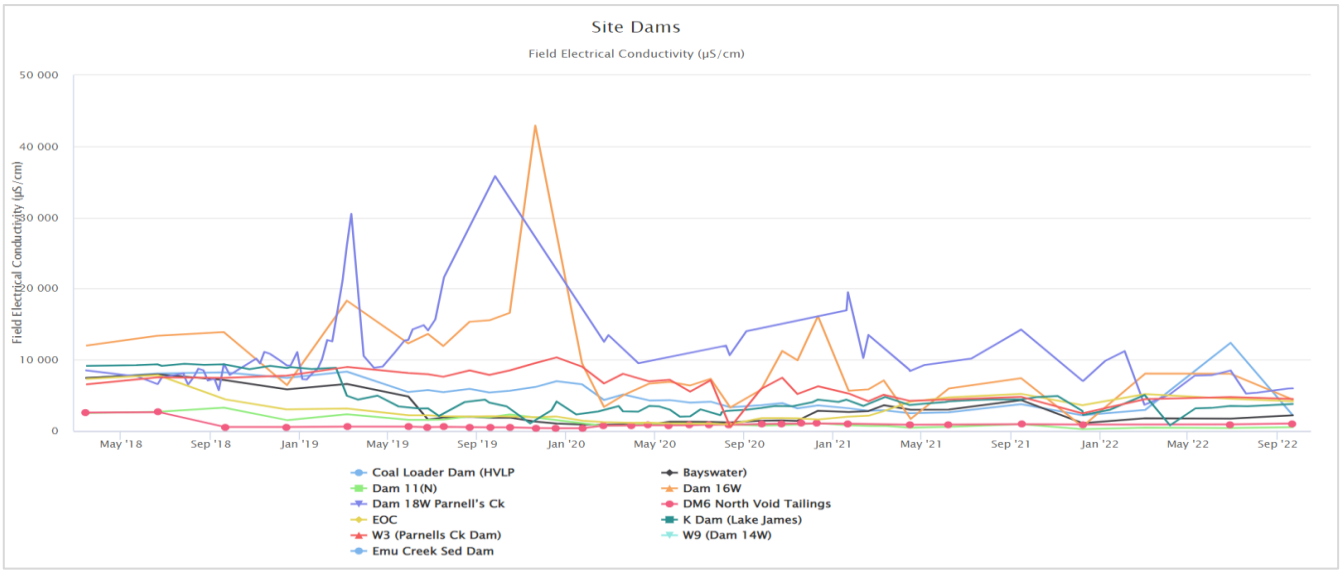

Figure 14 - Site Dams Electrical Conductivity – September 2022

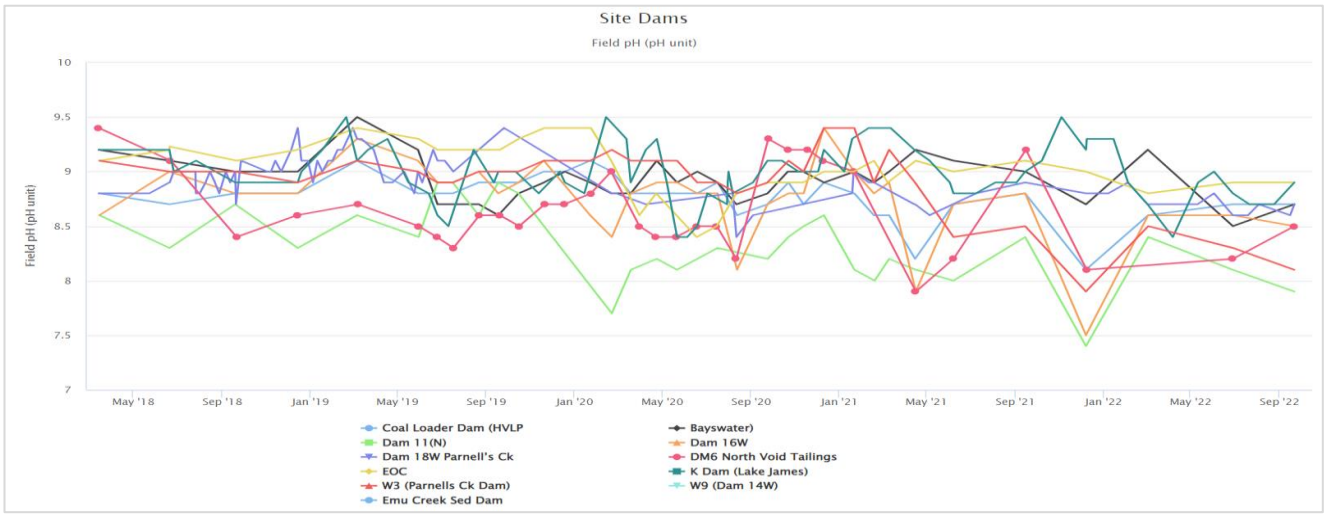

Figure 14 - Site Dams Field pH – September 2022

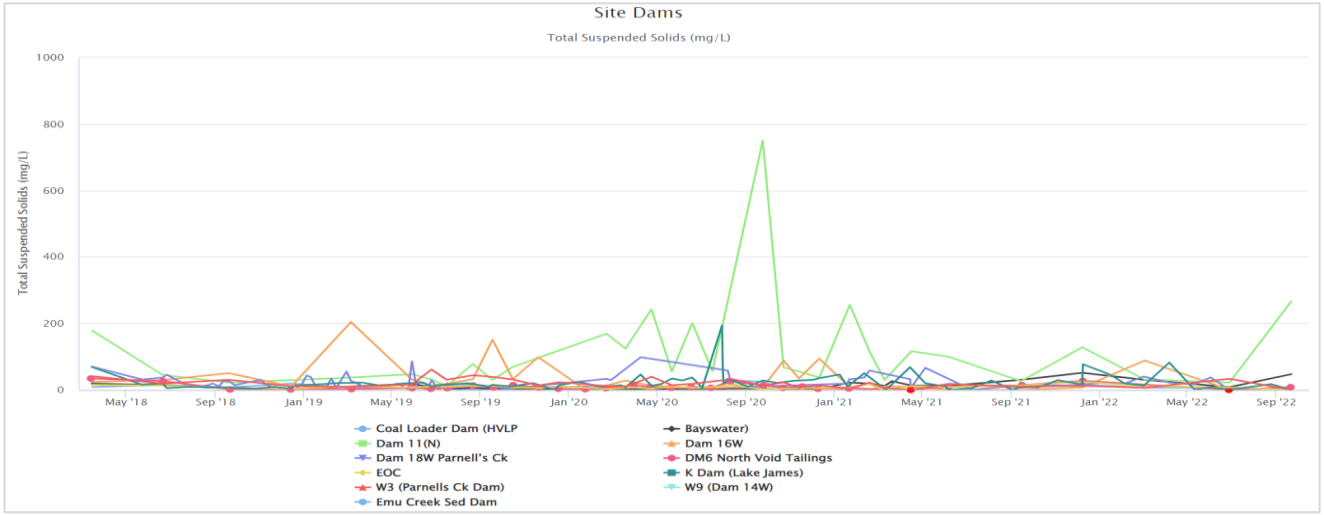

Figure 15 - Site Dams Total Suspended Solids - September 2022

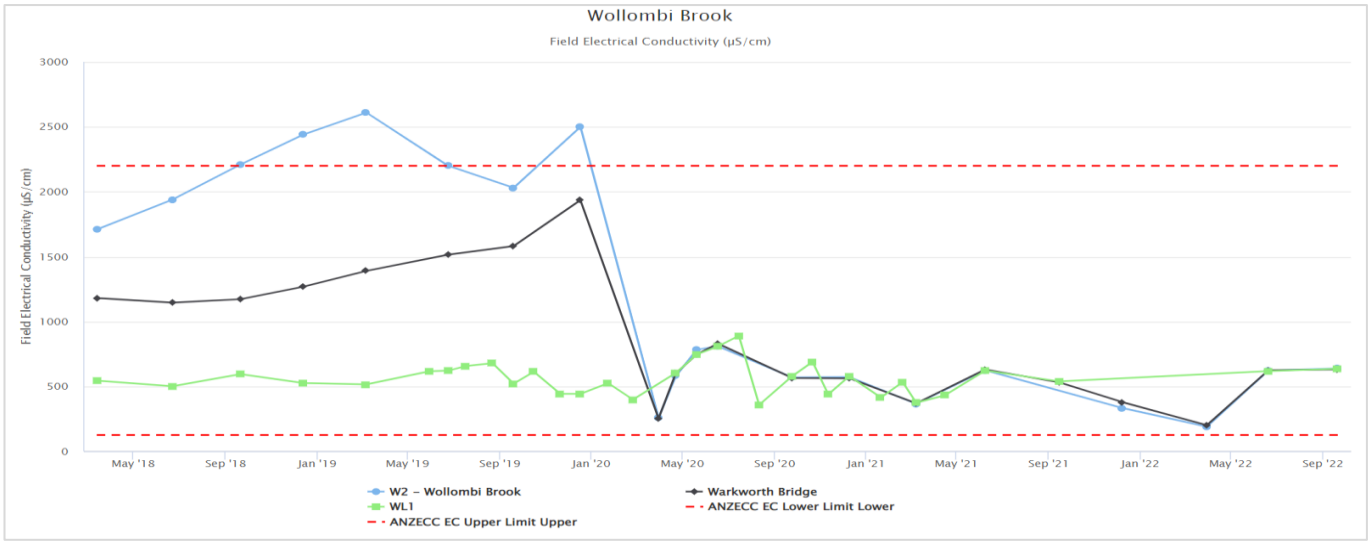

Figure 16 - Wollombi Brook Electrical Conductivity – September 2022

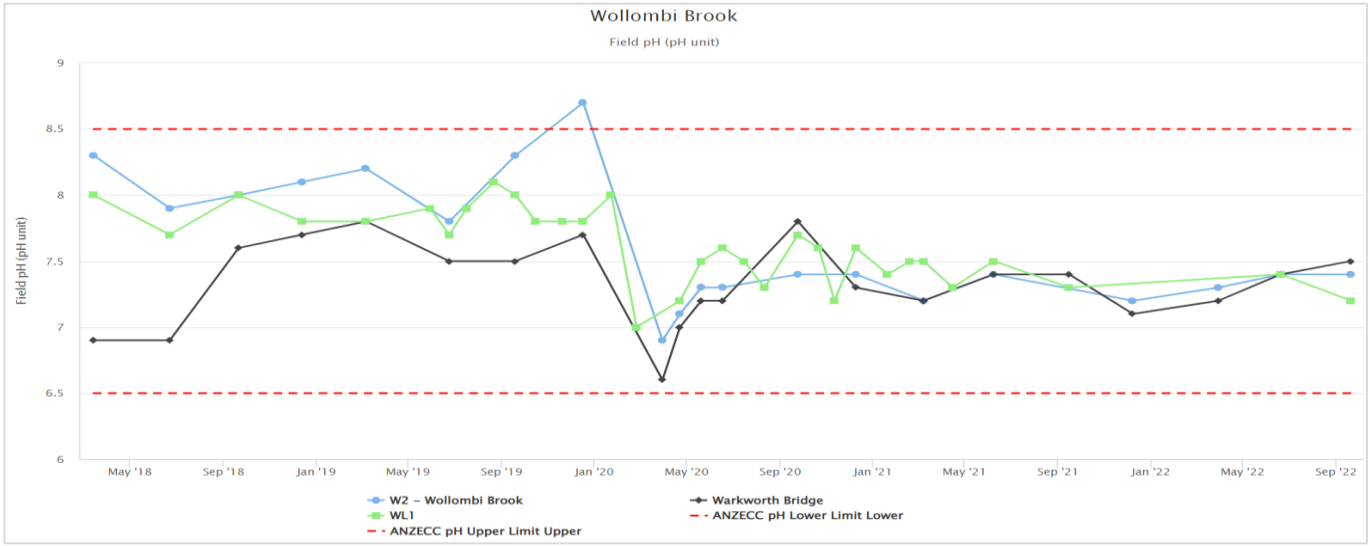

Figure 17 - Wollombi Brook Field pH – September 2022

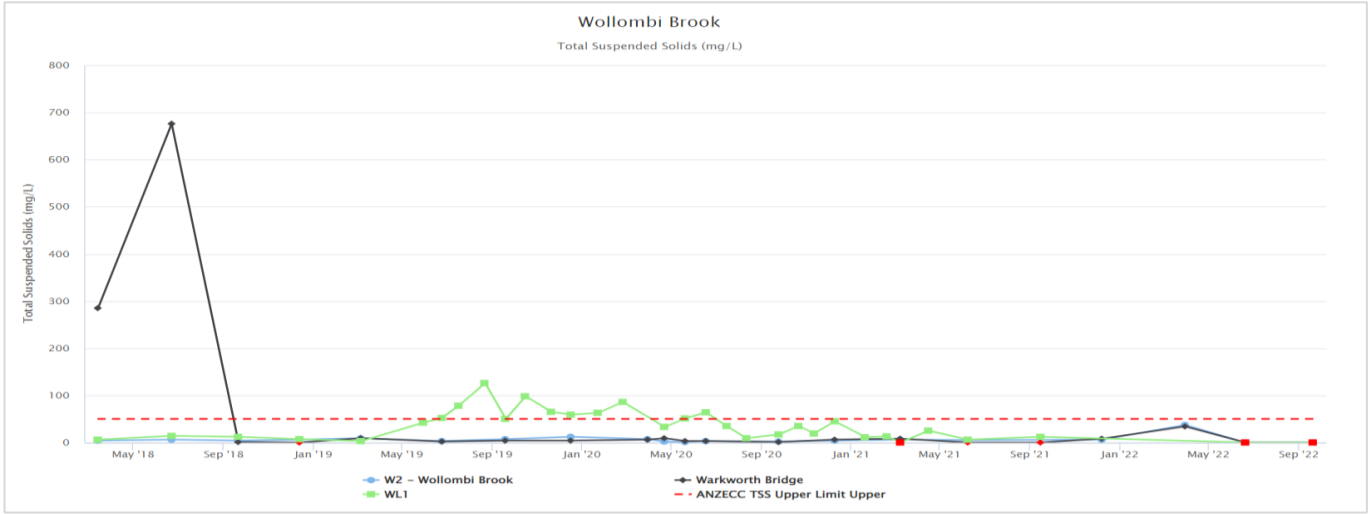

Figure 18 - Wollombi Brook Total Suspended Solids – September 2022

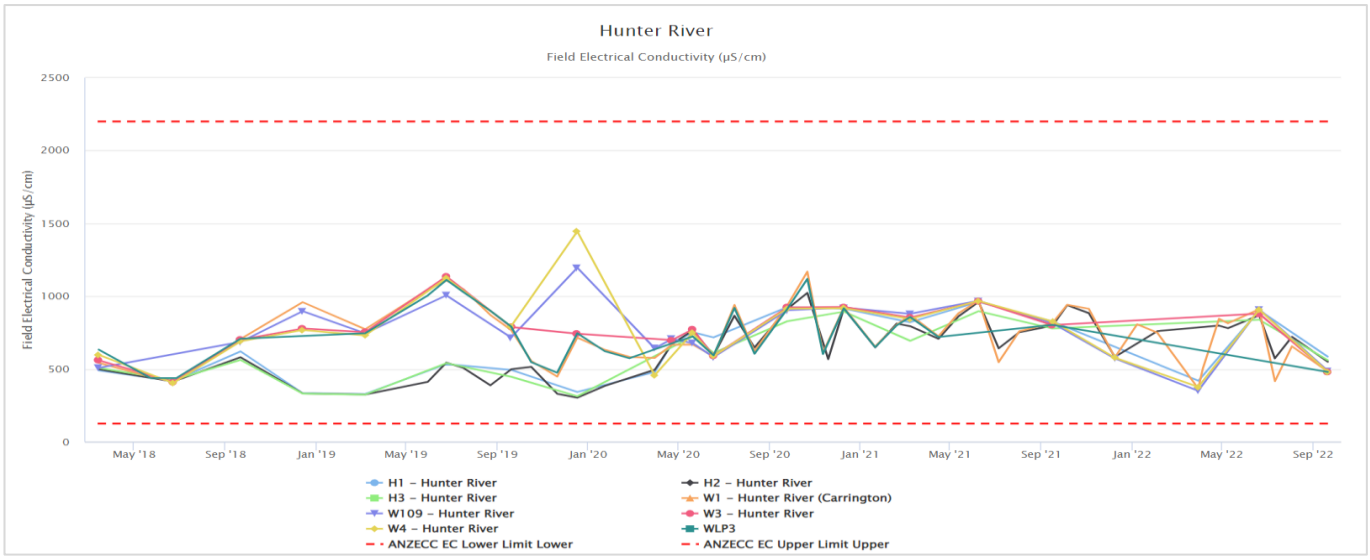

Figure 19 - Hunter River Electrical Conductivity - September 2022

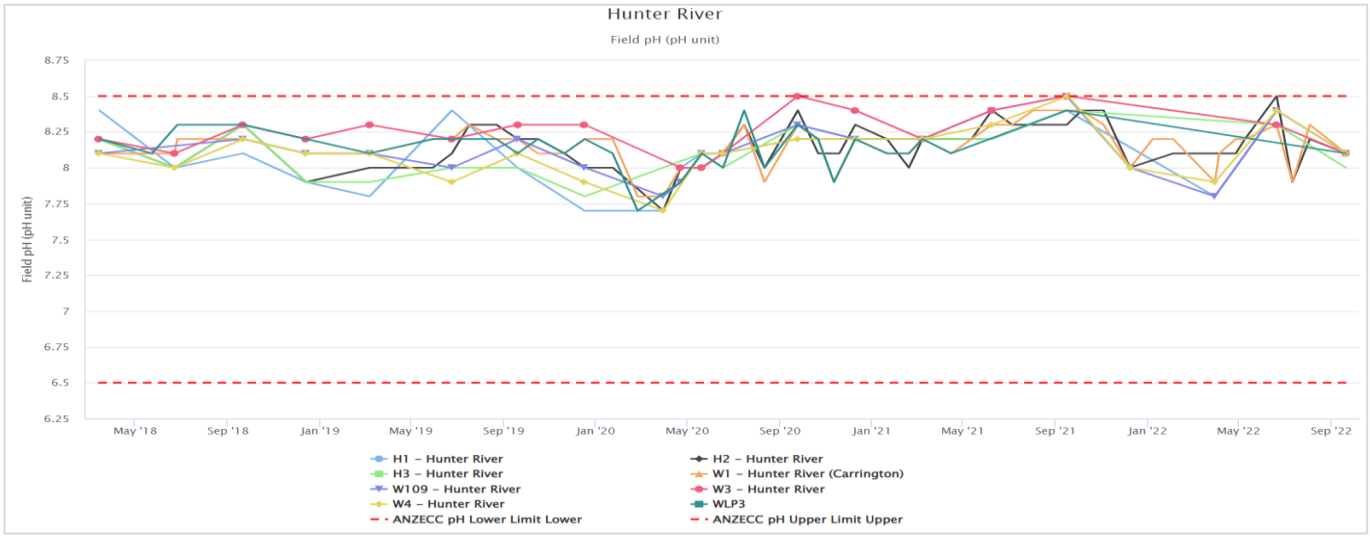

Figure 20 - Hunter River Field pH – September 2022

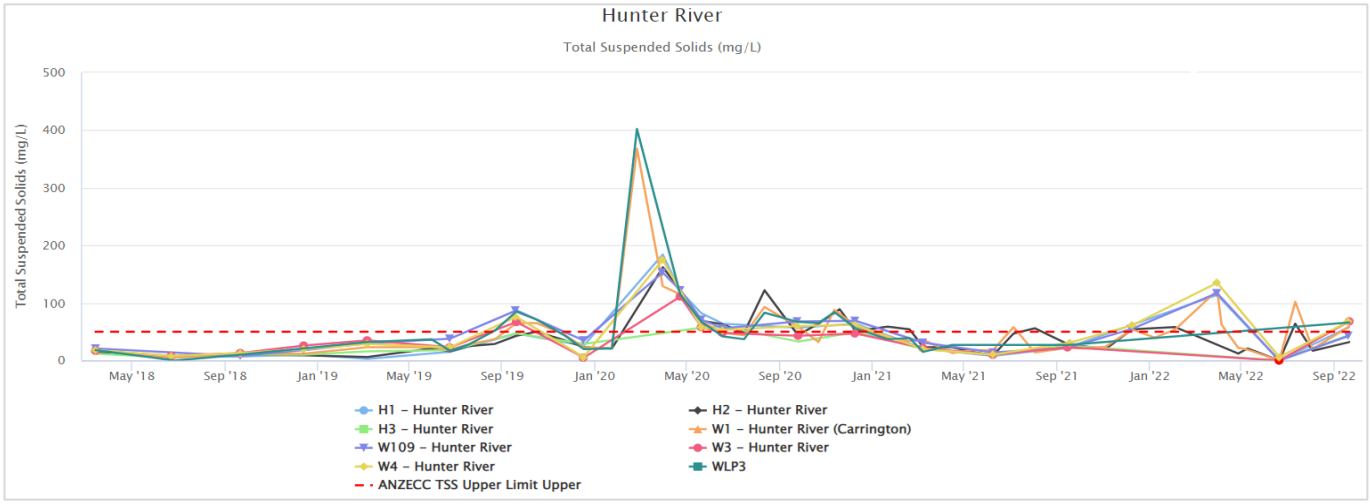

Figure 21 - Hunter River Total Suspended Solids - September 2022

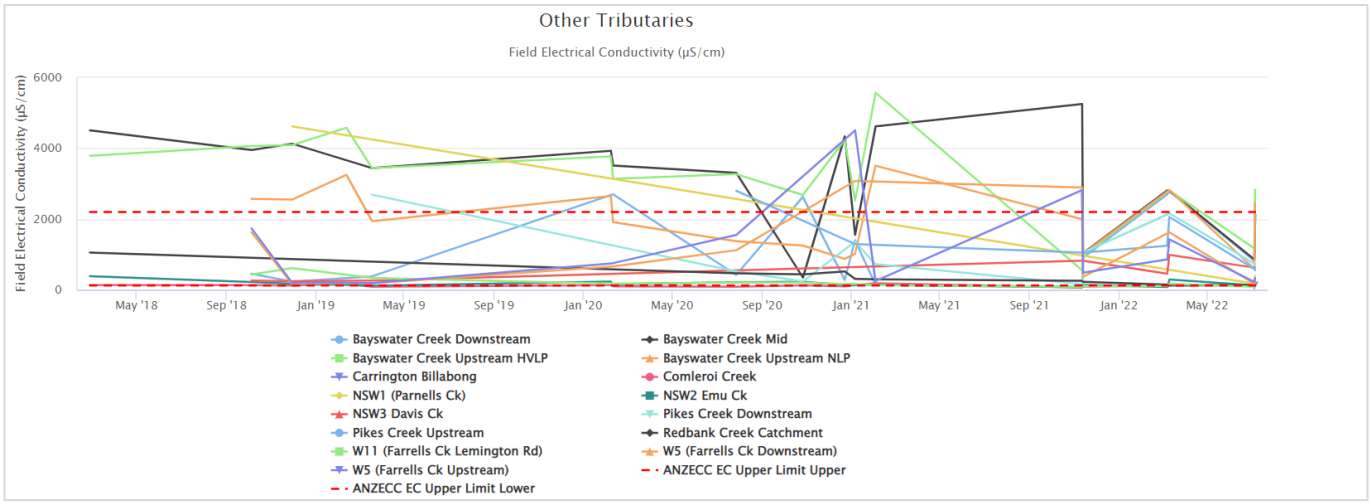

Figure 22 - Other Tributaries Electrical Conductivity - September 2022

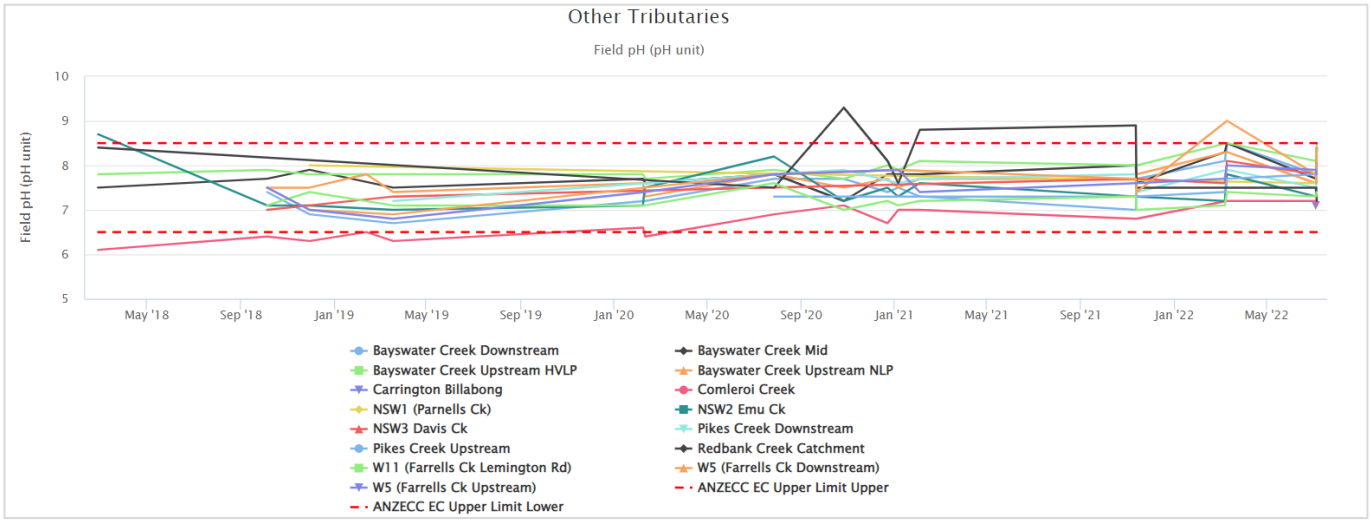

Figure 23 - Other Tributaries Field pH - September 2022

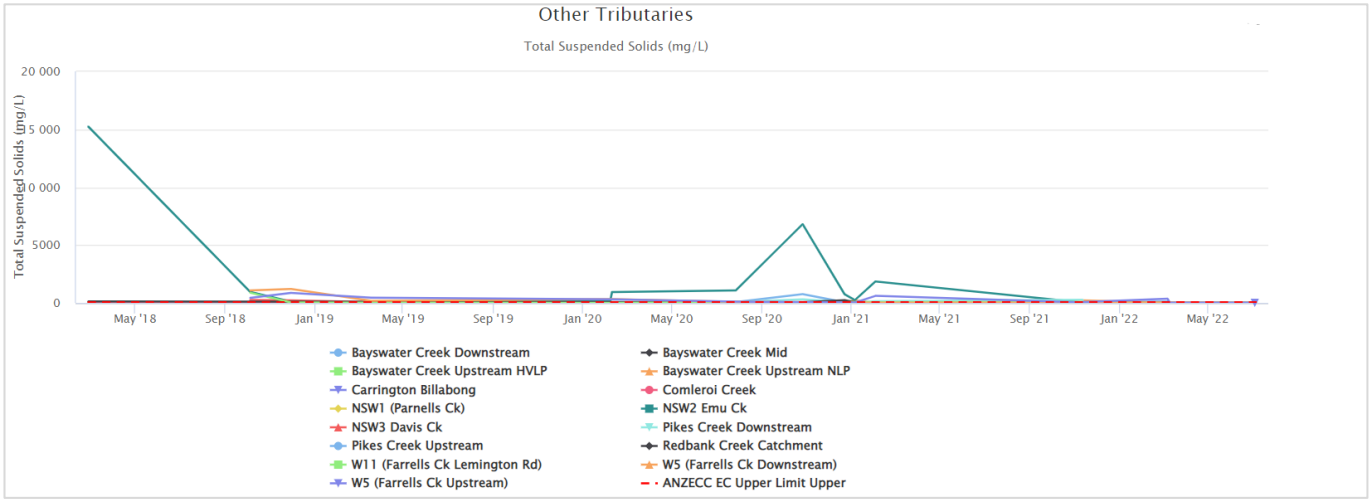

Figure 24 - Other Tributaries Total Suspended Solids - September 2022

3.1.1 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 HVO Water Management Plan.

Surface water trigger tracking results are summarised in **Table 2**.

Table 2 – Surface Water Trigger Tracking – Q3 2022

Site	Date	Trigger Limit Breached	Response Action
Bayswater Creek Mid	4/07/2022	pH	No investigation required – second exceedance of pH trigger
NSW 1 (Parnells Creek)	4/07/2022	pH	No investigation required – first exceedance of pH trigger
Bayswater Creek Upstream HVLP	5/7/2022	pH	No investigation required – second exceedance of pH trigger
Bayswater Creek Mid	5/7/2022	pH	Rain Event Sampling - 3rd consecutive exceedance of pH trigger - Field observations indicated that the sample was light brown in colour and slightly turbid - Approximately 137 mm of rainfall in the seven days prior to sampling - Approximately 240ML/Day discharging from Bayswater power station who discharges upstream from sampling point - The result is consistent with pH in Bayswater Creek following rainfall - No evidence of scouring or mine influence from HVO Investigation outcome: There is no evidence to indicate that the pH exceedance is associated with a HVO mining impact. Action: Continue monitoring this location for further trigger exceedances.
Bayswater Creek Downstream	5/7/2022	pH	No investigation required – first consecutive exceedance of pH trigger
NSW 1 (Parnells Creek)	5/7/2022	pH	No investigation required – second consecutive exceedance of pH trigger

W1 – Hunter River (Carrington)	11/07/2022	TSS	First exceedance of TSS. - Field Observations indicated that the sample was brown in colour and turbid. - Approximately 70 mm of rainfall in the seven days prior to sampling. - HRSTS discharges that occurred on or 6 days prior to sampling have TSS concentrations of <40 mg/L Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The exceeded TSS value appears to be a result of high TSS within the broader catchment and high rainfall prior to sampling. Action: Continue monitoring this location for further trigger exceedances.
H2 – Hunter River	11/07/2022	TSS	First exceedance of TSS. - Field Observations indicated that the sample was brown in colour and turbid. - Approximately 70 mm of rainfall in the seven days prior to sampling. - HRSTS discharges that occurred on or 6 days prior to sampling have TSS concentrations of <40 mg/L Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The exceeded TSS value appears to be a result of high TSS within the broader catchment and high rainfall prior to sampling. Action: Continue monitoring this location for further trigger exceedances.
W1 – Hunter River (Carrington)	11/07/2022	pH	No investigation required - second trigger
H2 – Hunter River	11/7/2022	pH	No investigation required - first trigger

W1 - Hunter River (Carrington)	20/09/2022	TSS	First Exceedance of TSS. - Field Observations indicate that the sample was brown in colour and turbid. - Approximately 25mm of rainfall in the seven days prior to sampling. - TSS at W109-Hunter River (upstream of W1) on 20/09/22 was 43mg/L indicating elevated TSS in broader catchment. - No HRSTS discharges upstream of W1 on or prior to the 20/09/22. Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The exceeded TSS value appears to be a result of high TSS within the broader catchment. Action: Continue monitoring this location for further trigger exceedances.
W4 - Hunter River	20/09/2022	TSS	First Exceedance of TSS. - Field Observations indicate that the sample is brown in colour and turbid. - Approximately 25mm of rainfall in the seven days prior to sampling. - TSS at W109 Hunter River (upstream of W4) on 20/09/22 was 43mg/L, indicating elevated TSS in broader catchment. - HRSTS discharges that occurred 1 day prior to sampling had a TSS concentration of <15 mg/L Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The exceeded TSS value appears to be a result of high TSS within the broader catchment. Action: Continue monitoring this location for further trigger exceedances.

W3 - Hunter River	20/09/2022	TSS	First Exceedance of TSS. - Field Observations indicate that the sample is brown in colour and turbid. - Approximately 25mm of rainfall in the seven days prior to sampling. - TSS at W109 Hunter River (upstream of W3) on 20/09/22 was 43mg/L, indicating elevated TSS in broader catchment. - No HRSTS discharges upstream of W3 on or prior to the 20/09/22. Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The exceeded TSS value appears to be a result of high TSS within the broader catchment. Action: Continue monitoring this location for further trigger exceedances.
H1 - Hunter River	20/09/2022	TSS	First Exceedance of TSS. - Field Observations indicate that the sample is brown in colour and turbid. - Approximately 25mm of rainfall in the seven days prior to sampling. - TSS at W109 Hunter River (upstream of H1) on 20/09/22 was 43mg/L, indicating elevated TSS in broader catchment. - HRSTS discharges that occurred 1 day prior to sampling have TSS concentrations of <15 mg/L Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The exceeded TSS value appears to be a result of high TSS within the broader catchment. Action: Continue monitoring this location for further trigger exceedances.

WL1	20/09/2022	pH	No investigation required - first trigger

3.2 Site Water Use

HVO is permitted to extract water from the Hunter River under water allocation licenses issued by Water NSW.

HVO did not extract water from the Hunter River during the reporting period.

3.3 HRSTS Discharge

HVO participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points Dam 11N (to Farrell's Creek), Lake James (to the Hunter River) and Parnell's Dam (to Parnell's Creek). Discharges can only take place subject to HRSTS regulations.

HVO discharged a total of 744.5 ML under the HRSTS during the reporting period.

3.4 Groundwater Monitoring Results

Groundwater monitoring is undertaken on a quarterly basis in accordance with the HVO Water Management Plan and Groundwater Monitoring Program. The location of groundwater monitoring points across HVO are show in **Figure 26.**

Groundwater monitoring results are provided in **Figure 27** to **Figure 77**.

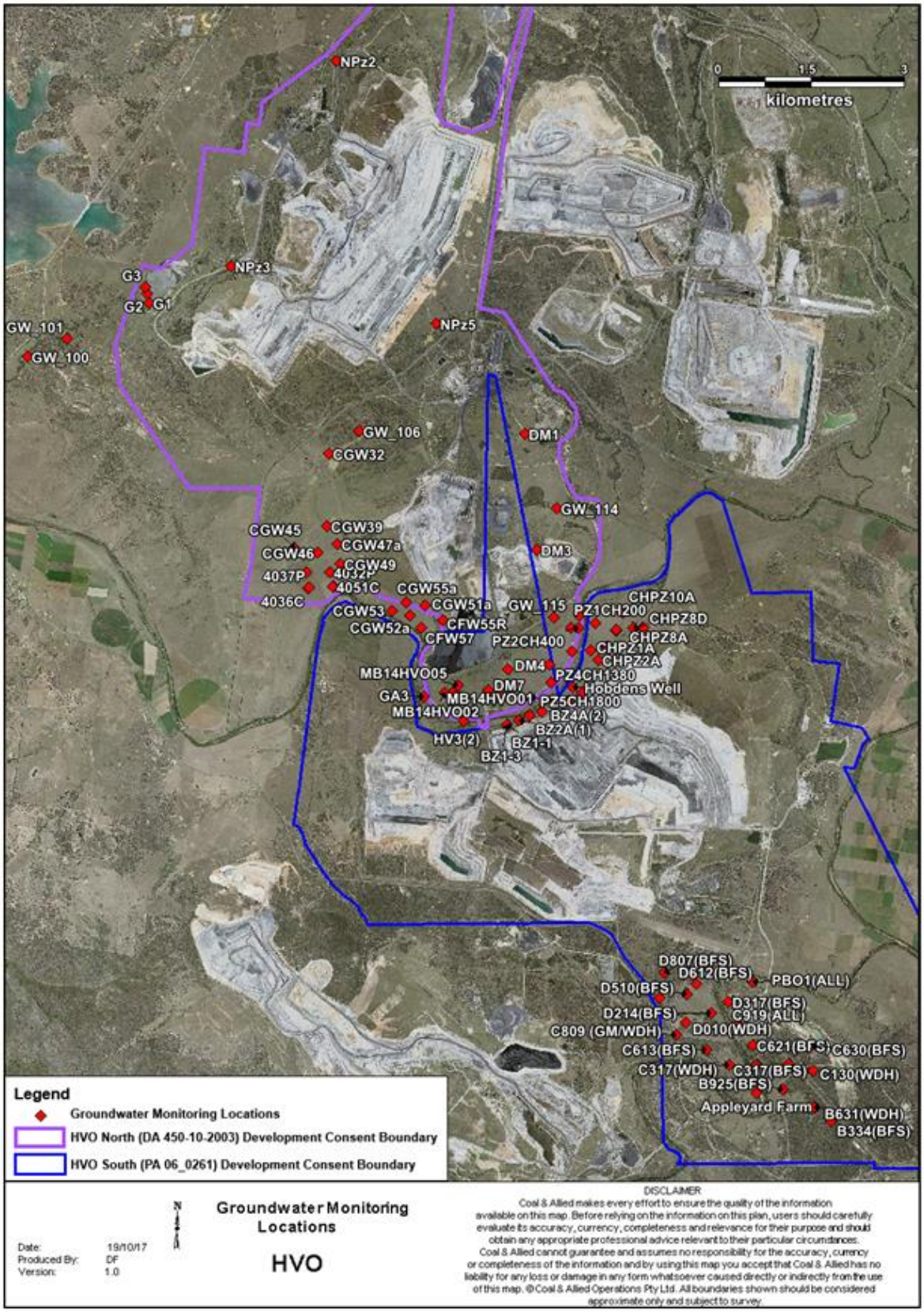

Figure 26 Groundwater Monitoring Locations at HVO

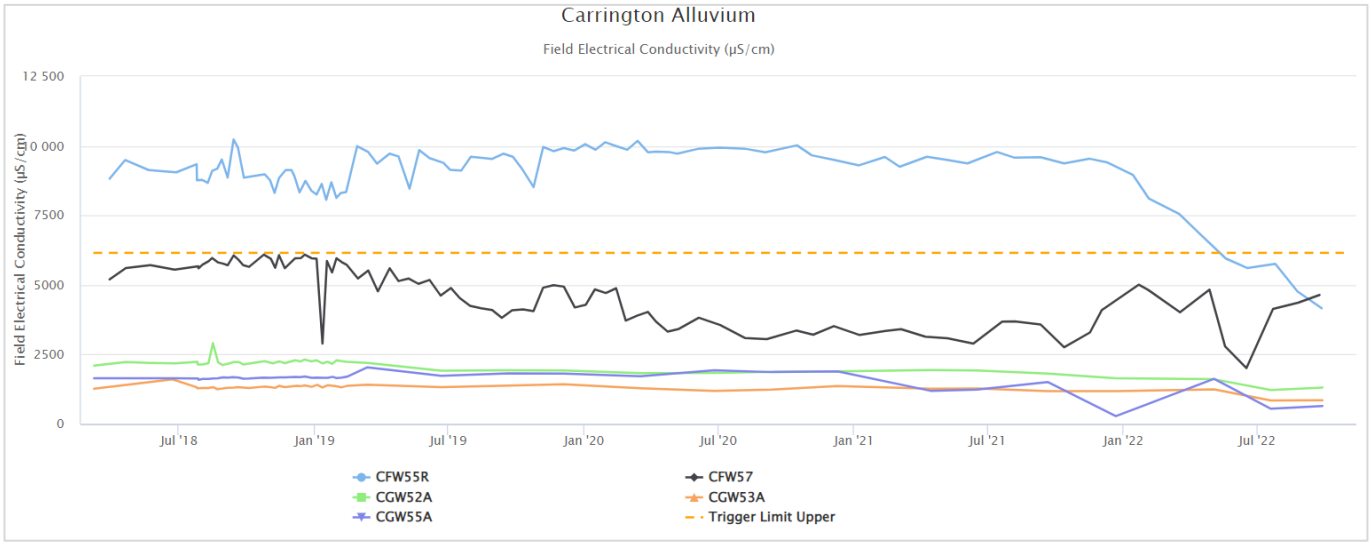

Figure 25 - Carrington Alluvium Electrical Conductivity Trend – Q3 2022

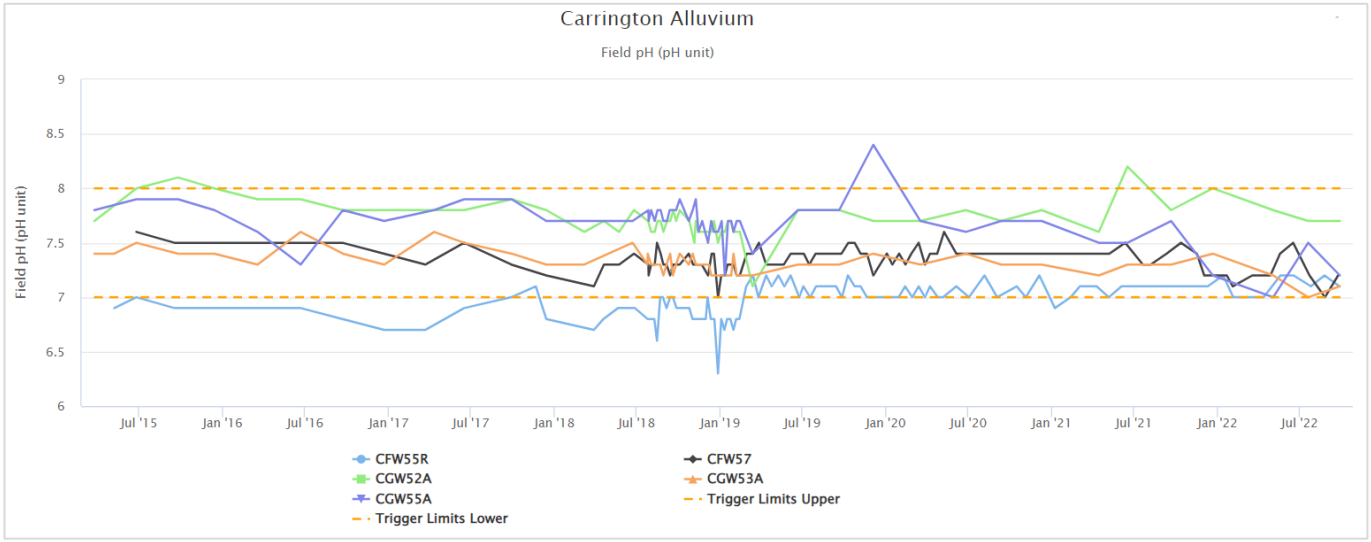

Figure 26 - Carrington Alluvium Field pH Trend – Q3 2022

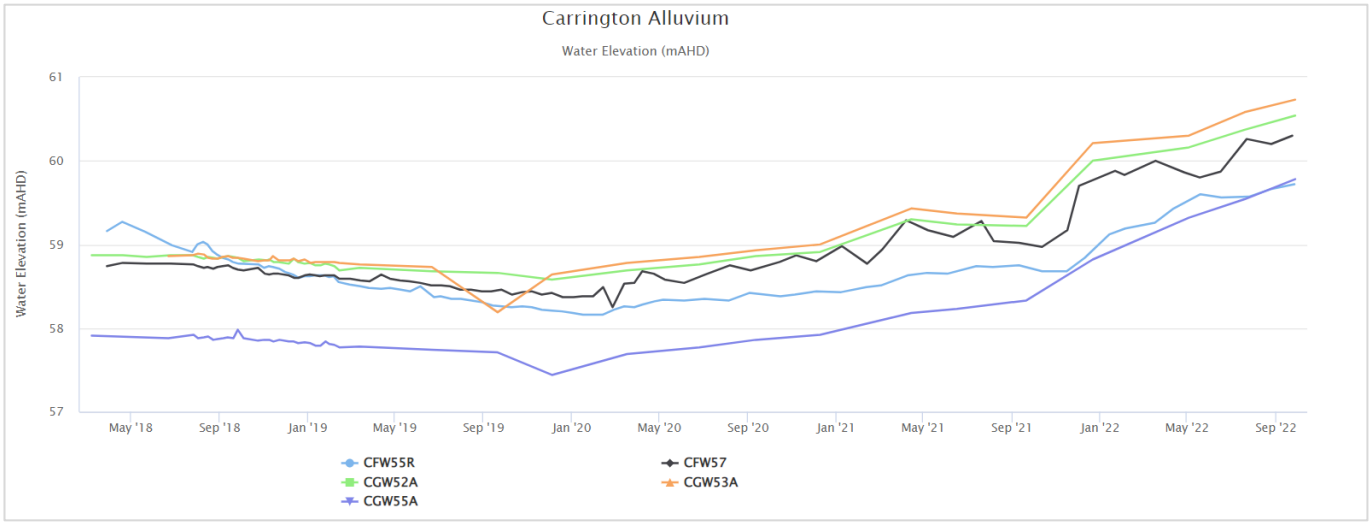

Figure 27 - Carrington Alluvium Water Elevation Trend – Q3 2022

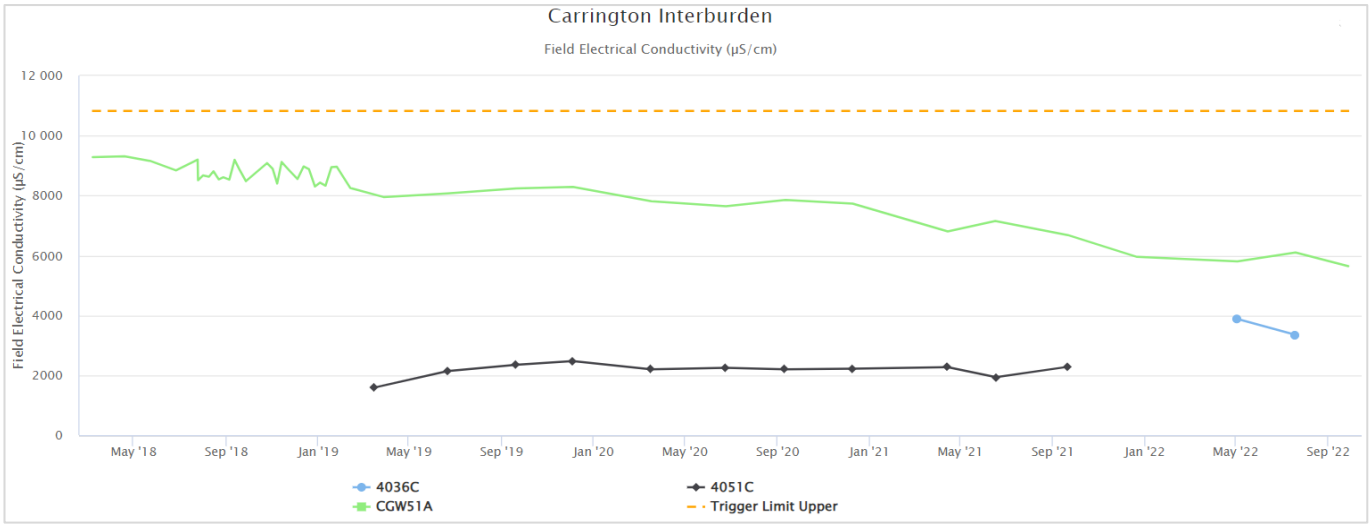

Figure 28 - Carrington Interburden Electrical Conductivity Trend – Q3 2022

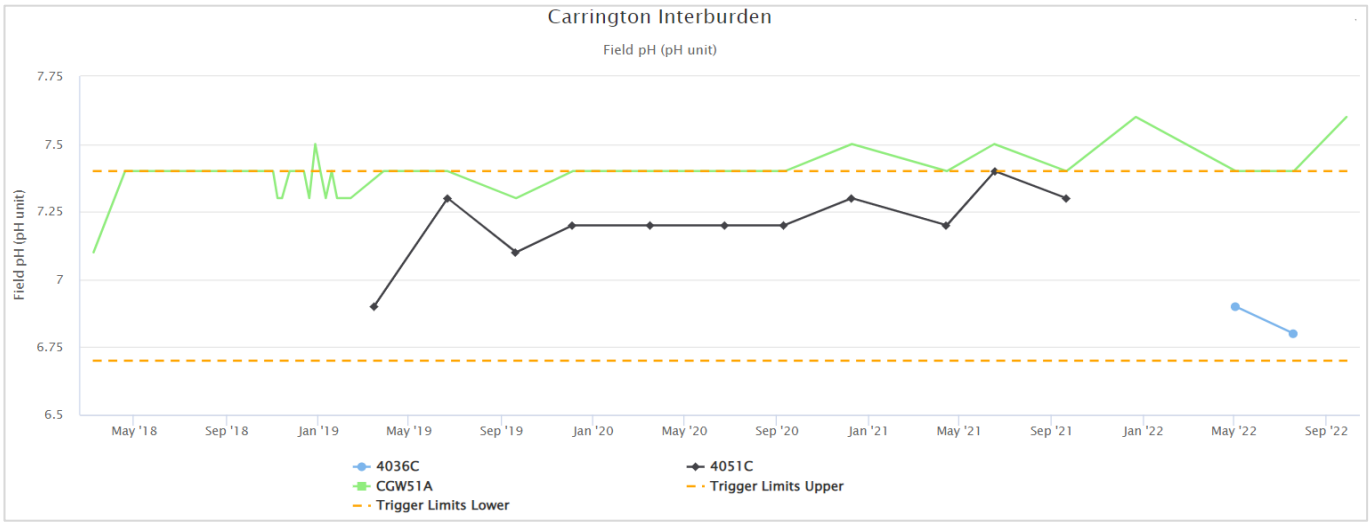

Figure 29 - Carrington Interburden Field pH Trend – Q3 2022

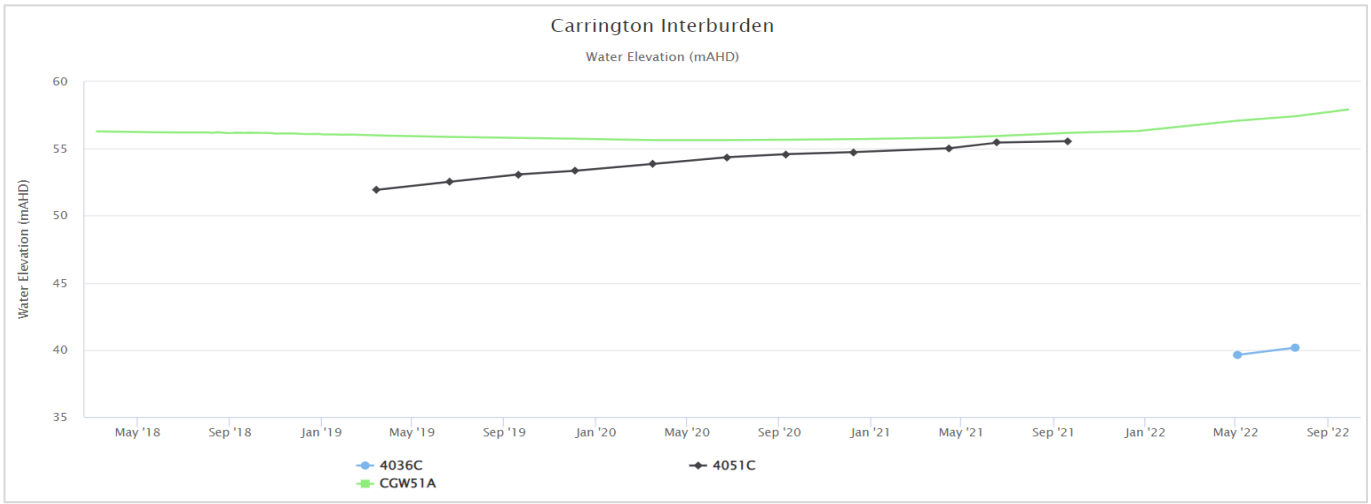

Figure 30 - Carrington Interburden Water Elevation Trend – Q3 2022

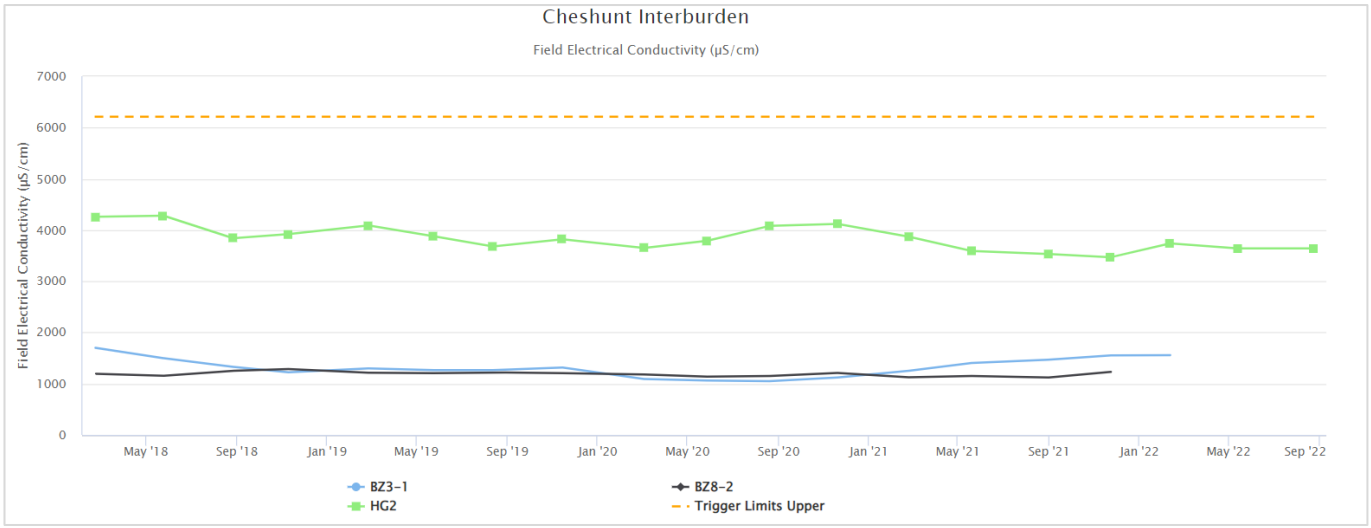

Figure 31 - Cheshunt Interburden Electrical Conductivity Trend – Q3 2022

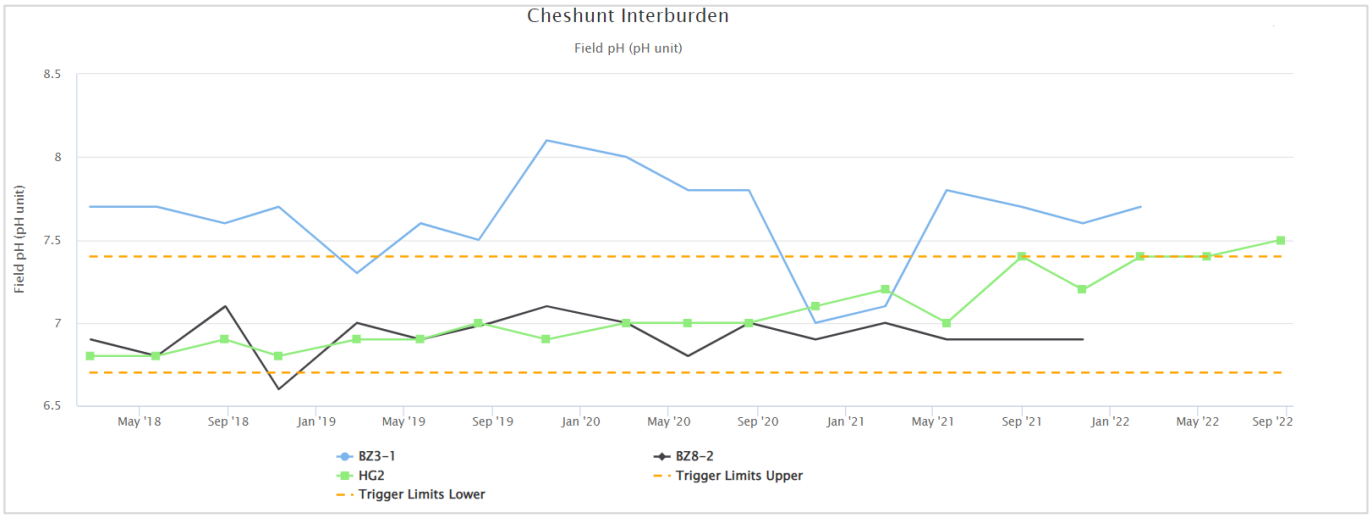

Figure 32 - Cheshunt Interburden Field pH Trend – Q3 2022

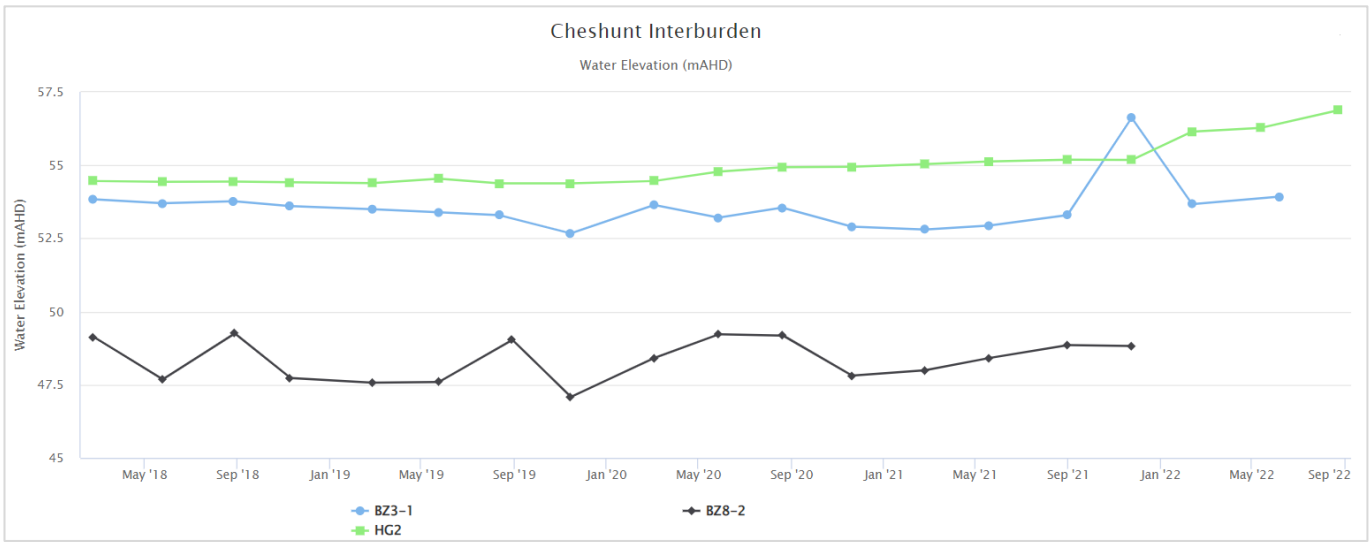

Figure 33 – Cheshunt Interburden Water Elevation Trend – Q3 2022

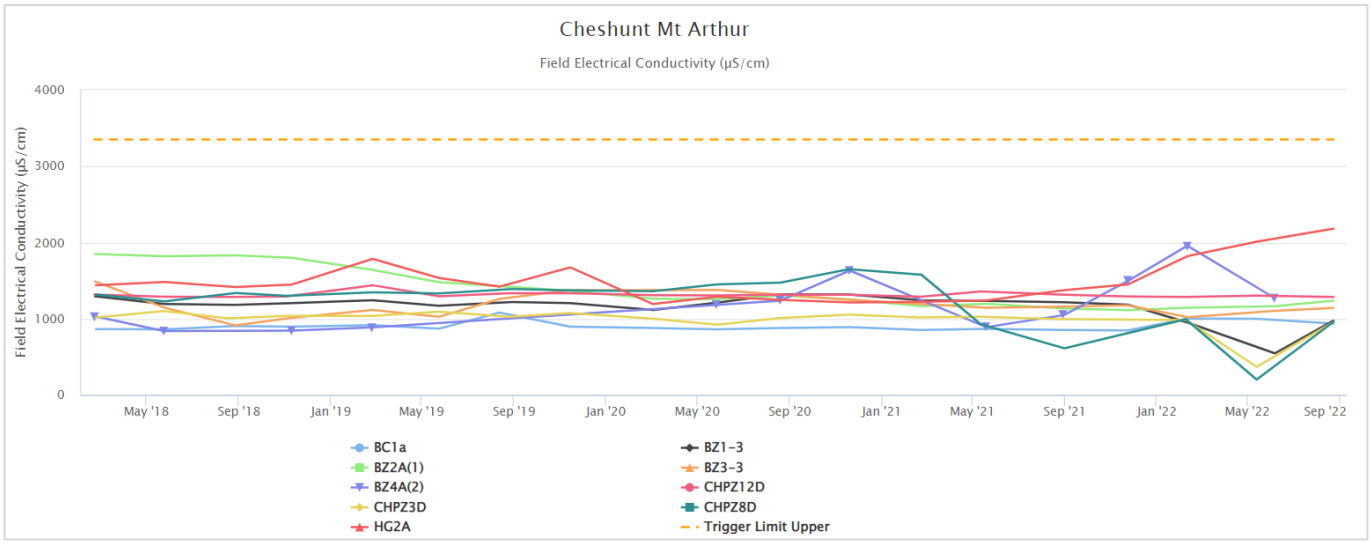

Figure 34 - Cheshunt Mt Arthur Electrical Conductivity Trend – Q3 2022

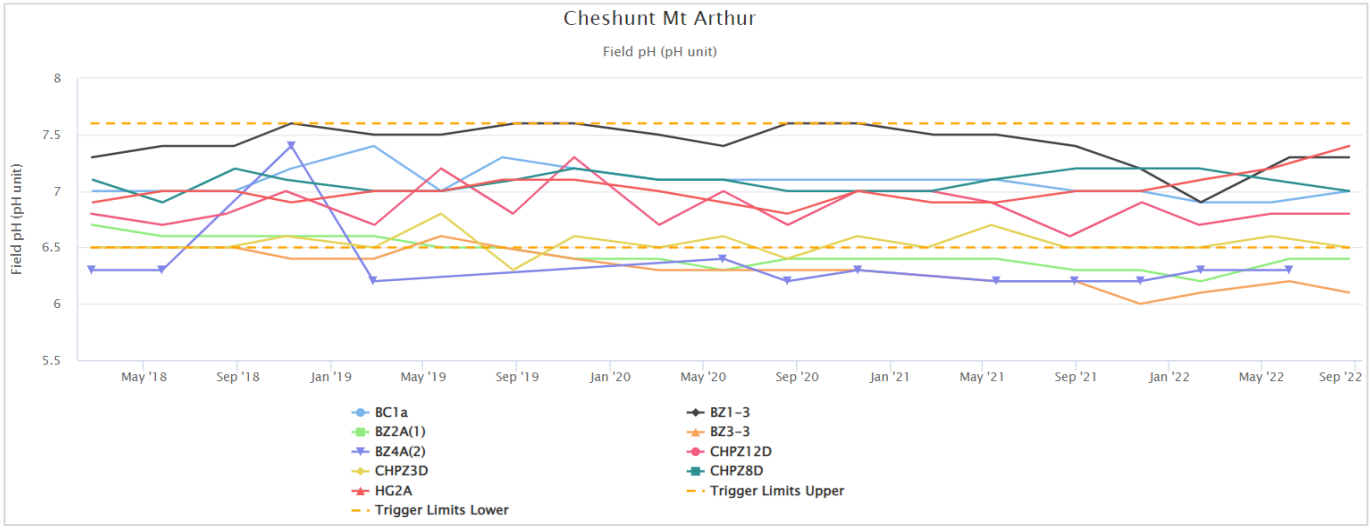

Figure 35 - Cheshunt Mt Arthur Field pH Trend – Q3 2022

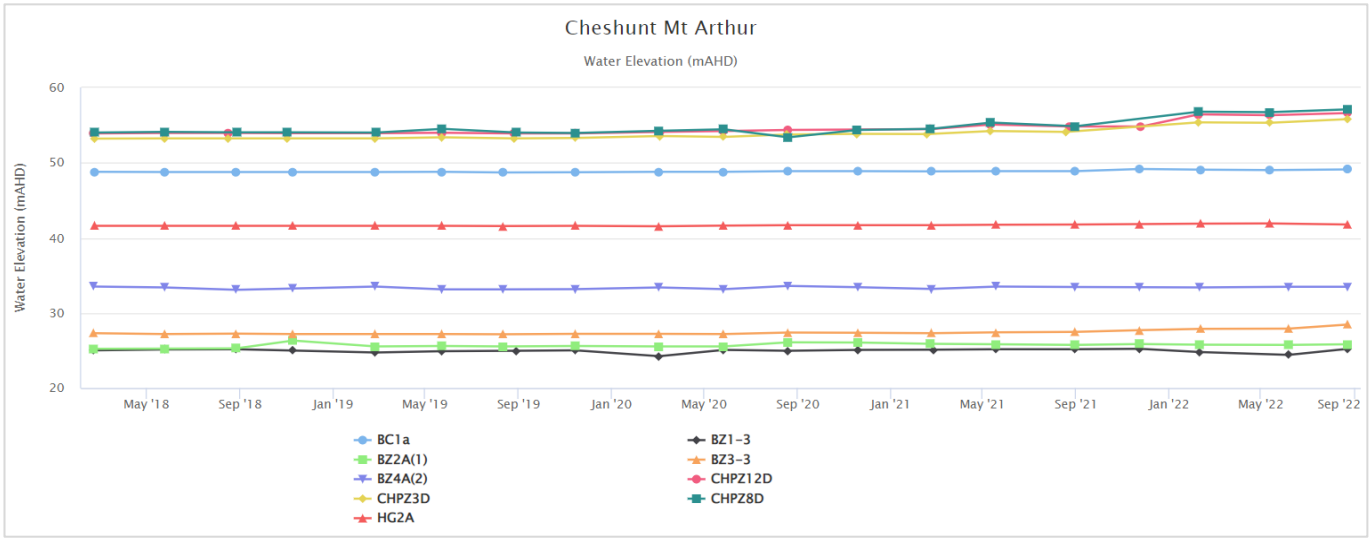

Figure 36 - Cheshunt Mt Arthur Water Elevation Trend – Q3 2022

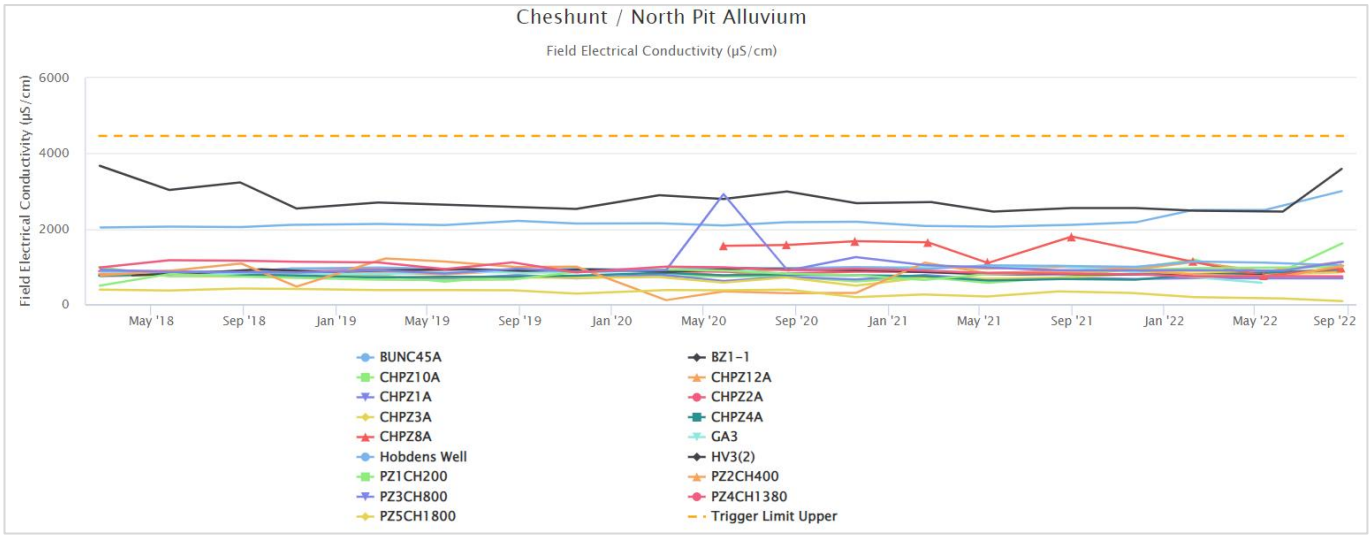

Figure 37 - Cheshunt North Pit Alluvium Electrical Conductivity Trend – Q3 2022

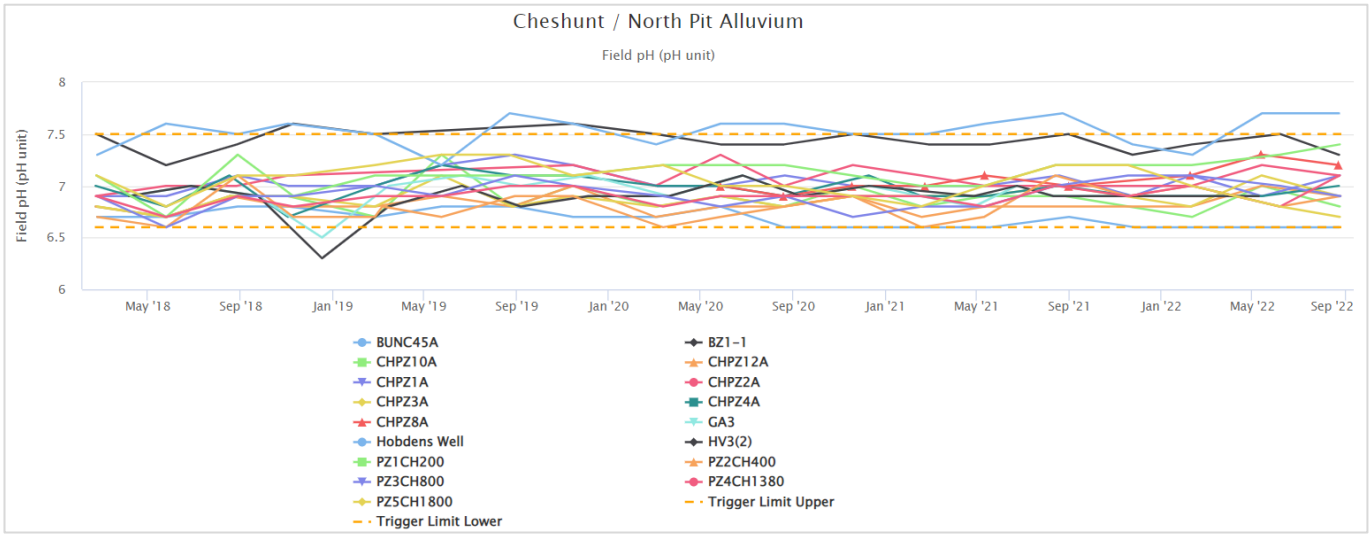

Figure 38 - Cheshunt North Pit Alluvium Field pH Trend – Q3 2022

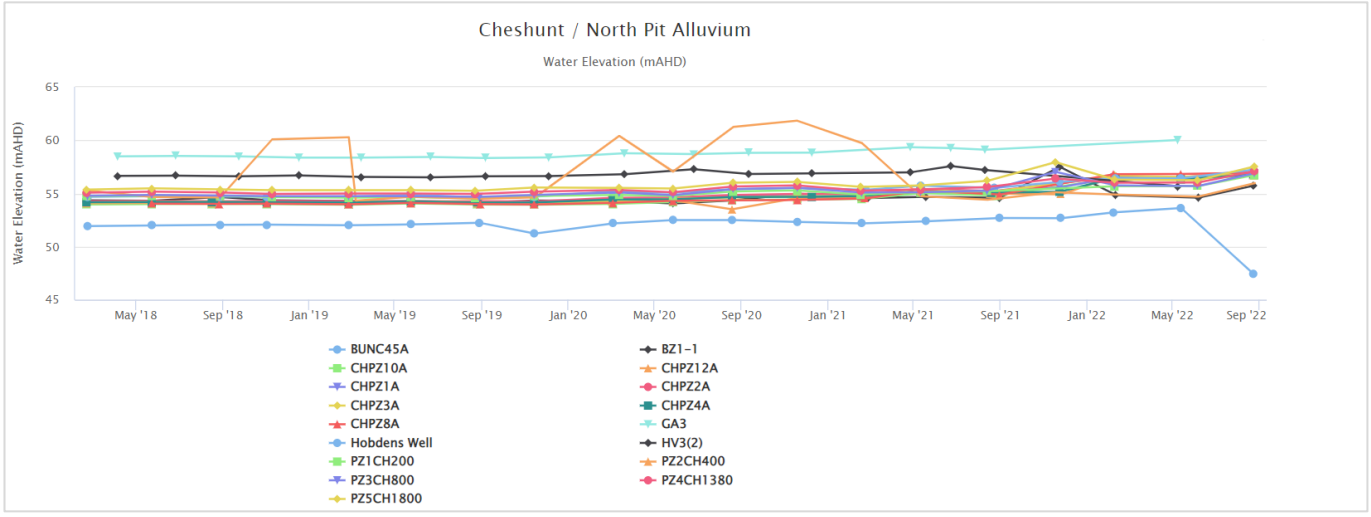

Figure 39 - Cheshunt North Pit Alluvium Water Elevation Trend – Q3 2022

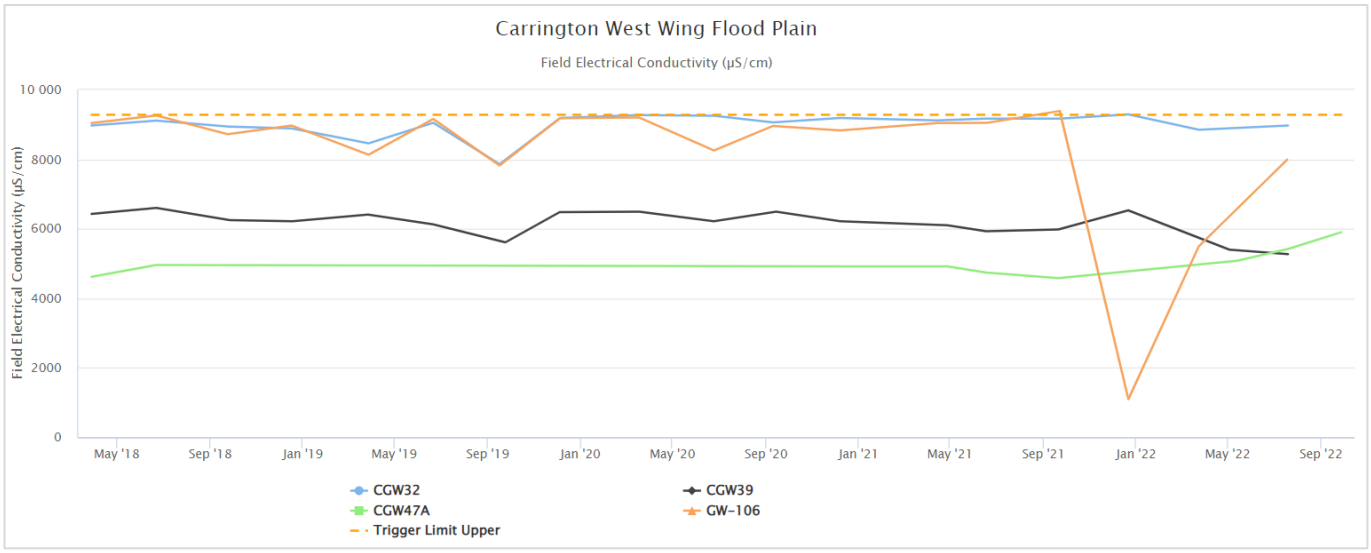

Figure 40 - Carrington West Wing Flood Plain Electrical Conductivity trend – Q3 2022

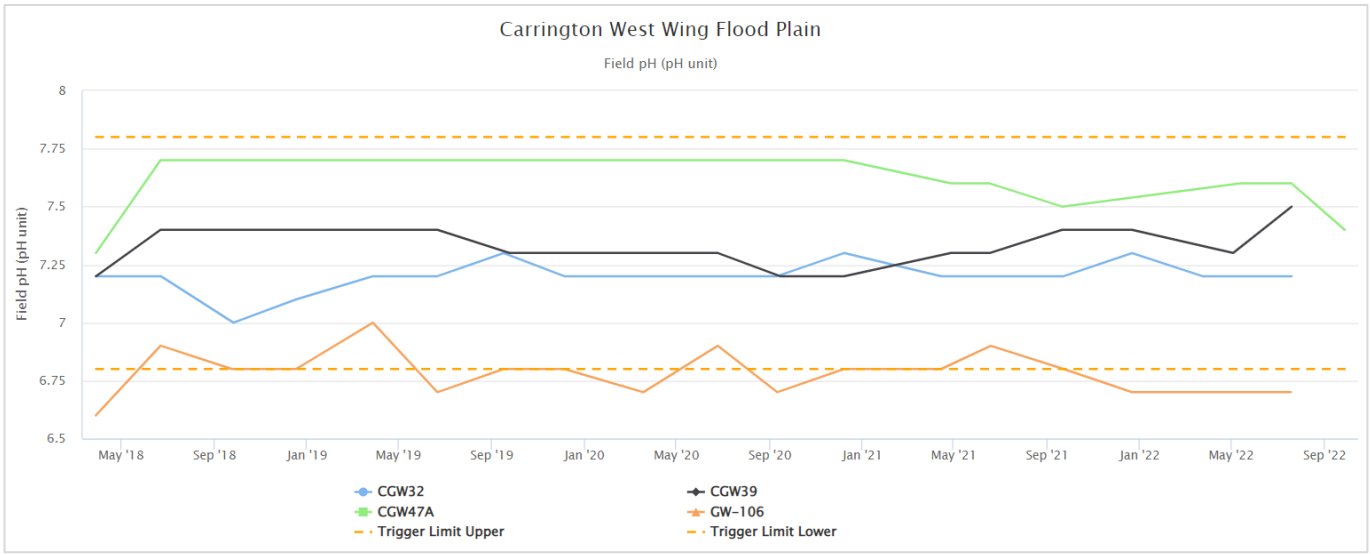

Figure 41 - Carrington West Wing Flood Plain Field pH Trend – Q3 2022

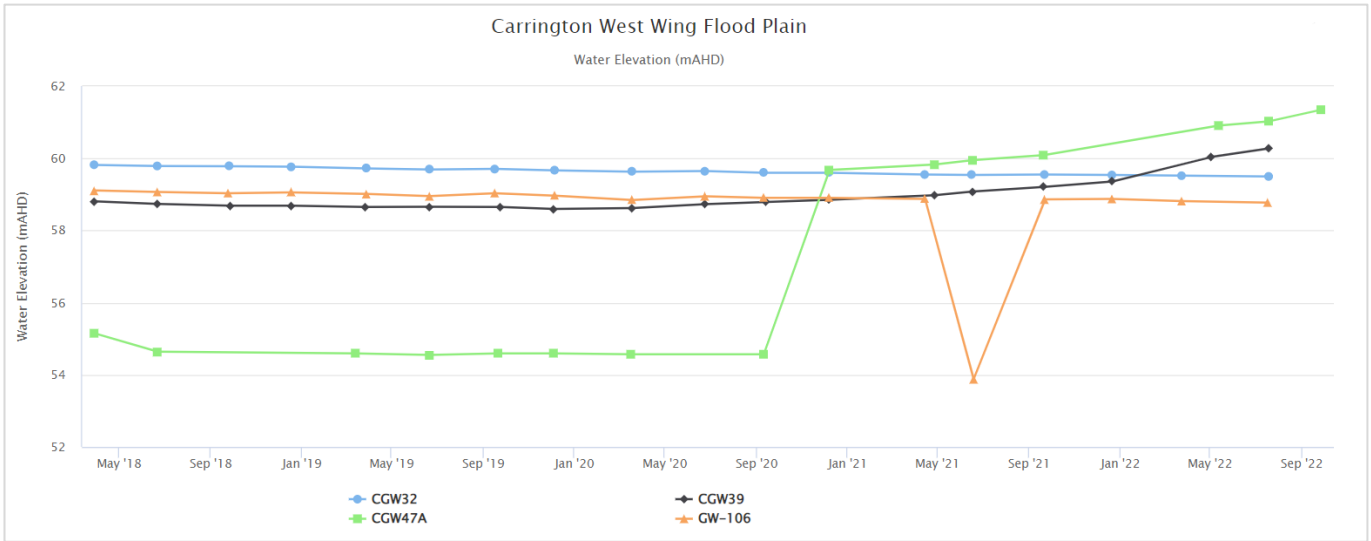

Figure 42 - Carrington West Wing Flood Plain Water Elevation Trend – Q3 2022

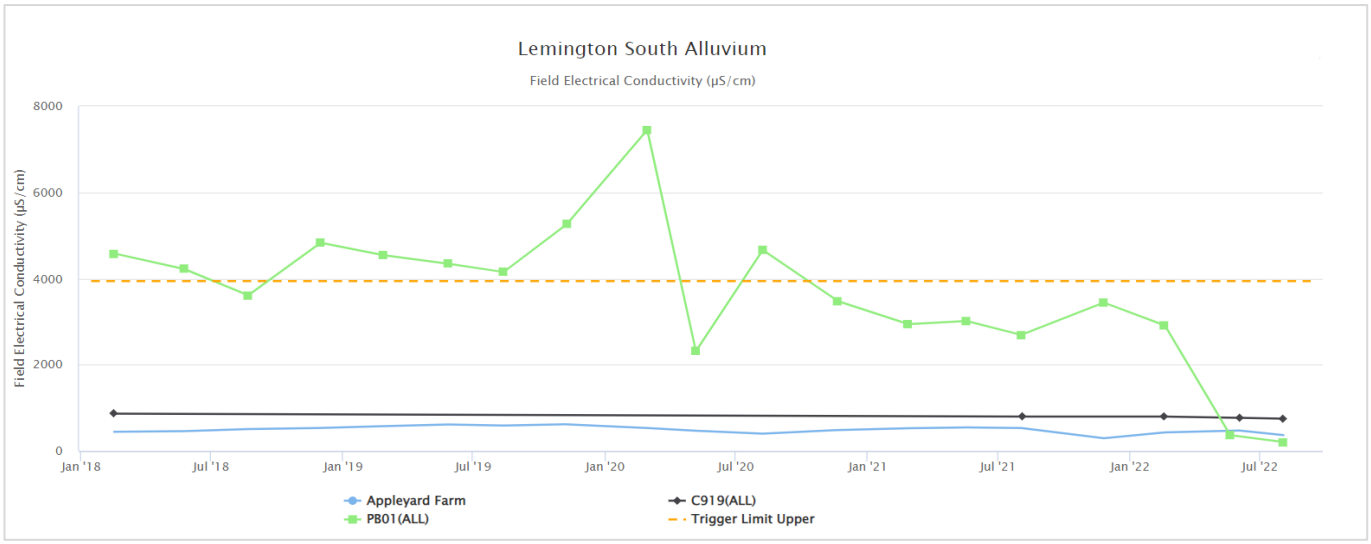

Figure 43 - Lemington South Alluvium Electrical Conductivity Trend – Q3 2022

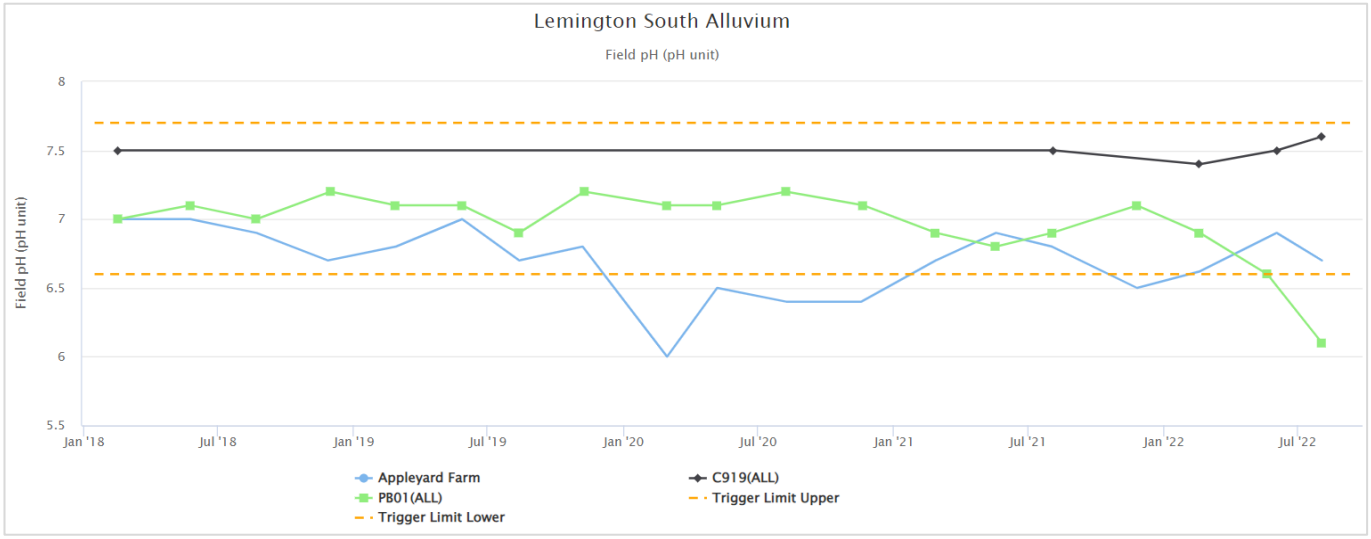

Figure 44 Lemington South Alluvium Field pH Trend – Q3 2022

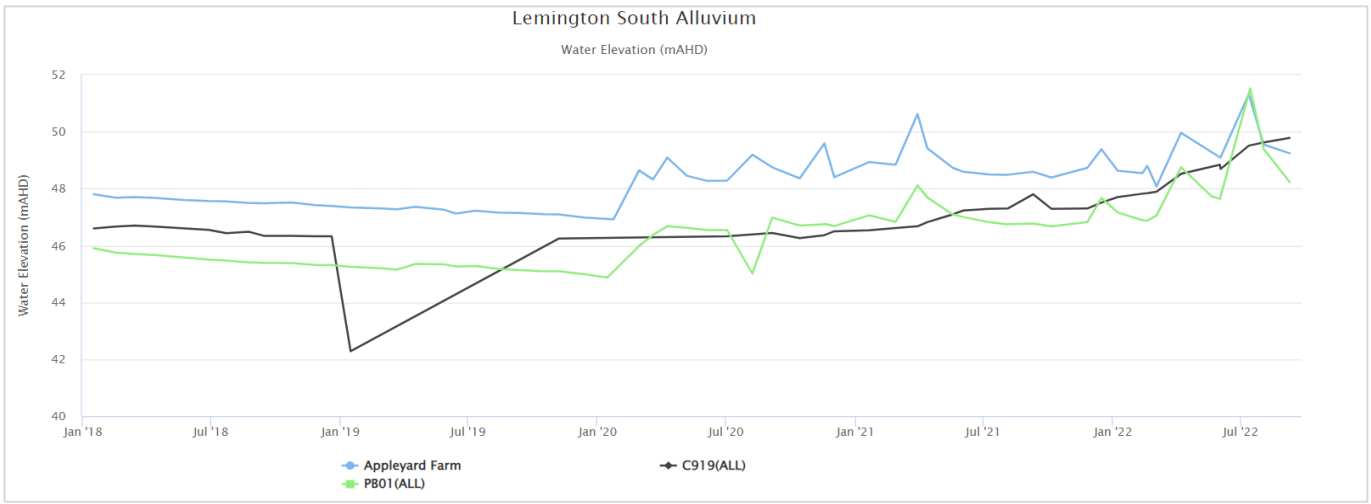

Figure 45 - Lemington South Alluvium Water Elevation Trend – Q3 2022

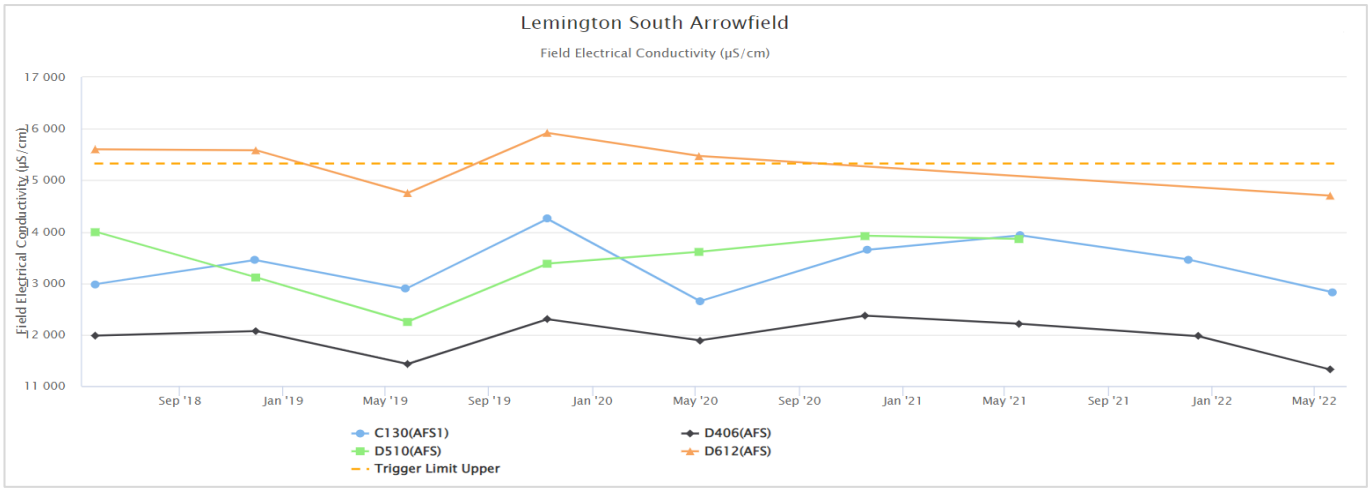

Figure 46 - Lemington South Arrowfield Electrical Conductivity Trend – Q3 2022

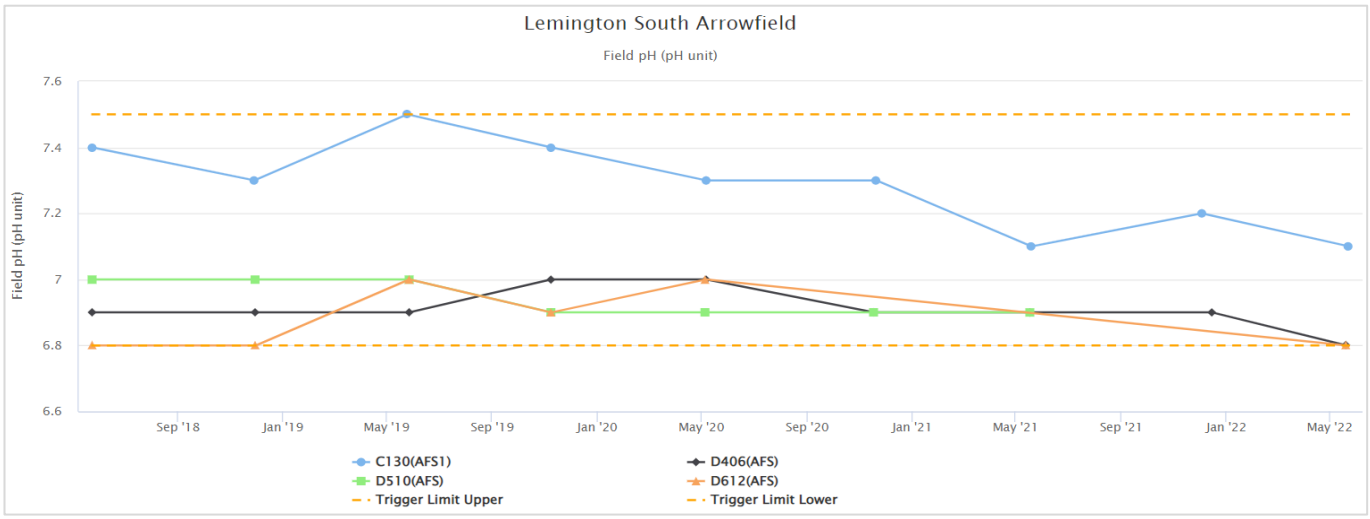

Figure 47 - Lemington South Arrowfield Field pH Trend – Q3 2022

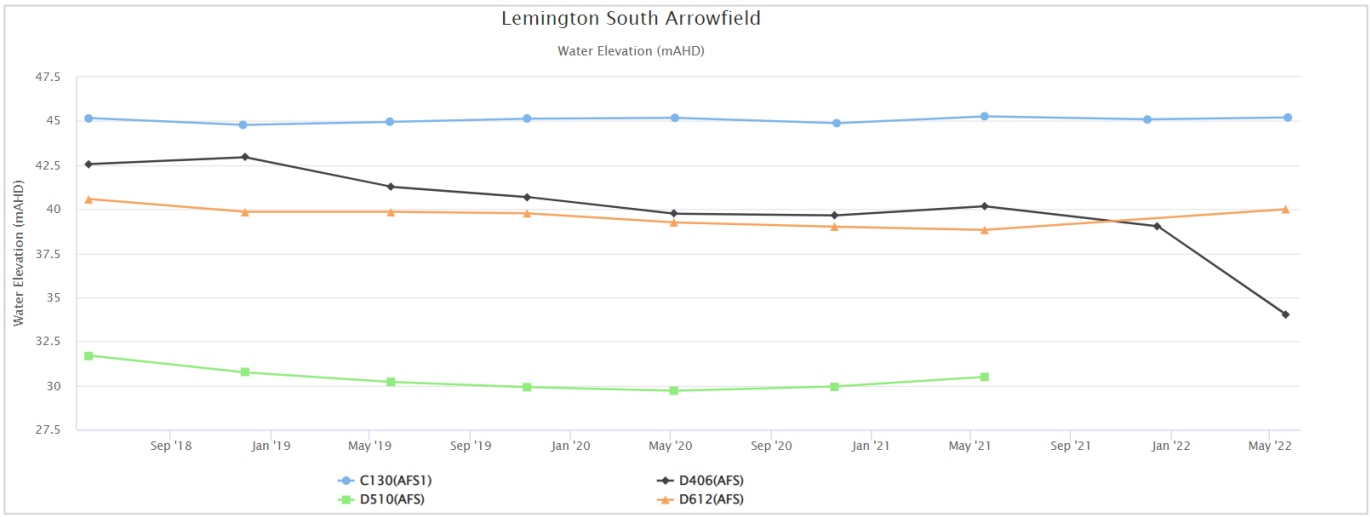

Figure 48 - Lemington South Arrowfield Water Elevation Trend – Q3 2022

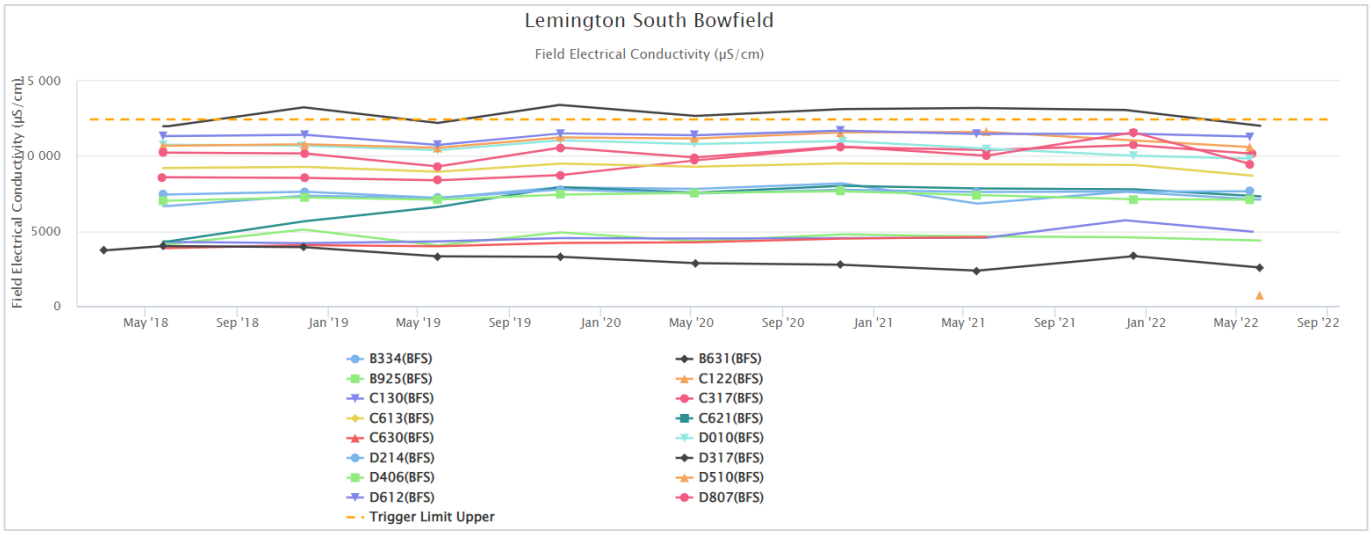

Figure 49 - Lemington South Bowfield Electrical Conductivity Trend – Q3 2022

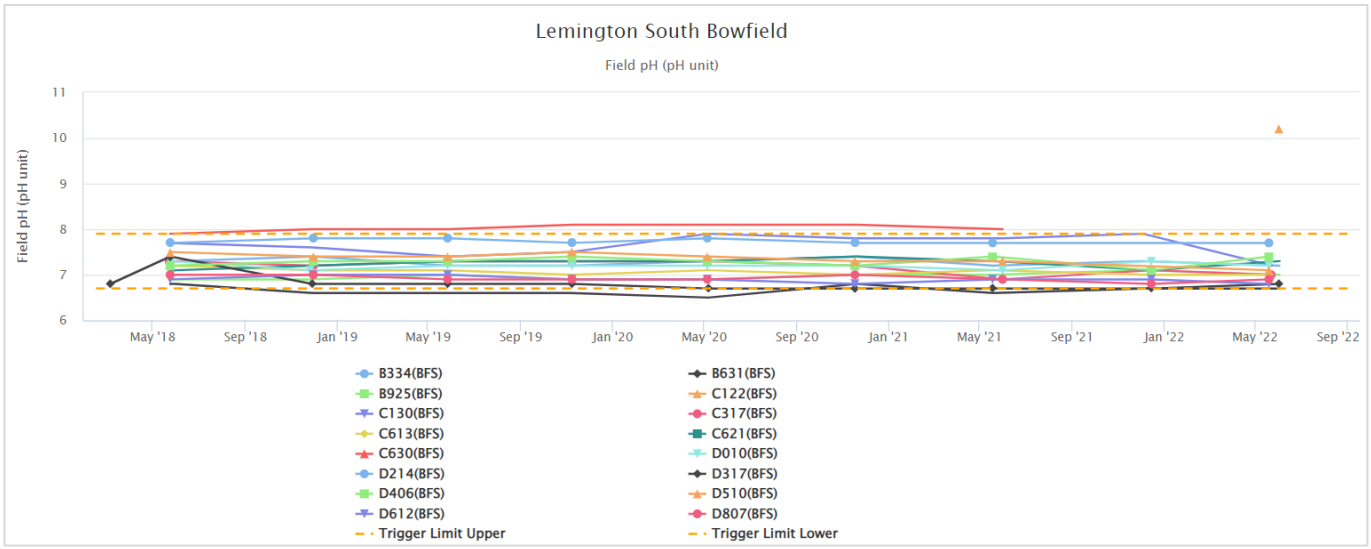

Figure 50 - Lemington South Bowfield Field pH Trend – Q3 2022

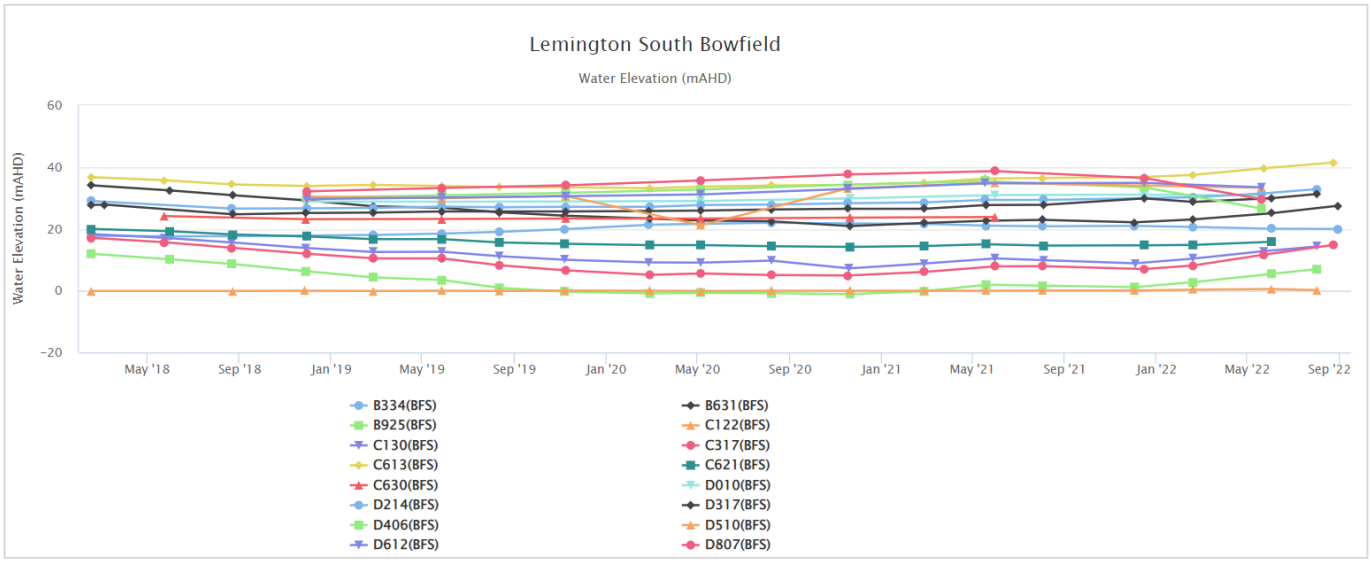

Figure 51 - Lemington South Bowfield Water Elevation Trend – Q3 2022

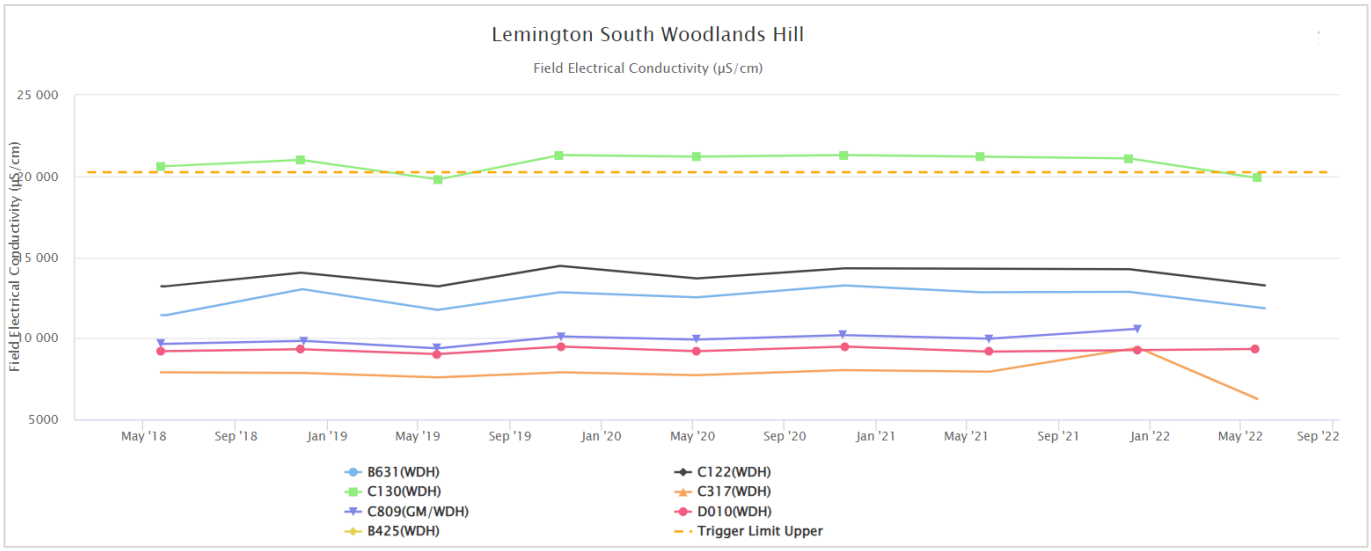

Figure 52 - Lemington South Woodlands Hill Electrical Conductivity Trend – Q3 2022

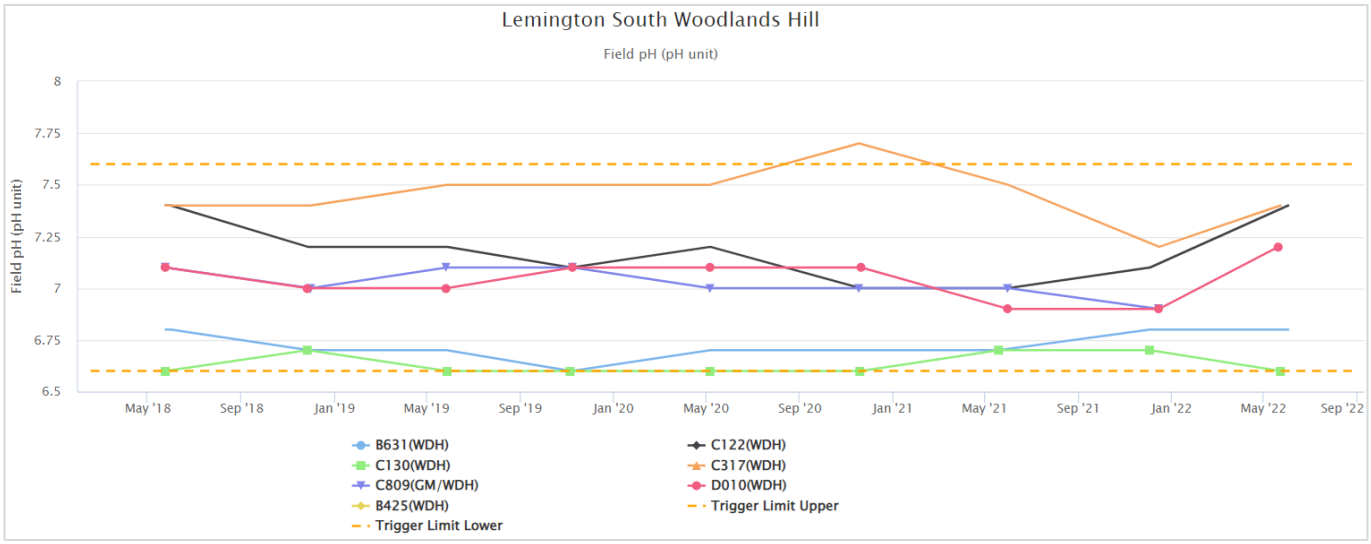

Figure 53 - Lemington South Woodlands Hill Field pH Trend – Q3 2022

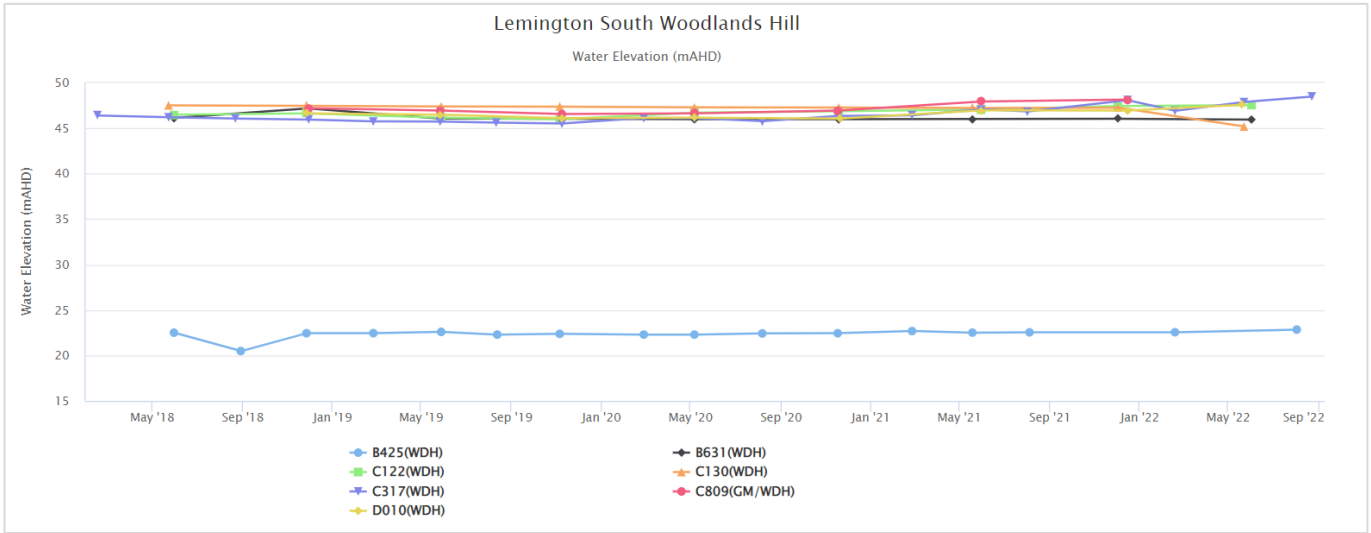

Figure 54 - Lemington South Woodlands Hill Water Elevation Trend – Q3 2022

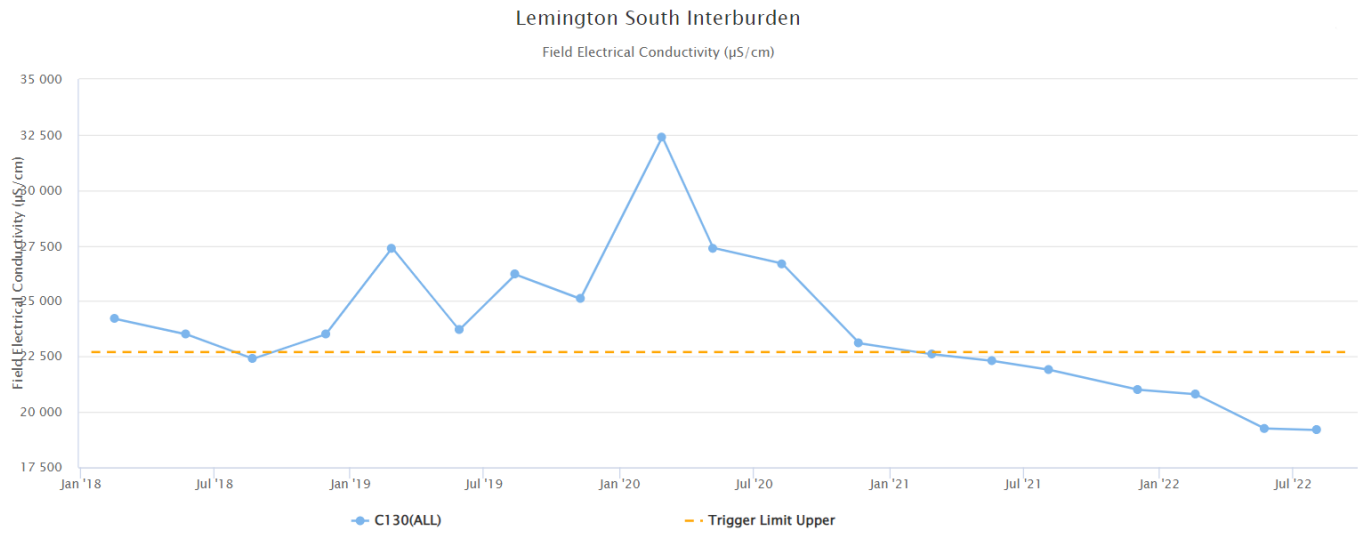

Figure 55 - Lemington South Interburden Electrical Conductivity Trend – Q3 2022

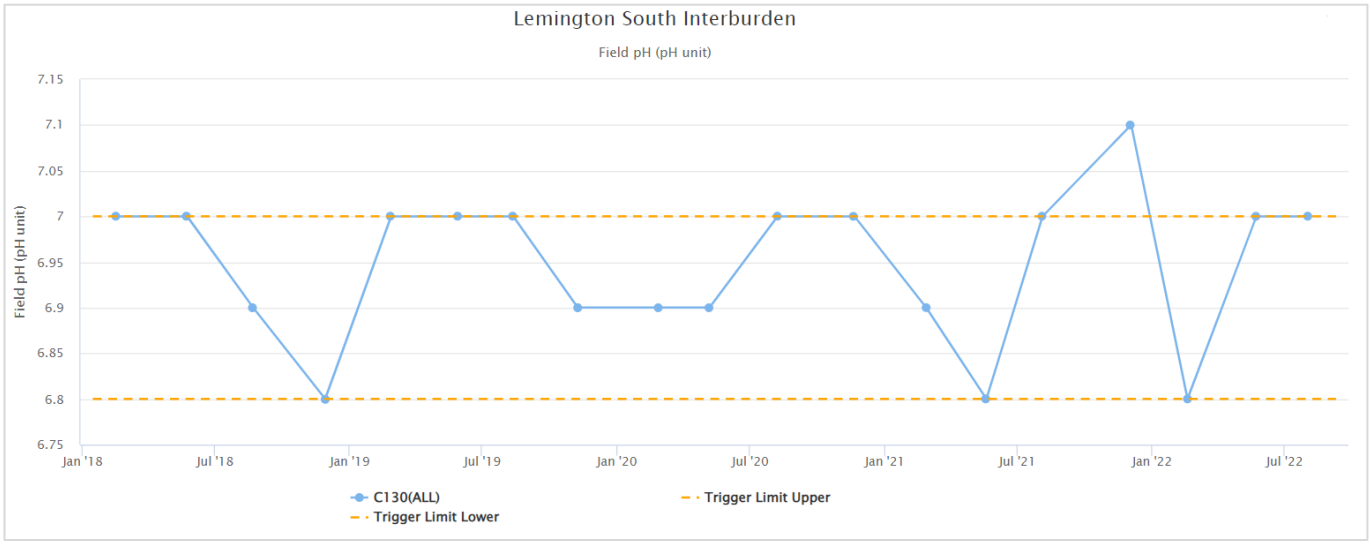

Figure 56 - Lemington South Interburden Field pH Trend – Q3 2022

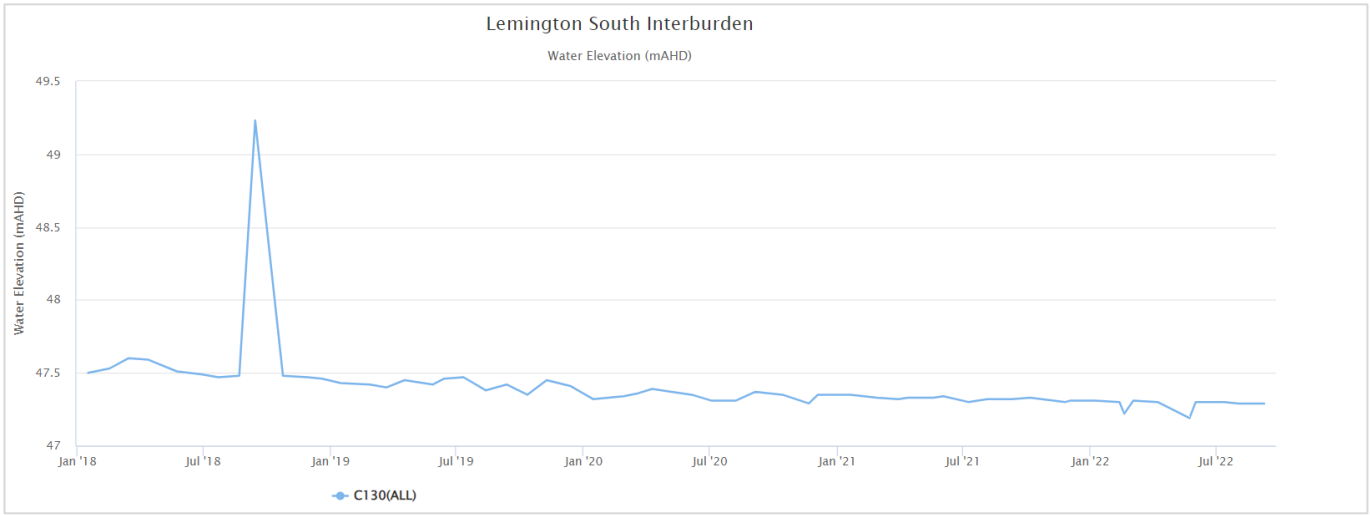

Figure 57 - Lemington South Interburden Water Elevation Trend – Q3 2022

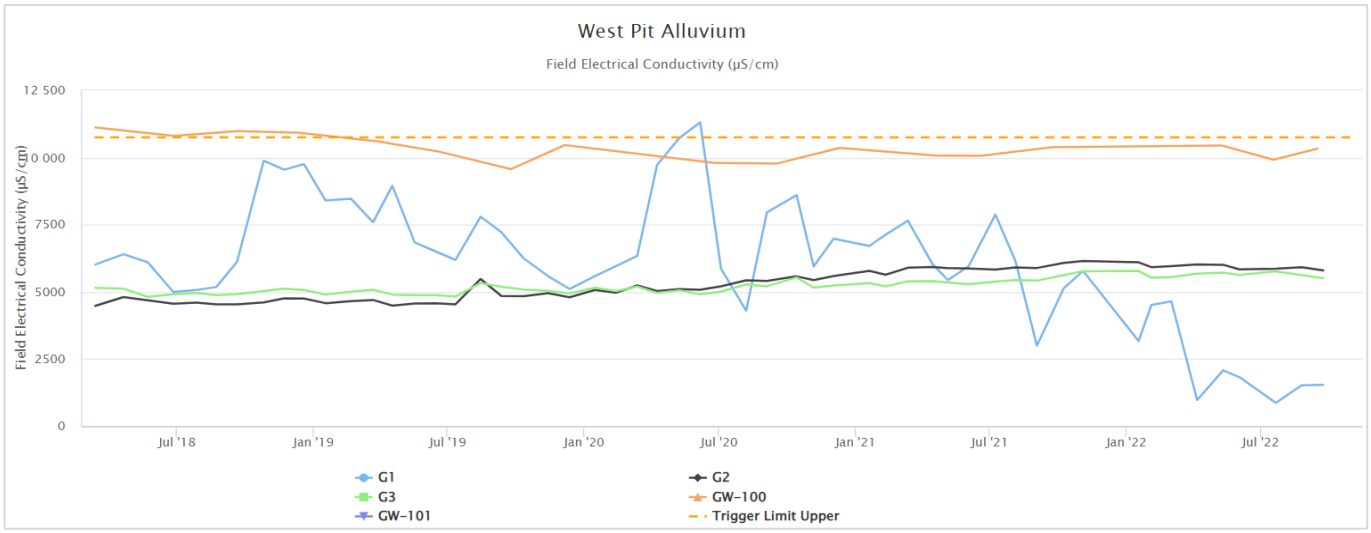

Figure 58 - West Pit Alluvium Electrical Conductivity Trend – Q3 2022

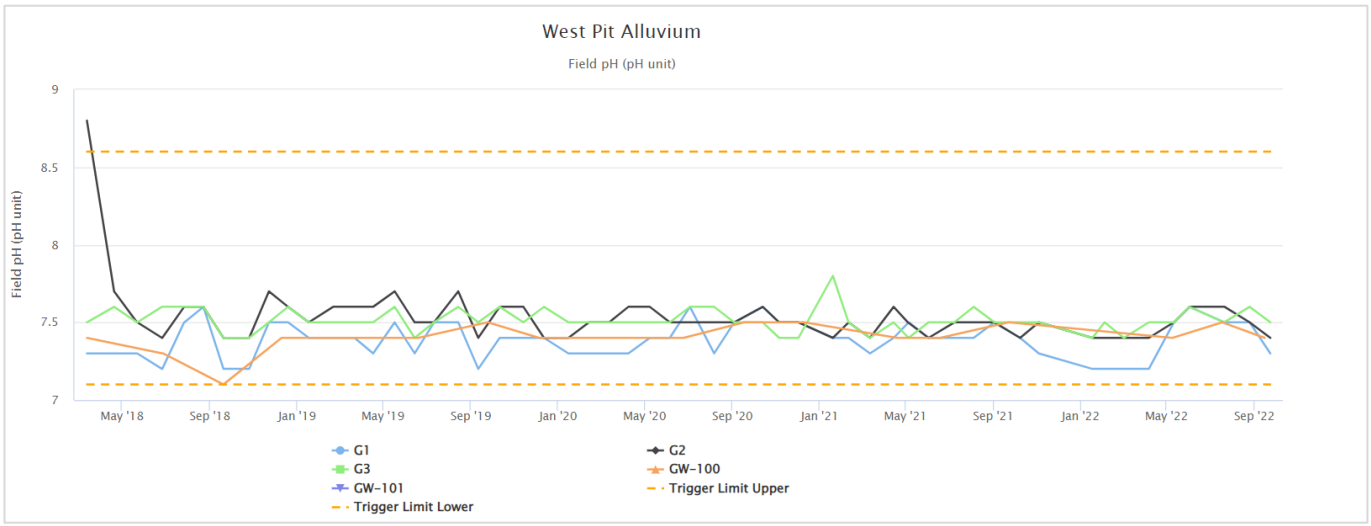

Figure 59 - West Pit Alluvium Field pH Trend – Q3 2022

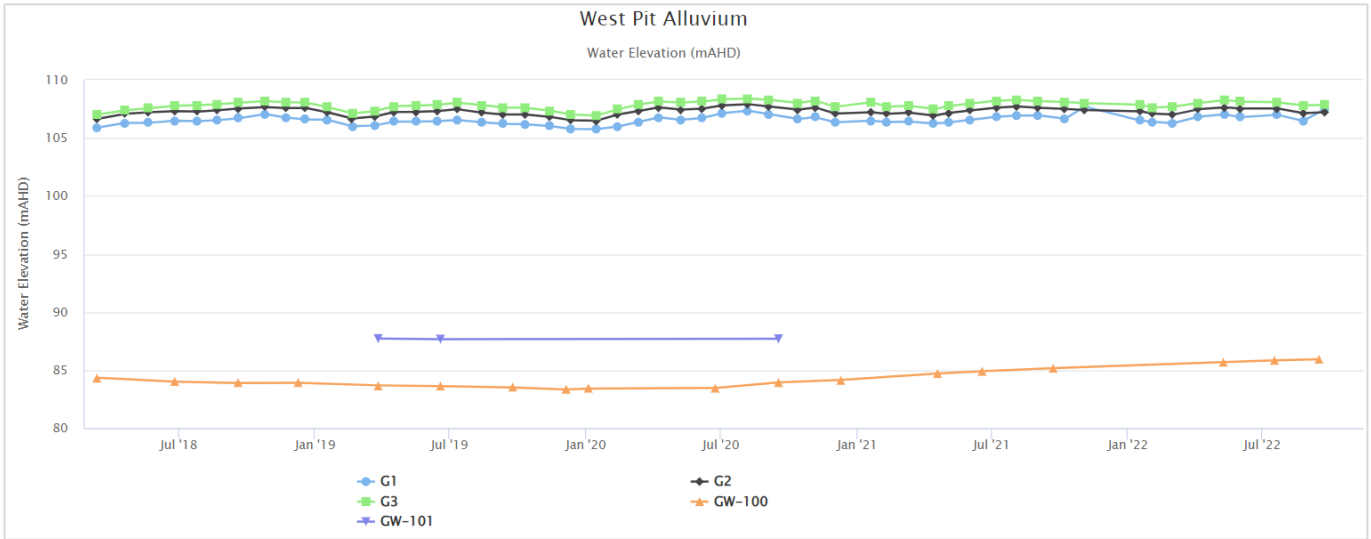

Figure 60 - West Pit Alluvium Water Elevation Trend – Q3 2022

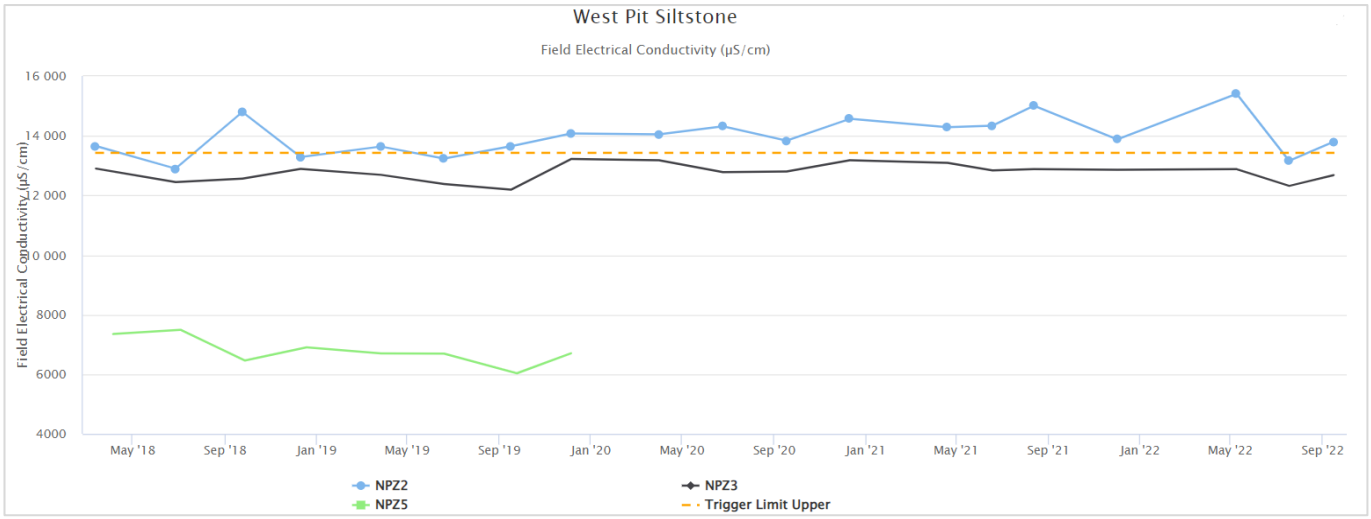

Figure 61 - West Pit Siltstone Electrical Conductivity Trend – Q3 2022

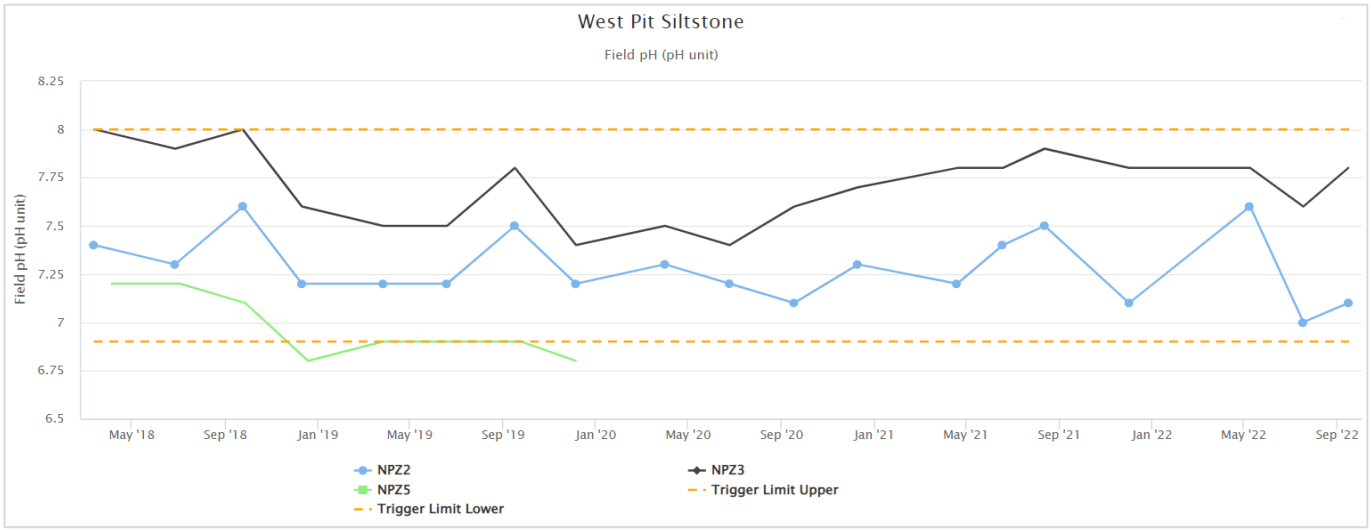

Figure 62 - West Pit Siltstone Field pH Trend – Q3 2022

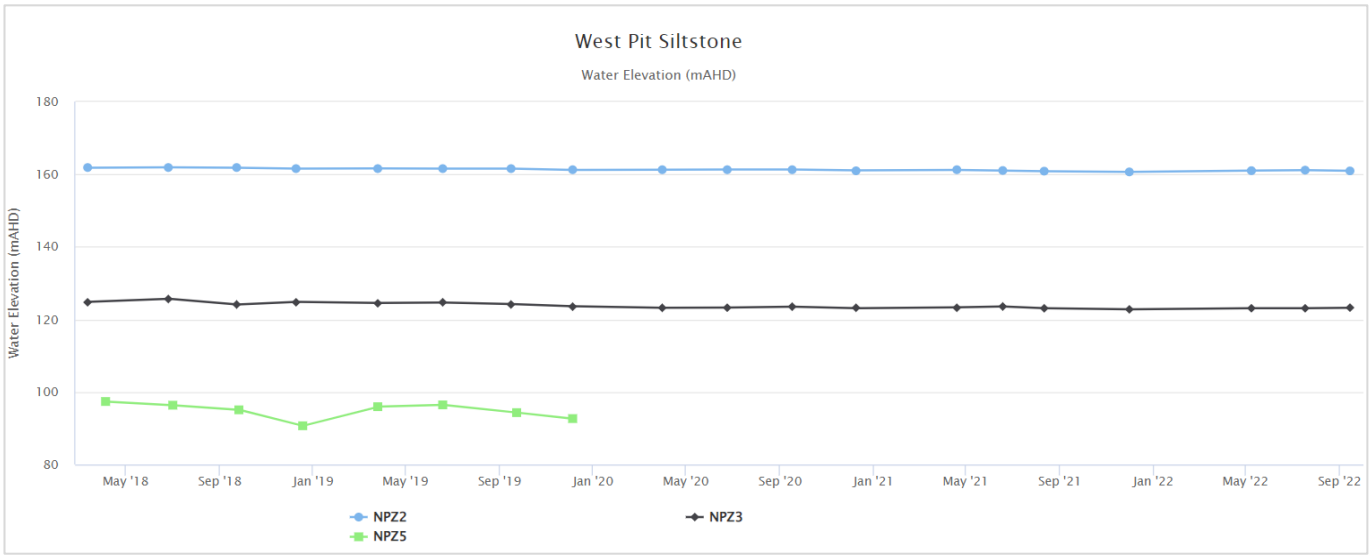

Figure 63 - West Pit Siltstone Water Elevation Trend – Q3 2022

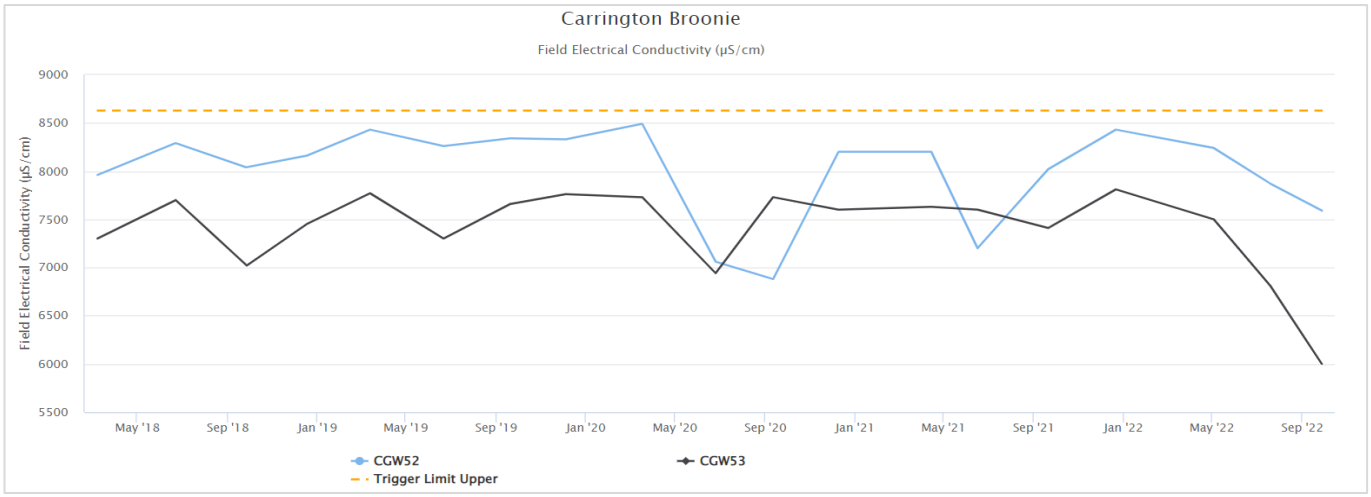

Figure 64 - Carrington Broonie Electrical Conductivity Trend – Q3 2022

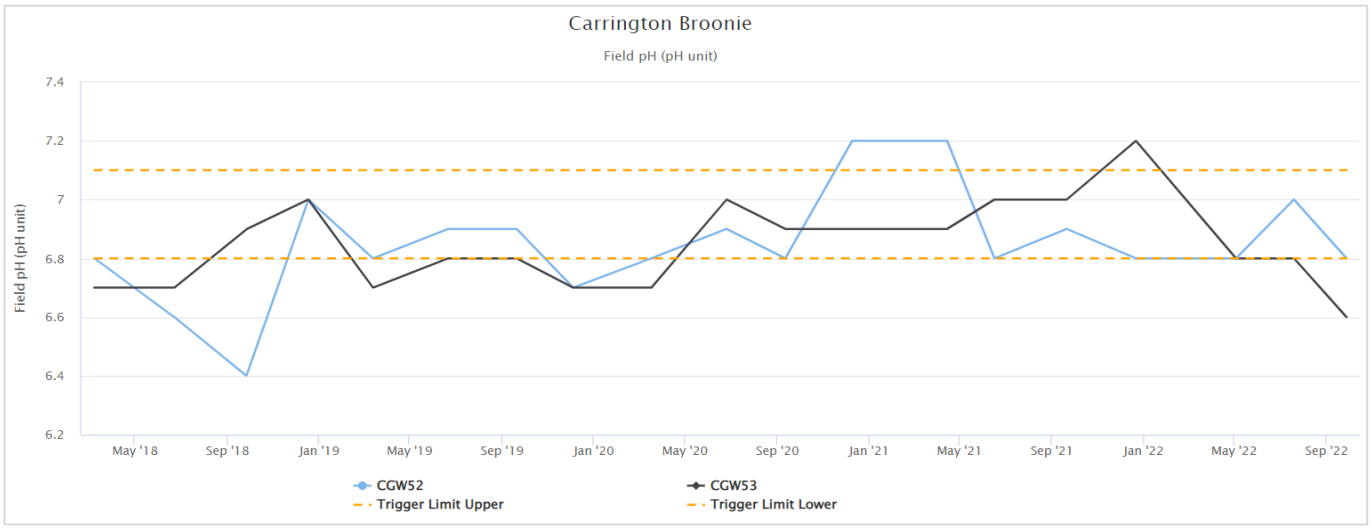

Figure 65 - Carrington Broonie Field pH Trend – Q3 2022

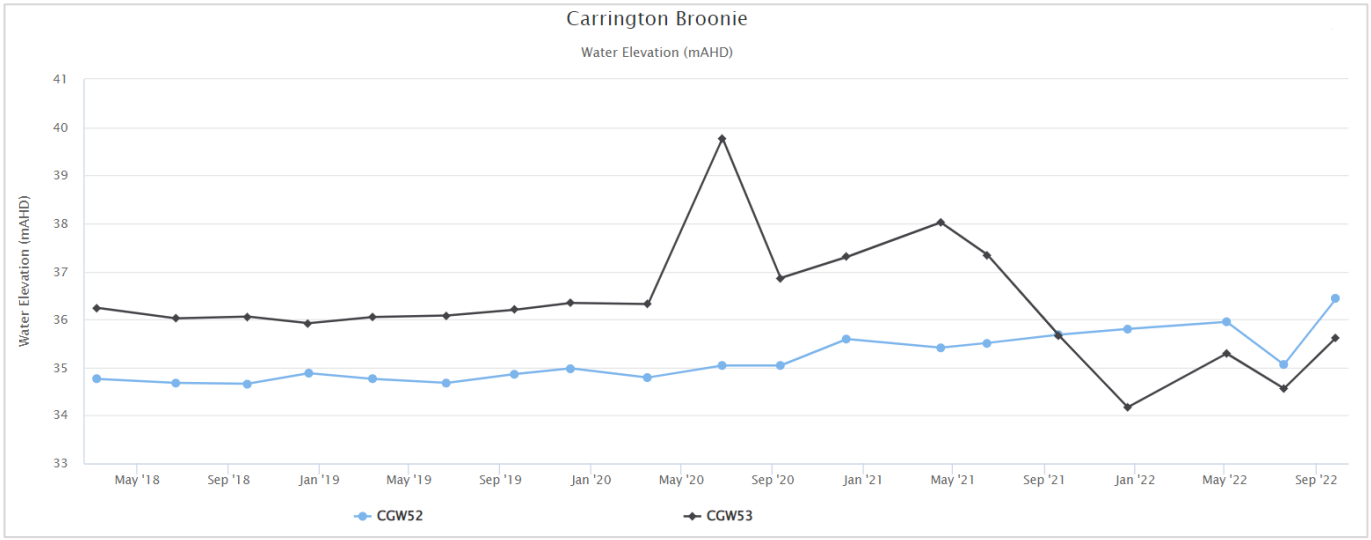

Figure 66 - Carrington Broonie Water Elevation Trend – Q3 2022

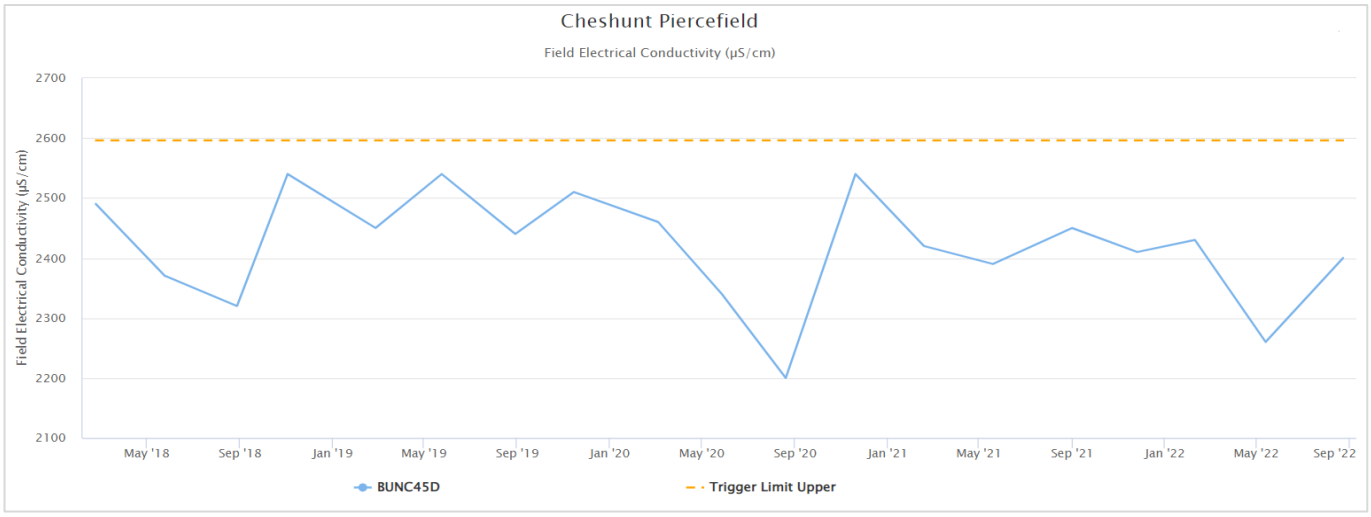

Figure 67 - Cheshunt Piercefield Electrical Conductivity Trend – Q3 2022

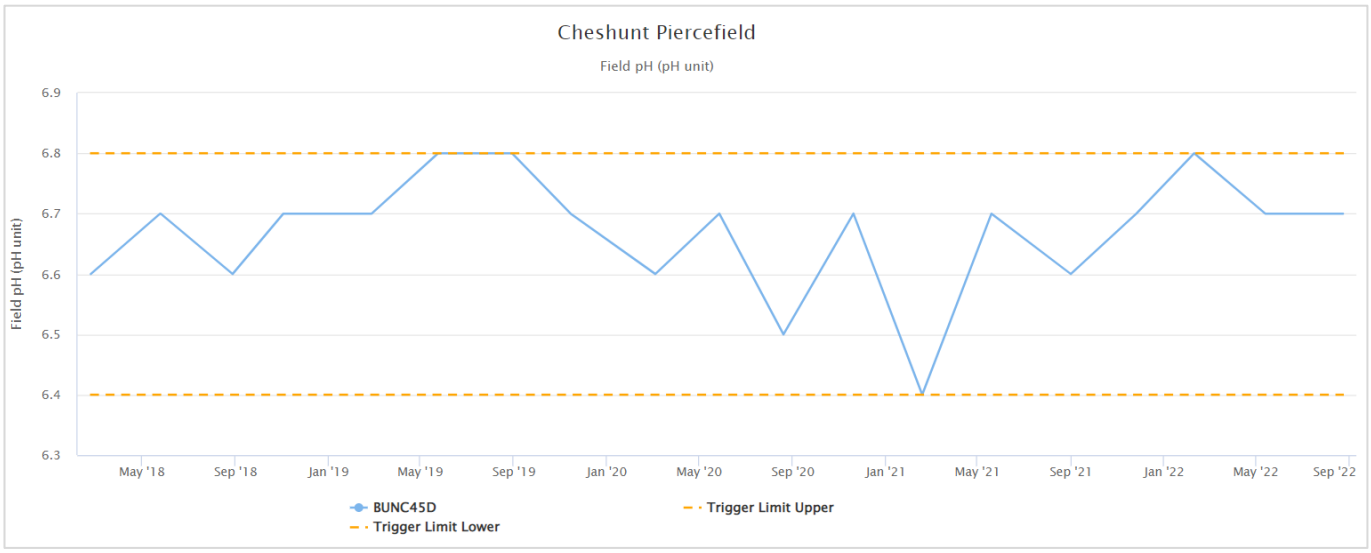

Figure 68 - Cheshunt Piercefield Field pH Trend – Q3 2022

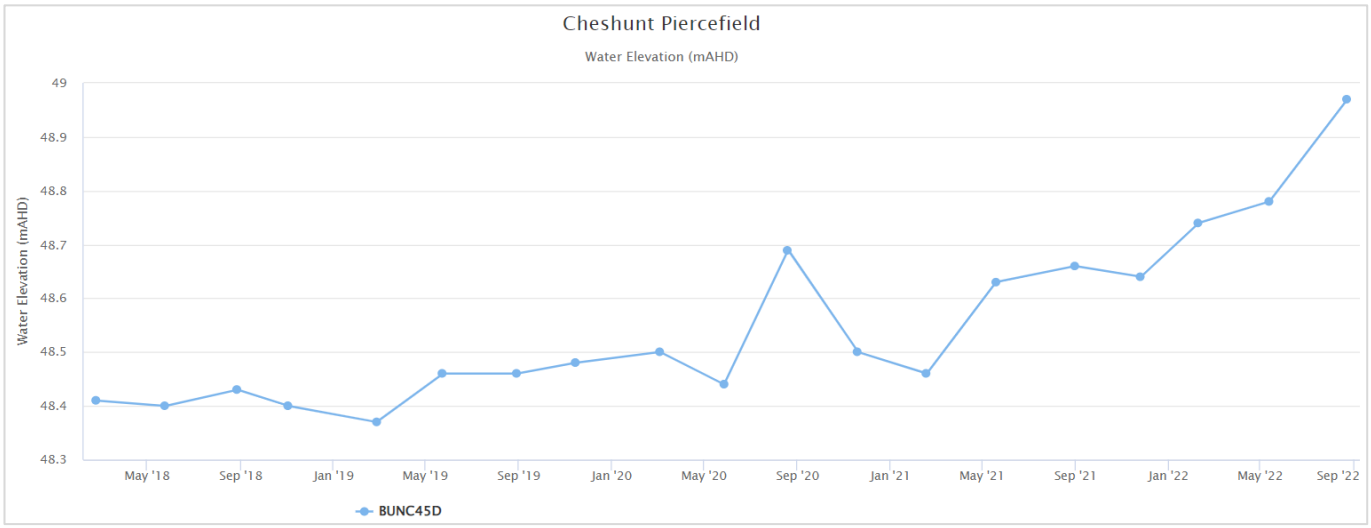

Figure 69 - Cheshunt Piercefield Water Elevation Trend – Q3 2022

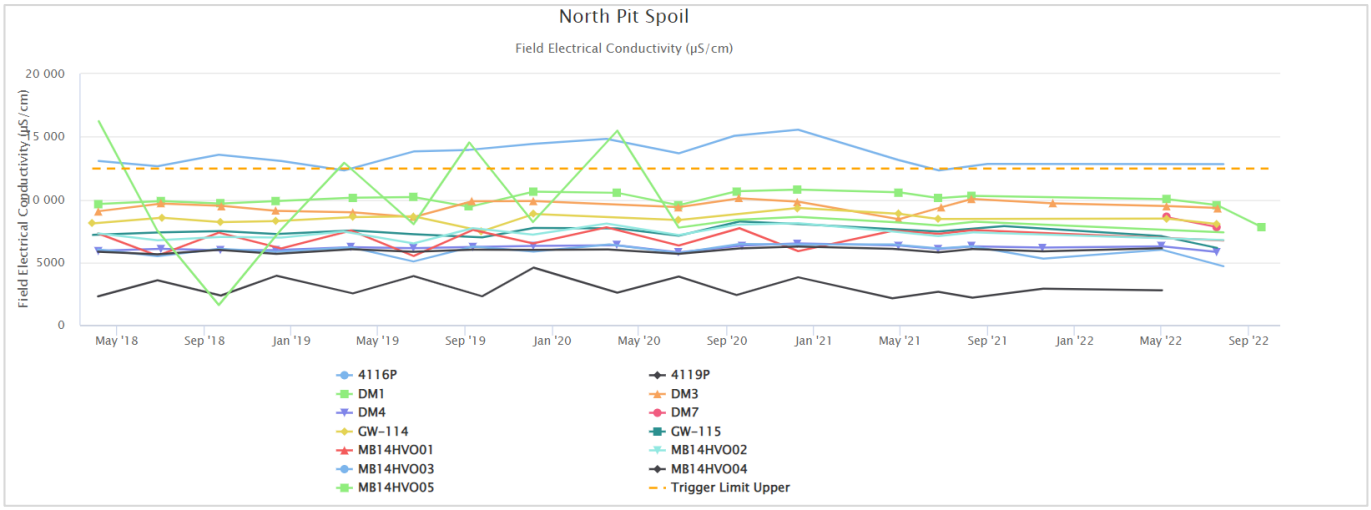

Figure 70 - North Pit Spoil Electrical Conductivity Trend – Q3 2022

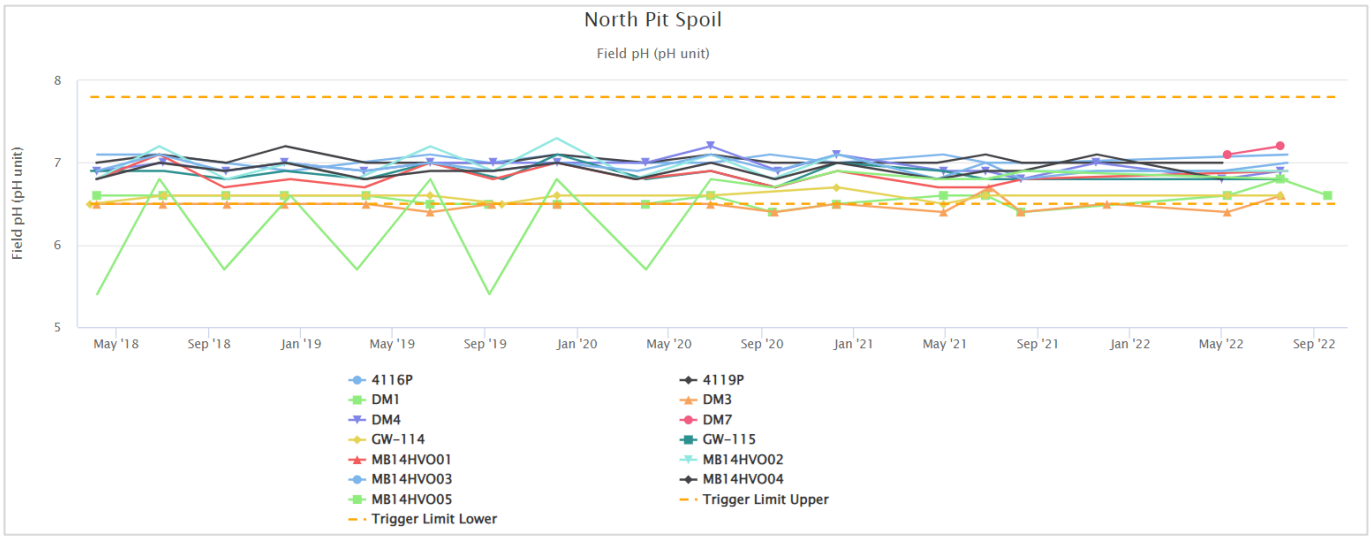

Figure 71 - North Pit Spoil Field pH Trend – Q3 2022

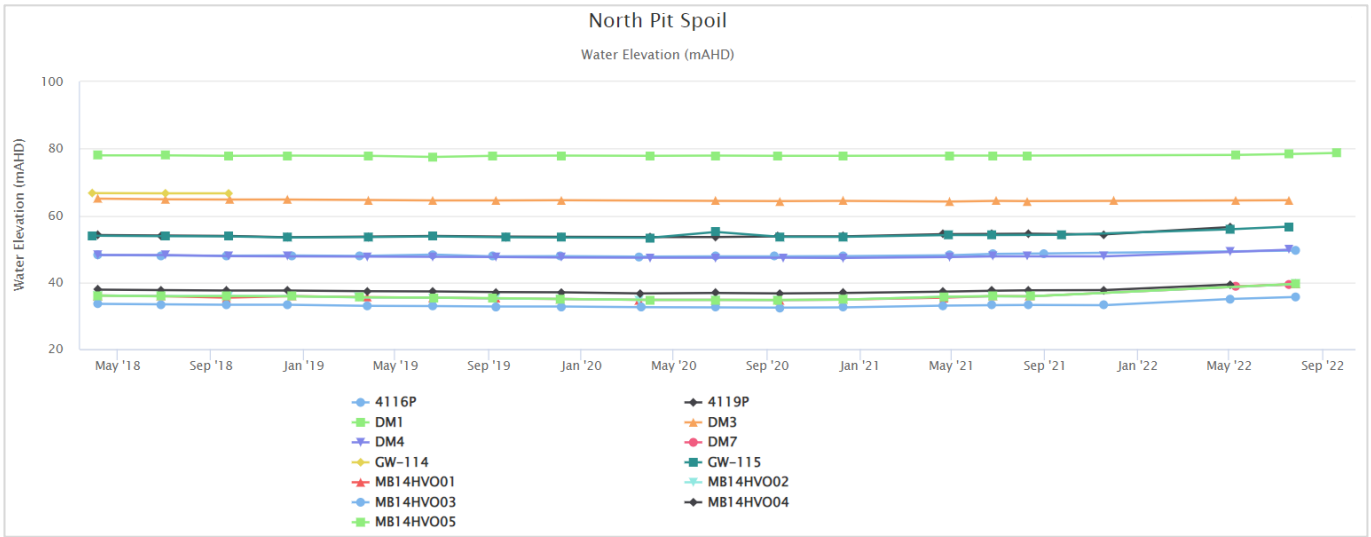

Figure 72 - North Pit Spoil Water Elevation Trend – Q3 2022

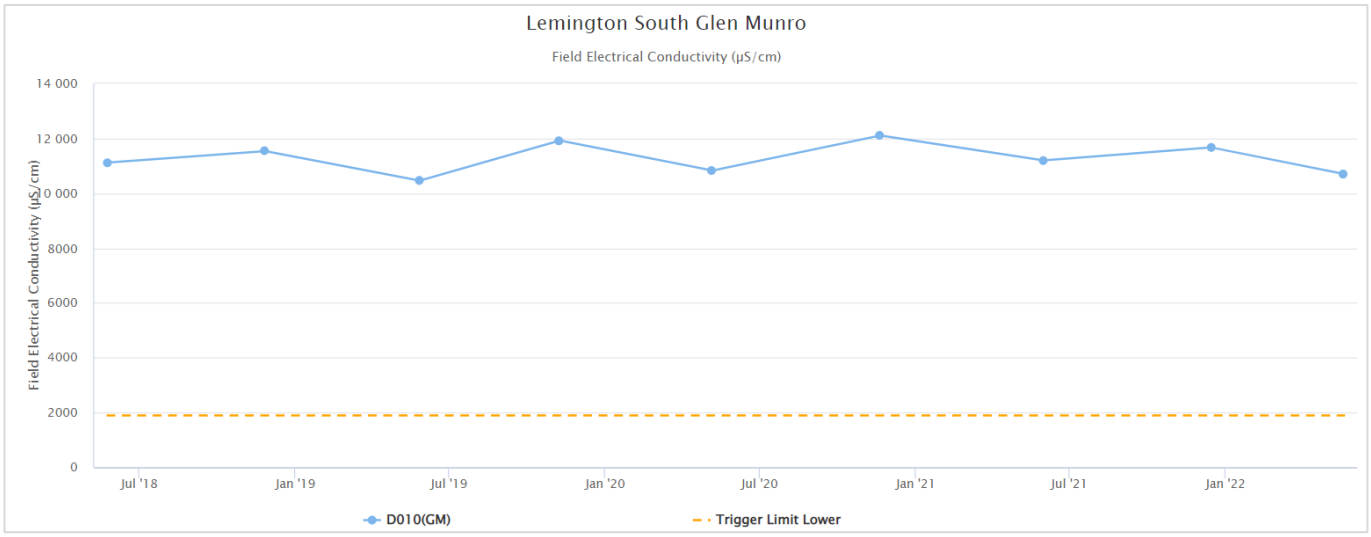

Figure 73 - Lemington South Glen Munro Electrical Conductivity Trend – Q3 2022

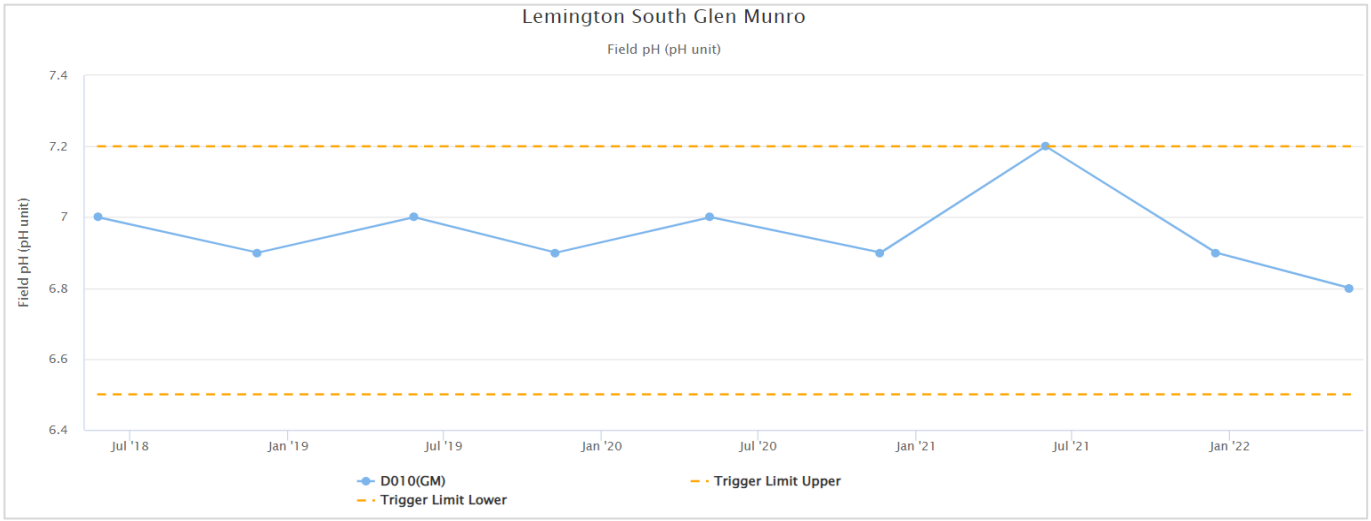

Figure 74 - Lemington South Glen Munro Field pH Trend – Q3 2022

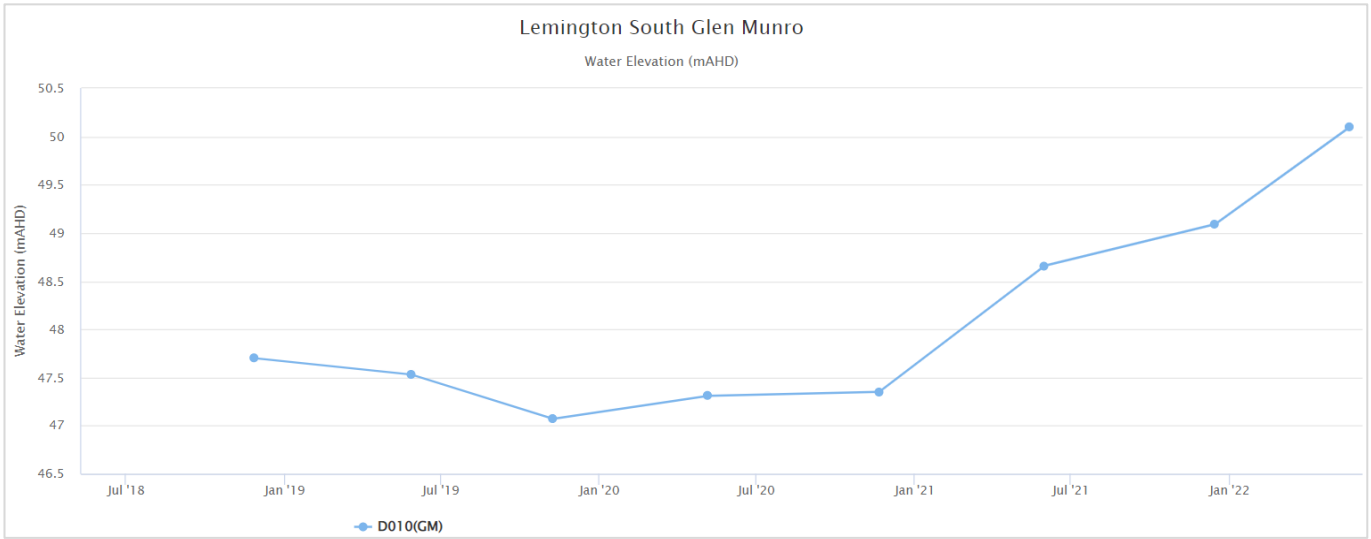

Figure 75 - Lemington South Glen Munro Water Elevation Trend – Q3 2022

3.4.1 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 is outlined in the HVO Water Management Plan.

Groundwater trigger tracking results are summarised below in **Table 3**.

Table 3 – Groundwater Trigger Tracking- Q3 2022

Site	Date	Trigger Limit Breached	Response Action
GW-106	18/07/2022	Field pH (pH unit)	1st exceedance - monitor
CGW53A	19/07/2022	Water Elevation (mAHD)	2nd exceedance - monitor
CGW55A	19/07/2022	Water Elevation (mAHD)	2nd exceedance - monitor
CFW57	22/07/2022	Water Elevation (mAHD)	10th exceedance - monitor
CFW55R	25/07/2022	Water Elevation (mAHD)	5th exceedance - monitor
GW-129	25/07/2022	Water Elevation (mAHD)	1st exceedance - monitor
4116P	27/07/2022	Field Electrical Conductivity (µS/cm)	1st exceedance - monitor
GW-129	24/08/2022	Water Elevation (mAHD)	1st exceedance - monitor
CFW55R	24/08/2022	Water Elevation (mAHD)	6th exceedance – investigation The purpose of bore CFW55R is monitoring of the groundwater response to mining/recovery in Carrington and the NV TSF. Groundwater levels in bore CFW55R have gradually increased since February 2020 with a sharp increase between September 2021 and September 2022 in response to above average rainfall. It is noted that the trigger level has already been aligned with the EPL conditions in version 3.4 of the WMP which is currently with DPE for approval. No further action required.
CFW57	25/08/2022	Water Elevation (mAHD)	11th exceedance – investigation The purpose of bore CFW57 is monitoring of the groundwater response to mining/recovery in Carrington and the NV TSF. Groundwater levels in bore CFW57 have gradually increased since February 2020 with a sharp increase between September 2021 and September 2022 in

Site	Date	Trigger Limit Breached	Response Action
			response to above average rainfall. It is noted that the trigger level has already been aligned with the EPL conditions in version 3.4 of the WMP which is currently with DPE for approval. No further action required.
BZ2A(1)	23/08/2022	Field pH (pH unit)	1st exceedance - monitor
BZ3-3	23/08/2022	Field pH (pH unit)	1st exceedance - monitor
PB01(ALL)	2/08/2022	Field pH (pH unit)	1st exceedance - monitor
Hobdens Well	23/08/2022	Field pH (pH unit)	1st exceedance - monitor
NPZ2	15/09/2022	Field Electrical Conductivity (µS/cm)	1st exceedance - monitor
CGW51A	27/09/2022	Field pH (pH unit)	1st exceedance - monitor
CGW52A	27/09/2022	Water Elevation (mAHD)	1st exceedance - monitor
CGW53	27/09/2022	Field pH (pH unit)	1st exceedance - monitor
CGW53A	27/09/2022	Water Elevation (mAHD)	3rd exceedance. Investigation The purpose of bore CGW53a is monitoring of the groundwater response to mining/recovery in Carrington and the NV TSF. Groundwater levels in bore CGW53a have gradually increased since December 2019 with a sharp increase between September 2021 and September 2022 in response to above average rainfall. It is noted that the trigger level has already been aligned with the EPL conditions in version 3.4 of the WMP which is currently with DPE for approval. No further action required.
CGW55A	27/09/2022	Water Elevation (mAHD)	3rd exceedance. Investigation. The purpose of bore CGW55a is monitoring of the groundwater response to mining/recovery in Carrington and the NV TSF. Groundwater levels in bore CGW55a have gradually increased since March 2020 with a sharp increase between September 2021 and September 2022 in response to above average rainfall.

Site	Date	Trigger Limit Breached	Response Action
			It is noted that the trigger level has already been aligned with the EPL conditions in version 3.4 of the WMP which is currently with DPE for approval. No further action required.

4 Blasting

HVO maintains a network of blast monitoring units located at nearby privately owned residences and function as regulatory compliance monitors. The location of these monitors can be found in **Figure 78**. Blasting criteria for HVO are summarised in Error! Reference source not found.**4**.

Table 4 - Blasting Criteria

Airblast Overpressure (dBL)	Comments
115	5% of the total number of blasts in a 12-month period
120	0% of blasts
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12-month period
10	0% of blasts

4.1 Blast Monitoring Results

Twenty three (23) blasts were initiated at HVO during the reporting period. Blast monitoring results for the period are shown in **Table 5** and **Table 6**.

Table 5 - Overpressure Blast Monitoring Results for the reporting period

Date and Time	Moses Crossing (dBL)	Jerrys Plains Village (dBL)	Maison Dieu (dBL)	Warkworth (dBL)	Knodlers Lane (dBL)
1/09/2022 16:09	83.77	82.65	91.28	84.15	84.47
2/09/2022 11:37	92.4	92.69	101.87	89.35	97.86
2/09/2022 13:15	90.63	87.03	83.34	88.55	83.67
6/09/2022 13:17	94.02	101.35	97.12	97.86	95.27
6/09/2022 13:18	88.18	102.73	99.7	98.3	94.83
8/09/2022 12:54	85.03	101.86	93.39	98.11	85.44
9/09/2022 16:16	83.19	78.45	103.63	98.36	98.76
10/09/2022 13:13	84.76	93.08	103.18	105.36	94.0
12/09/2022 13:08	102.07	111.06	110.86	107.13	106.51
13/09/2022 9:57	79.13	77.25	87.17	80.05	82.08
14/09/2022 13:01	96.53	97.85	93.25	93.48	94.18
15/09/2022 13:03	93.05	97.39	102.69	98.13	98.24
16/09/2022 12:55	86.84	89.87	84.65	92.77	107.55
19/09/2022 12:52	80.61	108.42	90.98	93.93	106.28
19/09/2022 12:53	89.33	110.2	103.81	107.51	114.19
19/09/2022 12:53	89.33	108.79	103.81	107.51	114.19
20/09/2022 11:26	99.64	96.68	89.16	89.58	88.13
20/09/2022 11:33	97.42	94.88	87.38	90.77	92.04
20/09/2022 13:22	89.54	90.57	93.35	78.34	80.16
23/09/2022 13:03	95.52	95.27	96	81.37	92.52
26/09/2022 15:05	100.38	93.87	100.23	93.92	90.7
28/09/2022 13:35	92.96	86.85	96.11	96.68	101
30/09/2022 14:27	105.69	100.42	107.11	94.93	110.13

Table 6- Ground Vibration Blast Monitoring Results for the reporting period

Date and Time	Moses Crossing (mm/s)	Jerrys Plains Village (mm/s)	Maison Dieu (mm/s)	Warkworth (mm/s)	Knodlers Lane (mm/s)
1/09/2022 16:09	0.11	0.05	0.06	0.24	0.07
2/09/2022 11:37	0.13	0.06	0.18	0.45	0.2
2/09/2022 13:15	0.2	0.15	0.09	0.24	0.09
6/09/2022 13:17	0.2	0.08	0.5	0.96	0.46
6/09/2022 13:18	0.11	0.04	0.22	0.68	0.15
8/09/2022 12:54	0.15	0.11	0.06	1.29	0.08
9/09/2022 16:16	0.24	0.1	0.66	1.13	0.57
10/09/2022 13:13	0.16	0.05	0.19	0.45	0.17
12/09/2022 13:08	0.13	0.09	0.04	0.34	0.08
13/09/2022 9:57	0.13	0.03	0.14	0.4	0.16
14/09/2022 13:01	0.14	0.09	0.05	0.14	0.09
15/09/2022 13:03	0.14	0.1	0.03	0.75	0.08
16/09/2022 12:55	0.13	0.04	0.04	0.26	0.08
19/09/2022 12:52	0.65	0.04	0.35	0.74	0.32
19/09/2022 12:53	0.65	0.05	0.35	0.74	0.32
19/09/2022 12:53	0.34	0.05	0.35	0.74	0.32
20/09/2022 11:26	0.16	0.05	0.06	0.25	0.08
20/09/2022 11:33	0.23	0.06	0.07	0.38	0.09
20/09/2022 13:22	0.11	0.05	0.03	0.11	0.08
23/09/2022 13:03	0.12	0.03	0.07	0.18	0.09
26/09/2022 15:05	0.12	0.07	0.05	0.27	0.08
28/09/2022 13:35	0.26	0.07	0.08	0.58	0.09
30/09/2022 14:27	0.25	0.12	0.72	1.66	0.79

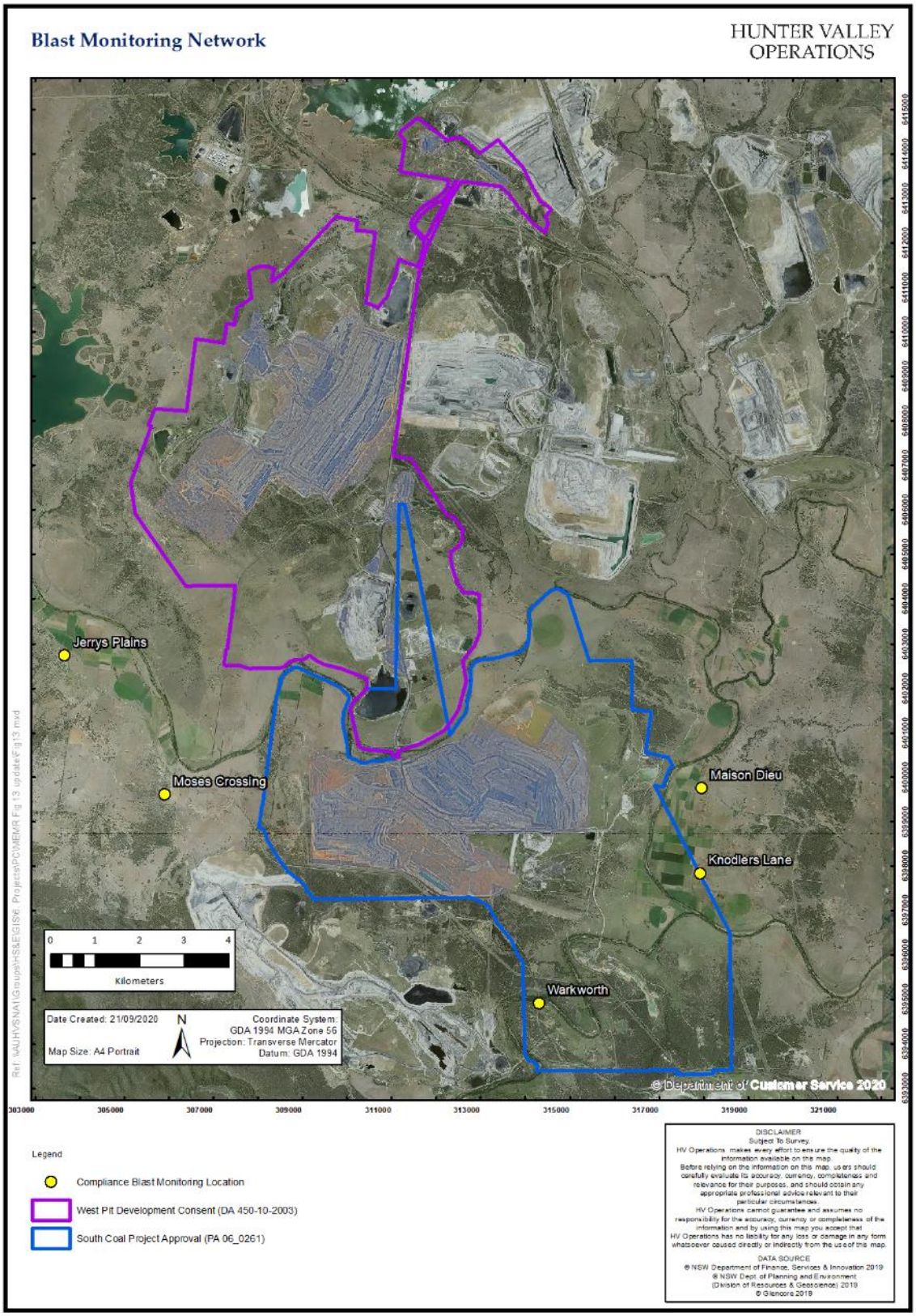

Figure 78 - Blast Monitoring Location Plan

5 Noise

Routine attended noise monitoring occurs at defined locations around HVO, as described in the HVO Noise Monitoring Program. The noise monitoring aims to quantify and describe the acoustic environment around the site and compare results with specified limits. The attended noise monitoring locations are displayed in **Figure 79**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations around HVO during the night period of the 19 September 2022.

Monitoring results are detailed in **Table 7** to **Table 11.**

Table 7 - LAeq,15minute HVO North Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO North L_{Aeq} [3,4,5,6,]	Exceedance[4,5]
Shearers Lane	*19/09/2022 21:17*	1.9	D	35	Yes	IA	Nil
Knodlers Lane	*19/09/2022 22:13*	2	D	35	Yes	IA	Nil
Maison Dieu	*19/09/2022 21:45*	1.3	F	35	Yes	IA	Nil
Long Point (Dights Crossing)	*19/09/2022 23:11*	2.6	D	35	Yes	IA	Nil
Kilburnie South	*19/09/2022 23:16*	2.6	D	39	Yes	IA	Nil
Jerrys Plains East	*19/09/2022 22:56*	2.2	D	39	Yes	IA	Nil
Jerrys Plains Village	*19/09/2022 21:28*	1.4	E	40	Yes	IA	Nil
Jerrys Plains West	*19/09/2022 21:06*	2.6	D	40	Yes	IA	Nil
HVGC	*19/09/2022 23:46*	2.3	D	NA	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Corporate AWS using logged meteorological data;
2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3°C/100m (G stability class);
3. Site-only L_{Aeq} 15 minute attributed to HVO North Pit Area, including modifying factors if applicable;
4. Bold results in red indicate exceedance of criterion;
5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval therefore criterion not applicable;

Table 8 - LAeq,15minute HVO North Against Land Acquisition Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO North L_{Aeq} [3,4,6,]	Exceedance[4,5]
Shearers Lane	*19/09/2022 21:17*	1.9	D	41	Yes	IA	Nil
Knodlers Lane	*19/09/2022 22:13*	2	D	41	Yes	IA	Nil
Maison Dieu	*19/09/2022 21:45*	1.3	F	41	Yes	IA	Nil
Long Point (Dights Crossing)	*19/09/2022 23:11*	2.6	D	41	Yes	IA	Nil
Kilburnie South	*19/09/2022 23:16*	2.6	D	41	Yes	IA	Nil
Jerrys Plains East	*19/09/2022 22:56*	2.2	D	41	Yes	IA	Nil
Jerrys Plains Village	*19/09/2022 21:28*	1.4	E	41	Yes	IA	Nil
Jerrys Plains West	*19/09/2022 21:06*	2.6	D	41	Yes	IA	Nil
HVGC	*19/09/2022 23:46*	2.3	D	NA	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Corporate AWS using logged meteorological data;

2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3°C/100m (G stability class);

3. Site-only LAeq,15minute attributed to HVO North Pit Area, including modifying factors if applicable;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

Table 9 - LA1,1minute HVO North Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO North L_{Aeq} [3,4,6,]	Exceedance[4,5]
Shearers Lane	*19/09/2022 21:17*	1.9	D	46	Yes	IA	Nil
Knodlers Lane	*19/09/2022 22:13*	2	D	46	Yes	IA	Nil
Maison Dieu	*19/09/2022 21:45*	1.3	F	46	Yes	IA	Nil
Long Point (Dights Crossing)	*19/09/2022 23:11*	2.6	D	46	Yes	IA	Nil
Kilburnie South	*19/09/2022 23:16*	2.6	D	46	Yes	IA	Nil
Jerrys Plains East	*19/09/2022 22:56*	2.2	D	46	Yes	IA	Nil
Jerrys Plains Village	*19/09/2022 21:28*	1.4	E	46	Yes	IA	Nil
Jerrys Plains West	*19/09/2022 21:06*	2.6	D	46	Yes	IA	Nil
HVGC	*19/09/2022 23:46*	2.3	D	NA	Yes	IA	Nil
Kilburnie South	*19/09/2022 21:17*	1.9	D	46	Yes	IA	Nil
Jerrys Plains East	*19/09/2022 22:13*	2	D	46	Yes	IA	Nil
Jerrys Plains Village	*19/09/2022 21:45*	1.3	F	46	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Corporate AWS using logged meteorological data;

2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3°C/100m (G stability class);

3. Site-only LA1,1minute attributed to HVO North Pit Area;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

Table 10- LAeq,15minute HVO South Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO South L_{Aeq} [3,4,6,]	Exceedance[4,5]
Shearers Lane	*19/09/2022 21:17*	3.2	E	41	No	28	NA
Knodlers Lane	*19/09/2022 22:13*	2.6	F	40	No	32	NA
Maison Dieu	*19/09/2022 21:45*	0.8	F	39	Yes	IA	Nil
Long Point (Dights Crossing)	*19/09/2022 23:11*	1.2	E	37	Yes	IA	Nil
Kilburnie South	*19/09/2022 23:16*	1.2	E	39	Yes	IA	Nil
Jerrys Plains East	*19/09/2022 22:56*	0.9	F	38	Yes	IA	Nil
Jerrys Plains Village	*19/09/2022 21:28*	1.9	F	35	Yes	IA	Nil
Jerrys Plains West	*19/09/2022 21:06*	3.9	E	35	No	IA	NA
HVGC	*19/09/2022 23:46*	0.8	F	35	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Cheshunt AWS using logged meteorological data;

2. Noise criteria apply under meteorological conditions of wind speeds up to 3 m/s measured at 10 metres above ground level and temperature inversion conditions of up to 3°C/100m (G stability class);

3. Site-only LAeq,15minute attributed to HVO South Pit Area, including modifying factors if applicable;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

Table 11 - LA1,1minute HVO South Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO South L_{Aeq} [3,4,6,7]	Exceedance[4,5]
Shearers Lane	*19/09/2022 21:17*	3.2	E	45	No	34	NA
Knodlers Lane	*19/09/2022 22:13*	2.6	F	45	No	37	NA
Maison Dieu	*19/09/2022 21:45*	0.8	F	45	Yes	IA	Nil
Long Point (Dights Crossing)	*19/09/2022 23:11*	1.2	E	45	Yes	IA	Nil
Kilburnie South	*19/09/2022 23:16*	1.2	E	45	Yes	IA	Nil
Jerrys Plains East	*19/09/2022 22:56*	0.9	F	45	Yes	IA	Nil
Jerrys Plains Village	*19/09/2022 21:28*	1.9	F	45	Yes	IA	Nil
Jerrys Plains West	*19/09/2022 21:06*	3.9	E	45	No	IA	NA
HVGC	*19/09/2022 23:46*	0.8	F	NA	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Cheshunt AWS using logged meteorological data;

2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, stability category F conditions and wind speeds greater than 2 m/s measured at 10m above ground level, or stability category G conditions;

3. Site-only LA1,1minute attributed to HVO;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

5.2 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. No penalties were applied for monitoring undertaken through the reporting period. The assessments for the low frequency noise are shown in Error! Reference source not found.**2** and

3.

Table 12 - Modifying Factor Assessment HVO North for the Reporting Period

Location	Date and Time	Measured HVO North L_{Aeq}	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of NPfI Reference Spectrum[1,2]	Total Penalty [2]
Shearers Lane	*19/09/2022 21:17*	IA	Yes	No	No	NA	No	NA	Nil
Knodlers Lane	*19/09/2022 22:13*	IA	Yes	No	No	NA	No	NA	Nil
Maison Dieu	*19/09/2022 21:45*	IA	Yes	No	No	NA	No	NA	Nil
Long Point (Dights Crossing)	*19/09/2022 23:11*	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	*19/09/2022 23:16*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*19/09/2022 22:56*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*19/09/2022 21:28*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains West	*19/09/2022 21:06*	IA	Yes	No	No	NA	No	NA	Nil
HVGC	*19/09/2022 23:46*	IA	Yes	No	No	NA	No	NA	Nil

1. NA denotes 'not applicable'; and

2. Bold results indicate that application of NPfI modifying factor/s is required

Table 13 - Modifying Factor Assessment HVO South for the Reporting Period

Location	Date and Time	Measured HVO South L_{Aeq}	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of NPfI Reference Spectrum [1,2]	Total Penalty [2]
Shearers Lane	*19/09/2022 21:17*	28	No	NA	NA	NA	NA	NA	NA
Knodlers Lane	*19/09/2022 22:13*	32	No	NA	NA	NA	NA	NA	NA
Maison Dieu	*19/09/2022 21:45*	IA	Yes	No	No	NA	No	NA	Nil
Long Point (Dights Crossing)	*19/09/2022 23:11*	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	*19/09/2022 23:16*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*19/09/2022 22:56*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*19/09/2022 21:28*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains West	*19/09/2022 21:06*	IA	No	NA	NA	NA	NA	NA	NA
HVGC	*19/09/2022 23:46*	IA	Yes	No	No	NA	No	NA	Nil

1. NA denotes 'not applicable'; and

2. Bold results indicate that application of NPfI modifying factor/s is required

5.3 Real Time Noise Monitoring

HVO utilises a network of real-time directional noise monitors to manage noise impacts on a continuous basis, shown in **Figure 79**. Noise alarms are in place at five monitoring locations (Knodlers Lane, Maison Dieu, Jerrys Plains, Moses Crossing, and Long Point) which alert HVO staff to elevated noise levels that require investigation.

HVO investigates and responds to noise alarms with appropriate modification to operations. Changes in response to a noise alarm can include replacing equipment with alternative units, changing or relocating tasks, or shutting down equipment. It should be noted that this assessment does not compliment or conflict with attended noise monitoring detailed in **Section 5.1**. Real time monitoring data includes non-mine noise sources such as animals, road traffic and weather.

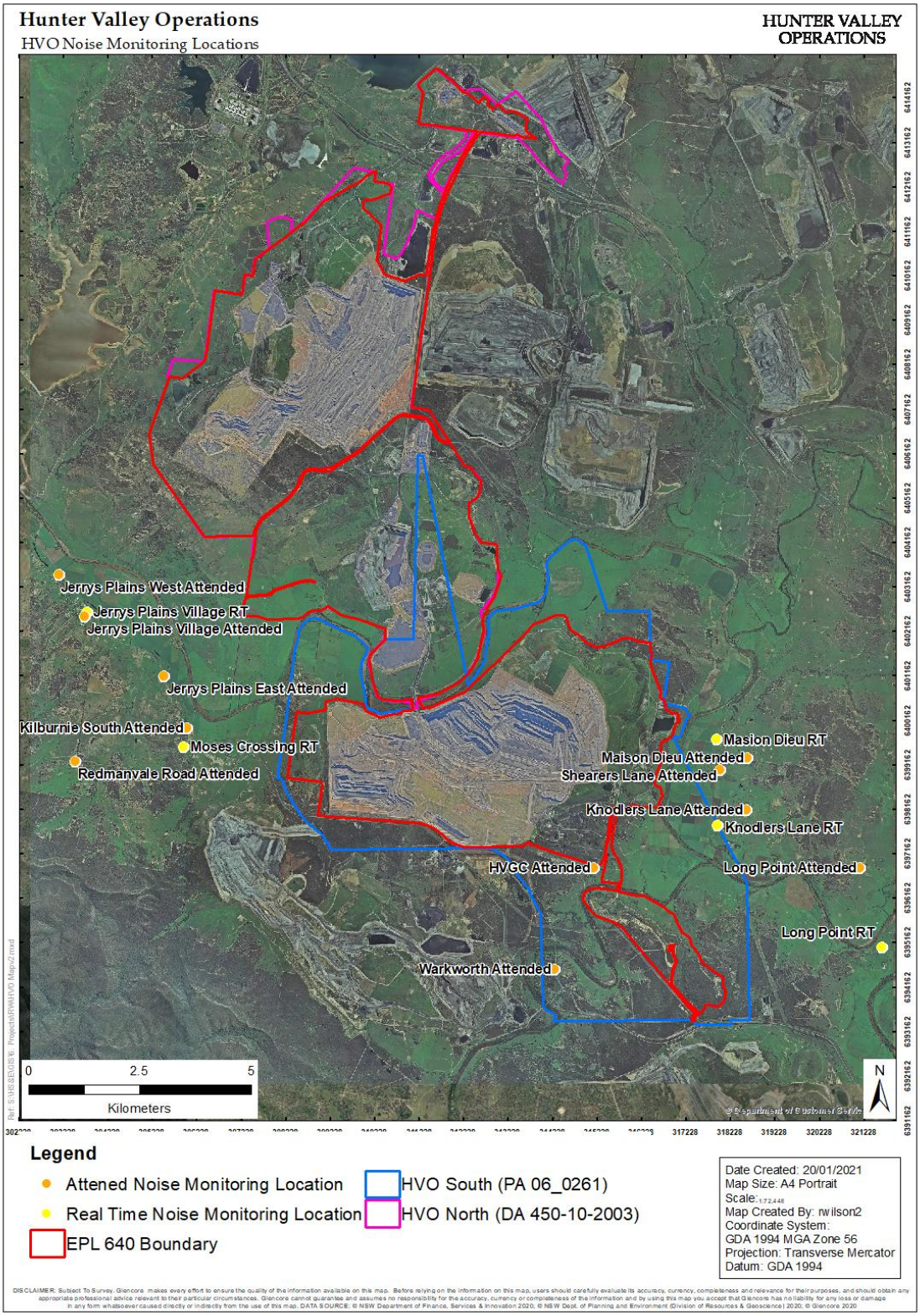

Figure 79 - Noise Monitoring Location Plan

6 Operational Downtime

A total of 15.1 hours of equipment downtime was logged in response to real time monitoring and inspections for environmental factors such as noise and dust during the reporting period. Operational downtime by equipment type is show in **Figure 80.** Note that these delays are instances where operations were completely stopped and does not include occasions where operations were changed/modified but not stopped (e.g. changed from exposed dump to in-pit dump).

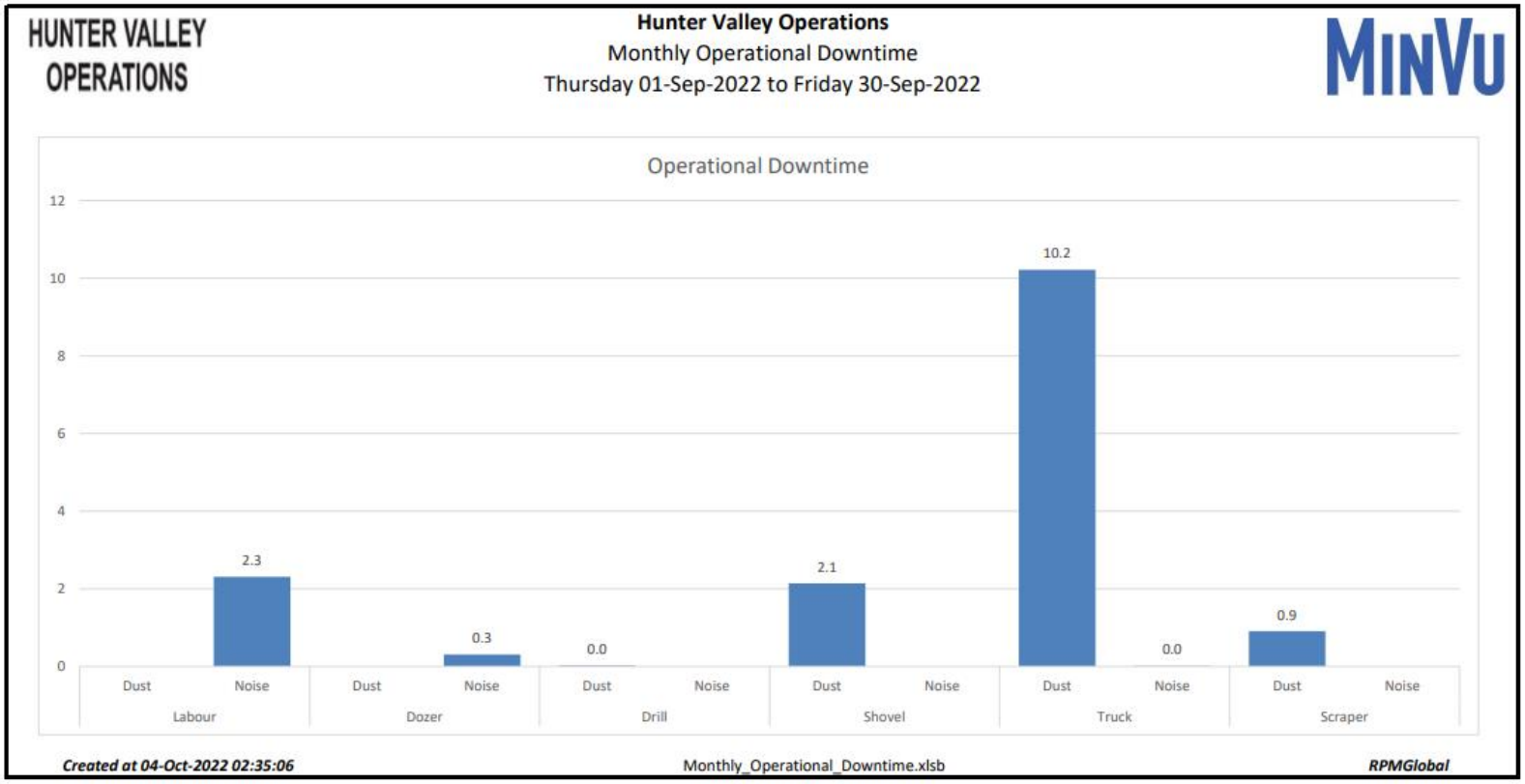

Figure 80 - Operational Downtime by Equipment Type for the reporting period

7 Rehabilitation

The following activities related to rehabilitation were completed during the reporting period:

- 30.21 Ha of land was reshaped
- 30.21 Ha of land was released (became available for the application of topsoil)
- 0 Ha of land was topsoiled
- 0 Ha of land was rehabilitated

Year to date progress is shown in **Figure 76**.

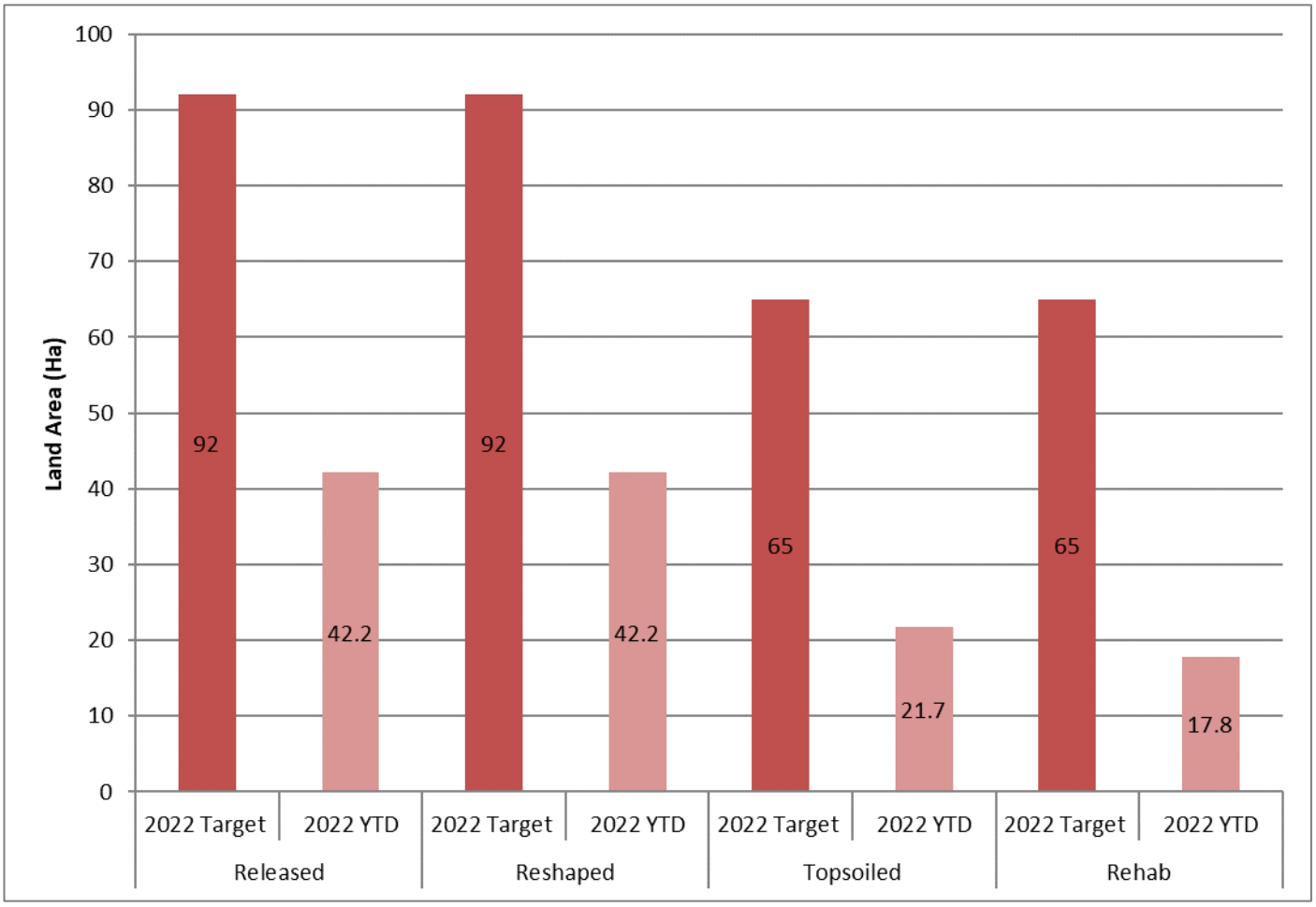

Figure 76 - Rehabilitation YTD August 2022

8 Complaints

No complaints were received during the reporting period.

Details of complaints received for 2022 are shown in Error! Reference source not found.**4**.

Table 14 - Complaints Summary 2022

Complaint Number	Date	Time	Complainant ID	Nature of Complaint	Mode of Complaint	Brief Description and Response
1	5 January	1.24pm	1	Blast	Community Hotline	• A complainant from Jerrys Plains called the Community Hotline at 1.24pm to mention that a blast fired at approximately 1:06pm was noisy and sounded like lighting had struck her house and that the windows rattled. • The blasting database was checked which confirmed that the blast was below the compliance criteria. • The Environment and Community Officer contacted the complainant who confirmed that a blast had been fired from HVO and informed the complainant of the investigation results.
2	11 February	1.05pm	2	Blast	SMS to Environment and Community Officer	• A complainant from Maison Dieu sent an SMS to the Environment and Community Officer at 1.05pm asking to record a complaint due to noise and movement from a blast fired at 1pm from HVO. • The Environment and Community Officer confirmed HVO blast firing times aligned with the complaint and called the complainant.

Complaint Number	Date	Time	Complainant ID	Nature of Complaint	Mode of Complaint	Brief Description and Response
						• The blasting database was checked which recorded overpressure and ground vibration levels at the Maison Dieu blast monitor which is the closest monitor to the complainant's property and recorded low overpressure and vibration.
3	19 March	7.35pm	3	Driving	Community Hotline	• A member of the public made a complaint about reckless driving from a vehicle observed to be entering Golden Highway from an HVO access road. • Complaint was communicated internally, however vehicle was unable to be identified. • A slide was included in the presentation pack at the quarterly HVO Safety Training Day about the importance of safe driving practices when driving to and from HVO.
4	19 September	1.02pm	4	Dust	Community Hotline	• A complainant from Long Point made a complaint about dust following two blasts at 12.52 and 12.53 pm from HVO. • The Environment and Community Officer contacted the complainant to confirm that the dust was from a blast fired at HVO and that the complaint would be recorded. The Environment and Community Officer offered a face-to-face meeting to discuss the complaint in person. • The blasting permissions for wind speed and directions between 280 and 311 degrees will be reviewed

9 Environmental Incidents

There was one reportable environmental incident during the reporting period:

- **13/09/2022 – HVGC PM10 High Volume Air Sampler missed sample**

Environmental contractor was changing out the filter at the Gliding Club PM10 HVAS, following the sample run on 13 September 2022, when a gust of wind blew the filter off the cassette. The filter was damaged and could not be analysed. The contractor supervisor spoke with their team and reminded them under such conditions they should take the filter cassette to the vehicle to change the filter, out of the wind. The Department of Planning and Environment were notified of the missed sample.

Appendix A - Meteorological Data

Date	Air Temp Max (°C)	Air Temp Min (°C)	Relative Humidity (Max %)	Relative Humidity (Min %)	Solar Radiation Maximum (W/Sq. M)	Average Wind Direction (°)	Average Wind Speed (m/sec)	Rainfall (mm)
1/09/2022	21.37	10.4	38.25	96.9	958	162.7	1.265	0
2/09/2022	16.04	10.36	56.9	93	389.6	204	1.897	3.8
3/09/2022	12.24	8.33	69.42	93.7	306.4	135.6	3.928	8.4
4/09/2022	16.65	8.43	47.27	93.5	1214	134.9	3.487	4.8
5/09/2022	17.54	6.77	36.91	94.6	1019	185.3	1.85	0
6/09/2022	17.14	7.199	46.65	89.3	1120	117.4	1.958	0
7/09/2022	19.24	6.046	44.59	96.5	1070	136	1.941	0
8/09/2022	20.67	8.31	43.78	94.6	781.9	135.6	1.39	0
9/09/2022	21.36	11.59	35.85	94.3	1265	223.7	1.946	3.4
10/09/2022	19.06	10.17	42.66	90.6	1210	280.9	4.394	0.6
11/09/2022	18.56	8.56	37.7	81.6	1052	284.8	4.266	0
12/09/2022	19.27	7.076	29.83	74.86	857	277.9	3.503	0
13/09/2022	19.01	8.47	34.18	86.2	1111	186.2	2.373	0
14/09/2022	18.3	6.947	36.07	92.9	1084	114.4	2.308	0
15/09/2022	14.75	9.14	76.39	96.8	904	162.9	1.293	21.6
16/09/2022	20.93	10.82	30.79	93.7	1047	285.2	4.482	7.2
17/09/2022	21.87	12.17	28.06	60.69	1140	277.5	4.947	0
18/09/2022	19.95	11.1	33.93	60.66	1183	289.1	5.84	0
19/09/2022	20.91	11.15	28.48	66.76	1019	274.6	3.962	0
20/09/2022	21.02	7.546	39.15	81.2	894	174	2.176	0
21/09/2022	18.61	9.85	59.41	95.8	1178	136.1	1.305	5
22/09/2022	17.12	11.53	71.69	96.6	1021	118.9	3.703	18.4
23/09/2022	20.78	11.66	62.41	94.7	1174	123.5	2.45	0.2
24/09/2022	23.2	10.96	31.71	95.3	1295	234	2.377	2.2
25/09/2022	21.81	8.97	30.06	95.1	928	273	2.648	0.2

Date	Air Temp Max (°C)	Air Temp Min (°C)	Relative Humidity (Max %)	Relative Humidity (Min %)	Solar Radiation Maximum (W/Sq. M)	Average Wind Direction (°)	Average Wind Speed (m/sec)	Rainfall (mm)
26/09/2022	21.45	8.17	28.11	89	1419	226	1.427	0
27/09/2022	21.01	11	47.54	91.6	1281	197.3	1.764	0.4
28/09/2022	21.24	11.57	29.46	93.4	943	272.8	3.68	2.2
29/09/2022	19.78	9.24	48.59	93.3	1398	209.3	2.825	8.2
30/09/2022	17.79	11.43	60.67	93	1422	138.6	3.633	2.2