HUNTER VALLEY
OPERATIONS

MONTHLY ENVIRONMENTAL MONITORING REPORT – MARCH 2023

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TABLE OF CONTENTS

1 | Introduction 4

2 | Air Quality 4

2.1 | Meteorological Monitoring 4

2.1.1 | Rainfall 4

2.1.2 | Wind Speed and Direction 4

2.2 | Depositional Dust 7

2.3 | Suspended Particles 8

2.3.1 | HVAS PM_{10} Results 8

2.3.2 | HVAS $PM_{2.5}$ Results 10

2.3.3 | TSP Results 12

2.3.4 | Real Time PM_{10} Results 13

2.3.5 | Real Time Alarms for Air Quality 14

3 | Water Quality 15

3.1 | Surface Water 15

3.1.1 | Surface Water Trigger Tracking 23

3.2 | Site Water Use 30

3.3 | HRSTS Discharge 30

3.4 | Groundwater Monitoring Results 31

3.4.1 | Groundwater Trigger Tracking 33

4 | Blasting 61

4.1 | Blast Monitoring Results 62

5 | Noise 65

5.1 | Attended Noise Monitoring Results 65

5.2 | Low Frequency Assessment 68

5.3 | Real Time Noise Monitoring 70

6 | Operational Downtime 72

7 | Rehabilitation 73

8 | Complaints 74

9 | Environmental Incidents 75

Appendix A: Meteorological Data 76

FIGURES

Figure 1 - Rainfall Summary 2023 4
Figure 2 – HVO Corporate Wind Rose for the Reporting Period 5
Figure 3 – HVO Cheshunt Wind Rose for the Reporting Period 5
Figure 4 – Air Quality Monitoring Location Plan 6
Figure 5 - Depositional Dust Results for the Reporting Period 7
Figure 6 – Individual PM_{10} Results for the Reporting Period 8
Figure 7 – Year to Date Average PM10 as at end of the Reporting Period 9
Figure 8 - Results for the Reporting Period 10
Figure 9 - Year to Date Average PM2.5 as at end of the Reporting Period 11
Figure 10 - Year to Date Average Total Suspended Particulates as at end of the Reporting Period 12
Figure 11 – Real Time PM10 24hr for the Reporting Period 13
Figure 12 – Real Time PM_{10} Annual Average for the Reporting Period. 14
Figure 13 – HVO Surface Water Monitoring Locations 16
Figure 14 - Groundwater Monitoring Locations at HVO 32
Figure 15 - Blast Monitoring Location Plan 64
Figure 16 - Noise Monitoring Location Plan 71
Figure 17 - Operational Downtime by Equipment Type for the Reporting Period 72
Figure 18 - Rehabilitation YTD January 2023 73

TABLES

Table 1 - Rainfall data for the reporting period 4
Table 2 Surface Water Trigger Tracking - Q1 2023 24
Table 3 Groundwater Trigger Tracking 2023 ..... **Error! Bookmark not defined.**
Table 4 – Blasting Criteria 61
Table 5 – Overpressure Blast Monitoring Results for the reporting period 62
Table 6 – Ground Vibration Blast Monitoring Results for the reporting period 63
Table 7 - LAeq,15minute and 1minute HVO North Against Impact Assessment Criteria for the Reporting Period 66
Table 8 - LAeq,15minute and 1minute HVO South Against Impact Assessment Criteria for the Reporting Period 67
Table 9 - Modifying Factor Assessment HVO North for the Reporting Period 68
Table 10 - Modifying Factor Assessment HVO South for the Reporting Period 69
Table 11 – Complaints Summary 2023 74

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 31st March 2023 (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 2021, 2022 and 2023 trends are shown in Figure 1.

Table 1 - Rainfall data for the reporting period

2023	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
March	62.0	204.8

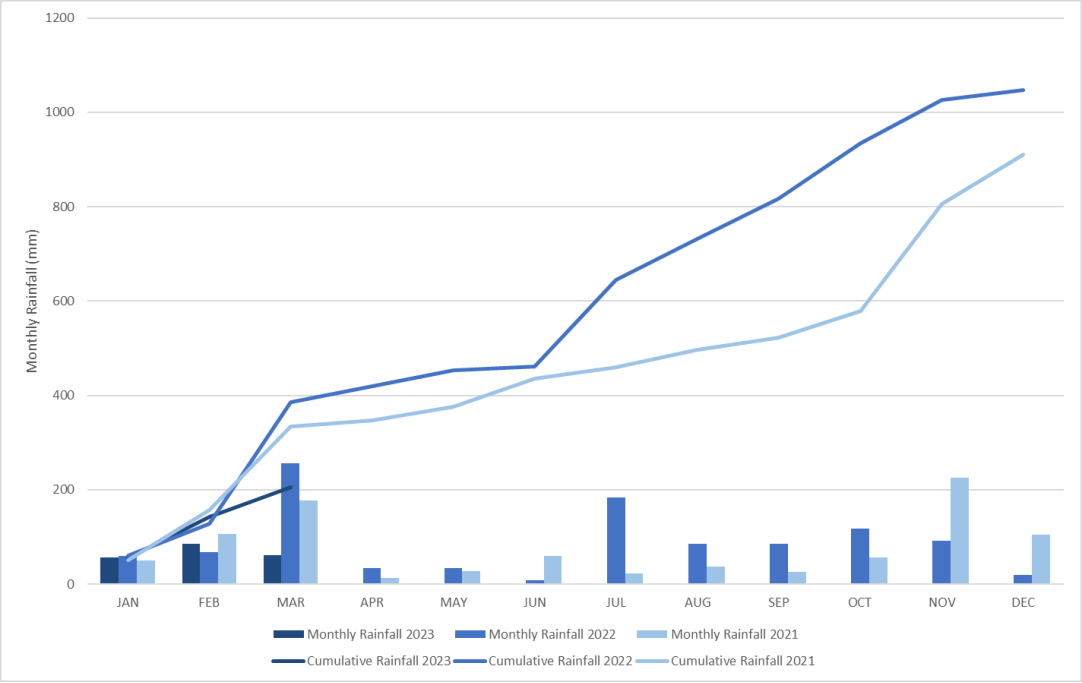

Figure 1 - Rainfall Summary 2023

2.1.2 | WIND SPEED AND DIRECTION

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

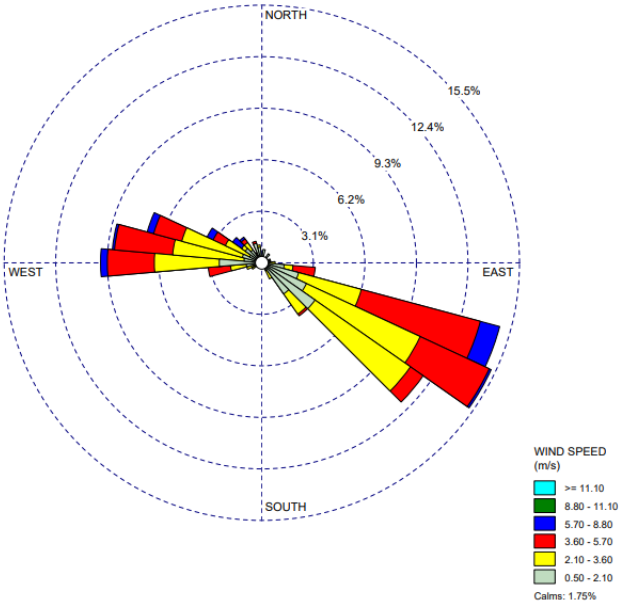

Figure 2 – HVO Corporate Wind Rose for the Reporting Period

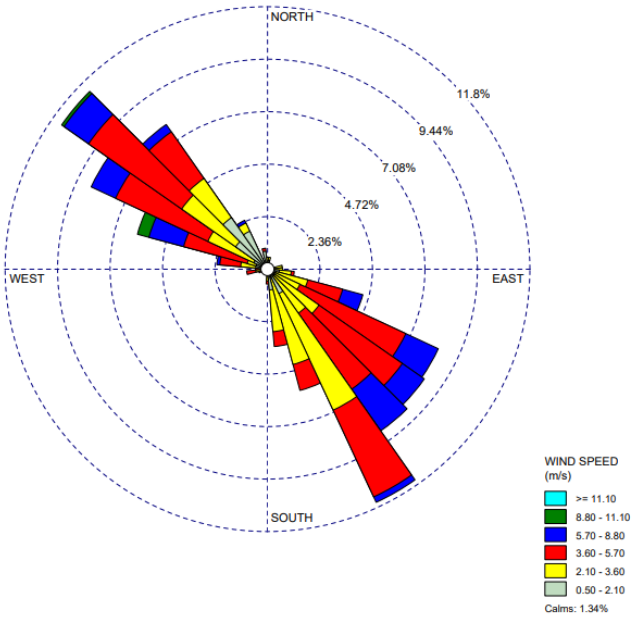

Figure 3 – HVO Cheshunt Wind Rose for the Reporting Period

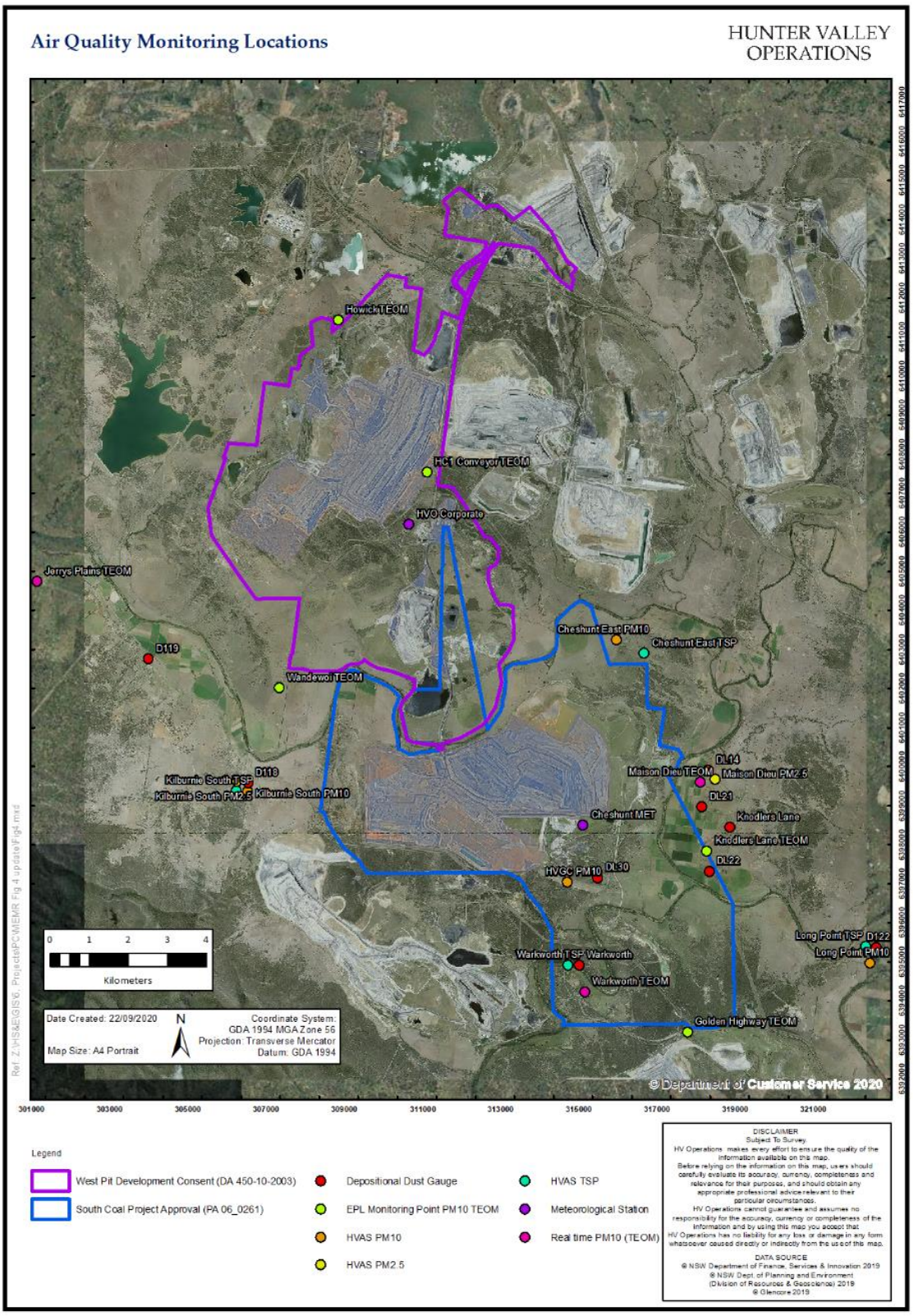

Figure 4 – Air Quality Monitoring Location Plan

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 2023 Annual Review.

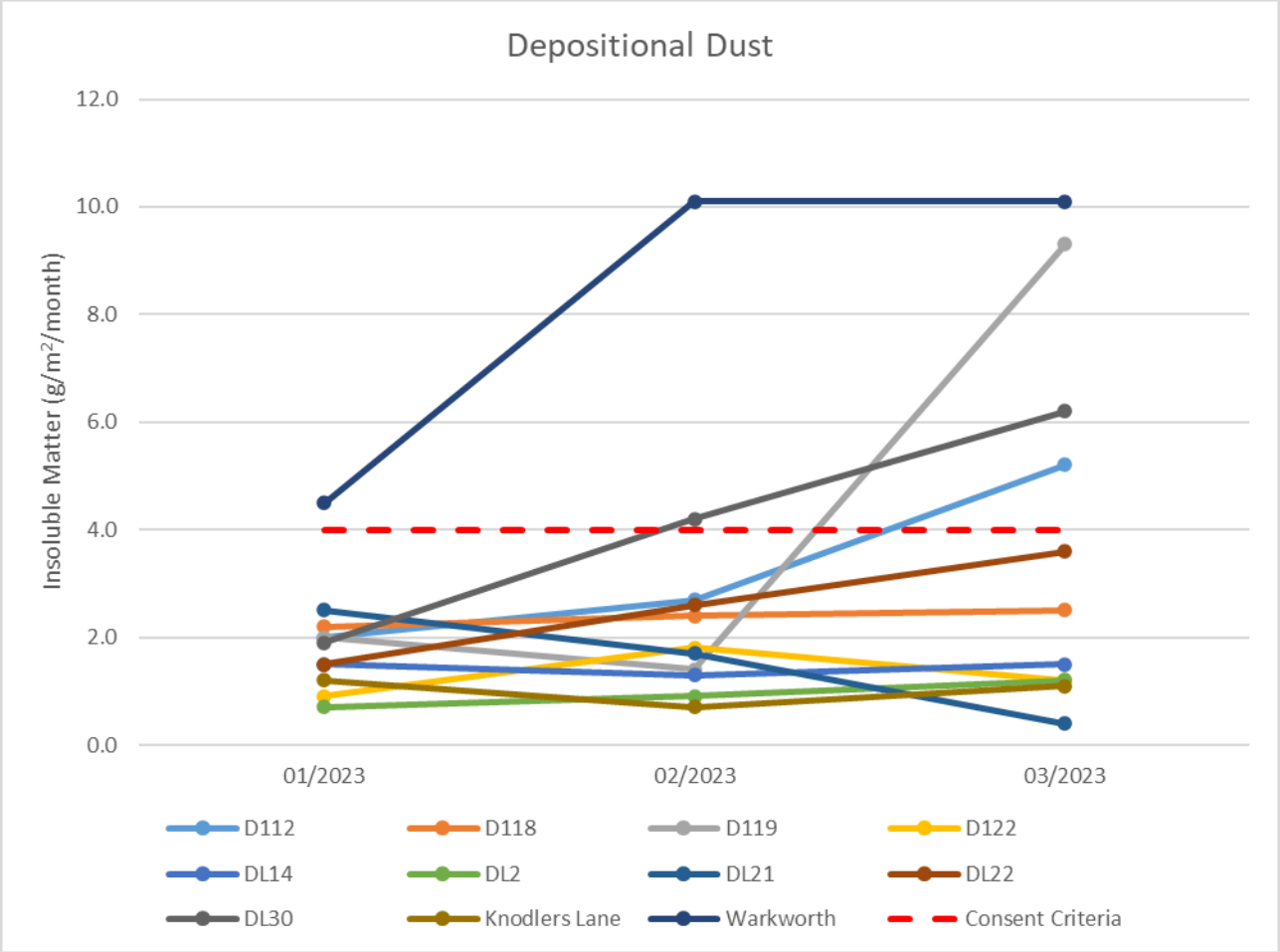

Figure 5 - Depositional Dust Results for the Reporting Period

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 (PM10). The Kilburnie South and Maison Dieu HVAS also monitor Particulate Matter <2.5µm (PM2.5). 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 PM10 results at each monitoring station against the short-term impact assessment criteria of 50µg/m^3. An exceedance was recorded on 6 March at Cheshunt East of 61.1µg/m^3 and at Gliding Club of 63.4 µg/m3. Internal investigations into these results deemed HVO's contribution to be below the short-term impact assessment criteria.

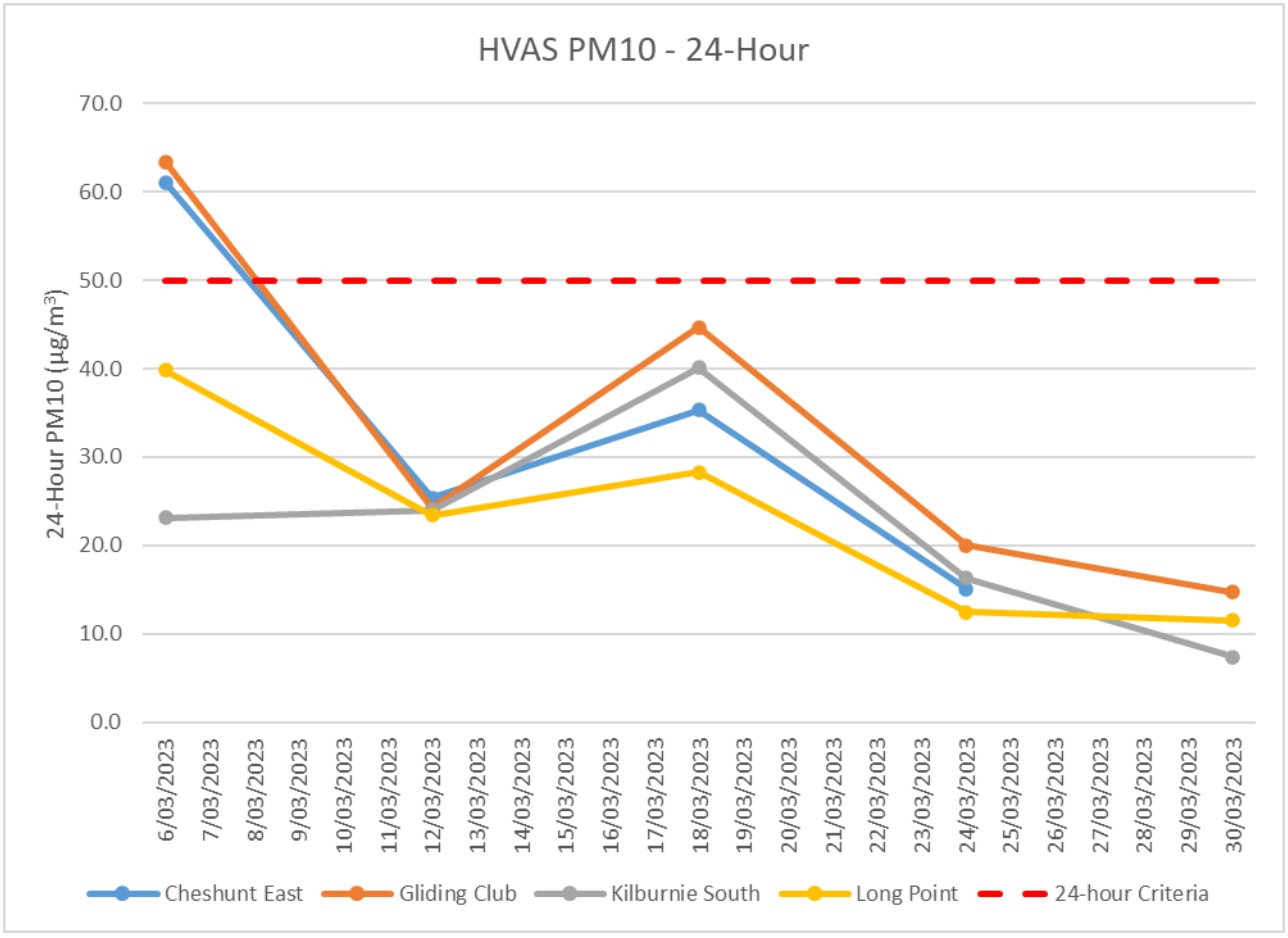

Figure 6 – Individual PM_{10} Results for the Reporting Period

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 2023 Annual Review.

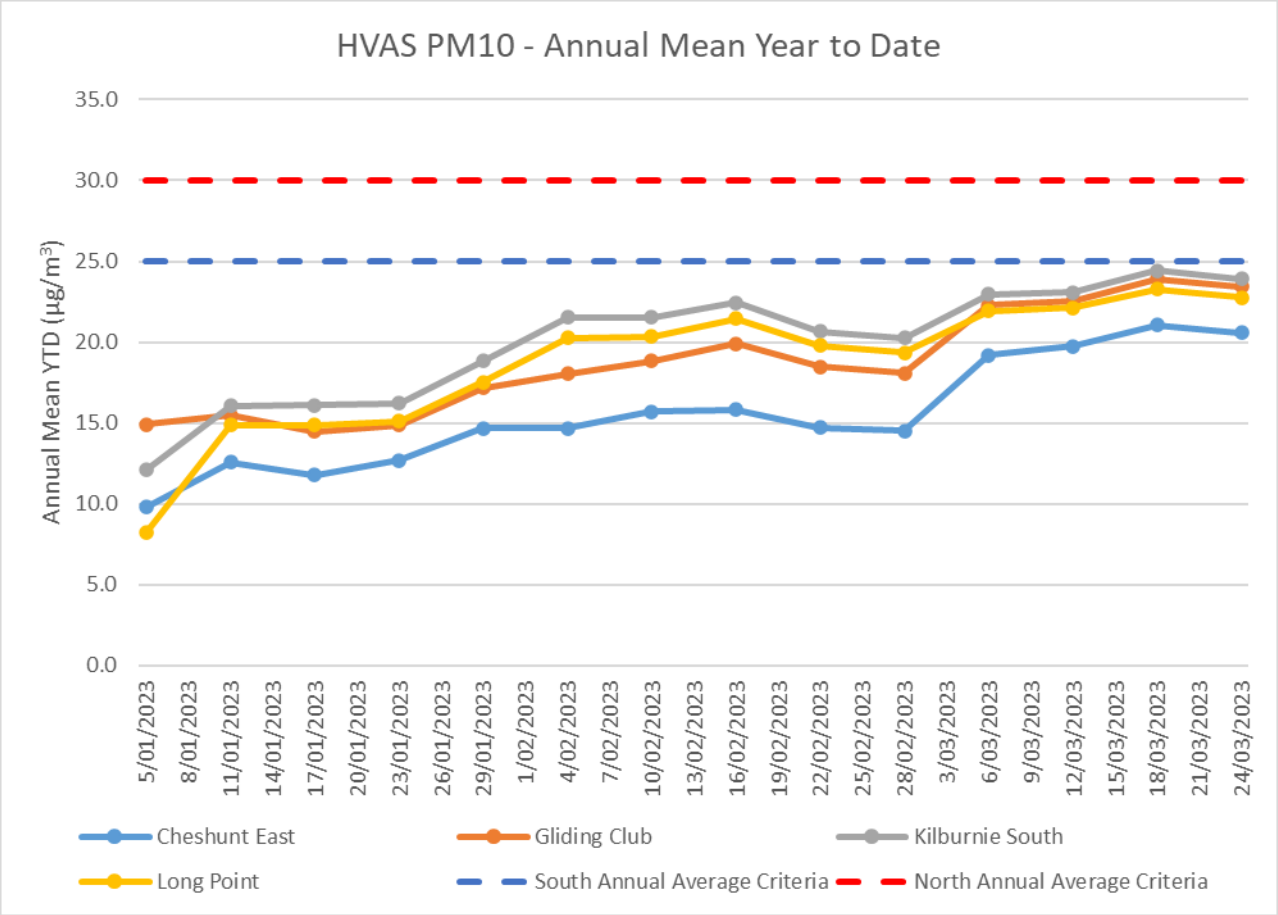

Figure 7 – Year to Date Average PM_{10} as at end of the Reporting Period

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 | HVAS $PM_{2.5}$ RESULTS

Figure 8 shows individual PM2.5 results at each monitoring station against the HVO South short-term impact assessment criteria of 25µg/m3.

An exceedance was recorded on 6 March at the Mason Dieu monitor and on 18 March at the Kilburnie South monitor. Internal investigations into these results deemed HVO's contribution to be below the short-term impact assessment criteria. HVO's contribution was 23 ug/m3 and 3ug/m3 respectively.

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

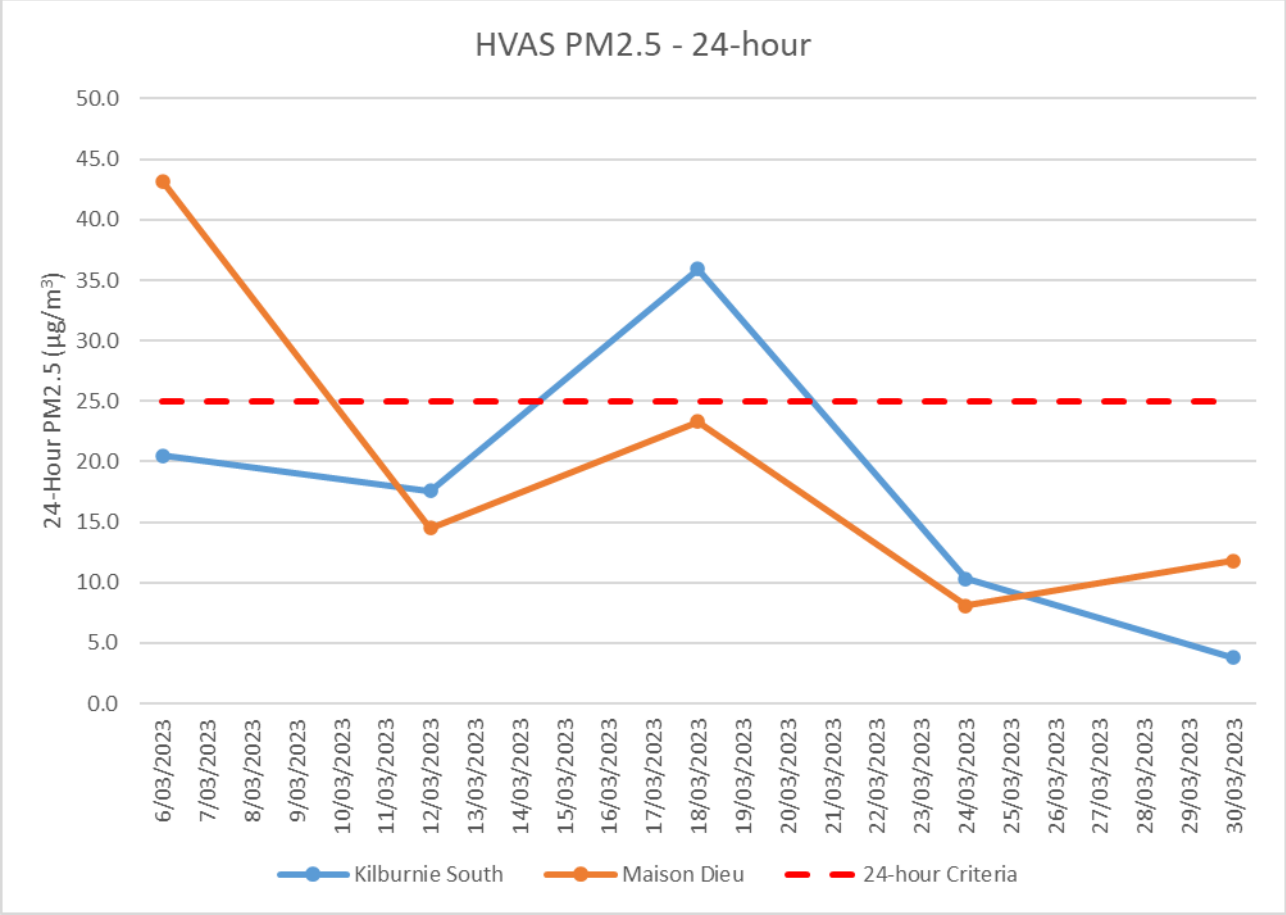

Figure 8 - Results for the Reporting Period

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 above the $PM_{2.5}$ Annual Rolling Mean criteria of 8µg/m3.

An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2023 Annual Review.

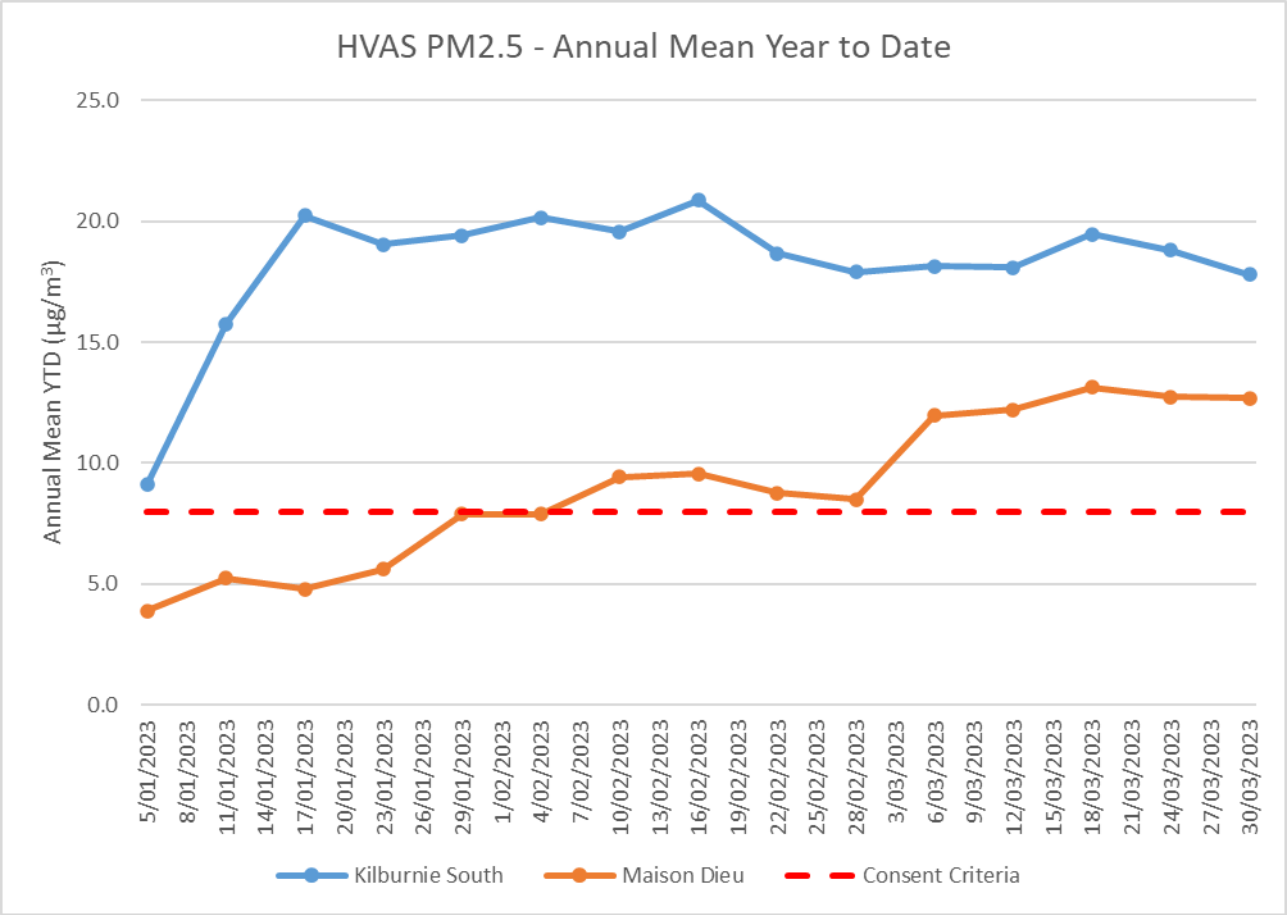

Figure 9 - Year to Date Average $PM_{2.5}$ as at end of the Reporting Period

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/m3.

Kilburnie South, Warkworth, and Wandewoi monitors, were above the relevant long-term impact assessment criteria during the reporting period. All other 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 2023 Annual Review.

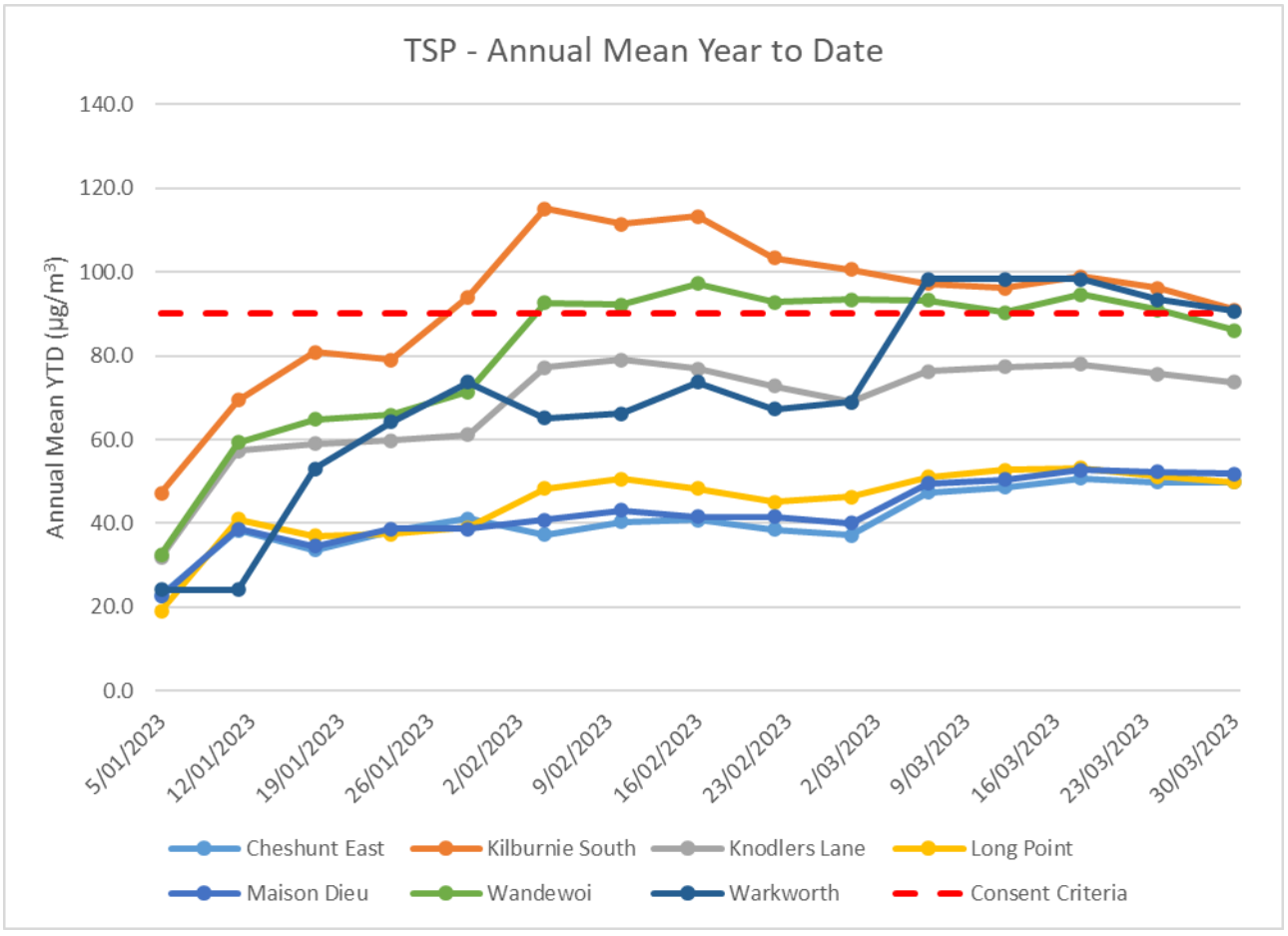

Figure 10 - Year to Date Average Total Suspended Particulates as at end of the Reporting Period

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 that the Knodlers Lane TEOM exceeded the PM10 24 hour average on 6th, 7th and 8th March and Warkworth TEOM exceeded the average on 7th, 8th and 20th March. These exceedances were investigated, and it was found that the maximum calculated HVO contribution was below the compliance limit. The year to date annual averages for each monitoring site are shown in Figure 12**.**

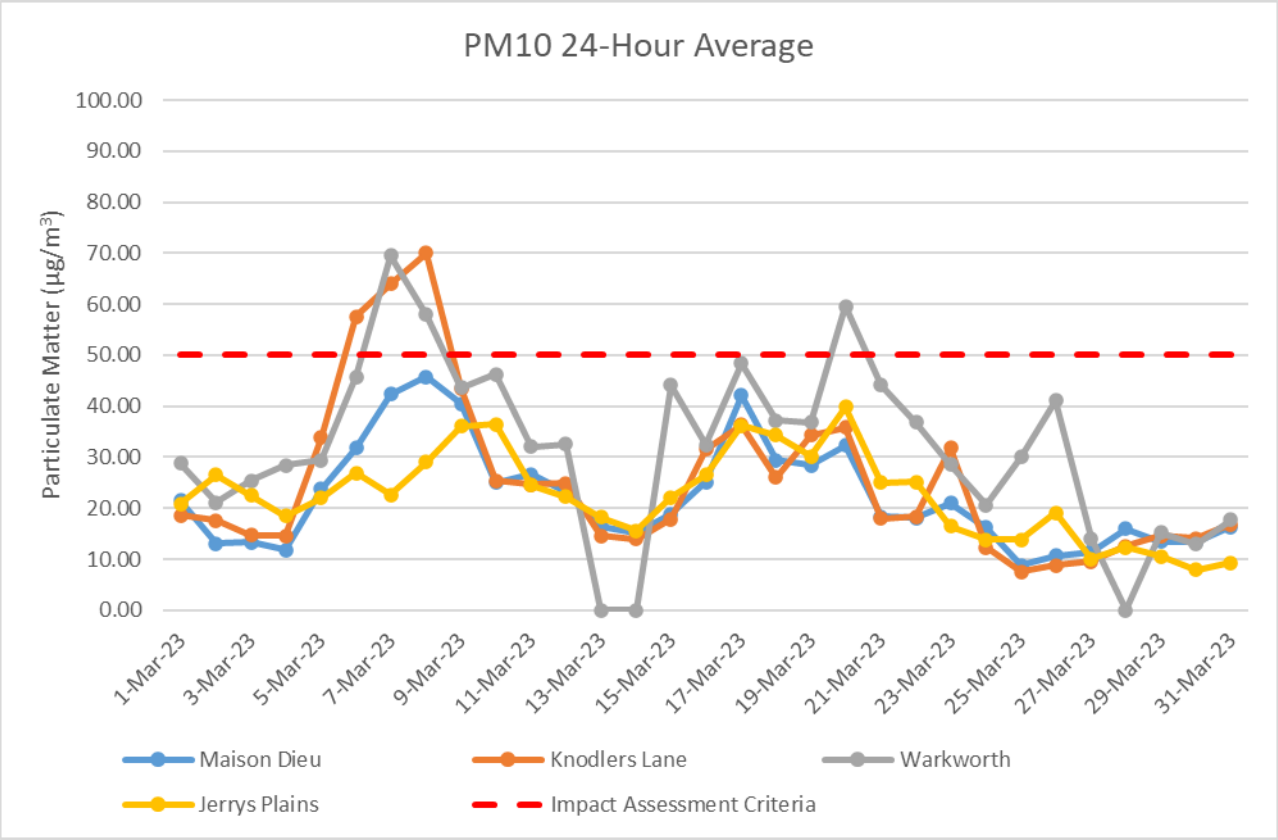

Figure 11 – Real Time PM_{10} 24hr for the Reporting Period

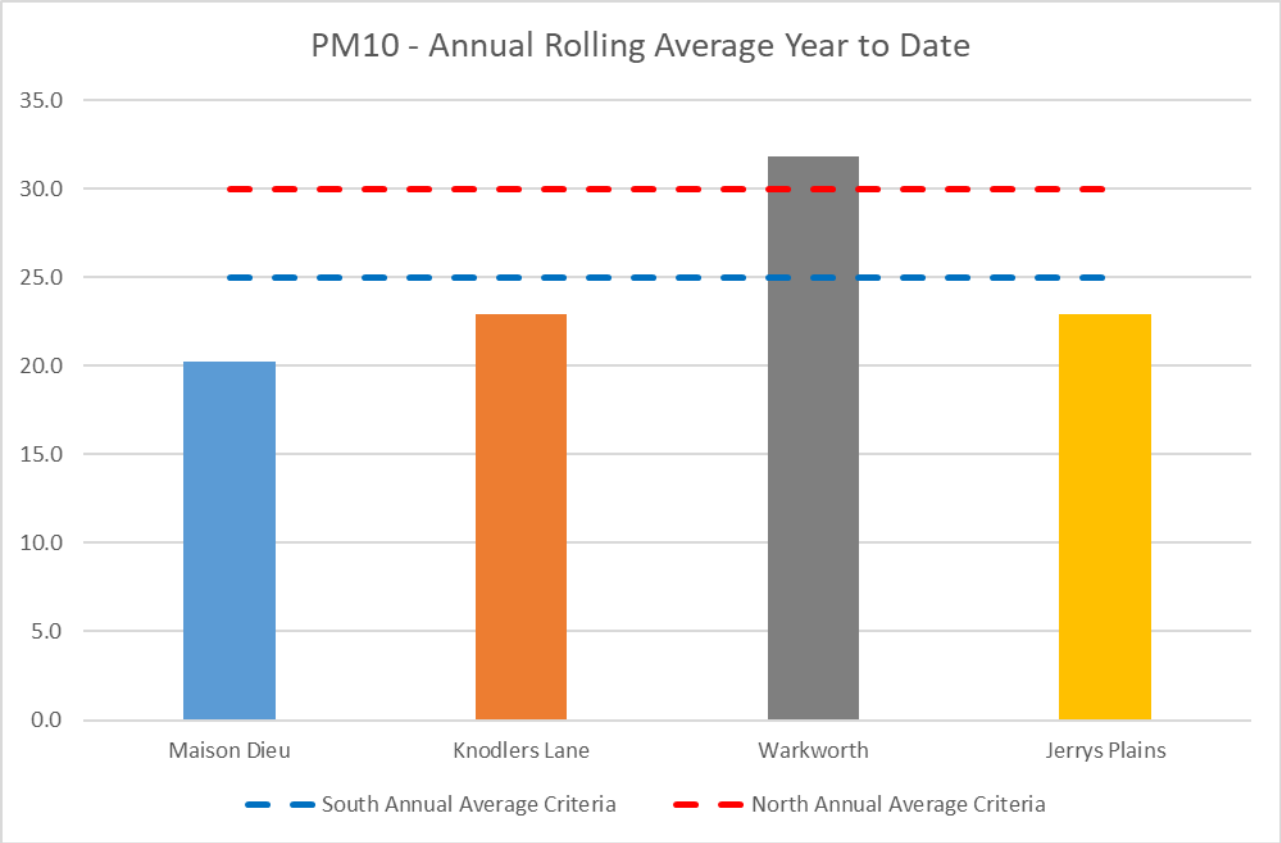

Figure 12 – Real Time PM_{10} Annual Average for the Reporting Period.

2.3.5 | REAL TIME ALARMS FOR AIR QUALITY

The real time monitoring system generated 114 automated air quality related alarms during the reporting period. 36 alarms related to adverse weather conditions and 76 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 on site dams, the Hunter River and other natural tributaries are provided in Figure 14 to Figure 25.

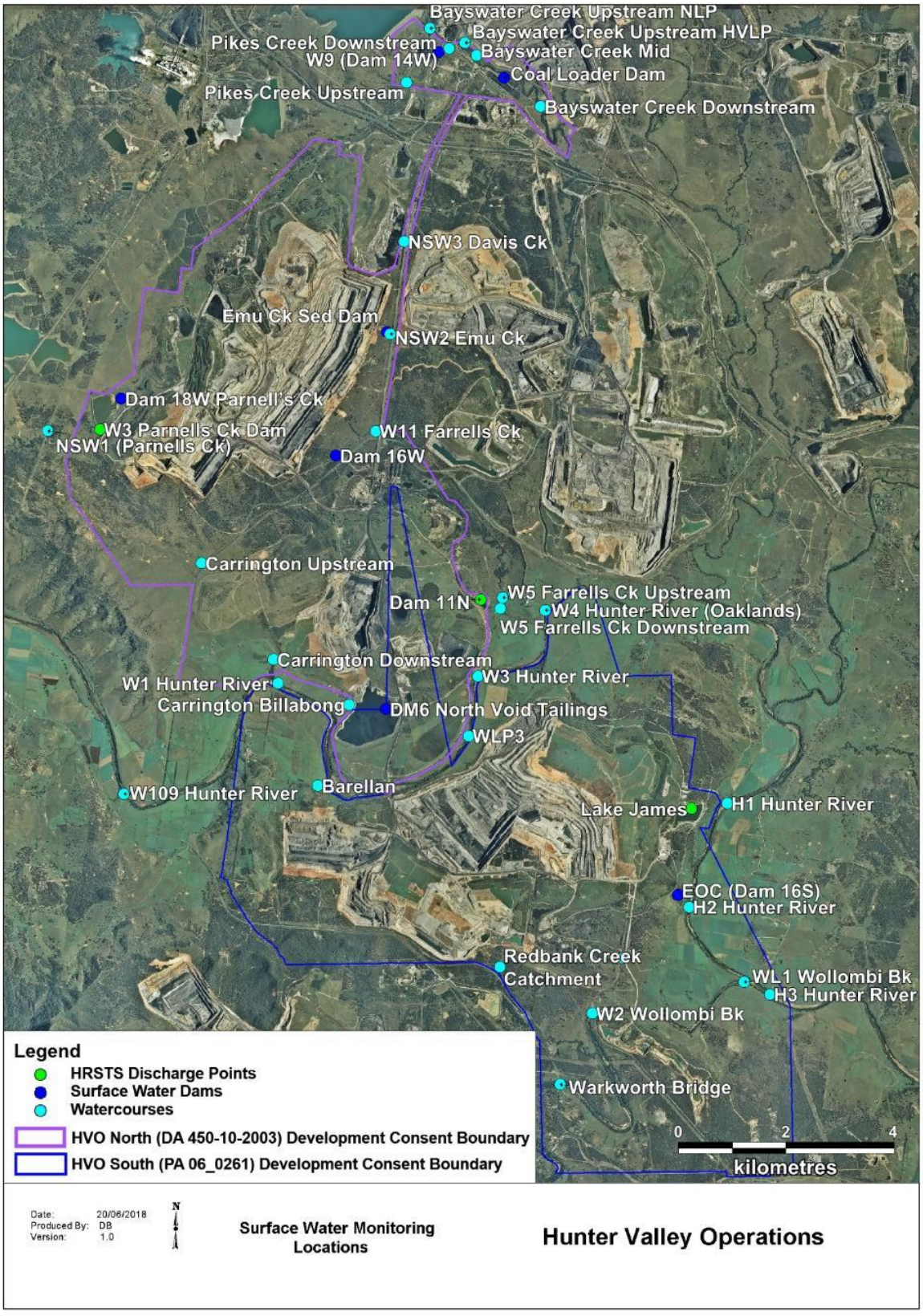

Figure 13 – HVO Surface Water Monitoring Locations

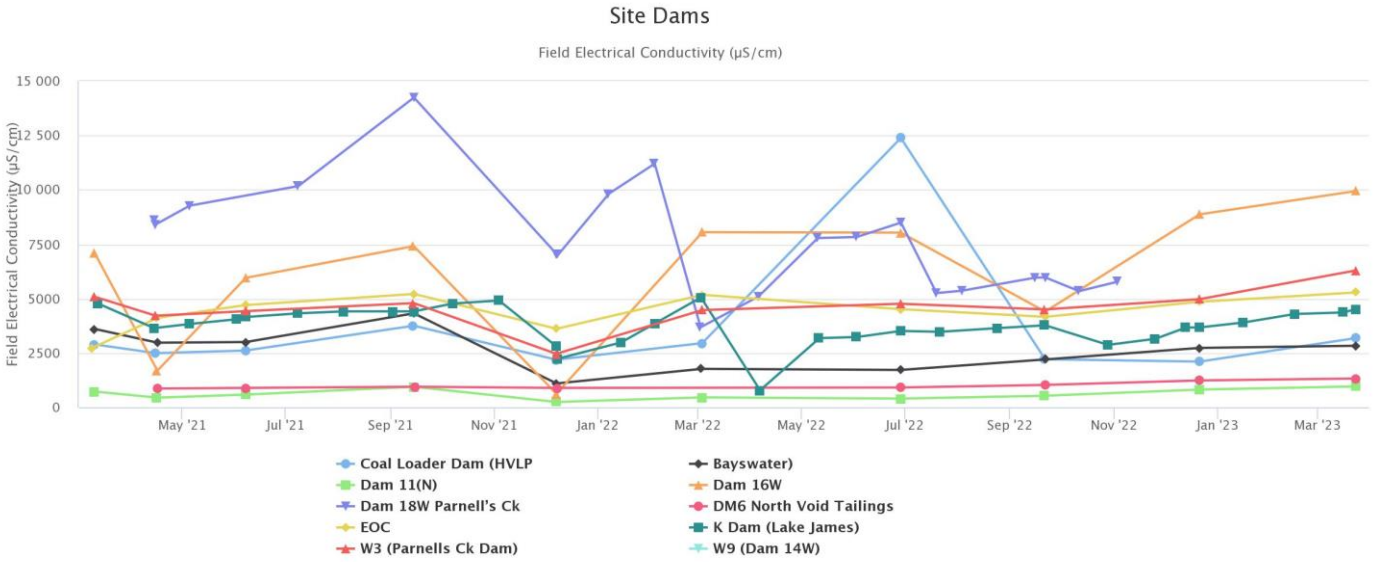

Figure 14 Site Dams Electrical Conductivity - March 2023

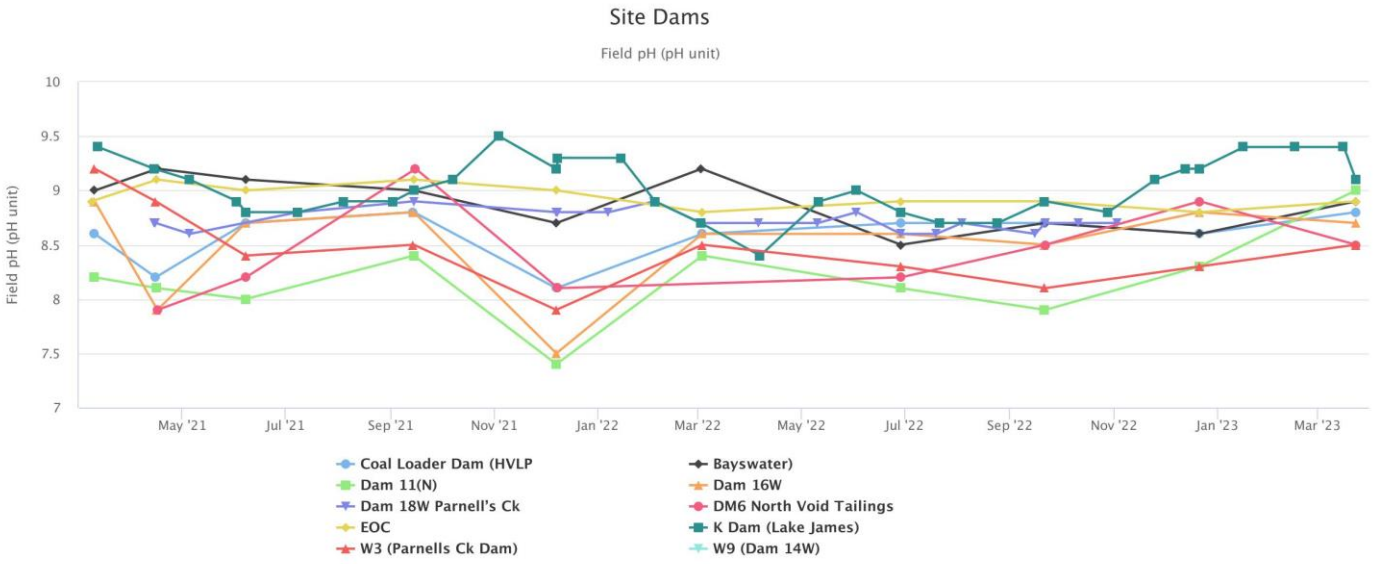

Figure 15 Site Dams Field pH - March 2023

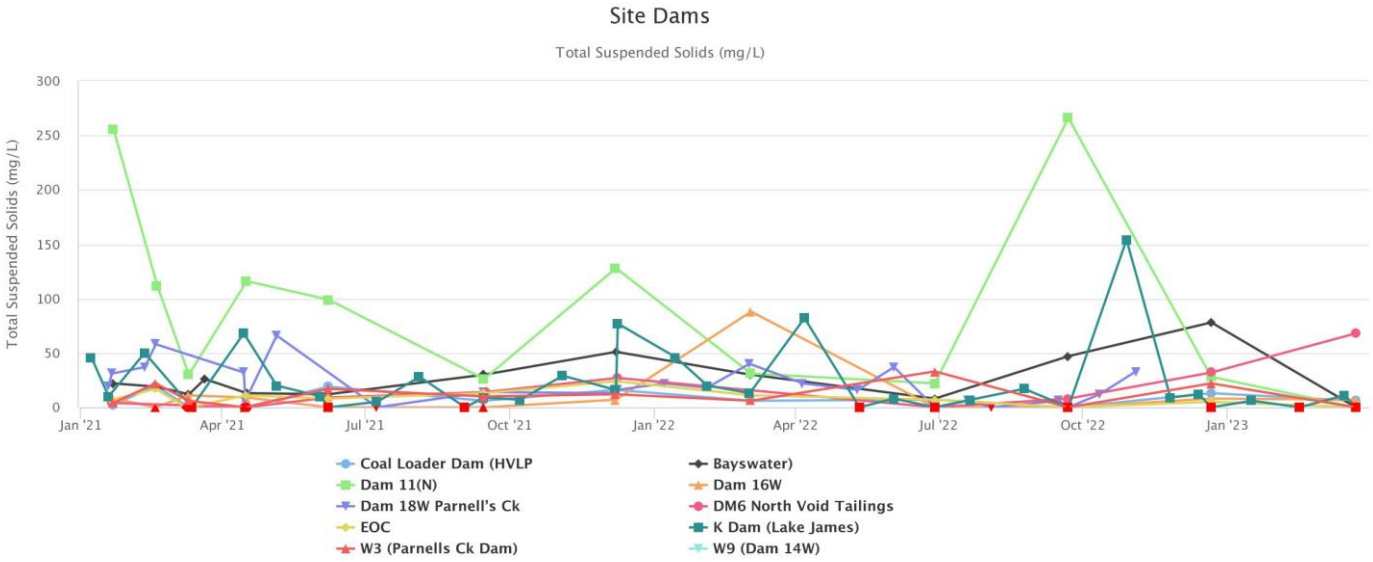

Figure 16 Site Dams Total Suspended Solids - March 2023

Figure 17 Wollombi Brook Electrical Conductivity - March 2023

Figure 18 Wollombi Brook Field pH - March 2023

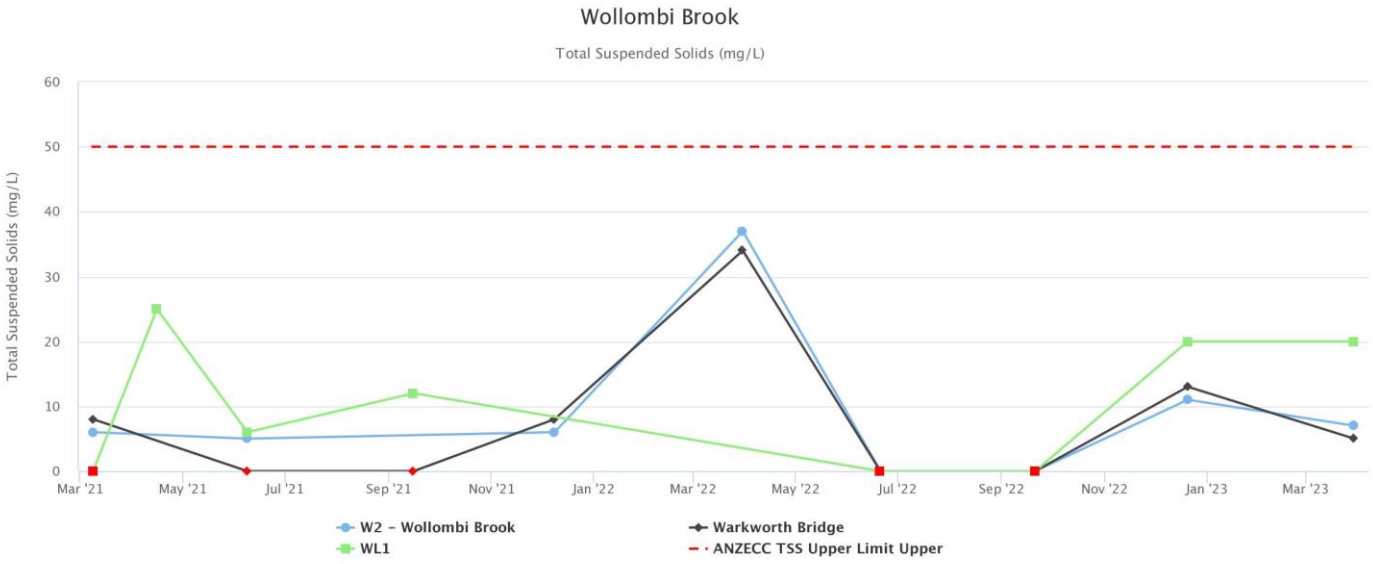

Figure 19 Wollombi Brook Total Suspended Solids - March 2023

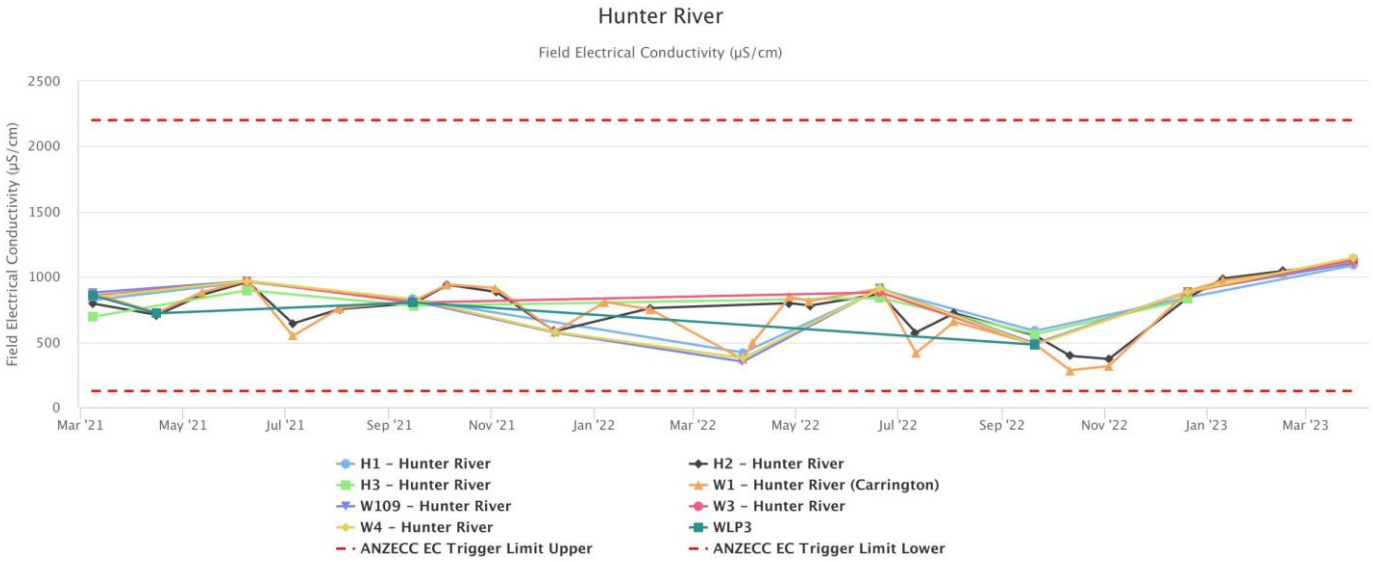

Figure 20 Hunter River Electrical Conductivity - March 2023

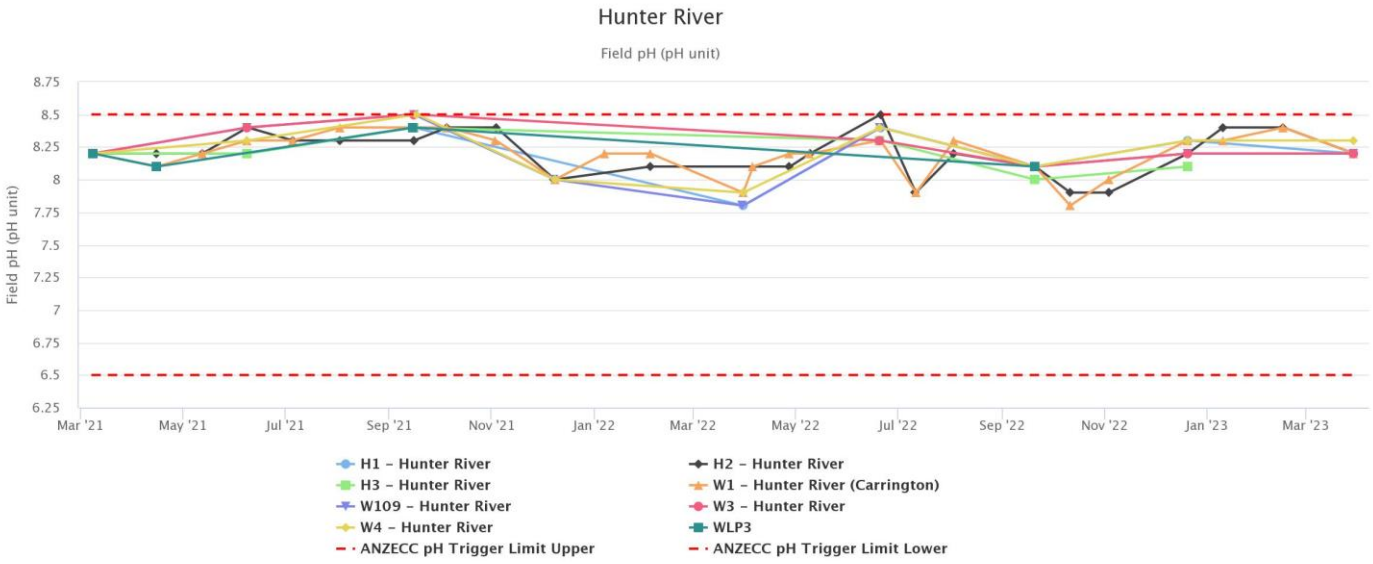

Figure 21 Hunter River Field pH - March 2023

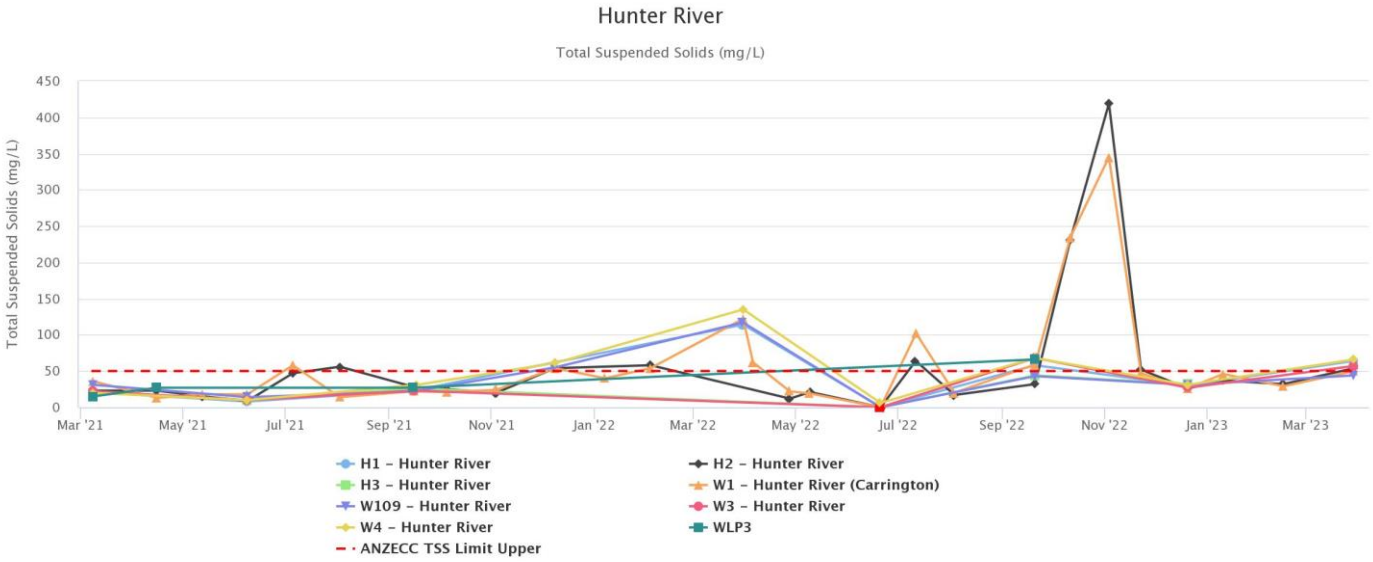

Figure 22 Hunter River Total Suspended Solids - March 2023

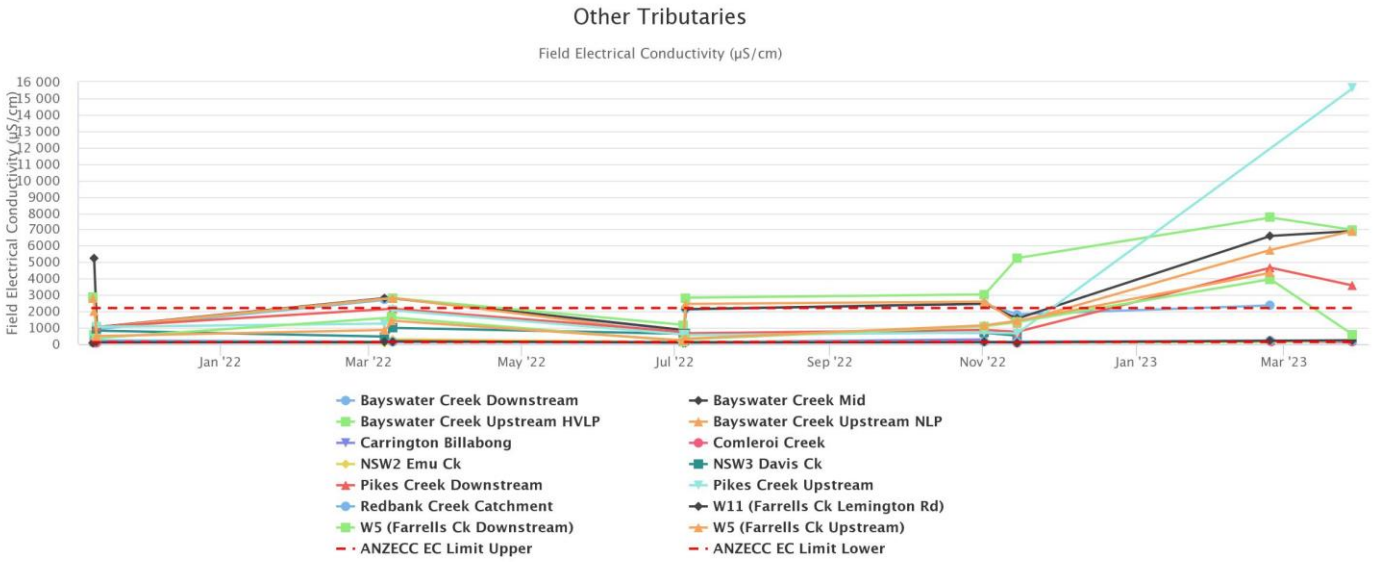

Figure 23 Other Tributaries Electrical Conductivity - March 2023

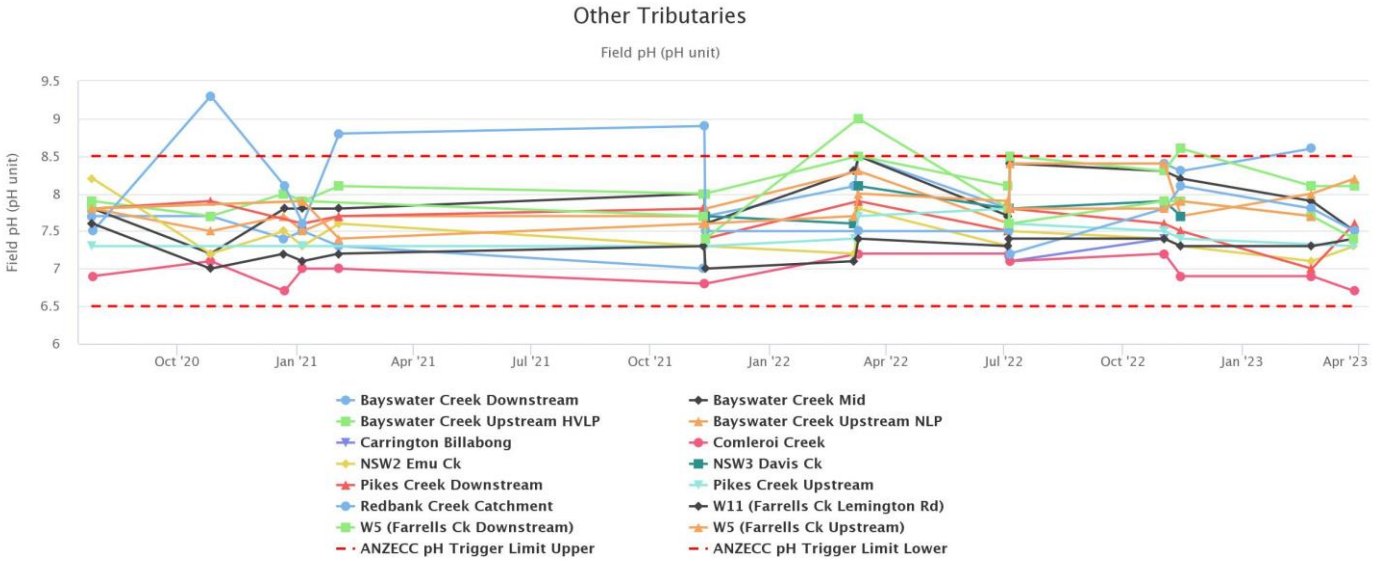

Figure 24 Other Tributaries Field pH - March 2023

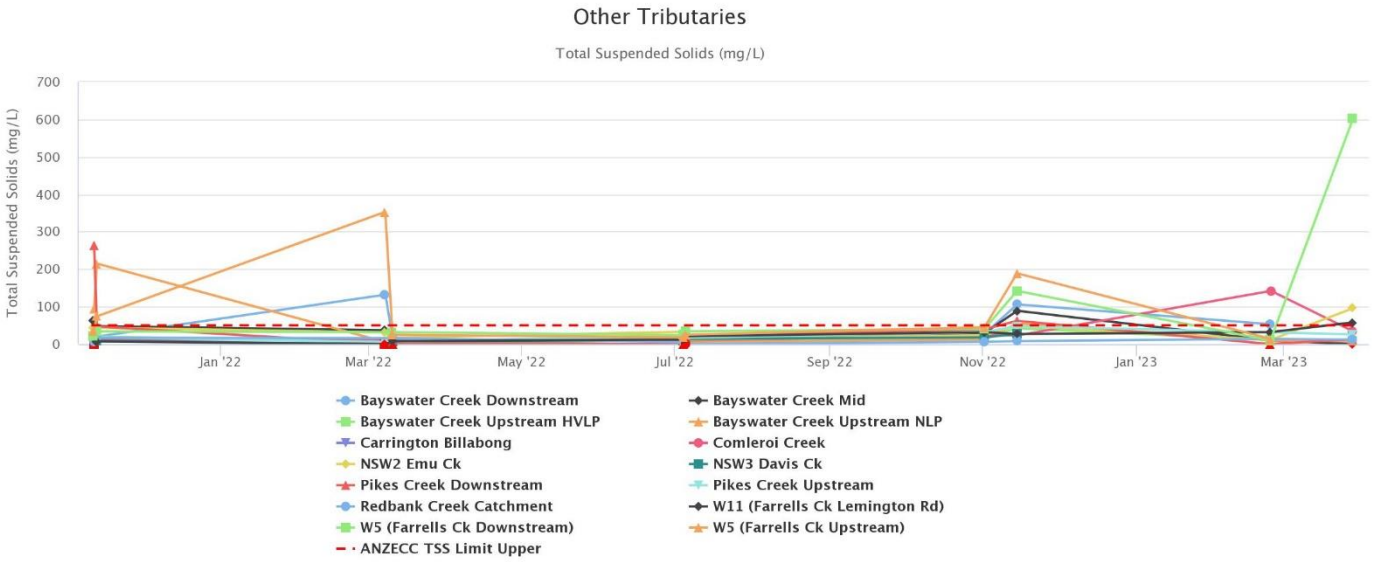

Figure 25 Other Tributaries Total Suspended Solids - March 2023

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 - Q1 2023

Site	Date	Trigger Limit Breached	Response Action
Bayswater Creek Downstream	23/02/2023	Total Suspended Solids (mg/L)	Rain event sampling. First Exceedance of TSS. -Field observations indicated that the sample was brown in colour and turbid with no flow. - Approximately 75mm of rainfall in the seven days prior to sampling. - No HRSTS discharges upstream of Bayswater Creek Downstream on or prior to the 23/02/23. - No sediment basins overtopped during rain event Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The exceeded TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff. Action: Continue monitoring this location for further trigger exceedances.
Comleroi Creek	23/02/2023	Total Suspended Solids (mg/L)	Rain event sampling. First Exceedance of TSS. -Field observations indicated that the sample was brown in colour and turbid with pool/no flow. - Approximately 75mm of rainfall in the seven days prior to sampling. - No HRSTS discharges upstream of Comleroi on or prior to the 23/02/23. - No sediment basins overtopped during rain event Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The TSS exceedance appears to be a result of disturbance of sediment while collecting sample from a pool of water at the monitoring site. Action: Continue monitoring this location for further trigger exceedances.
Pikes Creek Downstream	23/02/2023	pH	First trigger – No investigation required.
Bayswater Creek Upstream HVLP	23/02/2023	EC (µS/cm)	Second trigger – No investigation required.

Bayswater Creek Mid	23/02/2023	EC (µS/cm)	First trigger – No investigation required
Bayswater Creek Downstream	23/02/2023	pH	First trigger – No investigation required.
W1 - Hunter River (Carrington)	29/03/2023	Total Suspended Solids (mg/L)	First Exceedance of TSS. - Field Observations indicate that the sample was brown in colour and slightly turbid. - Approximately 60mm of rainfall in the seven days prior to sampling. - No HRSTS discharges upstream of W1 on or prior to the 29/03/23. - No sediment basins overtopped during rain event - On 29/03/23 TSS at W109 Hunter River (upstream of W1) indicated a slightly elevated TSS result of 44 mg/L but was lower than the W1 result. - Other monitoring locations in the Hunter River downstream of W1 (W3, W4, H1 and H2) also exceeded the TSS trigger value. Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff. HVO reviewed (as required) areas upstream of W1 and were unable to identify any areas of ground disturbance that would have attributed to the TSS result at this location. Action: Continue monitoring this location for further trigger exceedances.

W3 – Hunter River	29/03/2023	Total Suspended Solids (mg/L)	First Exceedance of TSS. - Field Observations indicate that the sample was brown in colour and slightly turbid. - Approximately 60mm of rainfall in the seven days prior to sampling. - No HRSTS discharges upstream of W3 on or prior to the 29/03/23. - No sediment basins overtopped during rain event - On 29/03/23 TSS at W109 Hunter River (upstream of W3) indicated a slightly elevated TSS result of 44 mg/Land W1 (50 mg/L) recorded a trigger value exceedance (also upstream of W3) but both of these results were lower than W3 (57 mg/L). - Other monitoring locations in the Hunter River downstream of W3 (W4, H1 and H2) also exceeded the TSS trigger value. Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff. HVO reviewed (as required) areas upstream of W3 and were unable to identify any areas of ground disturbance that would have attributed to the TSS result at this location. Action: Continue monitoring this location for further trigger exceedances.

W4 - Hunter River	29/03/2023	Total Suspended Solids (mg/L)	First Exceedance of TSS. - Field Observations indicate that the sample was brown in colour and slightly turbid. - Approximately 60mm of rainfall in the seven days prior to sampling. - No HRSTS discharges upstream of W4 on or prior to the 29/03/23. - No sediment basins overtopped during rain event - On 29/03/23 TSS at W109 Hunter River (upstream of W4) indicated a slightly elevated TSS result of 44 mg/L and W1 (50 mg/L) and W3 (57 mg/L) recorded trigger value exceedances (both upstream of W3) but all of these results were lower than W4 (66 mg/L). - Other monitoring locations in the Hunter River downstream of W4 (H1 and H2) also exceeded the TSS trigger value. Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff. HVO reviewed (as required) areas upstream of W4 and were unable to identify any areas of ground disturbance that would have attributed to the TSS result at this location. Action: Continue monitoring this location for further trigger exceedances.

H1 - Hunter River	29/03/2023	Total Suspended Solids (mg/L)	First Exceedance of TSS. - Field Observations indicate that the sample was brown in colour and slightly turbid. - Approximately 60mm of rainfall in the seven days prior to sampling. - No HRSTS discharges upstream of H1 on or prior to the 29/03/23. - No sediment basins overtopped during rain event - On 29/03/23 TSS at W109 Hunter River (upstream of W4) indicated a slightly elevated TSS result of 44 mg/L and W1 (50 mg/L), W3 (57 mg/L) and W4 (66 mg/L) recorded trigger value exceedances (all upstream of W4). The TSS result at H1 (64 mg/L) was greater than that recorded at W109, W1 and W3 and similar to that recorded at W4. Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff. HVO reviewed (as required) areas upstream of H1 and were unable to identify any areas of ground disturbance that would have attributed to the TSS result at this location. Action: Continue monitoring this location for further trigger exceedances.

H2 - Hunter River	29/03/2023	Total Suspended Solids (mg/L)	First Exceedance of TSS. - Field Observations indicate that the sample was brown in colour and slightly turbid. - Approximately 60mm of rainfall in the seven days prior to sampling. - No HRSTS discharges upstream of H2 on or prior to the 29/03/23. - No sediment basins overtopped during rain event -On 29/03/23 TSS at W109 Hunter River (upstream of H2) indicated a slightly elevated TSS result of 44 mg/L, and W1 (50 mg/L), W3 (57 mg/L), W4 (66 mg/L) and H1 (64 mg/L) all recorded trigger value exceedances (all upstream of H2). The TSS result at H2 (54 mg/L) was greater than that recorded at W109, similar to that recorded at W1 and lower than that recorded at W3, W4 and H1 (immediately upstream of H2). Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff. Action: Continue monitoring this location for further trigger exceedances.

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 did not undertake any HRSTS discharges 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.

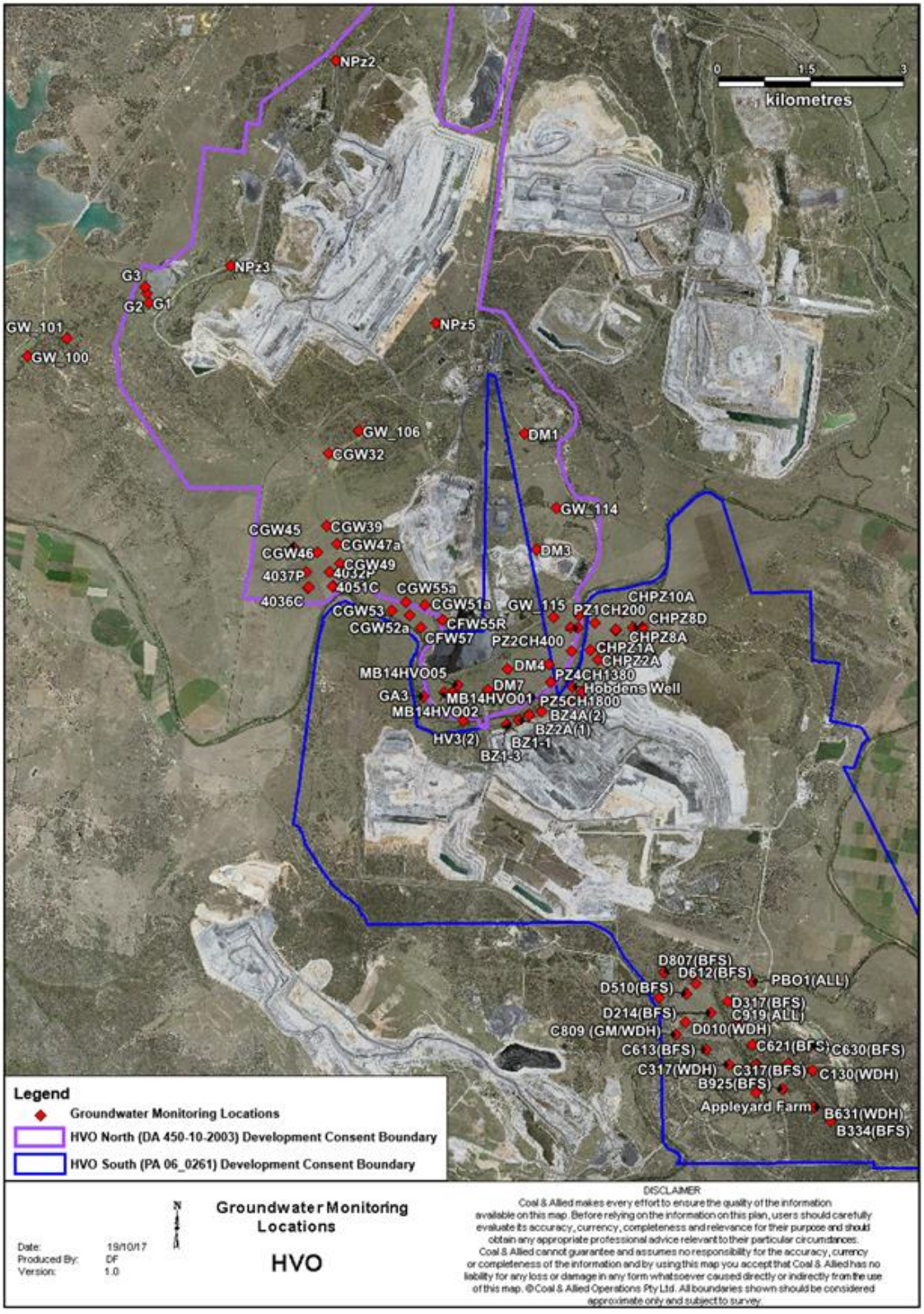

Figure 26 - Groundwater Monitoring Locations at HVO

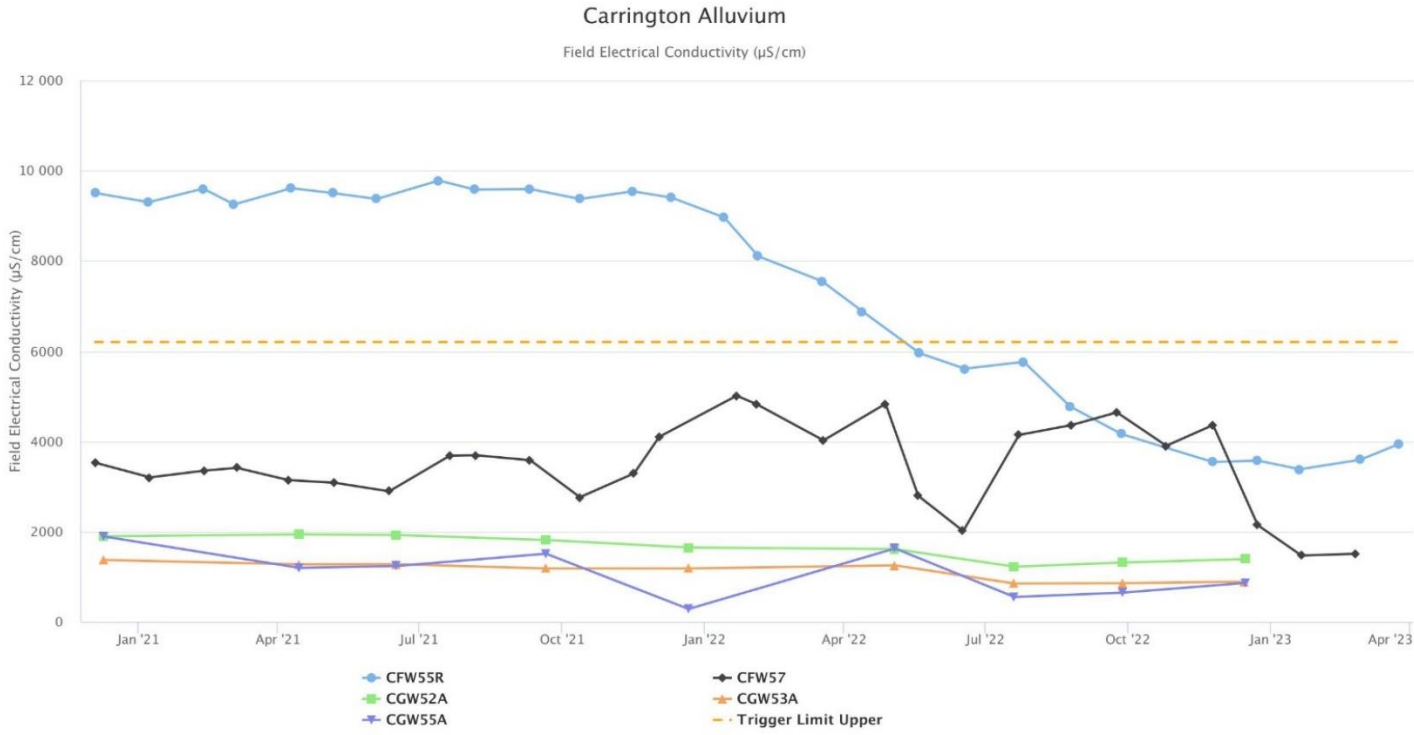

Figure 27 - Carrington Alluvium Electrical Conductivity Trend - Q1 2023

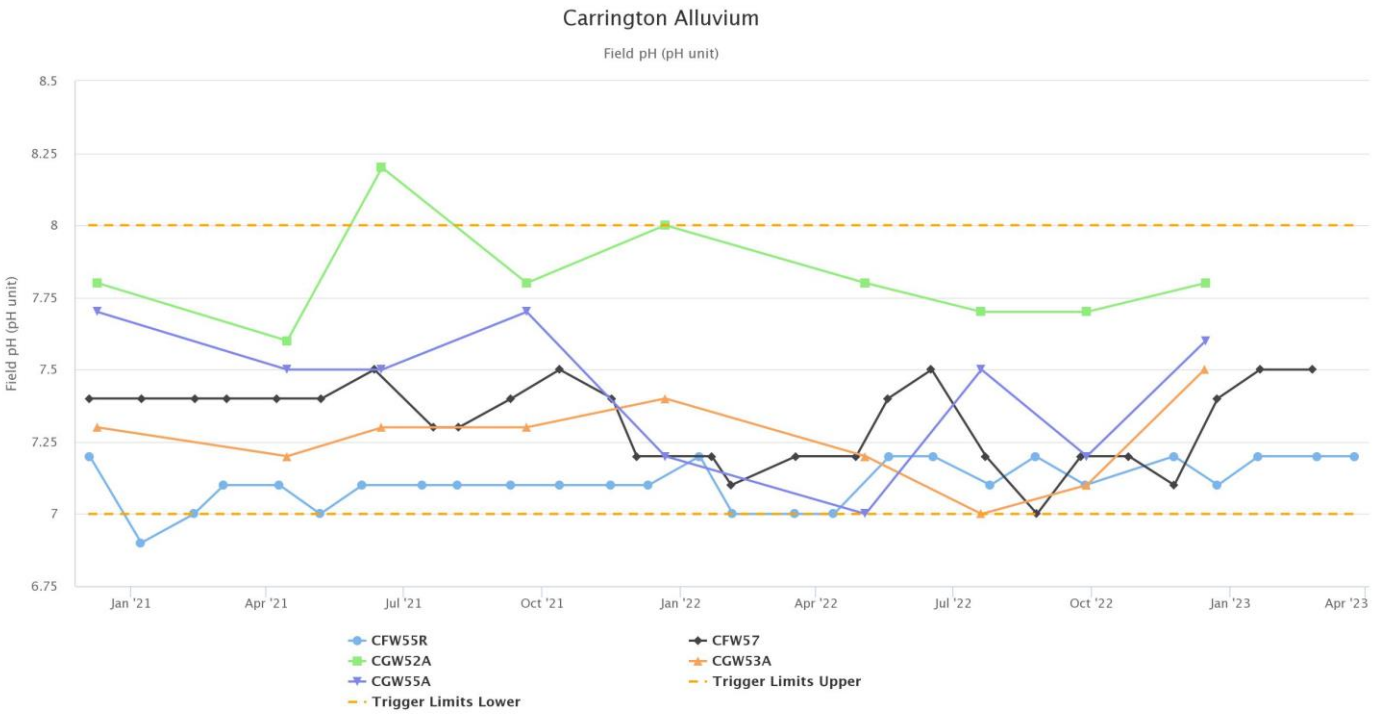

Figure 28 Carrington Alluvium Field pH Trend - Q1 2023

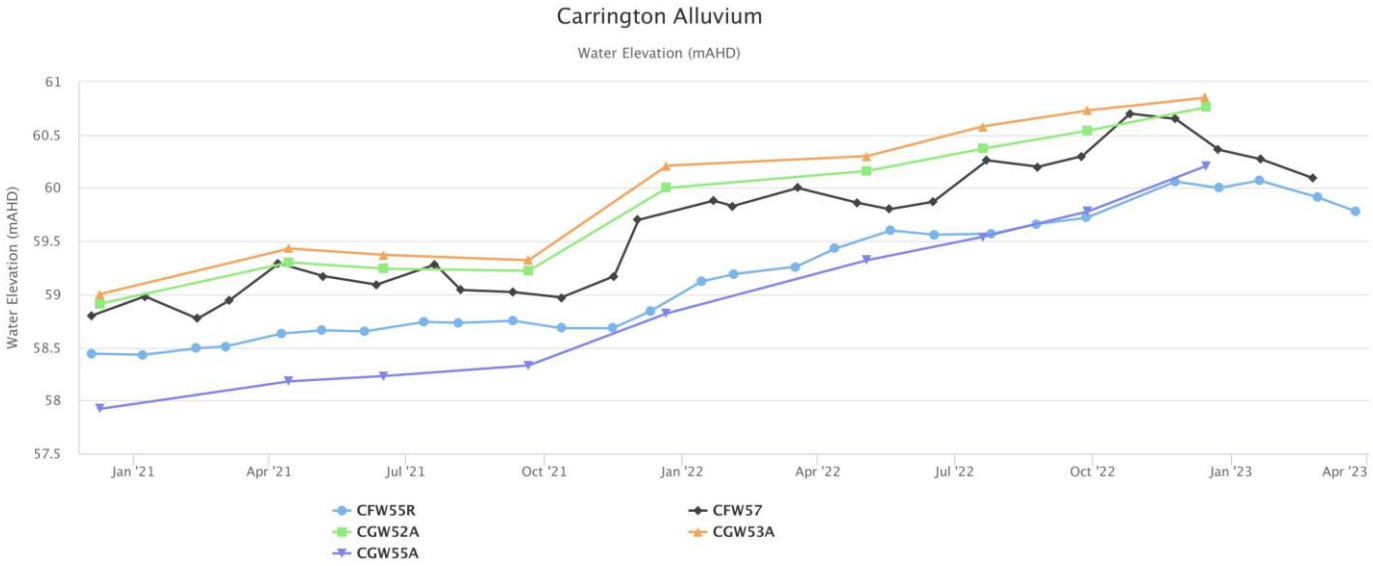

Figure 29 - Carrington Alluvium Water Elevation Trend - Q1 2023

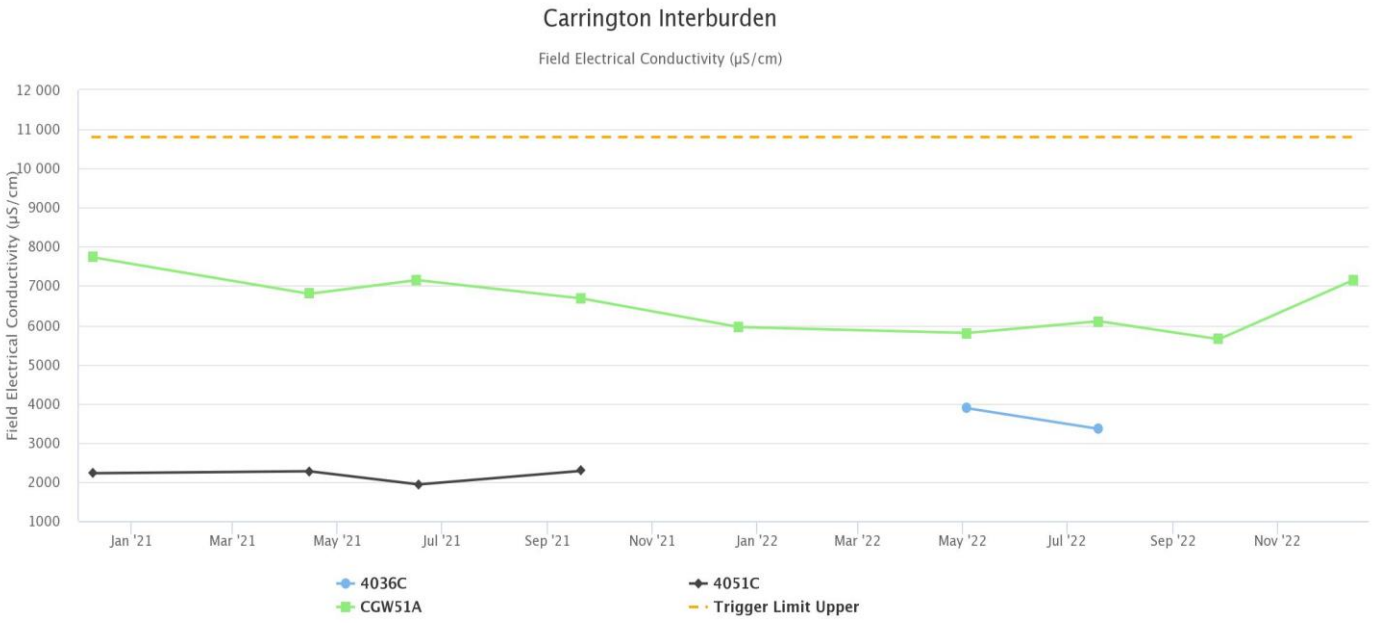

Figure 30 - Carrington Interburden Electrical Conductivity Trend - Q1 2023

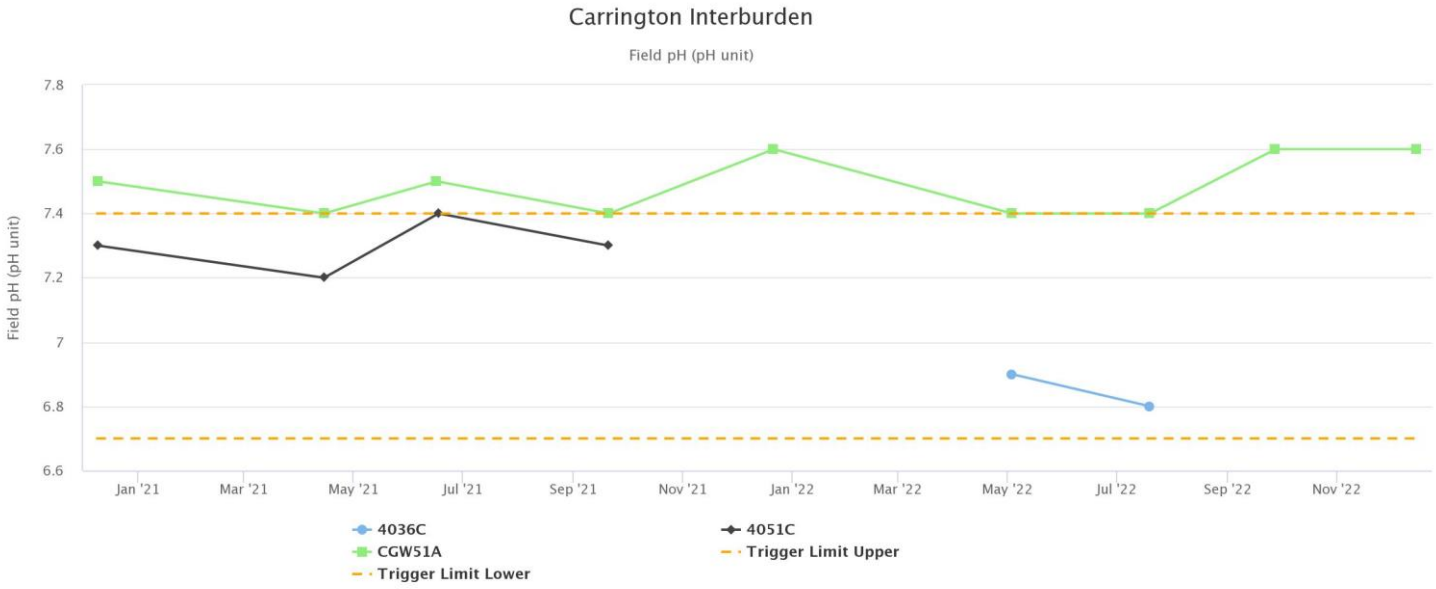

Figure 31 - Carrington Interburden Field pH Trend - Q1 2023

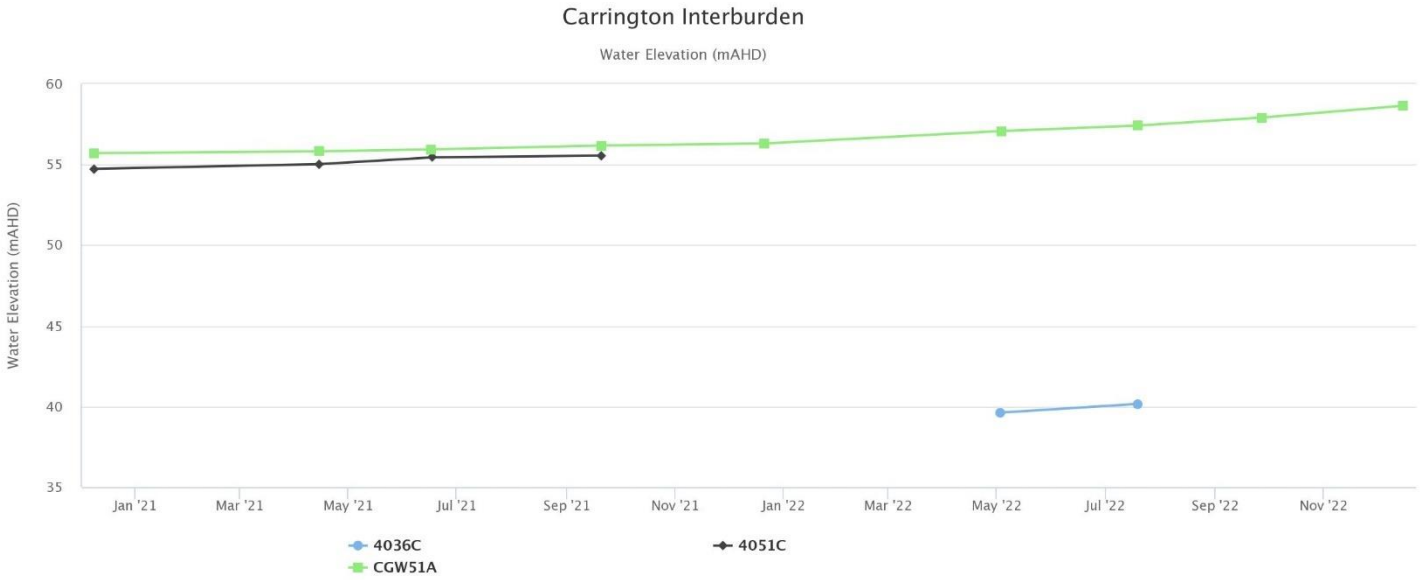

Figure 32 - Carrington Interburden Water Elevation Trend - Q1 2023

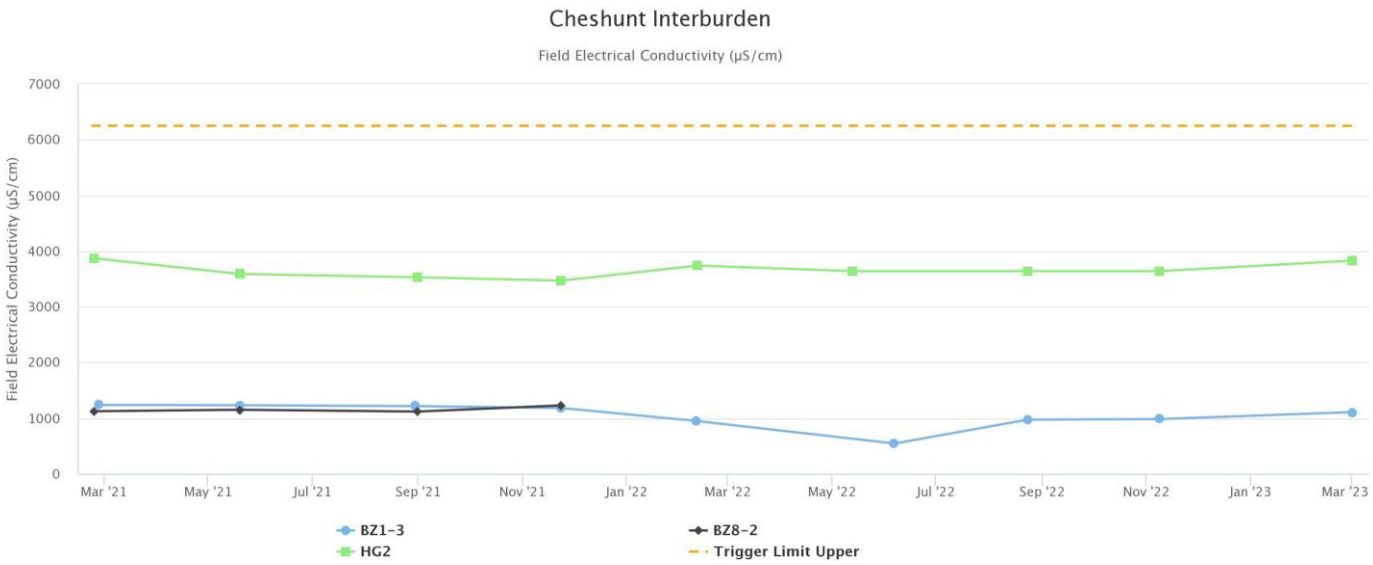

Figure 33 - Cheshunt Interburden Electrical Conductivity Trend - Q1 2023

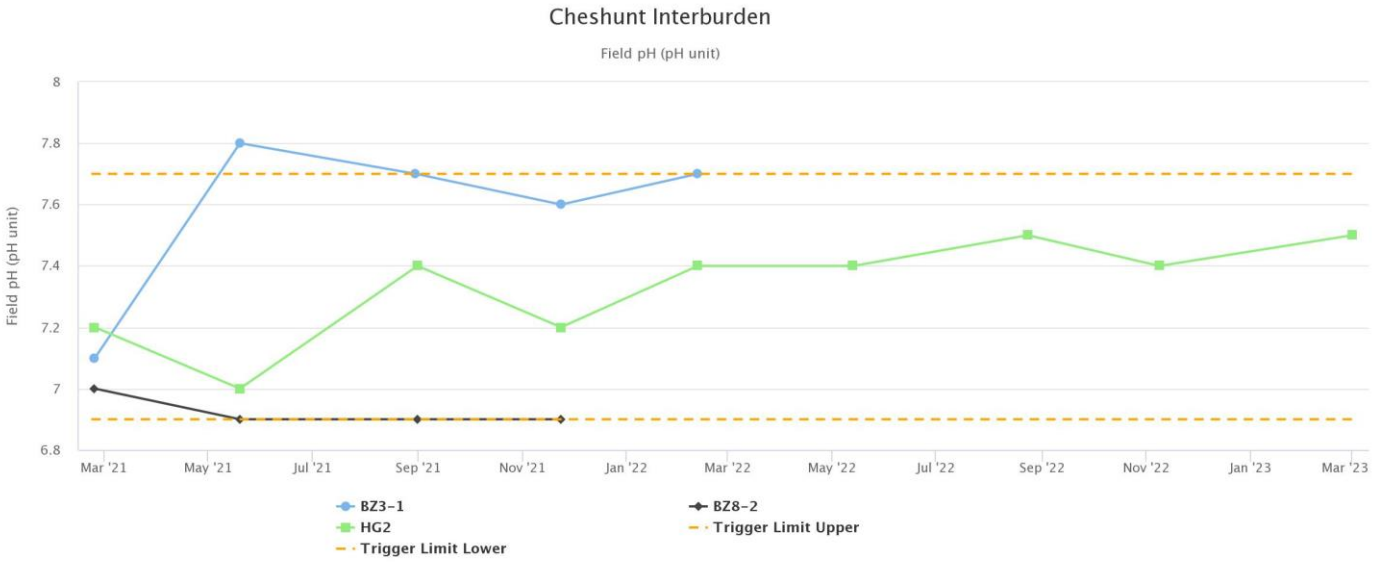

Figure 34 - Cheshunt Interburden Field pH Trend - Q1 2023

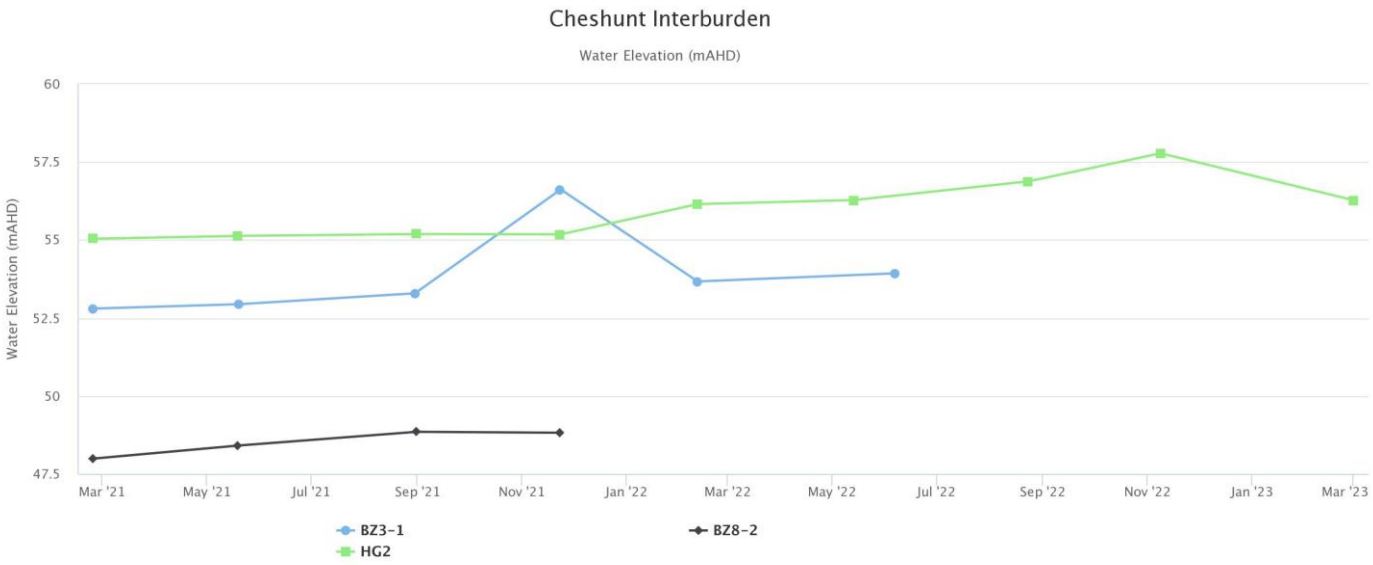

Figure 35 - Cheshunt Interburden Water Elevation Trend - Q1 2023

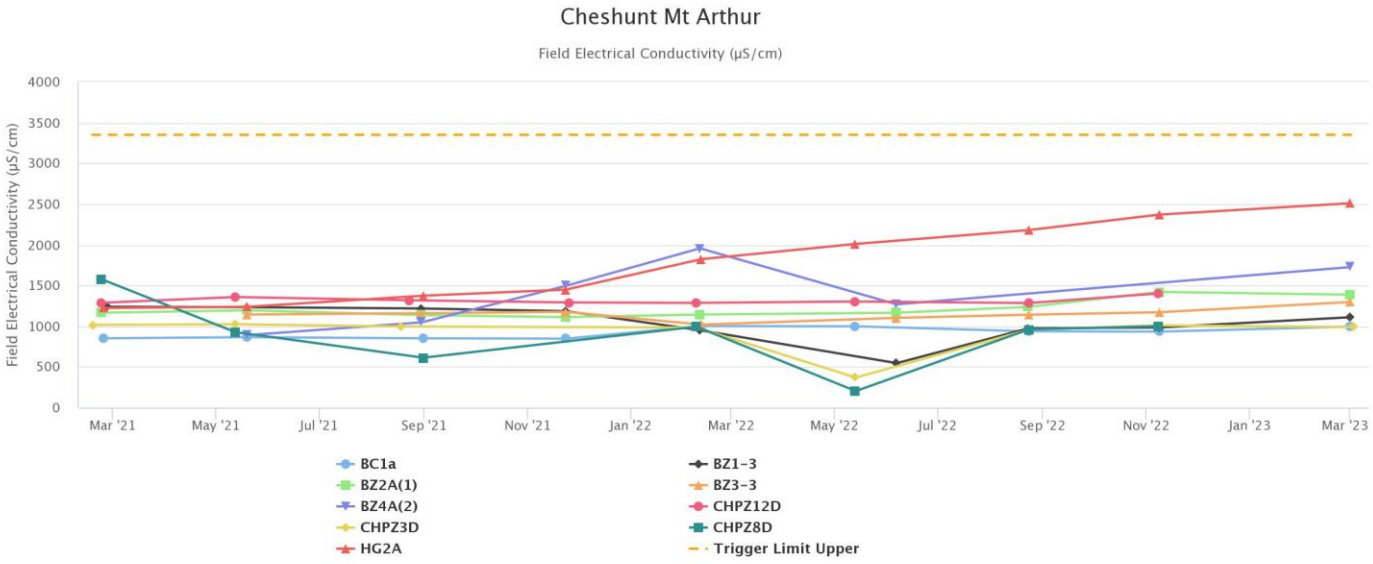

Figure 36 – Cheshunt Mt Arthur Electrical Conductivity Trend – Q1 2023

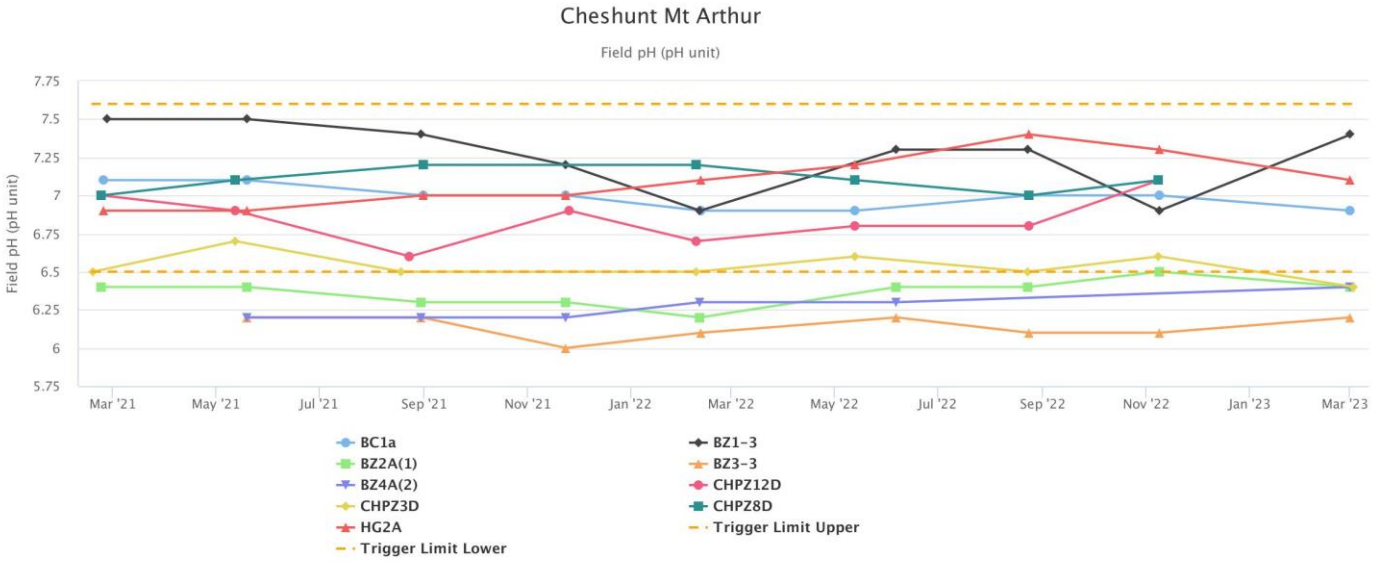

Figure - 37 Cheshunt Mt Arthur Field pH Trend - Q1 2023

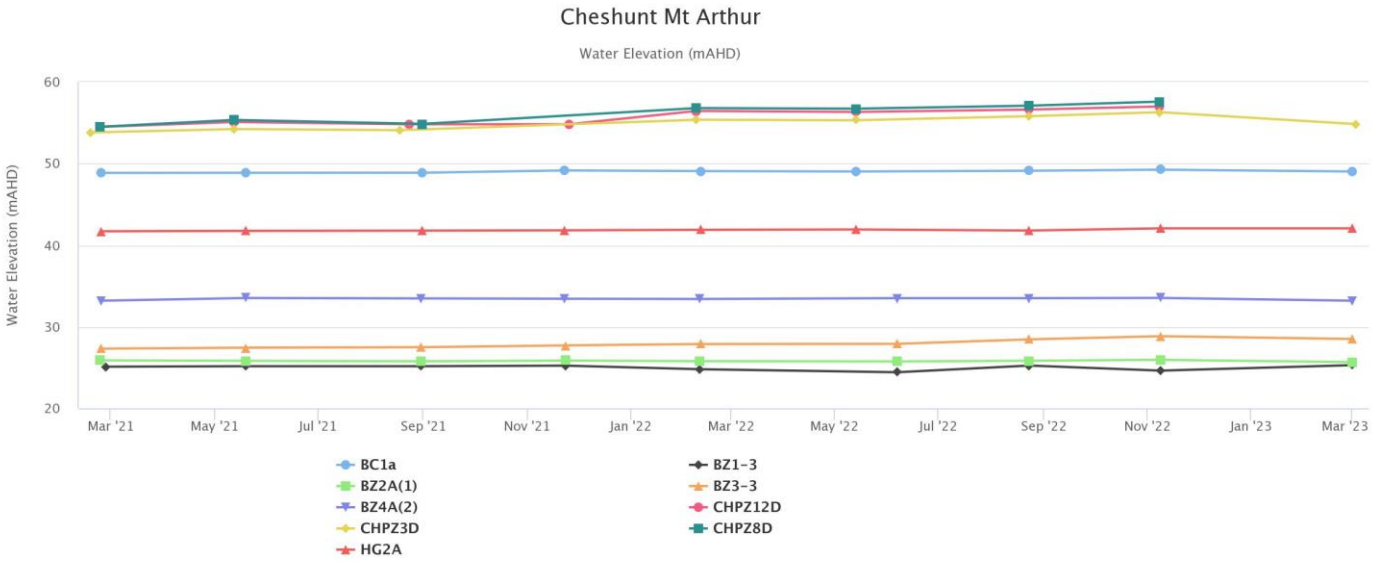

Figure 38 - Cheshunt Mt Arthur Water Elevation Trend - Q1 2023

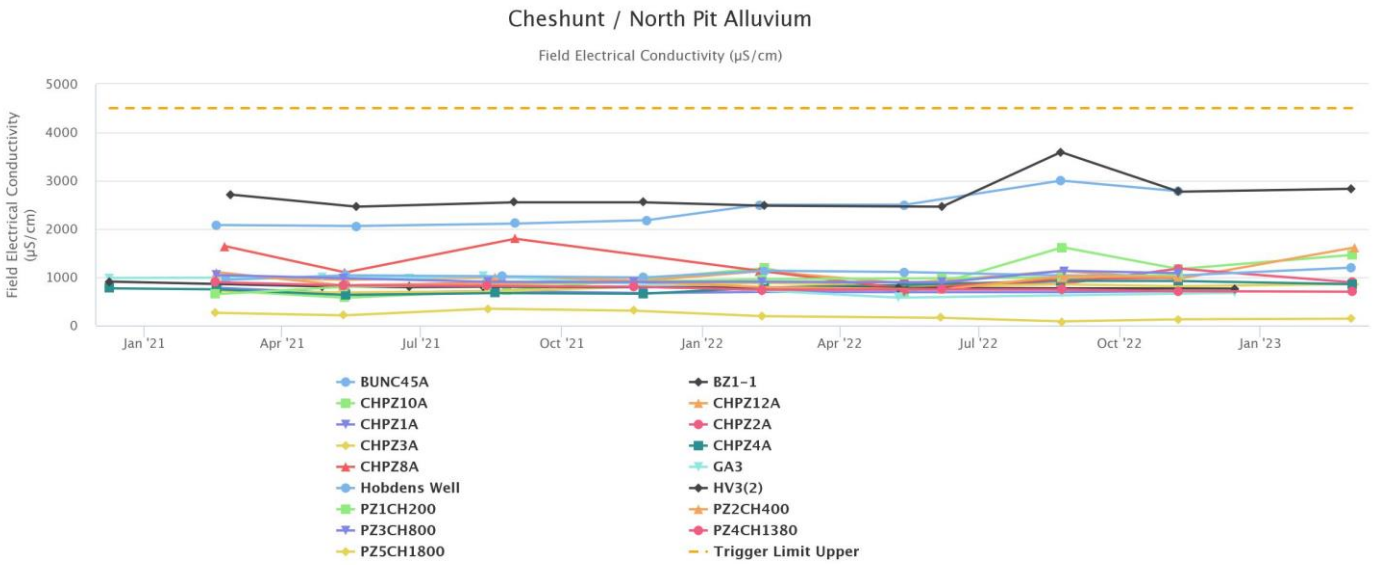

Figure 39 - Cheshunt North Pit Alluvium Electrical Conductivity Trend - Q1 2023

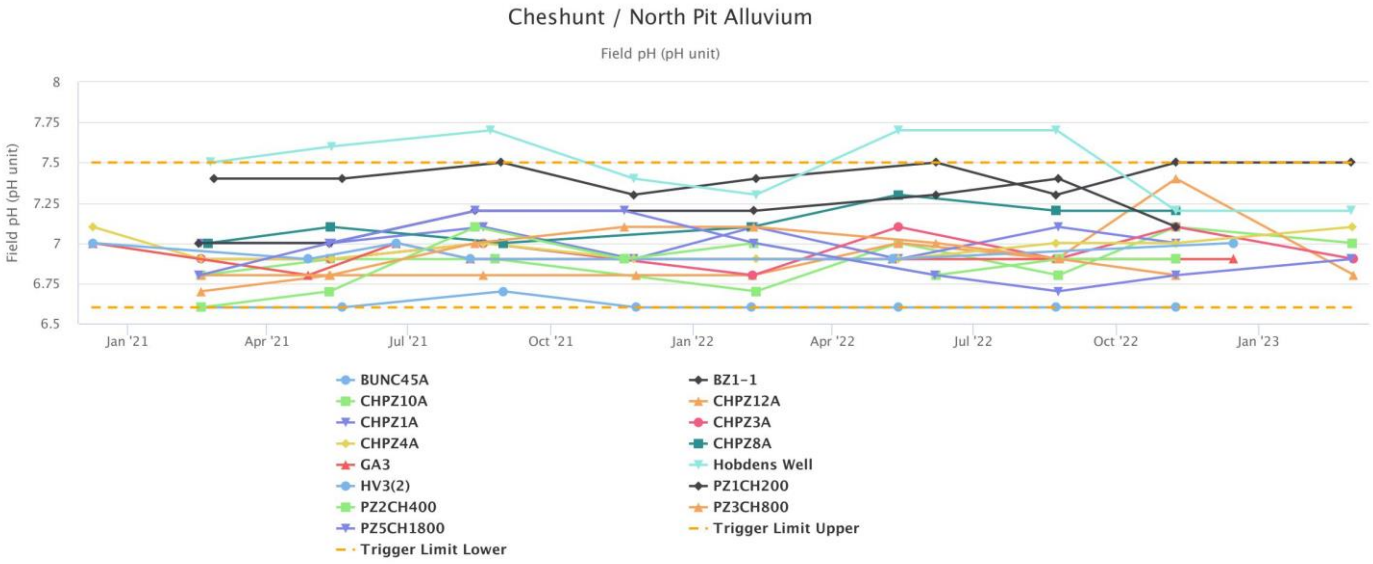

Figure 40 - Cheshunt North Alluvium Field pH Trend - Q1 2023

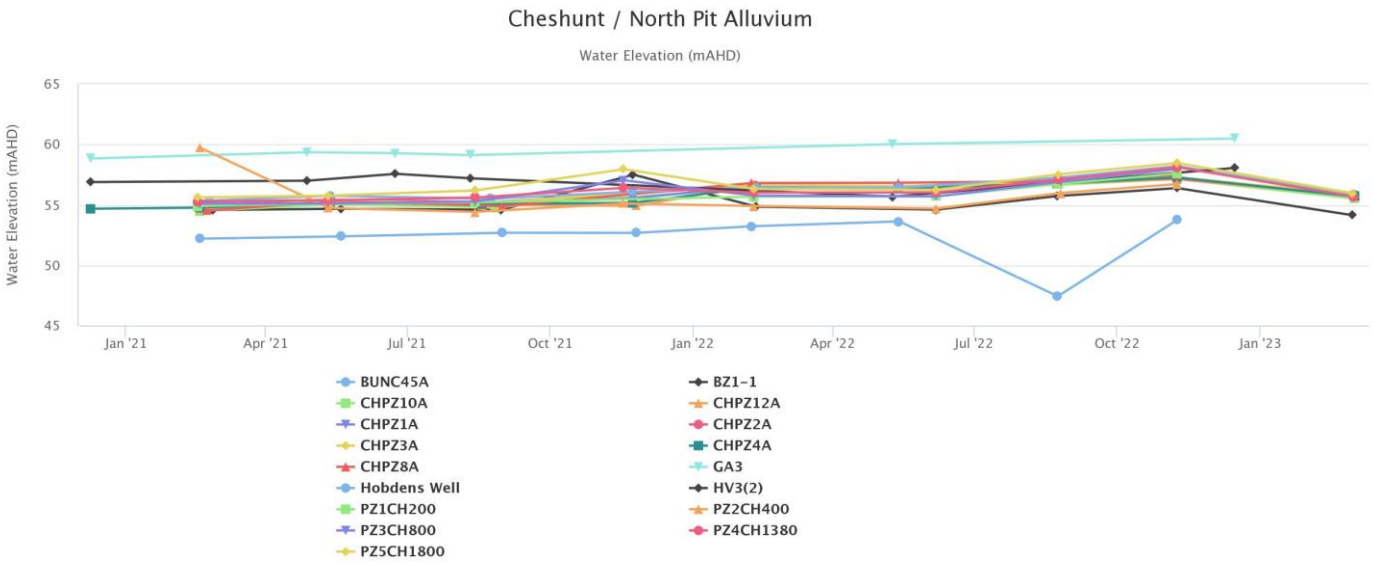

Figure 41 - Cheshunt North Pit Alluvium Water Elevation Trend - Q1 2023

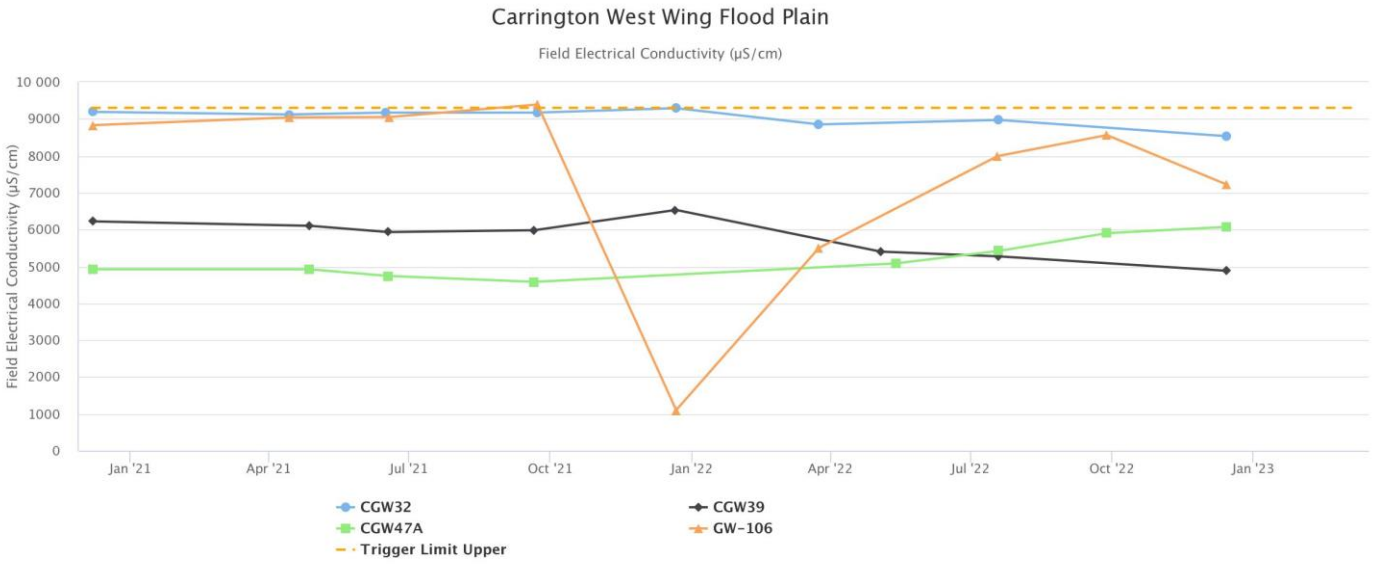

Figure 42 - Carrington West Wing Flood Plain Electrical Conductivity Trend - Q1 2023

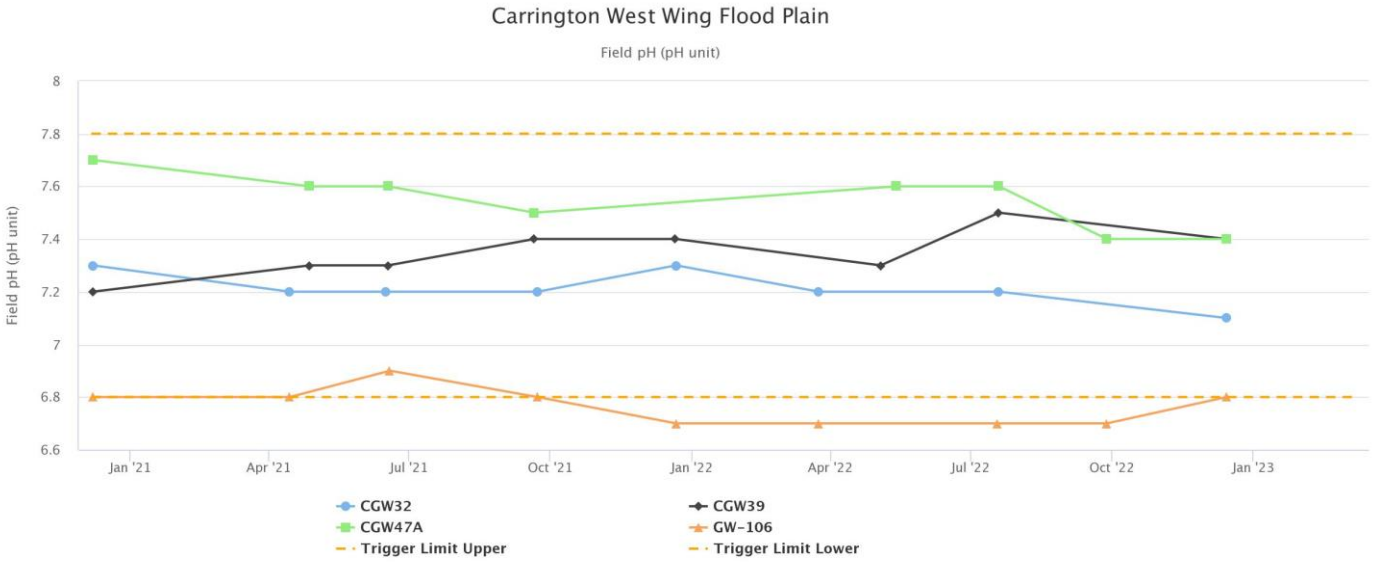

Figure 43 - Carrington West Wing Flood Plain pH Trend - Q1 2023

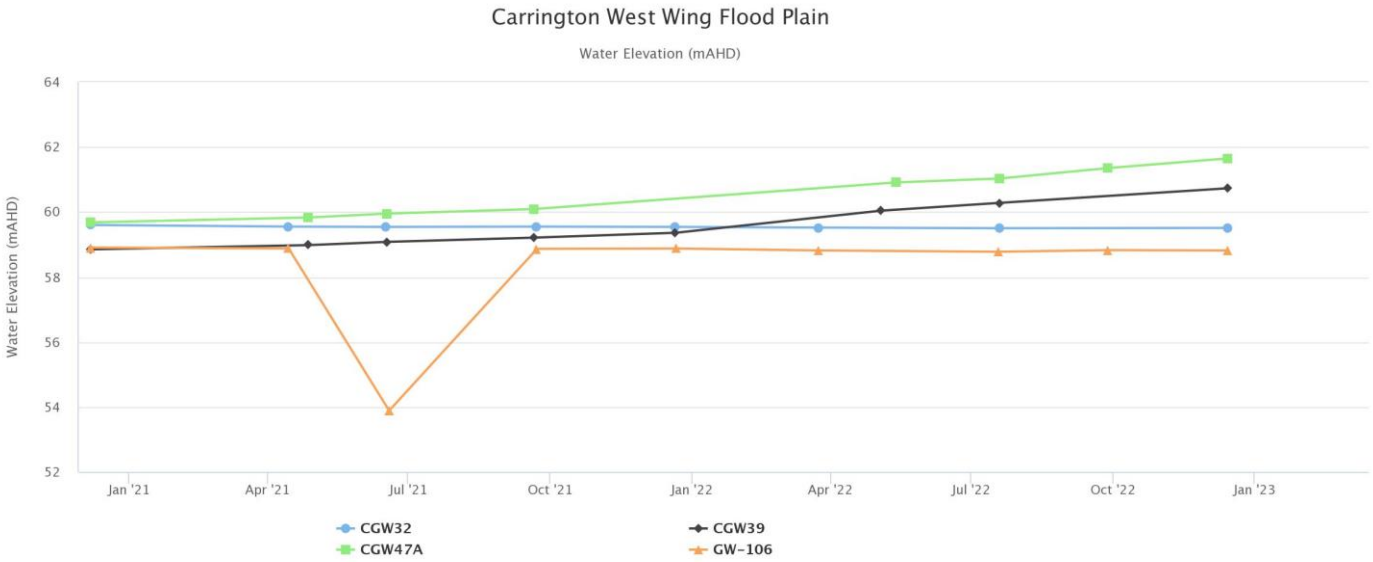

Figure 44 - Carrington West Wing Flood Plain Water Elevation Trend - Q1 2023

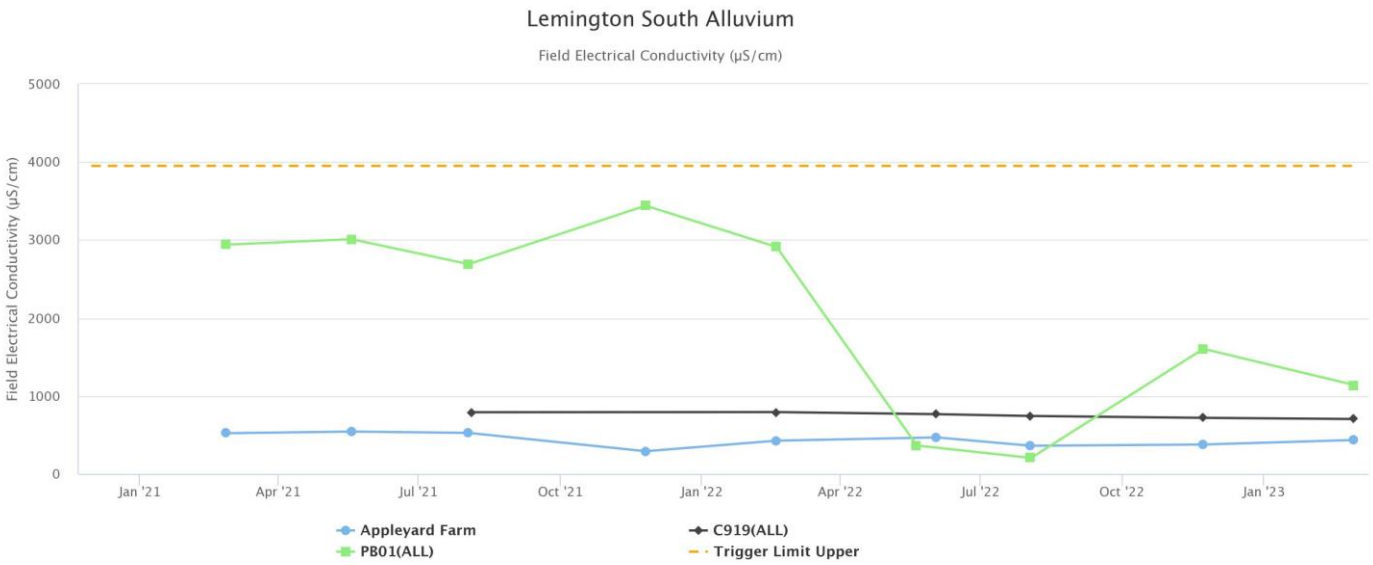

Figure 45 - Lemington South Alluvium Electrical Conductivity Trend - Q1 2023

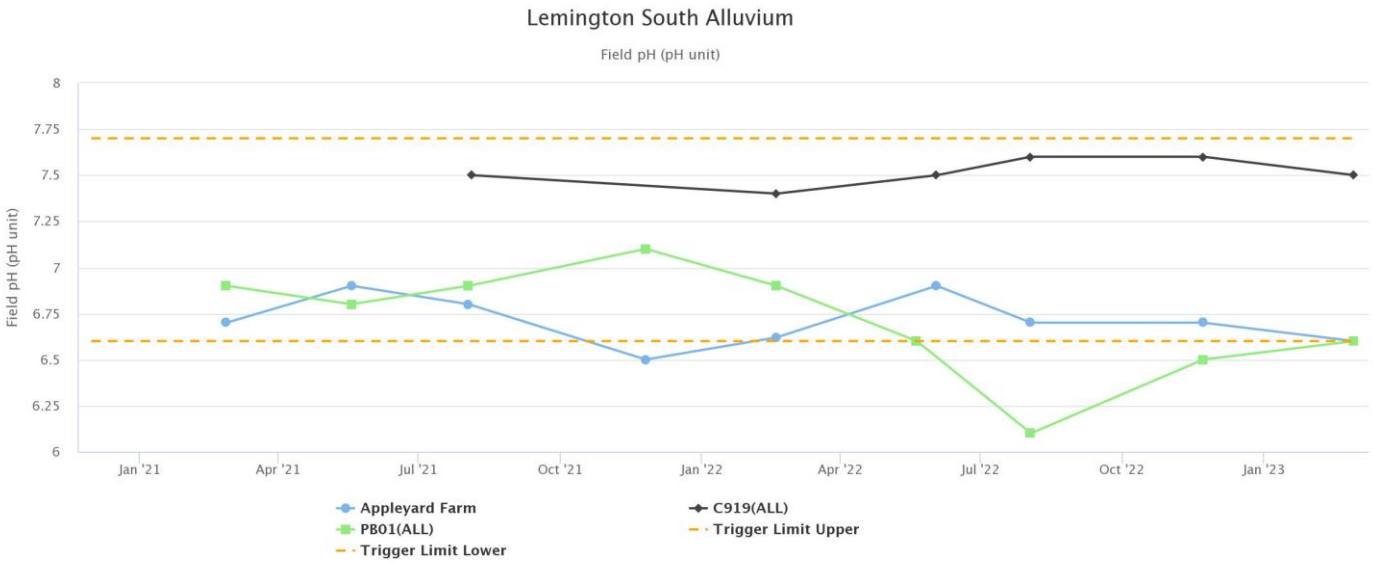

Figure 46 - Lemington South Alluvium Field pH Trend - Q1 2023

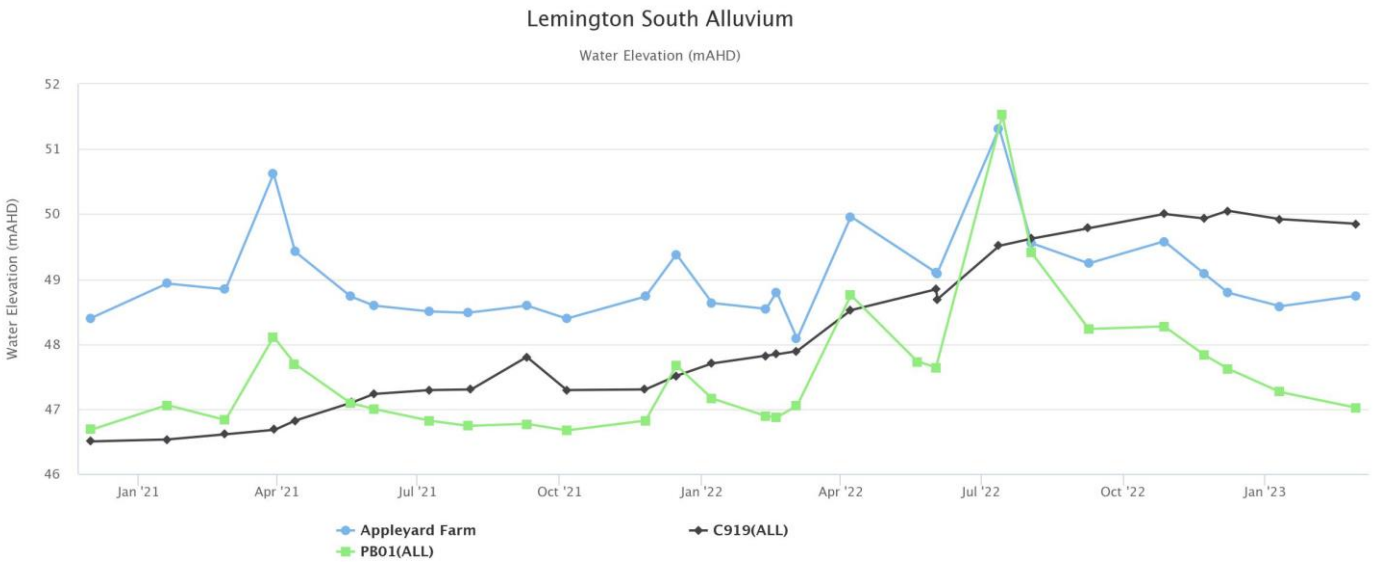

Figure 47 - Lemington South Alluvium Water Elevation Trend - Q1 2023

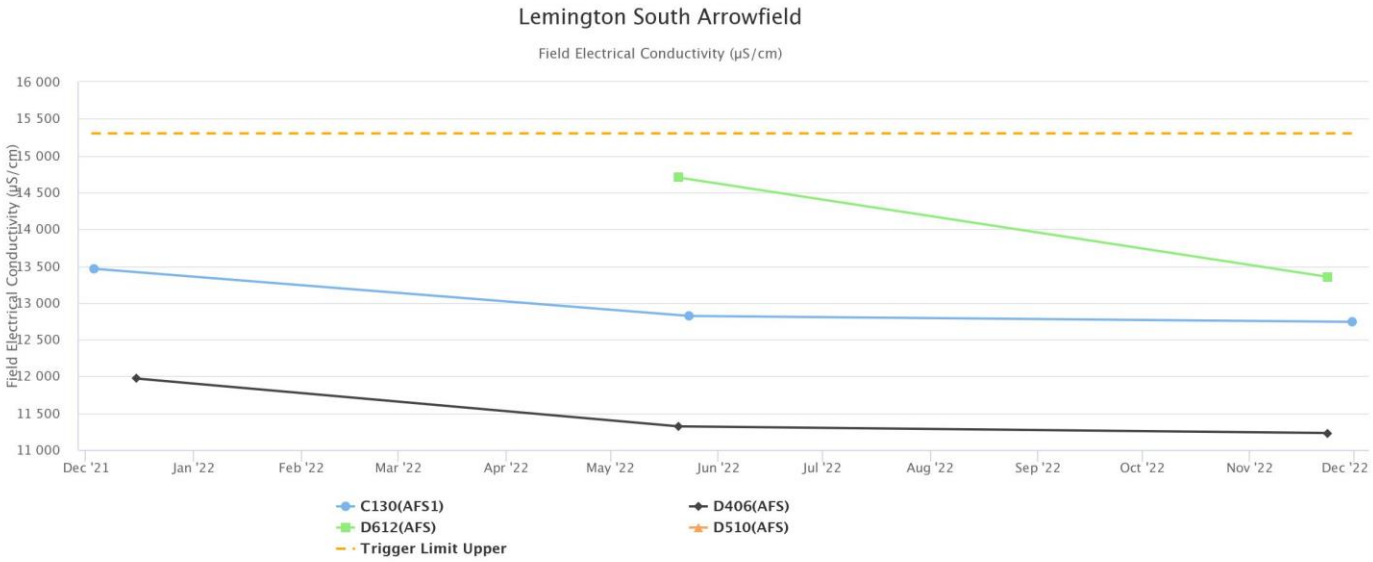

Figure 48 - Lemington South Arrowfield Electrical Conductivity Trend - Q1 2023

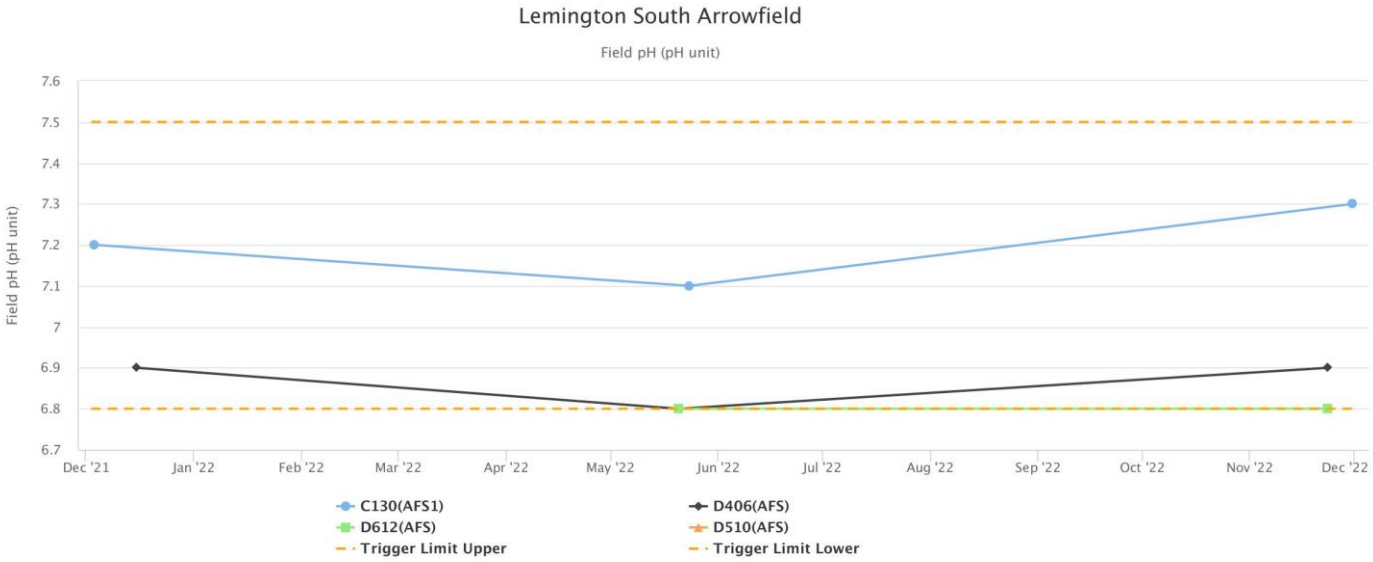

Figure 49 - Lemington South Arrowfield Field pH Trend - Q1 2023

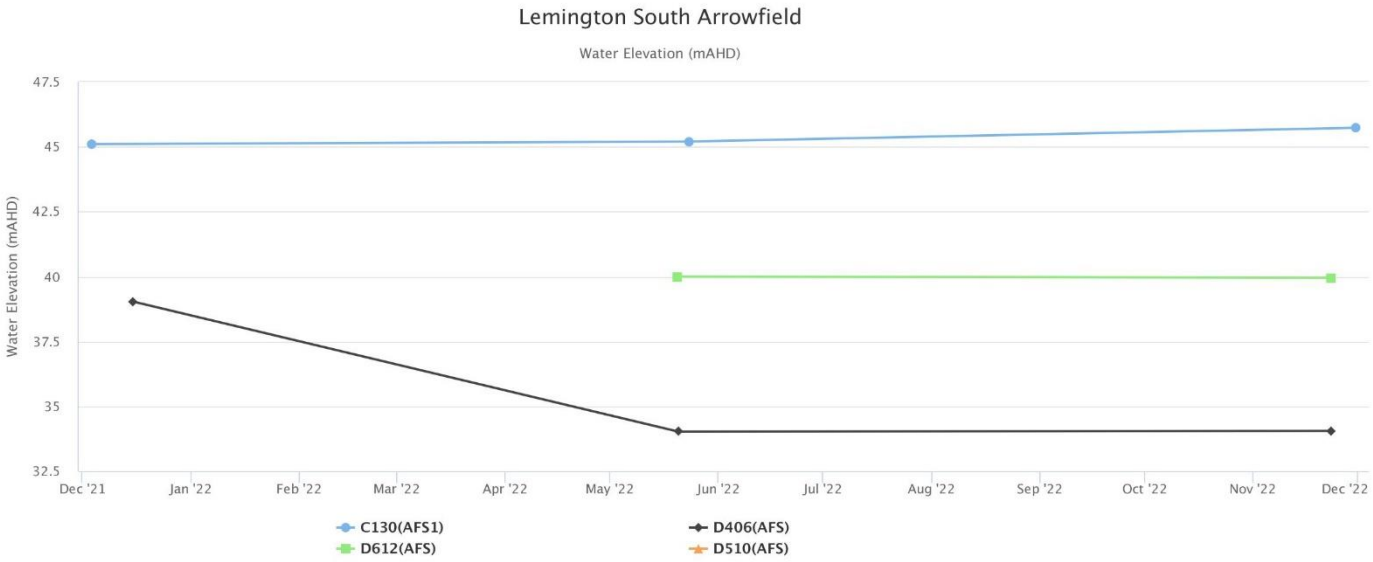

Figure 50 – Lemington South Arrowfield Water Elevation Trend – Q1 2023

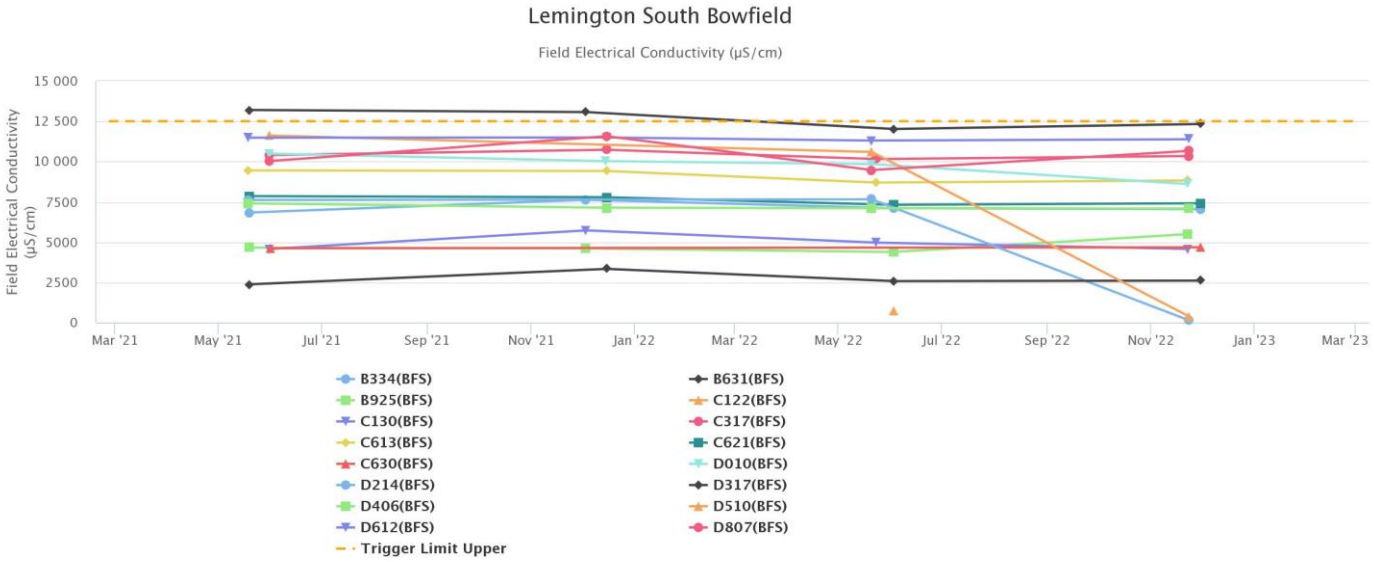

Figure 51 - Lemington South Bowfield Electrical Conductivity Trend - Q1 2023

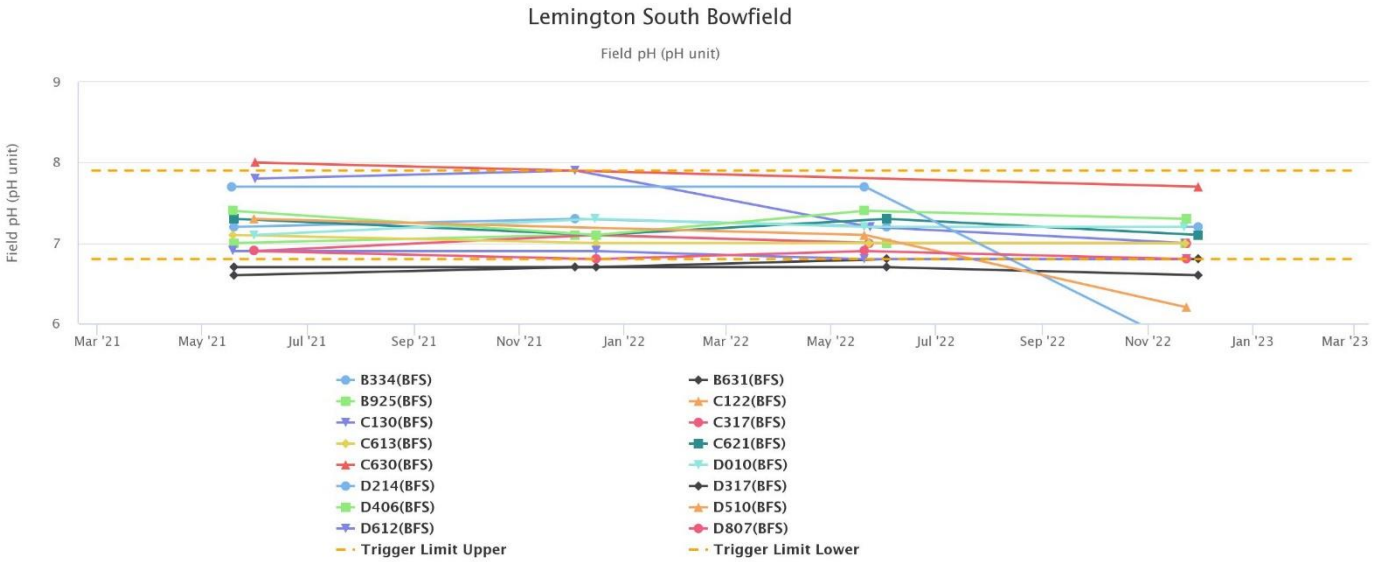

Figure 52 - Lemington South Bowfield pH Trend - Q1 2023

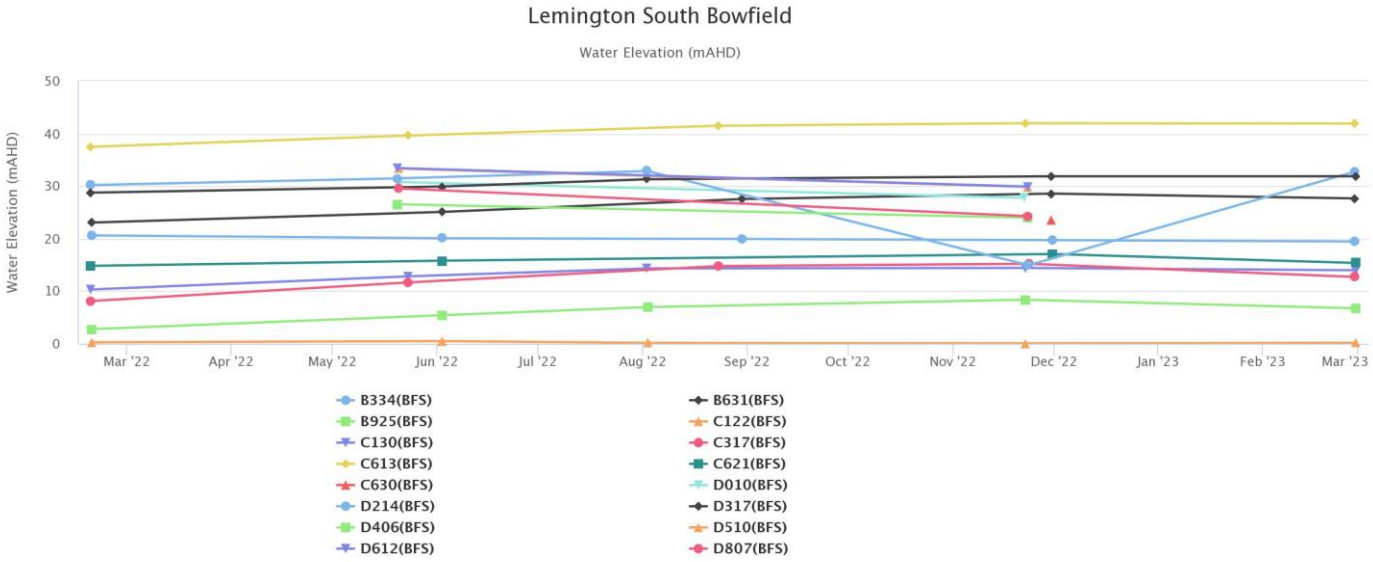

Figure 53 - Lemington South Bowfield Water Elevation Trend - Q1 2023

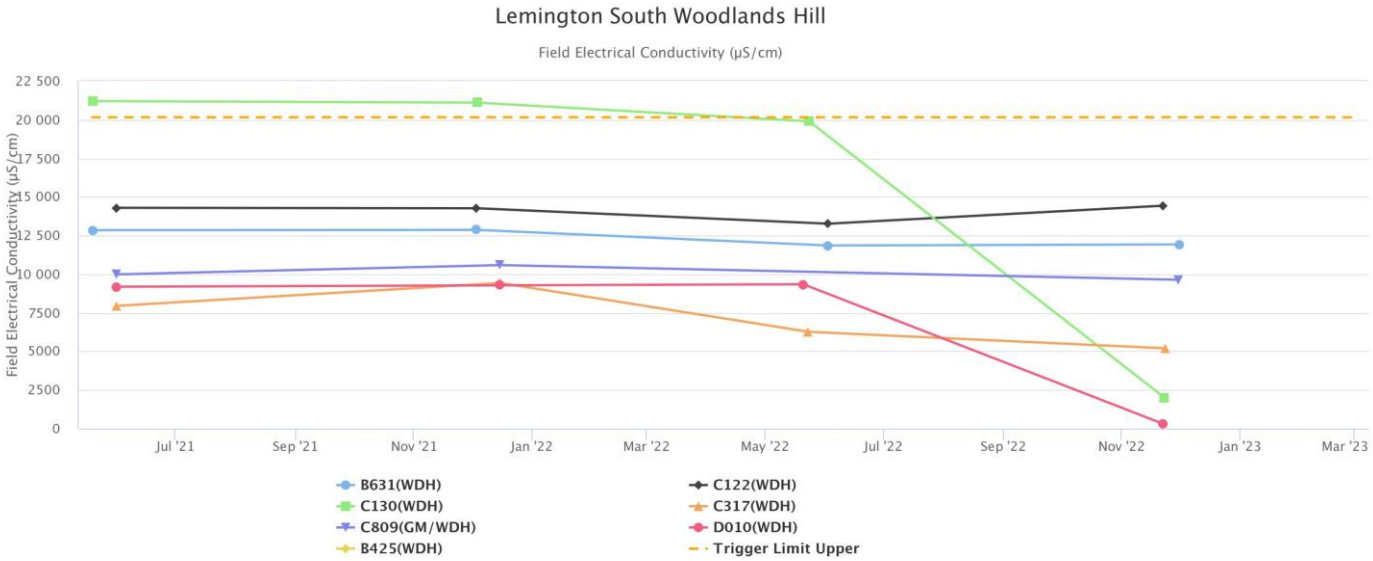

Figure 54 - Lemington South Woodlands Hill Electrical Conductivity Trend - Q1 2023

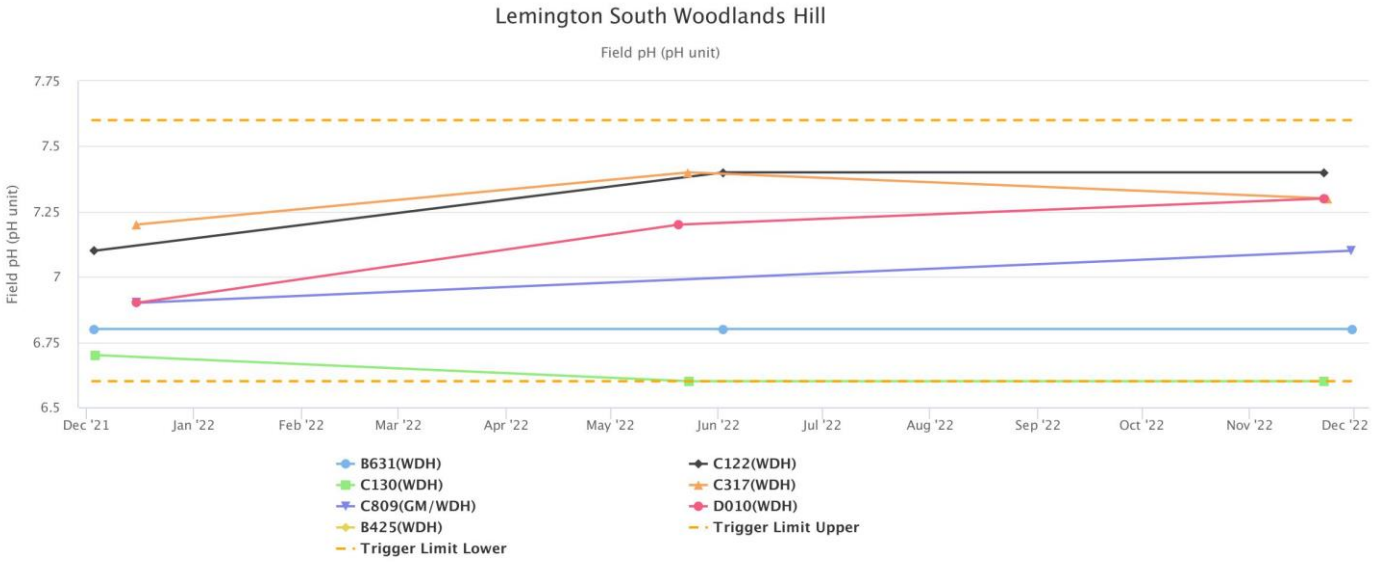

Figure 55 - Lemington South Woodlands Hill Field pH Trend - Q1 2023

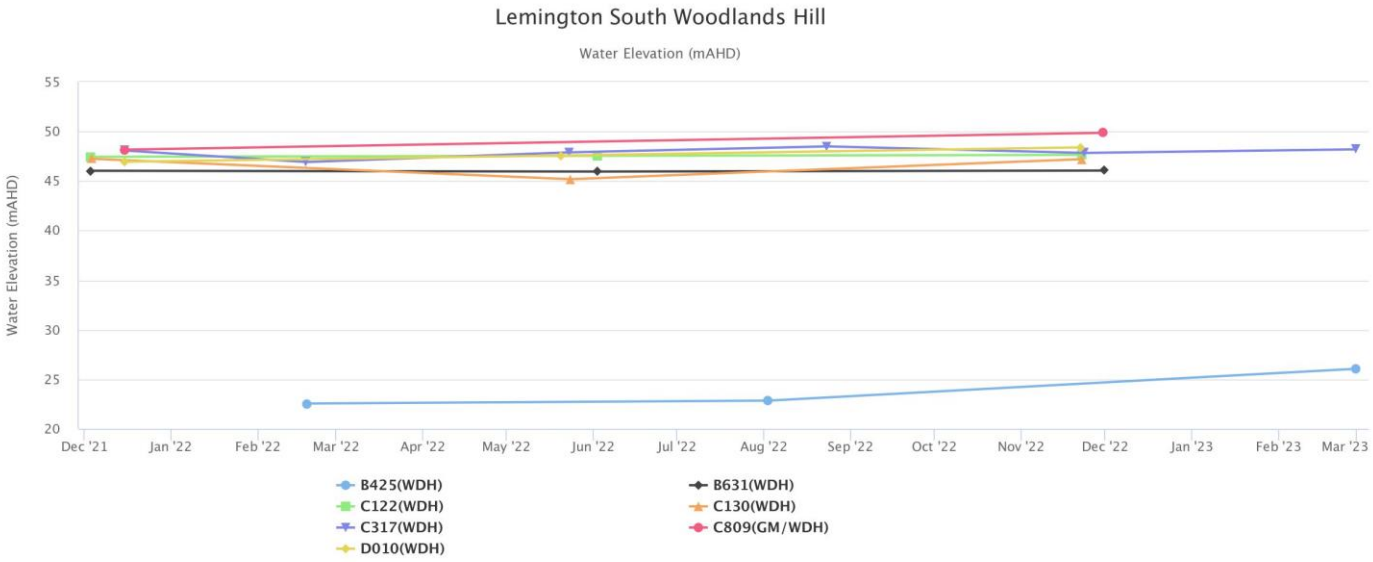

Figure 56 - Lemington South Woodlands Hill Water Elevation Trend - Q1 2023

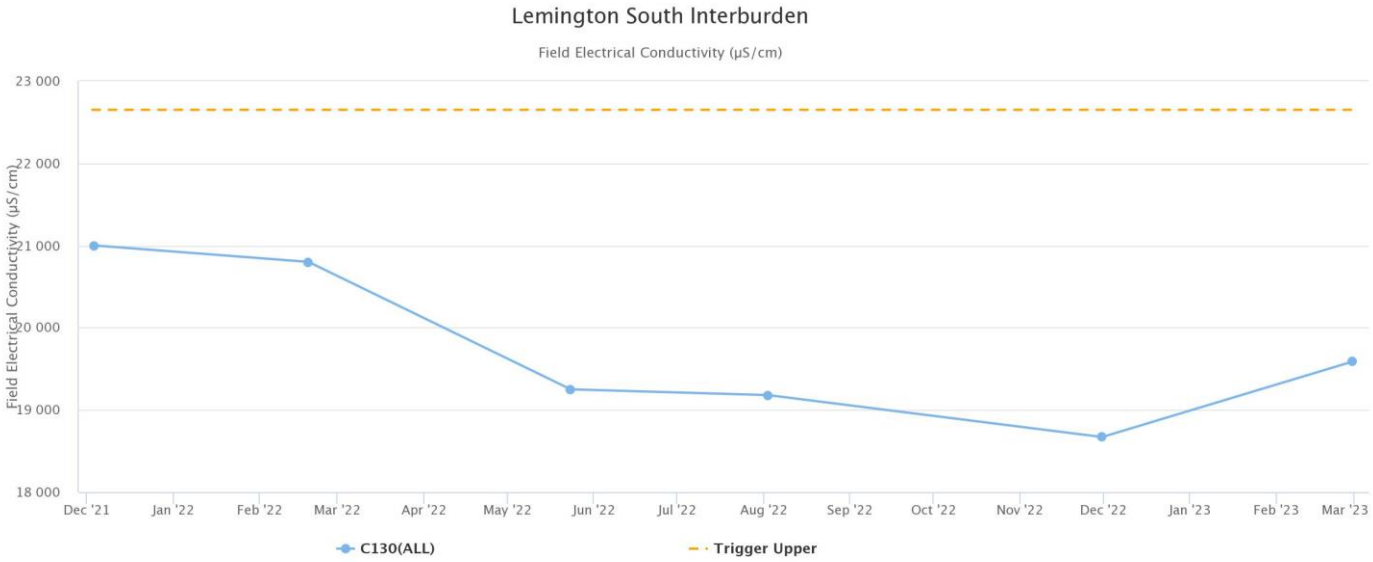

Figure 57 - Lemington South Interburden Electrical Conductivity Trend - Q1 2023

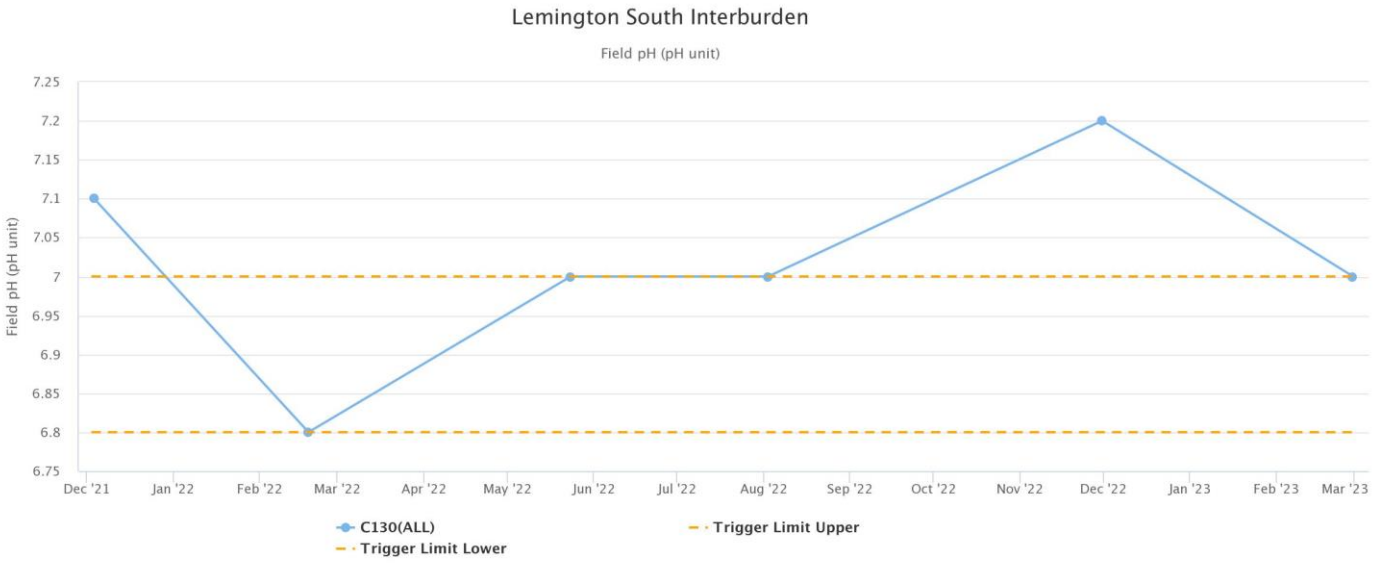

Figure 58 - Lemington South Interburden Field pH Trend - Q1 2023

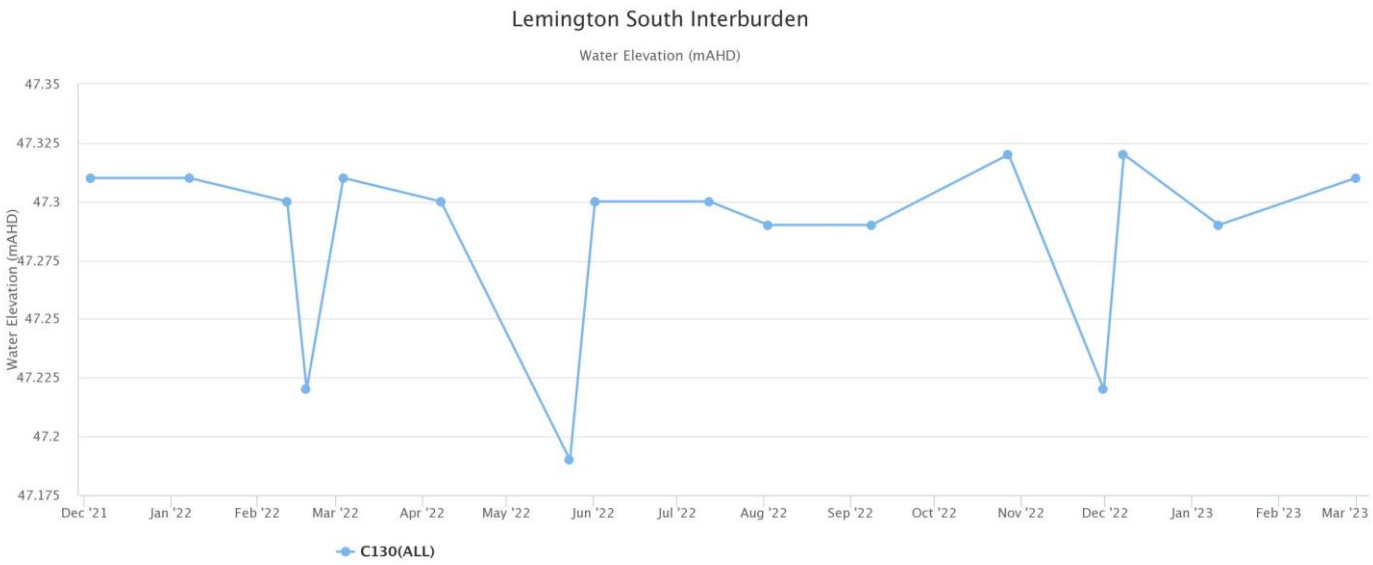

Figure 59 - Lemington South Interburden Water Elevation Trend - Q1 2023

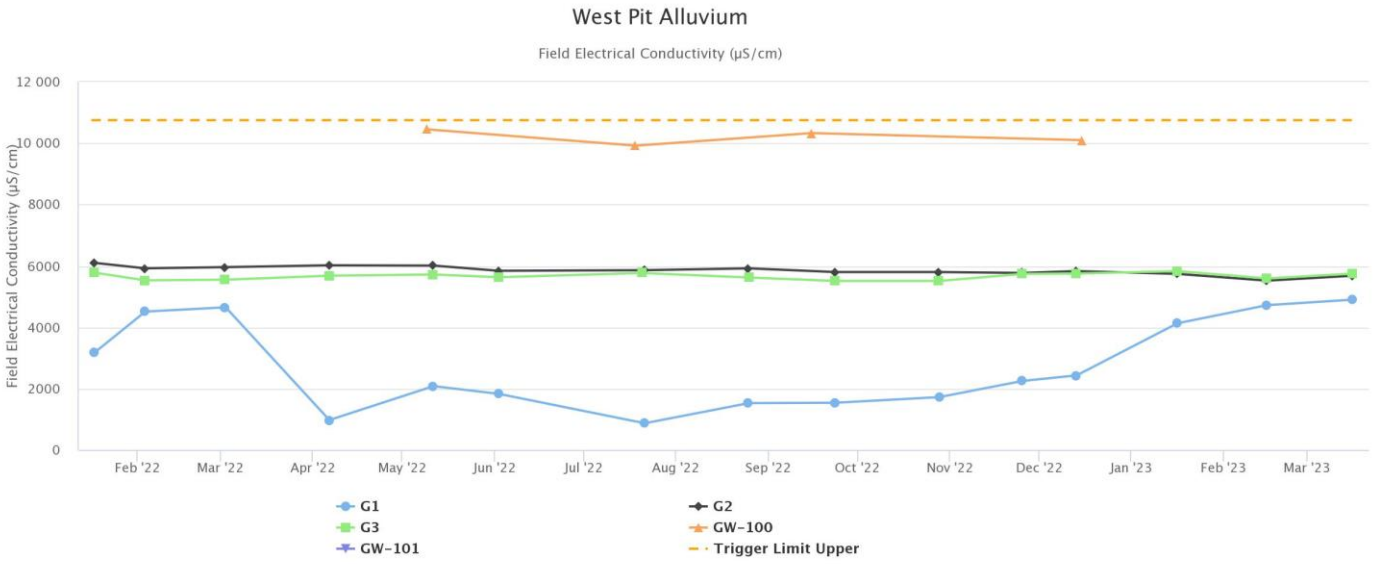

Figure 60 - West Pit Alluvium Electrical Conductivity Trend - Q1 2023

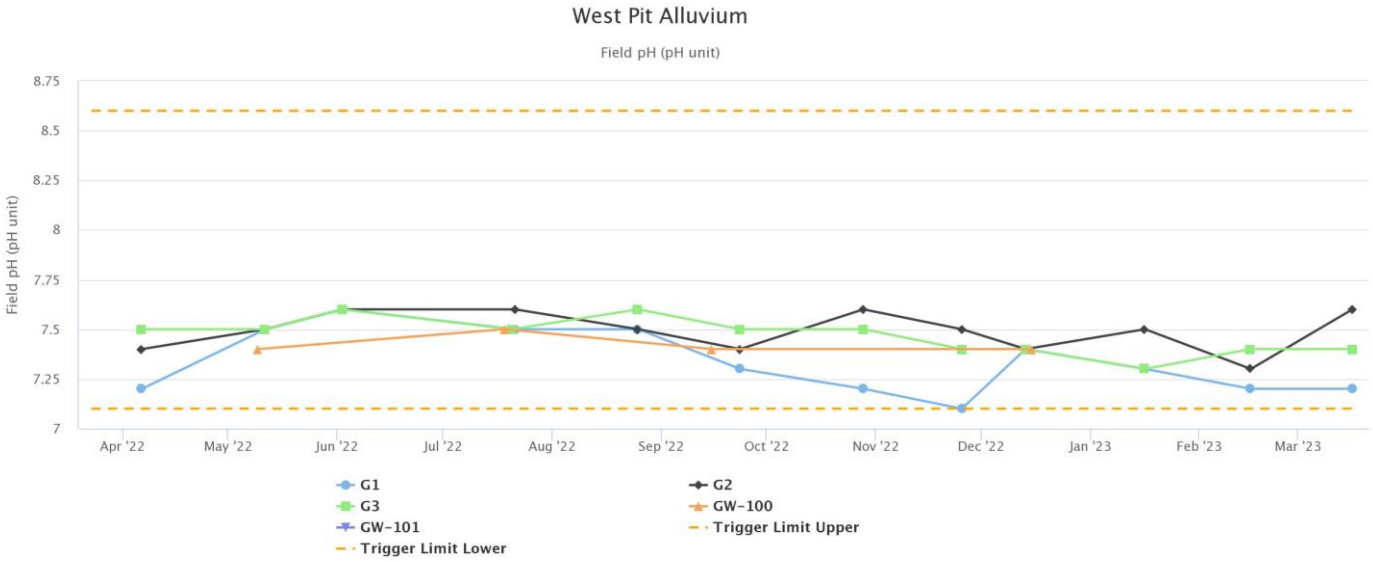

Figure 61 - West Pit Alluvium pH Trend - Q1 2023

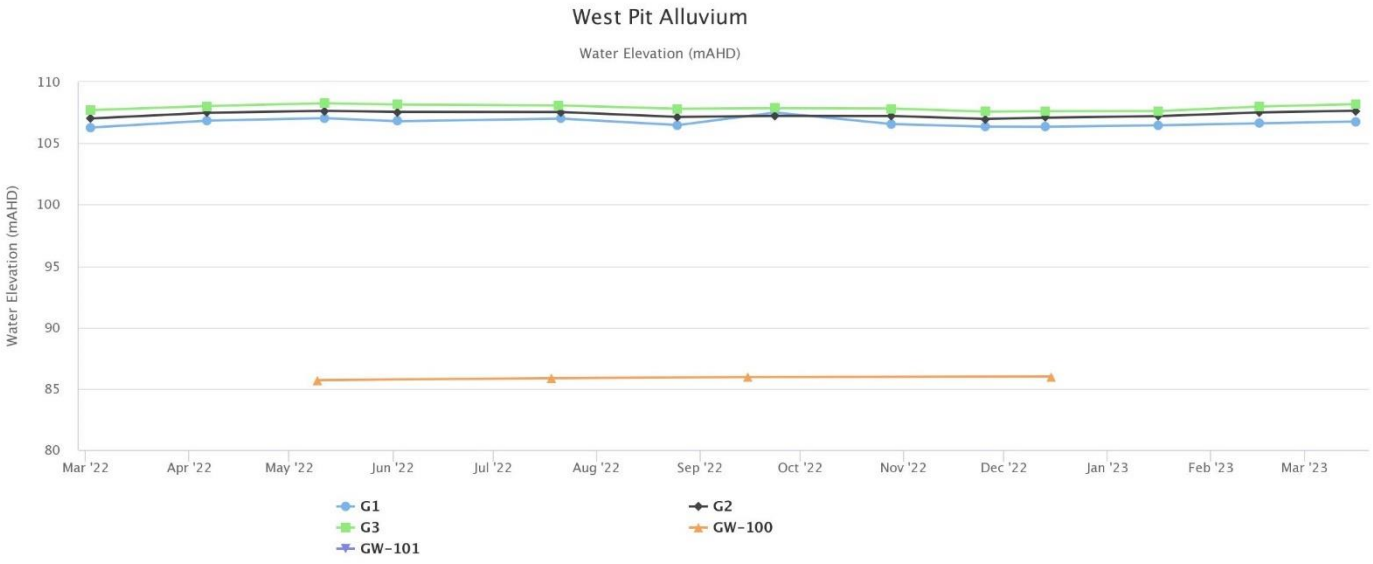

Figure 62 - West Pit Alluvium Water Elevation Trend - Q1 2023

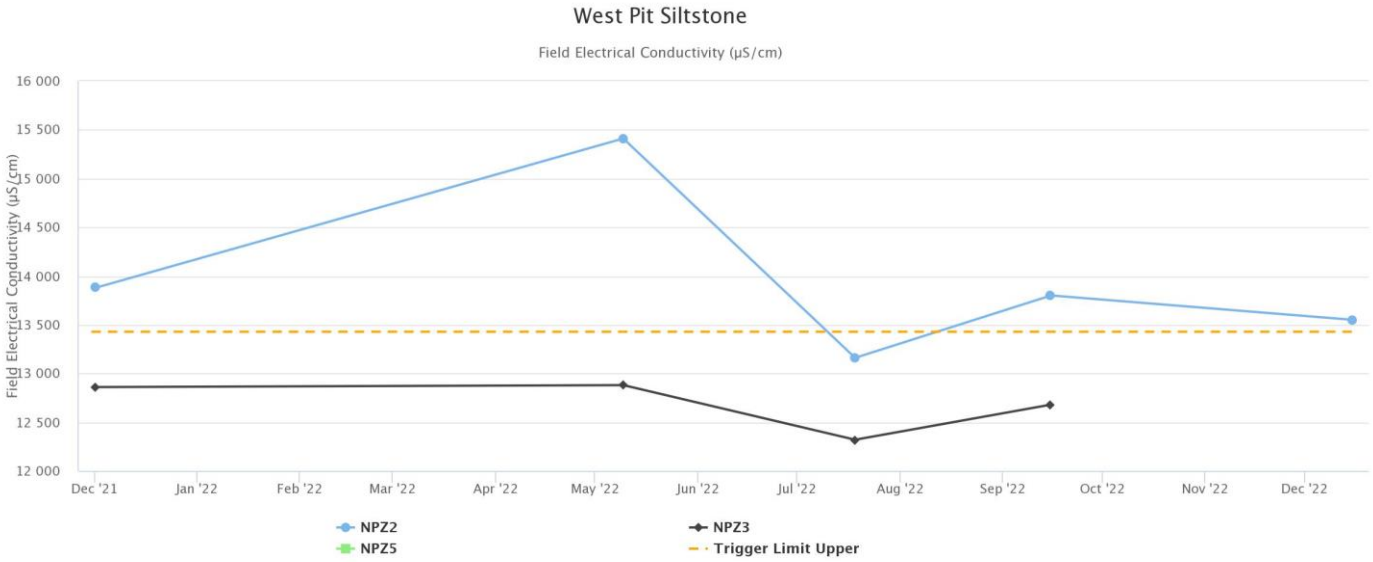

Figure 63 - West Pit Siltstone Electrical Conductivity Trend - Q1 2023

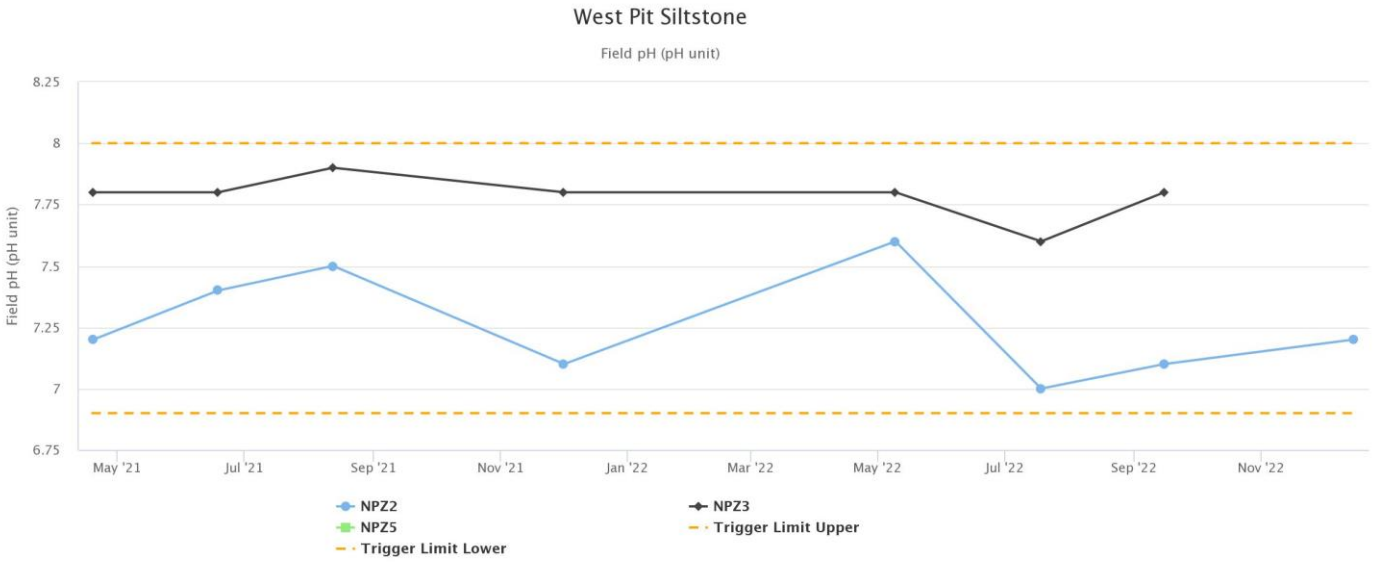

Figure 64 - West Pit Siltstone Field pH Trend - Q1 2023

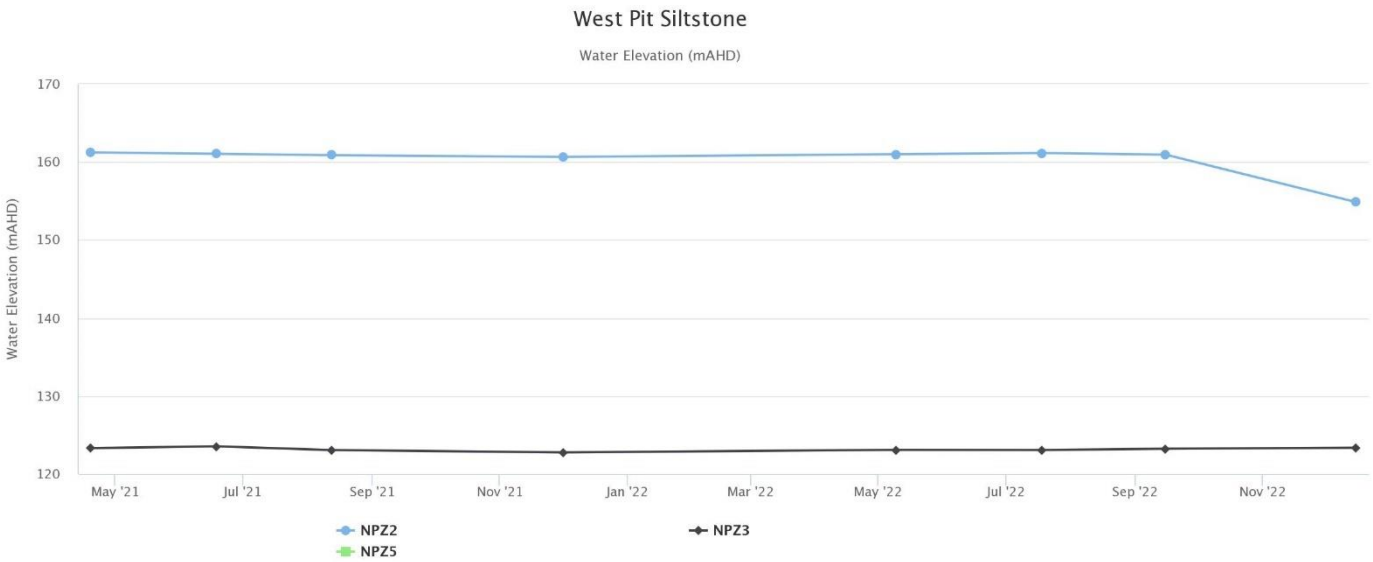

Figure 65 - West Pit Siltstone Water Elevation Trend- Q1 2023

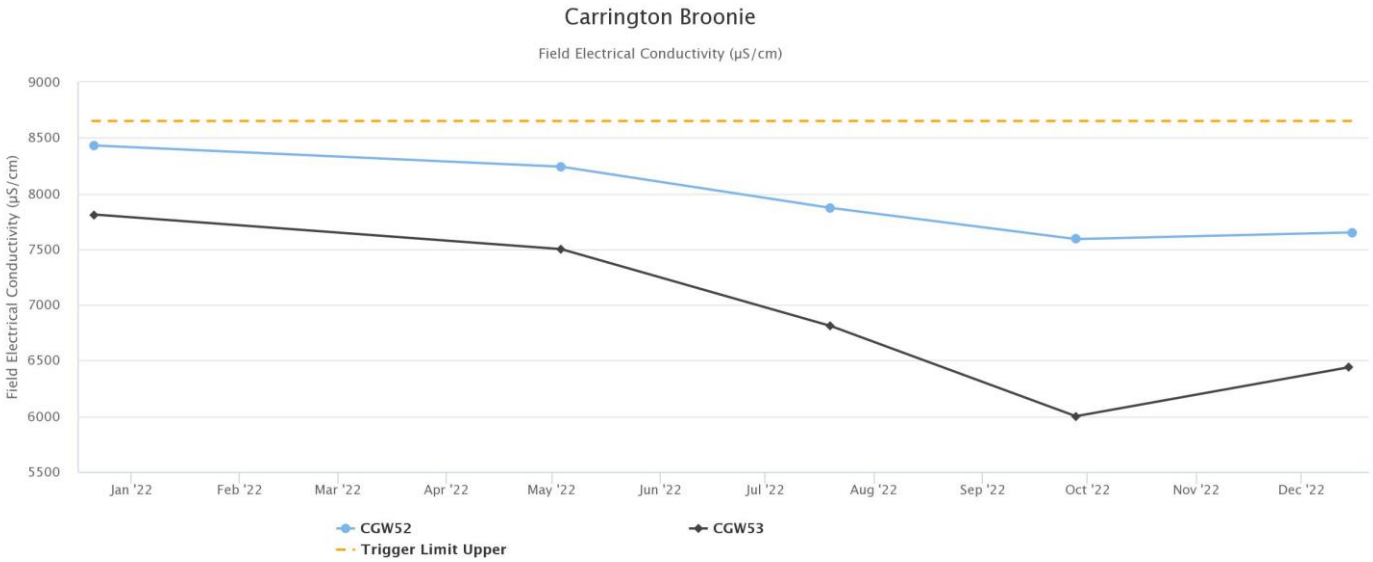

Figure 66 - Carrington Broonie Electrical Conductivity Trend - Q1 2023

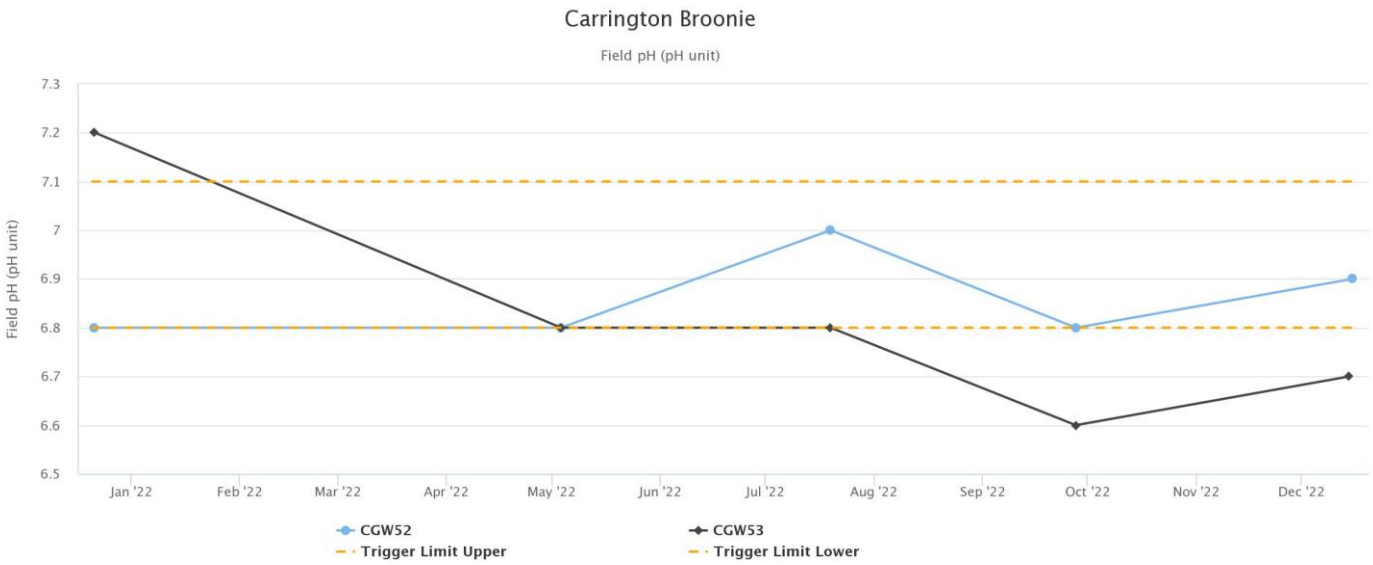

Figure 67 - Carrington Broonie Field pH Trend - Q1 2023

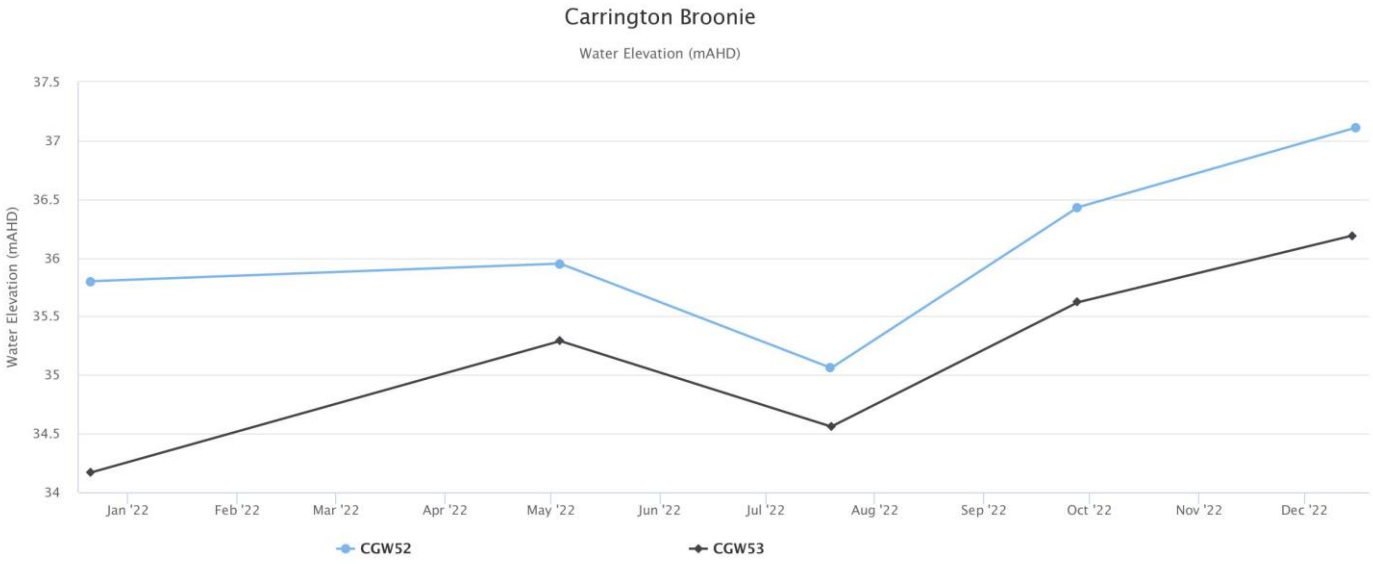

Figure 68 - Carrington Broonie Water Elevation Trend - Q1 2023

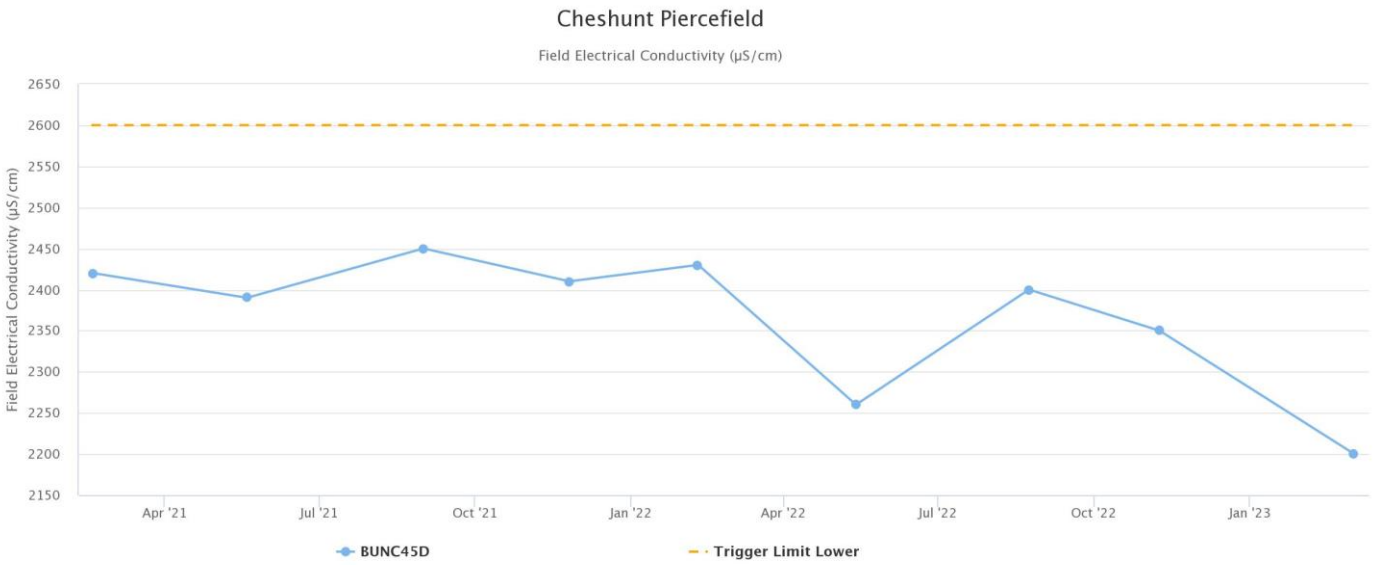

Figure 69 - Cheshunt Piercefield Electrical Conductivity Trend - Q1 2023

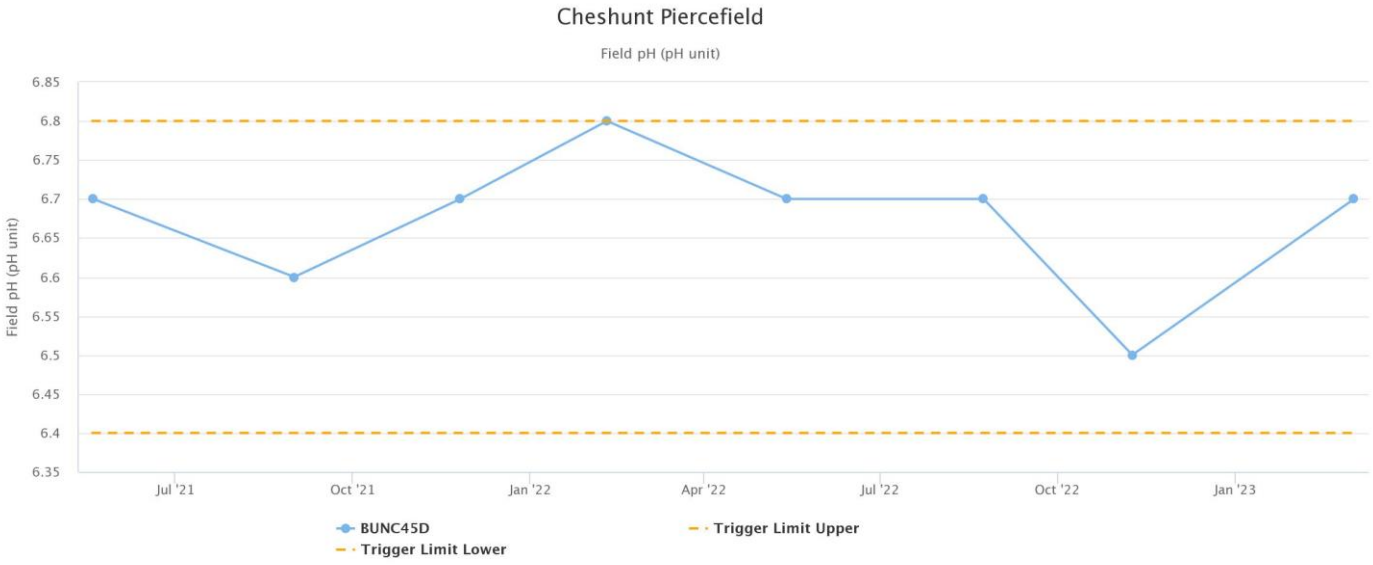

Figure 70 – Cheshunt Piercefield Field pH Trend – Q1 2023

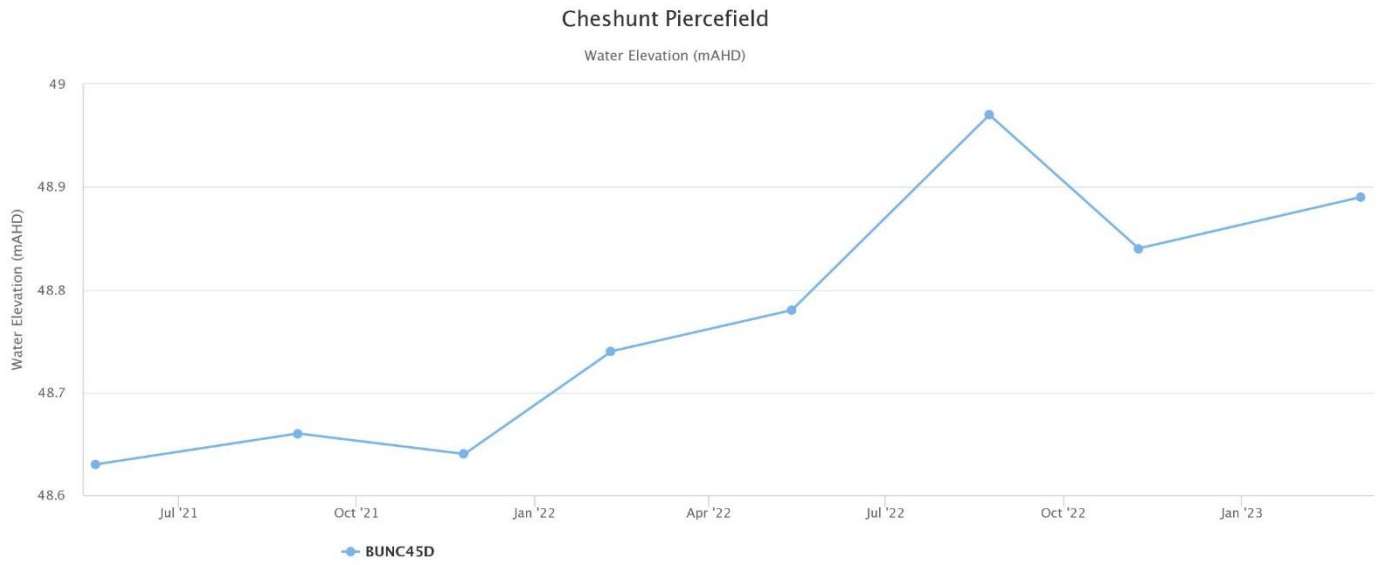

Figure 71 - Cheshunt Piercefield Water Elevation Trend - Q1 2023

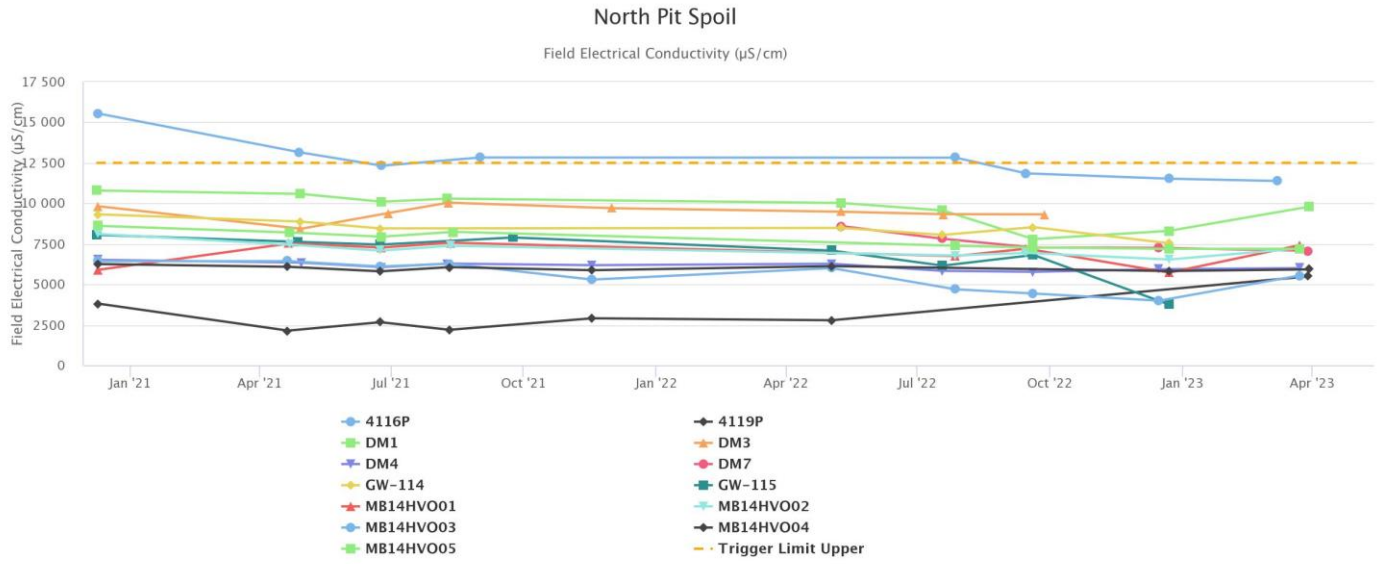

Figure 72 - North Pit Spoil Electrical Conductivity Trend - Q1 2023

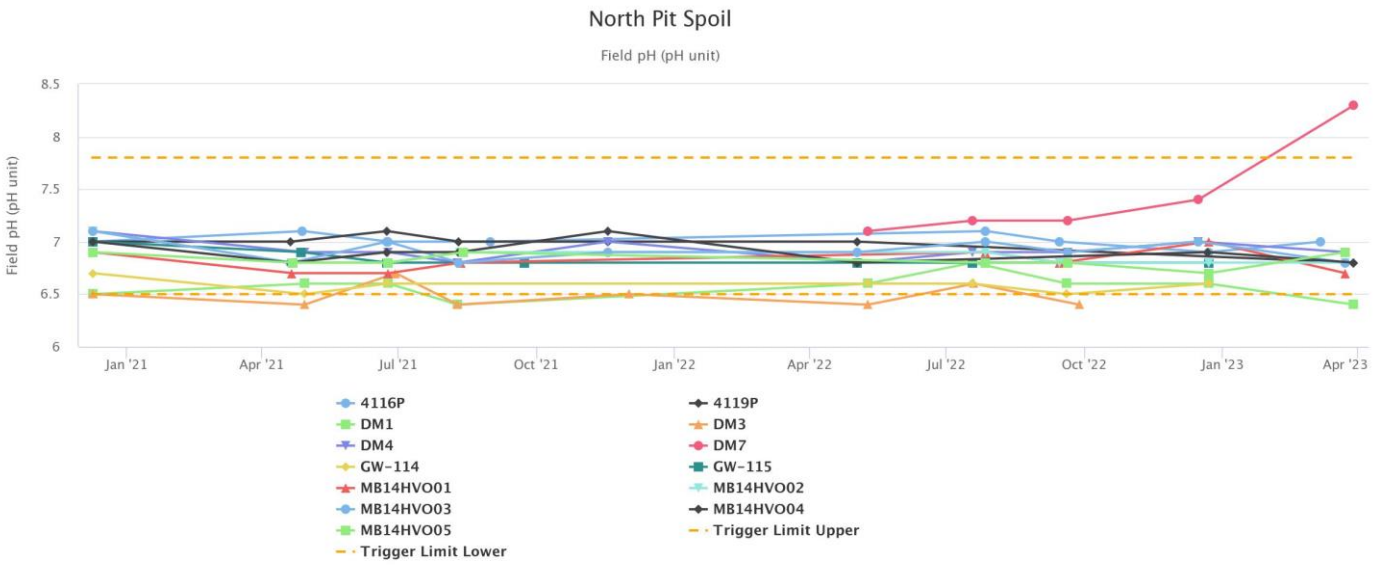

Figure 73 - North Pit Spoil Field pH Trend - Q1 2023

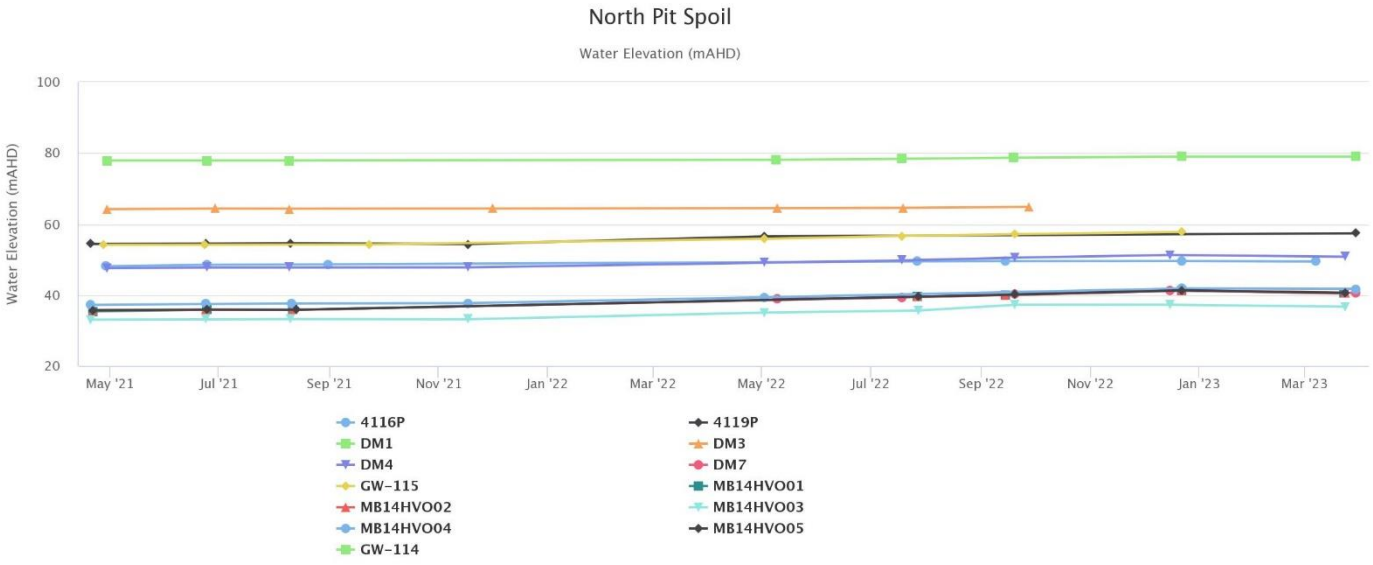

Figure 74 - North Pit Spoil Water Elevation Trend - Q1 2023

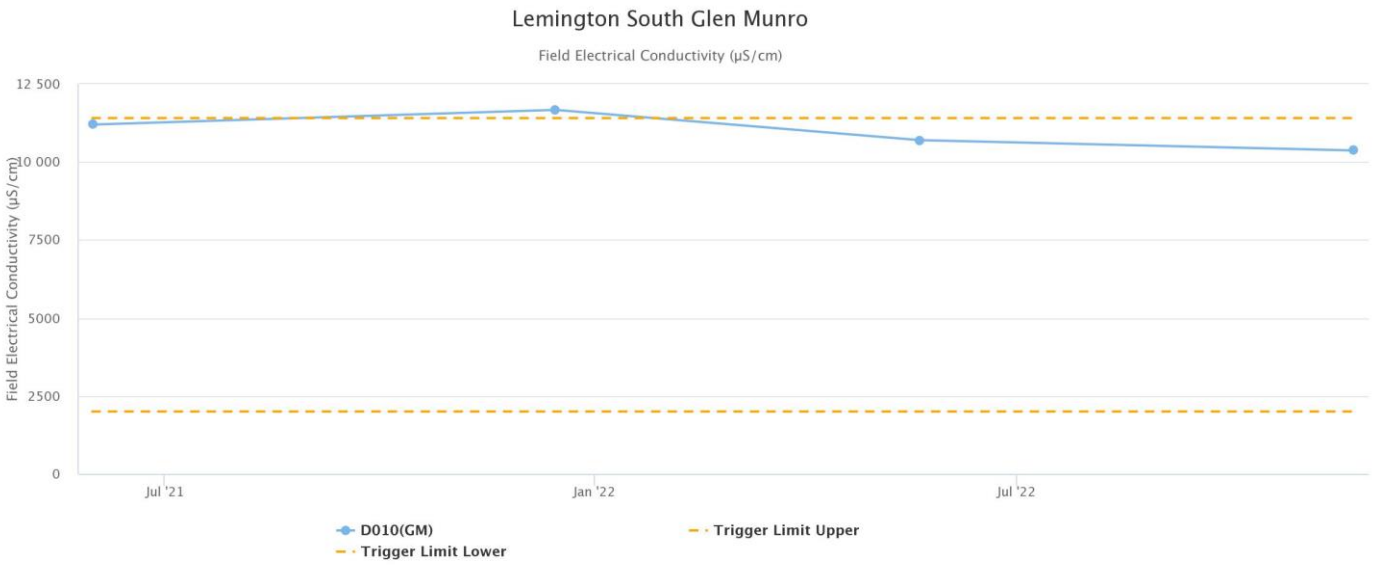

Figure 75 - Lemington South Glen Munro Electrical Conductivity Trend - Q1 2023

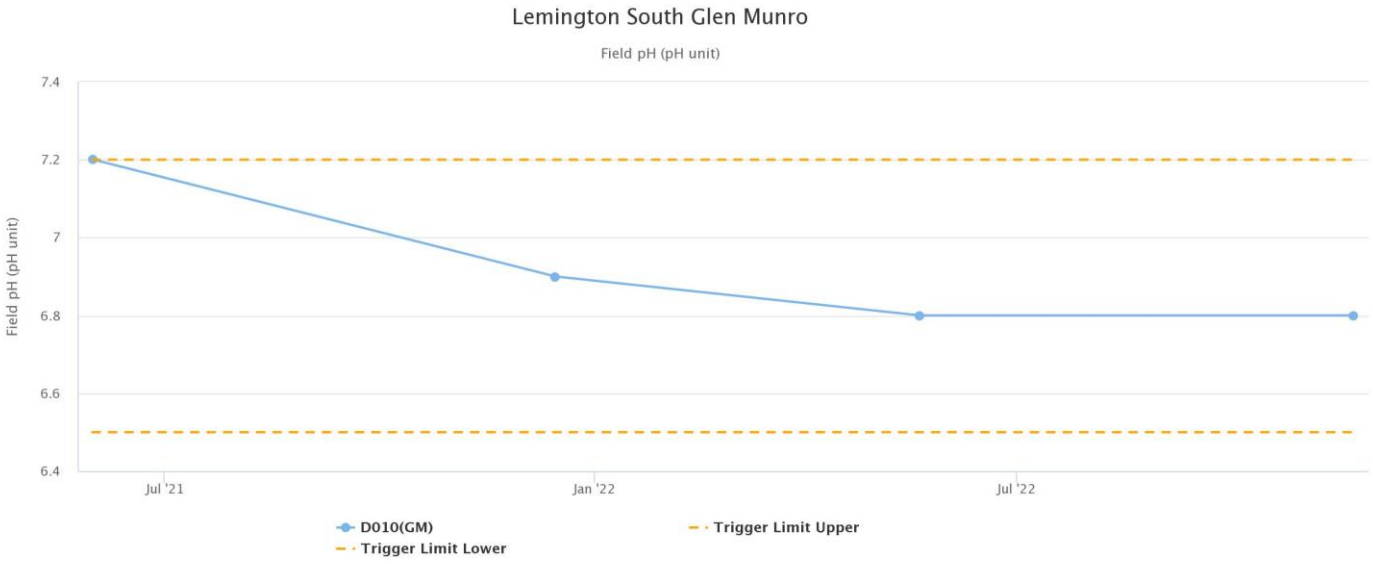

Figure 76 - Lemington South Glen Munro Field pH Trend - Q1 2023

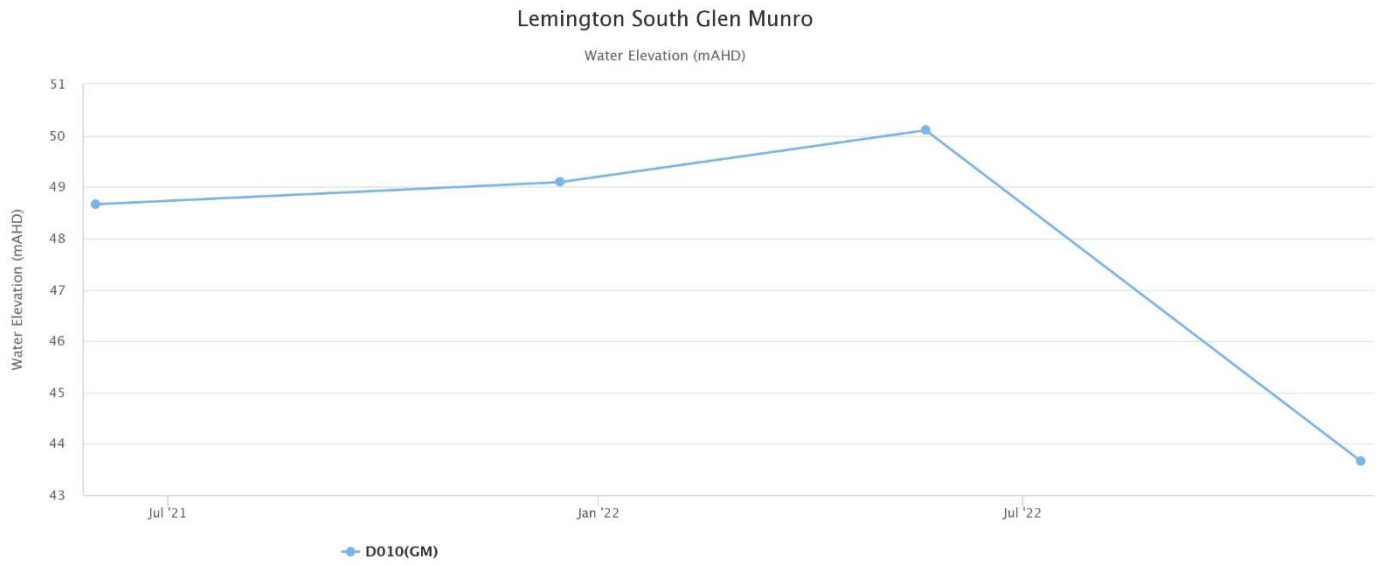

Figure 77 - Lemington South Glen Munro Water Elevation Trend - Q1 2023

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 2023

Site	Date	Trigger Limit Breached	Response Action
CFW55R	19/01/2023	Water Elevation (mAHD)	Eleven consecutive water level readings about the 95th percentile trigger level of 59.41 mAHD since April 2022. Groundwater levels in bore CFW55R have gradually increased since February 2020 with a sharp increase between September 2021 and January 2023 in response to above average rainfall, followed by a slight decline in levels in response to average rainfall over the reporting period. No further action required.
CFW57	20/01/2023	Water Elevation (mAHD)	Sixteen consecutive water level readings above the 95th percentile trigger level of 59.24 mAHD since December 2021.

			Groundwater levels in bore CFW57 have gradually increased since February 2020 with a sharp increase between September 2021 and November 2022 in response to above average rainfall, followed by a slight decline in levels in response to average rainfall over the reporting period. No further action required.
CFW57	24/02/2023	Water Elevation (mAHD)	Sixteen consecutive water level readings above the 95th percentile trigger level of 59.24 mAHD since December 2021. Groundwater levels in bore CFW57 have gradually increased since February 2020 with a sharp increase between September 2021 and November 2022 in response to above average rainfall, followed by a slight decline in levels in response to average rainfall over the reporting period. No further action required.
GW-127	27/02/2023	Sulphate/Chloride Ratio	One sulphate/chloride ratio reading above the trigger level over the reporting period (0.2 meq in February). No further action required.
CFW55R	27/02/2023	Water Elevation (mAHD)	Eleven consecutive water level readings about the 95th percentile trigger level of 59.41 mAHD since April 2022. Groundwater levels in bore CFW55R have gradually increased since February 2020 with a sharp increase between September 2021 and January 2023 in response to above average rainfall, followed by a slight decline in levels in response to average rainfall over the reporting period. No further action required.
BZ4A(2)	1/03/2023	Field pH (pH unit)	1st exceedance - monitor
BZ3-3	1/03/2023	Field pH (pH unit)	1st exceedance - monitor
BZ2A(1)	1/03/2023	Field pH (pH unit)	1st exceedance - monitor
BUNC45A	3/03/2023	Field pH (pH unit)	1st exceedance - monitor
CHPZ3D	3/03/2023	Field pH (pH unit)	1st exceedance - monitor
CGW46	6/03/2023	Field pH (pH unit)	1st exceedance - monitor
CFW55R	24/03/2023	Water Elevation (mAHD)	Eleven consecutive water level readings about the 95th percentile trigger level of 59.41 mAHD since April 2022.

			Groundwater levels in bore CFW55R have gradually increased since February 2020 with a sharp increase between September 2021 and January 2023 in response to above average rainfall, followed by a slight decline in levels in response to average rainfall over the reporting period. No further action required.
DM1	29/03/2023	Field pH (pH unit)	1st exceedance - monitor
DM7	29/03/2023	Field pH (pH unit)	1st exceedance - monitor
CFW57	31/03/2023	Water Elevation (mAHD)	Sixteen consecutive water level readings above the 95th percentile trigger level of 59.24 mAHD since December 2021. Groundwater levels in bore CFW57 have gradually increased since February 2020 with a sharp increase between September 2021 and November 2022 in response to above average rainfall, followed by a slight decline in levels in response to average rainfall over the reporting period. 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 15. Blasting criteria for HVO are summarised in Table 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

Seventeen (17) 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)
1/03/2023 13:04	91.33	95.32	91.41	90.48	93.95
2/03/2023 13:07	100.38	104.14	101.26	88.84	105.21
9/03/2023 14:17	96.94	109.82	91.14	94.96	105.70
9/03/2023 14:17	90.68	110.82	99.65	101.71	106.91
10/03/2023 13:02	99.28	92.86	90.99	98.53	93.80
15/03/2023 13:48	89.99	81.89	85.65	97.75	82.31
16/03/2023 13:12	93.70	101.59	104.10	102.33	103.90
16/03/2023 13:14	86.85	115.54	101.69	98.56	108.83
18/03/2023 15:10	94.15	95.75	97.13	93.81	99.31
20/03/2023 13:13	102.48	104.87	105.11	88.28	91.16
20/03/2023 13:13	104.37	105.99	105.11	97.30	97.02
22/03/2023 14:40	88.25	94.79	89.07	92.56	90.34
23/03/2023 13:17	91.63	106.68	94.64	93.76	96.75
23/03/2023 16:55	96.52	97.36	96.71	99.05	97.46
25/03/2023 16:01	96.37	102.38	107.06	88.38	102.89
25/03/2023 16:03	103.97	104.92	108.92	96.75	100.93
30/03/2023 16:10	93.38	95.92	102.72	100.24	94.94

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)
1/03/2023 13:04	0.10	0.03	0.17	0.16	0.14
2/03/2023 13:07	0.12	0.07	0.03	0.48	0.07
9/03/2023 14:17	0.11	0.05	0.46	0.17	0.47
9/03/2023 14:17	0.21	0.11	0.53	1.05	0.09
10/03/2023 13:02	0.25	0.11	0.05	0.48	0.09
15/03/2023 13:48	0.21	0.10	0.09	0.45	0.08
16/03/2023 13:12	0.27	0.13	0.68	0.89	0.53
16/03/2023 13:14	0.22	0.09	0.14	0.46	0.15
18/03/2023 15:10	0.16	0.13	0.04	0.13	0.07
20/03/2023 13:13	0.12	0.04	0.04	0.14	0.08
20/03/2023 13:13	0.15	0.07	0.04	0.44	0.08
22/03/2023 14:40	0.18	0.11	0.11	0.58	0.08
23/03/2023 13:17	0.22	0.24	0.10	0.24	0.11
23/03/2023 16:55	0.13	0.04	0.10	0.20	0.13
25/03/2023 16:01	0.16	0.08	0.04	0.12	0.08
25/03/2023 16:03	0.14	0.05	0.06	0.16	0.08
30/03/2023 16:10	0.24	0.22	0.15	0.86	0.10

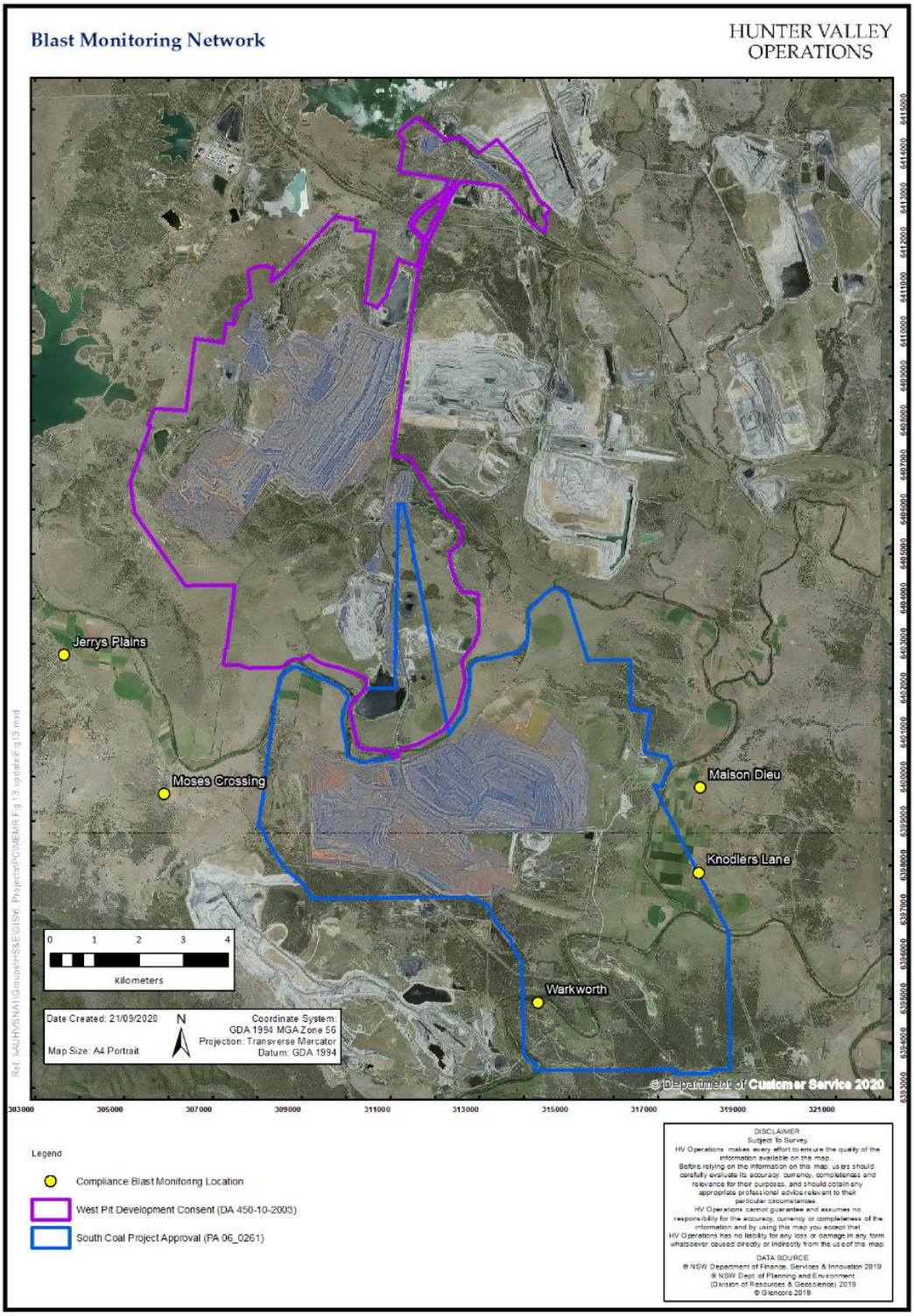

Figure 78 - Blast Monitoring Location Plan

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 16**.**

5.1 | ATTENDED NOISE MONITORING RESULTS

Attended monitoring was conducted at receiver locations around HVO during the night periods of the 15th and 27th of March 2023.

Compliance with the HVO noise impact limits ensures compliance with the land acquisition criteria. Therefore, since no noise impact exceedances occurred for the reporting period the land acquisition assessment has not been presented. These will only be reported in instances of noise impact exceedances.

Monitoring results are detailed in Table 7 and Table 8**.**

Table 7 - LAeq,15minute and 1minute HVO North Against Impact Assessment Criteria for the Reporting Period

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	HVO North limits, dB [1]		HVO North levels, dB		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	$L_{A1,1min}$	$L_{Aeq,15minute}$ [2]	$L_{A1,1min}$	$L_{Aeq,15minute}$	$L_{A1,1min}$
Shearers Lane	15/03/2023 21:31	2.2	124	E	Yes	35	46	IA	IA	Nil	Nil
Knodlers Lane	15/03/2023 21:53	2.2	131	E	No	35	46	IA	IA	Nil	Nil
Maison Dieu	15/03/2023 21:10	1.8	127	E	No	35	46	IA	IA	Nil	Nil
Long Point (Dights Crossing)	15/03/2023 22:43	2.5	140	D	Yes	35	46	IA	IA	Nil	Nil
Kilburnie South	15/03/2023 23:13	1.0	125	D	No	39	46	IA	IA	Nil	Nil
Jerrys Plains East	15/03/2023 22:52	2.5	140	D	Yes	39	46	31	35	Nil	Nil
Jerrys Plains Village	15/03/2023 21:21	1.8	127	E	No	40	46	31	35	Nil	Nil
Jerrys Plains West	15/03/2023 21:01	1.7	137	E	No	40	46	30	40	Nil	Nil

1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only LAeq,15minute, includes modifying factor penalties if applicable.
3. Degrees magnetic north, "-" indicates calm conditions

Table 8 - LAeq,15minute and 1minute HVO South Against Impact Assessment Criteria for the Reporting Period

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	HVO South limits, dB [1]		HVO South levels, dB		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	$L_{A1,1min}$	$L_{Aeq,15minute}$ [2]	$L_{A1,1min}$	$L_{Aeq,15minute}$	$L_{A1,1min}$
Shearers Lane	15/03/2023 21:31	3.1	151	D	Yes	41	45	IA	IA	Nil	Nil
Knodlers Lane	15/03/2023 21:53	2.6	142	D	No	40	45	IA	IA	Nil	Nil
Maison Dieu	15/03/2023 21:10	2.6	138	D	No	39	45	IA	IA	Nil	Nil
Long Point (Dights Crossing)	15/03/2023 22:43	3.2	149	D	Yes	37	45	IA	IA	Nil	Nil
Kilburnie South	15/03/2023 23:13	2.2	139	E	No	39	45	33	35	Nil	Nil
Jerrys Plains East	15/03/2023 22:52	3.2	149	D	Yes	38	45	IA	IA	Nil	Nil
Jerrys Plains Village	15/03/2023 21:21	2.6	138	D	No	35	45	IA	IA	Nil	Nil
Jerrys Plains West	15/03/2023 21:01	2.8	143	E	No	35	45	IA	IA	Nil	Nil
HVGC	15/03/2023 23:42	2.3	145	E	NA	55	NA	IA	IA	Nil	Nil

1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only LAeq,15minute, includes modifying factor penalties if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.

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 Table 9 and Table 10**.**

Table 9 - Modifying Factor Assessment HVO North for the Reporting Period

Location	Start date and time	Measured HVO North L_{Aeq} dB	Very enhancing? [1]	Intermittency modifying factor?	Tonality modifying factor?	Frequency of tonality	Low-frequency modifying factor? [1,2]	Exceedance of reference spectrum [2,3]	Total penalty dB [2,3]
Shearers Lane	15/03/2023 21:31	IA	Yes	No	No	NA	No	NA	Nil
Knodlers Lane	15/03/2023 21:53	IA	No	No	No	NA	No	NA	Nil
Maison Dieu	15/03/2023 22:43	IA	No	No	No	NA	No	NA	Nil
Long Point (Dights Crossing)	27/02/2023 22:54	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	27/02/2023 23:38	IA	No	No	No	NA	NA	NA	Nil
Jerrys Plains East	27/02/2023 23:15	31	Yes	No	No	NA	NA	NA	Nil
Jerrys Plains Village	27/02/2023 21:34	31	No	No	No	NA	No	NA	Nil
Jerrys Plains West	27/02/2023 21:10	30	No	No	No	NA	No	NA	Nil

1. Low-frequency modifying factors are not applicable during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.

2. NA denotes 'not applicable'.

3. Bold results indicate that application of NPfI modifying factor(s) is required.

Table 10 - Modifying Factor Assessment HVO South for the Reporting Period

Location	Start date and time	Measured HVO South LAeq dB	Very enhancing?!	Intermittency modifying factor?	Tonality modifying factor?	Frequency of tonality	Low-frequency modifying factor? 1,2	Exceedance of reference spectrum 2,3	Total penalty dB 2,3
Shearers Lane	15/03/2023 21:31	IA	Yes	NA	NA	NA	NA	NA	NA
Knodlers Lane	15/03/2023 21:53	IA	No	No	No	NA	No	NA	Nil
Maison Dieu	15/03/2023 21:10	IA	No	No	No	NA	No	NA	Nil
Long Point (Dights Crossing)	15/03/2023 22:43	IA	Yes	NA	NA	NA	NA	NA	NA
Kilburnie South	15/03/2023 23:13	33	No	No	No	NA	No	NA	Nil
Jerrys Plains East	15/03/2023 22:52	IA	Yes	NA	NA	NA	NA	NA	NA
Jerrys Plains Village	15/03/2023 21:21	IA	No	No	No	NA	No	NA	Nil
Jerrys Plains West	15/03/2023 21:01	IA	No	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.

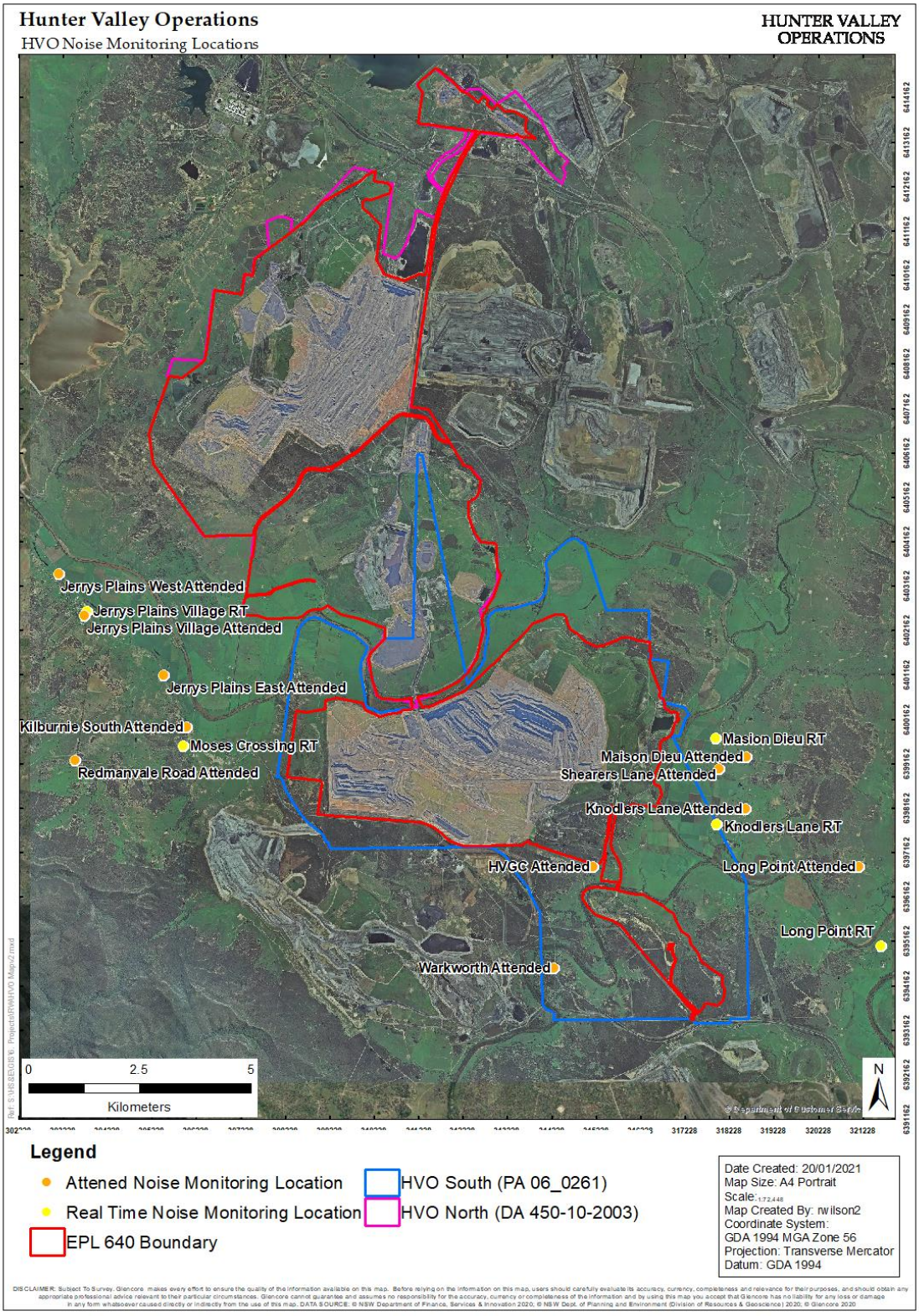

Figure 79 - Noise Monitoring Location Plan

6 | OPERATIONAL DOWNTIME

A total of 248.7 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 17. 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).

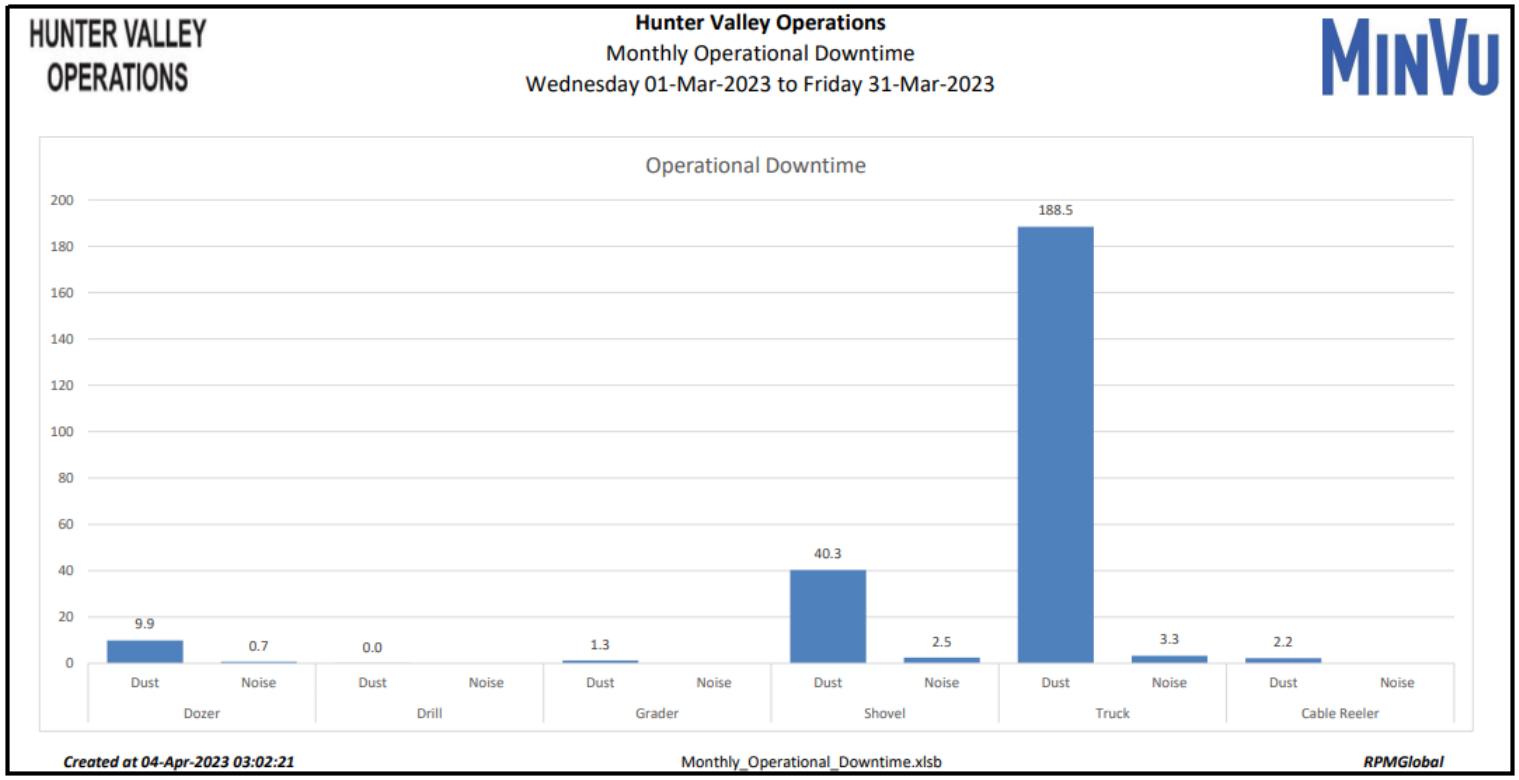

Figure 80 - Operational Downtime by Equipment Type for the Reporting Period

7 | REHABILITATION

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

- 0 Ha of land was reshaped
- 0 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 18.

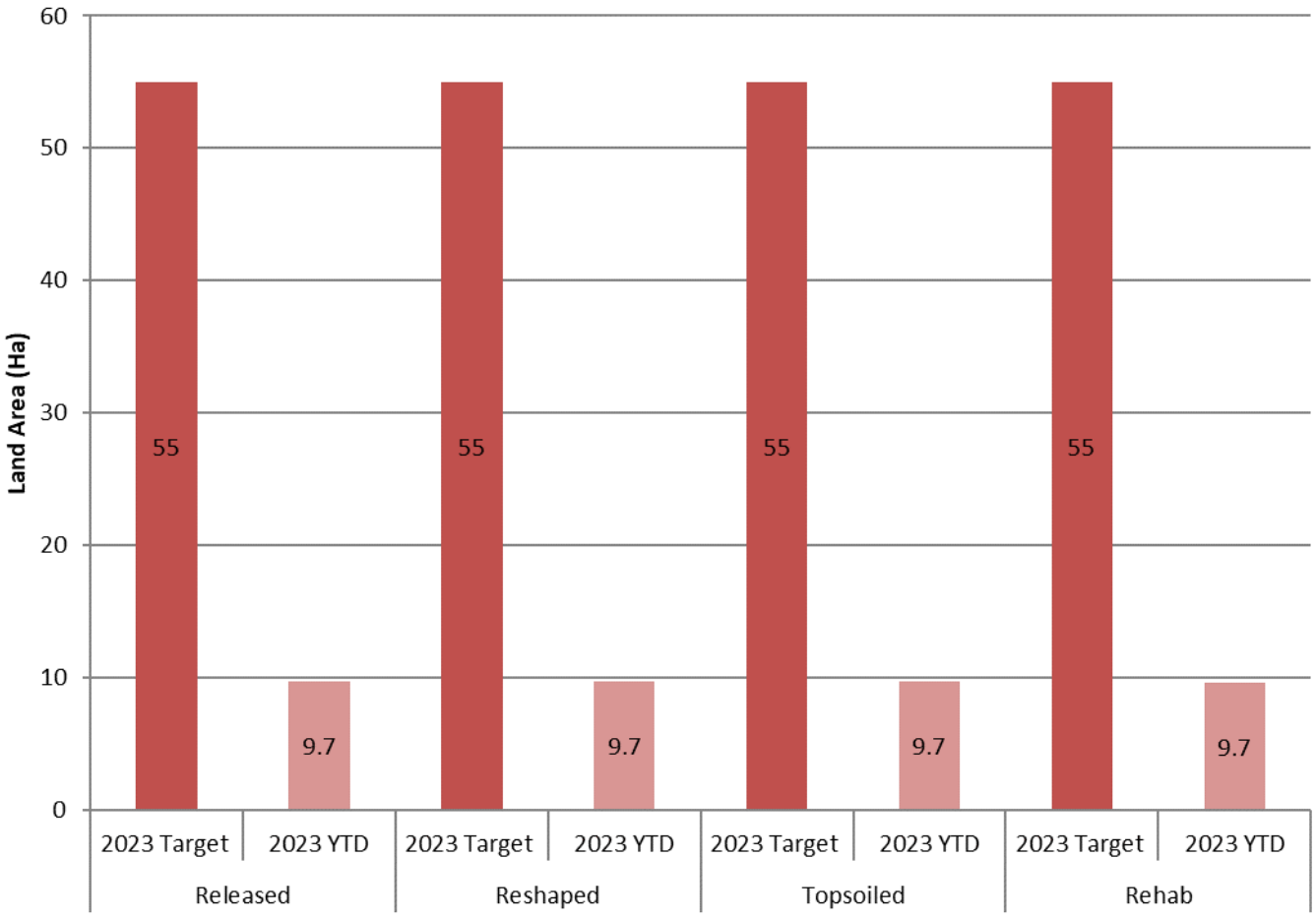

Figure 81 - Rehabilitation YTD March 2023

8 | COMPLAINTS

There was one complaint during the reporting period.

Details of complaints received from 2023 are shown in Table 11**.**

Table 11 – Complaints Summary 2023

Complaint Number	Date	Time	Complainant ID	Nature of Complaint	Mode of Complaint	Brief Description and Response
No community complaints were received in January.						
1	1 February	12:06am	1	Lighting	Community Hotline	• A complainant of Long Point called the Community Complaints Hotline at 12.06am regarding a lighting complaint, commenting that “light from HVO was shining directly into their house keeping their family awake”. • The OCE contacted the complainant at 12:27am and shutdown the lighting plant identified to be causing the disturbance. This was verified by the complainant. • An internal investigation conducted following the complaint found that the light from the lighting plant was likely to be visible from the complainant's location. Process changes have been made as a result of the complaint to close the identified gap in operational practices.
No community complaints were received in March.						

9 | ENVIRONMENTAL INCIDENTS

There were three reportable environmental incidents during the reporting period:

- 06/03/2023 – Cheshunt East PM10 High Volume Air Sampler (HVAS) PM10 exceedance

HVO received a report from the monitoring contractor on 20 April 2023 that identified a 24-hour PM10 average of 61.1ug/m3 at the Cheshunt East HVAS for 6 March 2023, exceeding the Project Approval criteria of 50ug/m3.

Result were sent to a third party to investigate HVO's contribution to the exceedance. The investigation calculated HVO 's estimated maximum PM10 contribution to be less than or equal to 20.3µg/m3 or 33% of the recorded measurement. While this shows HVO is not the primary source, the criteria requires total PM10 levels, including HVO and all other sources, to be below 50ug/m3. Subsequently HVO notified the DPE of this exceedance and provided an incident investigation report.

- 12/03/2023 and 18/03/2023 – Warkworth HVAS mis-capture

HVO were notified by the monitoring contractor on 17 March 2023 that the Warkworth TSP HVAS failed to run for the full monitoring period on 12 March 2023. It was identified that the power supply tripped at the Residual Current Device (RCD). Once power was restored the HVAS monitor programme indicated it had run for 7 hours.

HVO were subsequently notified on 20 March by the monitoring contractor that the Warkworth TSP HVAS failed to run for the full monitoring period on 18 March 2023. Again, it was identified that the power supply tripped at the Residual Current Device (RCD). Power was reset during the morning of the monitoring period. The HVAS ran for a total period of 12.88 hours.

The existing RCD (RCD 2) was last replaced with a new one on 9 January 2023 as part of preventative maintenance. In response to the failures, HVO has connected the monitor to another available RCD (RCD1) and will further investigate RCD2. DPE were notified.

- 30/03/2023 – Cheshunt East HVAS mis-capture

HVO were notified by the monitoring contractor on 3 April that the Cheshunt East TSP and PM10 HVAS failed to run for the full day on 30 March. It was identified that the power supply at the circuit breaker was off, indicating a power trip. Once power was restored the monitor programme indicated the TSP had run for 207 minutes and the PM10 had run for 217 minutes. DPE were notified.

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)
1/03/2023 17:31	33.08	17.39	94	24.14	1320	197.3	3.018	0.00
2/03/2023 17:50	28.64	20.08	88.1	41.82	1255	114.1	3.225	0.00
3/03/2023 18:37	28.81	20.66	93.3	37.77	1246	118.3	3.088	0.00
4/03/2023 18:17	27.6	15.49	89.3	39.91	1359	116	3.075	13.80
5/03/2023 18:34	32.85	14.6	92.8	29.2	957	170.6	1.372	15.80
6/03/2023 11:42	37.11	16.04	79.53	12.41	968	274	3.899	18.40
7/03/2023 12:53	35.9	18.81	34.15	16.81	1391	285.9	4.799	18.40
8/03/2023 16:17	31.97	18.2	42.28	7.725	1226	271.2	3.945	18.40
9/03/2023 14:42	29.45	17.66	63.04	19.27	979	249.6	2.866	18.40
10/03/2023 18:08	29.74	16.31	83.2	32.96	968	133.2	2.231	18.40
11/03/2023 13:14	32.82	17.26	84.9	31.53	1284	223.4	2.004	18.40
12/03/2023 22:52	28.58	21.55	94.9	46.45	1206	165.4	3.093	18.40
13/03/2023 15:27	21.29	18.91	94.9	71.54	1240	120.9	3.09	18.40
14/03/2023 17:59	24.32	17.15	92.5	64.9	638	125.6	2.915	18.40
15/03/2023 23:00	29.33	15.07	94.8	42.12	1141	161	1.57	18.40
16/03/2023 14:27	35.35	14.77	93	17.33	931	260.6	2.849	18.40
17/03/2023 17:35	33.65	16.08	83.2	16.34	963	204.4	3.354	18.40
18/03/2023 17:12	34.44	18.32	90.1	22.41	925	158	1.635	18.60
19/03/2023 12:26	39.99	17.3	89.8	13.07	935	207.6	1.941	26.80
20/03/2023 14:56	26.5	19.28	91.7	52.28	1142	114.9	3.377	26.80
21/03/2023 4:43	21.83	18.27	86.6	56.33	524.1	113.4	3.899	26.80
22/03/2023 20:17	27.87	15.34	85.6	43.83	905	122.8	2.115	30.40

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)
23/03/2023 18:12	31.87	15.1	92.4	92.4	1041	222.4	2.556	30.60
24/03/2023 15:35	26.97	15.39	91.7	91.7	1005	161.6	2.782	30.60
25/03/2023 15:13	23.98	13.19	94.7	94.7	1272	120.5	3.366	30.60
26/03/2023 17:42	25.76	15.08	92.9	92.9	1168	120.5	2.782	32.80
27/03/2023 23:05	20.45	19.01	96.8	96.8	421.7	197.2	1.491	33.00
28/03/2023 16:20	25.26	18.92	94.4	94.4	958	195.4	1.765	33.00
29/03/2023 13:10	26.41	17.21	94.9	94.9	1316	265.8	2.498	33.60
30/03/2023 13:22	23.77	14.8	76.15	76.15	1008	268.8	3.964	54.40
31/03/2023 14:07	24.1	10.85	71.79	71.79	888	281.3	2.857	56.60