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Wednesday, March 15, 2023

Ms. Melanie Humphrey
Michigan Department of Environment, Great Lakes, and Energy
1504 W. Washington St.
Marquette, MI 49855

**Subject: Annual Mining and Reclamation Report, Eagle Mine, LLC**
**Nonferrous Metallic Mineral Mining Permit (MP 01 2010), Humboldt Mill**

Dear Ms. Humphrey:

Eagle Mine, LLC has an approved Mining Permit (MP 01 2010) dated February 9, 2010. General Permit Condition F-2 states, "The permittee shall file with the MMU supervisor a Mining and Reclamation Report on or before March 15 of each year, both during milling operations and post closure monitoring as required by Section 324.63213 and R 425.501. The report shall include a description of the status of mining and reclamation operations, an update of the contingency plan, monitoring results from the preceding calendar year, tonnage totals of material mined, and amount of metallic product by weight."

Please find enclosed, the 2022 Annual Mining and Reclamation Report for the Humboldt Mill.

Should you have any questions about this report, please do not hesitate to contact me at 906-203-0301.

Sincerely,

Lauren Cavalieri

Lauren Cavalieri
Environmental Advisor

Cc: Humboldt Township

enclosure

Eagle Mine

a subsidiary of lundin mining

# 2022 Annual Mining and Reclamation Report
# Humboldt Mill
# Mine Permit MP 01 2010

March 15, 2023

# Contents

## Appendices

## Acronyms and Abbreviations

| | |
|---|---|
| AEM | Advanced Ecological Management |
| AMP | adaptive management plan |
| BMPs | best management practices |
| COSA | Coarse Ore Storage Area |
| CLO | Concentrate Load-Out Facility |
| CN | Canadian National |
| COI | Constituents of Interest |
| DO | dissolved oxygen |
| Eagle | Eagle Mine LLC |
| EGLE | Michigan Department of the Environment, Great Lakes & Energy |
| EMT | Emergency Medical Technician |
| gpm | gallons per minute |
| HDPE | high-density polyethylene |
| HTDF | Humboldt Tailings Disposal Facility |
| HWMB | Humboldt Wetland Mitigation Bank |
| MER | Middle Branch Escanaba River |
| MDNR | Michigan Department of Natural Resources |
| MG | million gallons |
| MRR | Mining and Reclamation Report |
| µg/L | micrograms per liter |
| mg/L | milligrams per liter |
| MNFI | Michigan Natural Features Inventory |
| MSL | mean sea level |
| NPDES | National Pollution Discharge Elimination System |
| NREPA | Natural Resources & Environmental Protection Act |
| NTU | Nephelometric Turbidity Units |
| ORP | Oxidation Reduction Potential |
| PPB | parts per billion |
| Q1 | Quarter 1 |
| QAL | quaternary unconsolidated formation |
| QAPP | Quality Assurance Project Plan |
| SESC | Soil Erosion and Sedimentation Control |
| SU | standard units |
| SWPPP | Storm water Pollution Prevention Plan |
| t | metric ton (tonne) |
| TDS | total dissolved solids |
| TSS | total suspended solids |
| TIE | Toxicity Identification Evaluation |
| UFB | upper fractured bedrock |
| WBR | Black River |

| | |
|---|---|
| WTP | Water Treatment Plant |
| WRD | Water Resources Division |
| ZLD | Zero Liquid Discharge |

## 1. Document Preparers and Qualifications

This Mining and Reclamation Report (MRR) was prepared by the Eagle Mine-Humboldt Mill Environmental Department and incorporates information prepared by other qualified professionals. Table 1 provides a listing of the individuals and organizations who were responsible for the preparation of this MRR as well as those who contributed information for inclusion in the report.

**Table 1. Document Preparation – List of Contributors**

| Organization | Name | Title |
|---|---|---|
| **Individuals responsible for the preparation of the report** | | |
| Eagle Mine LLC | Jennifer Nutini, PE | Environmental Superintendent |
| Eagle Mine LLC | David Bertucci | Environmental Compliance Supervisor |
| Eagle Mine LLC | Lauren Cavalieri | Environmental Advisor |
| **Report contributors** | | |
| Advanced Ecological Management LLC | Doug Workman, PhD | Aquatic Scientist |
| Barr Engineering | Chris Miron, PE | Senior Chemical Engineer |
| Barr Engineering | Denise Levitan, Ph.D., PG | Geochemist |
| Barr Engineering | Katy Lindstrom, PE | Groundwater Hydrogeologist |
| Barr Engineering | Matt MacGregor | Wetland Scientist/Biologist |
| Barr Engineering | Mehgan Blair, PG | Geochemist |
| Eagle Mine LLC | Brooke Routhier, PE | Water Services Superintendent |
| Eagle Mine LLC | Carlye Hares | HSE Data Specialist |
| Eagle Mine LLC | Hugo Staton | Mill Operations Supervisor |
| Eagle Mine LLC | Karen Carlson | HSE Administrative |
| Eagle Mine LLC | Miguel Valenzuela | Metallurgist |
| Eagle Mine LLC | Steve Daavettila | Metallurgist |
| Golder Associates | Devin Castendyk, PhD | Geochemist |
| Golder Associates | Erica Evans, MSc, GIT | Geochemist |
| TriMedia Environmental & Engineering | Ryan Whaley | Senior Scientist |

## 2. Introduction

Eagle Mine began the remediation and reconstruction of the Humboldt Mill located in Humboldt Township in October 2008. The processing ore from the Eagle Mine began in September 2014. Due to the commencement of milling operations, Eagle Mine is required per Part 632 to submit an annual Mining and Reclamation Report (MMR) as detailed in R 425.501.

The MRR is required to provide a description of mining and reclamation activities, an updated contingency plan, monitoring results, tonnage of material processed, and a list of incident reports that created or may create a threat to the environment, natural resources, or public health and safety at the Eagle Mine Site. In addition, this MRR will also memorialize the decisions and/or modifications that have been approved throughout the process.

## 3. Site Modifications and Amendments

Two notifications were submitted in 2022, one of which was a notification requesting an adjustment to the sampling frequency of two groundwater monitoring wells; the other notification was for the construction of a Zero Liquid Discharge (ZLD) Treatment Plant Building.

Proper notifications were submitted and approved by the Michigan Department of Environment, Great Lakes & Energy (EGLE).

- In February of 2022, Eagle submitted a notification explaining the slow recharge rate of two groundwater monitoring wells (HW-1L and HW-1U LLA) due to slow moving groundwater. Because of this slow recharge rate, consultants reviewing the data suspected that the water collected during the quarterly sampling could be the same water quarter-to-quarter, therefore the sample results would not be representative of water quality changes over time. This was determined using EPA guidance in calculating an autocorrelation function for the wells. By sampling these wells once per year, instead of quarterly, the data collected will be statistically independent from previous samplings. The sampling frequency will be evaluated and revisited after the Q3 2023 sampling.
- In June of 2022, Eagle submitted a notification about the construction of the ZLD Treatment Plant Building. The ZLD Building will have office/restroom facilities and new process equipment specifically designed to remove salts from the Humboldt Tailings Disposal Facility (HTDF), a necessary element of the facility's reclamation plan. Construction began in the Spring of 2022, after initial earthwork to remove unsuitable foundation soil was completed in November 2021. The building shell was completed in Q1 2023.

Pictures of the ZLD Treatment Plant building construction.

**Table 3. Submittals and Approvals Required Under Part 632**

| Date | Description | Approval |
|---|---|---|
| 3/15/22 | 2021 Annual Mining and Reclamation Report | N/A |
| 2/23/22 | Notification Request for Changes to Well Sampling Frequency | 3/22/22 |
| 5/17/22 | Q1 groundwater and surface water monitoring data | N/A |
| 6/16/22 | Notification of Construction of Zero Liquid Discharge Treatment Building | N/A |
| 7/20/22 | Q2 groundwater and surface water monitoring data | N/A |
| 11/03/22 | Q3 groundwater and surface water monitoring data | N/A |
| 2/6/2023 | Q4 groundwater and surface water monitoring data | N/A |

**Table 4. Non-Routine Submittals and Approvals Required Under Other Permits**

| Date | Description | Approval |
|---|---|---|
| 1/04/22 | Submitted the revised Storm Water Pollution Prevention Plan (SWPPP) | N/A |
| 2/17/22 | SARA Title III Tier II Report | N/A |
| 3/04/22 | Notification of Humboldt Mill Unintentional Discharges | N/A |
| 3/21/22 | Notification of cyanide detection in WTP Effluent **Note: Lab re-analysis and QA/QC review indicated that lab contamination was present and the re-analyzed sample was non-detect for cyanide.* | NA |
| 3/23/22 | Submitted Michigan Air Emissions Reporting System (MARES) Report | N/A |
| 8/24/22 | Notification of Humboldt Mill WTP CBOD, 5-day monthly average concentration | N/A |
| 8/29/22 | Notification of Humboldt Mill Unintentional Discharge | |
| 9/29/22 | Notification of Humboldt Mill WTP CBOD, 5-day monthly average concentration | N/A |
| 10/12/22 | United States EPA DMR-QA 41 Study | N/A |
| 10/18/22 | Notification of Humboldt Mill WTP CBOD, 5-day monthly average concentration | N/A |
| 12/19/22 | Notification of Humboldt Mill WTP CBOD, 5-day monthly average concentration | N/A |

## 4. Processing Activities and Data Report

As of September 23, 2014, the mill began operating to produce concentrate. The commencement of milling activities initiated all monitoring programs per the Part 632 Mining Permit. A description of the 2022 monitoring activities can be found in Section 7 of this report.

## 4.1 Processing Report

In 2022, 720,930 wet metric tonnes of ore were transported from the Eagle Mine to the Humboldt Mill by over the road haul trucks. Table 4.1 below summarizes the dry tonnes of ore crushed and milled and the total volume of nickel and copper concentrate produced in 2022.

In 2022, approximately 41,889 dry tonnes of copper and 139,733 dry tonnes of nickel were shipped off-site via rail. Mineral Range manages rail shipments from the Humboldt Mill to the Ishpeming Rail Yard. From that point Canadian National (CN), and to a lesser extent, Canadian Pacific Rail and Ontario Northland Rail transports the material to its final destination.

**Table 4.1 Volume of Ore Crushed, Milled, and Concentrate Produced in 2022**

| Month | Ore Crushed (dry tonnes) | Ore Milled (dry tonnes) | Copper Concentrate Produced (dry tonnes) | Nickel Concentrate Produced (dry tonnes) |
|---|---|---|---|---|
| January | 59,027 | 59,228 | 3,385 | 8,862 |
| February | 55,076 | 54,249 | 3,689 | 10,742 |
| March | 65,439 | 65,510 | 4,866 | 13,362 |
| April | 68,141 | 67,999 | 4,908 | 13,143 |
| May | 61,484 | 61,005 | 3,851 | 13,072 |
| June | 52,703 | 52,733 | 3,228 | 11,922 |
| July | 61,416 | 62,271 | 4,094 | 12,560 |
| August | 62,076 | 60,923 | 3,527 | 12,379 |
| September | 62,792 | 63,941 | 2,639 | 10,455 |
| October | 58,760 | 58,294 | 2,904 | 11,147 |
| November | 51,459 | 53,236 | 2,680 | 11,140 |
| December | 59,284 | 58,317 | 2,118 | 10,949 |
| **2022 Annual Total** | 717,657 | 717,706 | 41,889 | 139,733 |

Source: Mill Operations Year-End Reconciled

### 1.1.1. Tailings

Tailings are the waste material that is generated when processing ore. At the Humboldt Mill, tailings are sub-aqueously disposed in the Humboldt Tailings Disposal Facility (HTDF) which is an industry best practice to minimize the risk of oxidation of sulfide-bearing material. The tailings slurry is composed of finely ground waste rock, water, and process effluents and is deposited in the HTDF via a double-walled high-density polyethylene (HDPE) pipeline. At the shoreline of the HTDF, the pipeline splits and the tailings can be routed to one of the subaqueous outfalls located within the HTDF. The use of multiple outfalls allows for better control of the depth of tailings in an area and optimizes the storage volume that is available.

Tailings were deposited at pit floor locations in the winter months (December-May) and in the summer months, tailings were deposited using a barge system at elevated positions between 70 feet and 100 feet deep. These deposition points strategically maintained a ridge across the pit effectively dividing the HTDF into north and south basins. This was a part of the tailings deposition plan and allows for the intentional isolation of water on either side of the ridge for water treatment purposes. In November 2022, tailings deposition returned to a pit floor deposition point in the northern portion of the HTDF where it will remain until Spring 2023. In 2022, approximately 195 million gallons (MG) of tailings slurry was sub-aqueously disposed of in the HTDF.

Following permit condition, F-7, an annual bathymetry survey is required to be conducted to accurately monitor tailings placement and calculate changes in HTDF water storage. However, to better understand the settling characteristics of the tailings, two surveys were completed in 2022. The surveys were conducted in May and October and focused on the entire HTDF as tailings had been dispersed to multiple areas. Copies of the bathymetry surveys are available in Appendix B. Based on October 2022 bathymetry survey results, the maximum tailings peak measured at 1,463 MSL with most of the tailings stored below elevation 1,445 MSL. The tailings elevations in the HTDF do not exceed the maximum allowed tailings elevation of 1515 MSL.

Photo of the HTDF, June 2021

The Metallic Minerals Lease (No. M-00602) requires the lessee to furnish a mill waste reject report on an annual basis. In 2022, 423 dry metric tonnes of copper and 2,281 dry metric tonnes of nickel were deposited in the HTDF entrained with the tailings.

## 2. Site Water Usage, Treatment, and Discharge

The site water balance is composed of well water, process water, precipitation, groundwater infiltration, and storm water runoff. Except for potable water, which is discharged to the onsite septic system, all of the other water sources are captured in the HTDF and are treated by the WTP before being discharged.

### 2.1. Supply Water Sources and Use

Three separate sources supply water to the mill site to support various operational activities. These sources include the potable well, industrial well, and reclaim water from the HTDF. The following summary of average water use from each source has been compiled using the detailed water use logs that are maintained on-site.

The domestic well is mainly used to supply potable water to the facility. In 2022, approximately 0.94 MG of water was withdrawn from the domestic water well which is an increase from the 2021 total of 0.75 MG. The increase in domestic water usage onsite in 2022 can likely be attributed to more employees returning to work onsite following several years of telecommuting due to COVID-19. The domestic water system filter media was replaced which increased water consumption in April to backwash and condition the media, and the main domestic water supply tank was also drained in June for cleaning which added to water use in 2022.

The industrial well is only used to keep the fire water tank full, limiting consumption from this source. In 2022, approximately 0.96 MG of water was used from the industrial well. Industrial water use increased from the 0.28 MG withdrawn in 2021. The water use increase is due to planned operational downs for Mill equipment maintenance which require additional industrial water to start processes back up. In addition, a pressure relief valve on a pump malfunctioned, which in turn caused higher water consumption. The additional water drained to the HTDF through the storm drain system.

The third source of water at the mill site is the reclaimed water which is pumped from the HTDF. This water is used throughout the process. Any water that is not consumed is recycled back to the HTDF via tailings. Where possible, reclaim water usage in the mill has been replaced with internally recycled process water and the volume of water sent to the HTDF has been reduced to match the reduction in reclaim water brought into the mill. In 2022, approximately 167 MG of reclaimed water was pumped from the HTDF for use in processing ore. Apart from approximately 5.3 MG of water that was contained in the concentrate and shipped offsite, the remainder of the water was recycled back to the HTDF for eventual reuse or treatment by the WTP.

### 5.2. Storm Water Control

A site grading plan was developed to keep all storm water on site and to direct run-off to one of two locations: the HTDF or an onsite storm water retention basin. Most of the site grading, paving, and curbing were previously completed to direct water to the series of catch basins that were installed along the length of the main facility from the rail spur to the security building. These catch basins direct storm water from the main mill facility to the HTDF. Water that falls south of the main site access road is directed to the storm water retention basin via a drainage ditch or series of catch basins in the administrative building parking lot. A copy of the Humboldt Mill Storm Water Drainage map is included in Appendix C.

Storm water control at the Humboldt Mill is managed under NPDES permit (MI00058649) and per Part I.B of the permit, a storm water pollution prevention plan (SWPPP) has been developed. The SWPPP describes the Humboldt Mill site and its operations, identifies potential sources of storm water pollution at the facility, recommends appropriate best management practices (BMPs) or pollution control measures to reduce the discharge of pollutants in storm water runoff, and provides for periodic inspections of pollution control measures. The plan must be reviewed and updated, if necessary, annually and a written report of the review must be maintained and submitted to EGLE on or before January 10$^{th}$ of each year. The 2022 SWPPP annual review was completed and submitted to the Department on December 29$^{th}$, 2022. A copy of the plan is available upon request.

## 5.3. Water Treatment Plant Operations and Discharge

Effluent discharges are regulated under the NPDES permit MI0058649, and analytical results and discharge volume are reported to EGLE monthly through the MiWaters electronic discharge monitoring reporting system. Throughout 2022, Eagle continued discharging treated effluent water to Outfall 004, located at the Escanaba River, which was permitted and constructed in late 2018. Eagle also continued using the Escanaba River intake system to supply water and maintain optimal hydrologic conditions in wetlands adjacent to the Humboldt WTP and within the wetlands north of U.S. Hwy 41 via Outfall 003. Outfalls 001 and 003 were not used to discharge treated effluent during 2022.

In 2022, approximately 303.8 MG of water was treated and discharged from the water treatment plant. Table 5.3 below summarizes the monthly flow rate from each WTP outfall in 2022.

**Table 5.3 Volume of Water Discharged in 2022**

To accomplish near-term and longer-term operating objectives Eagle continues to evaluate the equipment capacities in the WTP. The agency will be notified appropriately in advance of process changes under the NPDES program permit requirements.

The water treatment process generates one solid waste stream derived from solids in the clarifier, which is primarily composed of aluminum, iron, calcium, sodium, magnesium, and nickel. Waste characterization samples are required by the landfill to accept the material. Samples from the filter press waste stream were collected in January 2022 and sent to ALS Laboratory for analysis. Laboratory results confirmed the waste stream is non-hazardous. In 2022, approximately 285 tons of filter press waste were disposed of at the Marquette County Landfill.

| Month | Outfall 001 Volume of WTP Effluent Water Discharged (MG) | Outfall 003 Volume of WTP Effluent Water Discharged (MG) | Volume of Escanaba River Water Recirculated through Outfall 003 (MG) | Outfall 004 Volume of WTP Effluent Water Discharged (MG) |
|---|---|---|---|---|
| January | 0 | 0 | 18.0 | 27.5 |
| February | 0 | 0 | 17.7 | 24.8 |
| March | 0 | 0 | 20.3 | 25.8 |
| April | 0 | 0 | 19.5 | 22.1 |
| May | 0 | 0 | 18.0 | 35.3 |
| June | 0 | 0 | 14.4 | 15.9 |
| July | 0 | 0 | 16.5 | 23.0 |
| August | 0 | 0 | 17.1 | 18.4 |
| September | 0 | 0 | 9.3 | 24.5 |
| October | 0 | 0 | 17.4 | 32.7 |
| November | 0 | 0 | 18.7 | 30.3 |
| December | 0 | 0 | 21.0 | 23.5 |
| **2022 Total** | **0** | **0** | **207.9** | **303.8** |

Source = WTP Operators log

## 5.4. Water Balance

The main components of the water balance are reclaimed water/WTP intake, off-spec WTP water, process water, well water, precipitation, groundwater infiltration, and storm water runoff. Each are captured or otherwise managed in the HTDF and treated by the WTP before being discharged to the Middle Branch of the Escanaba River (Outfall 004). Permit condition F-2 requires that the site water balance be updated quarterly to ensure the water level of the HTDF is managed in a manner that minimizes risk to the environment. The 2022 target operating water elevation of the HTDF was between 1530.5 and 1531.0 ft MSL which is significantly lower than originally planned during the permitting process. The lower operating level mitigates risks associated with overflow situations and provides excess capacity to manage various operational situations.

Eagle returns off-specification water from the WTP plant in a single line depositing the water in the same area as tailings are being discharged. The off-specification water includes backwash from the UF and RO systems, filter press filtrate and excess RO permeate. This water exhibits a moderate concentration of dissolved solids like that of the tailings. Brine is discharged below the elevation of tailings disposal in an area of the HTDF that has been reserved for brine storage.

Throughout 2022 the region received average to moderate precipitation in the form of rainfall and snowfall. After high HTDF water levels of 1537.64 MSL in October of 2019, the HTDF elevation decreased in 2020. The water level remained at a stable elevation of approximately 1531.3 ft MSL in 2021. The average HTDF elevation in 2022 was 1531.55 ft MSL. In 2023, Eagle will again focus on maintaining the water level with a continued target operating level of 1530.5 to 1531.0 ft MSL.

Eagle continues to use an integrated groundwater, surface water, and water balance model to estimate the water balance based on several years of operational data. The model estimates the water balance for the HTDF and surrounding watershed for both current watershed conditions and those consistent with pre-existing conditions prior to the redevelopment of the Humboldt Mill.

Eagle continued to maintain the water balance to Wetland EE and the downstream wetland systems by discharging water from the Middle Branch of the Escanaba River to Outfall 003. Over the last few years, the pumping system was unable to reach the design flows despite improvement efforts. Although the system was still unable to meet high design flows in 2022, troubleshooting and improvements made in 2022 included:

- Ground checks were made on the flow meters to ensure proper function.
- Inspections of valves and flow meters were conducted to check for blockages. Maintenance cleaned valves and flow meters as needed to remove material that would plug them. Reduced flow through the system continued after cleaning.
- High volume pipeline flush and a system curve was developed.
- On September 13, 2022, Eagle contracted a American Pipeline Solutions to perform Ice Pigging™ which is an in-line inspection and cleaning technique where an ice slurry is pumped through the piping network to remove unwanted material, sediment, or product. The Ice Pigging™ cleared some obstructions within the pipeline, though the difference in flows was not significant.
- In 2023 troubleshooting on the pumps and flows will continue. In the Spring of 2023, one river pump will be upgraded to a higher horsepower pump to meet the desired flows.

Outfall 003 is supplied with water year-round.

Despite periodic deviations from the flow model, the wetland hydrology was maintained year-round with no major flooding or drought conditions experienced in the downstream areas. This may indicate that the downgradient wetland mitigation bank and other wetland culvert systems are robust and mature enough to handle a variety of water conditions, which will be useful information to consider for closure planning and design. The wetland response information is continually tracked for the purpose of a closure design of the future passively controlled discharge structure on the HTDF.

Copies of the 2022 quarterly water balance diagrams and HTDF water elevation data are included in Appendix D.

## 6. Materials Handling

### 6.1. Fuel Handling

A 3,000-gallon double-walled stationary bulk diesel tank with leak detection located on the east side of the COSA is the only bulk fuel storage on site. The bulk tank is refueled as necessary by an offsite fuel provider.

### 6.2. Bulk Chemical Handling and Storage

Eagle Mine's goal is to create a culture of environmental awareness throughout the workforce. Therefore, all employees and subcontractors are trained to immediately respond and report any spills that occur. In 2022, the Humboldt Mill had zero reportable spills under the Part 5 Rules of Part 31, Water Resources Protection of NREPA, 1994 PA 451 as amended (Spillage of Oil and Polluting Materials).

The Michigan SARA Title III Program requires the reporting of on-site chemicals being stored above certain threshold quantities. Due to the volume of chemicals stored/used at the site for processing and water treatment, a Tier II Report was submitted in February 2022 via the online Tier II Reporting System to the State Emergency Response Commission (SERC). Copies of the report were also mailed to the Marquette County Local Emergency Planning Committee (LEPC) and Humboldt Township Fire Department.

## 7. Monitoring Activities

### 7.1. Water Quality Monitoring

A significant amount of surface water and groundwater quality monitoring is required on the mill site and surrounding areas. The following is a summary of the water quality monitoring activities.

#### 7.1.1. Quarterly Groundwater Quality Monitoring

Groundwater quality is monitored through a network of monitoring wells located inside the perimeter fence line of the mill site. The monitoring wells are classified as either compliance, leachate, facility, or monitoring. Compliance wells are located on the north-side of the cut-off wall, outside of the influence of the HTDF; leachate wells are located on south-side of the cut-off wall and generally represent HTDF water quality (or would likely represent HTDF water quality once the groundwater gradient is established in an outward direction); facility monitoring wells are located downgradient of each operating facility; the remaining monitoring wells are located north of the cut-off wall but are not used to confirm effectiveness of the cut-off wall as the compliance and leachate wells are. A map of the well locations can be found in Appendix E. Four rounds of quarterly sampling were completed in March (Q1), June (Q2), August (Q3), and November (Q4), 2022. The Eagle Mine Permit prescribes both a long parameter list for annual monitoring events (conducted in Q3 2022) and a short list to be used quarterly (Q1, Q2, Q4 2022). Samples were collected in accordance with the Eagle Project Quality Assurance Project Plan and Standard Operating Procedures (North Jackson, 2004a and 2004b) and the results are summarized and compared to benchmarks in the tables found in Appendix F.

Monitoring Locations MW-702 well cluster (left), and MW-706 QAL (right), August 2022

***<u>Monitoring Results</u>***

Twenty-two monitoring well samples were collected by TriMedia Environmental & Engineering (TriMedia) during the Q2 and Q4 quarterly sampling events, and twenty-four wells were sampled during the Q1 quarterly event and the annual event that took place in Q3 2022. Samples were collected using low-flow sampling techniques, and field parameters (dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, specific conductivity, temperature, turbidity) were collected and analyzed using a flow-through cell and YSI probe. All samples were shipped overnight to Pace Analytical Services in Grand Rapids, Michigan, for analysis.

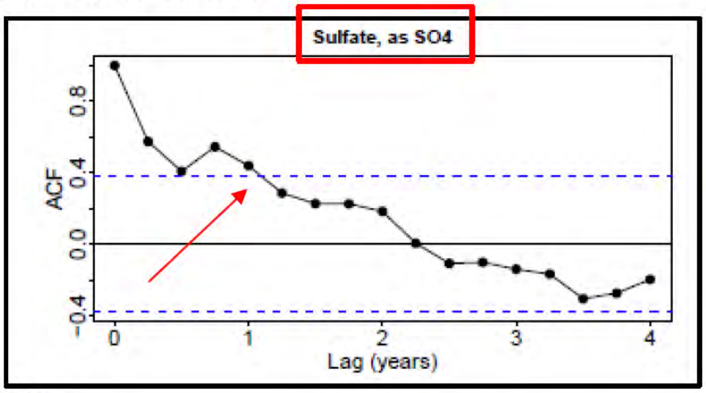
On March 22nd, 2022, Eagle's request to adjust the sampling frequency of two bedrock groundwater monitoring wells from quarterly to an annual sampling frequency was approved by the agency. Monitoring wells HW-1L and HW-1U LLA have an adjusted sampling frequency due to low recharge rates which likely leads to data not being statistically independent. The annual sampling event for these wells occurred in Q3 2022. These wells were also sampled in Q1 2022 as Eagle was still awaiting approval from the agency to modify the sampling frequency. This approval will be reevaluated after two annual sampling events.

Per Part 632, R426.406 (6) when a result is greater than a benchmark for two consecutive sampling events at a compliance monitoring location, the permittee is required to notify EGLE and determine the potential source or cause resulting in the deviation from the benchmark. Fluctuations in groundwater elevation, the potential impact by road salt/sand applications, and/or shifts in the redox conditions of groundwater are the likely drivers of the conditions that occurred throughout the year. The following is a summary of the events that occurred in 2022:

- Seventeen of the twenty-four monitoring locations required field filtering for at least one quarter in 2022 due to turbidity levels that exceeded 3 NTU, and therefore the values are reported as dissolved concentrations. The remaining locations/quarters reported turbidity below 3 NTU and are reported as total concentrations. The sample summary denotes whether the sample values are total or dissolved.
- Four of the monitoring locations (MW-702 UFB, MW-703 UFB, HW-1L, and HW-1LLA) are slow to recharge and are pumped down in advance of sampling to ensure that the sample is representative of the groundwater at the monitoring location. Locations MW-702 UFB and MW-703 UFB take one month to recover while HW-1U LLA takes approximately 3 quarters to fully recover and HW-1L takes approximately four quarters to fully recover due to low recharge rates to the well. The presence of bentonite has also been observed in proximity to the screened interval of monitoring well HW-1U and may also contribute to the slow recharge rate. Samples from these locations follow low-flow sampling procedures (except for HW-1U) after the recharge period. Sample independence is tested following EPA's guidance on autocorrelation functions (ACF). Eagle's consultant reviewed the four wells that Eagle believed to have a slow recharge rate and plotted the normally distributed parameters from each well and determined how many quarters it took for the parameter to reach an autocorrelation of nearly zero. Once the autocorrelation lag rate was determined, the parameter with the longest lag time is used as the recommended number of quarters between sampling events to ensure an independent sample. If we did not ensure enough time between sampling events, the results from these wells would not accurately

characterize the true water quality of the location and would likely be pulling the same water from the well every quarter (causing dependent sample measurements).

**Figure 1: HW-1L Sulfate ACF**




ACF Key:

- Red boxes indicate the parameters determined to be normally distributed, anything without a red box does not meet the criteria and is not relevant.
- Red arrows indicate the point/quarter at which the parameter reaches an autocorrelation of nearly zero.
- Blue dashed lines indicate the 95% confidence interval of zero.

- The major cation parameters analyzed (calcium, magnesium, potassium, and sodium) were detected at all locations with most of the detections below the calculated benchmarks. Among major anion parameters analyzed, bicarbonate alkalinity, sulfate and chloride were detected in many of the samples. Concentrations were frequently but not always below the calculated benchmarks. Nitrogen species (ammonia, nitrate, and nitrite) were detected more irregularly. Carbonate alkalinity, fluoride, and sulfide were rarely detected. A summary of wells that have had one or more parameters exceed a benchmark value can be found in Appendix F.

- The majority of the metals were listed as non-detect because the value was below the instrument detection limit.

- For several years, Eagle employees have used a gravel roadway from the mill property to the WTP that traverses the cut-off wall and passes by the Fenton's reactor area. This was commonly used by warehouse, maintenance, and WTP employees for activities such as delivering supplies or moving mobile equipment that cannot be driven over the road (such as a man lift). However, to keep that road surface safe for use year-round, the road periodically was treated with sand/salt mixtures. The typical salt used is sodium chloride, containing readily soluble calcium and sulfate, along with trace amounts of soluble magnesium. As an example, one salt product used contains 98% NaCl with 0.81% SO4 and 0.31% Ca. The road salt minerals are designed to dissolve in water, so represent a potentially significant source of these solutes to shallow groundwater and soils in the vicinity of the cut-off wall; in addition to these direct changes, road salts have the potential to affect general nutrient cycling (such as for nitrogen/ammonia) and cation exchange reactions within the affected soil profiles. Changes in these parameters in groundwater measurements are characteristic of the sand/salt application activities taking place nearby causing ion exchange processes to occur in the clays and other minerals in contact with shallow groundwater. Salt-impacted water is denser than fresh water, so it will tend to sink until it reaches an impermeable surface and occupy fractures. As this is a potential confounding factor to interpreting the results in the monitoring water quality in these wells, the road was closed to vehicle traffic for the first time in the winter of 2020-2021 and again from November 2021 – March 2022 to limit the application of sand/salt. Access to the Fenton's reactor area is still maintained for chemical deliveries and personnel, so some well sets will continue to be influenced by vehicle traffic and sand/salt application, though at a lesser rate than seen in the past. The majority of these parameters are not characteristically related to milling operations. Trend monitoring will continue in 2023.

- Sodium remained elevated at KMW-5R in 2022, a well located near the COSA which is nearby an area that is regularly salted throughout the winter. Rainfall and runoff near the COSA flow locally past the well and infiltrate in a low area approximately 40 feet from the well. This elevated concentration has been consistent since 2018 when benchmark values were established.
- De-icing salt related parameters were elevated at HW-8U. This well is located outside the cut-off wall along the access road where salt is applied throughout the winter for safety and accessibility to the WTP bulk storage area. In Q4 2022, naturally occurring iron remained elevated while manganese returned below benchmark values, indicating local changes in pH and/or redox conditions.
- Salt related parameters remained elevated at MW-701 QAL in Q1 2022, though they were lower than the highly elevated concentrations observed after the 2019 sulfuric acid release. Nitrogen as nitrate increased above benchmark range at MW-701 QAL. De-icing applications can affect the pH of the soil, which can cause an acceleration of the denitrification process, allowing excess nitrogen to leach into groundwater. Chloride and sodium concentrations increased in Q2, then decreasing in the second half of the year while remaining above benchmark values. Sulfate decreased throughout the year at MW-701 QAL while remaining above benchmark values, which may indicate that sulfate from the release is being flushed out more slowly than other solutes due to redox and biological interactions. In Q2 we also experienced a localized snow and stormwater inflow near this location, which could impact groundwater in the short term when meltwater caused erosion of surface soil draining into subsurface large-diameter run-of-mine rock near MW-701 QAL. Overall, the current levels are much lower than they were at their peak concentration following the 2019 sulfuric acid spill and now may reflect mainly salt-related concentrations due to the well series being in an area where sand and salt is required for safe access throughout the winter. In the second half of 2022, bicarbonate alkalinity was above the benchmark for the second consecutive quarter which is likely due to the effects on soil pH from sand/salt use, as well as the stormwater inflow event.

- Nitrogen present as nitrate remained above the benchmark value at MW-703 QAL throughout 2022. The MW-703 wells are located outside of the cut-off wall along the HTDF roadway.

- Chloride rose above benchmark values at MW-704 QAL in Q2 and Q3 2022. The MW-704 well series is located outside the cut-off wall where road salt has been applied in the winter for safety and accessibility and is also near the site of the new ZLD water treatment plant. In the fall of 2021, over 11,000 cubic yards of unsuitable soil (including cut-off wall bentonite mixed soil and other residual fill from the Cliffs-era mining) was removed and replaced with clean imported fill. Foundation work for this building began in June 2022 and we expect this well set to continue be influenced by local construction activities and future operations activities.

- Seven parameters (pH, calcium, chloride, hardness, iron, magnesium, and manganese) remained outside of benchmark at MW-704 LLA throughout 2022. This well is located outside the cut-off wall and is installed in the lower bedrock level. The parameters outside of benchmark are likely natural seasonal and long-term variation, like natural manganese fluctuations at this location, and/or related to well depth and the use of sand and salt in the area.

- The increasing trend for sodium was seen from Q1-Q3 at MW-705 QAL, along with a similar increase in chloride. This location is also in the vicinity of ZLD construction activities that have been occurring throughout 2022 as well as road maintenance activities such as road salt application, and vehicle traffic, which may result in an increasing trend for certain parameters. Salt related sodium and chloride decreased at MW-705 QAL in Q4 2022, while nitrogen as ammonia remained stable.

- Six parameters (calcium, chloride, hardness, magnesium, manganese, and sodium) at MW-705 UFB continue to be above benchmark ranges but have remained stable throughout the year. These parameters have been elevated since Q4 2020 with exception of sodium and chloride and have slowly trended upward since 2015.

- Aluminum was also higher than the benchmark since 2018 at KMW-5R during the annual sampling event in Q3. Aluminum peaked in Q3 2020, and concentrations significantly decreased to near the benchmark level in Q3 2021 before increasing again in Q3 2022. Aluminum is commonly found in wells with high turbidity levels because colloidal aluminum can bypass sample filters. Turbidity in KMW-5R has typically been higher than in other wells. KMW-5R is a low recharge well that is pumped down a day in advance of sampling to help ensure the sample is accurately representing the water quality of the location, and a bailer is used to sample which can increase sediment disturbance during sample collection. pH was slightly below the benchmark at KMW-5R in Q2-Q3 2022 and returned to the benchmark range in Q4 2022. pH can vary naturally due to temperature, flow, redox, and precipitation.
- pH decreased in Q2 2022 and remained below the benchmark range through Q4 2022 at HW-1U UFB. Calcium was elevated slightly above the benchmark in Q1, Q3, and Q4 at this location, which is likely related to the elevated bicarbonate alkalinity observed in Q3 and Q4. Naturally occurring iron (Q3, Q4) and manganese (Q2-Q4) were also elevated above the benchmark at HW-1U UFB in 2022.
- Manganese was observed outside of the benchmark value at several locations throughout 2022 (HW-1U UFB, HW-8U, HYG-1, MW-704 DBA, MW-704 LLA, MW-705 UFB, and MW-9R). Manganese is found ubiquitously in the environment and is expected to vary in groundwater throughout the region, often as a function of the redox environment. Manganese is monitored in shallow water within the HTDF on a regular basis and has been found at a concentration ranging from 129-1,060 parts per billion (ppb) throughout 2022. Most of the wells outside of the cut-off wall do not have matching manganese signatures, and more importantly, they are not accompanied by HTDF signatures such as sulfate and sodium at magnitudes found in the HTDF.

- In Q1 2021, ammonia at HYG-1 fell below the benchmark for the first time since Q2 2020, it remained below the benchmark in Q2 and then was elevated in both Q3 and Q4 2022, peaking in Q3.

- All parameters had decreasing trends at MW-701 UFB, except for bicarbonate alkalinity.

- Mercury was over the benchmark at MW-702 QAL, a leachate monitoring well inside the cut-off wall, throughout 2022. A different leachate monitoring location MW-701 QAL had an increase above the benchmark for mercury in Q3 2022. These leachate monitoring wells have varying recommended benchmark ranges, all within the range of typical mercury concentration at the site. Mercury is known to be present in precipitation (atmospheric deposition) and the results may be a natural occurrence. Eagle regularly samples the HTDF for mercury and it is found in lower concentrations than results at MW-702 QAL and MW-701 QAL.

- pH has been historically variable at MW-702 QAL, while the pH at MW-703 QAL has been stable while remaining below the benchmark range since 2018. Natural variations of pH may be greater than 1 S.U., and the possibility of pH falling outside of the benchmark range for shallower wells that are more influenced by precipitation or changing water elevations is likely.

- pH at MW-704 LLA has been generally decreasing since 2019 and could be related to the wetland irrigation discharge of lower pH river water at Outfall 003.

In 2022, trend testing was conducted using the Mann-Kendall test with Sen’s slope estimator. The Mann-Kendall test is a non-parametric evaluation for increasing or decreasing trend, and Sen’s slope estimator provides an indication of the magnitude of the trend. Although the Mann-Kendall test can be computed in most cases, guidance suggests that it is not appropriate to use for evaluating trend when there are fewer than eight (8) to twelve (12) detected measurements and/or the highest reporting limit is greater than most observations (USEPA, 2009). The trend testing was conducted only on parameters for which most of the wells had eight or more samples above detection limits. Well-parameter pairs with fewer than 40% of samples above reporting limits and/or fewer than six (6) detected samples were excluded. Based on these criteria, the parameters that were considered were bicarbonate alkalinity, calcium, chloride, hardness, iron, magnesium, manganese, PH, potassium, sodium, and sulfate. Visual outliers and outlier detection limits were removed from the data. Non-detect values were set to the reporting limit, which may introduce some error into the analysis due to variation in detection limits among samples.

Tabulated results of the GW trend analyses are shown in Appendix G The p-value determines whether a monotonic trend exists at 95% confidence. For this test, “no trend” is indicated when the p-value is >0.05. When the p-value is ≤0.05, there is either a “POSITIVE” (increasing with time) or “NEGATIVE” (decreasing with time) trend indicated. For compliance monitoring locations in which results are outside of established benchmarks for at least two consecutive sampling quarters and a potential trend is identified, the trend charts are provided in Appendix G.

### 7.1.2. Quarterly Surface Water Quality Monitoring

Surface water sampling was conducted on a quarterly basis in 2022 at eight surface water locations by TriMedia. Four locations are associated with surface water resources in the subwatershed containing the HTDF and four are associated with the subwatershed of the milling facility. The samples collected represent winter base flow, spring snowmelt/runoff, summer base flow, and the fall rain season. Samples were collected in March (Q1), June (Q2), August (Q3), and November (Q4) in 2022. A map of the surface water sampling locations is found in Appendix H. Samples are collected in accordance with the Eagle Project Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOP) (North Jackson, 2004a and 2004b) and the results are summarized and compared to the benchmarks (i.e., upper prediction limit) and are located in the tables found in Appendix I. Measured water levels in HMP-009 (Wetland EE) are also included in Appendix I.

As stated in the groundwater quality monitoring section above (7.1.1), the surface water benchmark values were also recalculated in 2018 using results that were not determined to be trending based on statistical analysis. A sufficient data set was also available which allowed the establishment of benchmarks for each season which will help to account for seasonal variability. Benchmarks were not updated at locations HMP-009 and HMWQ-004 as they did not have enough data points to revise the benchmarks at that time. Results for HMP-009 will continue to be compared to the initial benchmark values established in 2014. HMWQ-004 was a new surface water reference location that was added in 2020. For the remaining locations, results will now be compared based on seasonal variation (i.e., Q1 2017 compared to Q1 2018) per Special Permit Condition L2 of the Humboldt Mill Part 632 Mining Permit (MP 01 2010).


Middle Branch Escanaba River Monitoring Locations MBER-002 (left) and MBER-003 (right), August 2022

***Monitoring Results***

The Humboldt Mill Surface Water and Sediment Monitoring Plan prescribes a long parameter list for surface water samples that are collected annually (Q3 2022) and a shorter list to be used during the remaining quarterly monitoring events (Q1, Q2, Q4 2022). In addition to grab samples, field measurements (DO, PH, ORP, specific conductivity, temperature, and turbidity) were collected and determined using a YSI multiparameter water quality meter. Flow measurements were obtained, where conditions allowed, using a wading rod and current meter. Flow rates for location MER-002 were recorded from the USGS website for the station located adjacent to the monitoring location (i.e., 04057800 Middle Branch Escanaba River Humboldt Mill location). Water quality samples were shipped overnight to Pace Analytical Services in Grand Rapids, Michigan, for analysis. Parameters requiring low-level analysis were sent to Eurofins Frontier Global Sciences in Bothell, WA by subcontract of White Water Associates Laboratory in Amasa, MI.

The following is a summary of field observations that occurred at compliance monitoring locations in 2022:

- HMWQ-004 is located in an area in which the only contributions are related to precipitation and storm water run-off from the adjacent roadway, therefore sampling from this location is dependent upon precipitation. Similar to previous years, there was insufficient water to collect samples from this location in 2022.

- MER-002 is located upstream of Outfall 004 near the bridge crossing on Wolf Lake Road, and just downstream from the pump house used to recirculate river water within Wetland EE. pH results were greater than seasonal benchmarks for two consecutive Q4 sampling events at MER-001 and three consecutive sampling events at MER0-002. Reference location MER-001, located upstream follow a similar Q4 pH trend, showing an expected seasonal influence.

- MER-003 is located downstream of Outfall 004 and would be expected to be somewhat influenced by the discharge water quality. The discharge water quality meets all requirements of Eagle's NPDES permit but is not identical to water quality that was used when calculating initial benchmarks. pH was elevated for the last three Q4 sampling events. Reference surface water location MER-001 and monitoring location MER-002 also had elevated results for pH in Q4 indicating that in addition to the influence of the outfall water quality that there are also regional influences unrelated to mining that are also occurring. pH is continuously monitored in Eagle's effluent discharge, and the results have been within permit requirements without any non-compliance of the permit-established criteria in 2022.

- HMP-009 is located north of the HTDF in Wetland EE and is strongly influenced by the recirculating Escanaba River water. pH, Mercury, and TSS (total suspended solids) were elevated for two consecutive Q2 sampling events. Iron and TSS were detected above benchmarks for three consecutive Q3 sampling events. pH and Iron were within a similar range at MER-002 which is located near the river pumphouse and therefore would be indicative of the water quality being distributed to the wetland. Mercury is known to be present in precipitation (atmospheric deposition) and the results may be a natural occurrence.

- WBR-002 is located downstream of WBR-003 and near the old legacy iron tailings basin. Bicarbonate alkalinity was greater than established benchmarks for four consecutive Q4 sampling events. These surface water parameters at the Black River monitoring station over benchmark levels are likely effects of natural variation and not likely to be from any impacts from milling related activities.

- WBR-003 is located downstream of WBR-001 and WBR-002 the furthest south of the mill site and downstream of a nearby old legacy iron tailings basin. Bicarbonate alkalinity was greater than established benchmarks for two consecutive Q2 sampling events. Boron, and TSS were slightly elevated for two consecutive Q3 sampling events, and pH was elevated for two consecutive Q4 sampling events. These surface water parameters at the Black River monitoring station over benchmark levels are likely effects of natural variation and not likely to be from any impacts from milling related activities.

In 2022, trend testing was conducted using the Mann-Kendall test with Sen's slope estimator. The Mann-Kendall test is a non-parametric evaluation for increasing or decreasing trend, and Sen's slope estimator provides an indication of the magnitude of the trend. Although the Mann-Kendall test can be computed when there are fewer than eight (8) to twelve (12) detected measurements and/or the highest reporting limit is greater than most observations (USEPA be computed in most cases, guidance suggests that it is not appropriate to use for evaluating trend, 2009). The trend testing was conducted only on parameters for which most of the wells had eight or more samples above detection limits. Location-parameter pairs with fewer than 50% of samples above reporting limits and/or fewer than six (6) detected samples were excluded. Based on these criteria, the parameters that were considered were bicarbonate alkalinity, calcium, hardness, iron, magnesium, manganese, PH, potassium, sodium, and sulfate. Visual outliers and outlier detection limits were removed from the data. Non-detect values were set to the reporting limit, which may introduce some error into the analysis due to variation in detection limits among samples.

Tabulated results of the SW trend analyses are shown in Appendix J The p-value determines whether a monotonic trend exists at 95% confidence. For this test, "no trend" is indicated when the p-value is >0.05. When the p-value is ≤0.05, there is either a "POSITIVE" (increasing with time) or "NEGATIVE" (decreasing with time) trend indicated. For compliance monitoring locations in which results are outside of established benchmarks for at least two consecutive sampling quarters and a potential trend is identified, the trend charts are provided in Appendix J.

## 7.2. Sediment Sampling

Sediment sampling is required every two years and was conducted on August 29, 2022. Sediment monitoring stations are co-located with surface water monitoring stations and consist of reference stations MER-001 and WBR-001, HTDF sub-watershed monitoring stations MER-002, MER-003, and HMP-009 and Mill sub-watershed monitoring stations HMWQ-004, WBR-002, and WBR-003. Per the Part 632 Mining Permit, the sediment sample results were compared to the Consensus-Based Probable Effect Concentrations found in MacDonald et al., 2000. This included comparison to the threshold effects concentration (TEC) and probable effects concentration (PEC). A result below the TEC indicates that it is unlikely that harmful effects would be observed in sediment-dwelling organisms. In contrast, a result above the PEC indicates that harmful effects would likely be observed in sediment-dwelling organisms. To remove some of the uncertainty in effects, the Wisconsin DNR recommends calculating a Midpoint Effect Concentration (MEC) which is the calculated average between the TEC and PEC (i.e. [TEC+PEC]/2). Using the TEC, MEC, and PEC values, the WI DNR also established a rating system to better understand the level of concern the concentrations merit. The ranking is from one to four, where Level 1 is the least concerning and Level 4 is the most concerning. This ranking system was used to help interpret the findings of the 2022 sediment sampling event which are summarized below.

- Three parameters at three different sediment monitoring locations had results between the TEC and PEC, and there was one sampling location where results were above PEC values. Two reference sediment monitoring locations also had parameters above threshold and probable effect concentrations. In 2020, two locations had results that fell between the TEC and PEC, which was a decrease from 2018 when six parameters at four different sampling locations were between TEC and PEC.

- The arsenic result at location MER-002, upstream of Outfall 004, was found to be between the TEC and PEC. After a review of results from the baseline sampling event, Eagle observed that the arsenic concentration at MER-002 was above the PEC in May 2014 prior to the operation of the mill. The ranking for this location is a Level 2 in which there is low level of concern that harmful effects would be observed in sediment-dwelling organisms. Coincidentally, arsenic is naturally elevated in soil and groundwater in the region.

- Copper at MER-003 was found above the TEC and below the PEC. The copper concentrations decreased compared to previous results in both 2020 and 2018. The ranking for this location is a Level 2 indicating a low level of concern that harmful effects would be observed in sediment-dwelling organisms.

- Copper concentrations at HMP-009 were between the TEC and the PEC. HMP-009 was first sampled in Q3 2018 and copper was between the TEC and PEC at that time. The ranking for this location is a Level 2 indicating a low level of concern that harmful effects would be observed in sediment-dwelling organisms. Nickel at HMP-009 was over the PEC in 2022, and between the TEC and PEC in 2018. The ranking for this location is a Level 4 which represents the concentration above which adverse effects would frequently occur in sediment-dwelling organisms. HMP-009 is located near Outfall 003 which is used for wetland irrigation of Wetland EE. Eagle will further investigate the elevated nickel and copper levels at this location in 2023 and consider corrective actions that may be necessary. A follow up surface water sediment sample will be collected in 2023 at this location as part of the investigation.

A summary of the sediment results is provided in Appendix K.

## 7.3. Regional Hydrologic Monitoring

### 7.3.1. Continuous Groundwater Elevations

Monitoring wells MW-701, MW-702, MW-703, MW-704, MW-705, HYG-1, HW-2, HW-1U, HW-1L, HW-8U are instrumented with continuous water level meters and downloaded quarterly by TriMedia field technicians. Permit condition F-9 requires that water levels are continuously monitored in Wetland EE and the HTDF. HTDF water level readings were recorded using a stilling well containing a pressure transducer which was installed in the HTDF to collect continuous water level measurements. To ensure accurate readings in the winter, an “ice eater” was installed to prevent the water surrounding the stilling well from freezing. A map of monitoring locations can be found in Appendix E.

Special Condition F-9a requires continuous monitoring of water levels on each side of the cutoff wall and a comparison of the gradient changes measured versus pre-operational predictions. In 2022, there was a continued effort to maintain the HTDF water level at an operational level between 1530.5 and 1531.0 ft MSL. This has resulted in the current HTDF water level being approximately 2 feet lower than the wetland water level and therefore groundwater flows toward the HTDF rather than away.

Continuous groundwater elevation results are reported by water year (October 1 – September 30). Water year is the preferred approach for reporting water levels because the hydrographs demonstrate the effect of late fall and winter precipitation, which melts and drains in spring, in one 12-month hydrologic cycle. Copies of groundwater hydrographs are in Appendix L. Findings from the hydrograph review include:

- The hydrographs clearly illustrate when the wells are pumped down in advance of, or during, sampling and the rate at which they recharge.

- Equipment malfunctions which resulted in data gaps of continuous water level data occurred at two locations over the course of the year. All water level meters were replaced as soon as possible after discovery of the malfunction. Table 7.3.1 summarizes the locations, duration, and potential cause of equipment malfunctions:

**Table 7.3.1 Summary of Continuous Monitoring Equipment Malfunctions**

| Locations | Date Equipment Malfunction Occurred | Reason for Malfunction |
|---|---|---|
| MW-702 QAL | 9/7/2022 – 11/22/2022 | Battery Failure |
| MW-705 UFB | 5/24/2022 – 9/7/2022 | Battery Failure |

- HW-1L, HW-1U LLA are in a tight formation and are very slow to recharge. HW-1L needs at least 4 quarters of recharge between sampling to ensure independent samples and HW-1U LLA needs at least 3 quarters between sampling events to ensure independent samples are collected.
- Like previous years, most of the shallower, quaternary aquifer wells indicate seasonal influence as groundwater elevations decreased during the winter months and increased again in during the onset of spring melt.

### 7.3.2. Continuous Surface Water Monitoring

Special permit condition F-9 requires monitoring the effectiveness of the cut-off wall. This condition includes the requirement for collecting and analyzing water levels in wells, Wetland EE, and in the HTDF in comparison to predicted water levels; comparisons of groundwater quality between upgradient and downgradient wells, and analysis of the water balance of the facility to aid in evaluation of the data.

During the application process, the operating level of the HTDF was expected to be approximately five feet higher than the elevation of Wetland EE. Therefore, a significant change in water elevations between the inside and outside of the cutoff wall was anticipated and it was expected that this approach would be used throughout operations. However, in 2014 to ensure operational flexibility and as an additional contingency for extra storage capacity in the HTDF, the water management plan was modified, and the operating water level was revised to ten feet lower than originally planned. This lowered the operational HTDF water level to an elevation less than that of Wetland EE. As a result, the predicted gradient measurements originally calculated with a high HTDF elevation are no longer a measurement of cutoff wall effectiveness. In addition, the water elevation cannot be compared in the reverse gradient due to outside influences on the water levels in the wetland.

Per NPDES permit MI0058649, Eagle is required to maintain the hydrology of the wetland and deliver water flows that represent post-closure flows. Eagle maintains wetland hydrology using a river water intake/recirculation system. Continuous surface water monitoring in Wetland EE would be impacted by this outside influence of river water recirculation and would not indicate effectiveness and integrity of the cut-off wall, and therefore continuous readings are not currently being collected. Another requirement to ensure an effective cutoff wall is to monitor the chemical signatures between the HTDF, groundwater wells within the cut-off wall and their monitoring pair outside of the cut-off wall. This will continue to be the method utilized to verify the integrity of the cutoff wall and is discussed in section 7.4 below. Wetland EE elevations are currently recorded via staff gauge readings.

In 2023, Eagle will be installing continuous surface water monitoring devices in Wetland EE as part of an Adaptive Management Plan (AMP) to meet stormwater outflows to Wetland EE expected at closure and monitor water levels throughout the AMP study.

Surface water grab samples and field parameters at Wetland EE continue to be collected quarterly when possible although results are strongly influenced by Escanaba River water quality, and precipitation (i.e., rainfall and snow melt).

## 7.4. Cut-Off Wall Effectiveness Review

As discussed in special permit condition F-9, Eagle is required to monitor the effectiveness of the cut-off wall in terms of hydraulic containment. This condition includes the requirement for collecting and analyzing water levels in wells, Wetland EE, and in the HTDF in comparison to predicted water levels; comparisons of groundwater quality between upgradient and downgradient wells, and analysis of the water balance of the facility to aid in evaluation of the data.

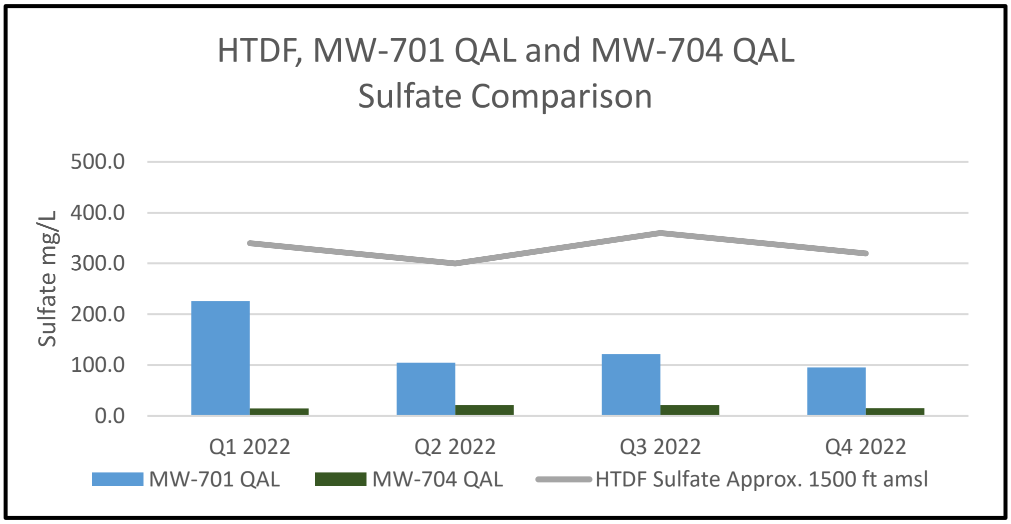
Prior to operations, Eagle's consultants prepared predictions of water gradients that would exist in the facility over a 10-year period of operation. The expectation was that water levels in the HTDF would rise to approximately 1540 ft amsl, and a gradient of up to 9 feet of hydraulic head would develop in paired wells over many years of operation. However, the water balance of the facility has not followed the trajectory that was used in that prediction because Eagle purposely lowered the water level of the HTDF by approximately 10 feet below that which was used to develop the gradient prediction. Over the past four years the facility water level has fluctuated by several feet (up and down) due to heavy precipitation and subsequent drawdown periods. As such, it is challenging to complete a direct comparison of the prediction to the actual gradients. Fortunately, the water quality, static water elevations, and other water balance observations are useful to demonstrate that the cut-off wall continues to perform well to hydraulically contain the tailings disposal facility despite nuances related to seasonal water balance.

The tabular summary provided in Appendix M provides commentary on various observations that the cut-off wall continues to meet hydraulic containment performance standards. Based on this data there is sufficient information to show that the cut-off wall is functioning as expected.

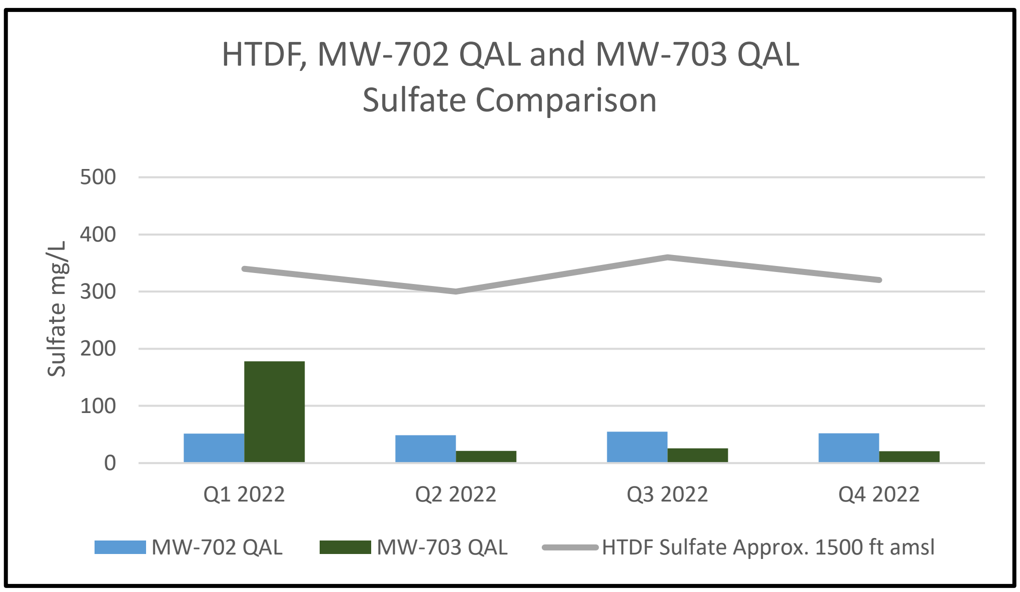
### 7.4.1. Water Quality

The effectiveness of the cut-off wall was also evaluated by comparing sulfate levels. Sulfate was chosen due to its substantial presence in the HTDF and its relative mobility in groundwater (i.e., low tendency for adsorption or precipitation in groundwater). As shown in the graphs below, the water quality at the leachate monitoring well pairs is distinct and shows that the cut-off wall is functioning as expected.

Sulfate levels at MW-701 QAL, a well inside the cut-off wall, are higher than sulfate levels at MW-704 QAL, and approximately correspond to the sulfate concentration in the HTDF. The sulfate concentration in groundwater in the well outside of the cut-off wall is much lower and does not correlate with concentrations in the HTDF. This relationship suggests overall water quality of the HTDF is not communicating with this well.




Though sulfate levels in MW-702 QAL, a well located within the cut-off wall, were lower than sulfate levels measured in the well located outside the cut-off wall (MW-703 QAL) in Q1, the sulfate concentrations at all of these wells are lower than those seen in the HTDF. This suggests that the cut-off wall is functioning as expected.

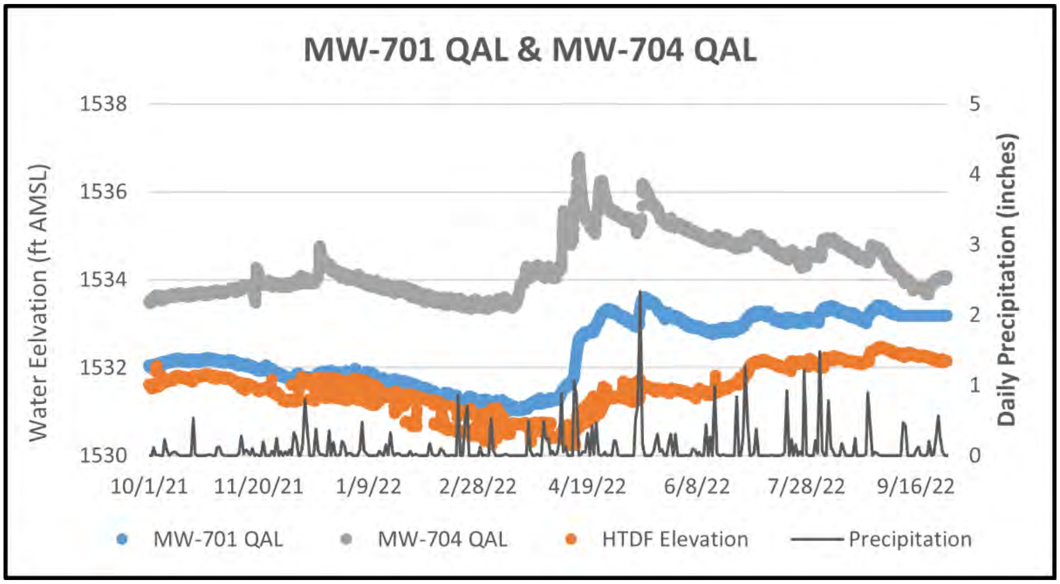



### 7.4.2. Water Levels

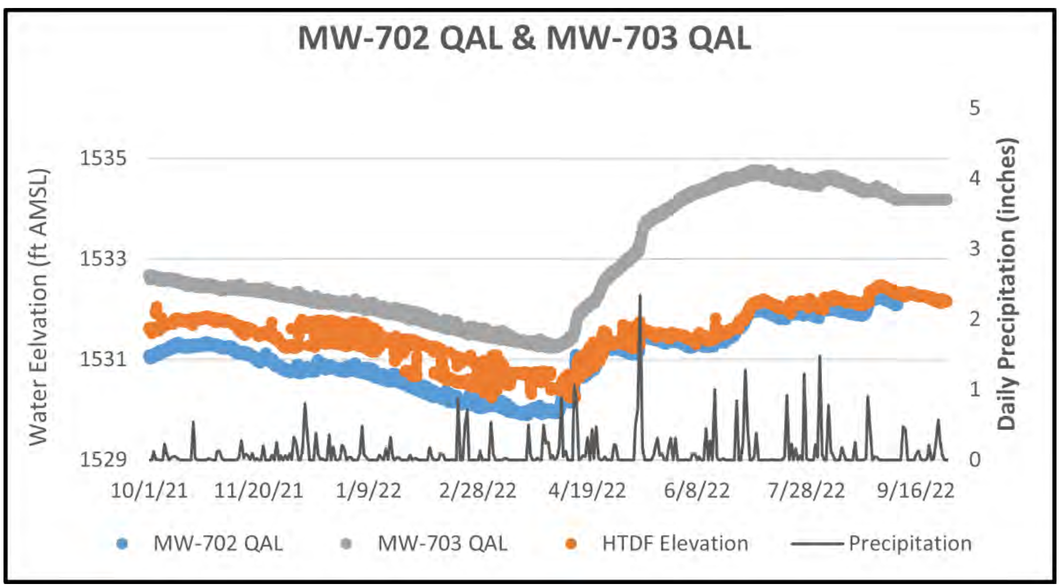
The elevation of groundwater compared to HTDF elevation also provide evidence that the cut-off wall is functioning as expected.

Fluctuations in groundwater elevation in MW-701 QAL were similar to what was seen in the HTDF, as expected. Groundwater elevations in MW-704 QAL still fluctuated seasonally with snow melt and precipitation but appeared to act independently from the HTDF water level fluctuations. MW-704

QAL is influenced by local discharges to Outfall 003 at Wetland EE and due to proximity and depth relative to the wetland.




Throughout most of 2022, the elevation of groundwater at MW-702 QAL corresponded to the HTDF levels, as expected. Though MW-703 QAL also followed similar fluctuations in late 2021 and early 2022, it remained at a higher elevation throughout the rest of the year, indicating that it was not influenced by the HTDF and was independently impacted by snow melt and precipitation.




*Note: MW-703 QAL experienced diver failure on 9/7/2022, no Q4 data available.*

### 7.5. Biological Monitoring

Biological monitoring events conducted in 2022 included surveys of birds, large and small mammals, frogs, toads, fish, and macro invertebrates. Results from each survey have been compiled into annual reports which are available upon request. A summary of each survey is provided below.

### 7.5.1. Flora and Fauna Report

The 2022 flora, fauna, and wetland vegetation surveys were conducted by Barr Engineering (formerly King & MacGregor Environmental, Inc. (KME)). Table 7.5.1 below outlines the type and duration of the surveys that were conducted in 2022. A map of the survey locations is included in Appendix N.

**Table 7.5.1 Type and Duration of 2022 Ecological Investigation**

| Survey Type | Survey Date |
|---|---|
| Birds | June 13, 14; September 21, 22 |
| Small Mammals | September 20-22 |
| Large Mammals | May – September |
| Toads/Frogs | May 5; June 6; July 6 |
| Threatened and Endangered Species | May - September |

The wildlife and plant species identified during the 2022 surveys within the study area are like those identified during previous flora and fauna surveys. Following is a summary of the survey results:

- A combined total of 697 birds representing 71 species were identified during 2022 bird surveys. Chestnut-sided warbler (*Setophaga pensylvanica*), American robin (*Turdus migratorius*), white-throated sparrow (*Zonotrichia albicollis*), and Nashville warbler (*Vermivora ruficapilla*) were the most abundant birds observed during the June 2022 survey, while Canada goose (*Branta canadensis*), black-capped chickadee (*Poecile atricapillus*), blue jay (*Cyanocitta cristata*), and American crow (*Corvus brachyrhynchos*) were the most abundant during the September 2022 survey. The bird species identified in 2022 are like those bird species identified in previous surveys conducted within the study area and are consistent with the bird species expected to be found in the habitats present.

- Forty-six small mammals representing eight species were collected during the September survey period. The most common small mammal identified during the survey was the Deer mouse (*Peromyscus maniculatus*). The total number of individuals captured, and species richness recorded in 2022 is consistent with those in previous years, with a small increase in number of species collected. No threatened, endangered, or special concern small mammals were observed during any of the surveys. The small mammals encountered within the study areas during the 2022 survey period is typical of those expected in the habitats present and are consistent with previous survey results.

- During the 2022 surveys, no large mammals were directly observed, however, tracks and scat of Whitetail deer (*Odocoileus virginianus*) were present. The American black bear (*Ursus americanus*), bobcat (*Lynx rufus*), coyote, the federally endangered gray wolf, moose (*Alces alces*), and red fox (*Vulpes vulpes*) were not observed during 2022 but were previously observed or are regionally common species possibly present within the study area. The large mammal species detected during the 2022 surveys are regionally common large mammal species and are expected to use the habitats in the Study Area.

- Four frog species were observed during the 2022 surveys: gray treefrog (*Hyla versicolor*), green frog (*Rana clamitans*), northern spring peeper (*Pseudacris crucifer*), and western chorus frog (*Pseudacris triseriata*). Calling activity included Call Index Values of 1, 2, and 3.

As in most years, the spring peeper was the most frequently recorded species in 2022. The 2022 observations are consistent with previous surveys.

### 7.5.2. Threatened and Endangered Species

The Michigan Natural Features Inventory (MNFI) maintains a database of rare plants and animals in Michigan. Barr requested a Rare Species Review to determine if any protected species had been found within 1.5 miles of the Study Area. Table 7.5.2 lists the species identified during the MNFI review process.

**Table 7.5.2 MNFI Review Results of Study Area**

| Species | Classification |
|---|---|
| Canada rice grass | State threatened species |
| American bittern | State special concern species |
| Bald eagle | State special concern species |
| Pickerel Prog | State special concern species |
| Osprey | State special concern species |
| Great blue heron rookery | Rare natural feature |

In accordance with Michigan Department of Natural Resources (MDNR) guidelines (MDNR 2001), Barr surveyed for any MNFI listed species and their habitats during the appropriate season. The exception is Canada grass which is no longer surveyed on an annual basis as there is no suitable habitat within the study area. Following are the results of the threatened and endangered species survey:

- Pickerel frogs have not been observed at any times since the surveys began in 2014, however suitable habitat may exist within the study area.
- American bitterns were observed near Survey Point 5 in June 2022.
- The bald eagle nest on the north shore of Lake Lory was observed to be in good condition, but the nest was not occupied during May, June, or July observations.
- In May, June, and July 2022, two unoccupied nests were identified in the heron rookery. This is the third year the rookery has been unoccupied during field surveys; however, the usage of the rookery has varied considerably since observations began. This rookery has been abandoned and reoccupied once before.
- An osprey was identified in May 2022 for the first time since observations began in 2014.

A copy of the 2022 Humboldt Mill flora and fauna report is available upon request.

### 7.5.3. Fisheries and Macro Invertebrate Report

The 2022 Fisheries and Macro-Invertebrate annual surveys were conducted by Advanced Ecological Management (AEM). A total of six stations were surveyed in June 2022, including two stations on the Middle Branch of the Escanaba River (MBER), one station on a tributary of the Middle Branch of the Escanaba, one station on an unnamed tributary of the Black River (WBR), one station in Wetland Complex EE located northeast of the HTDF, and Lake Lory. A map of the survey locations is included in Appendix O.

*Stream Stations*

A total of 102 fish representing 13 species were collected in 2022 from all stream stations, which is 218 less fish than were observed in 2021. Higher than average populations were found in 2021. In 2020, a total of 169 fish representing 18 species were collected from all stream stations. The 2022 results are comparable to all previous surveys (with exception of 2021). The elevated number of fish collected in 2021, can be attributed to an abnormally higher number (101) of central mudminnows found at MBER1. The central mudminnow (*Umbra limi*) was the most frequently collected species (28) followed by the Northern redbelly dace (*Chrosomus eos*) (14). No threatened, endangered, or special concern fish species were observed at any of the stream stations in 2022. The following is a summary of the findings:

- The community composition of fish species was generally consistent over the past six years.
- Beaver impoundments have been observed at Station 1 since 2014 and continue to influence the hydrology and potentially the number of fish collected during the surveys at that location. In 2021, a new station location was selected downstream of the road crossing to minimize the influence of beaver impoundments that are located upstream of the road crossing.
- A total of 40 fish representing six taxa were collected from Station 1 in 2022, which is a decrease from the 94 fish collected in 2021 and more representative to the 36 fish collected in 2020.
- The number and species of fish observed at Station 5 increased for the first time in several years from 7 fish in 2021 to 16 fish in 2022. The fish collection totals have varied since 2018, when 15 fish were observed. In 2019, there was a significant increase in fish due to an unexpected large number of central mudminnows found.
- There was a significant decrease in number and taxa at MBER1 in 2022, as 36 fish were collected representing seven species, and in 2021, 161 fish were collected representing 11 species. During the 2020 aquatic survey, a total of 80 fish representing 10 taxa were observed. The increase observed in both 2020 and 2021 is primarily associated with the large number of central mudminnows that were present.
- A total of 10 fish representing 10 taxa were observed at MBER2 in 2022, versus a total of 58 fish representing 10 taxa were observed in 2021. Community composition of fish species has varied among surveys at MBER2.

Station MBER1 – Downstream Extent, June 2022

Using the P-51 protocol, a total of 941 macroinvertebrates were collected from all four stream stations investigated in 2022. The total number of macro-invertebrates collected in 2022 decreased by 44 specimens compared to 2021. Though, the numbers and taxa observed in 2022 remained consistent with previous surveys. No threatened, endangered, or special concern macroinvertebrate species were observed at any of the stream stations in 2022. Table 7.5.3 below shows a macroinvertebrate data comparison for all stream locations.

**Table 7.5.3 Stream Macroinvertebrate Collection Data Comparison**

| | 2022 | 2021 |
|---|---|---|
| **Station 1** | 136 | 113 |
| **Station 5** | 150 | 164 |
| **MBER1** | 285 | 343 |
| **MBER2** | 370 | 365 |
| **Total:** | **941** | **985** |

A summary of the fish, macroinvertebrate, and habitat ratings for the four stream stations are displayed in Table 7.5.4 below. Note that station 1 is a low gradient system that is frequently affected by beaver activity, which has impounded the water. The low gradient coupled with the beaver activity impounding water has likely contributed to the fluctuation between “poor” and “acceptable” macroinvertebrate community ratings.

**Table 7.5.4 2022 Habitat Ratings**

| | | 2022 | 2021 | 2020 | 2019 | 2018 | 2017 | 2016 | 2015 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Station 1** | Fish Community | Poor | N/A | Poor | Poor | Poor | Poor | Poor | Poor | Poor |
| | Macroinvertebrate Community | Poor | Poor | Poor | Acceptable | Acceptable | Poor | Acceptable | Acceptable | Acceptable |
| | Stream Habitat | Good | Good | Good | Good | Good | Good | Good | Good | Excellent |
| **Station 5** | Fish Community | Poor | Poor | Poor | N/A | Poor | N/A | Poor | Poor | Poor |
| | Macroinvertebrate Community | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable |
| | Stream Habitat | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| **MBER1** | Fish Community | Poor | N/A | Poor | Poor | Poor | Poor | Poor | Poor | Poor |
| | Macroinvertebrate Community | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable |
| | Stream Habitat | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent |
| **MBER2** | Fish Community | Poor | N/A | Poor | Poor | Poor | Poor | Poor | Poor | Poor |
| | Macroinvertebrate Community | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable |
| | Stream Habitat | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent | Excellent |

N/A =Not Applicable

*Lake Lory*

A total of 170 fish were collected from Lake Lory in 2022 representing seven different taxa. A total of 167 fish were collected from Lake Lory in 2021, a total of 193 fish were collected from Lake Lory in 2020, and a total of 294 fish were collected from Lake Lory in 2019. However, the community composition was generally consistent among years surveyed by AEM. Bluegills (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), and black crappie (*Pomoxis nigromaculatus*) were the most frequently collected species among all sample gear in 2022. Many of the fish observed in Lake Lory appear to be in good condition, but similar to previous years, black spot was observed in several species. Black spot is caused by a natural parasite (larval trematode) that burrows into the skin of the fish. Per the MDNR website, black spot is a common disease in earthen bottom ponds and lakes.

Aquatic macroinvertebrate sampling was conducted on June 11, 2022, within Lake Lory where a total of 151 macroinvertebrates were collected, which is 114 fewer than the 265 that were collected in 2021. Snails, scuds, and true flies were the most abundant macroinvertebrates collected from Lake Lory in 2022 and the community composition was generally consistent with the 2015 through 2021 macroinvertebrate communities. No threatened, endangered, or special concern macroinvertebrate species were observed in Lake Lory.

Lake Lory – June 2022

*Wetland EE*

Three brook sticklebacks (*Culaea inconstans*) and nine central mudminnows were collected from Wetland EE during the 2022 study. One brook stickleback was collected in 2021, and one brook stickleback and one central mudminnow were collected during the 2020 study. Two brook sticklebacks were collected here in the 2018 and 2019 studies. No fish were collected during the 2015 or 2017 studies and one juvenile brook stickleback was collected from this location in 2016.

Aquatic macroinvertebrate sampling was conducted on June 7, 2022, where a total of 107 macroinvertebrates were collected, which is 59 more than was found in 2021 (48 total). Odonates, true flies, and mayflies were the most frequently collected species in 2022. These species observed have been consistent between survey years. No threatened, endangered, or special concern macroinvertebrate species were observed in Wetland Complex EE. The 2022 aquatic vegetation density appeared to be consistent with conditions observed in the previous five aquatic surveys (2017-2021). Cattails have grown in most of the areas of Wetland Complex EE that were previously open water. A copy of the 2022 Humboldt Mill Aquatic Survey Report is available upon request.


Wetland EE – North of the HTDF, June 2022

### 7.5.4. Fish Tissue Survey

No fish tissue survey was required to be completed in 2022. The next survey will be conducted in 2023.

## Miscellaneous Monitoring

### 7.6.1 Soil Erosion Control Measures

Soil erosion and sedimentation control (SESC) measures related to the construction of mining facilities falls under the purview of Part 632. Silt fence and riprap was maintained near the east side of the WTP expansion area where the risk of soil erosion and sedimentation was present, primarily near the adjacent wetland boundary areas in 2022. A mix of SESC measures were put in place in November of 2021 for the ZLD treatment plant project and have been maintained throughout construction. An existing vegetated berm is in place between the excavation site and the delineated wetland. Straw waddles were placed along the base of this berm and around monitoring wells as a secondary control. Silt fence was placed where the berm was nonexistent.

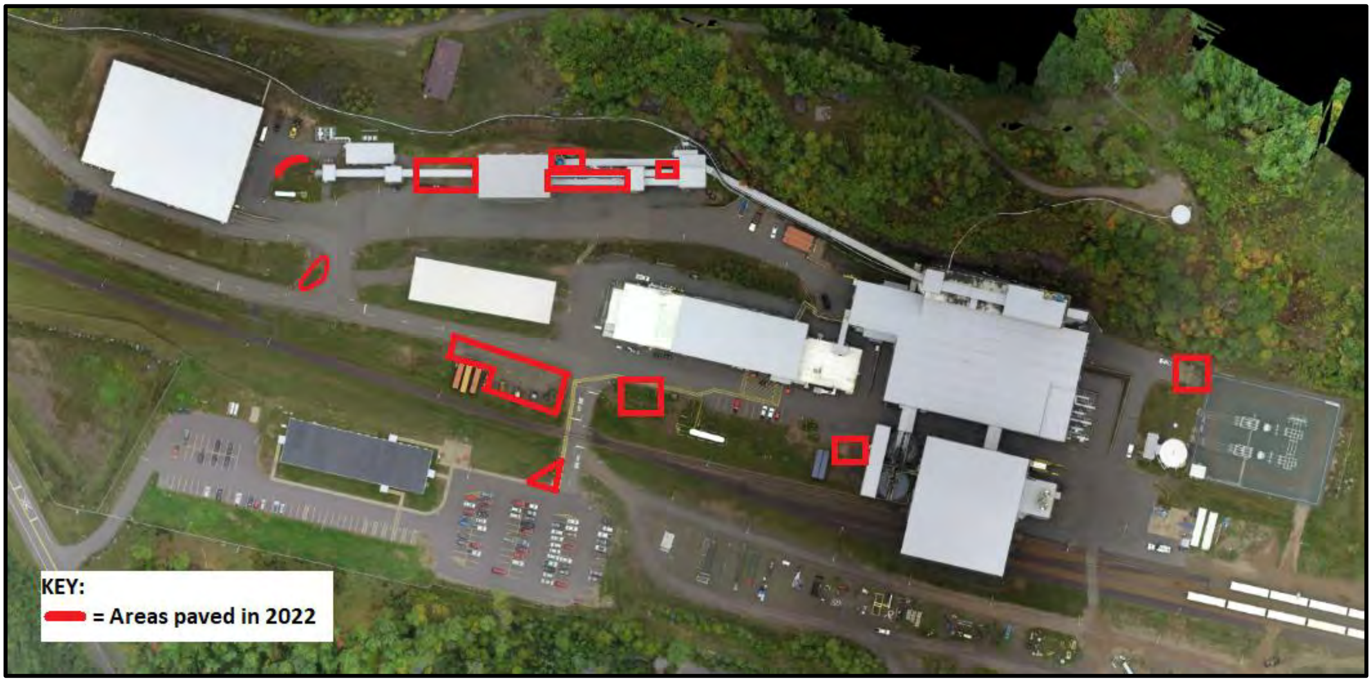
The Department will be notified if any construction activities occur where soil erosion measures are necessary, and all inspections will be completed as required.

### 7.6.2. Impermeable Surface Inspections

The Impermeable Surface Inspection and Surface Repair Plan outlines the requirements of integrity monitoring of surfaces exposed to site storm water and areas of ore, concentrate and chemical handling/storage. Areas inspected in 2022 included sumps and floors of the coarse ore storage area (COSA), concentrator building, concentrate load out facility, and WTP. Monitoring was conducted monthly as required by the plan.

Floors are inspected for cracks and overall general condition and the sumps are evaluated for any areas of cracking, pitting, or other surface deficiencies, and accumulation of material. All inspection results are recorded on the impermeable surface inspection form by Environmental Department staff and stored in the compliance binder at the Mill Administration Building. Any issues identified during the inspections are immediately reported and fixed by onsite staff. Follow-up inspections are completed to ensure the repairs were made.

In November 2022, eleven locations were paved for improvements to areas of high traffic, expansion of vehicle parking, and areas where curbing was needed to redirect stormwater, a map is provided below.



Map of the additional areas paved in 2022.

### 7.6.3. Tailings Line Inspection

Per Mining Permit Condition E-12, the double-walled HDPE pipeline is monitored by Mill operators and Environmental Department staff. Any concerns identified during the inspections would be immediately reported to the Mill operations and maintenance departments who would complete any necessary repairs. No new concerns were identified in 2022.

### 7.6.4. Geochemistry Program

Per Permit Condition F-1, Eagle continued implementation of the comprehensive HTDF geochemistry monitoring program which was prepared by Hatch Associates in 2015 and subsequent revisions by Golder Associates. In 2022, the monitoring program included collecting high resolution physiochemical profiles, limnological modeling, water quality monitoring, characterization of watershed input chemistry, and interpretation of the effects of changes in water management, water treatment, and tailings deposition on the chemistry and layer dynamics within the facility.

***Physiochemical Monitoring***

Eagle continued to conduct physiochemical monitoring of the HTDF using various multiparameter reading instruments either lowered over the side of a boat to multiple depths, or via the YSI EXO auto-profiler that was installed in 2018. In 2022, profiles were manually collected on March 17th, May 11tth, June 22nd, July 13th, October 20th, and November 3rd, 2022, using multiparameter probes. The profiling device was re-installed on the HTDF in 2022 and was operational during ice off conditions from July 11th through September 20th. This collection season had a shorter window of deployment compared to 2021 due to hardware issues and required maintenance. The YSI auto-profiler collected four profiles per day and data was regularly analyzed by geochemists to assess layer characteristics and physics.

Photo of the HTDF and YSI EXO auto-profiler, June 2021

The results of the 2022 monitoring showed that the HTDF continued to be stratified in 2022 and exhibited a six-layer system. The layers remained relatively stable with respect to position and physicochemical properties throughout the year. In 2022, Eagle continued the isolation of waste streams from the WTP and discharged them to specific depths of the HTDF to minimize unnecessary dilution of dense fluids and create distinct layers that could be managed according to their chemistry in the future. Below is a synopsis of the geochemistry observed in the six layers during 2022:

1) A mixolimnion existed from the HTDF surface at approximately 1,532 to 1,495 ft amsl (37 ft). Between May and November, this layer was separated into a 12-ft-thick epilimnion sublayer and a 20-ft-thick hypolimnion sublayer by a thermocline. Fall turnover between the epilimnion and hypolimnion layers began before the October 20, 2022, manual profile was collected as indicated by a gradual homogenization of temperature.

2) A middle layer from approximately 1,495 ft amsl to 1,479 ft amsl (16 ft) is marked by increased water temperature, a sharp drop in dissolved oxygen and oxygen reduction potential, and notable specific conductance. Since the start of operations in 2014, Eagle has not observed complete mixing

between the middle layer and the surface layer during fall or spring turnover periods. This has resulted in anoxic, strongly reducing conditions occurring below the top of the middle layer. The absence of complete vertical mixing of the water column defines the HTDF as a meromictic pit lake, one of the few known meromictic water bodies in the United States.

3) A 9-foot transitional boundary called the ‘chemocline’ occurred between 1,479 and 1,470 ft amsl and separated the middle layer from the deep layer. The strong density gradient across the chemocline limits the amount of mass transfer and mixing between the deep layer and the middle Layer.

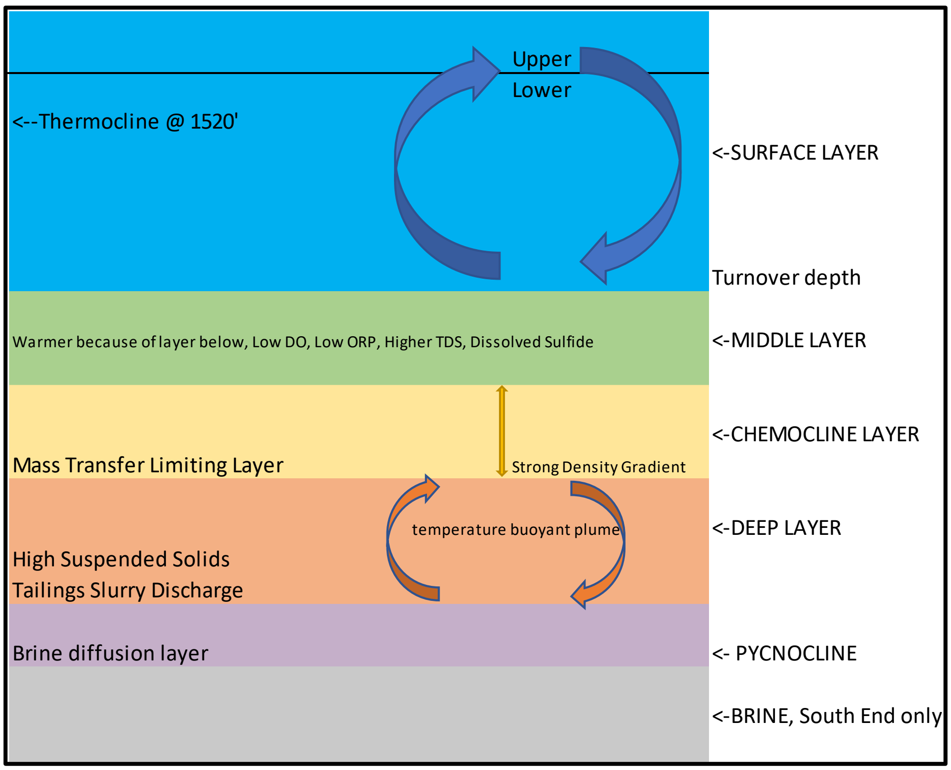
4) A ‘deep layer’ exists from approximately 1,470 and 1,451 ft amsl or, in places, the floor of the HTDF (varies in depth based on tailings deposition areas) consists of tailings slurry water, process water, and off-specification water (filter and membrane cleaning solutions) from the WTP. The injection of warmer slurry water (25°C) into a slightly cooler deep layer (13°C) results in a buoyant plume of process water that rises to the bottom of the chemocline. After cooling, the plume sinks to the base of the deep layer. The entire process results in a convection cell that perpetually mixes and homogenizes water across this 19-ft depth interval. The deep layer is thicker within the north basin and is thinner in the south basin due to the accumulation of brine.


Aerial map identifying the HTDF north and south basins

5) Within the south basin, a second transitional boundary exists from the base of the deep layer to the top of the brine layer, called the ‘pycnocline.’ This layer is between 1,451 and 1,431 ft amsl (20 ft). The Pycnocline results from the strong chemical gradient between the deep layer and brine that is being deposited in the south basin; and also results from the upward diffusion of mass along this gradient. The pycnocline was first observed in 2021 and expanded by 5 ft throughout 2022.

6) A brine layer approximately 10 feet thick formed in the deepest area of the southern section of the HTDF from approximately 1,431 ft amsl to the pit floor at approximately 1,418 ft amsl (13 ft). Due to strong density, temperature, and specific conductance differences between the brine and tailings water, brine has successfully formed its own distinct layer.

As previously experienced, in the spring and fall there were thermodynamically driven shallow turnover events within the mixolimnion with some partial erosion of the upper layer of the chemocline, but complete mixing of the entire water body did not occur. Modelling suggests that the HTDF will remain stratified in 2023.




Simplified layer diagram of the HTDF, 2022.

Eagle collected a transect of eight profiles along the North-South axis of the HTDF with two goals: (1) monitor the horizontal extent of each of the HTDF layers described above, and (2) evaluate whether the subaqueous tailings ridge remained effective at preventing water in the brine layer and pycnocline from spilling into the north basin. The HTDF transect completed in 2022 substantiated both of these goals.


HTDF Transect, July 2022.

As is done annually, several modeling efforts were conducted to understand HTDF limnology for both short-term and long-term stability. Short term modeling focused on spring and fall turnover predictions of the surface water layer quality, since this water is an integral part of the WTP operations strategy. As was described in the 2019 annual report, Eagle and its consultant have demonstrated ample confidence in the density-driven physical stability of the HTDF. The vertical position of inputs and outputs influenced the layering of the HTDF as predicted, and model calibration exercised continued to reproduce changes in the HTDF that were measured in-situ, so in 2022, the majority of modeling focused on incorporating the complexity of density-driven brine behavior, testing the modeled effects of specific water treatment objectives to predict a probable case for longer-term water quality, and further refining reclamation predictions.

The main modeling activity completed in 2022 a transient limnology model which is intended to be used to predict conditions in the HTDF at the beginning of reclamation, throughout reclamation, and in the decades of stability following reclamation. Reclamation of the facility will begin concurrent with operations by using a ZLD water treatment system (until the close of operations) through the closure of the facility after operations cease. This type of model is useful for several purposes: 1) to understand how to optimize water treatment and tailings placement operations; 2) to confirm the time and cost associated with reclamation of the HTDF; and 3) to confirm closure conditions will meet regulatory obligations in perpetuity.

Previously developed CE-QUAL-W2 limnology and water quality models were well-calibrated to observed conditions, therefore the hydrodynamics of the system would be expected to be predictable when modeled forward. During 2022, modelers updated modeling framework to accept transient changes in tailings placement in the model sequences, and updated tailings placement in the model through the first half of 2027 (matching the 2022 published resource). Eagle's engineer continued work that began in 2021 to provide model inputs in 6-month increments to iterate the transient modeling (i.e., changing) conditions in water treatment and tailings placement over time. Operational scenarios were selected which prevented significant deterioration of the surface water quality in the HTDF for as long as feasible in the mine plan, removed brine, and maintained the stability of the density stratification in the HTDF for the duration of operations. Then, a sequence of models was completed to mimic reclamation in the facility for as many 6-month increments as were needed to meet water quality objectives for parameters in the model (primarily nickel and dissolved solids). A total of 29 months of treatment was required to reach closure objectives. In 2023, additional model parameters (analytes of concern) will be added, and several alternative operational scenarios will be explored to determine if modeling outcomes are better or worse.

The two-dimensional groundwater fate and transport model that was developed in 2021 was not significantly updated in 2022 due to a lack of new inputs while the transient modeling was ongoing. Future updates that may be completed include: the incorporation of additional parameters of concern, tailings deposition design updates, model timeframe extended to 200 years post operations, and incorporation of the final water column characteristics predicted in the transient model.

***Tailings Pore Water Chemistry***

The tailings pore water chemistry sampling program that began in 2019 was not carried out in 2021 or 2022, however, Eagle and our consultant established plans to conduct a broader in-situ tailings porewater sampling program involving a barge mounted drill rig in 2023. This information will be used to update and/or verify modeling efforts.

***Sulfur Gas Analyses***

In response to sulfur gas odors detected in previous years, Eagle continued to take measures needed to monitor for sulfur gasses when working on the HTDF, including the use of gas monitors which is a common health and safety standard. Detections of both odor and $H_2S$ were rarely encountered. During spring and fall 2023 Eagle will continue monitoring for $H_2S$ gasses during the turnover timeframe and continue to track the relationship between concentration of dissolved sulfide present in the layer and sulfur odors to ensure that any changes are detected and addressed promptly if needed.

Concentrations of total sulfide, a proxy for dissolved $H_2S$ gas, decreased in the middle layer between 2021 and 2022. Elevated concentrations of dissolved $H_2S$ in the middle layer are typically associated with more noticeable odors during turnover events. Eagle planned to install an in-situ $H_2S$ measurement sensor to work in tandem with the YSI EXO sonde for HTDF monitoring in 2022, however the sensor company experienced challenges in the integration of the $H_2S$ sensor and our YSI EXO sonde. The company has not been able to produce $H_2S$ data outputs that would be usable with the remote monitoring equipment. Eagle is currently exploring alternative measurement options to collect in-situ $H_2S$ readings but does not yet have a feasible replacement.

***Water Chemistry***

Similar to previous years, water chemistry profile samples were collected on July $13^{th}$, 2022, from a vertical profile at multiple depths in the HTDF to monitor changes in total and dissolved concentrations and constituents of interest (COI) over time. Most COI concentrations increase with depth through the water column. All water samples collected were sent to a certified lab for analysis.

Key observations regarding water quality are divided between each layer of the HTDF:

General observations (entire basin)

- The pH of all layers of the HTDF remained above pH 6.6, showing no evidence of acidification due to tailings oxidation.
- Total thiosalt concentrations were at or below detection limits above 1,481 ft amsl in the surface and middle layers. Below this depth, total thiosalt concentrations were elevated between 1,468 and 1,454 ft amsl. Total thiosalt concentrations at 1,424 ft amsl were the highest measured since 2018.
- Concentrations of xanthate breakdown products (e.g., 2-propanol and carbon disulfide) were higher in the bottom of the surface layer, deep layer, and brine layer compared to 2021. Carbon disulfide concentrations in the brine layer were the highest measured to date.

Surface Layer

- Concentrations of TDS changed minimally compared to 2021 values. A declining trend in surface layer TDS values was first observed in 2020.
- Concentrations of magnesium, manganese, sulfate, nickel, barium, and strontium have decreased over time.
- Concentrations of the following constituents have increased in the surface layer since 2021: chloride, fluoride, alkalinity, copper, and iron.

Middle Layer

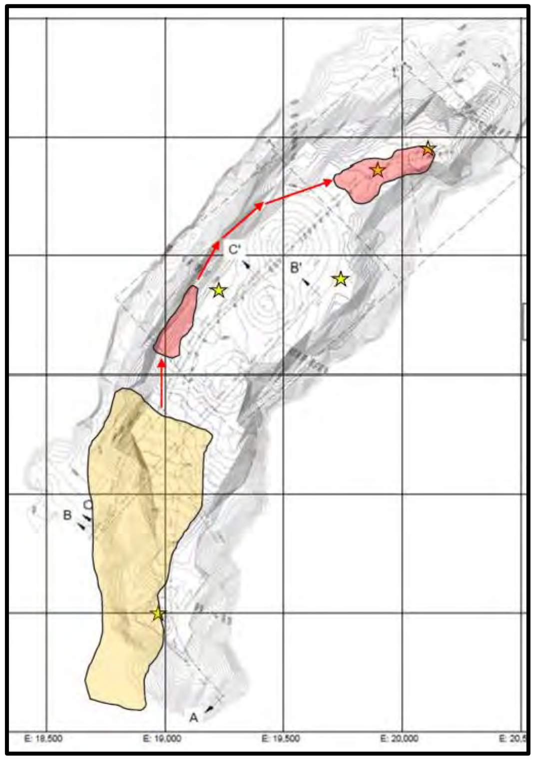
- Sulfide concentrations continue to decrease in the middle layer, following a trend observed since 2019.

Chemocline and Deep Layers

- Concentrations of the following constituents have decreased in the deep layer over time: manganese, arsenic, iron, and cadmium.
- Concentrations of the following constituents have increased in the deep layer relative to 2021: turbidity, chloride, ammonia, total nitrogen, chemical oxygen demand, carbon disulfide, copper, selenium, chromium, molybdenum, and sulfide.

***Tailings Deposition and Brine Storage***

The tailings deposition model design was implemented in 2022 to continue to store brine in the southern end of the HTDF. If brine was to move from the southern storage area it would not be considered problematic, but the preference is for it to be contained to just one area of the HTDF for ease of future removal. Some migration was observed in 2021, and the tailings deposition plan was adjusted to prevent this migration from continuing. The tailings deposition plan adjustment appeared to be successful at preventing migration of brine in 2022.




Approximate location of brine (including pycnocline) in yellow; minor brine migration (red), Summer 2021

Eagle is in the process of constructing a ZLD treatment plant which is scheduled to go online in late 2023 or early 2024. The plant is designed to remove brine prior to the end of operations and to facilitate rapid reclamation of the facility after operations cease. The process will involve pumping sources of brine from the HTDF and that which is produced in the WTP to the ZLD plant, which will concentrate and evaporate the liquid into a solid which can be either beneficially reused in another industrial market or disposed at a landfill.

## 8. Reclamation Activities

In 2022 Eagle removed approximately 1,452 cubic yards of soil from impacted areas and other various areas across site for asphalt base preparations. There are currently no plans to conduct any progressive reclamation activities in 2023. The Department will be notified in advance if any activities do commence in 2023.

*Closure Planning*

Closure planning continued in 2022 with the assistance of Ramboll US Consulting of Denver, Colorado. Work in 2022 primarily consisted of preparing a detailed temporary closure plan in alignment with both Lundin's Corporate Standards and Guidance from the International Council on Mining & Metals Integrated Mine (ICMM) Closure Good Practice Guide. The temporary closure plan describes the governance and activities undertaken to care for the asset, protect the environment, and maintain compliance with regulatory licenses in the event of both short-term or long-term temporary cessation of mining activities.

Throughout 2023, Eagle will advance the detailed planning for mine closure in all areas that were outlined in the 2021 revision of the plan, while remaining flexible to support change or growth within the business.

Closure related studies that occurred in 2022 included:

- Eagle continued waste characterization studies and solicitation of vendors for beneficial re-use opportunities for brine solids generated through the future brine treatment system.
- Previously a draft conceptual design was completed for the spillway that will be used for passive discharge at closure of the HTDF. Eagle's primary stakeholder in the design, the Humboldt Wetland Mitigation Bank (HWMB), was engaged in review of the preliminary design. In 2022 the AMP informing the near and future management of hydrology in Wetland EE and downgradient was drafted. The HWMB will continue to be engaged in the development and execution of the AMP. The AMP will be implemented in the summer of 2023 and will adjust the water flows provided to Wetland EE, gradually transitioning the hydrology to the expected post-closure conditions prior to the spillway being constructed.
- Eagle and our consultants completed the predictive closure water quality model for the HTDF.
- Eagle retained a demolition company to begin producing detailed demolition and recycling plans for each structure on the property.

## 9. Contingency Plan Update

One element of the contingency plan is to test its effectiveness on an annual basis. Testing is generally composed of two components. The first component is participation in adequate training programs for individuals involved in responding to emergencies and the second component is a mock field test.

The Humboldt Mill Emergency Response Team (ERT) continued to be active in 2022. This team is not required by the Mine Safety Health Administration (MSHA) but was established to assist first responders in the event of an emergency. The focus of the team is to act as the liaison with local first responders as well as the Eagle Crisis Management Team (CMT), providing assistance where needed as they are considered the site experts on our equipment, locations, and emergency procedures. ERT training occurs monthly and is focused on fire system familiarization, patient packaging/stokes basket use, EMS support and assistance, emergency equipment familiarization and inventory, and rope and knot work.

In addition to the ERT, security personnel are EMTs and paramedics who are trained in accordance with state and federal regulations. This allows for immediate response to medical emergency situations.

A mock field test in the form of a desktop exercise was conducted in October 2022. The exercise tested the emergency response measures of the contingency plan and crisis management plan in place at Eagle Mine. With the assistance of Eagle Mine employees, a third-party consultant developed an emergency scenario. The scenario generally involves a situation in which both safety and environmental risks are considered and in 2022 the emergency involved a fall of ground on the ramp in the mine. In the scenario, material fell onto the decline and trapped several employees in the mine. The crisis management team was aware that a test would occur but were unaware of the nature of the emergency. During the crisis management exercise, the team worked through the incident identifying the strategic objectives, key priorities, critical decisions and triggers, and communications that would need to be made to stakeholders. The third-party consultant observed the activity to identify strengths, weaknesses, and opportunities for improvement. Once the exercise was complete, the consultant and crisis management team held a debrief session to capture feedback. A summary report was produced with recommended actions for improvement.

An updated contingency plan can be found in Appendix P. This plan will also be submitted to the Local Emergency Management Coordinator.

## 10. Financial Assurance Update

Updated reclamation costs were submitted to the Department for review March 6, 2023. Eagle Mine understands that if these costs require updating of the current bond for financial assurance EGLE will notify Eagle Mine.

## 11. Organizational Information

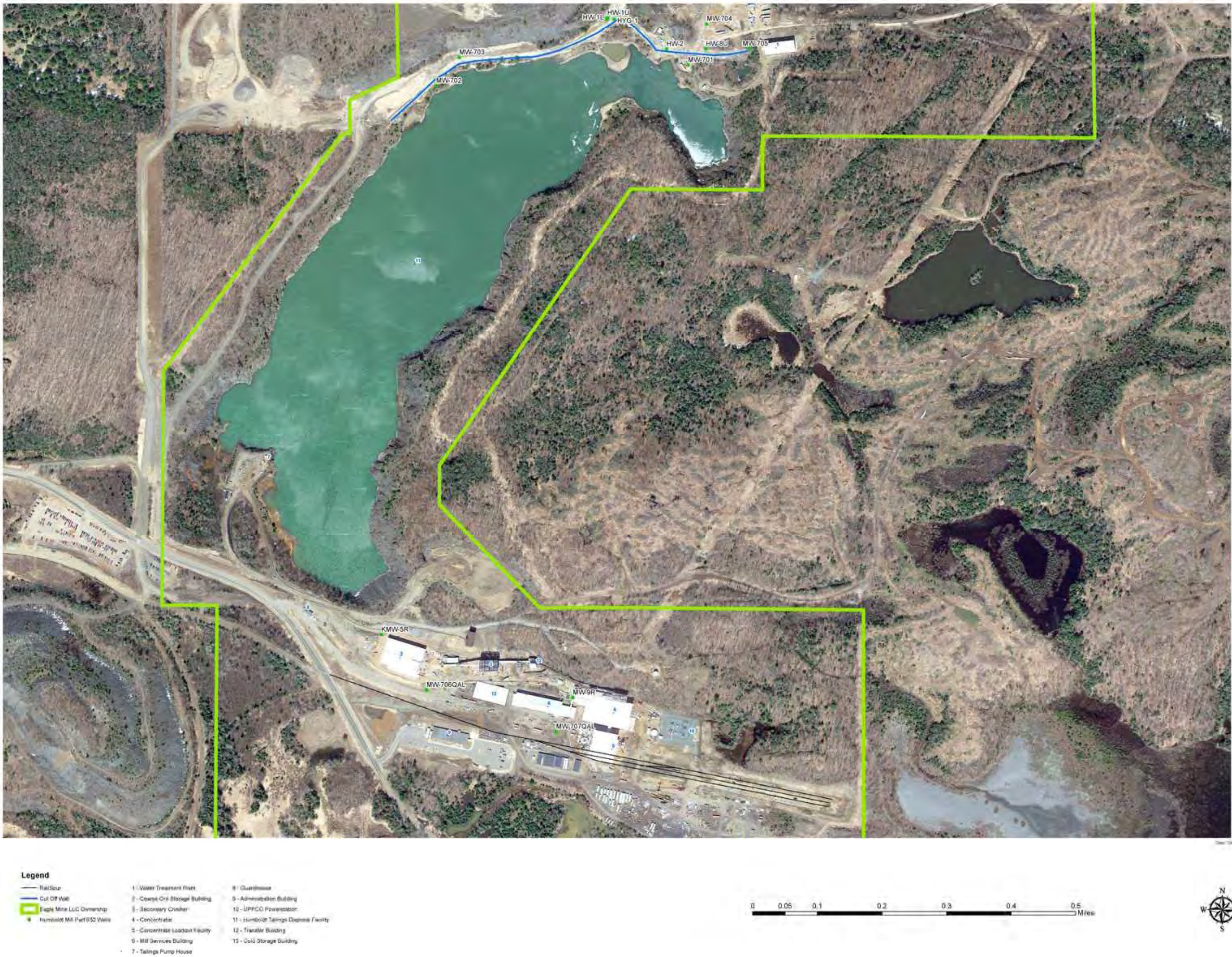
An updated organization report can be found in Appendix Q.

# Appendix A

# Humboldt Mill

# Site Map

# Eagle Mine LLC Humboldt Mill Monitoring Map




Humboldt Mill
Buildings and Features
N
Public Land Survey Sections
Humboldt Mill Buildings and Features
Roads
Rail
Culvert
Stormwater Drain
Topographic Contours
Monitoring Well Locations
Catch Basin
24 - Mini - Pit
25 - Coarse Ore Storage Area / Primary Crusher Building
26 - Admin Building
27 - Cold Storage Building
28 - Stormwater Detention Pond
29 - Mill Septic System Area
30 - Old Crusher Building
31- Secondary and Tertiary Crushing Building
32 - Transfer Building
33 - Mill Services Building
34 - Concentrate Building
35 -Concentrate Load-Out Building
36 - Uppco Substation
37 - Security Building
38 - Humboldt Tailings Disposal Facility
39 - Water Treatment Plant (WTP)
40 - WTP Intake Buildings and Reagent Storage
41 - Reclaim Water Tank
42 - Fire Water Tank
43 - Thickeners
44 - Transfer Building
45 - Shore Vault
46 - River Intake Building
47 - Water Treatment Outfall #1
48 - Water Treatment Outfall #3
49 - Water Treatment Outfall #4
50 - COSA Diesel Fuel Storage
0 0.03 0.05 0.1 Miles
47N 29W 11
KMW-5R
MW-706QAL
MW-9R
MW-707QAL
24
25
26
27
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45
50


Humboldt Mill
Buildings and Features

N

- Public Land Survey Sections
- Humboldt Mill Buildings and Features
- Roads
- Rail
- Culvert
- Stormwater Drain
- Topographic Contours
- Monitoring Well Locations
- Catch Basin

24 - Mini - Pit
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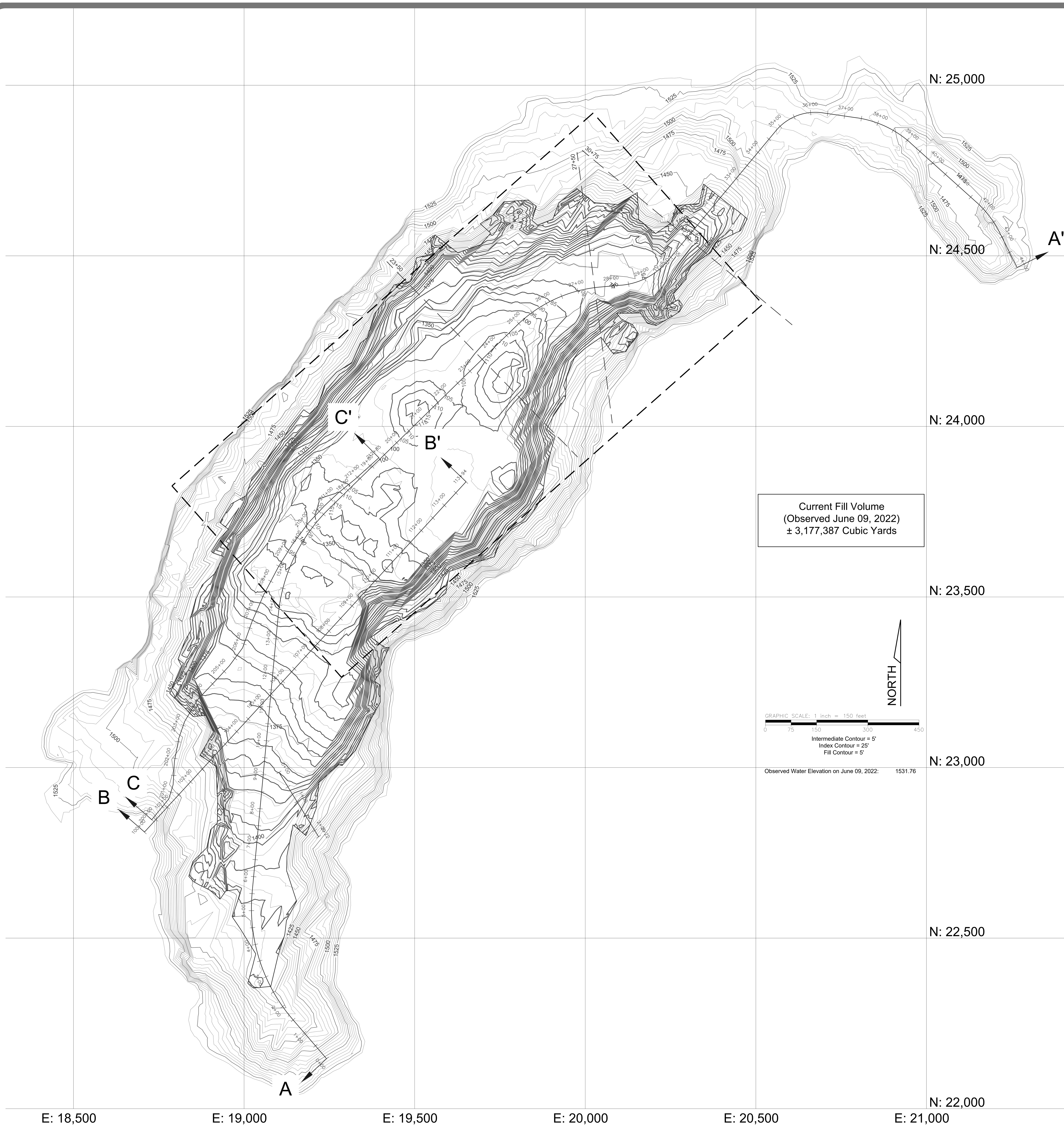
50 - COSA Diesel Fuel Storage

0 0.05 0.1 0.2 Miles

# Appendix B

# Humboldt Mill

# Bathymetry Maps



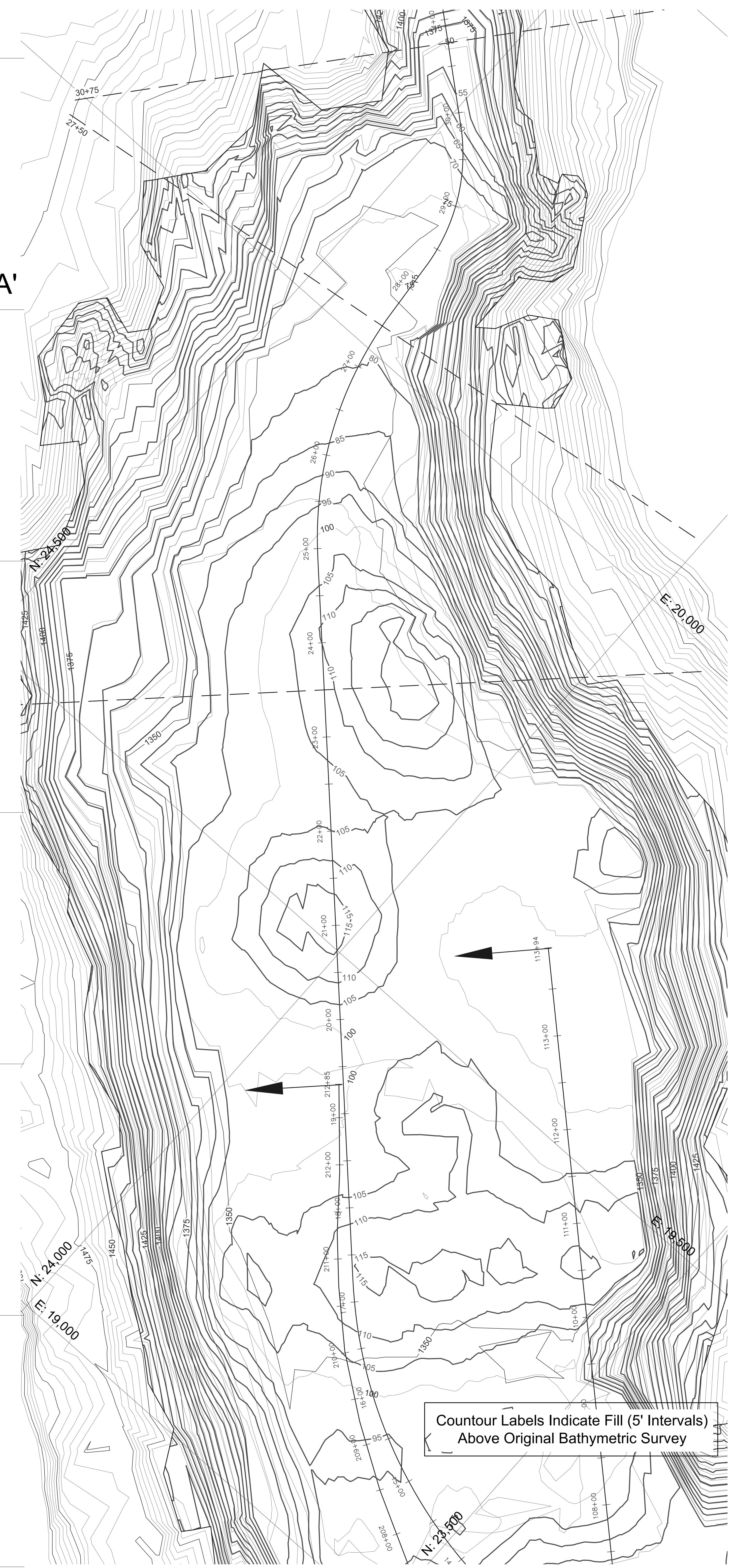

Current Fill Volume
(Observed June 09, 2022)
± 3,177,387 Cubic Yards

GRAPHIC SCALE: 1 inch = 150 feet

0 75 150 300 450

Intermediate Contour = 5'
Index Contour = 25'
Fill Contour = 5'

Observed Water Elevation on June 09, 2022: 1531.76




Countour Labels Indicate Fill (5' Intervals)
Above Original Bathymetric Survey

GRAPHIC SCALE: 1 inch = 80 feet

0 40 80 160 240

TRIMEDIA
ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
June 09, 2022 Bathymetric Survey
Champion, MI

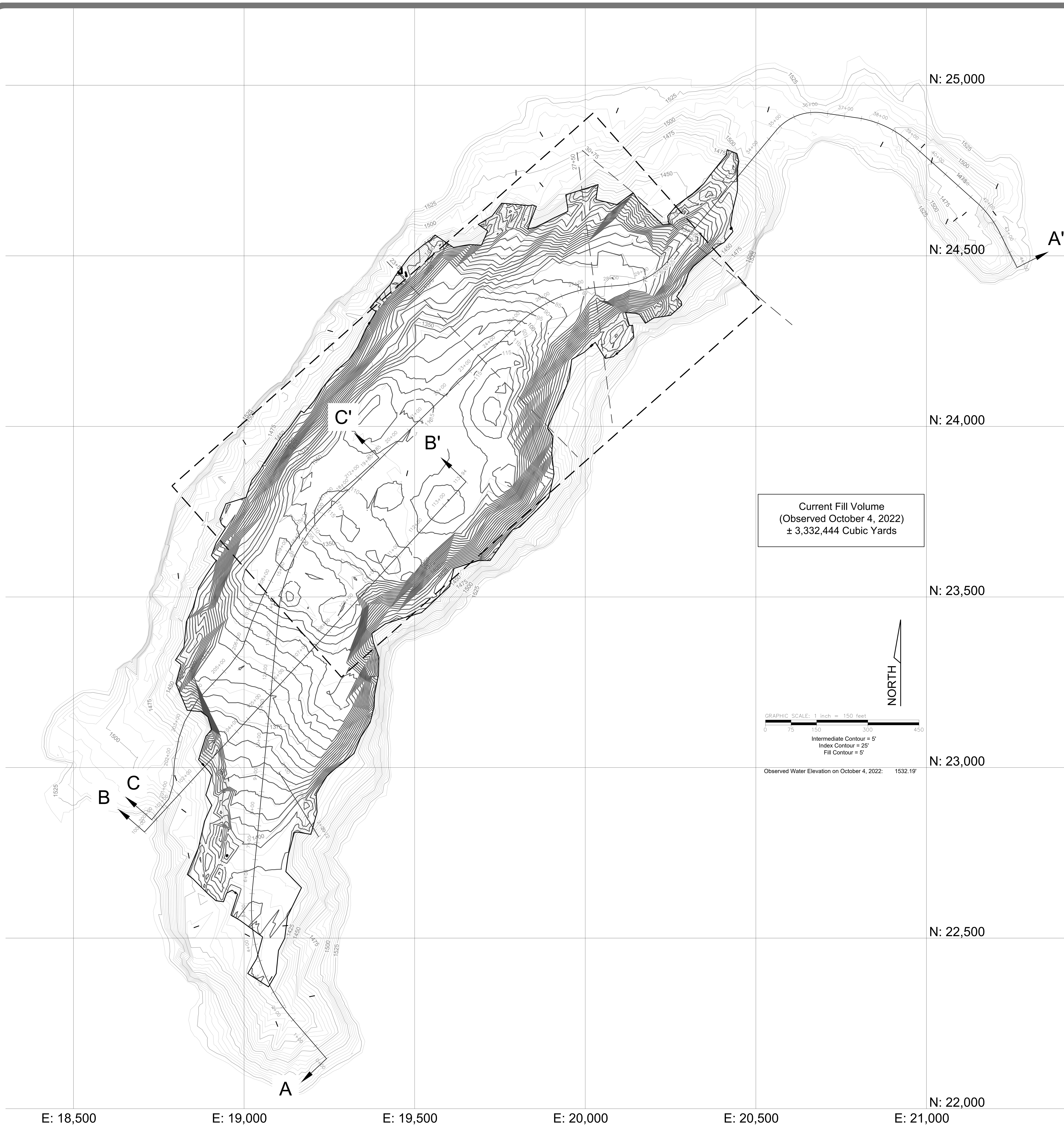
| DATE | DESCRIPTION | ISSUED |
| --- | --- | --- |
| 06/09/22 | Client Review | |

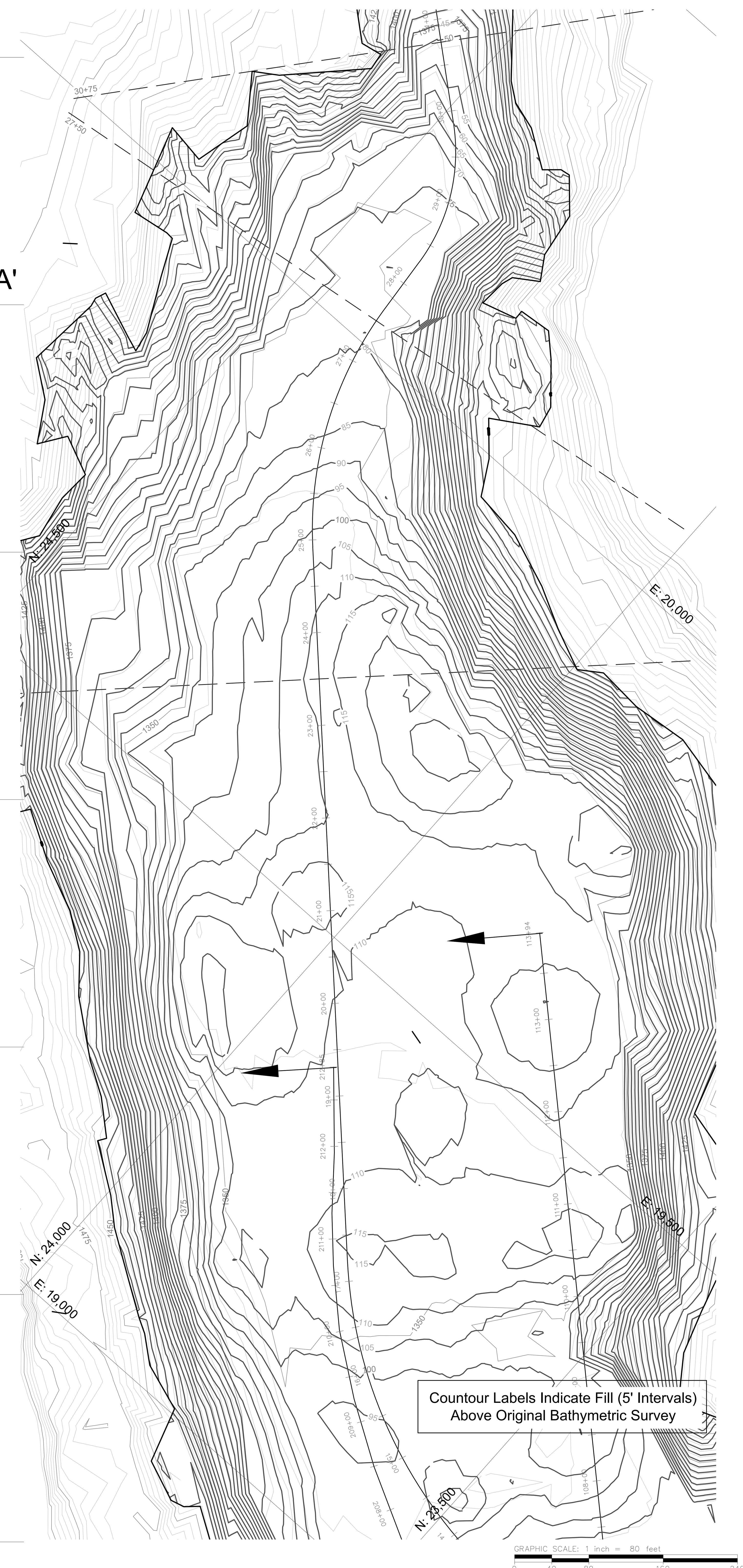
DESIGNED:
DRAWN: MLC
CHECKED: GWM
APPROVED: GWM

TRIMEDIA
JOB NUMBER:
2014-100

SHEET TITLE:
Tailings Basin
Product Fill Map

SHEET NUMBER:
1.0




TRIMEDIA
ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
October 4, 2022 Bathymetric Survey
Champion, MI

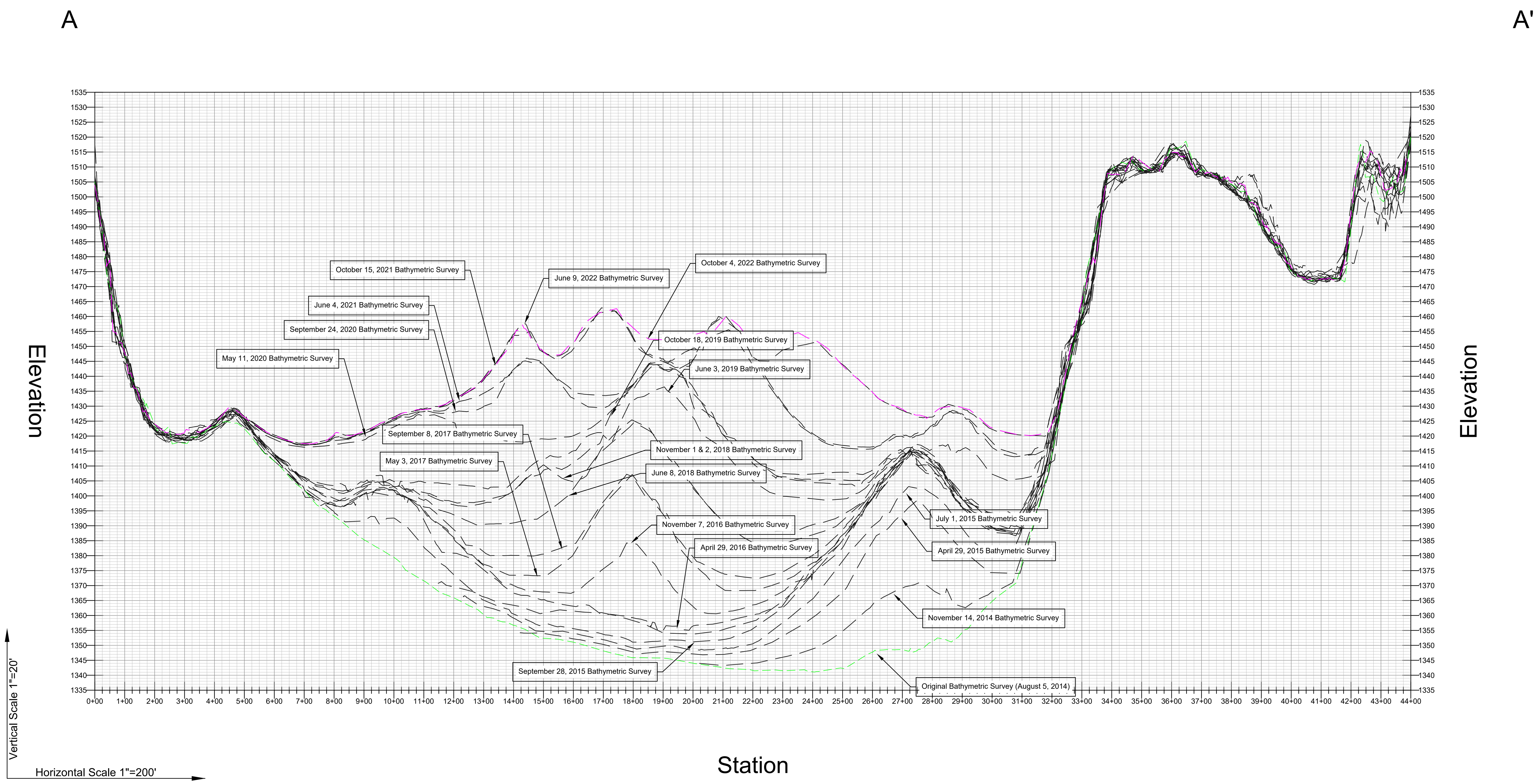
| DATE | DESCRIPTION | ISSUED |
|---|---|---|
| 10/18/22 | Client Review | |

DESIGNED:
DRAWN: MLC
CHECKED: GWM
APPROVED: GWM

TRIMEDIA
JOB NUMBER:
2014-100

SHEET TITLE:
Tailings Basin
Product Fill Map

SHEET NUMBER:
1.0




TRIMEDIA ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
October 4, 2022 Bathymetric Survey
Champion, MI

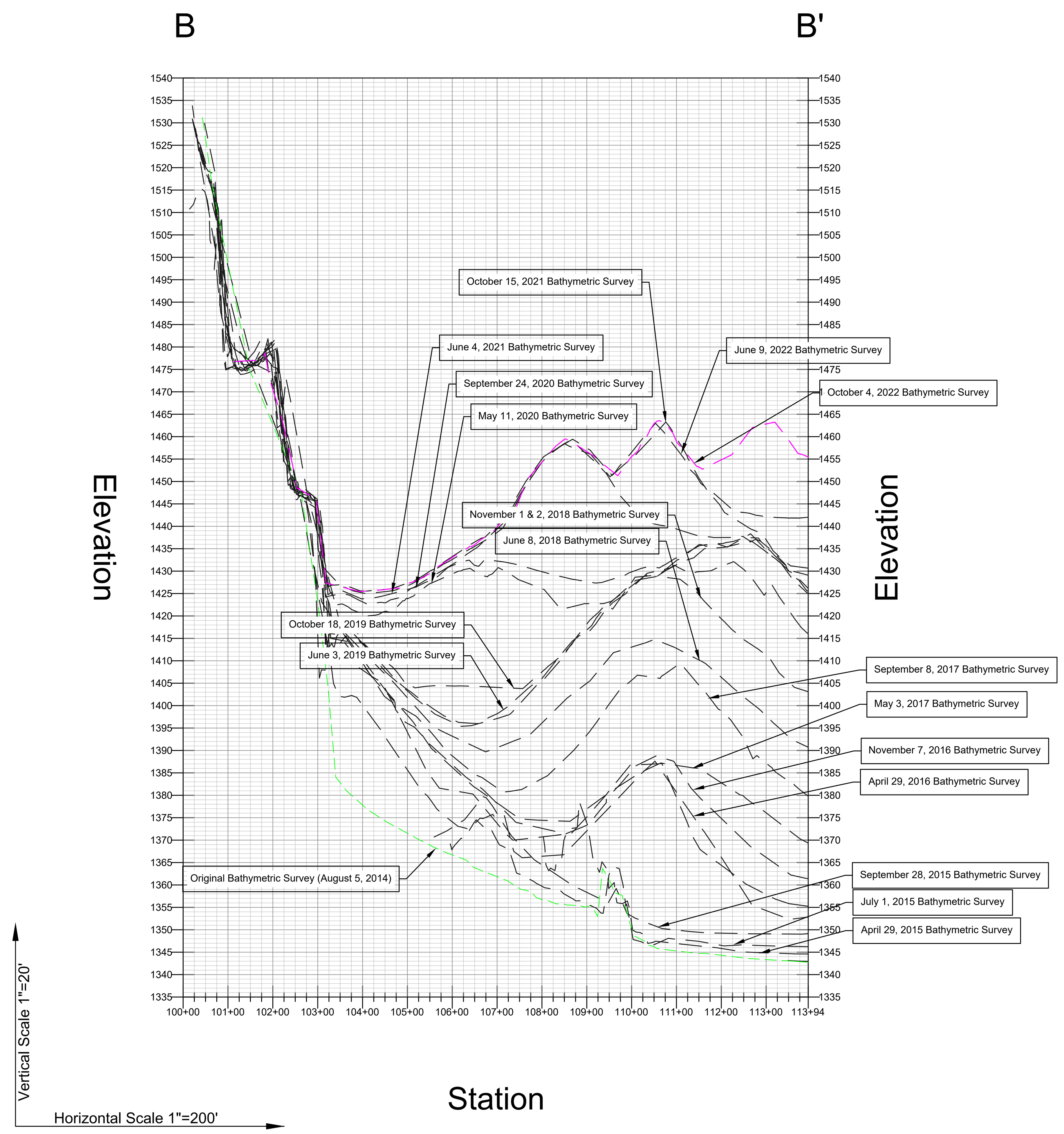
| DATE | DESCRIPTION | ISSUED |
|---|---|---|

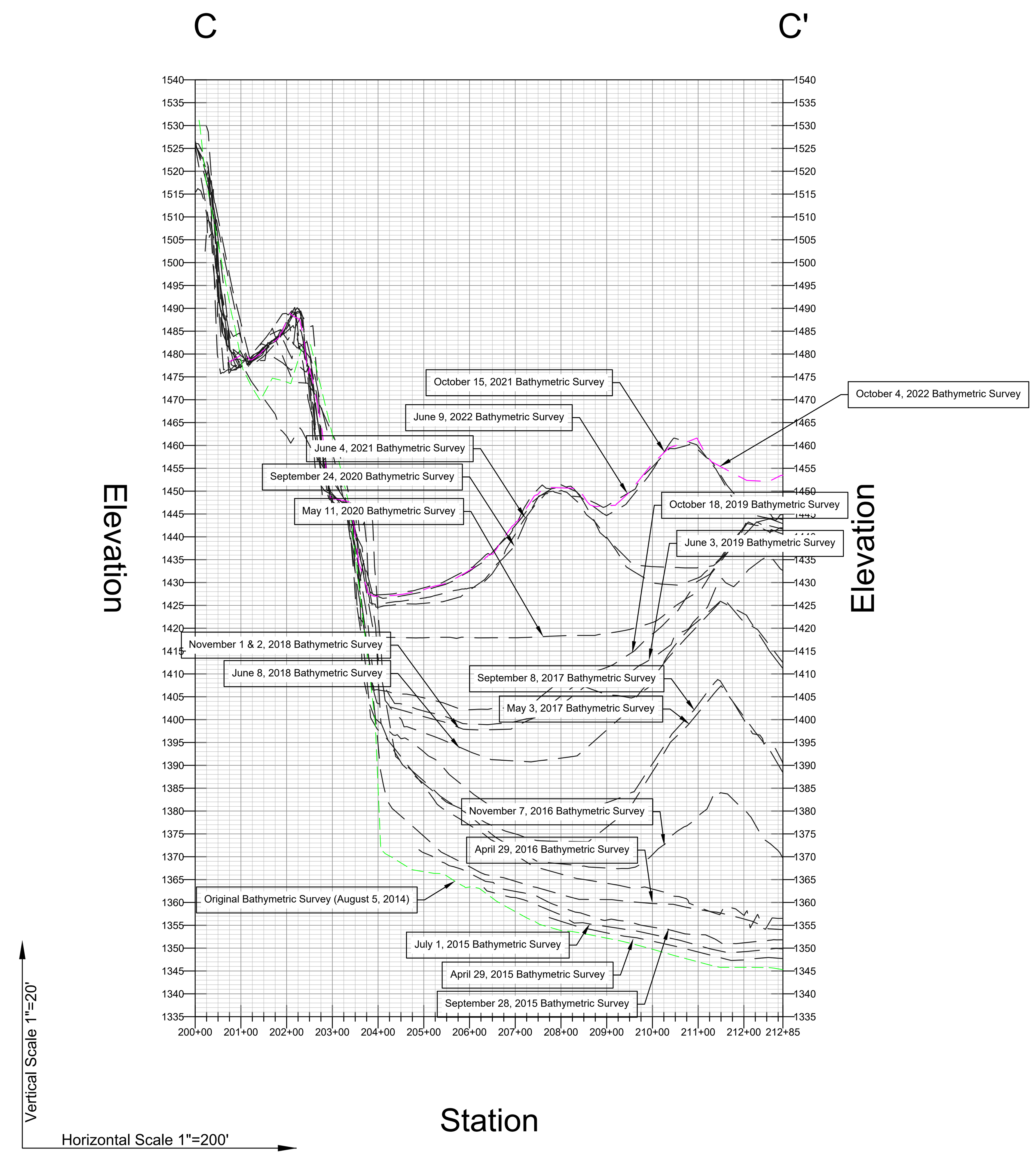
DESIGNED:
DRAWN: MLC
CHECKED: GWM
APPROVED: GWM

TRIMEDIA JOB NUMBER: 2014-100

SHEET TITLE: Tailings Basin 2022 Profile (Cross Section A)

SHEET NUMBER: 2.0




TRIMEDIA
ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
October 4, 2022 Bathymetric Survey
Champion, MI

ISSUED | DESCRIPTION | DATE

DESIGNED:
DRAWN: MLC
CHECKED: GWM
APPROVED: GWM

TRIMEDIA JOB NUMBER:
2014-100

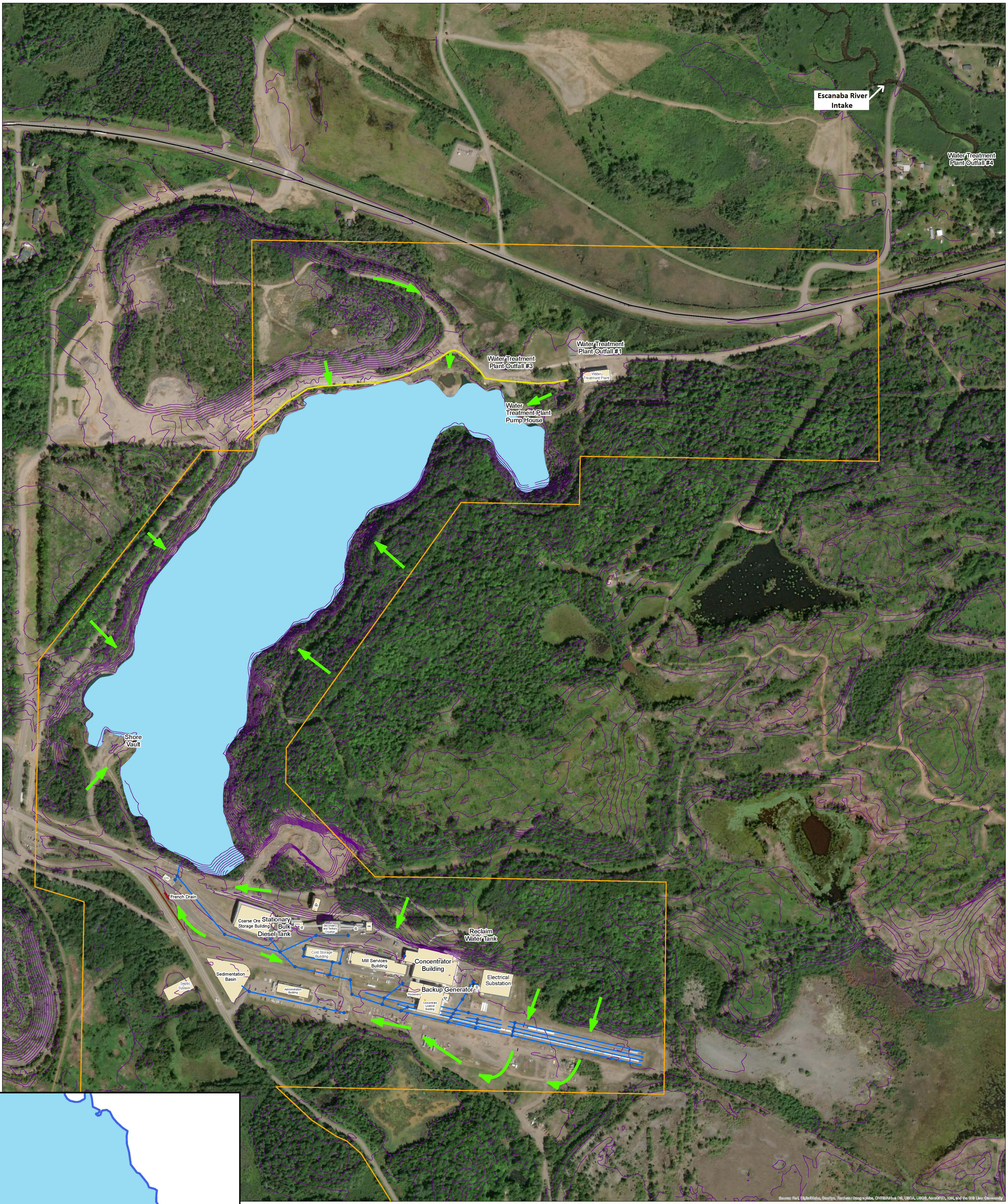
SHEET TITLE:
Tailings Basin 2022 Profiles (Cross Section B & C)

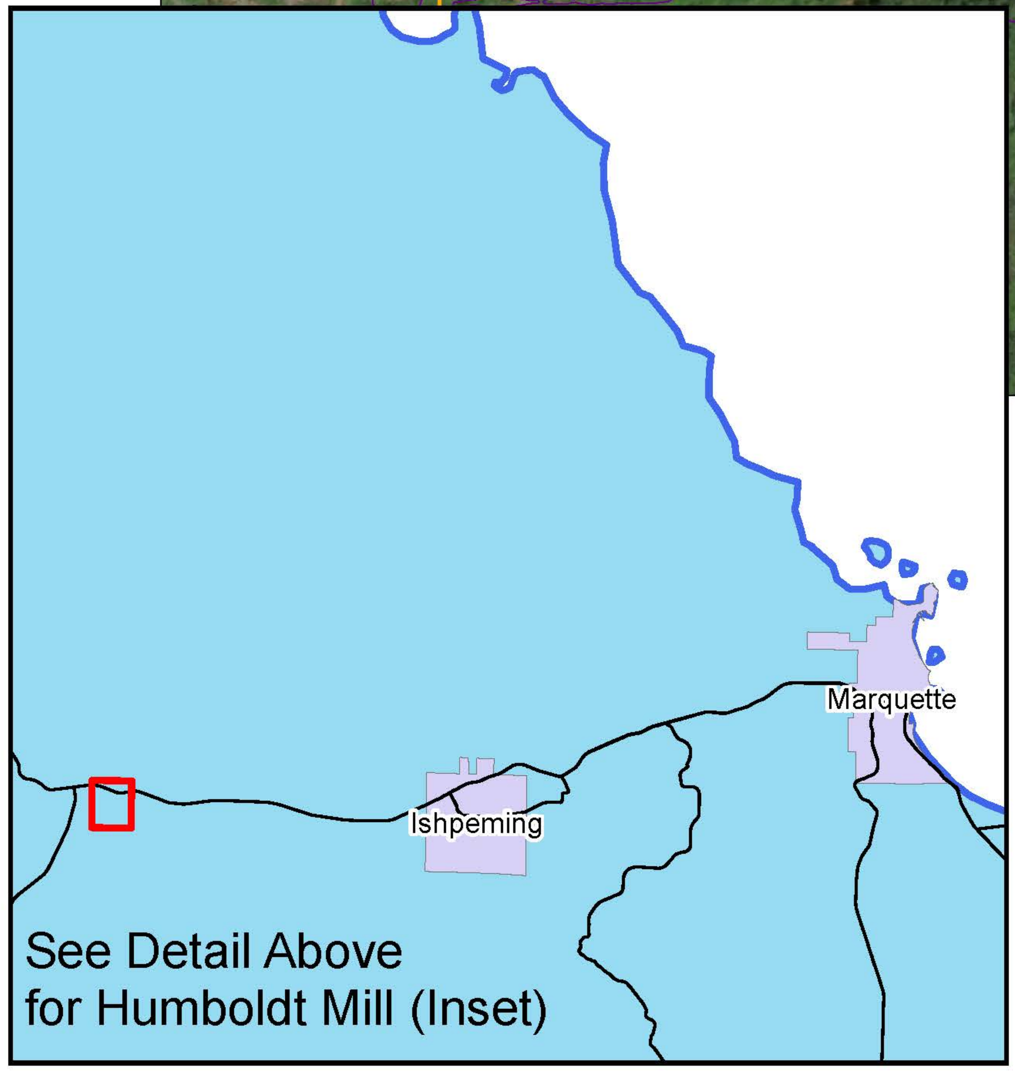
SHEET NUMBER:
3.0

# Appendix C

# Humboldt Mill

# Storm Water Drainage Map




0 0.05 0.1 0.2 0.3 0.4 Miles

**Legend**

| | |
|---|---|
| Cut Off Wall | Contours 10ft |
| Eagle Mine Property Boundary | Humboldt Facilities |
| Catch Basins | Humboldt Tailings Disposal Facility |
| Berm | Main Roads |
| Stormwater Conduit | |
| Surface Water Flow | |

# Humboldt Mill Site Map

Figure 1

| | |
|---|---|
| Edited on November 2, 2018<br>Created on October 9, 2015 | Locations and Coordinates based on UTM Zone 16N NAD83 |

Eagle Mine
a subsidiary of lundin mining

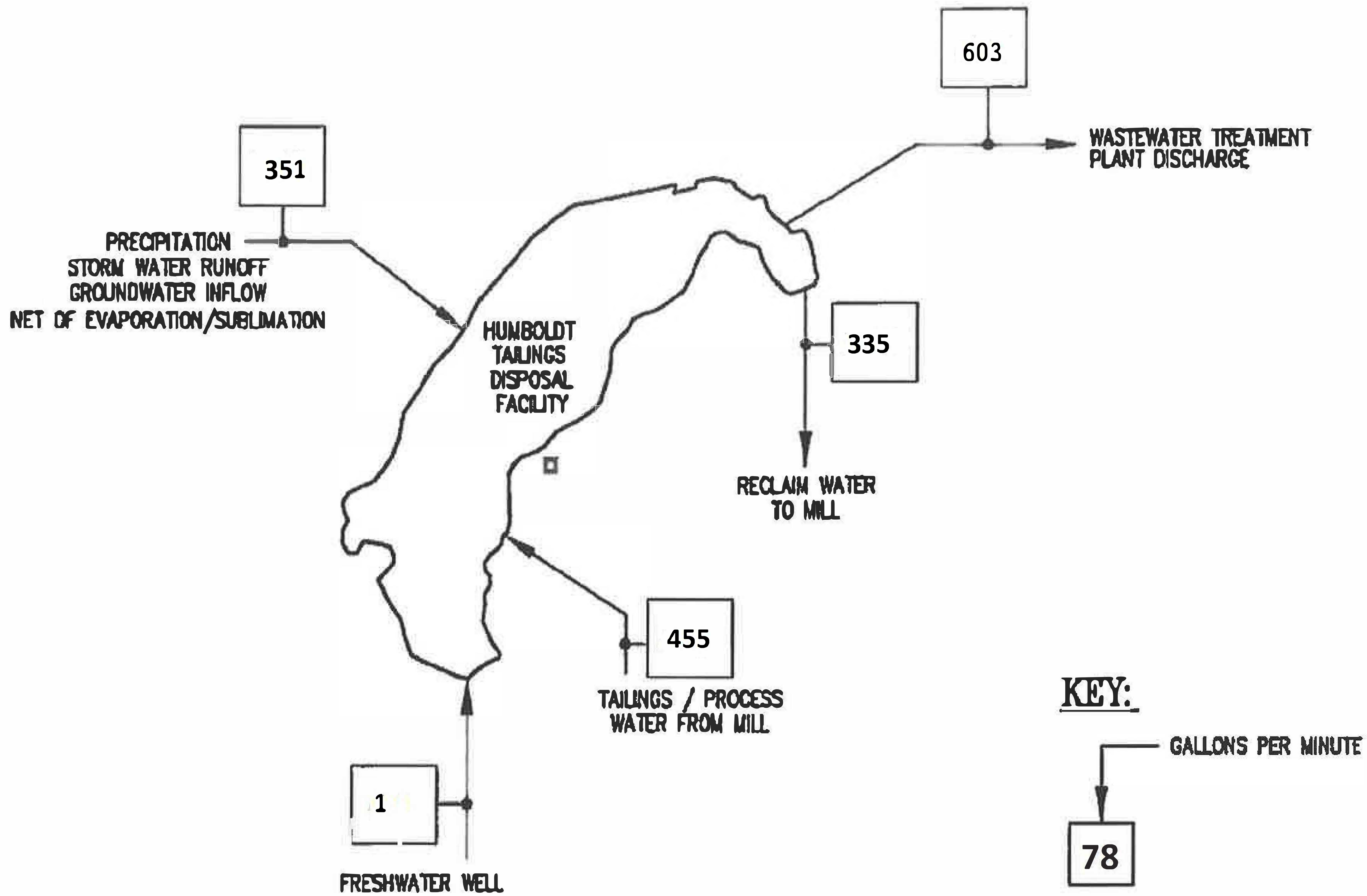
Author: JRE

# Appendix D

# Humboldt Mill

2022

# Water Balance Diagrams



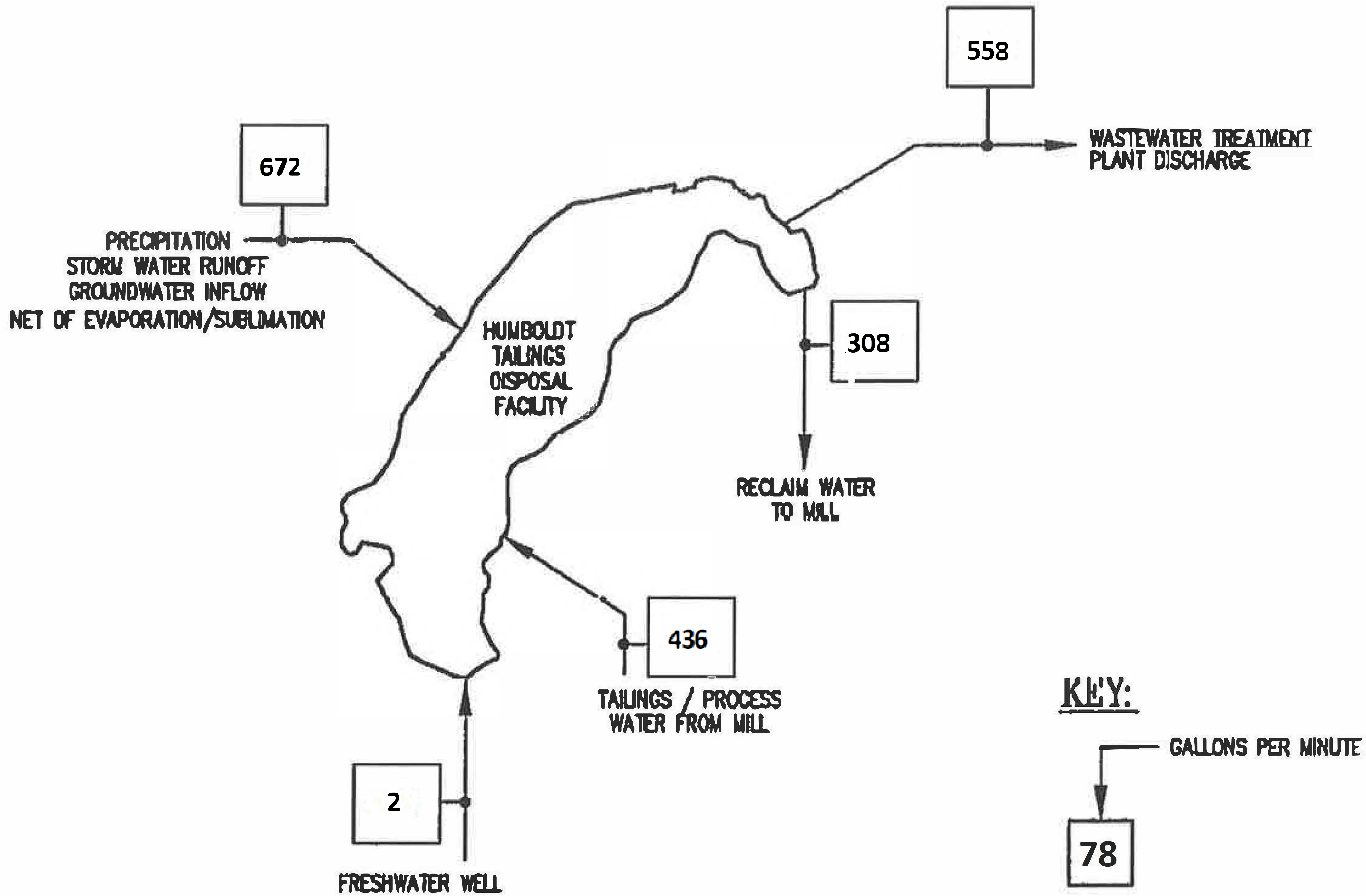

PROJECT NUMBER: KEX–0102

**Eagle Mine, LLC - Humboldt Mill Facility**
Humboldt Township, Marquette County, Michigan

WATER BALANCE

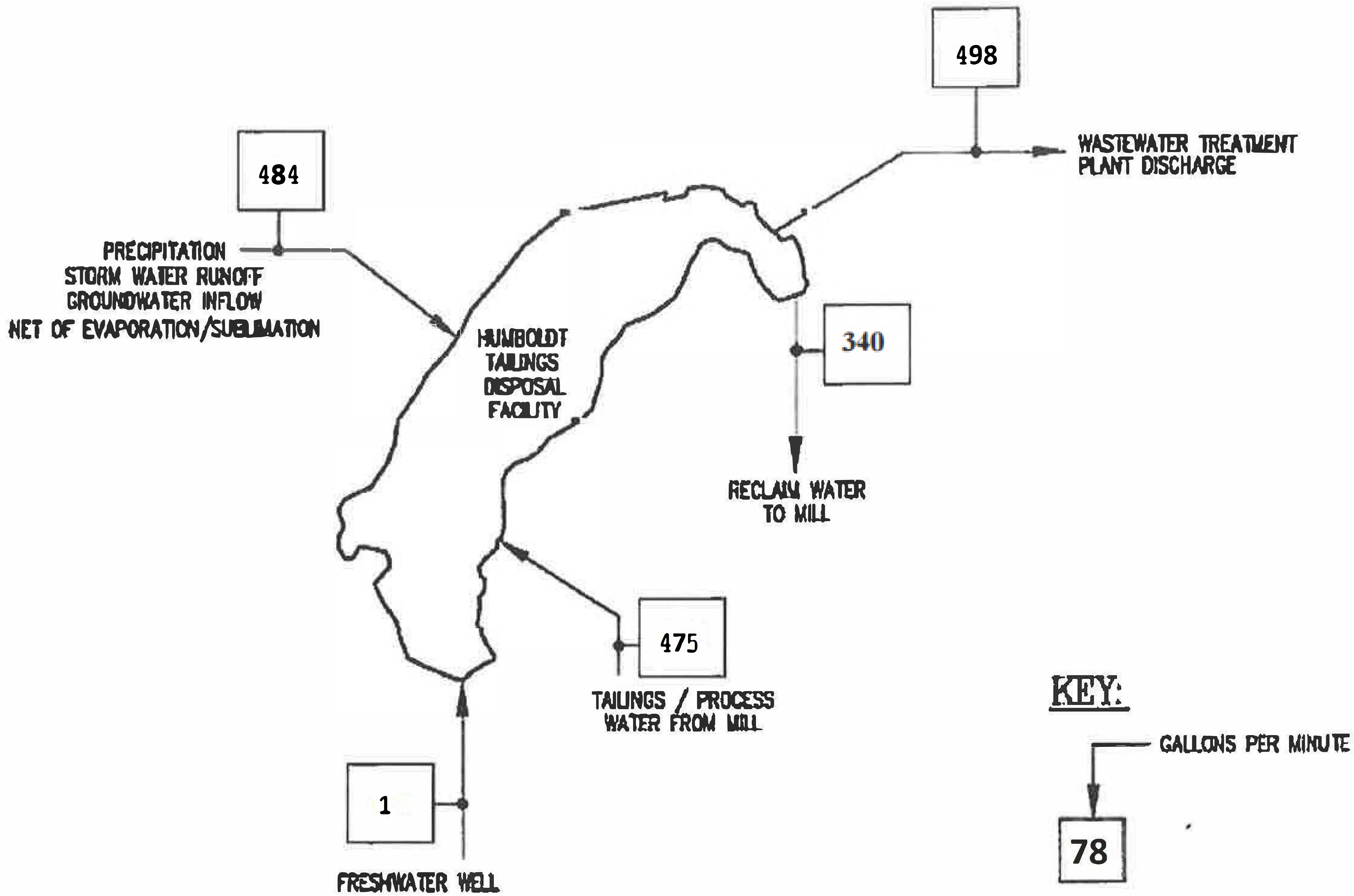
HUMBOLDT TAILINGS DISPOSAL FACILTY
(January 1st - March 31, 2022)

FIGURE: 1




Tailings total includes the dry tailings volume. As such, this diagram illustrates a volume balance rather than a pure water balance.

| | |
|---|---|
| | PROJECT NUMBER: KEX–0102 |
| Eagle Mine, LLC - Humboldt Mill Facility<br>Humboldt Township, Marquette County, Michigan | FIGURE: |
| WATER BALANCE<br>HUMBOLDT TAILINGS DISPOSAL FACILTY<br>(April 1 - June 30, 2022) | 1 |

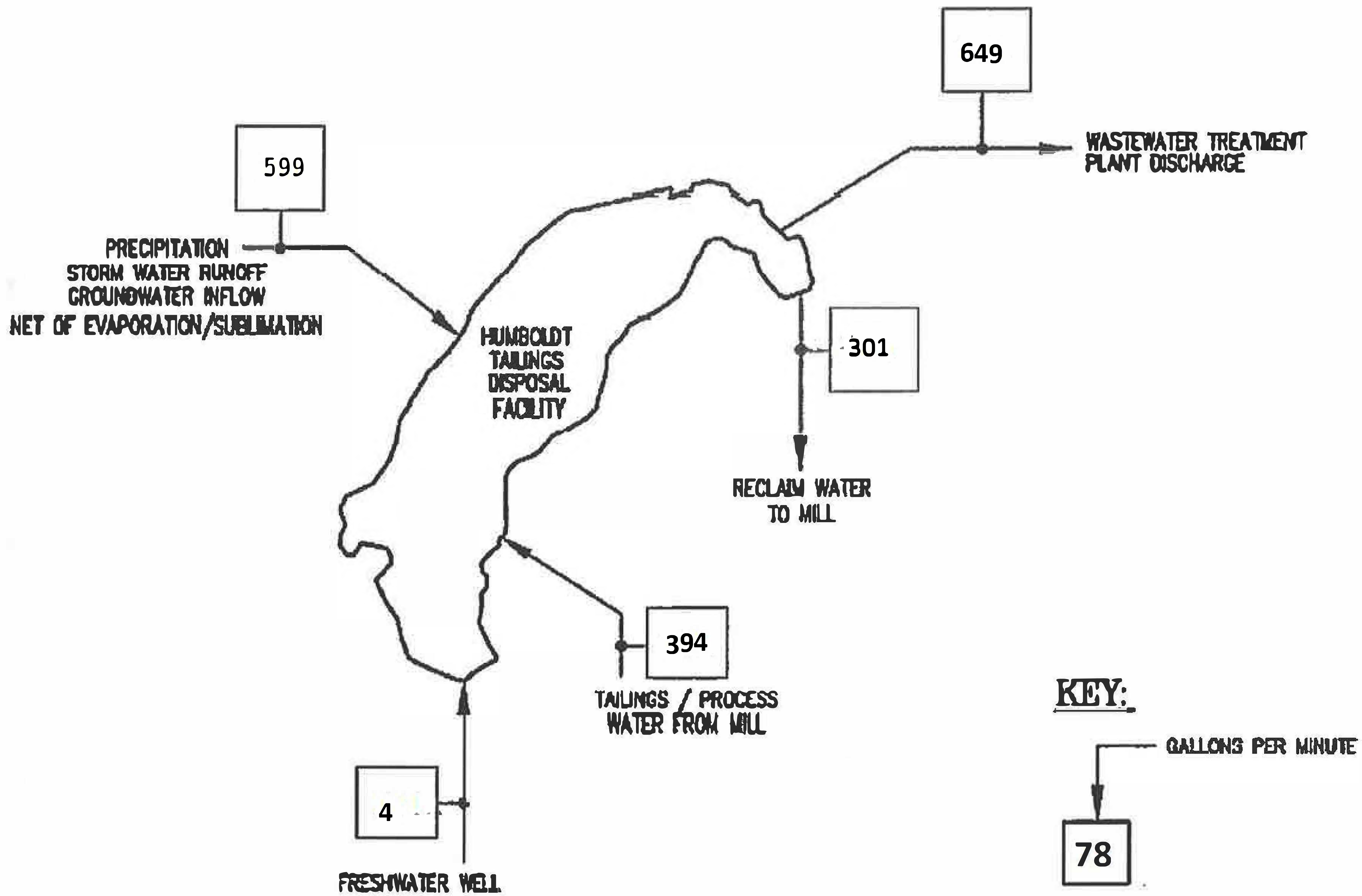



PROJECT NUMBER: KEx-0102

Eagle Mine, LLC - Humboldt Mill Facility
Humboldt Township, Marquette County, Michigan

WATER BALANCE
HUMBOLDT TAILINGS DISPOSAL FACILTY
(July 1 - September 30, 2022 )

FIGURE: 1




| | |
|---|---|
| Eagle Mine, LLC - Humboldt Mill Facility<br>Humboldt Township, Marquette County, Michigan | PROJECT NUMBER:<br>KEX-0102 |
| WATER BALANCE<br>HUMBOLDT TAILINGS DISPOSAL FACILTY<br>(October 1 - December 31, 2022) | FIGURE:<br>1 |

# Appendix E

# Humboldt Mill

# Groundwater Map


**CUT-OFF WALL
MONITORING WELL NETWORK
LOCATIONS**

**Legend**

- Monitoring Well
- Leachate Monitoring Well per R425.406(5)(a)
- Compliance Monitoring Well per R425.406(5)(b)
- Containment Wall
- Estimated Limit of Aquifer
- Flow Divide
- Highway
- Bedrock Outcrop

Reference

Data provided by: Eagle Mine and North Jackson Company
Projection & Datum: UTM NAD 83 Zone 16N
Aerial Photo: 2006

0 200 400 Feet

**1:3,500**

Eagle Mine
A subsidiary of lundin mining

North Jackson Company
ENVIRONMENTAL SCIENCE & ENGINEERING


Path: C:\Users\CStacey\Documents\Eagle\1401484 Eagle Mill Monitoring\GIS\Eagle Mill MW Location Map Portrait.mxd

**LEGEND**

New Compliance Monitoring Wells

**NOTES**

1. SCALE OF AERIAL IMAGERY IS APPROXIMATE.
2. THIS FIGURE HAS BEEN TRANSLATED AND SCALED TO THE HORIZONTAL DATUM NAD83 MICHIGAN STATE PLANE COORDINATE SYSTEM.
3. FOR REFERENCE PURPOSES ONLY. NOT TO BE USED FOR REPORTING.

**REFERENCE**

1. BASE MAP TAKEN FROM GOOGLE EARTH, 2014

CLIENT
EAGLE MINE
HUMBOLDT MILL

PROJECT
GROUNDWATER MONTIORING

TITLE
**EAGLE MINE HUMBOLDT MILL**
**COMPLIANCE MONITORING LOCATIONS**

DRAFT

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2014-08-14 |
| PREPARED | CJS |
| DESIGN | CJS |
| REVIEW | MAC |
| APPROVED | GJD |

PROJECT 1401484 | Rev. 0 | FIGURE 01

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1 in

# Appendix F

# Humboldt Mill

# Groundwater Monitoring Well Results

# &

# Benchmark Summary Table

**Humboldt Mill**
**2022 Mine Permit Groundwater Monitoring**
**Benchmark Comparison Summary**

| Location | Location Classification | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|---|
| HW-1L | Monitoring | iron | NM | sulfate | NM |
| HW-1U LLA | Monitoring | **chloride** | NM | ammonia | NM |
| HW-1U UFB | Monitoring | calcium | pH, manganese | **pH,** iron ,**manganese**, alkalinity bicarbonate, calcium, hardness | **pH, manganese, alkalinity bicarbonate, calcium** |
| HW-2 | Monitoring | | | | |
| HW-8U | Monitoring | pH, **iron,** manganese, **chloride**, **calcium**, **potassium**, **sodium**, hardness | iron, **manganese**, alkalinity bicarbonate, chloride, calcium, **potassium, sodium,** | iron, **manganese, chloride**, calcium, **potassium**, **sodium**, hardness | iron, **chloride, calcium, potassium, sodium**, **hardness** |
| HYG-1 | Monitoring | **manganese** | **manganese,** mercury | **antimony, manganese, ammonia,** nitrate | **manganese, ammonia** |
| KMW-5R | Monitoring | **sodium** | pH, **sodium** | **pH, aluminum, sodium** | **sodium** |
| MW-701 QAL | Monitoring | **chloride,** nitrate, **sulfate, sodium** | pH, **chloride, nitrate, sulfate, sodium** | mercury, alkalinity bicarbonate, **chloride, nitrate**, **sulfate, sodium** | **alkalinity bicarbonate, chloride, nitrate, sulfate, sodium** |
| MW-701 UFB | Monitoring | **iron, chloride, sulfate, calcium, magnesium, sodium, hardness** | **iron,** alkalinity bicarbonate, **chloride, sulfate, calcium, magnesium, sodium, hardness** | **iron, chloride, sulfate, calcium, magnesium, hardness** | **sulfate, calcium, magnesium, hardness** |
| MW-702 QAL | Monitoring | **mercury** | pH, **mercury** | **pH, mercury** | **mercury** |
| MW-702 UFB | Monitoring | | | | |
| MW-703 QAL | Monitoring | **pH, nitrate,** sulfate | **pH, nitrate** | **pH, nitrate** | **pH, nitrate** |
| MW-703 UFB | Monitoring | sulfate | | sulfate | |
| MW-703 LLA | Monitoring | sulfate | | | |
| MW-703-DBA | Monitoring | sulfate | pH | alkalinity bicarbonate, calcium | |
| MW-704 QAL | Monitoring | | **chloride, ammonia** | **chloride** | |
| MW-704 UFB | Monitoring | **chloride,** sulfide | **chloride** | **chloride** | **chloride** |
| MW-704 LLA | Monitoring | **pH, manganese, alkalinity bicarbonate, chloride, calcium, magnesium, hardness** | **pH,** iron**, manganese, alkalinity bicarbonate, chloride, calcium, magnesium, hardness** | **pH, iron**, **manganese, chloride, calcium, magnesium, hardness** | **pH, iron**, **manganese, alkalinity bicarbonate, chloride, calcium, magnesium, hardness** |
| MW-704 DBA | Monitoring | | alkalinity bicarbonate | manganese, hardness | alkalinity bicarbonate |
| MW-705 QAL | Monitoring | **ammonia,** sulfate, **sodium** | **chloride, ammonia, sodium** | **chloride, ammonia, sodium** | **chloride, ammonia, sodium** |
| MW-705 UFB | Monitoring | iron, **manganese, chloride, calcium, magnesium, potassium**, **sodium, hardness** | **manganese,** alkalinity bicarbonate, **chloride, calcium, magnesium, sodium, hardness** | **manganese, chloride, calcium, magnesium, sodium**, **hardness** | **manganese**, **chloride, calcium, magnesium, sodium, hardness** |
| MW-706 QAL | Monitoring | | **pH** | **pH** | |
| MW-707 QAL | Monitoring | | | alkalinity bicarbonate | ammonia |
| MW-9R | Monitoring | pH, copper, iron, manganese, nickel, zinc, sulfate, calcium, magnesium, potassium, hardness | | **zinc** | |

Parameters listed in this table had values reported that were equal to or greater than a site-specific benchmark. Parameters in **BOLD** are instances in which the Department was notified because benchmark deviations were identified at compliance monitoring locations for two consecutive quarters. N/A means there were no parameters outside of benchmark values for that quarter. If the location is classified as background, Department notification is not required for an exceedance.

Blank data cells indicate that no benchmark deviations occurred at the location during the specified sampling quarter.

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-1L (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.96** | NM | **0.59** | NM |
| ORP | mV | - | -304 | NM | -254 | NM |
| pH | SU | 8.14-9.14 | **8.2** | NM | **8.3** | NM |
| Specific Conductance | uS/cm | - | **381** | NM | **310** | NM |
| Temperature | C | - | **7.7** | NM | **9.9** | NM |
| Turbidity | NTU | - | **2.3** | NM | **13** | NM |
| Water Elevation | ft MSL | - | **1444.67** | **1444.74** | **1444.70** | **1507.42** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | **-** | NM | < 50.0 | NM |
| Antimony | ug/L | 4.0 | **-** | NM | < 2.0 | NM |
| Arsenic | ug/L | 7.5 | < 5.0 | NM | < 5.0 | NM |
| Barium | ug/L | 400 | **-** | NM | < 100 | NM |
| Beryllium | ug/L | 2.5 | **-** | NM | < 1.0 | NM |
| Boron | ug/L | 745 | **-** | NM | **610** | NM |
| Cadmium | ug/L | 3.0 | **-** | NM | < 1.0 | NM |
| Chromium | ug/L | 40 | - | NM | < 10.0 | NM |
| Cobalt | ug/L | 80 | - | NM | < 20.0 | NM |
| Copper | ug/L | 16 | < 4.0 | NM | < 4.0 | NM |
| Iron | ug/L | 1187 | **1230** | NM | **854** | NM |
| Lead | ug/L | 9.0 | < 3.0 | NM | < 3.0 | NM |
| Lithium | ug/L | 23.0 | - | NM | **21** | NM |
| Manganese | ug/L | 200 | **60** | NM | < 50.0 | NM |
| Mercury | ng/L | 4.0 | < 1.0 | NM | < 1.0 | NM |
| Molybdenum | ug/L | 200 | - | NM | < 50.0 | NM |
| Nickel | ug/L | 80 | < 20.0 | NM | < 20.0 | NM |
| Selenium | ug/L | 20 | **-** | NM | < 5.0 | NM |
| Silver | ug/L | 0.8 | **-** | NM | < 0.20 | NM |
| Thallium | ug/L | 2.0 | **-** | NM | < 2.0 | NM |
| Vanadium | ug/L | - | - | NM | - | NM |
| Zinc | ug/L | 40 | < 10.0 | NM | < 10.0 | NM |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 109.1 | **84** | NM | **92** | NM |
| Alkalinity, Carbonate | mg/L | 7.8 | < 2.0 | NM | **1.5** | NM |
| Chloride | mg/L | 57.2 | **44** | NM | **42** | NM |
| Fluoride | mg/L | 2.5 | < 1.0 | NM | < 1.0 | NM |
| Nitrogen, Ammonia | mg/L | 0.1 | <0.025 | NM | <0.025 | NM |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.1 | NM | <0.1 | NM |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.1 | NM | <0.1 | NM |
| Sulfate | mg/L | 33 | **32** | NM | **35** | NM |
| Sulfide | mg/L | 0.8 | < 0.20 | NM | < 0.20 | NM |
| Major Cations | | | | | | |
| Calcium | mg/L | 34 | **28** | NM | **29** | NM |
| Magnesium | mg/L | 15 | **11** | NM | **12** | NM |
| Potassium | mg/L | 6 | < 2.3 | NM | **1.8** | NM |
| Sodium | mg/L | 28 | **24** | NM | **23** | NM |
| General | | | | | | |
| Hardness | mg/L | 156 | **117** | NM | **120** | NM |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-1U LLA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[T] | Q3 2022[T] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.99** | NM | **0.61** | NM |
| ORP | mV | - | -304 | NM | -261 | NM |
| pH | SU | 8.06-9.06 | **8.2** | NM | **8.2** | NM |
| Specific Conductance | uS/cm | - | **577** | NM | **396** | NM |
| Temperature | C | - | **6.1** | NM | **10** | NM |
| Turbidity | NTU | - | **12** | NM | **11** | NM |
| Water Elevation | ft MSL | - | **1472.82** | **1471.50** | **1472.89** | **1472.18** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | NM | <50.0 | NM |
| Antimony | ug/L | 4.0 | - | NM | <2.0 | NM |
| Arsenic | ug/L | 9.6 | <5.0 | NM | <5.0 | NM |
| Barium | ug/L | 400 | - | NM | <100 | NM |
| Beryllium | ug/L | 2.5 | - | NM | <1.0 | NM |
| Boron | ug/L | 1200 | - | NM | <300 | NM |
| Cadmium | ug/L | 3.0 | - | NM | <1.0 | NM |
| Chromium | ug/L | 40 | - | NM | <10.0 | NM |
| Cobalt | ug/L | 80 | - | NM | <20.0 | NM |
| Copper | ug/L | 8.6 | <4.0 | NM | <4.0 | NM |
| Iron | ug/L | 56770 | **845** | NM | **834** | NM |
| Lead | ug/L | 15.0 | <3.0 | NM | <3.0 | NM |
| Lithium | ug/L | 17.4 | - | NM | **13** | NM |
| Manganese | ug/L | 673 | **62** | NM | **56** | NM |
| Mercury | ng/L | 14.2 | < 1.0 | NM | < 1.0 | NM |
| Molybdenum | ug/L | 200 | | NM | < 50.0 | NM |
| Nickel | ug/L | 80 | < 20.0 | NM | < 20.0 | NM |
| Selenium | ug/L | 20 | - | NM | <5.0 | NM |
| Silver | ug/L | 0.80 | - | NM | <0.20 | NM |
| Thallium | ug/L | 2.0 | - | NM | <2.0 | NM |
| Vanadium | ug/L | - | - | NM | - | NM |
| Zinc | ug/L | 44.2 | <10.0 | NM | <10.0 | NM |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 157 | **101** | NM | **120** | NM |
| Alkalinity, Carbonate | mg/L | 64.2 | < 2.0 | NM | **2.0** | NM |
| Chloride | mg/L | 61 | **65** | NM | **44** | NM |
| Fluoride | mg/L | 2.5 | <1.0 | NM | <1.0 | NM |
| Nitrogen, Ammonia | mg/L | 0.30 | **0.12** | NM | **0.44** | NM |
| Nitrogen, Nitrate | mg/L | 0.57 | <0.1 | NM | <0.1 | NM |
| Nitrogen, Nitrite | mg/L | 0.78 | <0.1 | NM | <0.1 | NM |
| Sulfate | mg/L | 395 | **67** | NM | **66** | NM |
| Sulfide | mg/L | 0.80 | < 0.20 | NM | <0.20 | NM |
| Major Cations | | | | | | |
| Calcium | mg/L | 61 | **38** | NM | **41** | NM |
| Magnesium | mg/L | 26 | **12** | NM | **14** | NM |
| Potassium | mg/L | 16.9 | **4.1** | NM | **3.6** | NM |
| Sodium | mg/L | 134 | **49** | NM | **29** | NM |
| General | | | | | | |
| Hardness | mg/L | 171 | **143** | NM | **159** | NM |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-1U UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.87** | **0.34** | **0.02** | **0.16** |
| ORP | mV | - | -391 | -317 | -316 | -341 |
| pH | SU | 8.4-9.4 | **8.4** | **8.0** | **8.1** | **8.3** |
| Specific Conductance | uS/cm | - | **489** | **221** | **309** | **216** |
| Temperature | C | - | **7.1** | **8.2** | **9.3** | **8.2** |
| Turbidity | NTU | - | **4.1** | **25** | **17** | **15** |
| Water Elevation | ft MSL | - | **1533.94** | **1535.38** | **1535.28** | **1535.16** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 9.3 | < 5.0 | < 5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 1364 | **902** | **1250** | **3960** | **2550** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 16.7 | - | - | <10.0 | - |
| Manganese | ug/L | 80 | **67** | **94** | **135** | **85** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 122 | **101** | **110** | **170** | **136** |
| Alkalinity, Carbonate | mg/L | 17.1 | **4.6** | < 2.0 | **3.3** | **1.7** |
| Chloride | mg/L | 96 | **78** | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.10 | **0.06** | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 72.3 | **21** | **1.1** | < 1.0 | **4.2** |
| Sulfide | mg/L | 2.47 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 34 | **34** | **30** | **48** | **41** |
| Magnesium | mg/L | 15.6 | **8.2** | **6.4** | **8.4** | **5.6** |
| Potassium | mg/L | 20.9 | **5.4** | **3.7** | **4.5** | **4.7** |
| Sodium | mg/L | 68 | **43** | **7.6** | **7.0** | **5.8** |
| General | | | | | | |
| Hardness | mg/L | 147 | **119** | **102** | **153** | **126** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-2 (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.30** | **0.50** | **0.61** | **0.20** |
| ORP | mV | - | -221 | -211 | -225 | -234 |
| pH | SU | 7.29-8.29 | **8.2** | **7.7** | **7.8** | **8.1** |
| Specific Conductance | uS/cm | - | **275** | **262** | **214** | **202** |
| Temperature | C | - | **7.6** | **9.2** | **9.3** | **8.4** |
| Turbidity | NTU | - | **30** | **37** | **41** | **79** |
| Water Elevation | ft MSL | - | **1532.38** | **1533.75** | **1534.18** | **1533.77** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 2595 | **354** | **940** | **1040** | **823** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 333 | **159** | **211** | **176** | **154** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 141 | **95** | **101** | **110** | **97** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **2.2** | <2.0 |
| Chloride | mg/L | 35 | **13** | **12** | **13** | **12** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.08 | <0.03 | <0.03 | **0.03** | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 175 | **28** | **24** | **18** | **15** |
| Sulfide | mg/L | 0.52 | <0.20 | <0.20 | <0.20 | **0.22** |
| Major Cations | | | | | | |
| Calcium | mg/L | 72 | **23** | **23** | **24** | **23** |
| Magnesium | mg/L | 26 | **9** | **9** | **9** | **8.3** |
| Potassium | mg/L | 6 | **2.7** | **2.8** | **2.6** | **2.6** |
| Sodium | mg/L | 30 | **19** | **17** | **15** | **15** |
| General | | | | | | |
| Hardness | mg/L | 297 | **97** | **97** | **95** | **92** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-8U (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.3** | **0.70** | **0.94** | **0.16** |
| ORP | mV | - | -209 | -193 | 0 | -230 |
| pH | SU | 6.4-7.4 | **10.0** | **6.9** | **7.1** | **7.4** |
| Specific Conductance | uS/cm | - | **606** | **534** | **469** | **467** |
| Temperature | C | - | **7.6** | **9.1** | **9.7** | **8.8** |
| Turbidity | NTU | - | **4.3** | **3.0** | **3.0** | **0.93** |
| Water Elevation | ft MSL | - | **1532.63** | **1536.13** | **1534.56** | **1534.41** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 8.8 | **5.5** | <5.0 | **5.2** | **5.9** |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 22049 | **24600** | **25700** | **26300** | **25400** |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 14.4 | - | - | **11** | - |
| Manganese | ug/L | 6268 | **6770** | **6350** | **6470** | **6170** |
| Mercury | ng/L | 4 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.8 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 26.7 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 214 | **160** | **235** | **180** | **166** |
| Alkalinity, Carbonate | mg/L | 8 | <2.0 | <2.0 | **1.5** | <2.0 |
| Chloride | mg/L | 18 | **66** | **66** | **64** | **64** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.04 | **0.03** | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 12.3 | **3.9** | **2.0** | **1.8** | **2.7** |
| Sulfide | mg/L | 0.8 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 46 | **59** | **57** | **57** | **57** |
| Magnesium | mg/L | 19 | **15** | **15** | **15** | **15** |
| Potassium | mg/L | 3.6 | **4.6** | **4.7** | **4.6** | **4.7** |
| Sodium | mg/L | 4.3 | **9.7** | **10** | **9.6** | **9.7** |
| General | | | | | | |
| Hardness | mg/L | 203 | **210** | **205** | **206** | **206** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**HYG-1 (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.30** | **0.44** | **0.63** | **0.21** |
| ORP | mV | - | **92** | **31** | **72** | **86** |
| pH | SU | 6.29-7.29 | **6.4** | **6.3** | **6.5** | **6.4** |
| Specific Conductance | uS/cm | - | **517** | **515** | **348** | **373** |
| Temperature | C | - | **7.2** | **7.3** | **8.1** | **8.5** |
| Turbidity | NTU | - | **2.4** | **2.1** | **2.4** | **0.39** |
| Water Elevation | ft MSL | - | **1530.72** | **1531.47** | **1531.39** | **1531.05** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | **6.4** | **-** |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 9.2 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 482 | <200 | <200 | **<200** | **<200** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 627 | **3820** | **3240** | **3040** | **3020** |
| Mercury | ng/L | 37.3 | **24** | **45** | **20** | **9.8** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 25.3 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 373 | **238** | **246** | **200** | **216** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **2.6** | <2.0 |
| Chloride | mg/L | 22 | **11** | **11** | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.56 | **0.50** | **0.55** | **0.71** | **0.59** |
| Nitrogen, Nitrate | mg/L | 0.08 | <0.10 | <0.10 | **0.24** | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.40 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 137 | **38** | **37** | **49** | **41** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 65 | **52** | **49** | **40** | **45** |
| Magnesium | mg/L | 34 | **21** | **22** | **16** | **18** |
| Potassium | mg/L | 13 | **10** | **9.7** | **7.8** | **8.7** |
| Sodium | mg/L | 80 | **26** | **25** | **19** | **21** |
| General | | | | | | |
| Hardness | mg/L | 322 | **217** | **211** | **166** | **187** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**KMW-5R (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **4.4** | **4.2** | **3.1** | **4.6** |
| ORP | mV | - | **8.0** | **65** | **320** | **134** |
| pH | SU | 6.67-7.67 | **7.0** | **6.4** | **6.6** | **6.8** |
| Specific Conductance | uS/cm | - | **481** | **661** | **606** | **596** |
| Temperature | C | - | **11** | **9.1** | **10** | **8.6** |
| Turbidity | NTU | - | **276** | **171** | **80** | **126** |
| Water Elevation | ft MSL | - | **1555.97** | **1561.36** | **1560.28** | **1559.98** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | **379** | **-** |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 28 | **5.3** | **7.1** | **4.1** | **6.1** |
| Iron | ug/L | 52956 | **5580** | **3770** | **2450** | **8170** |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 31 | - | - | **14** | **-** |
| Manganese | ug/L | 2789 | **1170** | **1410** | **1410** | **2000** |
| Mercury | ng/L | 14.9 | **2.8** | **0.81** | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.8 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 23.7 | <10.0 | **12** | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 481 | **380** | **366** | **430** | **422** |
| Alkalinity, Carbonate | mg/L | 8 | <2.0 | <2.0 | **0.58** | **1.3** |
| Chloride | mg/L | 192 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.06 | <0.03 | **0.03** | **0.03** | **0.03** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 139 | **56** | **63** | **66** | **62** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 166 | **94** | **108** | **107** | **105** |
| Magnesium | mg/L | 65 | **35** | **40** | **39** | **39** |
| Potassium | mg/L | 8.3 | **6.3** | **6.8** | **6.5** | **6.7** |
| Sodium | mg/L | 7.7 | **9.0** | **11** | **11** | **10** |
| General | | | | | | |
| Hardness | mg/L | 757 | **379** | **433** | **427** | **423** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-701 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.30** | **6.6** | **0.65** | **0.26** |
| ORP | mV | - | **244** | **132** | **64** | **138** |
| pH | SU | 5.46-6.46 | **5.7** | **5.4** | **5.7** | **6.0** |
| Specific Conductance | uS/cm | - | **940** | **1358** | **934** | **776** |
| Temperature | C | - | **6.2** | **8.4** | **11** | **9.0** |
| Turbidity | NTU | - | **2.2** | **1.7** | **2.9** | **2.7** |
| Water Elevation | ft MSL | - | **1531.05** | **1533.51** | **1533.17** | **1533.18** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | **54** | **-** |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | **7.0** | **4.6** | **7.2** | **6.4** |
| Iron | ug/L | 498 | <200 | <200 | <200 | <200 |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 5263 | **2760** | **2660** | **1680** | **1120** |
| Mercury | ng/L | 8.4 | <6.7 | **6.0** | **10** | **7.7** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | **31** | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 40 | <10.0 | **26** | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 118 | **73** | **100** | **190** | **131** |
| Alkalinity, Carbonate | mg/L | 8 | <2.0 | <2.0 | **0.62** | <2.0 |
| Chloride | mg/L | 23 | **126** | **298** | **175** | **152** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.40 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 1.9 | **2.0** | **4.8** | **4.5** | **4.0** |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 86 | **226** | **105** | **122** | **95** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 43 | **38** | **28** | **23** | **15** |
| Magnesium | mg/L | 19 | **12** | **7.1** | **5.9** | **4.1** |
| Potassium | mg/L | 9.0 | **5.7** | **5.7** | **4.7** | **4.7** |
| Sodium | mg/L | 12 | **139** | **255** | **190** | **165** |
| General | | | | | | |
| Hardness | mg/L | 199 | **146** | **98** | **81** | **55** |
| | | | | | | |
| Silica | mg/L | - | **-** | **-** | **-** | **-** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-701 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.19** | **0.44** | **0.61** | **0.21** |
| ORP | mV | - | -182 | -224 | -199 | -216 |
| pH | SU | 6.71-7.71 | **7.3** | **7.0** | **7.2** | **7.4** |
| Specific Conductance | uS/cm | - | **711** | **621** | **483** | **471** |
| Temperature | C | - | **7.5** | **7.8** | **8.4** | **8.1** |
| Turbidity | NTU | - | **46** | **30** | **23** | **58** |
| Water Elevation | ft MSL | - | **1531.34** | **1533.86** | **1533.45** | **1533.00** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 157 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 45.4 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 24958 | **32000** | **30800** | **25200** | **24200** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 12.9 | - | - | <10.0 | - |
| Manganese | ug/L | 4677 | **3600** | **3220** | **2900** | **2730** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 13.8 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 162 | **130** | **184** | **140** | **125** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **1.7** | <2.0 |
| Chloride | mg/L | 49 | **58** | **55** | **51** | **48** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 1.75 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 52 | **128** | **92** | **75** | **67** |
| Sulfide | mg/L | 1.86 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 39 | **57** | **51** | **50** | **45** |
| Magnesium | mg/L | 16 | **20** | **19** | **18** | **17** |
| Potassium | mg/L | 8.5 | **5.0** | **4.5** | **4.3** | **4.3** |
| Sodium | mg/L | 33 | **40** | **34** | **29** | **27** |
| General | | | | | | |
| Hardness | mg/L | 163 | **223** | **206** | **198** | **180** |
| | | | | | | |
| Silica | mg/L | - | **-** | **-** | **-** | **-** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-702 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[D] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.6** | **0.61** | **0.74** | **0.1** |
| ORP | mV | - | **111** | **26** | **137** | **120** |
| pH | SU | 8.81-9.91 | **9.0** | **7.7** | **8.2** | **7.9** |
| Specific Conductance | uS/cm | - | **395** | **376** | **302** | **357** |
| Temperature | C | - | **6.7** | **7.0** | **7.5** | **7.01** |
| Turbidity | NTU | - | **15.0** | **2.6** | **2.7** | **2.5** |
| Water Elevation | ft MSL | - | **1529.97** | **1531.50** | **1531.93** | - |
| Metals | | | | | | |
| Aluminum | ug/L | 123 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 196 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | **4.5** | <4.0 | **4.3** |
| Iron | ug/L | 800 | <200 | <200 | <200 | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 546 | <50.0 | <50.0 | <50.0 | <50.0 |
| Mercury | ng/L | 3.6 | **4.4** | **6.3** | **7.7** | **9.9** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 160 | **132** | **135** | **130** | **131** |
| Alkalinity, Carbonate | mg/L | 41 | <2.0 | <2.0 | **2.4** | <2.0 |
| Chloride | mg/L | 17.6 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.04 | < 0.03 | <0.03 | <0.03 | **0.04** |
| Nitrogen, Nitrate | mg/L | 1.2 | **0.42** | <0.10 | **0.23** | **0.14** |
| Nitrogen, Nitrite | mg/L | 0.18 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 133 | **51** | **49** | **55** | **52** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 79 | **31** | **22** | **24** | **21** |
| Magnesium | mg/L | 14.1 | **6.3** | **4.6** | **5.9** | **5.6** |
| Potassium | mg/L | 22 | **8.0** | **7.3** | **6.2** | **5.3** |
| Sodium | mg/L | 60 | **44** | **52** | **42** | **40** |
| General | | | | | | |
| Hardness | mg/L | 251 | **103** | **75** | **85** | **75** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-702 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[T] | Q3 2022[D] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.98** | **0.47** | **3.4** | **1.0** |
| ORP | mV | - | -231 | -258 | -182 | -227 |
| pH | SU | 7.11-8.11 | **8.1** | **7.9** | **8.1** | **8.1** |
| Specific Conductance | uS/cm | - | **267** | **244** | **232** | **207** |
| Temperature | C | - | **6.8** | **7.7** | **7.9** | **7.5** |
| Turbidity | NTU | - | **1.9** | **4.0** | **2.9** | **9.5** |
| Water Elevation | ft MSL | - | **1537.62** | **1536.54** | **1535.45** | **1538** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 1328 | **732** | **1100** | **747** | **685** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 12.91 | - | - | <10.0 | - |
| Manganese | ug/L | 118 | **86** | **89** | **82** | **86** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 76 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 112 | **93** | **96** | **100** | **100** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **1.8** | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.09 | < 0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | **0.28** | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 36 | **34** | **33** | **34** | **31** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 39 | **31** | **31** | **32** | **31** |
| Magnesium | mg/L | 11.7 | **9.8** | **9.6** | **9.6** | **9.1** |
| Potassium | mg/L | 11.2 | <3.0 | **3.0** | **3.0** | **2.9** |
| Sodium | mg/L | 5.2 | **3.2** | **3.1** | **3.1** | **3.2** |
| General | | | | | | |
| Hardness | mg/L | 140 | **118** | **117** | **118** | **116** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **4.8** | **5.6** | **5.8** | **5.9** |
| ORP | mV | - | **201** | **274** | **294** | **202** |
| pH | SU | 6.3-7.3 | **5.6** | **5.5** | **5.7** | **5.7** |
| Specific Conductance | uS/cm | - | **181** | **159** | **141** | **134** |
| Temperature | C | - | **6.0** | **6.2** | **7.2** | **6.8** |
| Turbidity | NTU | - | **0.98** | **2.7** | **2.5** | **2.8** |
| Water Elevation | ft MSL | - | **1531.36** | **1533.74** | **1534.47** | **1535.18** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 287 | <200 | <200 | <200 | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 107 | <50.0 | <50.0 | <50.0 | <50.0 |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 92 | **59** | **57** | **59** | **52** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.08 | < 0.03 | <0.03 | < 0.03 | < 0.03 |
| Nitrogen, Nitrate | mg/L | 1.8 | **2.3** | **2.4** | **2.5** | **2.9** |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <100 |
| Sulfate | mg/L | 41 | **178** | **21** | **26** | **21** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 31 | **20** | **17** | **18** | **15** |
| Magnesium | mg/L | 9.8 | **8.3** | **7.5** | **7.8** | **6.5** |
| Potassium | mg/L | 2.6 | <1.6 | **1.5** | **1.5** | **1.4** |
| Sodium | mg/L | 7.7 | **1.9** | **1.8** | **1.9** | **1.9** |
| General | | | | | | |
| Hardness | mg/L | 116 | **83** | **73** | **76** | **65** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.1** | **1.4** | **0.75** | **0.03** |
| ORP | mV | - | -239 | -254 | -270 | -301 |
| pH | SU | 7.44-8.44 | **7.8** | **7.8** | **8.0** | **8.3** |
| Specific Conductance | uS/cm | - | **280** | **258** | **223** | **220** |
| Temperature | C | - | **6.4** | **7.1** | **8.3** | **7.1** |
| Turbidity | NTU | - | **1.3** | **2.2** | **4.4** | **3.0** |
| Water Elevation | ft MSL | - | **1530.49** | **1531.83** | **1532.71** | **1531.15** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 1903 | **1500** | **1750** | **1540** | **1630** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 200 | **191** | **196** | **182** | **179** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 111 | **82** | **83** | **94** | **88** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **1.9** | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.75 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 49 | **532** | **46** | **50** | **44** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 43 | **32** | **32** | **32** | **31** |
| Magnesium | mg/L | 14 | **10** | **11** | **11** | **9.8** |
| Potassium | mg/L | 4.2 | <2.2 | **2.2** | **2.2** | **2.1** |
| Sodium | mg/L | 17.3 | **2.8** | **2.9** | **3.0** | **3** |
| General | | | | | | |
| Hardness | mg/L | 173 | **121** | **125** | **125** | **118** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 LLA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[T] | Q3 2022[T] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.95** | **0.43** | **0.76** | **0.17** |
| ORP | mV | - | -245 | -288 | -243 | -357 |
| pH | SU | 8.08-9.08 | **8.1** | **8.2** | **8.1** | **9.0** |
| Specific Conductance | uS/cm | - | **261** | **238** | **211** | **198** |
| Temperature | C | - | **6.6** | **7.1** | **7.7** | **6.9** |
| Turbidity | NTU | - | **1.5** | **3.6** | **5.0** | **0.93** |
| Water Elevation | ft MSL | - | **1532.56** | **1534.29** | **1534.79** | **1534.30** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 2082 | **583** | **415** | **448** | **457** |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 28 | - | - | **13** | - |
| Manganese | ug/L | 95 | **71** | **60** | **73** | **51** |
| Mercury | ng/L | 4 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.8 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 92 | **76** | **76** | **85** | **77** |
| Alkalinity, Carbonate | mg/L | 10.4 | <2.0 | <2.0 | **1.3** | **2.3** |
| Chloride | mg/L | 97 | **11** | **11** | <10.0 | **11** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.08 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 43 | **134** | **33** | **39** | **31** |
| Sulfide | mg/L | 0.8 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 34 | **25** | **24** | **27** | **22** |
| Magnesium | mg/L | 12.3 | **9.6** | **9.6** | **10** | **8.6** |
| Potassium | mg/L | 7.7 | **3.4** | **3.9** | **3.3** | **5.6** |
| Sodium | mg/L | 51.1 | **7.2** | **8.5** | **6.9** | **9.1** |
| General | | | | | | |
| Hardness | mg/L | 135 | **102** | **98** | **108** | **90** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 DBA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.94** | **0.42** | **0.62** | **0.18** |
| ORP | mV | - | -286 | -309 | -261 | -380 |
| pH | SU | 8.89-9.89 | **9.2** | **8.6** | **9.1** | **9.5** |
| Specific Conductance | uS/cm | - | **292** | **279** | **243** | **231** |
| Temperature | C | - | **6.2** | **6.7** | **8.0** | **6.8** |
| Turbidity | NTU | - | **1.0** | **2.0** | **3.0** | **0.43** |
| Water Elevation | ft MSL | - | **1529.71** | **1531.22** | **1531.69** | **1531.29** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 861 | <200 | <200 | <200 | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 20 | - | - | **14** | **-** |
| Manganese | ug/L | 200 | <50.0 | <50.0 | <50.0 | <50.0 |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 26.2 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 88 | **78** | **83** | **92** | **80** |
| Alkalinity, Carbonate | mg/L | 39 | **4.0** | <2.0 | **1.6** | **5.4** |
| Chloride | mg/L | 20 | **16** | **15** | **15** | **15** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.12 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.86 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 73 | **236** | **38** | **39** | **35** |
| Sulfide | mg/L | 1.27 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 27 | **27** | **27** | **27** | **24** |
| Magnesium | mg/L | 17.3 | **10** | **11** | **10** | **8.9** |
| Potassium | mg/L | 30 | **12** | **6.7** | **10** | **13** |
| Sodium | mg/L | 16 | **9.3** | **7.6** | **8.6** | **9.1** |
| General | | | | | | |
| Hardness | mg/L | 140 | **108** | **111** | **110** | **98** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[D] | Q3 2022[T] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | | **0.55** | **0.50** | **0.56** | **0.08** |
| ORP | mV | | **165** | **80** | **108** | **123** |
| pH | SU | 5.43-6.43 | **5.9** | **5.7** | **5.7** | **5.8** |
| Specific Conductance | uS/cm | | **190** | **311** | **276** | **228** |
| Temperature | C | | **5.7** | **6.7** | **11** | **9.8** |
| Turbidity | NTU | | **3.1** | **5.9** | **2.7** | **2.7** |
| Water Elevation | ft MSL | | **1533.38** | **1535.91** | **1534.67** | **1534.36** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 84519 | <200 | **1590** | **230** | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 8783 | **454** | **2610** | **1190** | **887** |
| Mercury | ng/L | 34.7 | **1.5** | **3.6** | **2.0** | **1.6** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 37.8 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 264 | **49** | **110** | **220** | **98** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **5.6** | <2.0 |
| Chloride | mg/L | 24 | **20** | **27** | **46** | **21** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.19 | <0.03 | **0.36** | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 1.47 | **0.10** | <0.10 | **0.26** | **0.71** |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 45 | **14** | **21** | **22** | **15** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| | | | | | | |
| Calcium | mg/L | 47 | **16** | **32** | **29** | **25** |
| Magnesium | mg/L | 15 | **5.5** | **10** | **10** | **8.1** |
| Potassium | mg/L | 6.1 | **1.8** | **3.2** | **2.8** | **2.6** |
| Sodium | mg/L | 32 | **10** | **14** | **19** | **16** |
| General | | | | | | |
| Hardness | mg/L | 191 | **63** | **123** | **114** | **94** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 LLA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.91** | **0.40** | **0.54** | **0.11** |
| ORP | mV | - | **285** | -260 | -271 | -273 |
| pH | SU | 8.2-9.2 | **7.7** | **7.7** | **7.9** | **7.9** |
| Specific Conductance | uS/cm | - | **670** | **589** | **514** | **521** |
| Temperature | C | - | **7.8** | **9.0** | **11** | **8.9** |
| Turbidity | NTU | - | **8.0** | **15** | **6.0** | **21** |
| Water Elevation | ft MSL | - | **1530.38** | **1533.63** | **1532.06** | **1531.94** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 3309 | **2580** | **4110** | **4140** | **3980** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 28 | - | - | **22** | **-** |
| Manganese | ug/L | 95 | **212** | **293** | **274** | **280** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 153 | **203** | **212** | **150** | **224** |
| Alkalinity, Carbonate | mg/L | 13 | <2.0 | <2.0 | **4.0** | **1.5** |
| Chloride | mg/L | 40 | **70** | **73** | **71** | **76** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.1 | **0.03** | < 0.03 | < 0.03 | < 0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 21 | **11** | **10** | **7.8** | **7.7** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 33 | **56** | **68** | **68** | **70** |
| Magnesium | mg/L | 16 | **22** | **27** | **27** | **28** |
| Potassium | mg/L | 12 | **6.0** | **6.6** | **6.9** | **6.9** |
| Sodium | mg/L | 15.5 | **7.5** | **8.9** | **8.9** | **9.3** |
| General | | | | | | |
| Hardness | mg/L | 157 | **230** | **284** | **283** | **289** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[T] | Q3 2022[T] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | | **1.2** | **1.5** | **0.74** | **0.26** |
| ORP | mV | | -146 | -138 | -173 | -165 |
| pH | SU | 6.4-7.4 | **7.1** | **6.8** | **7.0** | **6.9** |
| Specific Conductance | uS/cm | | **387** | **413** | **533** | **404** |
| Temperature | C | | **7.5** | **7.5** | **9.3** | **8.8** |
| Turbidity | NTU | | **8.7** | **11** | **5.3** | **6.0** |
| Water Elevation | ft MSL | | **1533.90** | **1536.41** | **1535.03** | **1534.98** |
| Metals | | | | | | |
| Aluminum | ug/L | 5824 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 44052 | **23700** | **25000** | **42500** | **26000** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 30 | - | - | <10.0 | - |
| Manganese | ug/L | 1384 | **559** | **648** | **923** | **595** |
| Mercury | ng/L | 1.4 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 198 | **94** | **114** | **140** | **122** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **0.94** | <2.0 |
| Chloride | mg/L | 24 | **51** | **52** | **96** | **58** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.78 | <0.03 | **0.03** | <0.03 | **0.03** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.18 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 45 | **6.3** | **4.0** | **4.0** | **4.7** |
| Sulfide | mg/L | 0.49 | **0.58** | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 67 | **28** | **34** | **46** | **36** |
| Magnesium | mg/L | 14 | **9** | **10** | **14** | **9** |
| Potassium | mg/L | 5.3 | **2.0** | **2.2** | **2.9** | **2.5** |
| Sodium | mg/L | 43 | **21** | **21** | **36** | **28** |
| General | | | | | | |
| Hardness | mg/L | 226 | **106** | **126** | **170** | **128** |

*Explanations of abbreviations are included on the final page of this table.*

**Humbolt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 DBA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[D] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.88** | **0.42** | **0.60** | **0.08** |
| ORP | mV | - | -330 | -290 | -284 | -297 |
| pH | SU | 8.13-9.13 | **8.3** | **8.2** | **8.4** | **8.4** |
| Specific Conductance | uS/cm | - | **251** | **239** | **209** | **205** |
| Temperature | C | - | **8.6** | **9.2** | **10.0** | **9.1** |
| Turbidity | NTU | - | **2.0** | **2.8** | **2.9** | **3.0** |
| Water Elevation | ft MSL | - | **1515.56** | **1515.34** | **1515.08** | **1515.05** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 8.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 20.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 4.0 | - | - | <1.0 | - |
| Boron | ug/L | 1480 | - | - | <300 | - |
| Cadmium | ug/L | 4.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 9645 | **727** | **741** | **812** | **683** |
| Lead | ug/L | 12.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | **20** | - |
| Manganese | ug/L | 58 | **52** | **58** | **60** | **53** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 8.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 11 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 129 | **122** | **134** | **88** | **136** |
| Alkalinity, Carbonate | mg/L | 32.0 | **4.2** | **2.8** | <0.50 | **2.6** |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.04 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 6 | <1.0 | **1.5** | **1.5** | **1.4** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 27 | **23** | **24** | **25** | **23** |
| Magnesium | mg/L | 14 | **11** | **11** | **12** | **11** |
| Potassium | mg/L | 4 | <2.5 | **2.9** | **3.0** | **2.8** |
| Sodium | mg/L | 14 | **10** | **11** | **11** | **10** |
| General | | | | | | |
| Hardness | mg/L | 111 | **103** | **106** | **112** | **100** |

* - Diver failed 9/6/17, replaced 3/15/18

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-705 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.3** | **0.52** | **1.4** | **0.25** |
| ORP | mV | - | -26 | -51 | -35 | -64 |
| pH | SU | 5.67-6.67 | **6.1** | **6.0** | **6.0** | **6.2** |
| Specific Conductance | uS/cm | - | **335** | **347** | **347** | **265** |
| Temperature | C | - | **4.9** | **6.2** | **12** | **10** |
| Turbidity | NTU | - | **1.2** | **2.6** | **2.7** | **0.33** |
| Water Elevation | ft MSL | - | **1533.24** | **1537.57** | **1535.90** | **1534.65** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 12957 | **10400** | **10500** | **9380** | **9440** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 1535 | **878** | **1080** | **1030** | **867** |
| Mercury | ng/L | 1.8 | <1.0 | <1.0 | **1.0** | **1.1** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 283 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 85 | **65** | **42** | **58** | **59** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 52 | **49** | **73** | **84** | **59** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.13 | **0.13** | **0.17** | **0.17** | **0.17** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 21.2 | **65** | **10** | **4.3** | **4.3** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 24 | **16** | **18** | **19** | **16** |
| Magnesium | mg/L | 10.9 | **6.8** | **7.8** | **8.1** | **6.6** |
| Potassium | mg/L | 3.0 | <2.3 | **2.5** | **3.0** | **2.8** |
| Sodium | mg/L | 17 | **26** | **30** | **38** | **30** |
| General | | | | | | |
| Hardness | mg/L | 110 | **69** | **77** | **81** | **66** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-705 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.0** | **0.43** | **0.56** | **0.20** |
| ORP | mV | - | -182 | -139 | -112 | -142 |
| pH | SU | 6.59-7.59 | **7.0** | **6.7** | **6.7** | **7.0** |
| Specific Conductance | uS/cm | - | **426** | **392** | **353** | **335** |
| Temperature | C | - | **7.4** | **8.9** | **10** | **9.5** |
| Turbidity | NTU | - | **6.7** | **3.9** | **3.0** | **0.57** |
| Water Elevation | ft MSL | - | **1535.27** | **1533.21** | - | **1534.95** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 13309 | **15700** | **12100** | **12200** | **12900** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 13.19 | - | - | **13** | **-** |
| Manganese | ug/L | 973 | **1320** | **1250** | **1290** | **1210** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 34 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 118 | **74** | **164** | **99** | **84** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | **0.52** | <2.0 |
| Chloride | mg/L | 36 | **69** | **69** | **67** | **69** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.1 | <0.03 | <0.03 | **0.04** | **0.04** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 14.2 | **3.6** | **3.8** | **4.2** | **4.2** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 26 | **35** | **36** | **37** | **35** |
| Magnesium | mg/L | 13 | **17** | **17** | **18** | **17** |
| Potassium | mg/L | 4.0 | **4.1** | **3.6** | **3.7** | **4.0** |
| Sodium | mg/L | 3.4 | **4.9** | **4.6** | **4.8** | **4.9** |
| General | | | | | | |
| Hardness | mg/L | 127 | **157** | **161** | **166** | **156** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-706 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.72** | **0.91** | **2.1** | **1.3** |
| ORP | mV | - | **76** | **56** | **132** | **60** |
| pH | SU | 5.74-6.74 | **5.9** | **5.5** | **5.7** | **5.9** |
| Specific Conductance | uS/cm | - | **801** | **821** | **689** | **641** |
| Temperature | C | - | **8.2** | **9.3** | **9.7** | **9.3** |
| Turbidity | NTU | - | **4.0** | **12** | **4.4** | **2.0** |
| Water Elevation | ft MSL | - | **1556.15** | **1561.89** | **1561.52** | **1560.81** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 31 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 8029 | **1760** | **2650** | **1820** | **1740** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 17.2 | - | - | <10.0 | - |
| Manganese | ug/L | 23484 | **9940** | **10400** | **10100** | **9440** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 27.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 4.8 | - | - | <4.0 | - |
| Zinc | ug/L | 77.1 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 131.8 | **87** | **85** | **87** | **86** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 165 | **136** | **144** | **144** | **131** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.88 | **0.35** | **0.43** | **0.37** | **0.34** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 434 | **124** | **129** | **159** | **134** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 133 | **63** | **60** | **60** | **56** |
| Magnesium | mg/L | 44 | **24** | **25** | **24** | **23** |
| Potassium | mg/L | 5.6 | **4.3** | **4.3** | **4.7** | **4.6** |
| Sodium | mg/L | 140 | **50** | **51** | **59** | **55** |
| General | | | | | | |
| Hardness | mg/L | 619 | **257** | **255** | **248** | **234** |

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-707 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[T] | Q2 2022[T] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.51** | **0.45** | **0.61** | **0.26** |
| ORP | mV | - | -130 | -127 | -130 | -145 |
| pH | SU | 6.43-7.43 | **7.2** | **6.8** | **6.9** | **7.1** |
| Specific Conductance | uS/cm | - | **290** | **289** | **252** | **244** |
| Temperature | C | - | **7.1** | **7.3** | **9.5** | **9.2** |
| Turbidity | NTU | - | **2.2** | **2.8** | **2.8** | **0.48** |
| Water Elevation | ft MSL | - | **1579.98** | **1583.17** | **1582.08** | **1581.82** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 7115 | **4110** | **4270** | **3980** | **4000** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 1128 | **970** | **956** | **922** | **933** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 29.3 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 168.3 | **158** | **160** | **170** | **166** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.32 | **0.27** | **0.28** | **0.27** | **0.33** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 9.4 | <1.0 | <1.0 | <1.0 | <1.0 |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 46 | **42** | **42** | **42** | **42** |
| Magnesium | mg/L | 13 | **11** | **11** | **11** | **11** |
| Potassium | mg/L | 2.9 | <2.2 | **2.2** | **2.1** | **2.3** |
| Sodium | mg/L | 3.6 | **2.7** | **2.7** | **2.6** | **2.6** |
| General | | | | | | |
| Hardness | mg/L | 162 | **149** | **150** | **150** | **150** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-9R (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2022[D] | Q2 2022[D] | Q3 2022[T] | Q4 2022[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **4.7** | **4.7** | **5.05** | **5.0** |
| ORP | mV | - | **348** | **69** | **253** | **176** |
| pH | SU | 5.4-6.4 | **3.4** | **6.1** | **5.6** | **6.2** |
| Specific Conductance | uS/cm | - | **1547** | **178** | **214.6** | **252** |
| Temperature | C | - | **7.4** | **8.4** | **13** | **13** |
| Turbidity | NTU | - | **9.2** | **4.9** | **472** | **1.4** |
| Water Elevation | ft MSL | - | **1592.91** | **1597.45** | **1592.00** | **1595.21** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | **114** | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 39 | **962** | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 4099 | **29700** | **280** | **1550** | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 1376 | **4300** | **50** | **58** | <50.0 |
| Mercury | ng/L | 10.1 | <1.0 | <1.0 | **3.0** | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 186 | **5950** | **84** | **170** | **174** |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | - | - |
| Zinc | ug/L | 38 | **2080** | **24** | **51** | **18** |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 85 | <2.0 | **32** | **39** | **58** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 185 | <10.0 | **12** | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.22 | **0.07** | <0.03 | **0.08** | <0.03 |
| Nitrogen, Nitrate | mg/L | 3.8 | **0.40** | **0.41** | **0.15** | **0.77** |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 335 | **776** | **36** | **81** | **89** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 116 | **166** | **18** | **25** | **38** |
| Magnesium | mg/L | 41 | **47** | **5.1** | **8.5** | **11** |
| Potassium | mg/L | 5.2 | **10** | **1.8** | **2.1** | **2.7** |
| Sodium | mg/L | 48 | **11** | **5.8** | **8.6** | **6.6** |
| General | | | | | | |
| Hardness | mg/L | 479 | **609** | **66** | **98** | **140** |

*- Inadequate groundwater volume available for monitoring or sampling

**Humboldt Mill 2022**

**Mine Permit Groundwater Quality Monitoring Data**

**Abbreviations and Data Qualifiers**

| **Notes:** |
| --- |
| Benchmarks are calculated based on guidance from Eagles Mine's Development of Site Specific Benchmarks for Mine Permit Water Quality Monitoring. |
| Results in **bold** text indicate that the parameter was detected at a level greater than the laboratory reporting limit. |
| Highlighted Cell = Value is equal to or above site-specific benchmark. An exceedance occurs if there are 2 consecutive sampling events with a value equal to or greater than the benchmark at a compliance monitoring location. |
| (p) = Due to less than two detections in baseline dataset, benchmark defaulted to four times the reporting limit. |
| --Denotes no benchmark required or parameter was not required to be collected during the sampling quarter. |
| e = estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded. |
| NM = Not measured. |
| $^{T}$ = Samples not filtered and all values are total concentrations. |
| $^{D}$ = Sample for metal and major cation parameters was filtered and values are dissolved concentrations. |

# Appendix G

# Humboldt Mill

# Groundwater Trend Analysis Summary

# 2022 Groundwater Trend Analysis
## Humboldt Mill

| Location | Parameter | Samples | Non-Detects | Percent Detected | Min. | Max. | Mean | Median | Standard Deviation | Coeff. of Variation | M-K Test Value (S) | Approx. p-value | Trend at 95% Conf. | Theil-Sen Slope, conc/yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HW-1L | Bicarbonate alkalinity | 32 | 0 | 100% | 74.5 | 92 | 81.1 | 81.0 | 3.09 | 0.04 | -7 | 0.9223 | no trend | 0 |
| HW-1L | Calcium | 33 | 0 | 100% | 20 | 31.7 | 26.1 | 26 | 2.40 | 0.09 | 244 | 0.0002 | POSITIVE | 0.664 |
| HW-1L | Chloride | 34 | 0 | 100% | 34 | 77.4 | 47.8 | 45.8 | 9.1 | 0.19 | -30 | 0.6667 | no trend | -0.109 |
| HW-1L | Hardness | 32 | 0 | 100% | 103 | 139 | 114 | 113 | 7.72 | 0.07 | 132 | 0.0330 | POSITIVE | 1.17 |
| HW-1L | Iron | 34 | 1 | 97% | 0.2 | 1.23 | 0.75 | 0.728 | 0.264 | 0.35 | 159 | 0.0191 | POSITIVE | 0.049 |
| HW-1L | Magnesium | 33 | 0 | 100% | 9.1 | 11.8 | 10.8 | 11 | 0.630 | 0.06 | 202 | 0.0016 | POSITIVE | 0.109 |
| HW-1L | Manganese | 33 | 31 | 6% | 0.0011 | 0.0599 | -- | -- | -- | -- | -- | -- | -- | -- |
| HW-1L | Field pH | 31 | 0 | 100% | 8.12 | 8.97 | 8.45 | 8.4 | 0.219 | 0.03 | -259 | 0.0000 | NEGATIVE | -0.071 |
| HW-1L | Potassium | 32 | 1 | 97% | 1.6 | 2.3 | 1.92 | 1.9 | 0.182 | 0.09 | 104 | 0.0833 | no trend | 0.015 |
| HW-1L | Sodium | 34 | 0 | 100% | 20.1 | 40.5 | 25.7 | 24.3 | 4.36 | 0.17 | -11 | 0.8818 | no trend | 0 |
| HW-1L | Sulfate | 32 | 0 | 100% | 16 | 35.4 | 25.3 | 25.3 | 4.20 | 0.17 | 395 | 0.0000 | POSITIVE | 1.63 |
| HW-1U LLA | Bicarbonate alkalinity | 32 | 0 | 100% | 48.5 | 170 | 101 | 101 | 20.2 | 0.20 | -112 | 0.0704 | no trend | -2.27 |
| HW-1U LLA | Calcium | 32 | 0 | 100% | 2.6 | 64 | 31.1 | 26.4 | 16.4 | 0.53 | 172 | 0.0055 | POSITIVE | 3.00 |
| **HW-1U LLA** | **Chloride** | **32** | **0** | **100%** | **17.6** | **408** | **84.7** | **28.5** | **115** | **1.35** | **115** | **0.0642** | **no trend** | **7.04** |
| HW-1U LLA | Hardness | 32 | 0 | 100% | 9.8 | 197 | 112 | 107 | 47.9 | 0.43 | 167 | 0.0071 | POSITIVE | 9.54 |
| HW-1U LLA | Iron | 32 | 12 | 63% | 0.013 | 45.2 | 4.16 | 0.515 | 11.3 | 2.72 | 214 | 0.0004 | POSITIVE | 0.099 |
| HW-1U LLA | Magnesium | 32 | 1 | 97% | 1 | 26.4 | 11.2 | 9.95 | 5.95 | 0.53 | 121 | 0.0514 | no trend | 0.613 |
| HW-1U LLA | Manganese | 32 | 20 | 38% | 0.0011 | 0.49 | -- | -- | -- | -- | -- | -- | -- | -- |
| HW-1U LLA | Field pH | 34 | 0 | 100% | 7.8 | 9.43 | 8.51 | 8.44 | 0.373 | 0.04 | -200 | 0.0031 | NEGATIVE | -0.060 |
| HW-1U LLA | Potassium | 31 | 0 | 100% | 0.57 | 6.7 | 3.94 | 3.6 | 1.67 | 0.42 | 65 | 0.2761 | no trend | 0.162 |
| HW-1U LLA | Sodium | 32 | 0 | 100% | 29.3 | 232 | 76.6 | 49.4 | 52.4 | 0.69 | 134 | 0.0309 | POSITIVE | 4.31 |
| HW-1U LLA | Sulfate | 32 | 0 | 100% | 38 | 434 | 90.9 | 58.2 | 95.0 | 1.04 | 117 | 0.0599 | no trend | 1.60 |
| **HW-1U UFB** | **Bicarbonate alkalinity** | **37** | **0** | **100%** | **49.4** | **170** | **91.1** | **92.0** | **25.2** | **0.28** | **-18** | **0.8240** | **no trend** | **-0.519** |
| **HW-1U UFB** | **Calcium** | **38** | **0** | **100%** | **9.1** | **89.8** | **27.7** | **20.8** | **19.2** | **0.69** | **298** | **0.0002** | **POSITIVE** | **2.55** |
| HW-1U UFB | Chloride | 38 | 18 | 53% | 0.72 | 1320 | 154 | 22 | 372 | 2.42 | -98 | 0.2003 | no trend | 0 |
| HW-1U UFB | Hardness | 38 | 0 | 100% | 45 | 291 | 104 | 89 | 60.2 | 0.58 | 206 | 0.0099 | POSITIVE | 6.45 |
| **HW-1U UFB** | **Iron** | **37** | **17** | **54%** | **0.2** | **3.96** | **0.62** | **0.234** | **0.783** | **1.26** | **451** | **0.0000** | **POSITIVE** | **0.090** |
| HW-1U UFB | Magnesium | 38 | 0 | 100% | 3.8 | 16.7 | 8.17 | 6.35 | 4.08 | 0.50 | 20 | 0.8111 | no trend | 0.045 |
| **HW-1U UFB** | **Manganese** | **38** | **21** | **45%** | **0.05** | **0.21** | **0.065** | **0.05** | **0.032** | **0.49** | **265** | **0.0003** | **POSITIVE** | **0.0004** |
| **HW-1U UFB** | **Field pH** | **38** | **0** | **100%** | **7.96** | **9.3** | **8.71** | **8.71** | **0.300** | **0.03** | **-463** | **0.0000** | **NEGATIVE** | **-0.092** |
| HW-1U UFB | Potassium | 38 | 0 | 100% | 2.3 | 21 | 7.15 | 4.7 | 5.36 | 0.75 | -188 | 0.0187 | NEGATIVE | -0.640 |
| HW-1U UFB | Sodium | 38 | 0 | 100% | 4.8 | 717 | 83.7 | 22 | 177 | 2.11 | -187 | 0.0193 | NEGATIVE | -3.50 |
| HW-1U UFB | Sulfate | 38 | 5 | 87% | 0.86 | 73 | 16.9 | 8.7 | 19.6 | 1.15 | -285 | 0.0004 | NEGATIVE | -3.04 |
| HW-2 | Bicarbonate alkalinity | 38 | 0 | 100% | 70.9 | 130 | 105 | 105 | 17.0 | 0.16 | -247 | 0.0019 | NEGATIVE | -3.33 |
| **HW-2** | **Calcium** | **38** | **0** | **100%** | **23** | **86.4** | **48.8** | **53.5** | **15.2** | **0.31** | **-166** | **0.0380** | **NEGATIVE** | **-2.39** |
| **HW-2** | **Chloride** | **37** | **0** | **100%** | **11.5** | **59.1** | **25.1** | **26** | **13.2** | **0.52** | **169** | **0.0279** | **POSITIVE** | **1.59** |
| **HW-2** | **Hardness** | **38** | **0** | **100%** | **91.8** | **374** | **212** | **218** | **66.9** | **0.32** | **-193** | **0.0158** | **NEGATIVE** | **-13.1** |
| **HW-2** | **Iron** | **38** | **3** | **92%** | **0.2** | **6.09** | **1.51** | **1.10** | **1.30** | **0.86** | **-13** | **0.8800** | **no trend** | **-0.0030** |

## 2022 Groundwater Trend Analysis
## Humboldt Mill

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HW-2 | Magnesium | 38 | 0 | 100% | 8.3 | 38.5 | 21.0 | 22.9 | 6.65 | 0.32 | -312 | 0.0001 | NEGATIVE | -1.40 |
| HW-2 | Manganese | 36 | 1 | 97% | 0.05 | 0.713 | 0.27 | 0.226 | 0.177 | 0.65 | 224 | 0.0024 | POSITIVE | 0.025 |
| HW-2 | Field pH | 34 | 0 | 100% | 7.39 | 8.72 | 7.91 | 7.91 | 0.339 | 0.04 | -97 | 0.1544 | no trend | -0.040 |
| **HW-2** | **Potassium** | **38** | **0** | **100%** | **2.6** | **12** | **4.94** | **4.65** | **2.03** | **0.41** | **-63** | **0.4353** | **no trend** | **-0.091** |
| **HW-2** | **Sodium** | **38** | **0** | **100%** | **13** | **79** | **29.4** | **23.3** | **17.4** | **0.59** | **303** | **0.0001** | **POSITIVE** | **4.17** |
| HW-2 | Sulfate | 38 | 0 | 100% | 14.7 | 298 | 134 | 133 | 65.6 | 0.49 | 26 | 0.7528 | no trend | 0.939 |
| HW-8U | Bicarbonate alkalinity | 38 | 0 | 100% | 126 | 235 | 154 | 149 | 26.3 | 0.17 | -67 | 0.4056 | no trend | -1.29 |
| **HW-8U** | **Calcium** | **38** | **0** | **100%** | **29** | **58.8** | **40.0** | **38.3** | **8.01** | **0.20** | **267** | **0.0008** | **POSITIVE** | **1.53** |
| **HW-8U** | **Chloride** | **38** | **12** | **68%** | **10** | **66.1** | **19.6** | **13** | **16.8** | **0.86** | **407** | **0.0000** | **POSITIVE** | **1.73** |
| **HW-8U** | **Hardness** | **38** | **0** | **100%** | **127** | **211** | **163** | **160** | **23.3** | **0.14** | **61** | **0.4503** | **no trend** | **1.08** |
| **HW-8U** | **Iron** | **38** | **0** | **100%** | **7** | **26.3** | **13.5** | **11.3** | **5.70** | **0.42** | **37** | **0.6507** | **no trend** | **0.175** |
| HW-8U | Magnesium | 38 | 0 | 100% | 11 | 19 | 13.4 | 13.0 | 1.95 | 0.15 | 19 | 0.8204 | no trend | 0 |
| **HW-8U** | **Manganese** | **38** | **0** | **100%** | **3** | **6.77** | **4.84** | **4.85** | **1.04** | **0.21** | **117** | **0.1446** | **no trend** | **0.111** |
| HW-8U | Field pH | 37 | 0 | 100% | 6.6 | 9.96 | 7.00 | 6.9 | 0.528 | 0.08 | 134 | 0.0815 | no trend | 0.020 |
| **HW-8U** | **Potassium** | **38** | **0** | **100%** | **2.5** | **4.7** | **3.44** | **3.3** | **0.652** | **0.19** | **417** | **0.0000** | **POSITIVE** | **0.208** |
| **HW-8U** | **Sodium** | **38** | **0** | **100%** | **2.7** | **10.2** | **4.58** | **3.9** | **1.99** | **0.43** | **407** | **0.0000** | **POSITIVE** | **0.330** |
| HW-8U | Sulfate | 38 | 4 | 89% | 1 | 15.7 | 7.44 | 7.85 | 4.41 | 0.59 | 161 | 0.0441 | POSITIVE | 0.708 |
| HYG-1 | Bicarbonate alkalinity | 38 | 0 | 100% | 140 | 370 | 221 | 226 | 56.2 | 0.25 | 97 | 0.2272 | no trend | 4.66 |
| HYG-1 | Calcium | 38 | 0 | 100% | 35 | 66.4 | 49.6 | 48.9 | 7.55 | 0.15 | 104 | 0.1950 | no trend | 0.664 |
| HYG-1 | Chloride | 38 | 10 | 74% | 10 | 24 | 13 | 12 | 3.4 | 0.26 | -227 | 0.0040 | NEGATIVE | -0.293 |
| HYG-1 | Hardness | 38 | 0 | 100% | 166 | 310 | 229 | 226 | 36.5 | 0.16 | -57 | 0.4811 | no trend | -1.37 |
| HYG-1 | Iron | 38 | 33 | 13% | 0.013 | 0.353 | -- | -- | -- | -- | -- | -- | -- | -- |
| HYG-1 | Magnesium | 38 | 0 | 100% | 16.1 | 32.9 | 24.0 | 23.4 | 4.09 | 0.17 | -143 | 0.0740 | no trend | -0.428 |
| **HYG-1** | **Manganese** | **37** | **1** | **97%** | **0.05** | **5.85** | **1.34** | **0.653** | **1.55** | **1.15** | **543** | **0.0000** | **POSITIVE** | **0.313** |
| **HYG-1** | **Field pH** | **38** | **0** | **100%** | **6.08** | **7.1** | **6.65** | **6.67** | **0.236** | **0.04** | **-354** | **0.0000** | **NEGATIVE** | **-0.062** |
| HYG-1 | Potassium | 38 | 0 | 100% | 6.6 | 13 | 9.46 | 9.7 | 1.49 | 0.16 | 141 | 0.0781 | no trend | 0.187 |
| HYG-1 | Sodium | 38 | 0 | 100% | 12 | 78 | 34.3 | 32.1 | 16.5 | 0.48 | -41 | 0.6149 | no trend | -0.791 |
| HYG-1 | Sulfate | 38 | 0 | 100% | 34.5 | 133 | 76.2 | 78.8 | 28.9 | 0.38 | -217 | 0.0066 | NEGATIVE | -5.49 |
| KMW-5R | Bicarbonate alkalinity | 37 | 0 | 100% | 310 | 430 | 371 | 371 | 21.5 | 0.06 | 200 | 0.0090 | POSITIVE | 3.13 |
| KMW-5R | Calcium | 36 | 0 | 100% | 94 | 160 | 120 | 113 | 18.7 | 0.16 | -443 | 0.0000 | NEGATIVE | -5.40 |
| KMW-5R | Chloride | 37 | 22 | 41% | 0.72 | 170 | 44.5 | 10 | 53.5 | 1.20 | -336 | 0.0000 | NEGATIVE | -9.07 |
| KMW-5R | Hardness | 35 | 0 | 100% | 379 | 634 | 495 | 480 | 76.1 | 0.15 | -428 | 0.0000 | NEGATIVE | -24.3 |
| KMW-5R | Iron | 37 | 7 | 81% | 0.2 | 129 | 17.7 | 3.52 | 34.4 | 1.94 | 189 | 0.0136 | POSITIVE | 0.531 |
| KMW-5R | Magnesium | 37 | 0 | 100% | 35.2 | 65 | 48.2 | 47 | 9.12 | 0.19 | -357 | 0.0000 | NEGATIVE | -2.31 |
| KMW-5R | Manganese | 35 | 1 | 97% | 0.718 | 2.79 | 1.87 | 1.91 | 0.464 | 0.25 | -242 | 0.0006 | NEGATIVE | -0.094 |
| KMW-5R | Field pH | 34 | 0 | 100% | 6.3 | 7.4 | 6.92 | 6.97 | 0.245 | 0.04 | -203 | 0.0027 | NEGATIVE | -0.043 |
| KMW-5R | Potassium | 37 | 0 | 100% | 6.3 | 8.3 | 7.30 | 7.2 | 0.535 | 0.07 | -331 | 0.0000 | NEGATIVE | -0.135 |
| **KMW-5R** | **Sodium** | **35** | **0** | **100%** | **3.2** | **10.5** | **7.13** | **8.4** | **2.62** | **0.37** | **450** | **0.0000** | **POSITIVE** | **0.894** |
| KMW-5R | Sulfate | 37 | 0 | 100% | 54.2 | 130 | 80.1 | 75.2 | 22.0 | 0.27 | -282 | 0.0002 | NEGATIVE | -4.25 |
| **MW-701 QAL** | **Bicarbonate alkalinity** | **36** | **0** | **100%** | **29** | **190** | **70.1** | **60.5** | **38.2** | **0.55** | **226** | **0.0022** | **POSITIVE** | **7.61** |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-701 QAL | Calcium | 36 | 0 | 100% | 8.5 | 197 | 50.5 | 26.4 | 56.0 | 1.11 | 109 | 0.1410 | no trend | 2.65 |
| **MW-701 QAL** | **Chloride** | **37** | **12** | **68%** | **10** | **1100** | **201** | **21** | **304** | **1.51** | **271** | **0.0003** | **POSITIVE** | **20.9** |
| MW-701 QAL | Hardness | 36 | 0 | 100% | 36 | 760 | 197 | 119 | 200 | 1.02 | 91 | 0.2201 | no trend | 7.51 |
| MW-701 QAL | Iron | 36 | 33 | 8% | 0.013 | 56 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-701 QAL | Magnesium | 36 | 0 | 100% | 3.9 | 64.9 | 16.5 | 10 | 16.0 | 0.97 | 55 | 0.4618 | no trend | 0.337 |
| MW-701 QAL | Manganese | 38 | 13 | 66% | 0.0011 | 9.99 | 1.57 | 0.344 | 2.25 | 1.44 | 111 | 0.1595 | no trend | 0.029 |
| MW-701 QAL | Field pH | 37 | 0 | 100% | 5.28 | 6.64 | 5.78 | 5.77 | 0.321 | 0.06 | -314 | 0.0000 | NEGATIVE | -0.084 |
| MW-701 QAL | Potassium | 36 | 0 | 100% | 2.1 | 17.7 | 6.72 | 5.8 | 4.28 | 0.64 | 29 | 0.7026 | no trend | 0.123 |
| **MW-701 QAL** | **Sodium** | **36** | **0** | **100%** | **5.1** | **590** | **107** | **11** | **155** | **1.44** | **248** | **0.0008** | **POSITIVE** | **21.9** |
| **MW-701 QAL** | **Sulfate** | **37** | **0** | **100%** | **11** | **535** | **109** | **45** | **134** | **1.23** | **90** | **0.2443** | **no trend** | **6.45** |
| MW-701 UFB | Bicarbonate alkalinity | 38 | 0 | 100% | 112 | 259 | 151 | 141 | 31.1 | 0.21 | 5 | 0.9594 | no trend | 0 |
| **MW-701 UFB** | **Calcium** | **38** | **0** | **100%** | **26** | **504** | **111** | **36.8** | **148** | **1.33** | **344** | **0.0000** | **POSITIVE** | **3.39** |
| **MW-701 UFB** | **Chloride** | **38** | **17** | **55%** | **10** | **867** | **145** | **14.3** | **260** | **1.80** | **301** | **0.0001** | **POSITIVE** | **5.22** |
| **MW-701 UFB** | **Hardness** | **38** | **0** | **100%** | **141** | **1930** | **445** | **158** | **564** | **1.27** | **293** | **0.0002** | **POSITIVE** | **8.33** |
| **MW-701 UFB** | **Iron** | **38** | **0** | **100%** | **0.21** | **203** | **46.6** | **19** | **59.6** | **1.28** | **287** | **0.0003** | **POSITIVE** | **2.73** |
| **MW-701 UFB** | **Magnesium** | **38** | **0** | **100%** | **13** | **162** | **39.3** | **15** | **48.0** | **1.22** | **229** | **0.0038** | **POSITIVE** | **0.670** |
| MW-701 UFB | Manganese | 38 | 1 | 97% | 0.05 | 19.3 | 4.95 | 2.55 | 5.22 | 1.05 | 121 | 0.1312 | no trend | 0.171 |
| MW-701 UFB | Field pH | 38 | 0 | 100% | 6.5 | 7.55 | 7.15 | 7.22 | 0.312 | 0.04 | -132 | 0.0994 | no trend | -0.024 |
| MW-701 UFB | Potassium | 38 | 0 | 100% | 2.7 | 20 | 6.83 | 4.3 | 5.55 | 0.81 | 124 | 0.1216 | no trend | 0.210 |
| **MW-701 UFB** | **Sodium** | **38** | **0** | **100%** | **4.3** | **530** | **87.6** | **10.4** | **151** | **1.73** | **150** | **0.0608** | **no trend** | **1.52** |
| **MW-701 UFB** | **Sulfate** | **38** | **0** | **100%** | **2.9** | **1950** | **320** | **27** | **563** | **1.76** | **143** | **0.0742** | **no trend** | **7.78** |
| MW-702 QAL | Bicarbonate alkalinity | 37 | 2 | 95% | 2 | 160 | 97.8 | 111 | 38.3 | 0.39 | 310 | 0.0001 | POSITIVE | 6.54 |
| MW-702 QAL | Calcium | 36 | 0 | 100% | 20.8 | 93 | 37.2 | 33.5 | 14.4 | 0.39 | -313 | 0.0000 | NEGATIVE | -3.16 |
| MW-702 QAL | Chloride | 36 | 27 | 25% | 10 | 17 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-702 QAL | Hardness | 36 | 0 | 100% | 74.7 | 227 | 131 | 129 | 37.2 | 0.28 | -357 | 0.0000 | NEGATIVE | -11.0 |
| MW-702 QAL | Iron | 37 | 37 | 0% | 0.013 | 0.2 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-702 QAL | Magnesium | 37 | 0 | 100% | 2.4 | 14.3 | 8.96 | 8.3 | 3.13 | 0.35 | -143 | 0.0631 | no trend | -0.360 |
| MW-702 QAL | Manganese | 37 | 22 | 41% | 0.0011 | 0.55 | 0.10 | 0.05 | 0.114 | 1.15 | -226 | 0.0011 | NEGATIVE | -0.0017 |
| **MW-702 QAL** | **Field pH** | **38** | **0** | **100%** | **6.53** | **11.4** | **8.53** | **8.44** | **1.46** | **0.17** | **-247** | **0.0020** | **NEGATIVE** | **-0.316** |
| MW-702 QAL | Potassium | 36 | 0 | 100% | 3.6 | 18 | 7.70 | 6.35 | 3.98 | 0.52 | -134 | 0.0699 | no trend | -0.347 |
| MW-702 QAL | Sodium | 37 | 0 | 100% | 17 | 60 | 37.3 | 38 | 10.8 | 0.29 | 223 | 0.0037 | POSITIVE | 1.90 |
| MW-702 QAL | Sulfate | 37 | 0 | 100% | 48.2 | 130 | 80.9 | 86 | 23.1 | 0.29 | -402 | 0.0000 | NEGATIVE | -6.72 |
| MW-702 UFB | Bicarbonate alkalinity | 35 | 0 | 100% | 87.2 | 100 | 92.4 | 92.2 | 3.04 | 0.03 | 18 | 0.8090 | no trend | 0.078 |
| MW-702 UFB | Calcium | 36 | 0 | 100% | 26 | 34 | 30.4 | 30.5 | 1.93 | 0.06 | 161 | 0.0291 | POSITIVE | 0.318 |
| MW-702 UFB | Chloride | 37 | 37 | 0% | 0.72 | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-702 UFB | Hardness | 35 | 0 | 100% | 107 | 125 | 117 | 118 | 4.18 | 0.04 | 56 | 0.4316 | no trend | 0.174 |
| MW-702 UFB | Iron | 35 | 1 | 97% | 0.2 | 1.28 | 0.75 | 0.73 | 0.209 | 0.28 | 36 | 0.6190 | no trend | 0.0060 |
| MW-702 UFB | Magnesium | 36 | 0 | 100% | 8.3 | 10.5 | 9.41 | 9.55 | 0.481 | 0.05 | 65 | 0.3803 | no trend | 0.028 |
| MW-702 UFB | Manganese | 37 | 1 | 97% | 0.05 | 0.13 | 0.088 | 0.0864 | 0.012 | 0.14 | -56 | 0.4718 | no trend | -0.0005 |
| MW-702 UFB | Field pH | 36 | 0 | 100% | 5.9 | 9.79 | 7.91 | 7.93 | 0.644 | 0.08 | -27 | 0.7231 | no trend | -0.011 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-702 UFB | Potassium | 36 | 1 | 97% | 2.6 | 3.8 | 3.07 | 3.05 | 0.244 | 0.08 | -87 | 0.2332 | no trend | -0.016 |
| MW-702 UFB | Sodium | 35 | 0 | 100% | 2.7 | 3.4 | 3.09 | 3.1 | 0.192 | 0.06 | 126 | 0.0719 | no trend | 0.029 |
| MW-702 UFB | Sulfate | 37 | 0 | 100% | 28.7 | 37.4 | 33.1 | 33.2 | 1.85 | 0.06 | -20 | 0.8029 | no trend | 0 |
| MW-703 DBA | Bicarbonate alkalinity | 37 | 0 | 100% | 30 | 92 | 66.4 | 69.0 | 15.4 | 0.23 | 250 | 0.0011 | POSITIVE | 3.16 |
| MW-703 DBA | Calcium | 37 | 0 | 100% | 4.1 | 29.5 | 19.9 | 23.6 | 7.77 | 0.39 | 257 | 0.0008 | POSITIVE | 1.51 |
| MW-703 DBA | Chloride | 38 | 0 | 100% | 13.9 | 20 | 16.4 | 15.8 | 1.8 | 0.11 | -475 | 0.0000 | NEGATIVE | -0.604 |
| MW-703 DBA | Hardness | 37 | 0 | 100% | 29 | 137 | 94.4 | 100 | 26.3 | 0.28 | 81 | 0.2951 | no trend | 2.15 |
| MW-703 DBA | Iron | 38 | 30 | 21% | 0.2 | 1.7 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 DBA | Magnesium | 37 | 0 | 100% | 4.2 | 16 | 10.3 | 10.3 | 2.69 | 0.26 | -124 | 0.1074 | no trend | -0.286 |
| MW-703 DBA | Manganese | 38 | 37 | 3% | 0.0011 | 0.059 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 DBA | Field pH | 34 | 0 | 100% | 8.14 | 10.68 | 9.02 | 9.10 | 0.496 | 0.05 | -124 | 0.0681 | no trend | -0.053 |
| MW-703 DBA | Potassium | 37 | 0 | 100% | 3.1 | 29 | 13.9 | 14 | 6.91 | 0.50 | -196 | 0.0107 | NEGATIVE | -1.17 |
| MW-703 DBA | Sodium | 37 | 0 | 100% | 6.5 | 15 | 10.3 | 9.7 | 2.63 | 0.26 | -303 | 0.0001 | NEGATIVE | -0.682 |
| MW-703 DBA | Sulfate | 36 | 1 | 97% | 1 | 236 | 37.3 | 35.0 | 38.6 | 1.03 | 140 | 0.0582 | no trend | 2.48 |
| MW-703 LLA | Bicarbonate alkalinity | 37 | 0 | 100% | 63.4 | 87 | 77.4 | 77.2 | 5.92 | 0.08 | -134 | 0.0818 | no trend | -0.772 |
| MW-703 LLA | Calcium | 36 | 0 | 100% | 16 | 35 | 25.2 | 25.3 | 3.68 | 0.15 | -144 | 0.0509 | no trend | -0.287 |
| MW-703 LLA | Chloride | 36 | 1 | 97% | 10 | 75 | 22.7 | 12 | 19.9 | 0.88 | -309 | 0.0000 | NEGATIVE | -2.04 |
| MW-703 LLA | Hardness | 36 | 0 | 100% | 74.2 | 135 | 107 | 108 | 13.3 | 0.12 | -244 | 0.0009 | NEGATIVE | -2.63 |
| MW-703 LLA | Iron | 35 | 3 | 91% | 0.2 | 1.2 | 0.58 | 0.583 | 0.222 | 0.38 | -225 | 0.0015 | NEGATIVE | -0.040 |
| MW-703 LLA | Magnesium | 36 | 0 | 100% | 8.3 | 12 | 10.1 | 10 | 0.939 | 0.09 | -139 | 0.0588 | no trend | -0.119 |
| MW-703 LLA | Manganese | 37 | 6 | 84% | 0.05 | 0.094 | 0.068 | 0.071 | 0.013 | 0.20 | -107 | 0.1636 | no trend | -0.0010 |
| MW-703 LLA | Field pH | 38 | 0 | 100% | 8 | 9.19 | 8.47 | 8.39 | 0.358 | 0.04 | -182 | 0.0228 | NEGATIVE | -0.051 |
| MW-703 LLA | Potassium | 36 | 0 | 100% | 2.7 | 7.6 | 4.33 | 3.75 | 1.36 | 0.31 | -131 | 0.0762 | no trend | -0.178 |
| MW-703 LLA | Sodium | 37 | 0 | 100% | 5.9 | 53 | 14.5 | 8.3 | 12.1 | 0.83 | -154 | 0.0452 | NEGATIVE | -1.16 |
| MW-703 LLA | Sulfate | 37 | 0 | 100% | 5.6 | 134 | 31.5 | 31.9 | 19.1 | 0.60 | 60 | 0.4400 | no trend | 0.289 |
| MW-703 QAL | Bicarbonate alkalinity | 37 | 0 | 100% | 46.8 | 91 | 58.3 | 54.5 | 11.6 | 0.20 | -338 | 0.0000 | NEGATIVE | -2.45 |
| MW-703 QAL | Calcium | 37 | 0 | 100% | 13 | 33 | 19.3 | 18.6 | 4.00 | 0.21 | -160 | 0.0373 | NEGATIVE | -0.290 |
| MW-703 QAL | Chloride | 37 | 37 | 0% | 0.72 | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 QAL | Hardness | 35 | 0 | 100% | 64 | 119 | 81.0 | 78.3 | 12.0 | 0.15 | -145 | 0.0407 | NEGATIVE | -1.18 |
| MW-703 QAL | Iron | 37 | 35 | 5% | 0.2 | 0.25 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 QAL | Magnesium | 37 | 0 | 100% | 5.9 | 9.7 | 7.78 | 7.9 | 0.874 | 0.11 | 9 | 0.9164 | no trend | 0 |
| MW-703 QAL | Manganese | 37 | 31 | 16% | 0.05 | 0.091 | -- | -- | -- | -- | -- | -- | -- | -- |
| **MW-703 QAL** | **Field pH** | **38** | **0** | **100%** | **5.53** | **8.01** | **6.23** | **6.08** | **0.670** | **0.11** | **-489** | **0.0000** | **NEGATIVE** | **-0.161** |
| MW-703 QAL | Potassium | 37 | 1 | 97% | 1.3 | 2.7 | 1.66 | 1.6 | 0.314 | 0.19 | -249 | 0.0009 | NEGATIVE | -0.045 |
| MW-703 QAL | Sodium | 37 | 0 | 100% | 1.7 | 7.8 | 2.83 | 2 | 1.64 | 0.58 | -472 | 0.0000 | NEGATIVE | -0.265 |
| MW-703 QAL | Sulfate | 37 | 0 | 100% | 12 | 178 | 28.9 | 24.5 | 25.9 | 0.90 | -45 | 0.5646 | no trend | -0.301 |
| MW-703 UFB | Bicarbonate alkalinity | 36 | 0 | 100% | 75 | 94 | 81.6 | 81.2 | 4.05 | 0.05 | -72 | 0.3323 | no trend | -0.223 |
| MW-703 UFB | Calcium | 36 | 0 | 100% | 28 | 35 | 31.7 | 31.6 | 1.35 | 0.04 | 143 | 0.0514 | no trend | 0.119 |
| MW-703 UFB | Chloride | 37 | 37 | 0% | 0.72 | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 UFB | Hardness | 35 | 0 | 100% | 118 | 147 | 125 | 124 | 6.35 | 0.05 | -63 | 0.3763 | no trend | -0.261 |

# 2022 Groundwater Trend Analysis
## Humboldt Mill

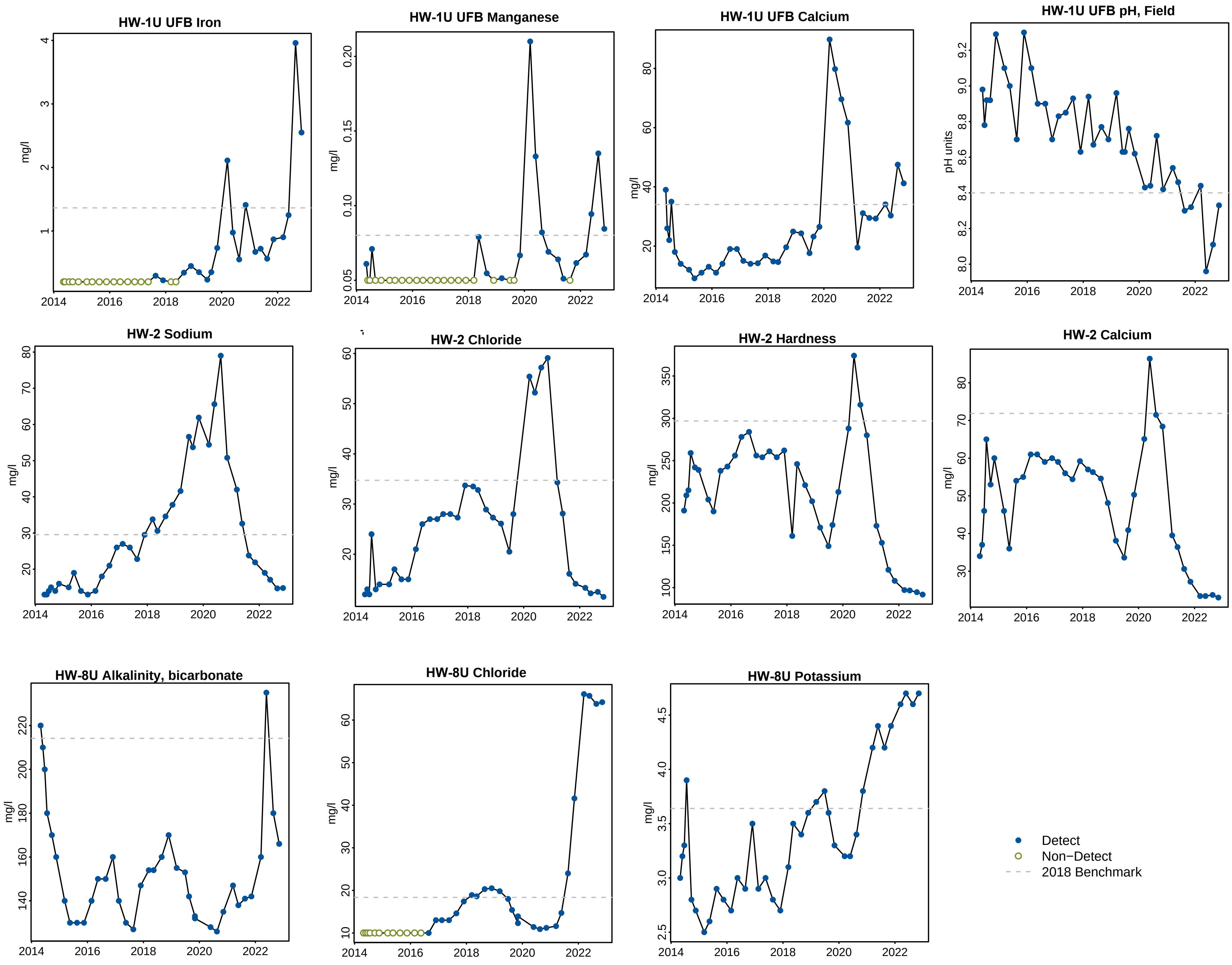
| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-703 UFB | Iron | 37 | 1 | 97% | 0.2 | 1.97 | 1.31 | 1.4 | 0.416 | 0.32 | 199 | 0.0095 | POSITIVE | 0.069 |
| MW-703 UFB | Magnesium | 36 | 0 | 100% | 9.6 | 11.1 | 10.5 | 10.5 | 0.450 | 0.04 | -21 | 0.7831 | no trend | 0 |
| MW-703 UFB | Manganese | 34 | 1 | 97% | 0.13 | 0.25 | 0.18 | 0.183 | 0.023 | 0.13 | 283 | 0.0000 | POSITIVE | 0.0060 |
| MW-703 UFB | Field pH | 36 | 0 | 100% | 6.3 | 8.86 | 7.99 | 8 | 0.413 | 0.05 | -76 | 0.3068 | no trend | -0.025 |
| MW-703 UFB | Potassium | 36 | 1 | 97% | 2.1 | 3.4 | 2.39 | 2.3 | 0.293 | 0.12 | -400 | 0.0000 | NEGATIVE | -0.052 |
| MW-703 UFB | Sodium | 36 | 0 | 100% | 2.7 | 5.5 | 3.10 | 3 | 0.517 | 0.17 | -100 | 0.1610 | no trend | 0 |
| MW-703 UFB | Sulfate | 37 | 0 | 100% | 38.5 | 532 | 58.6 | 45 | 80.0 | 1.37 | 143 | 0.0627 | no trend | 0.268 |
| **MW-704 DBA** | **Bicarbonate alkalinity** | **37** | **0** | **100%** | **83** | **144** | **122** | **126** | **15.3** | **0.13** | **284** | **0.0002** | **POSITIVE** | **2.95** |
| MW-704 DBA | Calcium | 37 | 0 | 100% | 16 | 28.6 | 22.3 | 22.4 | 2.82 | 0.13 | 383 | 0.0000 | POSITIVE | 0.678 |
| MW-704 DBA | Chloride | 38 | 38 | 0% | 0.72 | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-704 DBA | Hardness | 37 | 0 | 100% | 76 | 129 | 106 | 106 | 11.0 | 0.10 | 292 | 0.0001 | POSITIVE | 2.10 |
| MW-704 DBA | Iron | 38 | 3 | 92% | 0.2 | 0.95 | 0.67 | 0.72 | 0.195 | 0.29 | 278 | 0.0005 | POSITIVE | 0.037 |
| MW-704 DBA | Magnesium | 37 | 0 | 100% | 9.3 | 14.2 | 11.3 | 11.3 | 1.09 | 0.10 | 228 | 0.0029 | POSITIVE | 0.184 |
| MW-704 DBA | Manganese | 38 | 18 | 53% | 0.0011 | 0.075 | 0.053 | 0.05095 | 0.011 | 0.20 | 334 | 0.0000 | POSITIVE | 0.0009 |
| MW-704 DBA | Field pH | 38 | 0 | 100% | 7.6 | 9.23 | 8.39 | 8.41 | 0.383 | 0.05 | -320 | 0.0001 | NEGATIVE | -0.086 |
| MW-704 DBA | Potassium | 38 | 1 | 97% | 2.3 | 3.5 | 2.73 | 2.7 | 0.253 | 0.09 | 7 | 0.9390 | no trend | 0 |
| MW-704 DBA | Sodium | 38 | 0 | 100% | 9.1 | 13 | 10.9 | 11 | 0.803 | 0.07 | -15 | 0.8589 | no trend | 0 |
| MW-704 DBA | Sulfate | 38 | 25 | 34% | 0.86 | 4.6 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-704 LLA | Bicarbonate alkalinity | 39 | 0 | 100% | 55 | 224 | 136 | 135 | 42.6 | 0.31 | 471 | 0.0000 | POSITIVE | 13.0 |
| **MW-704 LLA** | **Calcium** | **39** | **0** | **100%** | **11** | **70.4** | **34.0** | **28** | **17.9** | **0.52** | **454** | **0.0000** | **POSITIVE** | **5.56** |
| **MW-704 LLA** | **Chloride** | **39** | **22** | **44%** | **10** | **75.8** | **20.1** | **10** | **19.6** | **0.98** | **502** | **0.0000** | **POSITIVE** | **1.91** |
| **MW-704 LLA** | **Hardness** | **38** | **0** | **100%** | **66** | **289** | **155** | **143** | **64.8** | **0.42** | **453** | **0.0000** | **POSITIVE** | **19.7** |
| **MW-704 LLA** | **Iron** | **38** | **4** | **89%** | **0.2** | **4.14** | **1.27** | **0.934** | **1.09** | **0.85** | **482** | **0.0000** | **POSITIVE** | **0.279** |
| **MW-704 LLA** | **Magnesium** | **39** | **0** | **100%** | **9.2** | **27.5** | **16.2** | **15** | **5.11** | **0.32** | **475** | **0.0000** | **POSITIVE** | **1.64** |
| **MW-704 LLA** | **Manganese** | **39** | **11** | **72%** | **0.05** | **0.293** | **0.11** | **0.08** | **0.075** | **0.66** | **420** | **0.0000** | **POSITIVE** | **0.022** |
| **MW-704 LLA** | **Field pH** | **37** | **0** | **100%** | **7.66** | **9.2** | **8.32** | **8.24** | **0.426** | **0.05** | **-453** | **0.0000** | **NEGATIVE** | **-0.134** |
| MW-704 LLA | Potassium | 39 | 0 | 100% | 3.8 | 11 | 6.47 | 6.4 | 1.86 | 0.29 | 183 | 0.0275 | POSITIVE | 0.225 |
| MW-704 LLA | Sodium | 37 | 0 | 100% | 3.6 | 9.3 | 5.29 | 5 | 1.39 | 0.26 | 338 | 0.0000 | POSITIVE | 0.265 |
| MW-704 LLA | Sulfate | 39 | 0 | 100% | 2.2 | 22 | 10.5 | 10.4 | 4.19 | 0.40 | -64 | 0.4458 | no trend | -0.296 |
| MW-704 QAL | Bicarbonate alkalinity | 38 | 0 | 100% | 48.6 | 283 | 120 | 114 | 56.6 | 0.47 | -78 | 0.3326 | no trend | -3.24 |
| MW-704 QAL | Calcium | 38 | 0 | 100% | 16.2 | 84.8 | 38.8 | 35.1 | 16.5 | 0.43 | 181 | 0.0236 | POSITIVE | 2.74 |
| **MW-704 QAL** | **Chloride** | **38** | **6** | **84%** | **10** | **269** | **46.3** | **18.3** | **60.1** | **1.30** | **364** | **0.0000** | **POSITIVE** | **2.64** |
| MW-704 QAL | Hardness | 38 | 0 | 100% | 63.1 | 344 | 155 | 141 | 66.2 | 0.43 | 197 | 0.0137 | POSITIVE | 11.6 |
| MW-704 QAL | Iron | 38 | 12 | 68% | 0.013 | 103 | 14.6 | 3.55 | 24.7 | 1.69 | -176 | 0.0258 | NEGATIVE | -0.601 |
| MW-704 QAL | Magnesium | 38 | 0 | 100% | 5.5 | 32.2 | 12.7 | 11 | 6.58 | 0.52 | 335 | 0.0000 | POSITIVE | 1.61 |
| MW-704 QAL | Manganese | 38 | 2 | 95% | 0.05 | 7.2 | 2.46 | 1.58 | 2.16 | 0.88 | -71 | 0.3787 | no trend | -0.069 |
| MW-704 QAL | Field pH | 38 | 0 | 100% | 5.29 | 6.51 | 5.86 | 5.8 | 0.281 | 0.05 | -218 | 0.0063 | NEGATIVE | -0.038 |
| MW-704 QAL | Potassium | 36 | 0 | 100% | 1.6 | 6.3 | 2.97 | 2.7 | 1.02 | 0.34 | 237 | 0.0013 | POSITIVE | 0.174 |
| MW-704 QAL | Sodium | 38 | 0 | 100% | 2.5 | 48.6 | 19.6 | 18.8 | 10.9 | 0.56 | 225 | 0.0049 | POSITIVE | 1.95 |
| MW-704 QAL | Sulfate | 38 | 1 | 97% | 1 | 96.8 | 30.2 | 23.6 | 21.5 | 0.71 | 153 | 0.0560 | no trend | 1.62 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-704 UFB | Bicarbonate alkalinity | 34 | 0 | 100% | 91 | 190 | 145 | 145 | 26.1 | 0.18 | -27 | 0.6995 | no trend | -0.751 |
| MW-704 UFB | Calcium | 33 | 0 | 100% | 10 | 110 | 52.9 | 50.2 | 26.2 | 0.49 | 259 | 0.0001 | POSITIVE | 7.40 |
| **MW-704 UFB** | **Chloride** | **34** | **8** | **76%** | **10** | **434** | **78.4** | **25** | **105** | **1.34** | **372** | **0.0000** | **POSITIVE** | **8.18** |
| MW-704 UFB | Hardness | 33 | 0 | 100% | 68 | 425 | 198 | 184 | 102 | 0.51 | 287 | 0.0000 | POSITIVE | 28.6 |
| MW-704 UFB | Iron | 33 | 0 | 100% | 0.21 | 79.8 | 33.9 | 35.3 | 25.1 | 0.74 | 286 | 0.0000 | POSITIVE | 6.86 |
| MW-704 UFB | Magnesium | 33 | 0 | 100% | 1.8 | 37 | 14.9 | 13.1 | 9.87 | 0.66 | 334 | 0.0000 | POSITIVE | 2.87 |
| MW-704 UFB | Manganese | 32 | 0 | 100% | 0.089 | 2.17 | 1.00 | 0.915 | 0.539 | 0.54 | 217 | 0.0005 | POSITIVE | 0.141 |
| MW-704 UFB | Field pH | 33 | 2 | 94% | 6.26 | 7.28 | 6.82 | 6.82 | 0.231 | 0.03 | -68 | 0.2989 | no trend | -0.018 |
| MW-704 UFB | Potassium | 34 | 0 | 100% | 0.81 | 5.5 | 3.25 | 3.3 | 1.13 | 0.35 | 105 | 0.1219 | no trend | 0.120 |
| MW-704 UFB | Sodium | 34 | 0 | 100% | 6.2 | 70.4 | 26.8 | 21.0 | 18.6 | 0.70 | 184 | 0.0067 | POSITIVE | 2.90 |
| MW-704 UFB | Sulfate | 31 | 0 | 100% | 3.3 | 47.4 | 16.8 | 10.6 | 14.0 | 0.83 | -122 | 0.0396 | NEGATIVE | -0.891 |
| MW-705 QAL | Bicarbonate alkalinity | 37 | 0 | 100% | 31.1 | 90 | 55.2 | 56.0 | 12.1 | 0.22 | -99 | 0.1997 | no trend | -0.927 |
| MW-705 QAL | Calcium | 38 | 0 | 100% | 11.7 | 24 | 16.8 | 17 | 3.17 | 0.19 | -117 | 0.1440 | no trend | -0.367 |
| **MW-705 QAL** | **Chloride** | **38** | **0** | **100%** | **15.8** | **83.9** | **43.6** | **38.9** | **18.9** | **0.43** | **205** | **0.0103** | **POSITIVE** | **3.60** |
| MW-705 QAL | Hardness | 38 | 0 | 100% | 48.1 | 109 | 75.0 | 74.0 | 14.3 | 0.19 | -191 | 0.0169 | NEGATIVE | -2.55 |
| MW-705 QAL | Iron | 38 | 0 | 100% | 1.9 | 13.6 | 8.86 | 8.86 | 2.16 | 0.24 | 92 | 0.2524 | no trend | 0.125 |
| MW-705 QAL | Magnesium | 38 | 0 | 100% | 4.6 | 11 | 7.37 | 7.25 | 1.49 | 0.20 | -164 | 0.0401 | NEGATIVE | -0.207 |
| MW-705 QAL | Manganese | 38 | 5 | 87% | 0.05 | 2.5 | 0.91 | 0.879 | 0.417 | 0.46 | -52 | 0.5211 | no trend | -0.011 |
| MW-705 QAL | Field pH | 38 | 0 | 100% | 5.62 | 6.7 | 6.17 | 6.16 | 0.234 | 0.04 | -39 | 0.6323 | no trend | -0.0061 |
| MW-705 QAL | Potassium | 38 | 1 | 97% | 1.8 | 3.2 | 2.53 | 2.55 | 0.316 | 0.12 | 43 | 0.5945 | no trend | 0 |
| **MW-705 QAL** | **Sodium** | **38** | **0** | **100%** | **4.3** | **38.3** | **17.9** | **14** | **8.63** | **0.48** | **492** | **0.0000** | **POSITIVE** | **2.61** |
| MW-705 QAL | Sulfate | 36 | 0 | 100% | 1.5 | 64.7 | 7.27 | 5.05 | 10.3 | 1.41 | 99 | 0.1817 | no trend | 0.292 |
| MW-705 UFB | Bicarbonate alkalinity | 38 | 0 | 100% | 73.6 | 164 | 88.5 | 85.5 | 14.4 | 0.16 | -258 | 0.0012 | NEGATIVE | -1.53 |
| **MW-705 UFB** | **Calcium** | **39** | **0** | **100%** | **18** | **36.9** | **26.4** | **25.9** | **5.40** | **0.20** | **557** | **0.0000** | **POSITIVE** | **1.91** |
| **MW-705 UFB** | **Chloride** | **39** | **9** | **77%** | **10** | **69.1** | **33.0** | **31.9** | **19.9** | **0.60** | **688** | **0.0000** | **POSITIVE** | **6.65** |
| **MW-705 UFB** | **Hardness** | **38** | **0** | **100%** | **92** | **166** | **123** | **121** | **21.4** | **0.17** | **521** | **0.0000** | **POSITIVE** | **7.27** |
| MW-705 UFB | Iron | 39 | 0 | 100% | 0.68 | 15.7 | 9.01 | 8.77 | 2.78 | 0.31 | 323 | 0.0001 | POSITIVE | 0.571 |
| **MW-705 UFB** | **Magnesium** | **39** | **0** | **100%** | **9** | **17.8** | **13.2** | **13.3** | **2.49** | **0.19** | **557** | **0.0000** | **POSITIVE** | **0.838** |
| **MW-705 UFB** | **Manganese** | **37** | **0** | **100%** | **0.53** | **1.32** | **0.93** | **0.9** | **0.222** | **0.24** | **516** | **0.0000** | **POSITIVE** | **0.071** |
| **MW-705 UFB** | **Field pH** | **36** | **0** | **100%** | **6.5** | **8.8** | **7.05** | **6.96** | **0.437** | **0.06** | **-151** | **0.0408** | **NEGATIVE** | **-0.031** |
| **MW-705 UFB** | **Potassium** | **39** | **0** | **100%** | **3.1** | **4.3** | **3.62** | **3.6** | **0.295** | **0.08** | **251** | **0.0022** | **POSITIVE** | **0.050** |
| **MW-705 UFB** | **Sodium** | **39** | **0** | **100%** | **2.4** | **4.9** | **3.31** | **3.1** | **0.692** | **0.21** | **484** | **0.0000** | **POSITIVE** | **0.195** |
| MW-705 UFB | Sulfate | 39 | 0 | 100% | 2.4 | 13 | 5.51 | 4.2 | 3.24 | 0.59 | -372 | 0.0000 | NEGATIVE | -0.654 |
| MW-706 QAL | Bicarbonate alkalinity | 36 | 0 | 100% | 67.8 | 120 | 82.4 | 78.7 | 12.8 | 0.16 | -126 | 0.0884 | no trend | -1.60 |
| MW-706 QAL | Calcium | 36 | 0 | 100% | 55.7 | 110 | 76.3 | 68.9 | 15.7 | 0.21 | -526 | 0.0000 | NEGATIVE | -5.31 |
| MW-706 QAL | Chloride | 38 | 0 | 100% | 86 | 153 | 125 | 131 | 21.0 | 0.17 | 318 | 0.0001 | POSITIVE | 5.47 |
| MW-706 QAL | Hardness | 38 | 0 | 100% | 6 | 503 | 239 | 260 | 135 | 0.57 | -109 | 0.1742 | no trend | -6.06 |
| MW-706 QAL | Iron | 36 | 0 | 100% | 1.6 | 7.8 | 3.71 | 3.14 | 1.68 | 0.45 | -556 | 0.0000 | NEGATIVE | -0.584 |
| MW-706 QAL | Magnesium | 36 | 0 | 100% | 23 | 37 | 28.9 | 27.3 | 4.00 | 0.14 | -450 | 0.0000 | NEGATIVE | -1.29 |
| MW-706 QAL | Manganese | 37 | 3 | 92% | 9.37 | 25 | 14.7 | 14 | 4.54 | 0.31 | -464 | 0.0000 | NEGATIVE | -1.19 |

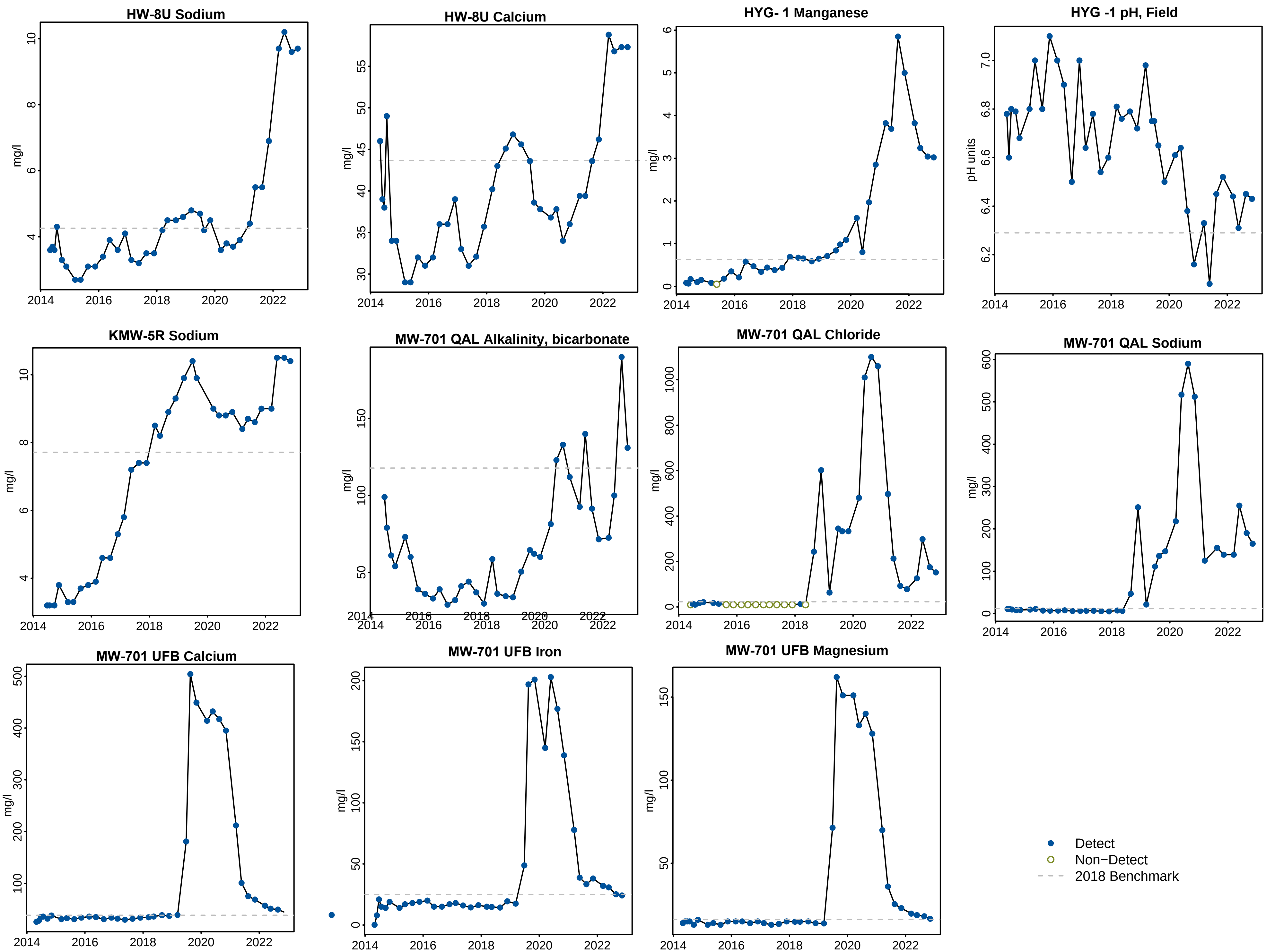
| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-706 QAL | Field pH | 38 | 0 | 100% | 5.52 | 7.01 | 5.98 | 5.87 | 0.369 | 0.06 | -396 | 0.0000 | NEGATIVE | -0.090 |
| MW-706 QAL | Potassium | 37 | 0 | 100% | 4 | 5.2 | 4.57 | 4.6 | 0.249 | 0.05 | -15 | 0.8521 | no trend | 0 |
| MW-706 QAL | Sodium | 35 | 0 | 100% | 24 | 58.8 | 42.3 | 44.9 | 9.31 | 0.22 | 413 | 0.0000 | POSITIVE | 3.00 |
| MW-706 QAL | Sulfate | 38 | 0 | 100% | 124 | 430 | 201 | 188 | 81.5 | 0.40 | -575 | 0.0000 | NEGATIVE | -19.1 |
| MW-707 QAL | Bicarbonate alkalinity | 37 | 0 | 100% | 145 | 170 | 157 | 158 | 6.39 | 0.04 | 61 | 0.4267 | no trend | 0 |
| MW-707 QAL | Calcium | 37 | 0 | 100% | 33 | 45 | 41.5 | 42 | 2.19 | 0.05 | 177 | 0.0210 | POSITIVE | 0.270 |
| MW-707 QAL | Chloride | 37 | 37 | 0% | 0.72 | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-707 QAL | Hardness | 36 | 0 | 100% | 145 | 160 | 153 | 153 | 4.08 | 0.03 | 25 | 0.7418 | no trend | 0 |
| MW-707 QAL | Iron | 37 | 0 | 100% | 3.41 | 7.2 | 4.82 | 4.44 | 0.941 | 0.20 | -476 | 0.0000 | NEGATIVE | -0.289 |
| MW-707 QAL | Magnesium | 37 | 0 | 100% | 10.7 | 14 | 11.6 | 11.5 | 0.662 | 0.06 | -264 | 0.0005 | NEGATIVE | -0.128 |
| MW-707 QAL | Manganese | 37 | 2 | 95% | 0.05 | 1.2 | 0.92 | 0.939 | 0.171 | 0.19 | -117 | 0.1285 | no trend | -0.0066 |
| MW-707 QAL | Field pH | 38 | 0 | 100% | 6.55 | 7.5 | 6.97 | 6.98 | 0.192 | 0.03 | 107 | 0.1820 | no trend | 0.013 |
| MW-707 QAL | Potassium | 37 | 1 | 97% | 2.1 | 3.2 | 2.38 | 2.4 | 0.201 | 0.08 | -221 | 0.0032 | NEGATIVE | -0.029 |
| MW-707 QAL | Sodium | 36 | 0 | 100% | 2.6 | 3.9 | 2.94 | 2.95 | 0.250 | 0.09 | -327 | 0.0000 | NEGATIVE | -0.052 |
| MW-707 QAL | Sulfate | 37 | 16 | 57% | 0.86 | 9.8 | 3.85 | 3.2 | 2.94 | 0.76 | -413 | 0.0000 | NEGATIVE | -0.893 |
| MW-9R | Bicarbonate alkalinity | 34 | 2 | 94% | 2 | 82 | 40.1 | 37.0 | 19.9 | 0.50 | -45 | 0.5141 | no trend | -0.702 |
| MW-9R | Calcium | 34 | 0 | 100% | 15.3 | 166 | 46.0 | 37.1 | 33.0 | 0.72 | -225 | 0.0009 | NEGATIVE | -5.40 |
| MW-9R | Chloride | 34 | 7 | 79% | 10 | 190 | 34.6 | 16.8 | 45.4 | 1.31 | -282 | 0.0000 | NEGATIVE | -2.76 |
| MW-9R | Hardness | 34 | 0 | 100% | 59 | 609 | 186 | 147 | 131 | 0.70 | -258 | 0.0001 | NEGATIVE | -26.1 |
| MW-9R | Iron | 34 | 20 | 41% | 0.0155 | 29.7 | 1.63 | 0.2 | 5.06 | 3.10 | -67 | 0.2714 | no trend | 0 |
| MW-9R | Magnesium | 34 | 0 | 100% | 5.1 | 47.4 | 15.9 | 11.8 | 10.9 | 0.69 | -257 | 0.0001 | NEGATIVE | -2.27 |
| MW-9R | Manganese | 34 | 12 | 65% | 0.05 | 4.3 | 0.36 | 0.066 | 0.770 | 2.11 | -298 | 0.0000 | NEGATIVE | -0.034 |
| MW-9R | Field pH | 35 | 0 | 100% | 3.35 | 6.52 | 5.89 | 6.01 | 0.500 | 0.08 | -34 | 0.6388 | no trend | -0.0065 |
| MW-9R | Potassium | 34 | 0 | 100% | 1.5 | 10.4 | 2.93 | 2.6 | 1.61 | 0.55 | -229 | 0.0007 | NEGATIVE | -0.249 |
| MW-9R | Sodium | 34 | 0 | 100% | 5.3 | 47 | 14.4 | 9.5 | 11.5 | 0.80 | -305 | 0.0000 | NEGATIVE | -1.79 |
| MW-9R | Sulfate | 34 | 0 | 100% | 26.8 | 776 | 131 | 85.1 | 138 | 1.05 | -228 | 0.0008 | NEGATIVE | -17.2 |

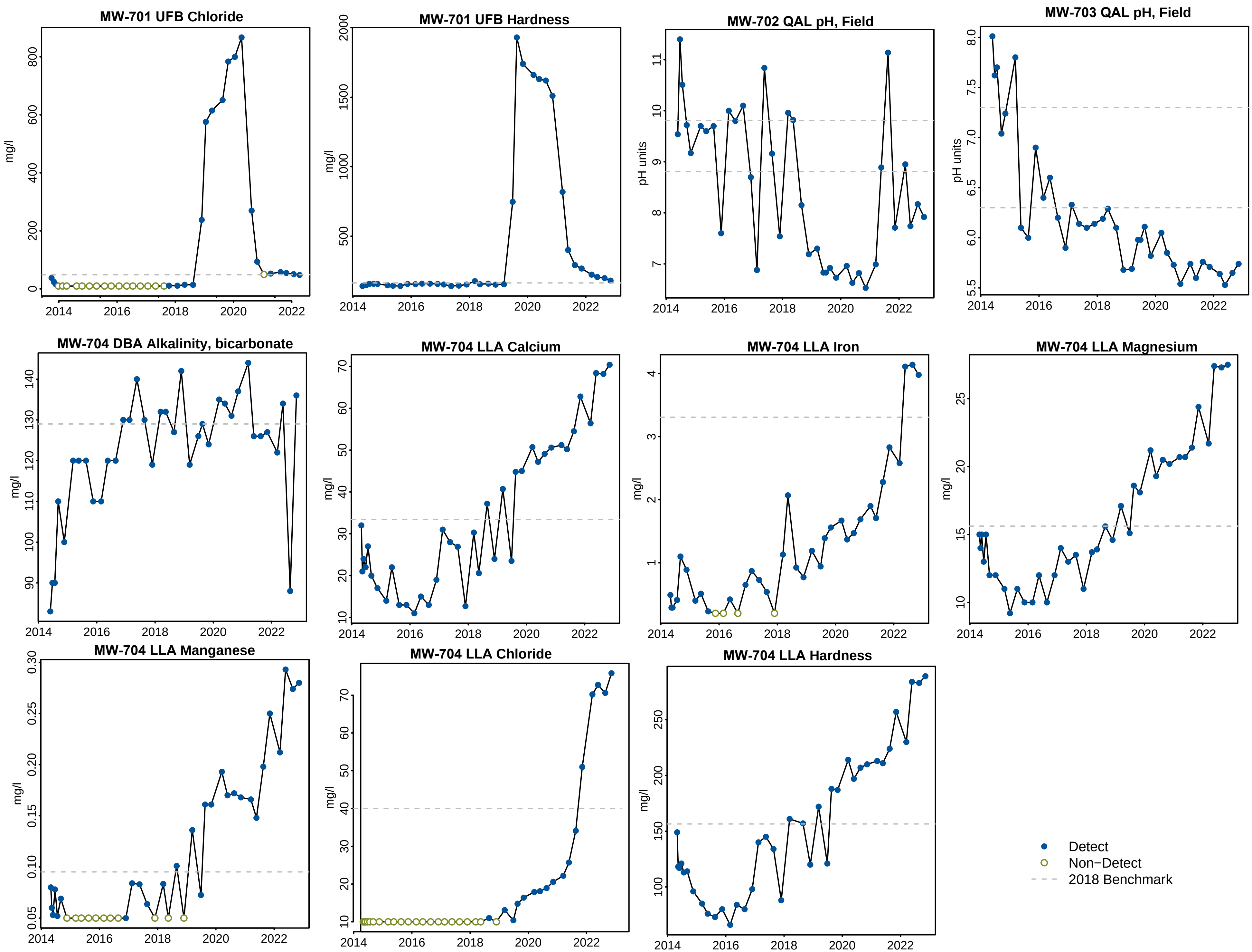
-- Insufficient number or fraction of detected values for calculation

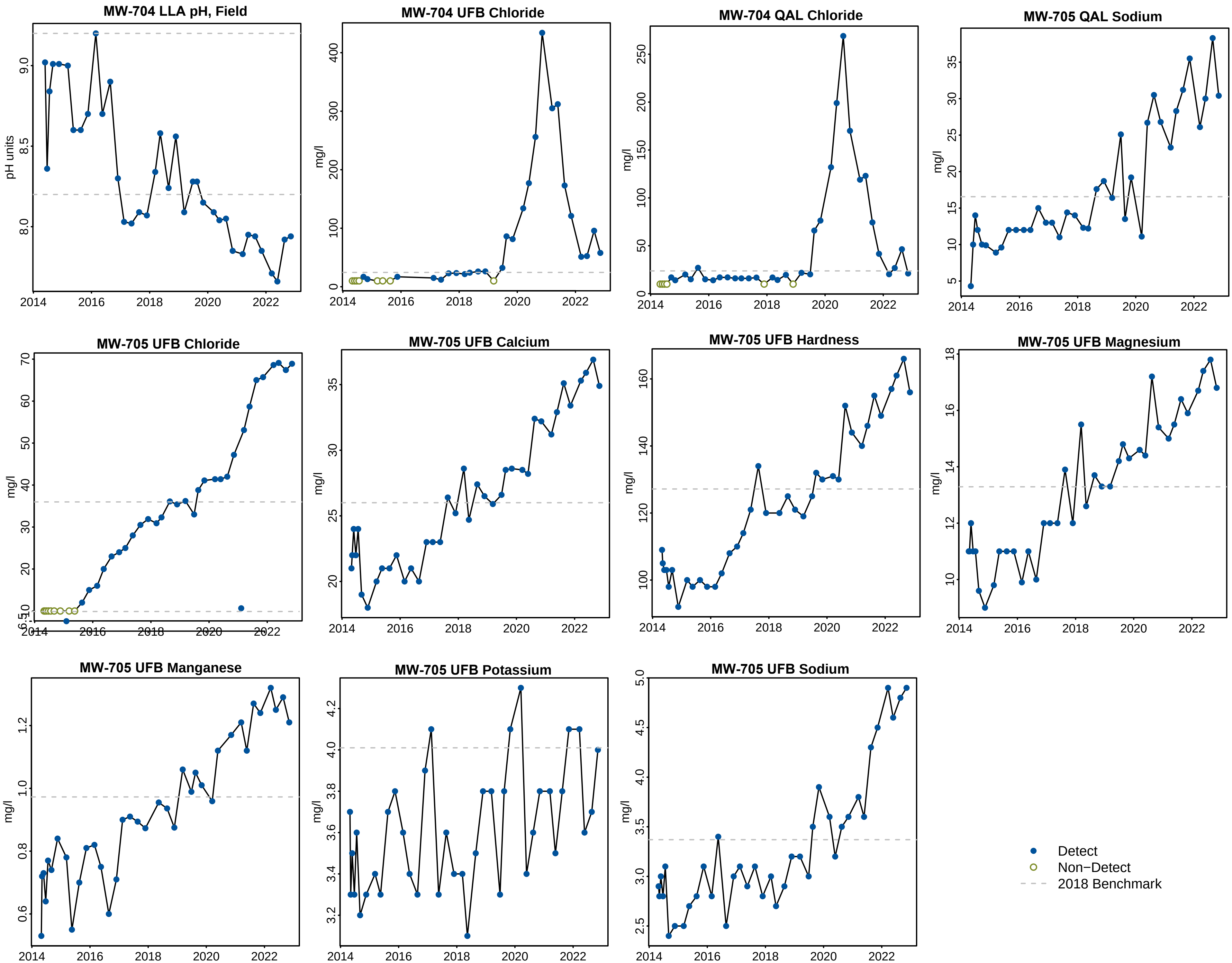
**Bold:** Exceeded benchmark for two or more consecutive quarters between 2021 Q4 and 2022 Q4

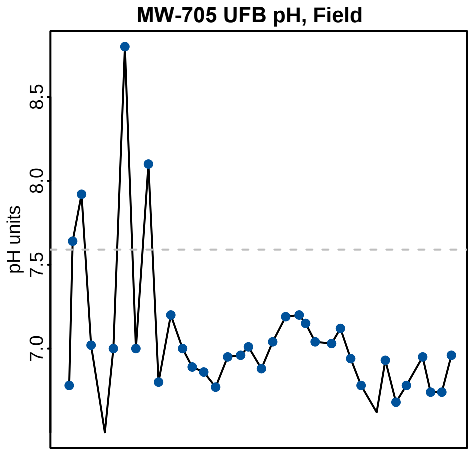


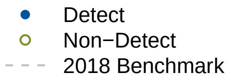
HW-1U UFB Iron
HW-1U UFB Manganese
HW-1U UFB Calcium
HW-1U UFB pH, Field
HW-2 Sodium
HW-2 Chloride
HW-2 Hardness
HW-2 Calcium
HW-8U Alkalinity, bicarbonate
HW-8U Chloride
HW-8U Potassium
mg/l
pH units
2014
2016
2018
2020
2022
Detect
Non−Detect
2018 Benchmark


HW-8U Sodium
HW-8U Calcium
HYG- 1 Manganese
HYG -1 pH, Field
KMW-5R Sodium
MW-701 QAL Alkalinity, bicarbonate
MW-701 QAL Chloride
MW-701 QAL Sodium
MW-701 UFB Calcium
MW-701 UFB Iron
MW-701 UFB Magnesium
mg/l
pH units
2014
2016
2018
2020
2022
Detect
Non−Detect
2018 Benchmark


MW-701 UFB Chloride
MW-701 UFB Hardness
MW-702 QAL pH, Field
MW-703 QAL pH, Field
MW-704 DBA Alkalinity, bicarbonate
MW-704 LLA Calcium
MW-704 LLA Iron
MW-704 LLA Magnesium
MW-704 LLA Manganese
MW-704 LLA Chloride
MW-704 LLA Hardness
mg/l
pH units
2014
2016
2018
2020
2022
Detect
Non−Detect
2018 Benchmark


MW-704 LLA pH, Field
pH units
MW-704 UFB Chloride
mg/l
MW-704 QAL Chloride
mg/l
MW-705 QAL Sodium
mg/l
MW-705 UFB Chloride
mg/l
MW-705 UFB Calcium
mg/l
MW-705 UFB Hardness
mg/l
MW-705 UFB Magnesium
mg/l
MW-705 UFB Manganese
mg/l
MW-705 UFB Potassium
mg/l
MW-705 UFB Sodium
mg/l
2014
2016
2018
2020
2022
Detect
Non−Detect
2018 Benchmark


MW-705 UFB pH, Field
pH units
7.0
7.5
8.0
8.5

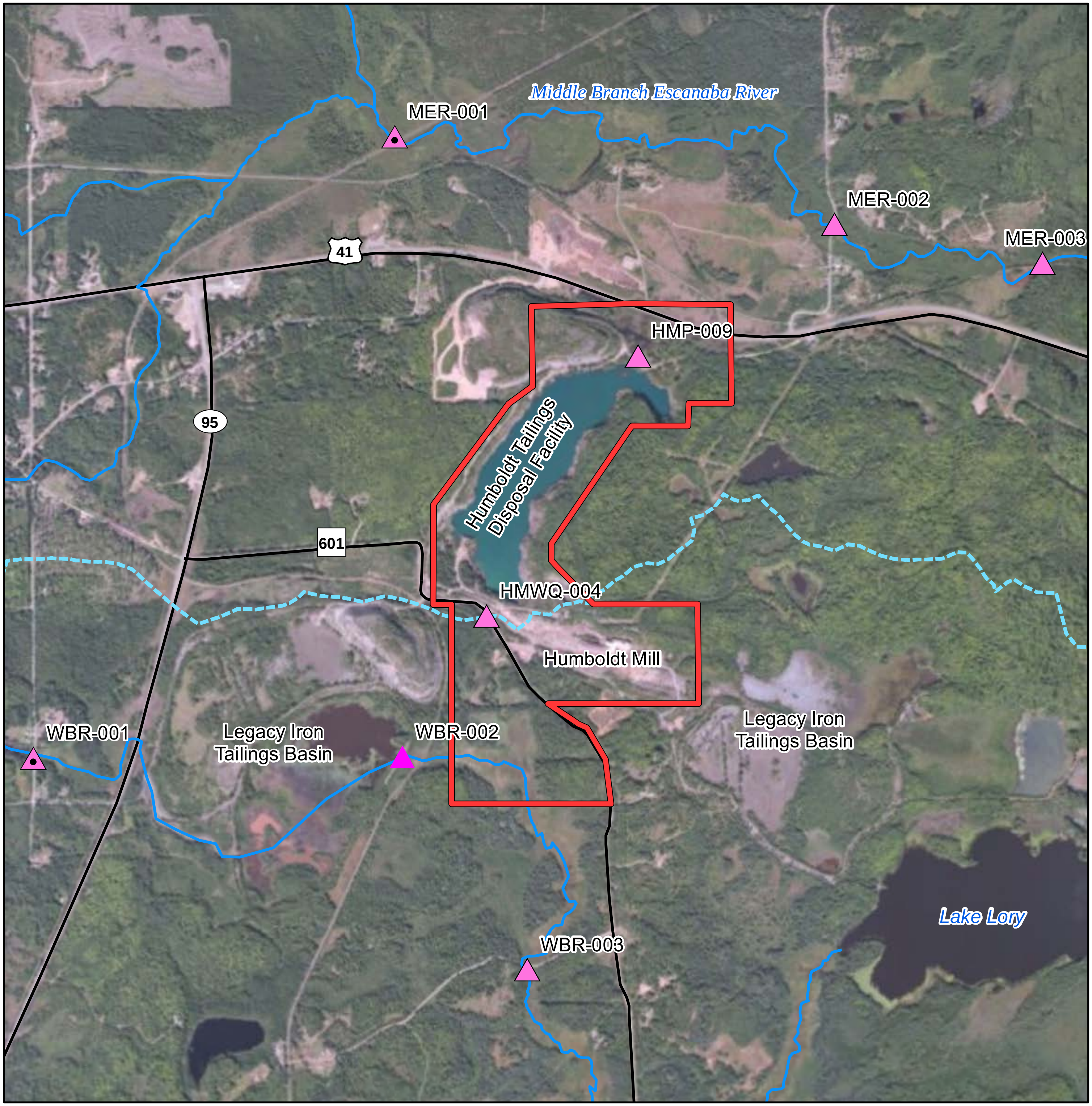

Detect
Non−Detect
2018 Benchmark

# Appendix H

# Humboldt Mill

# Surface Water Map

# HUMBOLDT MILL PROPOSED SURFACE WATER AND SEDIMENT MONITORING LOCATIONS




**Legend**

- Reference Monitoring Station
- Surface Water and Sediment Monitoring Location
- Road
- River
- Watershed Boundary
- Humboldt Mill Property

Reference:

Data provided by: Eagle Mine, ESRI, and North Jackson Company

Projection & Datum: NAD 1927 UTM Zone 16N

Aerial Photo: 2010

0 2,000 4,000 Feet

**1:32,000**

Eagle Mine a subsidiary of lundin mining

North Jackson Company
ENVIRONMENTAL SCIENCE & ENGINEERING

**Figure 1**

# Appendix I

# Humboldt Mill

# Surface Water Results

# &

# Benchmark Summary Table

**2022**
**Mine Permit Surface Water Quality Monitoring Data**
**Benchmark Summary Table**
**Humboldt Mill**

| Location | Location Classification | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|---|
| HMWQ-004 | Compliance - Mill Subwatershed | NM | NM | NM | NM |
| HMP-009 | Compliance - HTDF Subwatershed | NM | **pH**, **mercury,** alkalinity bicarbonate, **TSS** | pH, **iron,** mercury, **TSS** | NM |
| MER-001 | Reference - HTDF Subwatershed | pH, nitrate | copper | copper | **pH** |
| MER-002 | Compliance - HTDF Subwatershed | | **manganese**, zinc | | **pH,** arsenic, iron, lead, mercury |
| MER-003 | Compliance - HTDF Subwatershed | nitrate, sulfate, sodium | manganese, sodium, TSS | | **pH,** copper |
| MER-004* | Monitoring - HTDF Subwatershed | | | | |
| WBR-001 | Reference - Mill Subwatershed | NM | **manganese** | **aluminum, arsenic, barium**, chromium, copper, **iron**, **manganese**, **vanadium**, zinc, **alkalinity bicarbonate**, potassium, **TSS** | iron, **manganese,** alkalinity bicarbonate, TSS |
| WBR-002 | Compliance - Mill Subwatershed | arsenic, iron, potassium, TDS, **TSS** | | | pH, **alkalinity bicarbonate** |
| WBR-003 | Compliance - Mill Subwatershed | alkalinity bicarbonate, calcium, magnesium, hardness | **alkalinity bicarbonate** | **boron**, **TSS** | **pH**, lead, TSS |

Parameters listed in this table had values reported that were equal to or greater than a site-specific benchmark. Parameters in BOLD are instances in which the Department was notified because benchmarks deviations were identified at compliance monitoring locations for two consecutive seasonal (e.g. Q1 2021 and Q1 2022) sampling events. If the location is classified as background or reference, Department notification is not required for an exceedance.

Blank data cells indicate that no benchmark deviations occurred at the location during the specified sampling quarter.

NM = Not measured during the sampling event due to insufficient water volume or frozen conditions.

* Eagle added MER-004 as a monitoring location in 2020, however it is not considered a compliance monitoring location. No benchmarks have been established due to insufficient data.

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-001 (Reference - HTDF Subwatershed)**

| Parameter | Unit | MER-001 Seasonal Benchmarks | | | | MER-001 2022 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2022[T] | Q2 2022[T] | Q3 2022[D] | Q4 2022[T] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **12** | **7.2** | -- | **13** |
| ORP | mV | - | - | - | - | **108** | **101** | -- | **112** |
| pH | SU | 6.2-7.2 | 5.7-6.7 | 6.1-7.1 | 5.4-6.4 | **7.2** | **6.0** | **6.5** | **6.5** |
| Specific Conductance | uS/cm | - | - | - | - | **67** | **56** | -- | **41** |
| Temperature | C | - | - | - | - | **0.19** | **18** | -- | **0.68** |
| Turbidity | NTU | - | - | - | - | **2.0** | **2.3** | -- | **1.7** |
| Flow | cfs | - | - | - | - | -- | -- | -- | -- |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | -- | -- | **91** | -- |
| Antimony | ug/L | - | - | 3.5 | - | -- | -- | < 1.0 U | -- |
| Arsenic | ug/L | 3.6 | 4.0 | 2.8 | 1.8 | <1.0 | < 5.0 U | **1.8** | < 1.0 U |
| Barium | ug/L | - | - | 11 | - | -- | -- | **9.3** | -- |
| Beryllium | ug/L | - | - | 2.5 | - | -- | -- | < 1.0 U | -- |
| Boron | ug/L | - | - | 40 | - | -- | -- | < 10.0 U | -- |
| Cadmium | ug/L | - | - | 0.08 | - | -- | -- | -- | -- |
| Chromium | ug/L | - | - | 1.1 | - | -- | -- | < 1.0 U | -- |
| Cobalt | ug/L | - | - | 0.38 | - | -- | -- | -- | -- |
| Copper | ug/L | 0.62 | 0.98 | 0.68 | 1.6 | -- | **0.78** | **2.4** | **0.58** |
| Iron | ug/L | 2413 | 1206 | 3532 | 2136 | **1120** | **1430** | **2460** | **813** |
| Lead | ug/L | 0.21 | 0.18 | 0.35 | 0.66 | | **0.15** | **0.16** | **0.12** |
| Lithium | ug/L | - | - | 32 | - | -- | -- | < 8.0 U | -- |
| Manganese | ug/L | 149 | 101 | 242 | 124 | **80** | **146** | **141** | **28** |
| Mercury | ng/L | 5.8 | 6.9 | 8.1 | 4.6 | **2.2** | **4.34** | **3.1** | **3.4 H** |
| Molybdenum | ug/L | - | - | 4 | - | -- | -- | < 1.0 U | -- |
| Nickel | ug/L | 1.1 | 0.68 | 1.5 | 0.74 | -- | **0.82** | **0.87** | < 0.50 U |
| Selenium | ug/L | - | - | 0.13 | - | -- | -- | -- | -- |
| Silver | ug/L | - | - | 0.8 | - | -- | -- | < 0.20 U | -- |
| Thallium | ug/L | - | - | 1.5 | - | -- | -- | < 1.0 U | -- |
| Vanadium | ug/L | - | - | 4 | - | -- | -- | < 1.0 U | -- |
| Zinc | ug/L | 39 | 9.3 | 5.5 | 6.3 | -- | **3.6** | **1.6** | **1.5** |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 41 | 26 | 48 | 24 | **24.8** | **21** | **29** | **15** |
| Alkalinity, Carbonate | mg/L | 8 | 8 | 8 | 8 | < 2.0 | < 2.0 U | < 0.50 U | < 1.00 U |
| Chloride | mg/L | 13 | 8.4 | 16 | 14 | **4.3** | **3.4** | **2.9** | **2.3** |
| Fluoride | mg/L | 0.4 | 0.4 | 0.4 | 0.4 | < 0.10 | < 0.10 U | < 0.10 U | < 0.10 U |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.04** | < 0.025 U | < 0.025 U | < 0.025 |
| Nitrogen, Nitrate | mg/L | 0.17 | 2.0 | 2.0 | 2.0 | **0.21** | < 0.10 U | < 0.10 U | < 0.100 UH |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Sulfate | mg/L | 9.0 | 4.0 | 4.0 | 6.4 | **2.7** | **2.2** | **1.1** | **2.0** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | < 0.20 | < 0.20 U | < 0.20 U | < 0.20 U |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 14 | 7.6 | 15 | 10 | **6.9** | **6.0** | **8.0** | **4.5** |
| Magnesium | mg/L | 3.8 | 2.4 | 4.1 | 3.0 | **2** | **1.6** | **2.0** | **1.3** |
| Potassium | mg/L | 0.93 | 0.69 | 1.1 | 1.4 | **0.66** | < 0.50 U | **0.54** | < 0.50 U |
| Sodium | mg/L | 6.7 | 5.1 | 8.5 | 6.7 | **2.5** | **2.4** | **2.2** | **1.7** |
| General | | | | | | | | | |
| Hardness | mg/L | 51 | 31 | 59 | 44 | **26** | **22** | **29** | **17** |
| Total Dissolved Solids | mg/L | 106 | 113 | 200 | 200 | **62** | **47** | **68** | **42** |
| Total Suspended Solids | mg/L | 3.4 | 7.6 | 13 | 20 | < 2.5 | **2.8** | **3.2** | < 2.5 U |

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-002 (Compliance HTDF Subwatershed)**

| Parameter | Unit | MER-002 Seasonal Benchmarks | | | | MER-002 2022 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **12** | **6.8** | -- | **12** |
| ORP | mV | - | - | - | - | **62** | **74** | -- | **100** |
| pH | SU | 6.2-7.2 | 5.7-6.7 | 5.9-6.9 | 5.3-6.3 | **6.6** | **6.4** | **6.6** | **6.5** |
| Specific Conductance | uS/cm | - | - | - | - | **84** | **64** | -- | **52** |
| Temperature | C | - | - | - | - | **0.74** | **18** | -- | **0.86** |
| Turbidity | NTU | - | - | - | - | **2.5** | **2.9** | -- | **1.9** |
| Flow | cfs | - | - | - | - | -- | -- | -- | -- |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 461 | - | -- | -- | **78** | -- |
| Antimony | ug/L | - | - | 3.5 | - | -- | -- | < 1.0 U | -- |
| Arsenic | ug/L | 2.8 | 0.6 | 5.3 | 2.1 | < 1.0 | < 5.0 U | **2.2** | **2.2** |
| Barium | ug/L | - | - | 21 | - | -- | -- | **11** | -- |
| Beryllium | ug/L | - | - | 2.5 | - | -- | -- | < 1.0 U | -- |
| Boron | ug/L | - | - | 40 | - | -- | -- | < 10.0 U | -- |
| Cadmium | ug/L | - | - | 0.08 | - | -- | -- | -- | -- |
| Chromium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Cobalt | ug/L | - | - | 0.4 | - | -- | -- | -- | -- |
| Copper | ug/L | 1.1 | 0.97 | 1.4 | 0.72 | | **0.95** | < 0.50 U | **0.72** |
| Iron | ug/L | 3081 | 1679 | 6901 | 2831 | **1540** | **2040** | **2970** | **3040** |
| Lead | ug/L | 0.34 | 0.19 | 0.34 | 0.15 | -- | **0.25** | **0.15** | **0.22** |
| Lithium | ug/L | - | - | 1.4 | - | -- | -- | < 8.0 U | -- |
| Manganese | ug/L | 212 | 134 | 628 | 347 | **140** | **252** | **261** | **218** |
| Mercury | ng/L | 5.1 | 6.6 | 7.5 | 4.3 | **2.4** | **4.5** | **3.6** | **4.7 H** |
| Molybdenum | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Nickel | ug/L | 1.2 | 0.71 | 2.1 | 0.82 | -- | **0.98** | **0.80** | **0.62** |
| Selenium | ug/L | - | - | 0.80 | - | -- | -- | -- | -- |
| Silver | ug/L | - | - | 0.80 | - | -- | -- | < 0.20 U | -- |
| Thallium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Vanadium | ug/L | - | - | 4.7 | - | -- | -- | < 1.0 U | -- |
| Zinc | ug/L | 6.3 | 7.6 | 2.0 | 5.3 | -- | **10** | **1.7** | **2.6** |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 46 | 25 | 54 | 31 | **27** | **22** | **31** | **16** |
| Alkalinity, Carbonate | mg/L | 8.0 | 4.0 | 8.0 | 8.0 | < 2.0 | < 2.0 U | < 0.50 U | < 1.00 U |
| Chloride | mg/L | 14 | 7.4 | 17 | 18 | **6.1** | **4.2** | **3.7** | **4.2** |
| Fluoride | mg/L | 0.40 | 0.40 | 0.40 | 0.40 | < 0.10 | < 0.10 U | < 0.10 U | < 0.10 U |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.05** | < 0.025 U | < 0.025 U | < 0.025 U |
| Nitrogen, Nitrate | mg/L | 0.52 | 0.21 | 2.0 | 2.0 | **0.21** | < 0.10 U | < 0.10 U | < 0.100 UH |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Sulfate | mg/L | 14 | 7.9 | 16 | 4.0 | **4.1** | **2.7** | **1.8** | **2.6** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | < 0.20 | < 0.20 U | < 0.20 U | < 0.20 U |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 17 | 9.2 | 18 | 15 | **7.9** | **6.6** | **8.7** | **5.3** |
| Magnesium | mg/L | 4.6 | 2.7 | 5.2 | 4.1 | **2.3** | **1.9** | **2.3** | **1.6** |
| Potassium | mg/L | 1.3 | 0.68 | 1.4 | 1.6 | **0.82** | **0.55** | **0.67** | **0.57** |
| Sodium | mg/L | 8.5 | 5.1 | 9.9 | 9.1 | **3.7** | **2.9** | **2.8** | **2.9** |
| General | | | | | | | | | |
| Hardness | mg/L | 60 | 34 | 70 | 53 | **29** | **24** | **31** | **20** |
| Total Dissolved Solids | mg/L | 210 | 104 | 200 | 200 | **50** | **56** | **78 J** | **46** |
| Total Suspended Solids | mg/L | 5.6 | 7.8 | 21 | 123 | < 2.5 | **4.7** | **3.3** | **9.1** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-003 (Compliance - HTDF Subwatershed)**

| Parameter | Unit | MER-003 Seasonal Benchmarks | | | | MER-003 2022 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2022[D] | Q2 2022[T] | Q3 2022[D] | Q4 2022[D] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | 12 | 6.9 | -- | 12 |
| ORP | mV | - | - | - | - | 143 | 113 | -- | 98 |
| pH | SU | 6.3-7.3 | 5.6-6.6 | 5.7-6.7 | 5.4-6.4 | 7.3 | 6.0 | 6.6 | 6.6 |
| Specific Conductance | uS/cm | - | - | - | - | 151 | 108 | -- | 77 |
| Temperature | C | - | - | - | - | 0.77 | 17 | -- | 0.88 |
| Turbidity | NTU | - | - | - | - | 2.9 | 2.9 | -- | 2.3 |
| Flow | cfs | - | - | - | - | -- | -- | -- | -- |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | -- | -- | 77 | -- |
| Antimony | ug/L | - | - | 3.5 | - | -- | -- | < 1.0 U | -- |
| Arsenic | ug/L | 2.6 | 1.8 | 2.6 | 2.7 | < 1.0 | < 5.0 U | 2.3 | < 1.0 U |
| Barium | ug/L | - | - | 15 | - | -- | -- | 10 | -- |
| Beryllium | ug/L | - | - | 2.5 | - | -- | -- | < 1.0 U | -- |
| Boron | ug/L | - | - | 18 | - | -- | -- | < 10.0 U | -- |
| Cadmium | ug/L | - | - | 0.08 | - | -- | -- | -- | -- |
| Chromium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Cobalt | ug/L | - | - | 0.4 | - | -- | -- | -- | -- |
| Copper | ug/L | 2.9 | 0.97 | 0.65 | 0.67 | | 0.86 | 0.53 | 0.72 |
| Iron | ug/L | 3007 | 1873 | 3749 | 3493 | 1590 | 2010 | 2890 | 1020 |
| Lead | ug/L | 0.35 | 0.24 | 0.18 | 1.9 | -- | 0.18 | 0.20 | 0.14 |
| Lithium | ug/L | - | - | 32 | - | -- | -- | < 8.0 U | -- |
| Manganese | ug/L | 223 | 157 | 273 | 326 | 164 | 256 | 230 | 51 |
| Mercury | ng/L | 5.2 | 6.7 | 7.2 | 7.0 | 2.3 | 4.6 | 3.1 | 3.5 H |
| Molybdenum | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Nickel | ug/L | 1.5 | 1.2 | 1.8 | 1.5 | -- | 1.5 | 0.88 | 1.2 |
| Selenium | ug/L | - | - | 0.28 | - | -- | -- | -- | -- |
| Silver | ug/L | - | - | 0.80 | - | -- | -- | < 0.20 U | -- |
| Thallium | ug/L | - | - | 1.5 | - | -- | -- | < 1.0 U | -- |
| Vanadium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Zinc | ug/L | 7.5 | 8.5 | 2.7 | 13 | -- | 3.6 | 3.4 | 1.5 |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 50 | 31 | 58 | 33 | 30 | 24 | 32 | 19 |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | < 2.0 | < 2.0 U | < 0.50 U | < 1.00 U |
| Chloride | mg/L | 15 | 11 | 23 | 21 | 11 | 8.9 | 4.7 | 6.0 |
| Fluoride | mg/L | 0.20 | 0.50 | 0.40 | 0.40 | < 0.10 | < 0.10 U | < 0.10 U | < 0.10 U |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | 0.13 | 0.08 | < 0.025 U | 0.14 |
| Nitrogen, Nitrate | mg/L | 0.2 | 2.0 | 2.0 | 2.0 | 0.22 | < 0.10 U | < 0.10 U | 0.13 H |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Sulfate | mg/L | 17 | 15 | 21 | 26 | 24 | 14 | 1.9 | 8.1 |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | < 0.20 | < 0.20 U | < 0.20 U | < 0.20 U |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 17 | 11 | 18 | 13 | 9.0 | 7.1 | 8.8 | 6.0 |
| Magnesium | mg/L | 4.7 | 3.3 | 5.8 | 4.2 | 3.0 | 2.2 | 2.3 | 1.8 |
| Potassium | mg/L | 1.3 | 0.94 | 1.7 | 1.7 | 1.2 | 0.77 | 0.70 | 0.72 |
| Sodium | mg/L | 8.8 | 7.4 | 12 | 9.3 | 13 | 9.8 | 3.4 | 6.8 |
| General | | | | | | | | | |
| Hardness | mg/L | 63 | 38 | 78 | 57 | 35 | 27 | 31 | 23 |
| Total Dissolved Solids | mg/L | 134 | 54 | 200 | 200 | 102 | 73 | 76 | 51 |
| Total Suspended Solids | mg/L | 4.0 | 9.8 | 13 | 20 | < 2.5 | 4.1 | 2.7 | < 2.5 U |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-004 (Monitoring - HTDF Subwatershed)**

| Parameter | Unit | MER-004 Seasonal Benchmark* | MER-004 2022 Quarterly Benchmark | | | |
|---|---|---|---|---|---|---|
| | | | Q1 2022[D] | Q2 2022[T] | Q3 2022[D] | Q4 2022[D] |
| Field | | | | | | |
| D.O. | ppm | - | **12** | **7.0** | -- | **12** |
| ORP | mV | - | **78** | **88** | -- | **87** |
| pH | SU | - | **6.6** | **6.4** | **6.5** | **6.8** |
| Specific Conductance | uS/m | - | **150** | **104** | -- | **75** |
| Temperature | C | - | **1.4** | **19** | -- | **1.1** |
| Turbidity | NTU | - | **6.3** | **3.7** | -- | **2.4** |
| Flow | cfs | - | -- | -- | -- | -- |
| Metals | | | | | | |
| Aluminum | ug/L | - | -- | -- | **114** | -- |
| Antimony | ug/L | - | -- | -- | < 1.0 U | -- |
| Arsenic | ug/L | - | **1.0** | < 5.0 U | **2.5** | **1.4** |
| Barium | ug/L | - | -- | -- | **11** | -- |
| Beryllium | ug/L | - | -- | -- | < 1.0 U | -- |
| Boron | ug/L | - | -- | -- | < 10.0 U | -- |
| Cadmium | ug/L | - | -- | -- | -- | -- |
| Chromium | ug/L | - | -- | -- | < 1.0 U | -- |
| Cobalt | ug/L | - | -- | -- | -- | -- |
| Copper | ug/L | - | -- | **0.95** | **0.89** | **0.82** |
| Iron | ug/L | - | **1600** | **2340** | **3180** | **1900** |
| Lead | ug/L | - | -- | **0.26** | **6.0** | **0.26** |
| Lithium | ug/L | - | -- | -- | < 8.0 U | -- |
| Manganese | ug/L | - | **167** | **266** | **242** | **119** |
| Mercury | ng/L | - | **2.5** | **4.7** | **4.5** | **4.7 H** |
| Molybdenum | ug/L | - | -- | -- | < 1.0 U | -- |
| Nickel | ug/L | - | -- | **1.5** | **1.0** | **0.96** |
| Selenium | ug/L | - | -- | -- | -- | -- |
| Silver | ug/L | - | -- | -- | < 0.20 U | -- |
| Thallium | ug/L | - | -- | -- | < 1.0 U | -- |
| Vanadium | ug/L | - | -- | -- | **1.1** | -- |
| Zinc | ug/L | - | -- | **4.9** | **3.8** | **2.3** |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | - | **29** | **24** | **32** | **19** |
| Alkalinity, Carbonate | mg/L | - | < 2.0 | < 2.0 U | < 0.50 U | < 1.00 U |
| Chloride | mg/L | - | **10** | **7.2** | **4.2** | **5.5** |
| Fluoride | mg/L | - | < 0.10 | < 0.10 U | < 0.10 U | < 0.10 U |
| Nitrogen, Ammonia | mg/L | - | **0.13** | **0.08** | < 0.025 U | **0.12** |
| Nitrogen, Nitrate | mg/L | - | **0.22** | < 0.10 U | < 0.10 U | < 0.100 UH |
| Nitrogen, Nitrite | mg/L | - | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Sulfate | mg/L | - | **25** | **14** | **1.8** | **8.3** |
| Sulfide | mg/L | - | < 0.20 | < 0.20 U | < 0.20 U | < 0.20 U |
| Major Cations | | | | | | |
| Calcium | mg/L | - | **9.0** | **7.3** | **8.8** | **5.7** |
| Magnesium | mg/L | - | **3.0** | **2.3** | **2.3** | **1.7** |
| Potassium | mg/L | - | **1.2** | **0.82** | **0.59** | **0.65** |
| Sodium | mg/L | - | **13** | **9.1** | **3.2** | **6.00** |
| General | | | | | | |
| Hardness | mg/L | - | **35** | **28** | **32** | **21** |
| Total Dissolved Solids | mg/L | - | **101** | **73** | **64** | **55** |
| Total Suspended Solids | mg/L | - | < 2.5 | **8.1** | **5.9** | **14** |

*Seasonal benchmarks are not calculated for this location due to insufficient data available.

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**WBR-001 (Reference Mill Subwatershed)**

| Parameter | Unit | WBR-001 Seasonal Benchmarks | | | | WBR-001 2022 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[T] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | NM | **2.4** | -- | **8.8** |
| ORP | mV | - | - | - | - | NM | **113** | -- | **170** |
| pH | SU | 4.97-5.97 | 4.7-5.7 | 5.7-6.7 | 4.6-5.6 | NM | **5.3** | **6.2** | **5.3** |
| Specific Conductance | uS/cm | - | - | - | - | NM | **83** | -- | **95** |
| Temperature | C | - | - | - | - | NM | **16** | -- | **1.1** |
| Turbidity | NTU | - | - | - | - | NM | **6.6** | -- | **10** |
| Flow | cfs | - | - | - | - | - | | -- | -- |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | NM | | **573** | -- |
| Antimony | ug/L | - | - | 3.5 | - | NM | | < 1.0 U | -- |
| Arsenic | ug/L | 6.6 | 1.8 | 3.2 | 1.5 | NM | < 5.0 U | **7.9** | **1.1** |
| Barium | ug/L | - | - | 17 | - | NM | | **20** | -- |
| Beryllium | ug/L | - | - | 2.5 | - | NM | | < 1.0 U | -- |
| Boron | ug/L | - | - | 40 | - | NM | | < 10.0 U | -- |
| Cadmium | ug/L | - | - | 0.08 | - | NM | | -- | -- |
| Chromium | ug/L | - | - | 1.6 | - | NM | | **1.6** | -- |
| Cobalt | ug/L | - | - | 0.4 | - | NM | | -- | -- |
| Copper | ug/L | 3.3 | 1.1 | 1.4 | 0.66 | NM | **2.4** | **1.7** | **0.57** |
| Iron | ug/L | 11518 | 1759 | 4873 | 1900 | NM | **4560** | **7100** | **1950** |
| Lead | ug/L | 4.3 | 1.1 | 2.3 | 1.3 | NM | **2.1** | **1.2** | **0.84** |
| Lithium | ug/L | - | - | 32 | - | NM | | < 8.0 U | -- |
| Manganese | ug/L | 363 | 106 | 770 | 122 | NM | **632** | **911** | **156** |
| Mercury | ng/L | 15 | 11 | 16 | 11 | NM | **4.8** | **1.9** | **4.0 H** |
| Molybdenum | ug/L | - | - | 4 | - | NM | | < 1.0 U | -- |
| Nickel | ug/L | 3.1 | 0.97 | 3.0 | 0.98 | NM | **1.5** | **2.2** | **0.68** |
| Selenium | ug/L | - | - | 0.28 | - | NM | | -- | -- |
| Silver | ug/L | - | - | 0.8 | - | NM | | < 0.20 U | -- |
| Thallium | ug/L | - | - | 1.5 | - | NM | | < 1.0 U | -- |
| Vanadium | ug/L | - | - | 1.7 | - | NM | | **2.5** | -- |
| Zinc | ug/L | 16 | 12 | 13 | 8.2 | NM | **13** | **15** | **6.3** |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 9 | 5 | 16 | 6 | NM | **8.0** | **20** | **7.7** |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | NM | < 2.0 U | < 0.50 U | < 1.00 U |
| Chloride | mg/L | 24 | 25 | 28 | 23 | NM | **12** | **16** | **19** |
| Fluoride | mg/L | 0.40 | 0.40 | 0.40 | 0.40 | NM | < 0.10 U | < 0.10 U | < 0.10 U |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | NM | **0.09** | **0.19** | **0.06** |
| Nitrogen, Nitrate | mg/L | 0.24 | 2.0 | 2.0 | 2.0 | NM | < 0.10 U | < 0.10 U | < 0.100 UH |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | NM | < 0.10 U | < 0.10 U | < 0.100 UH |
| Sulfate | mg/L | 11 | 4.0 | 4.0 | 4.0 | NM | < 1.0 U | < 1.0 U | **1.2** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | NM | < 0.20 U | < 0.20 U | < 0.20 U |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 7.6 | 4.8 | 7.9 | 5.6 | NM | **4.9** | **6.8** | **5.1** |
| Magnesium | mg/L | 3.0 | 1.9 | 3.1 | 2.5 | NM | **1.6** | **2.5** | **2.0** |
| Potassium | mg/L | 2.7 | 0.94 | 1.6 | 1.6 | NM | **1.2** | **1.8** | **1.0** |
| Sodium | mg/L | 11 | 12 | 13 | 11 | NM | **7.2** | **9.0** | **9.3** |
| General | | | | | | | | | |
| Hardness | mg/L | 37 | 21 | 39 | 39 | NM | **19** | **27** | **21** |
| Total Dissolved Solids | mg/L | 211 | 211 | 200 | 200 | NM | **114** | **166** | **88** |
| Total Suspended Solids | mg/L | 55 | 13 | 13 | 13 | NM | **13** | **57** | **17** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**WBR-002 (Compliance - Mill Subwatershed)**

| Parameter | Unit | WBR-002 Seasonal Benchmarks | | | | WBR-002 2022 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **8.7** | **8.5** | **--** | **12** |
| ORP | mV | - | - | - | - | **45** | **60** | **--** | **46** |
| pH | SU | 5.9-6.9 | 6.04-6.94 | 6.2-7.2 | 5.4-6.4 | **6.5** | **6.6** | **6.5** | **6.9** |
| Specific Conductance | uS/cm | - | - | - | - | **313** | **127** | **--** | **166** |
| Temperature | C | - | - | - | - | **1.0** | **19** | **--** | **3.1** |
| Turbidity | NTU | - | - | - | - | **10** | **3.32** | **--** | **10** |
| Flow | cfs | - | - | - | - | **--** | **--** | **--** | **--** |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | -- | -- | < 50.0 U | -- |
| Antimony | ug/L | - | - | 3.5 | - | -- | -- | < 1.0 U | -- |
| Arsenic | ug/L | 7.1 | 3.0 | 7.2 | 4.6 | **8.5** | < 5.0 U | **6.3** | **2.9** |
| Barium | ug/L | - | - | 16 | - | -- | -- | **8.3** | -- |
| Beryllium | ug/L | - | - | 2.5 | - | -- | -- | < 1.0 U | -- |
| Boron | ug/L | - | - | 18 | - | -- | -- | **16** | -- |
| Cadmium | ug/L | - | - | 0.08 | - | -- | -- | -- | -- |
| Chromium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Cobalt | ug/L | - | - | 0.69 | - | -- | -- | **--** | -- |
| Copper | ug/L | 1.4 | 2.5 | 1.9 | 2.0 | **--** | **0.80** | < 0.50 U | **0.53** |
| Iron | ug/L | 16421 | 4819 | 12928 | 9123 | **17400** | **2940** | **5600** | **3680** |
| Lead | ug/L | 0.44 | 0.55 | 0.49 | 0.61 | **--** | **0.14** | **0.06** | **0.15** |
| Lithium | ug/L | - | - | 32 | - | -- | -- | < 8.0 U | -- |
| Manganese | ug/L | 1550 | 262 | 709 | 458 | **1420** | **38** | **350** | **44** |
| Mercury | ng/L | 4.5 | 3.6 | 3.0 | 4.7 | **2.0** | **2.2** | **1.2** | **1.3 H** |
| Molybdenum | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Nickel | ug/L | 3.3 | 2.5 | 2.6 | 3.2 | **--** | **1.2** | **1.1** | **0.98** |
| Selenium | ug/L | - | - | 0.28 | - | -- | -- | **--** | -- |
| Silver | ug/L | - | - | 0.80 | - | -- | -- | < 0.20 U | -- |
| Thallium | ug/L | - | - | 1.5 | - | -- | -- | < 1.0 U | -- |
| Vanadium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Zinc | ug/L | 20 | 25 | 2.5 | 4.8 | **--** | **1.9** | < 1.0 U | < 1.0 U |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 105 | 18 | 38 | 20 | **48** | **26** | **31** | **25** |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | < 2.0 | < 2.0 U | < 0.50 U | < 1.00 U |
| Chloride | mg/L | 60 | 42 | 48 | 59 | **49** | **24** | **29** | **32** |
| Fluoride | mg/L | 0.29 | 0.40 | 0.40 | 0.40 | < 0.10 | < 0.10 U | < 0.10 U | < 0.10 U |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.30** | < 0.025 U | < 0.025 U | **0.06** |
| Nitrogen, Nitrate | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Sulfate | mg/L | 10 | 9.1 | 4.0 | 4.0 | **1.3** | **2.0** | < 1.0 U | **1.4** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | < 0.20 | < 0.20 U | < 0.20 U | < 0.20 U |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 13 | 7.0 | 9.7 | 9.8 | **12** | **5.3** | **7.4** | **6.9** |
| Magnesium | mg/L | 5.9 | 3.5 | 4.5 | 5.1 | **5.5** | **2.3** | **3.3** | **3.2** |
| Potassium | mg/L | 2.6 | 2.0 | 1.4 | 2.1 | **2.8** | **1.6** | **1.4** | **1.7** |
| Sodium | mg/L | 28 | 22 | 25 | 27 | **27** | **13** | **18** | **18** |
| General | | | | | | | | | |
| Hardness | mg/L | 57 | 33 | 46 | 44 | **52** | **23** | **32** | **31** |
| Total Dissolved Solids | mg/L | 170 | 278 | 200 | 200 | **191** | **85** | **117** | **99** |
| Total Suspended Solids | mg/L | 13 | 13 | 32 | 16 | **14** | **2.5** | < 6.2 U | **5.6** |

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**WBR-003 (Compliance - Mill Subwatershed)**

| Parameter | Unit | WBR-003 Seasonal Benchmarks | | | | WBR-003 2022 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2022[D] | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **5.5** | **3.0** | -- | **8.9** |
| ORP | mV | - | - | - | - | **172** | **75** | -- | **154** |
| pH | SU | 5.8-6.8 | 5.8-6.8 | 6.2-7.2 | 4.9-5.9 | **6.6** | **6.0** | **6.1** | **6.3** |
| Specific Conductance | uS/m | - | - | - | - | **189** | **119** | -- | **143** |
| Temperature | C | - | - | - | - | **0.07** | **18** | -- | **0.29** |
| Turbidity | NTU | - | - | - | - | **6.1** | **8.6** | -- | **5.8** |
| Flow | cfs | - | - | - | - | -- | -- | -- | -- |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | -- | -- | **157** | -- |
| Antimony | ug/L | - | - | 3.5 | - | -- | -- | < 1.0 U | -- |
| Arsenic | ug/L | 4.0 | 1.7 | 6.3 | 2.1 | **2.0** | < 5.0 U | **5.9** | **1.8** |
| Barium | ug/L | - | - | 27 | - | -- | -- | **20** | -- |
| Beryllium | ug/L | - | - | 2.5 | - | -- | -- | < 1.0 U | -- |
| Boron | ug/L | - | - | 13 | - | -- | -- | **13** | -- |
| Cadmium | ug/L | - | - | 0.08 | - | -- | -- | -- | -- |
| Chromium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Cobalt | ug/L | - | - | 2.6 | - | -- | -- | -- | -- |
| Copper | ug/L | 0.67 | 0.74 | 0.20 | 1.1 | -- | **0.60** | **0.71** | **0.81** |
| Iron | ug/L | 12988 | 5033 | 19898 | 4248 | **4720** | **4060** | **15200** | **3070** |
| Lead | ug/L | 0.40 | 0.26 | 0.29 | 0.28 | -- | **0.21** | **0.32** | **0.38** |
| Lithium | ug/L | - | - | 32 | - | -- | -- | < 8.0 U | -- |
| Manganese | ug/L | 2261 | 374 | 2794 | 235 | **611** | **252** | **1230** | **25** |
| Mercury | ng/L | 6.1 | 3.4 | 5.7 | 6.9 | **1.5** | **2.5** | **1.3** | **2.6 H** |
| Molybdenum | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Nickel | ug/L | 3.5 | 1.8 | 2.4 | 1.7 | -- | **1.5** | **1.5** | **0.97** |
| Selenium | ug/L | - | - | 0.28 | - | -- | -- | -- | -- |
| Silver | ug/L | - | - | 0.80 | - | -- | -- | < 0.20 U | -- |
| Thallium | ug/L | - | - | 1.5 | - | -- | -- | < 1.0 U | -- |
| Vanadium | ug/L | - | - | 4.0 | - | -- | -- | < 1.0 U | -- |
| Zinc | ug/L | 17 | 15 | 4.5 | 18 | -- | **5.4** | **3.8** | **2.9** |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 51 | 34 | 88 | 22 | **37** | **60** | **59** | **22** |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | < 2.0 | < 2.0 U | < 0.50 U | < 1.00 U |
| Chloride | mg/L | 43 | 32 | 42 | 37 | **29** | **16** | **21** | **26** |
| Fluoride | mg/L | 0.30 | 0.34 | 0.19 | 0.40 | < 0.10 | < 0.10 U | **0.11** | < 0.10 U |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.14** | < 0.025 U | **0.06** | < 0.025 U |
| Nitrogen, Nitrate | mg/L | 0.26 | 2.0 | 2.0 | 2.0 | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | < 0.10 | < 0.10 U | < 0.10 U | < 0.100 UH |
| Sulfate | mg/L | 17 | 20 | 4.0 | 4.0 | **1.6** | **1.0** | < 1.0 U | **1.6** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | < 0.20 | < 0.20 U | < 0.20 U | < 0.20 U |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 15 | 11 | 24 | 8.4 | **9.1** | **8.1** | **14** | **6.1** |
| Magnesium | mg/L | 6.1 | 4.5 | 9.6 | 3.9 | **4.3** | **3.2** | **4.9** | **2.9** |
| Potassium | mg/L | 2.2 | 1.7 | 2.3 | 2.7 | **1.9** | **1.3** | **1.4** | **1.3** |
| Sodium | mg/L | 20 | 15 | 22 | 20 | **16** | **9.5** | **14** | **14** |
| General | | | | | | | | | |
| Hardness | mg/L | 64 | 43 | 109 | 36 | **41** | **34** | **54** | **27** |
| Total Dissolved Solids | mg/L | 177 | 120 | 200 | 200 | **111** | **89** | **130** | **87** |
| Total Suspended Solids | mg/L | 19 | 9.8 | 27 | 13 | **3.4** | **16** | **28** | **42** |

* - Lowest achievable Reporting Limit by laboratory due to matrix interference

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**HMWQ-004 (Compliance - Mill Subwatershed)**

| Parameter | Unit | HMWQ-004 Seasonal Benchmark* | HMWQ-004 2022 Quarterly Data | | | |
|---|---|---|---|---|---|---|
| | | | Q1 2022 | Q2 2022 | Q3 2022 | Q4 2022 |
| Field | | | | | | |
| D.O. | ppm | - | NM | NM | NM | NM |
| ORP | mV | - | NM | NM | NM | NM |
| pH | SU | 5.69-6.69 | NM | NM | NM | NM |
| Specific Conductance | uS/m | - | NM | NM | NM | NM |
| Temperature | C | - | NM | NM | NM | NM |
| Turbidity | NTU | - | NM | NM | NM | NM |
| Flow | cfs | - | - | - | - | - |
| Metals | | | | | | |
| Aluminum | ug/L | 200 (p) | NM | NM | NM | NM |
| Antimony | ug/L | 2.3 | NM | NM | NM | NM |
| Arsenic | ug/L | 35 | NM | NM | NM | NM |
| Barium | ug/L | 118 | NM | NM | NM | NM |
| Beryllium | ug/L | 4.0 (p) | NM | NM | NM | NM |
| Boron | ug/L | 36 | NM | NM | NM | NM |
| Cadmium | ug/L | 0.10 | NM | NM | NM | NM |
| Chromium | ug/L | 14 | NM | NM | NM | NM |
| Cobalt | ug/L | 3.0 | NM | NM | NM | NM |
| Copper | ug/L | 11 | NM | NM | NM | NM |
| Iron | ug/L | 73409 | NM | NM | NM | NM |
| Lead | ug/L | 2.1 | NM | NM | NM | NM |
| Lithium | ug/L | 16 | NM | NM | NM | NM |
| Manganese | ug/L | 2541 | NM | NM | NM | NM |
| Mercury | ng/L | 43 | NM | NM | NM | NM |
| Molybdenum | ug/L | 4.7 | NM | NM | NM | NM |
| Nickel | ug/L | 5.6 | NM | NM | NM | NM |
| Selenium | ug/L | 0.44 | NM | NM | NM | NM |
| Silver | ug/L | 0.35 | NM | NM | NM | NM |
| Thallium | ug/L | 4.0 (p) | NM | NM | NM | NM |
| Vanadium | ug/L | 39 | NM | NM | NM | NM |
| Zinc | ug/L | 44 | NM | NM | NM | NM |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 68 | NM | NM | NM | NM |
| Alkalinity, Carbonate | mg/L | 8.0 (p) | NM | NM | NM | NM |
| Chloride | mg/L | 68 | NM | NM | NM | NM |
| Fluoride | mg/L | 0.23 | NM | NM | NM | NM |
| Nitrogen, Ammonia | mg/L | 1.9 | NM | NM | NM | NM |
| Nitrogen, Nitrate | mg/L | 2.0 (p) | NM | NM | NM | NM |
| Nitrogen, Nitrite | mg/L | 2.0 (p) | NM | NM | NM | NM |
| Sulfate | mg/L | 4.0 (p) | NM | NM | NM | NM |
| Sulfide | mg/L | 20 (p) | NM | NM | NM | NM |
| Major Cations | | | | | | |
| Calcium | mg/L | 21 | NM | NM | NM | NM |
| Magnesium | mg/L | 8.1 | NM | NM | NM | NM |
| Potassium | mg/L | 3.3 | NM | NM | NM | NM |
| Sodium | mg/L | 49 | NM | NM | NM | NM |
| General | | | | | | |
| Hardness | mg/L | 88 | NM | NM | NM | NM |
| Total Dissolved Solids | mg/L | 209 | NM | NM | NM | NM |
| Total Suspended Solids | mg/L | 353 | NM | NM | NM | NM |

*Seasonal benchmarks are not calculated for this location due to insufficient data available.

**Humbold Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**HMP-009 (Compliance - HTDF Subwatershed - Wetland EE)**

| Parameter | Unit | HMP-009 Seasonal Benchmark* | HMP-009 2022 Quarterly Benchmark | | | |
|---|---|---|---|---|---|---|
| | | | Q1 2022 | Q2 2022[D] | Q3 2022[D] | Q4 2022[D] |
| Field | | | | | | |
| D.O. | ppm | - | NM | **6.4** | -- | NM |
| ORP | mV | - | NM | **-38** | -- | NM |
| pH | SU | 6.6-7.6 | NM | **6.4** | **6.2** | NM |
| Specific Conductance | uS/m | - | NM | **160** | -- | NM |
| Temperature | C | - | NM | **24** | -- | NM |
| Turbidity | NTU | - | NM | **112** | -- | NM |
| Flow | cfs | - | - | -- | -- | - |
| Elevation | ft MSL | - | NM | 1534.1 | 1534.37 | NM |
| Metals | | | | | | |
| Aluminum | ug/L | - | NM | -- | **1750** | NM |
| Antimony | ug/L | - | NM | -- | **3.4** | NM |
| Arsenic | ug/L | 6.0 | NM | < 5.0 U | **3.3** | NM |
| Barium | ug/L | - | NM | -- | **18** | NM |
| Beryllium | ug/L | - | NM | -- | < 1.0 U | NM |
| Boron | ug/L | - | NM | -- | **20** | NM |
| Cadmium | ug/L | - | NM | -- | -- | NM |
| Chromium | ug/L | - | NM | -- | **1.8** | NM |
| Cobalt | ug/L | - | NM | -- | -- | NM |
| Copper | ug/L | 1300 | NM | **9.1** | **9.2** | NM |
| Iron | ug/L | 1759 | NM | **1340** | **3690** | NM |
| Lead | ug/L | 6.4 | NM | **0.71** | **4.2** | NM |
| Lithium | ug/L | - | NM | -- | < 8.0 U | NM |
| Manganese | ug/L | 856 | NM | **73** | **243** | NM |
| Mercury | ng/L | 1.2 | NM | **7.0** | **8.6** | NM |
| Molybdenum | ug/L | - | NM | -- | **2.9** | NM |
| Nickel | ug/L | 172 | NM | **14** | **15** | NM |
| Selenium | ug/L | - | NM | -- | -- | NM |
| Silver | ug/L | - | NM | -- | < 0.20 U | NM |
| Thallium | ug/L | - | NM | -- | < 1.0 U | NM |
| Vanadium | ug/L | - | NM | -- | **2.7** | NM |
| Zinc | ug/L | 64 | NM | **8.8** | **5.1** | NM |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 101 | NM | **112 J** | **65** | NM |
| Alkalinity, Carbonate | mg/L | 8 | NM | < 2.0 U | < 0.50 U | NM |
| Chloride | mg/L | 37 | NM | **8.1** | **5.5** | NM |
| Fluoride | mg/L | 2.7 | NM | < 0.10 U | < 0.10 U | NM |
| Nitrogen, Ammonia | mg/L | 2.0 | NM | < 0.025 U | **0.05** | NM |
| Nitrogen, Nitrate | mg/L | 0.16 | NM | < 0.10 U | < 0.10 U | NM |
| Nitrogen, Nitrite | mg/L | 2.0 | NM | < 0.10 U | < 0.10 U | NM |
| Sulfate | mg/L | 207 | NM | **8.1** | **5.4** | NM |
| Sulfide | mg/L | 20 | NM | < 0.20 U | < 0.20 U | NM |
| Major Cations | | | | | | |
| Calcium | mg/L | 77 | NM | **17** | **16** | NM |
| Magnesium | mg/L | 66 | NM | **4.8** | **5.0** | NM |
| Potassium | mg/L | 87 | NM | **2.2** | **1.7** | NM |
| Sodium | mg/L | 37 | NM | **5.4** | **4.3** | NM |
| General | | | | | | |
| Hardness | mg/L | 342 | NM | **61** | **61** | NM |
| Total Dissolved Solids | mg/L | 529 | NM | **92** | **84** | NM |
| Total Suspended Solids | mg/L | 13 | NM | **19** | **135** | NM |

* - Recommended Benchmarks are for Q2 - Insufficient Q4 Data to Develop Benchmarks

**Humboldt Mill 2022**
**Mine Permit Surface Water Quality Monitoring Data**
**Abbreviations and Data Qualifiers**

| **Notes:** |
|---|
| Benchmarks are calculated based on guidance from Eagles Mine's Development of Site Specific Benchmarks for Mine Permit Water Quality Monitoring. |
| Results in **bold** text indicate that the parameter was detected at a level greater than the laboratory reporting limit. |
| Highlighted Cell = Value is equal to or above site-specific benchmark. An exceedance occurs if there are 2 consecutive sampling events with a value equal to or greater than the benchmark at a compliance monitoring location. |
| (p) = Due to less than two detections in baseline dataset, benchmark defaulted to four times the reporting limit. |
| --Denotes no benchmark required or parameter was not required to be collected during the sampling quarter. |
| e = estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded. |
| NM = Not measured. |
| T = Samples not filtered and all values are total concentrations. |
| D = Sample for metal and major cation parameters was filtered and values are dissolved concentrations. |

# Appendix J

# Humboldt Mill

# Surface Water Trend Analysis Summary

## 2022 Surface Water Trend Analysis
## Humboldt Mill

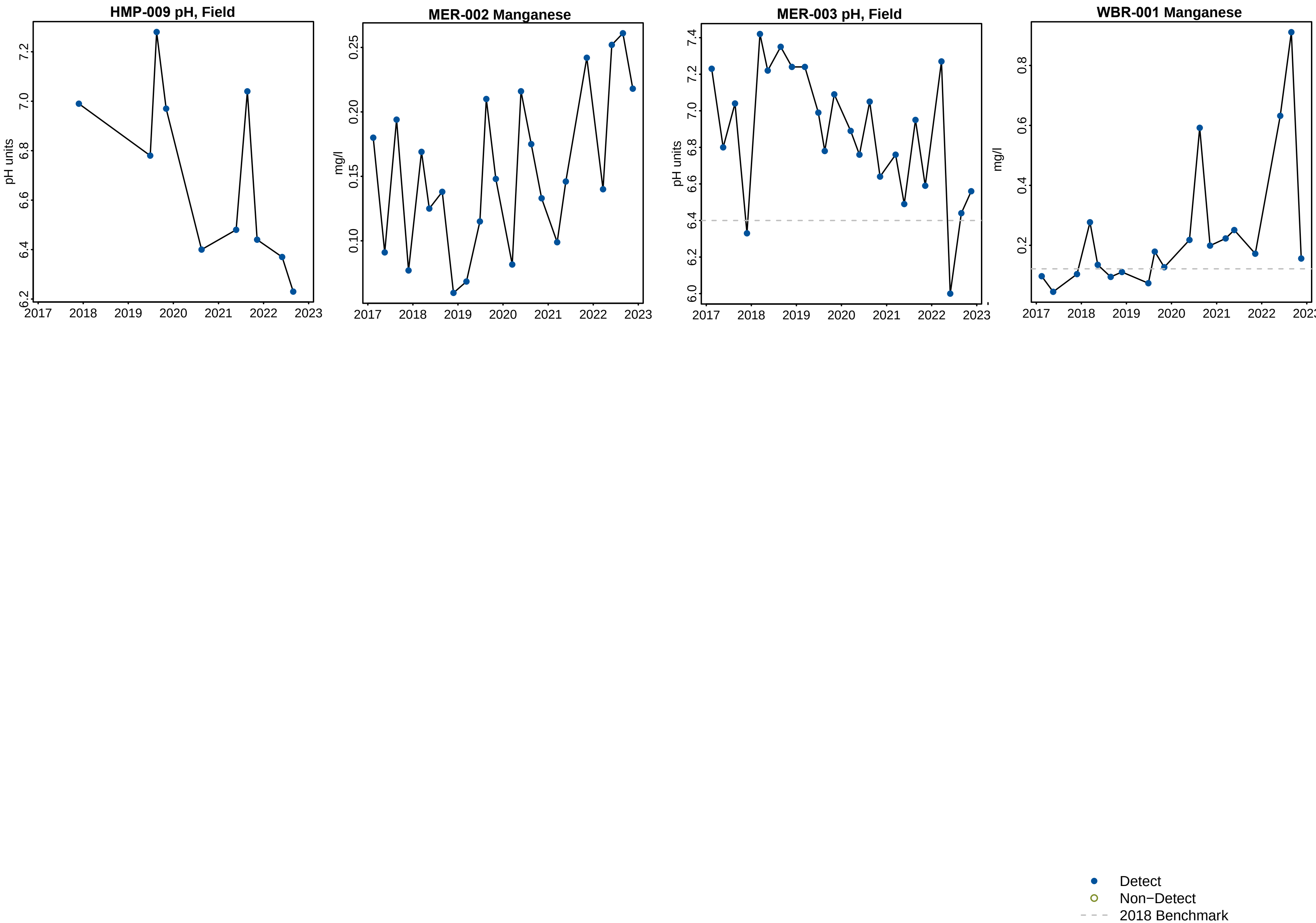
| Location | Parameter | Samples | Non-Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coeff. of Variation | M-K Test Value (S) | Approx. p-value | Trend at 95% Conf. | Theil-Sen Slope, conc/yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HMP-009 | Bicarbonate alkalinity | 9 | 0 | 100% | 21.3 | 112 | 55.4 | 58.9 | 26.8 | 0.48 | 18 | 0.0763 | no trend | 6.91 |
| HMP-009 | Calcium | 9 | 0 | 100% | 6.7 | 44.9 | 19.7 | 16.6 | 12.10 | 0.61 | -4 | 0.7545 | no trend | -0.98 |
| **HMP-009** | **Field pH** | **10** | **0** | **100%** | **6.23** | **7.28** | **6.70** | **6.63** | **0.36** | **0.05** | **-25** | **0.0318** | **NEGATIVE** | **-0.15** |
| HMP-009 | Hardness | 9 | 0 | 100% | 17.3 | 138 | 58.7 | 61.1 | 35.6 | 0.61 | -2 | 0.9161 | no trend | -1.58 |
| **HMP-009** | **Iron** | **9** | **0** | **100%** | **0.0109** | **163** | **19.6** | **1.34** | **53.8** | **2.74** | **4** | **0.7545** | **no trend** | **0.09** |
| HMP-009 | Magnesium | 9 | 0 | 100% | 2.2 | 14.9 | 6.66 | 5 | 4.75 | 0.71 | 0 | 1.0000 | no trend | -0.01 |
| HMP-009 | Manganese | 9 | 0 | 100% | 0.0149 | 0.243 | 0.096 | 0.073 | 0.082 | 0.86 | 6 | 0.6022 | no trend | 0.01 |
| HMP-009 | Sodium | 9 | 0 | 100% | 4.1 | 39.7 | 10.5 | 5.4 | 11.5 | 1.09 | -8 | 0.4655 | no trend | -1.80 |
| HMP-009 | Sulfate | 9 | 0 | 100% | 0.117 | 178 | 24.8 | 6.2 | 57.5 | 2.32 | -10 | 0.3481 | no trend | -1.09 |
| MER-001 | Bicarbonate alkalinity | 23 | 0 | 100% | 8.8 | 45.5 | 23.1 | 21 | 9.3 | 0.40 | 24 | 0.5430 | no trend | 0.64 |
| MER-001 | Calcium | 23 | 0 | 100% | 4 | 15.1 | 7.70 | 6.9 | 2.91 | 0.38 | 10 | 0.8119 | no trend | 0.10 |
| **MER-001** | **Field pH** | **24** | **0** | **100%** | **5.96** | **7.64** | **6.75** | **6.71** | **0.46** | **0.07** | **-29** | **0.4872** | **no trend** | **-0.04** |
| MER-001 | Hardness | 21 | 0 | 100% | 14.4 | 55 | 30.7 | 28 | 11.8 | 0.39 | -37 | 0.2768 | no trend | -1.65 |
| MER-001 | Iron | 23 | 0 | 100% | 0.813 | 3.3 | 1.47 | 1.29 | 0.63 | 0.43 | 16 | 0.6919 | no trend | 0.03 |
| MER-001 | Magnesium | 23 | 0 | 100% | 1.1 | 4.2 | 2.16 | 2 | 0.76 | 0.35 | -3 | 0.9576 | no trend | 0 |
| MER-001 | Manganese | 23 | 0 | 100% | 0.0281 | 1.9 | 0.184 | 0.095 | 0.378 | 2.05 | 15 | 0.7116 | no trend | 0.00 |
| MER-001 | Sodium | 23 | 0 | 100% | 1.7 | 7.6 | 3.3 | 3.2 | 1.4 | 0.42 | -34 | 0.3822 | no trend | -0.14 |
| MER-001 | Sulfate | 23 | 7 | 70% | 1 | 5.4 | 2.53 | 2.4 | 1.3 | 0.50 | 58 | 0.1306 | no trend | 0.22 |
| MER-002 | Bicarbonate alkalinity | 23 | 0 | 100% | 10 | 51.4 | 25.7 | 24 | 10.4 | 0.40 | 19 | 0.6345 | no trend | 0.59 |
| MER-002 | Calcium | 23 | 0 | 100% | 4.3 | 17.7 | 8.82 | 8 | 3.41 | 0.39 | 2 | 0.9789 | no trend | 0 |
| **MER-002** | **Field pH** | **24** | **0** | **100%** | **6** | **7.49** | **6.78** | **6.69** | **0.39** | **0.06** | **-47** | **0.2537** | **no trend** | **-0.07** |
| MER-002 | Hardness | 21 | 0 | 100% | 15.7 | 64.4 | 33.4 | 29.5 | 12.9 | 0.39 | -10 | 0.7858 | no trend | -0.54 |
| MER-002 | Iron | 23 | 0 | 100% | 0.998 | 3.42 | 1.97 | 2.01 | 0.79 | 0.40 | 50 | 0.1955 | no trend | 0.14 |
| MER-002 | Magnesium | 23 | 0 | 100% | 1.2 | 4.9 | 2.52 | 2.3 | 0.91 | 0.36 | -12 | 0.7703 | no trend | -0.02 |
| **MER-002** | **Manganese** | **23** | **0** | **100%** | **0.0596** | **0.261** | **0.154** | **0.146** | **0.061** | **0.39** | **81** | **0.0346** | **POSITIVE** | **0.02** |
| MER-002 | Sodium | 23 | 0 | 100% | 2.4 | 9.6 | 4.5 | 4.2 | 1.7 | 0.38 | -40 | 0.3020 | no trend | -0.15 |
| MER-002 | Sulfate | 23 | 3 | 87% | 1 | 13.1 | 4.91 | 4.9 | 3.0 | 0.60 | -49 | 0.2046 | no trend | -0.48 |
| MER-003 | Bicarbonate alkalinity | 23 | 0 | 100% | 10.7 | 105 | 30.9 | 25 | 19.4 | 0.63 | 12 | 0.7713 | no trend | 0.32 |
| MER-003 | Calcium | 23 | 0 | 100% | 4.4 | 16.7 | 9.28 | 8.8 | 3.48 | 0.38 | 11 | 0.7916 | no trend | 0.14 |
| **MER-003** | **Field pH** | **24** | **0** | **100%** | **6** | **7.42** | **6.88** | **6.92** | **0.36** | **0.05** | **-114** | **0.0050** | **NEGATIVE** | **-0.13** |
| MER-003 | Hardness | 21 | 0 | 100% | 12 | 62.7 | 35.6 | 34.9 | 15.3 | 0.43 | 5 | 0.9038 | no trend | 0.26 |
| MER-003 | Iron | 23 | 0 | 100% | 1.02 | 3.05 | 1.83 | 1.75 | 0.65 | 0.36 | -5 | 0.9159 | no trend | -0.01 |
| MER-003 | Magnesium | 23 | 0 | 100% | 1.3 | 5.6 | 2.89 | 2.6 | 1.12 | 0.39 | 9 | 0.8319 | no trend | 0 |
| MER-003 | Manganese | 23 | 0 | 100% | 0.0509 | 0.263 | 0.155 | 0.150 | 0.060 | 0.39 | 43 | 0.2673 | no trend | 0.01 |
| MER-003 | Sodium | 23 | 0 | 100% | 3.4 | 45.1 | 10.4 | 7.3 | 8.7 | 0.84 | 74 | 0.0538 | no trend | 1.07 |
| MER-003 | Sulfate | 23 | 1 | 96% | 1 | 84.2 | 15.7 | 9.9 | 17.2 | 1.10 | 54 | 0.1614 | no trend | 1.79 |
| MER-004 | Bicarbonate alkalinity | 11 | 0 | 100% | 10.4 | 46.4 | 28.7 | 29.2 | 9.9 | 0.35 | -1 | 1.0000 | no trend | -0.37 |
| MER-004 | Calcium | 11 | 0 | 100% | 4.5 | 15.7 | 9.76 | 9.4 | 3.47 | 0.36 | -21 | 0.1195 | no trend | -1.26 |

# 2022 Surface Water Trend Analysis
## Humboldt Mill

| Location | Parameter | Samples | Non-Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coeff. of Variation | M-K Test Value (S) | Approx. p-value | Trend at 95% Conf. | Theil-Sen Slope, conc/yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MER-004 | Field pH | 12 | 0 | 100% | 6 | 7.37 | 6.63 | 6.55 | 0.38 | 0.06 | 2 | 0.9453 | no trend | 0.02 |
| MER-004 | Hardness | 11 | 0 | 100% | 16.9 | 61.1 | 37.1 | 36.2 | 13.6 | 0.37 | -21 | 0.1195 | no trend | -5.13 |
| MER-004 | Iron | 11 | 0 | 100% | 1.12 | 3.18 | 2.05 | 1.9 | 0.65 | 0.32 | 9 | 0.5334 | no trend | 0.19 |
| MER-004 | Magnesium | 11 | 0 | 100% | 1.4 | 5.6 | 3.09 | 3 | 1.24 | 0.40 | -21 | 0.1172 | no trend | -0.59 |
| MER-004 | Manganese | 11 | 0 | 100% | 0.103 | 0.276 | 0.191 | 0.175 | 0.062 | 0.33 | 1 | 1.0000 | no trend | 0.00 |
| MER-004 | Sodium | 11 | 0 | 100% | 3.2 | 45.1 | 13.0 | 9.2 | 11.8 | 0.91 | -13 | 0.3502 | no trend | -1.74 |
| MER-004 | Sulfate | 11 | 0 | 100% | 1.8 | 83.4 | 21.9 | 15.7 | 22.8 | 1.04 | -15 | 0.2758 | no trend | -6.15 |
| **WBR-001** | **Bicarbonate alkalinity** | **19** | **1** | **95%** | **2** | **25.6** | **7.27** | **5.5** | **5.9** | **0.82** | **36** | **0.2205** | **no trend** | **0.41** |
| WBR-001 | Calcium | 19 | 0 | 100% | 2.4 | 6.8 | 4.27 | 4.3 | 1.11 | 0.26 | 55 | 0.0586 | no trend | 0.27 |
| WBR-001 | Field pH | 20 | 0 | 100% | 5.05 | 7.36 | 5.82 | 5.66 | 0.62 | 0.11 | 35 | 0.2692 | no trend | 0.05 |
| WBR-001 | Hardness | 17 | 0 | 100% | 0.99 | 60 | 20.7 | 18 | 13.0 | 0.63 | 25 | 0.3224 | no trend | 0.58 |
| **WBR-001** | **Iron** | **19** | **0** | **100%** | **1** | **7.1** | **2.27** | **1.95** | **1.48** | **0.65** | **51** | **0.0802** | **no trend** | **0.21** |
| WBR-001 | Magnesium | 19 | 1 | 95% | 1 | 2.5 | 1.65 | 1.6 | 0.39 | 0.24 | 42 | 0.1457 | no trend | 0.07 |
| **WBR-001** | **Manganese** | **19** | **0** | **100%** | **0.045** | **0.911** | **0.242** | **0.172** | **0.225** | **0.93** | **85** | **0.0033** | **POSITIVE** | **0.04** |
| WBR-001 | Sodium | 19 | 0 | 100% | 4.1 | 13.3 | 8.1 | 7.8 | 2.5 | 0.31 | 33 | 0.2623 | no trend | 0.40 |
| WBR-001 | Sulfate | 19 | 14 | 26% | 1 | 120 | -- | -- | -- | -- | -- | -- | -- | -- |
| **WBR-002** | **Bicarbonate alkalinity** | **23** | **0** | **100%** | **11.8** | **98** | **29.3** | **27.8** | **17.3** | **0.59** | **12** | **0.7713** | **no trend** | **0.62** |
| WBR-002 | Calcium | 23 | 0 | 100% | 4.7 | 11.6 | 7.83 | 7.5 | 1.99 | 0.25 | -14 | 0.7309 | no trend | -0.04 |
| WBR-002 | Field pH | 24 | 0 | 100% | 5.8 | 7.4 | 6.36 | 6.36 | 0.38 | 0.06 | 20 | 0.6372 | no trend | 0.02 |
| WBR-002 | Hardness | 23 | 0 | 100% | 21.6 | 51.7 | 34.2 | 32.5 | 8.2 | 0.24 | -11 | 0.7917 | no trend | -0.48 |
| WBR-002 | Iron | 23 | 0 | 100% | 2.3 | 21.8 | 7.86 | 6.93 | 4.91 | 0.62 | -13 | 0.7513 | no trend | -0.31 |
| WBR-002 | Magnesium | 23 | 0 | 100% | 2.2 | 5.5 | 3.63 | 3.7 | 0.92 | 0.25 | -33 | 0.3970 | no trend | -0.14 |
| WBR-002 | Manganese | 23 | 0 | 100% | 0.0384 | 1.42 | 0.480 | 0.337 | 0.407 | 0.85 | -23 | 0.5612 | no trend | -0.02 |
| WBR-002 | Sodium | 23 | 0 | 100% | 13.4 | 26.9 | 18.9 | 18.2 | 3.4 | 0.18 | -17 | 0.6724 | no trend | -0.30 |
| WBR-002 | Sulfate | 23 | 11 | 52% | 0.86 | 10 | 2.22 | 1.7 | 2.05 | 0.92 | -19 | 0.6260 | no trend | 0 |
| **WBR-003** | **Bicarbonate alkalinity** | **22** | **0** | **100%** | **11.8** | **90.7** | **35.9** | **31.9** | **18.2** | **0.51** | **54** | **0.1349** | **no trend** | **3.10** |
| WBR-003 | Calcium | 22 | 0 | 100% | 4.9 | 25.3 | 9.73 | 9 | 4.41 | 0.45 | 24 | 0.5161 | no trend | 0.22 |
| **WBR-003** | **Field pH** | **23** | **0** | **100%** | **5.8** | **7.53** | **6.31** | **6.26** | **0.40** | **0.06** | **-36** | **0.3551** | **no trend** | **-0.04** |
| WBR-003 | Hardness | 22 | 0 | 100% | 21.6 | 97.7 | 40.9 | 39.5 | 16.8 | 0.41 | 22 | 0.5536 | no trend | 0.78 |
| WBR-003 | Iron | 22 | 0 | 100% | 2.57 | 35.4 | 8.65 | 5.28 | 7.83 | 0.90 | -17 | 0.6519 | no trend | -0.23 |
| WBR-003 | Magnesium | 22 | 0 | 100% | 2.3 | 8.4 | 4.11 | 4.05 | 1.35 | 0.33 | 7 | 0.8654 | no trend | 0.04 |
| WBR-003 | Manganese | 22 | 0 | 100% | 0.0253 | 1.55 | 0.536 | 0.406 | 0.445 | 0.83 | -15 | 0.6930 | no trend | -0.01 |
| WBR-003 | Sodium | 22 | 0 | 100% | 8 | 20 | 14.0 | 14.7 | 3.2 | 0.23 | -64 | 0.0755 | no trend | -0.60 |
| WBR-003 | Sulfate | 22 | 13 | 41% | 0.86 | 10 | 2.11 | 1 | 2.09 | 0.99 | 17 | 0.6282 | no trend | 0 |

-- Insufficient number or fraction of detected values for calculation

**Bold:** Exceeded benchmark for two or more consecutive seasonal quarterly benchmarks between Q1 2021 and Q4 2022



HMP-009 pH, Field
pH units
6.2
6.4
6.6
6.8
7.0
7.2
MER-002 Manganese
mg/l
0.10
0.15
0.20
0.25
MER-003 pH, Field
pH units
6.0
6.2
6.4
6.6
6.8
7.0
7.2
7.4
WBR-001 Manganese
mg/l
0.2
0.4
0.6
0.8
2017
2018
2019
2020
2021
2022
2023
Detect
Non−Detect
2018 Benchmark

# Appendix K

# Humboldt Mill

# Sediment Monitoring Results

**2022**
**Sediment Monitoring Data**
**MER-001 (Reference)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **6470** | **7050** |
| Antimony | mg/kg | - | - | <0.026 | **0.1** |
| Arsenic | mg/kg | 9.79 | 33 | **12** | **7.8** |
| Barium | mg/kg | - | - | **18** | **12.5** |
| Beryllium | mg/kg | - | - | **0.18 J** | <0.55 |
| Boron | mg/kg | - | - | **0.72 J** | <5.5 |
| Cadmium | mg/kg | 0.99 | 4.98 | <0.054 | **0.063** |
| Chromium | mg/kg | 43.4 | 111 | **32** | **29.6** |
| Cobalt | mg/kg | - | - | **4.5** | **4.3** |
| Copper | mg/kg | 31.6 | 149 | **7.2** | **29.2** |
| Iron | mg/kg | - | - | **17900** | **20900** |
| Lead | mg/kg | 35.8 | 128 | **1.9** | **11.1** |
| Lithium | mg/kg | - | - | **14** | **9.9** |
| Manganese | mg/kg | - | - | **258** | **124** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.059 | <0.22 |
| Molybdenum | mg/kg | - | - | **0.13 J** | <1.1 |
| Nickel | mg/kg | 22.7 | 48.6 | **19** | **24.2** |
| Selenium | mg/kg | - | - | **0.32** | **0.57** |
| Silver | mg/kg | - | - | **0.014 J** | <0.049 |
| Thallium | mg/kg | - | - | **0.022 J** | <0.097 |
| Vanadium | mg/kg | - | - | **24** | **28.6** |
| Zinc | mg/kg | 121 | 459 | **34** | **31.7** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | **40** | <4.9 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **3530** | **3460** |

**2022**
**Sediment Monitoring Data**
**MER-002 (Compliance)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **7090** | **4860** |
| Antimony | mg/kg | - | - | 0.071 J | <0.11 |
| Arsenic | mg/kg | 9.79 | 33 | **6.4** | **11.2** |
| Barium | mg/kg | - | - | **11** | **10.7** |
| Beryllium | mg/kg | - | - | 0.14 J | <0.50 |
| Boron | mg/kg | - | - | **1.1 J** | <5.0 |
| Cadmium | mg/kg | 0.99 | 4.98 | <0.054 | <0.056 |
| Chromium | mg/kg | 43.4 | 111.0 | **18** | **13.3** |
| Cobalt | mg/kg | - | - | **4.5** | **3.4** |
| Copper | mg/kg | 31.6 | 149 | **27** | **3.3** |
| Iron | mg/kg | - | - | **16100** | **12400** |
| Lead | mg/kg | 35.8 | 128 | **2.9** | <1.0 |
| Lithium | mg/kg | - | - | **11** | **7.4** |
| Manganese | mg/kg | - | - | **98** | **115** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.060 | <0.25 |
| Molybdenum | mg/kg | - | - | 0.47 J | <1.0 |
| Nickel | mg/kg | 22.7 | 48.6 | **18** | **11** |
| Selenium | mg/kg | - | - | **0.61** | **0.98** |
| Silver | mg/kg | - | - | 0.045 J | <0.056 |
| Thallium | mg/kg | - | - | 0.033 J | <0.11 |
| Vanadium | mg/kg | - | - | **20** | **13.2** |
| Zinc | mg/kg | 121.0 | 459.0 | **29** | **26.6** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | <19 | <4.9 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **3730** | **2670** |

**2022**
**Sediment Monitoring Data**
**MER-003 (Compliance)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **10400** | **4570** |
| Antimony | mg/kg | - | - | **0.056 J** | **0.13** |
| Arsenic | mg/kg | 9.79 | 33 | **3.2** | **6.9** |
| Barium | mg/kg | - | - | **9.2** | **12.9** |
| Beryllium | mg/kg | - | - | **0.20 J** | <0.59 |
| Boron | mg/kg | - | - | **1.4 J** | <5.9 |
| Cadmium | mg/kg | 0.99 | 4.98 | **0.059** | **0.069** |
| Chromium | mg/kg | 43.4 | 111.0 | **24** | **10.9** |
| Cobalt | mg/kg | - | - | **8.9** | **4.6** |
| Copper | mg/kg | 31.6 | 149 | **57** | **39.9** |
| Iron | mg/kg | - | - | **22200** | **14200** |
| Lead | mg/kg | 35.8 | 128 | **2.9** | **2** |
| Lithium | mg/kg | - | - | **4.7 J** | <5.9 |
| Manganese | mg/kg | - | - | **424** | **234** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.057 | <0.23 |
| Molybdenum | mg/kg | - | - | <0.046 | <1.2 |
| Nickel | mg/kg | 22.7 | 48.6 | **23** | **13** |
| Selenium | mg/kg | - | - | **0.39 J** | <0.54 |
| Silver | mg/kg | - | - | **0.11** | <0.054 |
| Thallium | mg/kg | - | - | **0.021 J** | <0.11 |
| Vanadium | mg/kg | - | - | **32** | **29** |
| Zinc | mg/kg | 121 | 459 | **25** | **22** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | <18 | <4.9 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **8460** | **3150** |

**2022**
**Sediment Monitoring Data**
**MER-004 (Monitoring)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **4430** | **2910** |
| Antimony | mg/kg | - | - | **0.034 J** | <0.13 |
| Arsenic | mg/kg | 9.79 | 33 | **8.3** | **8.5** |
| Barium | mg/kg | - | - | **13** | **20** |
| Beryllium | mg/kg | - | - | **0.13 J** | <0.61 |
| Boron | mg/kg | - | - | **0.72 J** | <6.1 |
| Cadmium | mg/kg | 0.99 | 4.98 | <0.058 | **0.2** |
| Chromium | mg/kg | 43.4 | 111.0 | **12** | **7** |
| Cobalt | mg/kg | - | - | **3.4** | **2.8** |
| Copper | mg/kg | 31.6 | 149 | **3.8** | **5.3** |
| Iron | mg/kg | - | - | **14000** | **20100** |
| Lead | mg/kg | 35.8 | 128 | **1.8** | **13** |
| Lithium | mg/kg | - | - | **5.6 J** | <6.1 |
| Manganese | mg/kg | - | - | **202** | **504** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.063 | <0.27 |
| Molybdenum | mg/kg | - | - | **0.26 J** | <1.2 |
| Nickel | mg/kg | 22.7 | 48.6 | **9.0** | **7.1** |
| Selenium | mg/kg | - | - | **0.37 J** | **0.73** |
| Silver | mg/kg | - | - | **0.0074 J** | <0.064 |
| Thallium | mg/kg | - | - | **0.016 J** | <0.13 |
| Vanadium | mg/kg | - | - | **16** | **16** |
| Zinc | mg/kg | 121 | 459 | **27** | **28** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | <20.3 | <4.9 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **2370** | **1460** |

**2022**
**Sediment Monitoring Data**
**WBR-001 (Reference)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **4160** | **5230** |
| Antimony | mg/kg | - | - | **0.057 J** | <0.20 |
| Arsenic | mg/kg | 9.79 | 33 | **6.7** | **74.3** |
| Barium | mg/kg | - | - | **24** | **24.1** |
| Beryllium | mg/kg | - | - | **0.12 J** | <1.1 |
| Boron | mg/kg | - | - | **2.0 J** | <10.7 |
| Cadmium | mg/kg | 0.99 | 4.98 | **0.20** | **0.11** |
| Chromium | mg/kg | 43.4 | 111 | **10** | **9.6** |
| Cobalt | mg/kg | - | - | **2.0** | **2.5** |
| Copper | mg/kg | 31.6 | 149 | **6.8** | **8.8** |
| Iron | mg/kg | - | - | **9170** | **13400** |
| Lead | mg/kg | 35.8 | 128 | **16** | **7.4** |
| Lithium | mg/kg | - | - | **3.5 J** | <10.7 |
| Manganese | mg/kg | - | - | **86** | **191** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.10 | <0.44 |
| Molybdenum | mg/kg | - | - | **0.58 J** | <2.1 |
| Nickel | mg/kg | 22.7 | 48.6 | **7.2** | **8.9** |
| Selenium | mg/kg | - | - | **0.77** | <1.0 |
| Silver | mg/kg | - | - | **0.027 J** | <0.10 |
| Thallium | mg/kg | - | - | **0.065 J** | <0.20 |
| Vanadium | mg/kg | - | - | **16** | **18** |
| Zinc | mg/kg | 121 | 459 | **18** | **21** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | <31.6 | <4.9 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **1500** | **1610** |

**2022**
**Sediment Monitoring Data**
**WBR-002 (Compliance)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **7900** | **4350** |
| Antimony | mg/kg | - | - | **0.046 J** | <0.11 |
| Arsenic | mg/kg | 9.79 | 33 | **7.1** | **4.9** |
| Barium | mg/kg | - | - | **24** | **14.6** |
| Beryllium | mg/kg | - | - | **0.37 J** | <0.59 |
| Boron | mg/kg | - | - | **1.2 J** | <5.9 |
| Cadmium | mg/kg | 0.99 | 4.98 | <0.053 | <0.055 |
| Chromium | mg/kg | 43.4 | 111.0 | **13** | **8.2** |
| Cobalt | mg/kg | - | - | **4.0** | **2.8** |
| Copper | mg/kg | 31.6 | 149 | **26** | **5.5** |
| Iron | mg/kg | - | - | **27900** | **15500** |
| Lead | mg/kg | 35.8 | 128 | **17** | **1.3** |
| Lithium | mg/kg | - | - | **9.0** | **7** |
| Manganese | mg/kg | - | - | **147** | **103** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.057 | <0.26 |
| Molybdenum | mg/kg | - | - | **8.7** | <1.2 |
| Nickel | mg/kg | 22.7 | 48.6 | **12** | **8.7** |
| Selenium | mg/kg | - | - | **0.38 J** | <0.55 |
| Silver | mg/kg | - | - | **0.009 J** | <0.055 |
| Thallium | mg/kg | - | - | **0.032 J** | <0.11 |
| Vanadium | mg/kg | - | - | **51** | **16.9** |
| Zinc | mg/kg | 121 | 459 | **16** | **14.7** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | <18 | <4.9 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **3400** | **2030** |

**2022**
**Sediment Monitoring Data**
**WBR-003 (Compliance)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **7710** | **4370** |
| Antimony | mg/kg | - | - | **0.035 J** | **0.12** |
| Arsenic | mg/kg | 9.79 | 33 | **5.6** | **5.4** |
| Barium | mg/kg | - | - | **20** | **16.7** |
| Beryllium | mg/kg | - | - | **0.23 J** | <0.52 |
| Boron | mg/kg | - | - | **2.1 J** | <5.2 |
| Cadmium | mg/kg | 0.99 | 4.98 | <0.053 | <0.051 |
| Chromium | mg/kg | 43.4 | 111.0 | **17** | **8.3** |
| Cobalt | mg/kg | - | - | **4.4** | **2.8** |
| Copper | mg/kg | 31.6 | 149 | **23** | **17.3** |
| Iron | mg/kg | - | - | **22500** | **29500** |
| Lead | mg/kg | 35.8 | 128 | **2.3** | **1.8** |
| Lithium | mg/kg | - | - | **11** | <5.2 |
| Manganese | mg/kg | - | - | **191** | **116** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.056 | <0.24 |
| Molybdenum | mg/kg | - | - | **1.6** | <1.0 |
| Nickel | mg/kg | 22.7 | 48.6 | **18** | **11.7** |
| Selenium | mg/kg | - | - | **0.98 J** | **0.56** |
| Silver | mg/kg | - | - | **0.025 J** | <0.051 |
| Thallium | mg/kg | - | - | **0.11** | <0.10 |
| Vanadium | mg/kg | - | - | **41** | **28** |
| Zinc | mg/kg | 121 | 459 | **49** | **52.5** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | <19 | <4.8 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **20400** | **1910** |

# 2022
# Sediment Monitoring Data
# HMWQ-004 (Compliance)
# Humboldt Mill

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 9/4/2018 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | NM | NM |
| Antimony | mg/kg | - | - | NM | NM |
| Arsenic | mg/kg | 9.79 | 33 | NM | NM |
| Barium | mg/kg | - | - | NM | NM |
| Beryllium | mg/kg | - | - | NM | NM |
| Boron | mg/kg | - | - | NM | NM |
| Cadmium | mg/kg | 0.99 | 4.98 | NM | NM |
| Chromium | mg/kg | 43.4 | 111 | NM | NM |
| Cobalt | mg/kg | - | - | NM | NM |
| Copper | mg/kg | 31.6 | 149 | NM | NM |
| Iron | mg/kg | - | - | NM | NM |
| Lead | mg/kg | 35.8 | 128 | NM | NM |
| Lithium | mg/kg | - | - | NM | NM |
| Manganese | mg/kg | - | - | NM | NM |
| Mercury | mg/kg | 0.18 | 1.06 | NM | NM |
| Molybdenum | mg/kg | - | - | NM | NM |
| Nickel | mg/kg | 22.7 | 48.6 | NM | NM |
| Selenium | mg/kg | - | - | NM | NM |
| Silver | mg/kg | - | - | NM | NM |
| Thallium | mg/kg | - | - | NM | NM |
| Vanadium | mg/kg | - | - | NM | NM |
| Zinc | mg/kg | 121 | 459 | NM | NM |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | NM | NM |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | NM | NM |

**2022**
**Sediment Monitoring Data**
**HMP-009 (Compliance)**
**Humboldt Mill**

| Parameter | Unit | Threshold Effects Concentration | Probable Effects Concentration | Q4 2020 12/29/2020 | Q3 2022 8/29/2022 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | mg/kg | - | - | **9100** | **9830** |
| Antimony | mg/kg | - | - | **0.29** | **0.84** |
| Arsenic | mg/kg | 9.8 | 33.0 | **7.9** | **4.8** |
| Barium | mg/kg | - | - | **39** | **41.1** |
| Beryllium | mg/kg | - | - | **0.71 J** | <0.94 |
| Boron | mg/kg | - | - | **7.2 J** | <9.4 |
| Cadmium | mg/kg | 0.99 | 4.98 | <0.12 | <0.079 |
| Chromium | mg/kg | 43.4 | 111 | **18** | **17.6** |
| Cobalt | mg/kg | - | - | **5.6** | **8** |
| Copper | mg/kg | 31.6 | 149 | **29** | **51.6** |
| Iron | mg/kg | - | - | **17200** | **15700** |
| Lead | mg/kg | 35.8 | 128 | **14** | **10.6** |
| Lithium | mg/kg | - | - | **6.4 J** | <9.4 |
| Manganese | mg/kg | - | - | **241** | **255** |
| Mercury | mg/kg | 0.18 | 1.06 | <0.13 | <0.39 |
| Molybdenum | mg/kg | - | - | **1.5 J** | **2.6** |
| Nickel | mg/kg | 22.7 | 48.6 | **22** | **52** |
| Selenium | mg/kg | - | - | **1.8 J** | <1.6 |
| Silver | mg/kg | - | - | **0.089 J** | **0.14** |
| Thallium | mg/kg | - | - | **0.12 J** | <0.16 |
| Vanadium | mg/kg | - | - | **19** | **24.6** |
| Zinc | mg/kg | 121 | 459 | **38** | **34.4** |
| **Major Anions** | | | | | |
| Sulfide | mg/kg | - | - | <39 | <5.0 |
| **Major Cations** | | | | | |
| Magnesium | mg/kg | - | - | **6830** | **7950** |

**Sediment Monitoring Data**
**Abbreviations Data Qualifiers**
**Humboldt Mill**

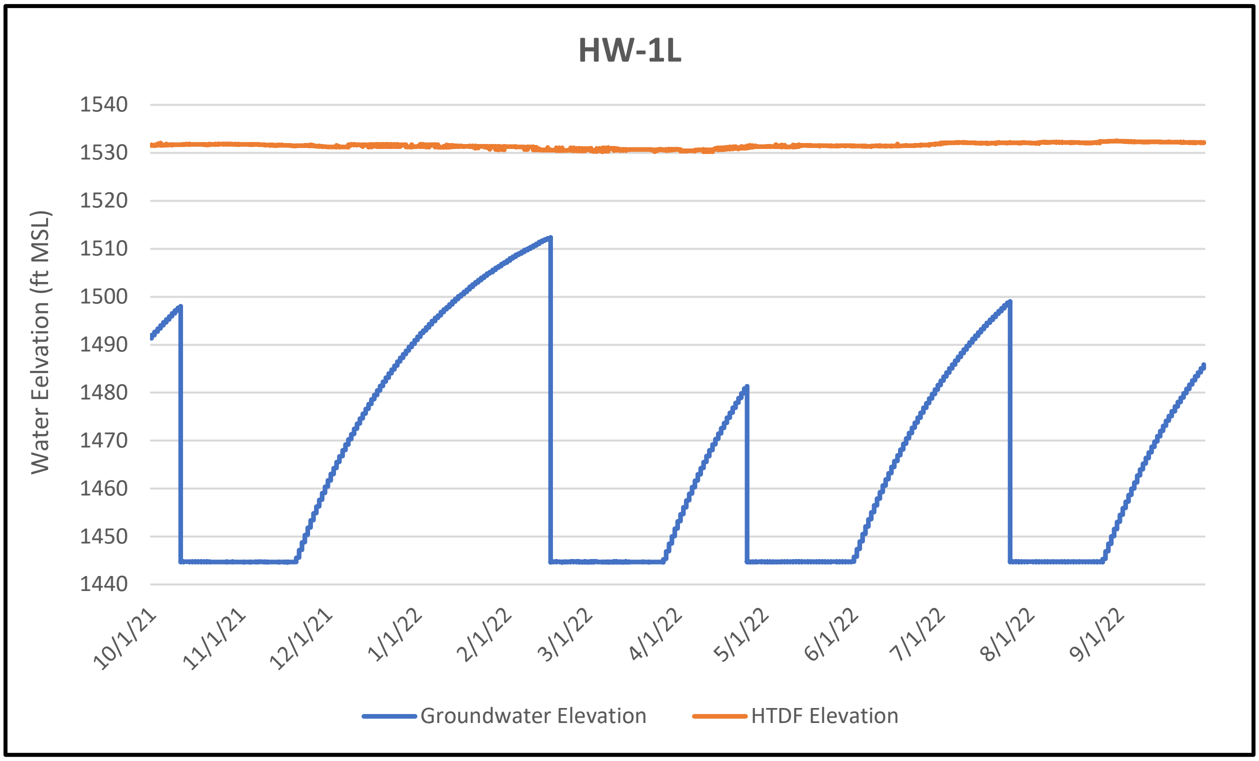
| **Notes:** |
|---|
| Threshold Effects Concentration (TEC) and Probable Effects Concentration (PEC) are consensus based guidelines developed by D.D. MacDonald, C.G. Inersol, T.A. Berger and published in the Archives of Environmental Contamination and Toxicology, "Development and Evaluation of Consensus Based Sediment Quality Guidelines for Freshwater Ecosystems, " January 2000. |
| Results in **bold** text indicate that the parameter was detected at a level greater than the laboratory reporting limit. |
| Highlighted Cell = Value is equal to or greater than the TEC or PEC established for the parameter. |
| --Denotes no TEC or PEC is established for the parameter |
| NM = Not measured during the sampling event |
| * MER-004 was added as a monitoring location in 2020 and therefore no sediment data is available from prior sampling events. |

# Appendix L

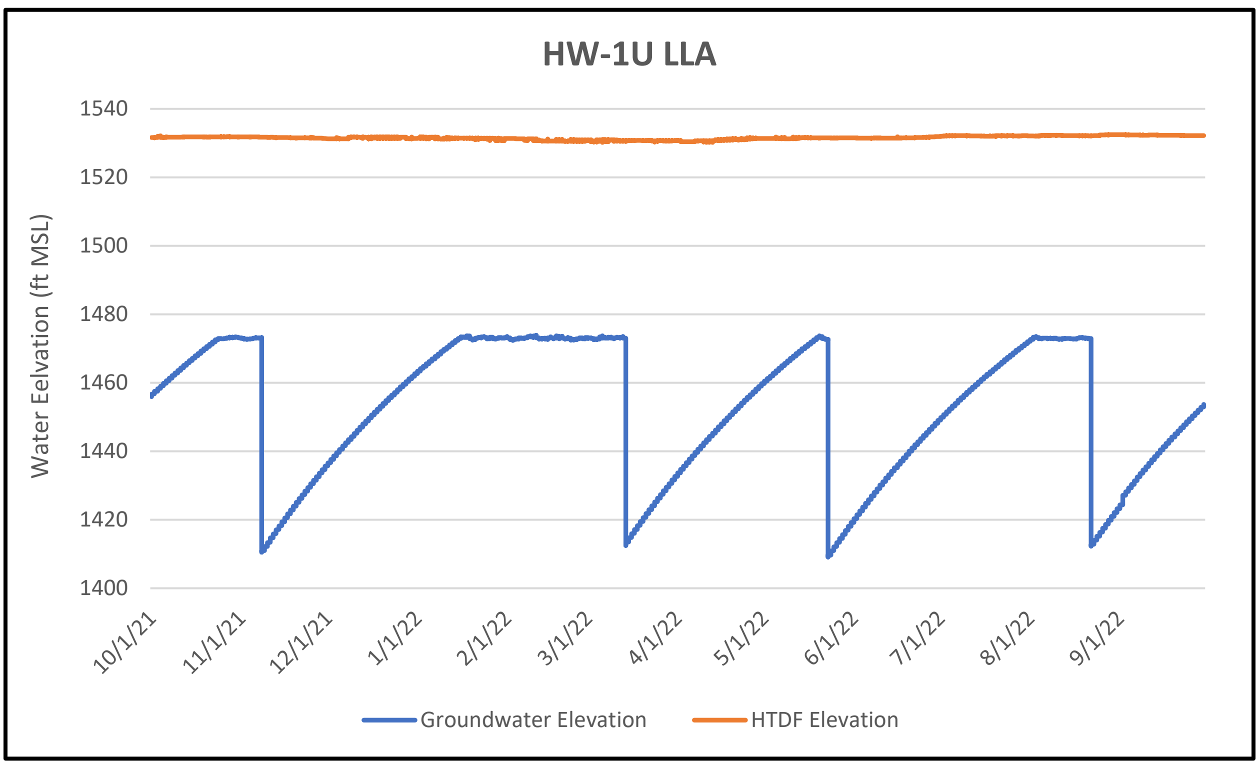
# Humboldt Mill

# Groundwater Hydrographs

# 2022 Groundwater Hydrographs
# Humboldt Mill

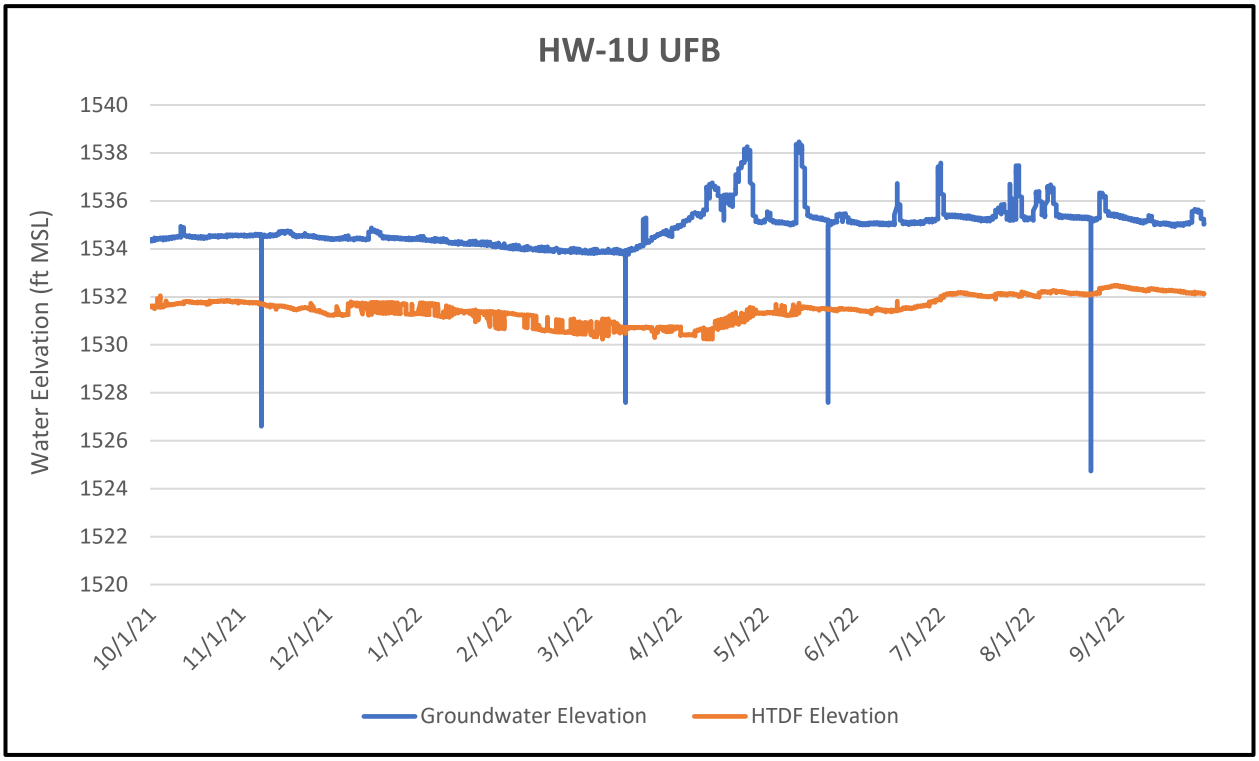



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

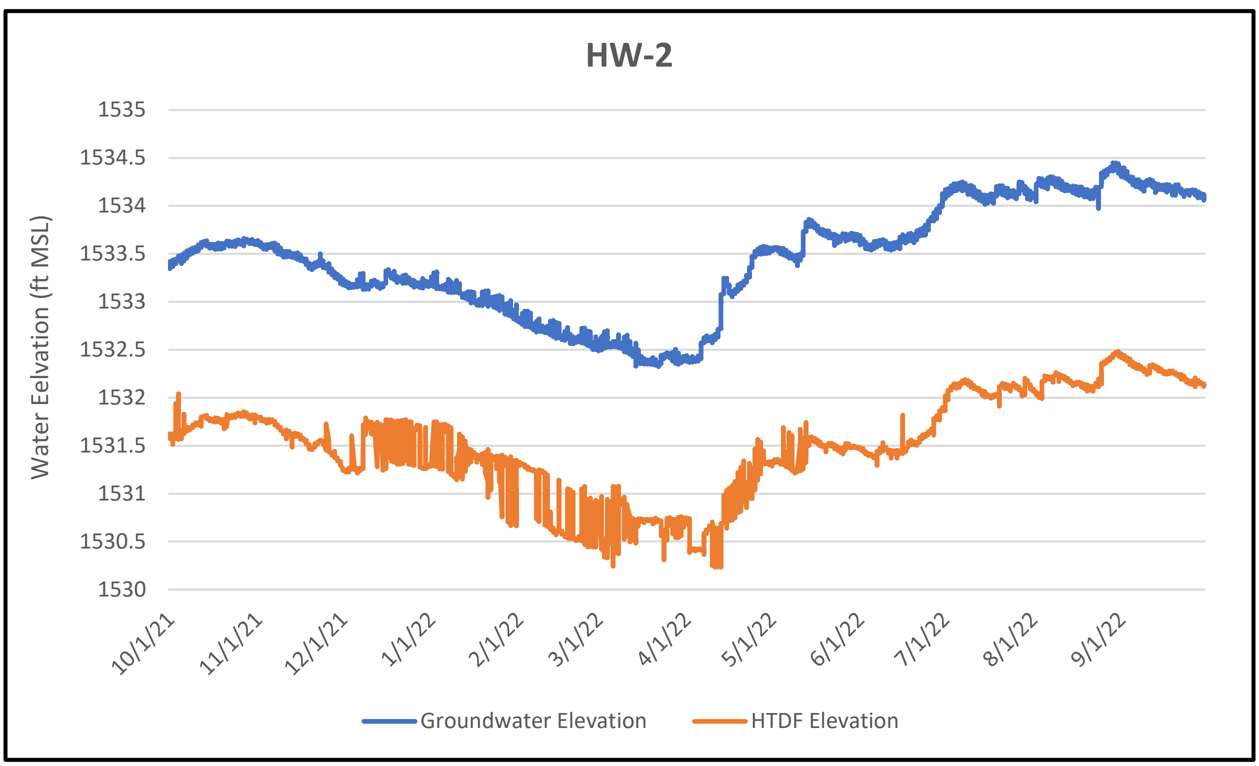



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2022 Groundwater Hydrographs**
**Humboldt Mill**

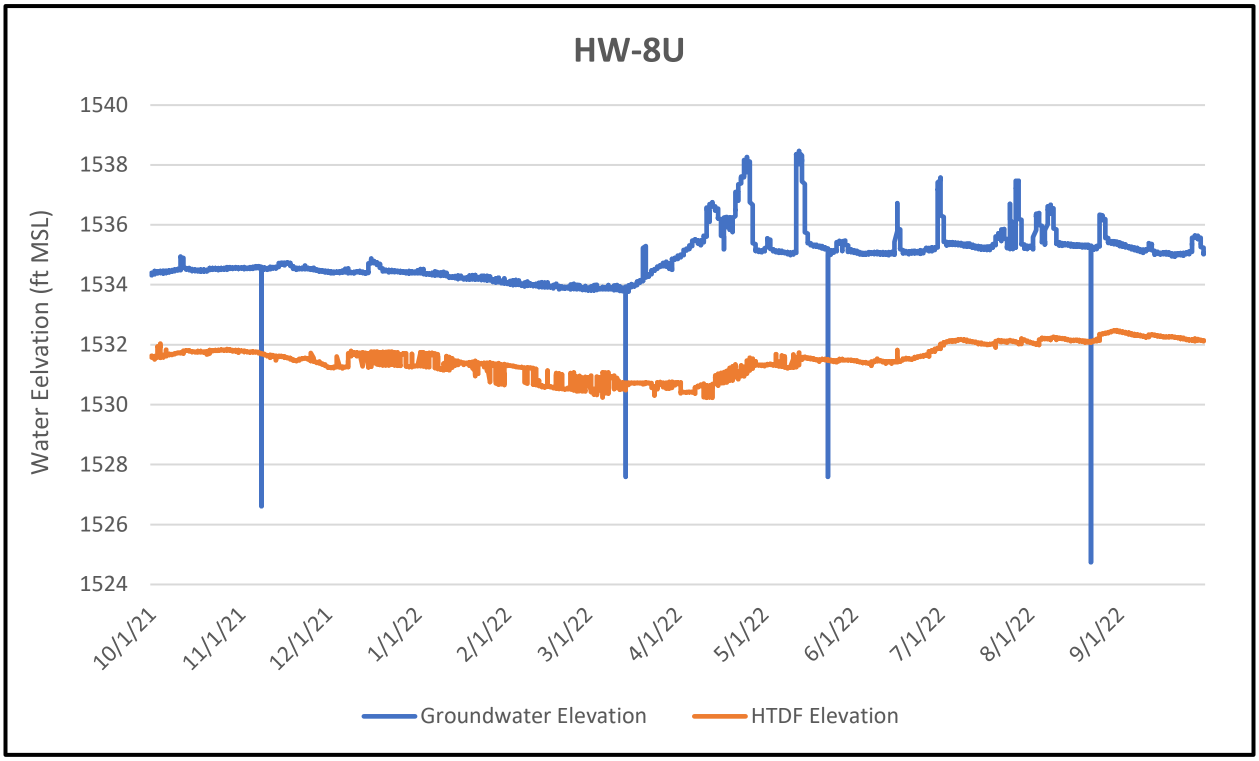



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

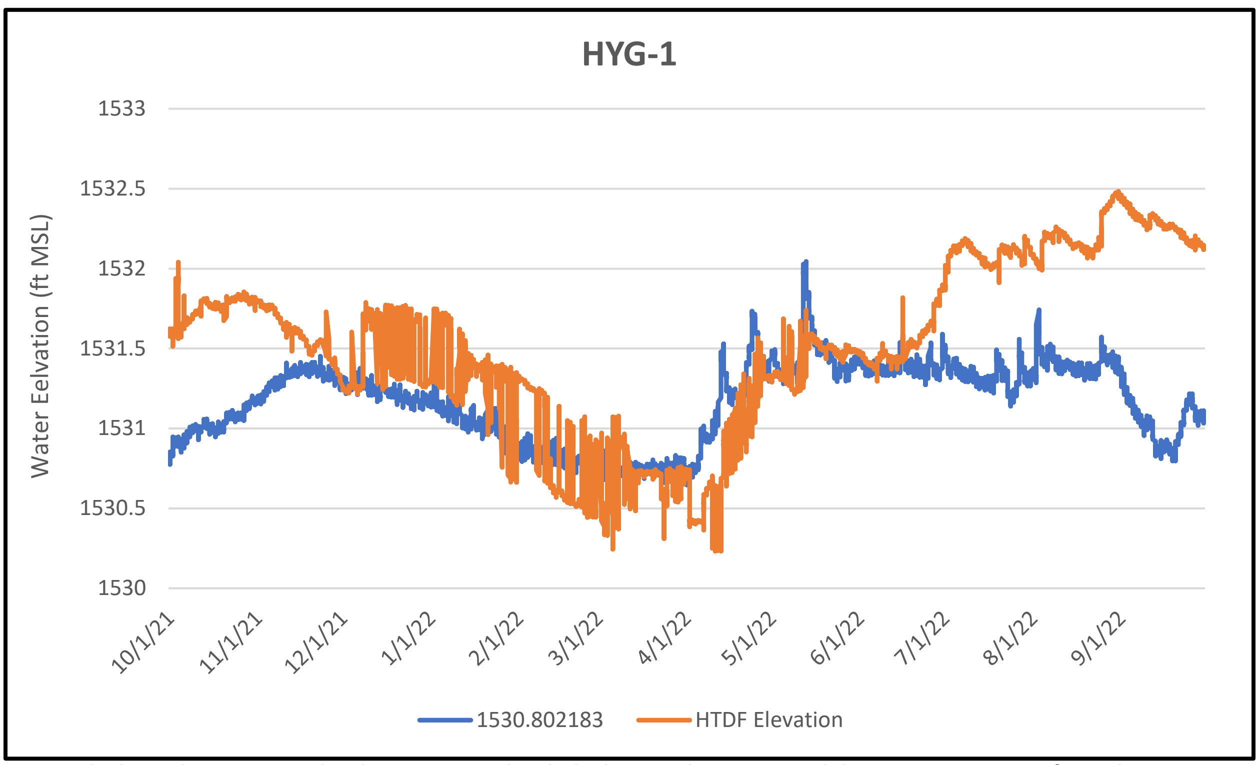



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2022 Groundwater Hydrographs**
**Humboldt Mill**

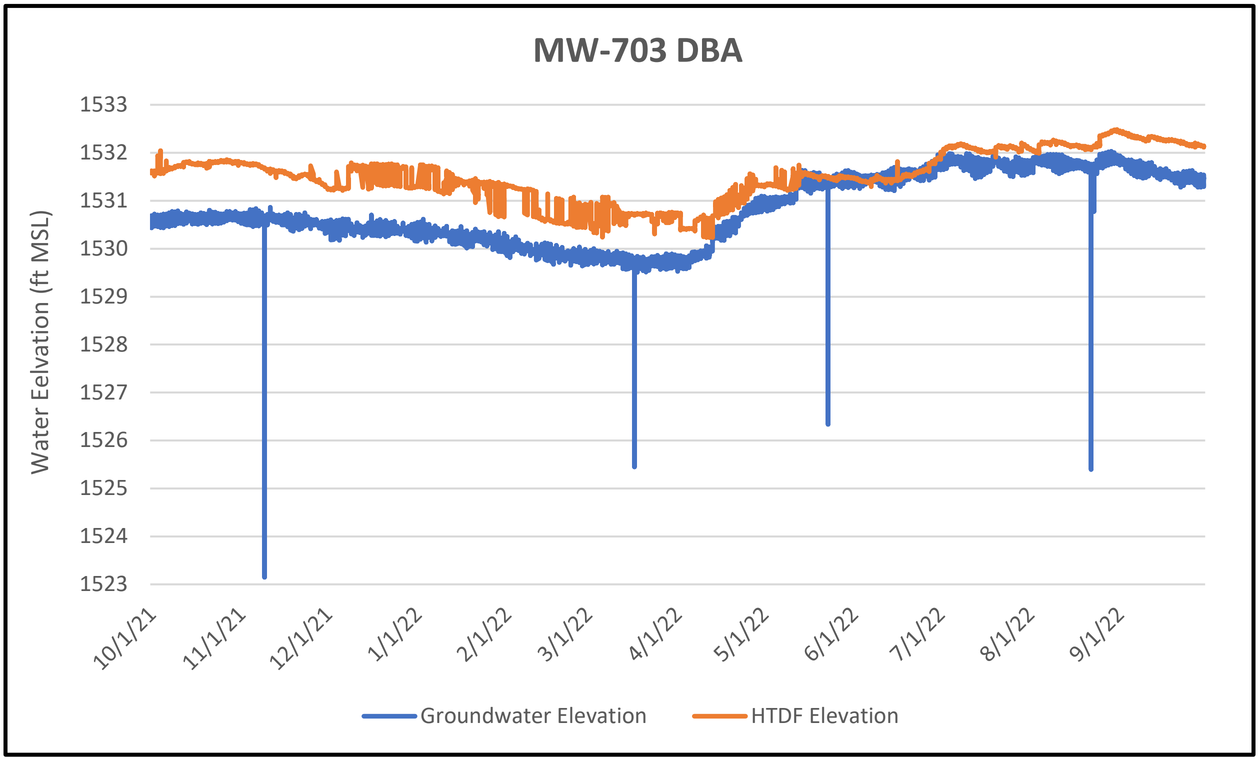



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

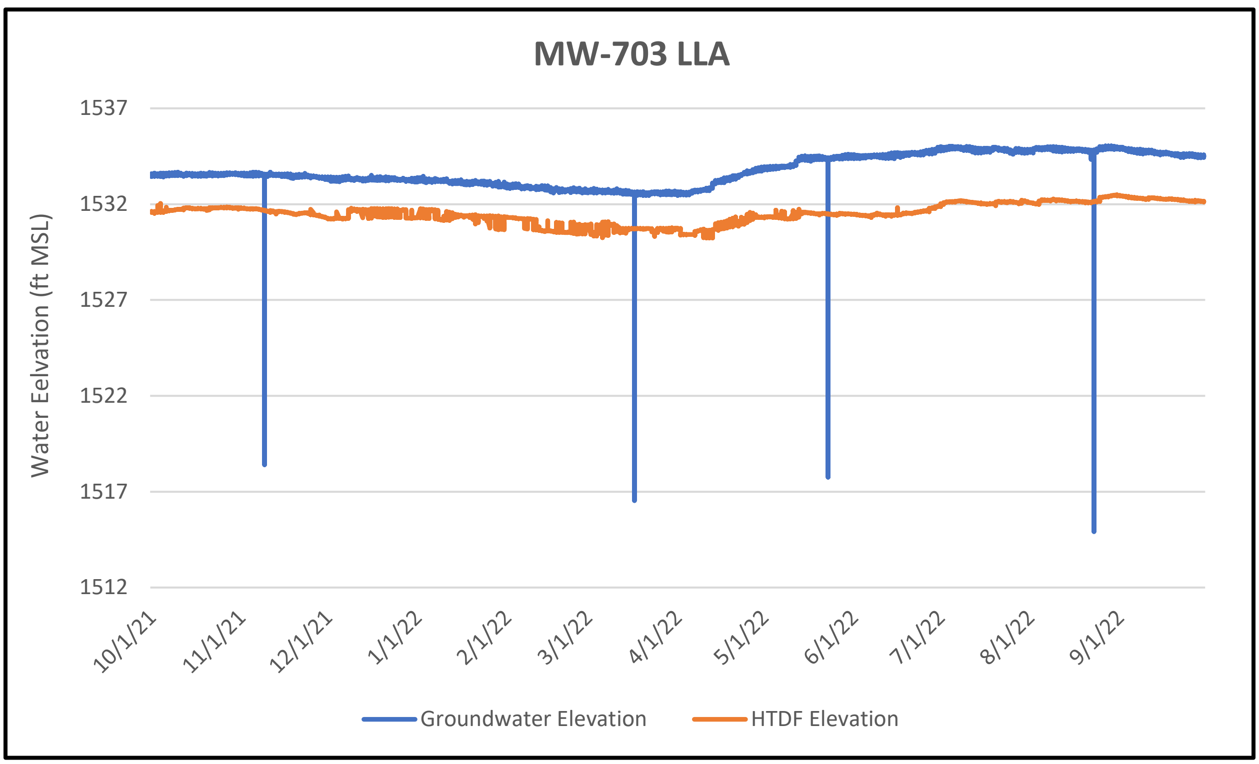



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2022 Groundwater Hydrographs**
**Humboldt Mill**

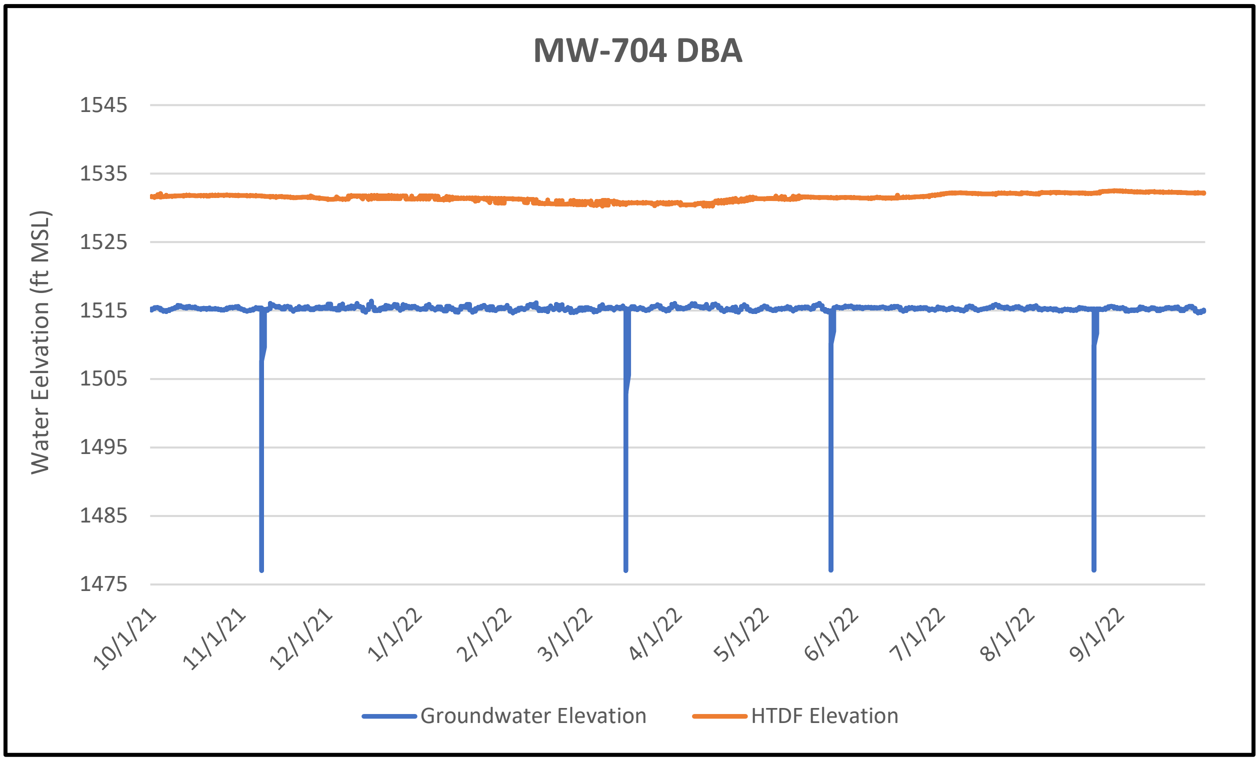



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

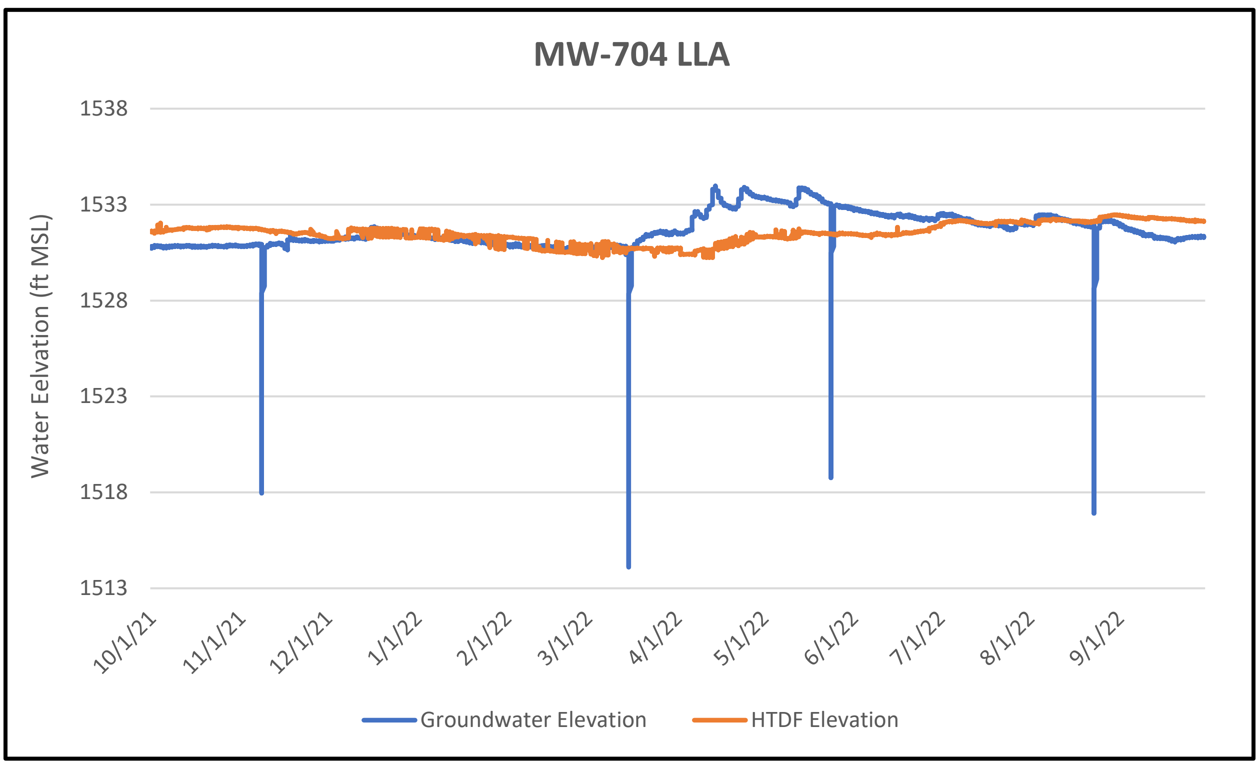



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

## 2022 Groundwater Hydrographs
## Humboldt Mill

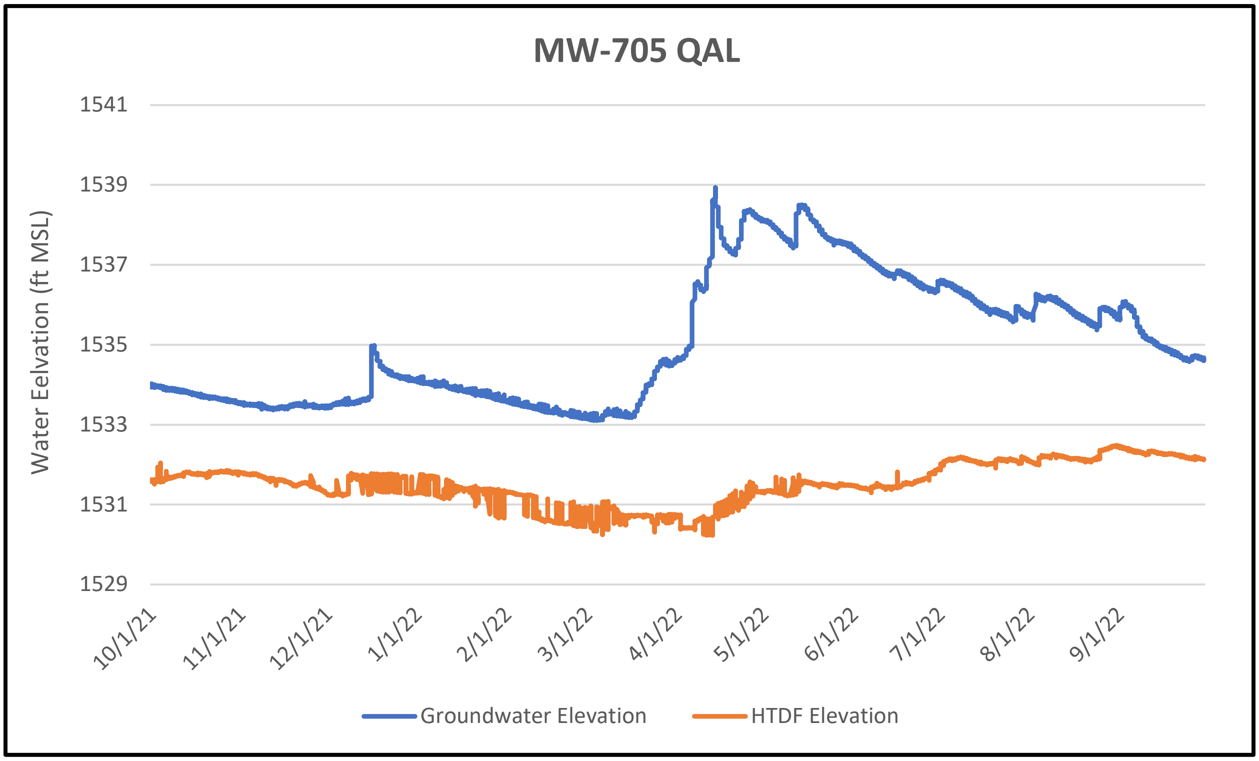



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

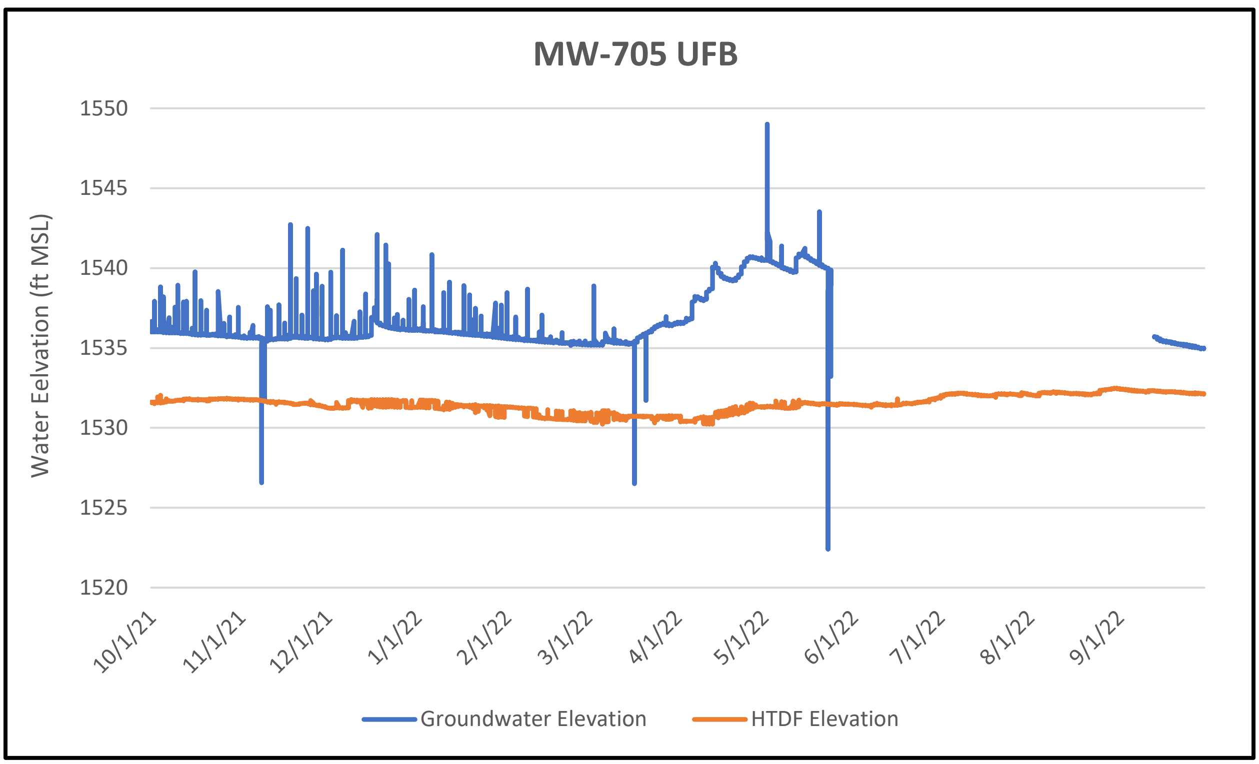



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2022 Groundwater Hydrographs**
**Humboldt Mill**

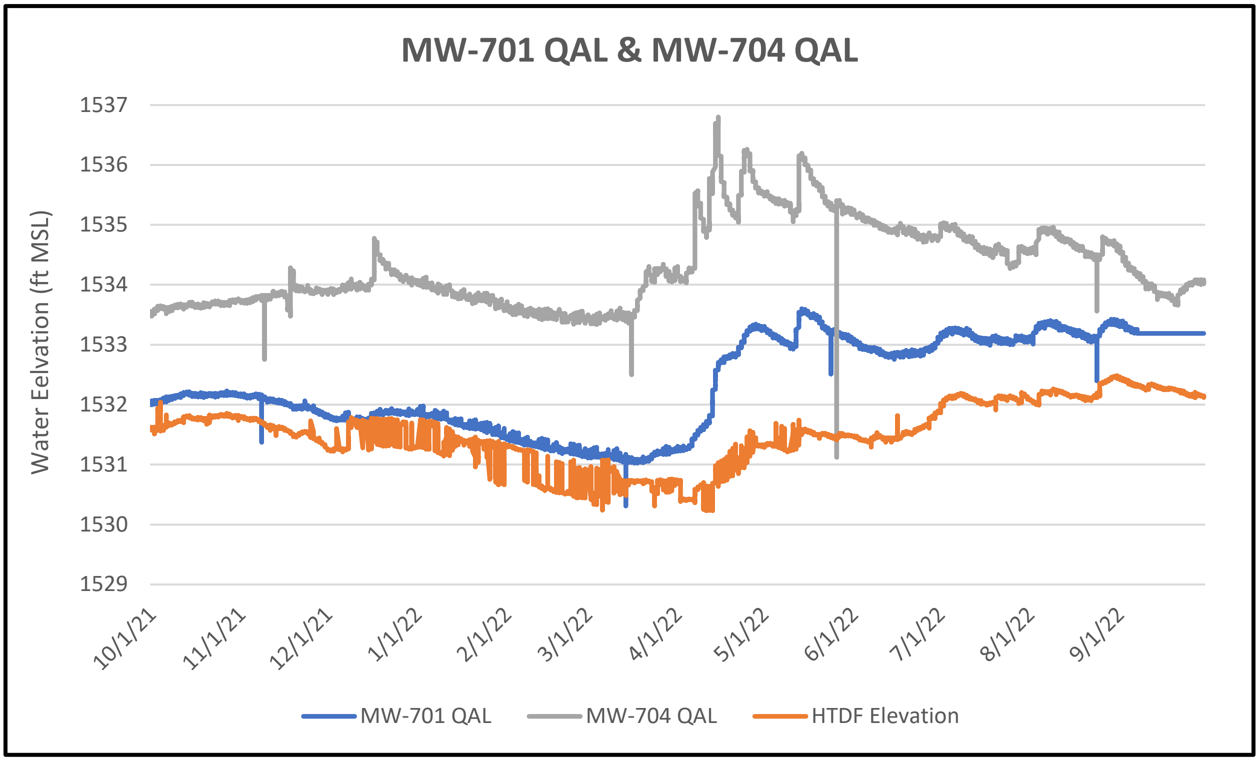



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

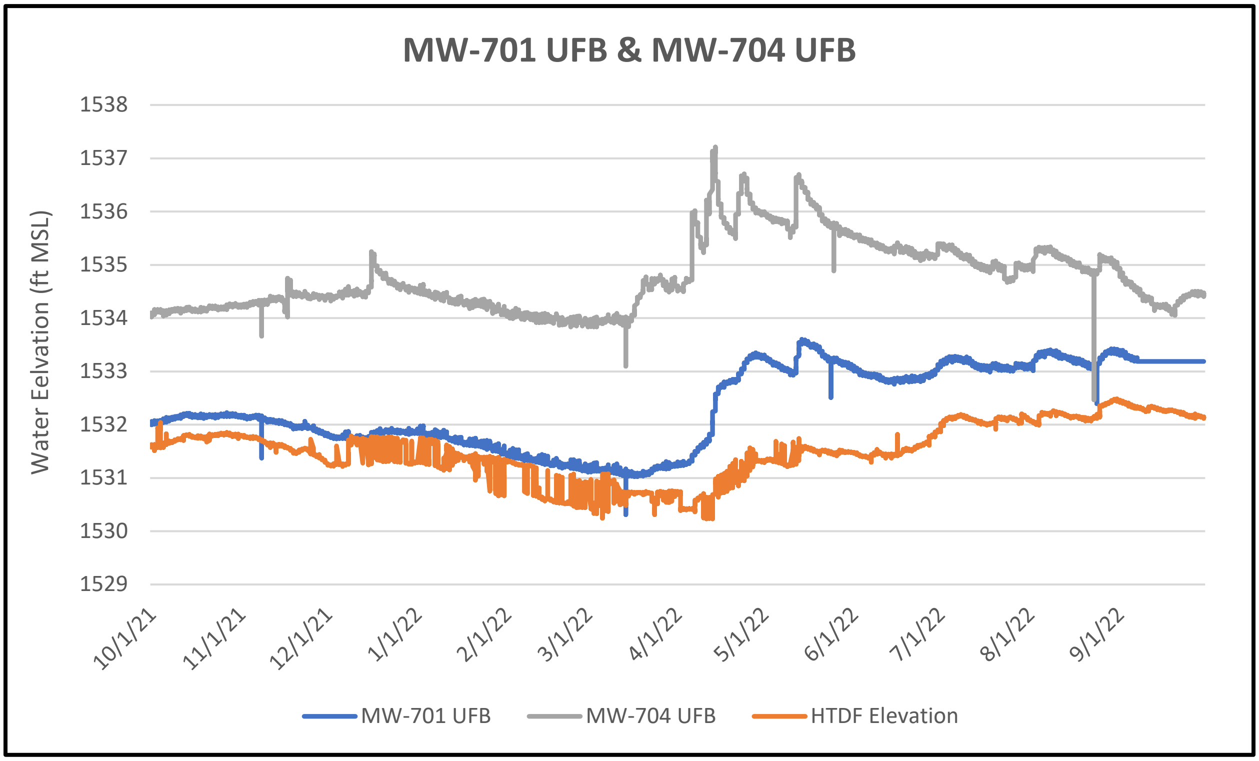



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.
Note: GW elevation data from 05-24-22 through 09-07-22 was unavailable due to equipment malfunction.

**2022 Groundwater Hydrographs**
**Humboldt Mill**

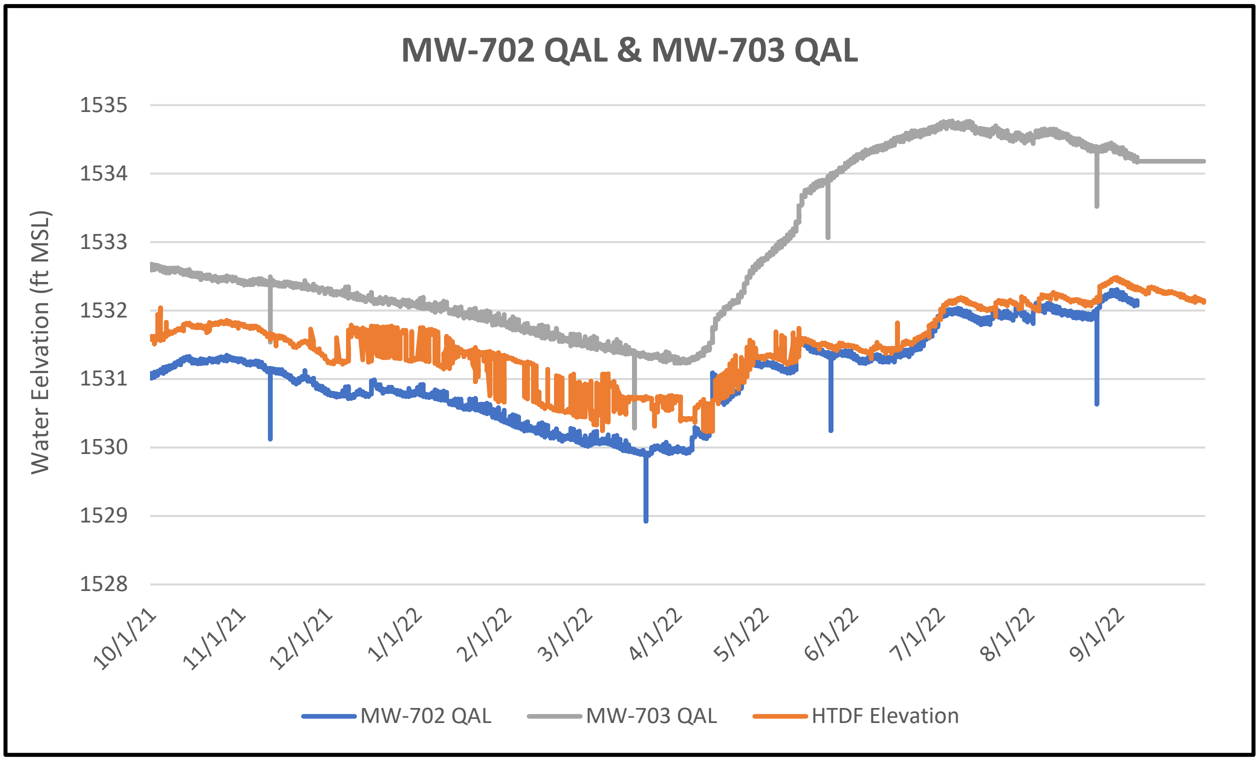



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

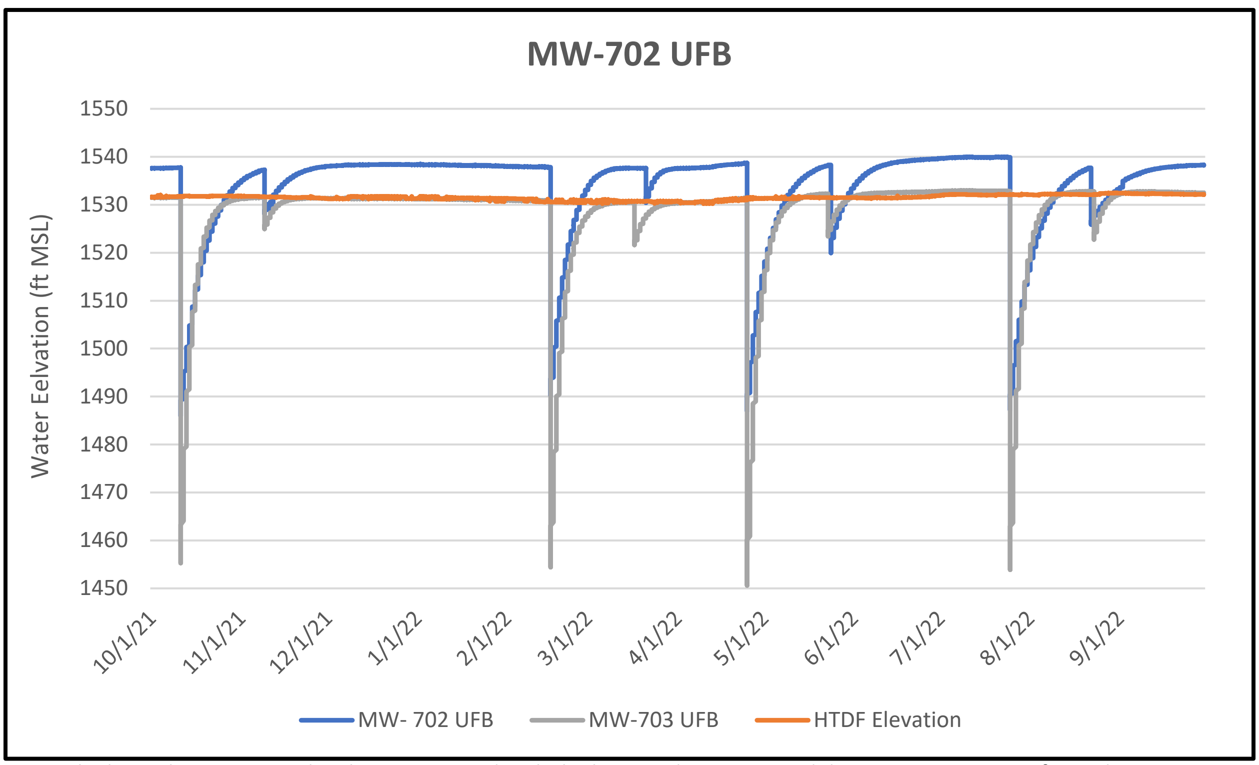



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2022 Groundwater Hydrographs**
**Humboldt Mill**




Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.
Note: GW elevation data from 09-07-22 through 11-22-22 was unavailable due to equipment malfunction.




Note: The large drops in water level are associated with the location being pumped down in preparation of sampling

# Appendix M

# Humboldt Mill

# Cut-off Wall Tabular Summary

# 2022 Cut-off Wall Monitoring Well Tabular Summary

| Monitoring Well | Location | Quarter | Groundwater Level (ft MSL) | Commentary | Sulfate mg/L |
|---|---|---|---|---|---|
| HTDF | | Q1 | 1530.73 | Sulfate measured at approx. 1500 ft MSL. | 340.0 |
| | | Q2 | 1531.56 | | 300.0 |
| | | Q3 | 1532.14 | | 360.0 |
| | | Q4 | 1531.70 | | 320.0 |
| HW-1L | Outside Cut-off Wall | Q1 | 1444.67 | Sulfate concentrations are lower in this well than in the HTDF.<br>*Following EGLE approval following the Q1 2022 sampling event, this well is only sampled once per year in Q3. | 32.0 |
| | | Q2 | 1444.74 | | * |
| | | Q3 | 1444.70 | | 35.4 |
| | | Q4 | 1507.42 | | * |
| HW-1U LLA | Outside Cut-off Wall | Q1 | 1472.82 | Sulfate concentrations are similar to other wells outside of the cut off wall, and are lower than concentrations within the HTDF.<br>*Following EGLE approval following the Q1 2022 sampling event, this well is only sampled once per year in Q3. | 66.6 |
| | | Q2 | 1471.50 | | * |
| | | Q3 | 1472.89 | | 66.0 |
| | | Q4 | 1472.18 | | * |
| HW-1U UFB | Outside Cut-off Wall, Compared to HW-2 | Q1 | 1533.94 | Low or nondetect sulfate concentrations at this well do not correlate with those found in HW-2 demonstrating the effectiveness of the cut-off wall. | 20.7 |
| | | Q2 | 1535.38 | | 1.1 |
| | | Q3 | 1535.28 | | < 1.0 |
| | | Q4 | 1535.16 | | 4.2 |
| HW-2 | Inside Cut-off Wall | Q1 | 1532.38 | The sulfate in this well is lower than concentrations in the HTDF. | 27.6 |
| | | Q2 | 1533.75 | | 23.6 |
| | | Q3 | 1534.18 | | 18.2 |
| | | Q4 | 1533.77 | | 14.7 |
| HW-8U | Outside Cut off Wall, Compared to HW-2 | Q1 | 1532.63 | Sulfate concentrations are much lower at this well then observed in the HTDF, showing the effectiveness of the cut off wall. | 3.6 |
| | | Q2 | 1536.13 | | 2.0 |
| | | Q3 | 1534.56 | | 1.8 |
| | | Q4 | 1534.41 | | 2.7 |
| HYG-1 | Outside Cut off Wall, Compared to HW-2 | Q1 | 1530.72 | After the cut off wall was installed the head difference between HW-2 and HYG-1 increased by approximately 5 feet. A 2-3 foot head difference remains between the two wells indicating similar conditions with seasonal impacts. | 38.0 |
| | | Q2 | 1531.47 | | 37.0 |
| | | Q3 | 1531.39 | | 49.3 |
| | | Q4 | 1531.05 | | 40.5 |
| MW-701 QAL | Inside-Cut off Wall | Q1 | 1531.05 | Sulfate at this well has remained elevated indicating influence of water from the HTDF as predicted. The magnitude and changes in water level in MW-701 QAL follow the magnitude and changes in water level of the HTDF as expected given it's close proximity to the HTDF and location south of the cut-off wall. It is likely we are also seeing elevations related to the 2019 sulfuric acid spill that occured in this area. | 226.0 |
| | | Q2 | 1533.51 | | 105.0 |
| | | Q3 | 1533.17 | | 122.0 |
| | | Q4 | 1533.18 | | 95.4 |
| MW-701 UFB | Bedrock, Inside-Cut off Wall | Q1 | 1531.34 | Due to the sulfuric acid spill that occurred in 2019, sulfate concentrations in this well were significantly higher in 2019-2021 than those observed at the 1500 msl Level of the HTDF. In 2022, the sulfate levels in this well have lowered to values similar to other wells inside the cut-off wall. | 128.0 |
| | | Q2 | 1533.86 | | 91.9 |
| | | Q3 | 1533.45 | | 75.1 |
| | | Q4 | 1533.00 | | 67.2 |
| MW-702 QAL | Inside Cut-off Wall | Q1 | 1529.97 | The sulfate in this well is lower than it is in the HTDF, but it is higher than the concentration occuring in its paired leachate monitoring well MW-703 QAL (with exception of Q1 2022) This is expected given its close proximity to the HTDF and location south of the cut-off wall.<br>*Diver discovered in failed state during 2022 Q4 monitoring event, replaced on 11/22/2022 | 51.3 |
| | | Q2 | 1531.50 | | 49.0 |
| | | Q3 | 1531.93 | | 54.8 |
| | | Q4 | * | | 52.1 |
| MW-702 UFB | Inside Cut-off Wall | Q1 | 1537.62 | The behavior of MW-702 UFB and MW-703 UFB (with exception of Q1 2022) have had no apparent changes for the years of facility operations, which show that the wall is behaving similarly to its performance in the past despite water level changes in the basin over the years. | 34.4 |
| | | Q2 | 1536.54 | | 33.2 |
| | | Q3 | 1535.45 | | 34.2 |
| | | Q4 | 1537.51 | | 31.1 |
| MW-703 QAL | Outside Cut-off Wall | Q1 | 1531.36 | Sulfate in MW-703 QAL is lower than inside of the cut off wall and is similar to levels observed in other wells outside of the cut off wall. This shows the effectiveness of the wall. With the exception of Q2, the water level in MW-703 QAL was approximately 1-2 feet higher than the elevation of the HTDF, indicating cut-off wall effectivness. | 178.0 |
| | | Q2 | 1533.74 | | 21.2 |
| | | Q3 | 1534.47 | | 25.9 |
| | | Q4 | 1534.18 | | 21.0 |
| MW-703 UFB | Outside Cut-off Wall | Q1 | 1530.49 | The behavior of MW-702 UFB and MW-703 UFB (with exception of Q1 2022 which appears anomalous) have had no apparent changes for the years of facility operations, which show that the wall is behaving similarly to its performance in the past despite water level changes in the basin over the years. | 532.0 |
| | | Q2 | 1531.83 | | 46.2 |
| | | Q3 | 1532.71 | | 49.6 |
| | | Q4 | 1531.15 | | 44.3 |

# 2022 Cut-off Wall Monitoring Well Tabular Summary

| Monitoring Well | Location | Quarter | Groundwater Level (ft MSL) | Commentary | Sulfate mg/L |
|---|---|---|---|---|---|
| MW-703 LLA | Outside Cut-off Wall | Q1 | 1532.56 | Sulfate concentrations in this well are lower than in the HTDF which evidences the cut-off wall effectiveness. The elevation observed in Q1 2022 appears anomalous. | 134.0 |
| | | Q2 | 1534.29 | | 32.5 |
| | | Q3 | 1534.79 | | 39.0 |
| | | Q4 | 1534.30 | | 31.1 |
| MW-703 DBA | Outside Cut-off Wall | Q1 | 1529.71 | Sulfate concentrations in this well are lower than in the HTDF which evidences the cut-off wall effectiveness. The elevation observed in Q1 2022 appears anomalous. | 236.0 |
| | | Q2 | 1531.22 | | 38.4 |
| | | Q3 | 1531.69 | | 39.2 |
| | | Q4 | 1531.29 | | 35.0 |
| MW-704 QAL | Leachate Monitoring Well for MW-701 QAL Outside Cut-off Wall | Q1 | 1533.38 | Sulfate levels in this well do not correlate with those found in its leachate monitoring pair, indicating overall that water quality of the HTDF is not communicating with this well. Water quality in MW-704 QAL may be locally under the influence of discharges of Escanaba River irrigation water to Outfall 003 at Wetland EE. The water level in MW-704 QAL was approximately 2-3 feet higher than the elevation of the HTDF throughout 2022, indicating the cut-off wall was effective at limiting communication between wells. | 14.3 |
| | | Q2 | 1535.91 | | 21.2 |
| | | Q3 | 1534.67 | | 21.6 |
| | | Q4 | 1534.36 | | 15.1 |
| MW-704 UFB | Leachate Monitoring Well for MW-701 QAL Outside Cut-off Wall | Q1 | 1533.90 | The magnitude and changes in water level in MW-704 UFB vary from levels observed in the HTDF. Sulfate levels in this well do not correlate with those found in its leachate monitoring pair MW-701 UFB, and are also lower than concentrations at the 1500 msl level of the HTDF, indicating overall that water quality of the HTDF is not communicating with this well. | 6.3 |
| | | Q2 | 1536.41 | | 4.0 |
| | | Q3 | 1535.03 | | 4.0 |
| | | Q4 | 1534.98 | | 4.7 |
| MW-704 LLA | Outside Cut-off Wall | Q1 | 1530.38 | Sulfate concentrations in this well are significantly lower than in the HTDF which evidences the cut-off wall effectiveness. | 10.5 |
| | | Q2 | 1533.63 | | 10.4 |
| | | Q3 | 1532.06 | | 7.8 |
| | | Q4 | 1531.94 | | 7.7 |
| MW-704 DBA | Outside Cut-off Wall | Q1 | 1515.56 | Low or nondetect levels of sulfate found at this well shows no communication with the HTDF at this groundwater depth. | < 1.0 |
| | | Q2 | 1515.34 | | 1.5 |
| | | Q3 | 1515.08 | | 1.5 |
| | | Q4 | 1515.05 | | 1.4 |

# Appendix N

# Humboldt Mill

# Flora & Fauna Survey Location Maps

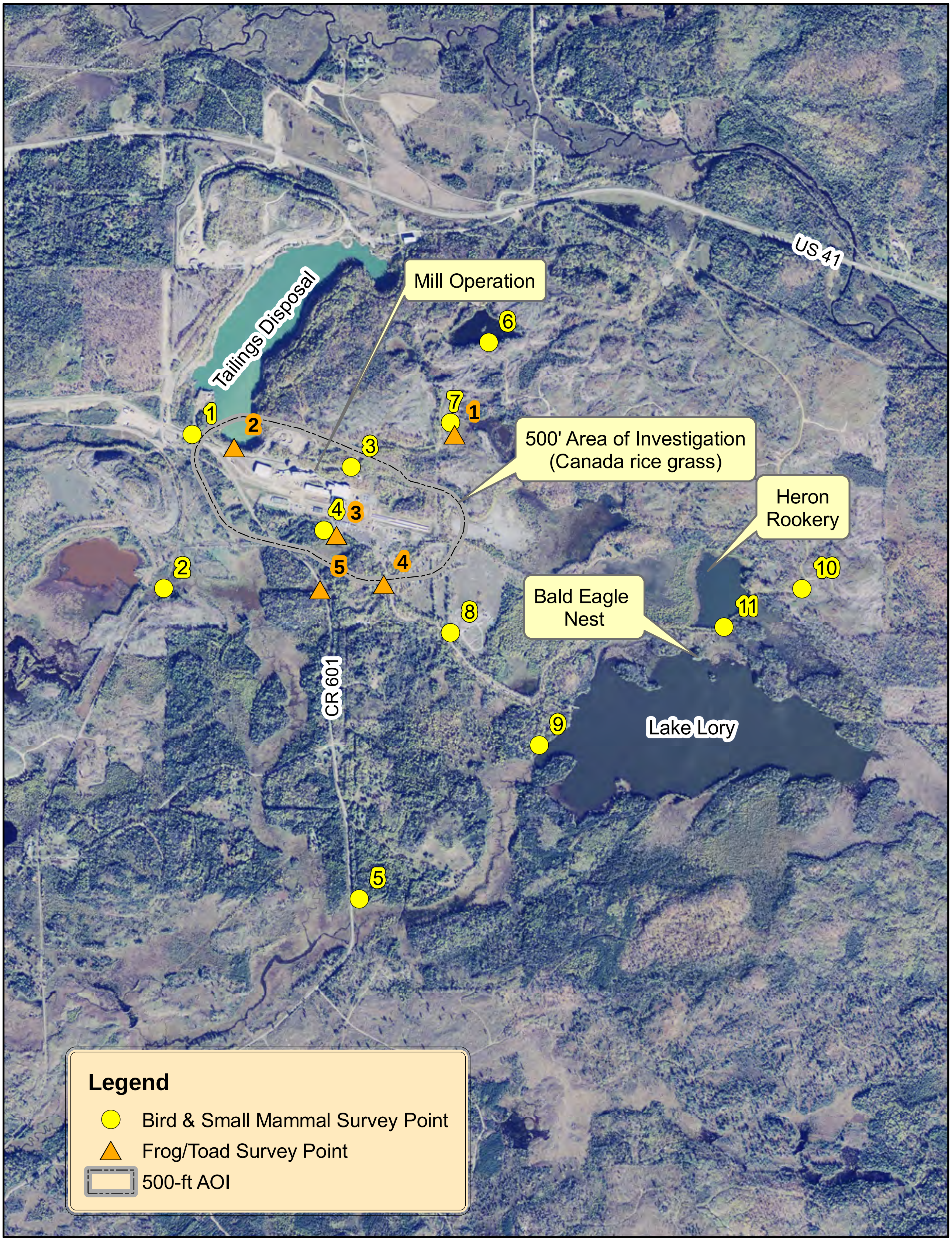
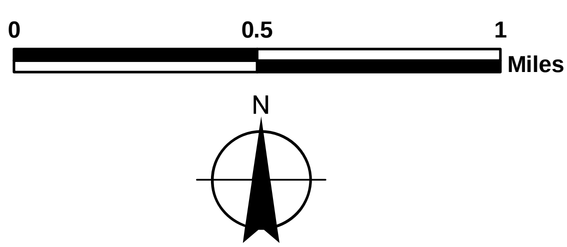



**Figure 1-3. Biological Survey Areas**




BARR

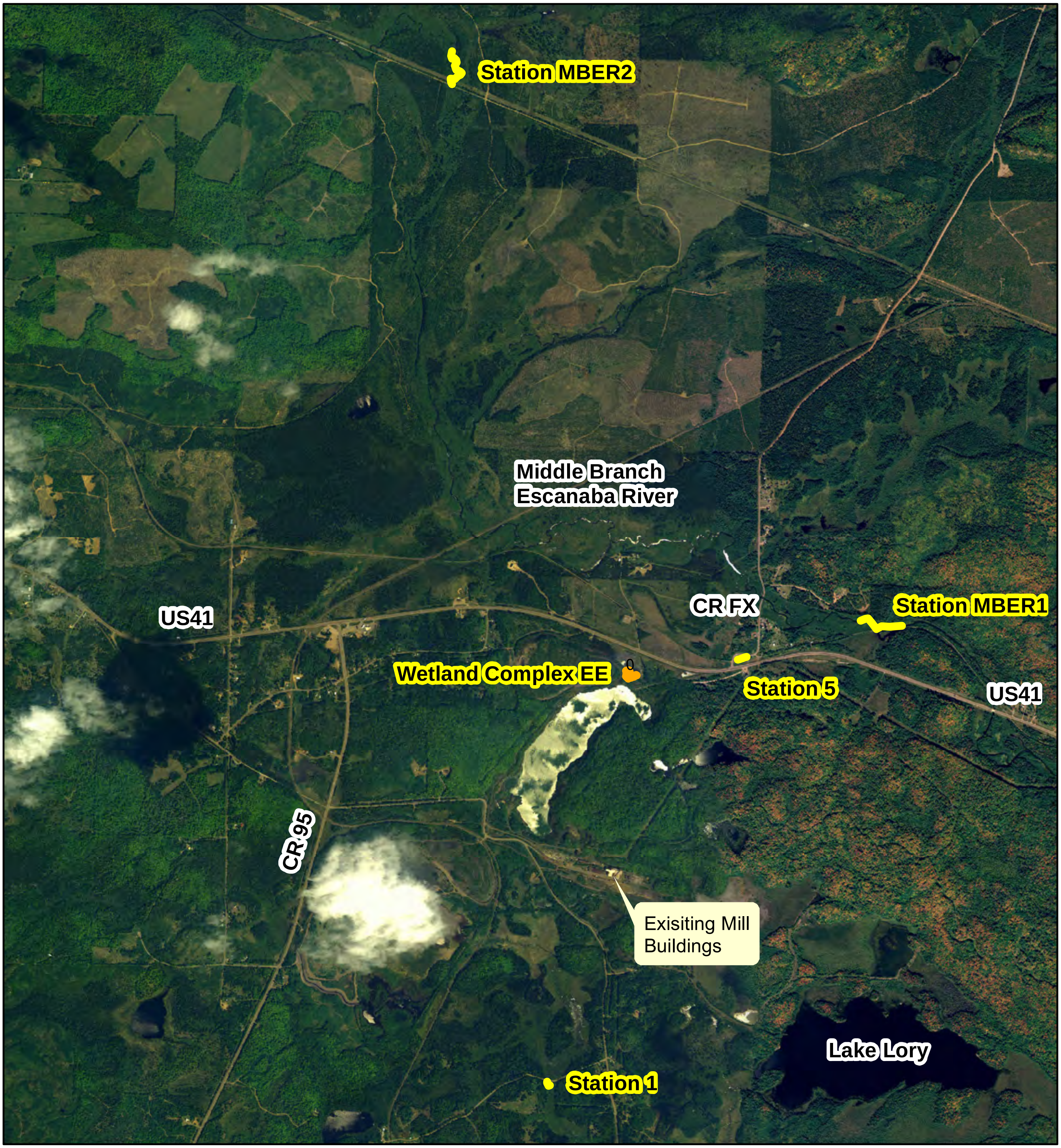

Figure 5-1. Great Blue Heron Rookery

BARR

# Appendix O

# Humboldt Mill

# Aquatic Survey Location Maps




## Legend

- Wetland Complex EE Station
- Stream Sample Station Locations

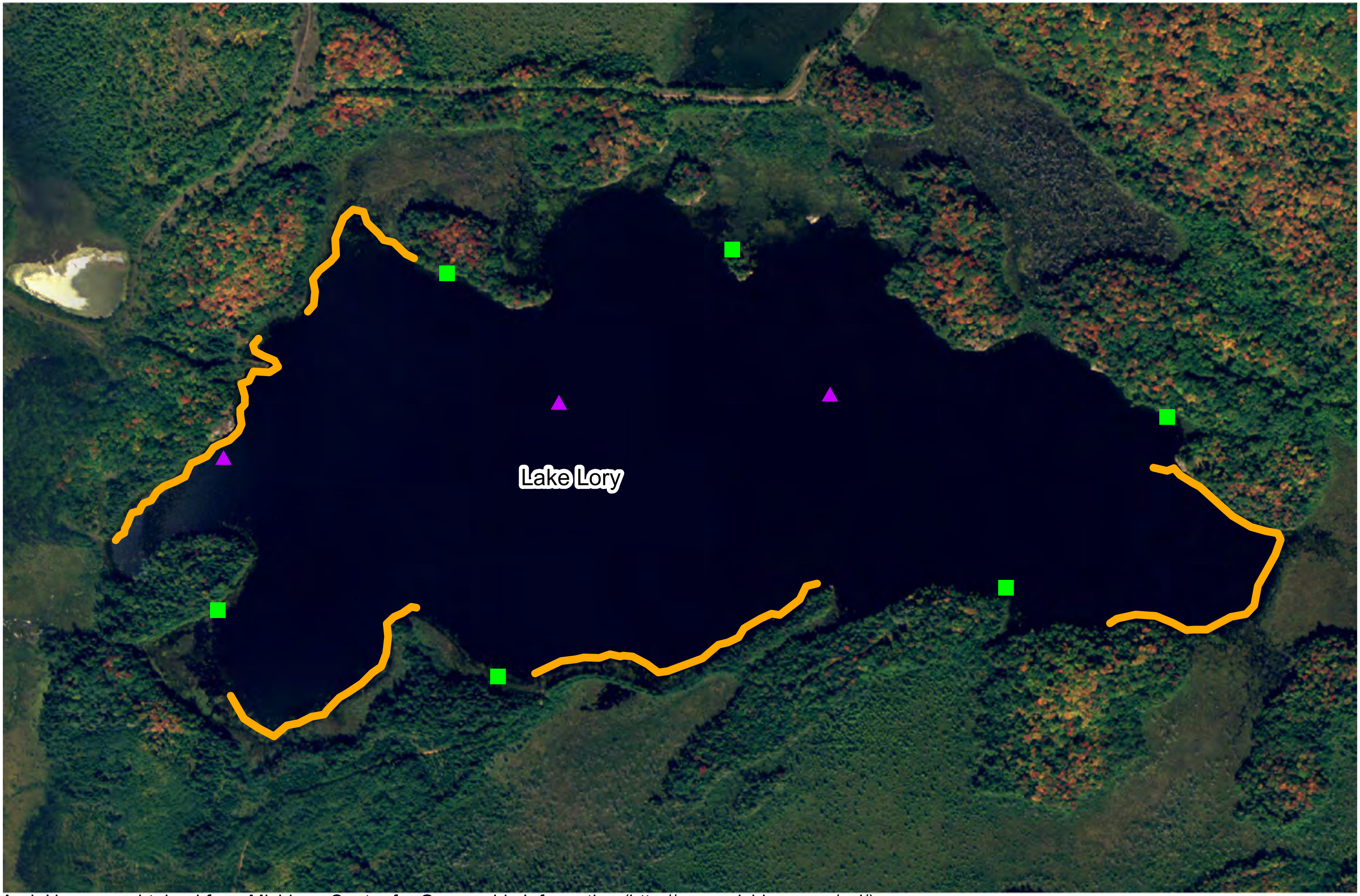
0 875 1,750 3,500 5,250 7,000 Feet

N

Aerial imagery obtained from Michigan Center for Geographic Information (http://www.michigan.gov/cgi/)

AeM ADVANCED ECOLOGICAL MANAGEMENT

| | |
|---|---|
| PROJECT | Humboldt Mill - Eagle Mine |
| TITLE | Sample Station Locations |
| FIGURE | 1-2 |




Aerial imagery obtained from Michigan Center for Geographic Information (http://www.michigan.gov/cgi/)

**Legend**

- Fyke Net Locations
- Gill Net Locations
- Electroshocker Transect Locations

Feet: 0, 275, 550, 1,100, 1,650, 2,200

N

AEM ADVANCED ECOLOGICAL MANAGEMENT

| | |
|---|---|
| PROJECT | Humboldt Mill - Eagle Mine |
| TITLE | Lake Lory Gear Locations |
| FIGURE | 1-3 |

# Appendix P

# Humboldt Mill

# Mill Contingency Plan

# 1. Contingency Plan – Humboldt Mill

This contingency plan addresses the requirements defined in R 425.205. This includes a qualitative assessment of the risk to public health and safety, or the environment (HSE risks) associated with potential accidents or failures involving activities at the Humboldt Mill. Engineering or operational controls to protect human health and the environment are discussed in Section 4 and Section 5 of this document. The focus of this contingency plan is on possible HSE risks and contingency measures. Possible HSE risks to on-site workers will be addressed by Eagle Mine through HSE procedures in accordance with Mine Safety and Health Administration (MSHA) requirements.

The Humboldt Mill involves processing ore, as well as storing and treating by-products of that process. The milling, storage, and treatment facilities have been designed, constructed, and are operated in a manner that is protective of the environment through the use of proven technologies and engineering practices.

## 1.1 Contingency Items

This contingency plan addresses the items listed below in this Section in accordance with R 425.205 (1)(a)(i) - (xii).

- Release or threat of release of toxic or acid-forming materials
- Storage, transportation, and handling of explosives
- Fuel storage and distribution
- Fires
- Wastewater collection and treatment system
- Air emissions
- Spills of hazardous substances
- Other natural risks defined in the EIA
- Power disruption, and
- Leaks from containment systems for stockpiles or disposal and storage facilities.

For each contingency item, a description of the risk is provided, followed by a qualitative assessment of the risk(s) to the environment or public health and safety. Next, the response measures to be taken in the event of an accident or failure are described.

### 1.1.1 Release of Toxic or Acid-Forming Materials

Potentially reactive materials generated as a result of processing operations include ore concentrate and tailings. Both materials have the potential to leach metals constituents when exposed to air and water. As described in the following sub-sections, handling, and temporary storage of both the ore concentrate and tailings have been carefully considered in the design of the Humboldt Mill to prevent the uncontrolled release of acid rock drainage (ARD).

#### 1.1.1.1 Coarse Ore Storage Area (COSA)

The potential environmental risk associated with the COSA is the release of contact water to the environment via cracks in the floor areas or collection sumps. The COSA is a steel-sided building with a full roof that is used for the temporary storage of stockpiled coarse ore that has been transported from the mine and is awaiting crushing. The COSA has a concrete floor that is sloped to keep any water associated with the ore inside the facility. The lower level of the facility is equipped with an epoxy-lined sump and any water collected is pumped to the Humboldt Tailings Disposal Facility (HTDF) for eventual treatment by the water treatment plant.

A secondary potential environmental risk in the COSA is the release of acid-generating material via track out and fugitive emissions. Track out is managed by the housekeeping standard practices that have been established in the building.

Contingency planning for this facility includes timely repair of cracks in the floors and walls that could allow the release of material into the environment. An impermeable surface inspection plan has been developed and describes procedures for routine impermeable surface inspections, preventative and remedial actions as well as documentation procedures. Also, per Air Permit (No. 405-08), all overhead doors must be closed during loading or unloading of ore and a sweeping program is in place to minimize the generation of dust.

#### 1.1.1.2 Concentrate Load-Out (CLO)

The potential environmental risk associated with the CLO is the release of acid-generating material via track-out and fugitive emissions. The CLO is a steel-sided building with a full roof that is used for the temporary storage of stockpiled nickel and copper concentrate prior to loading the material into railcars destined for customers. The CLO has concrete floors and does not contain any floor drains as water use is discouraged in this area.

Contingency planning for this facility includes timely repair of cracks in the floors and walls that could allow the release of material into the environment. An impermeable surface inspection plan has been developed and describes procedures for routine impermeable surface inspections, preventative and remedial actions as well as documentation procedures. Also, per Air Permit (No. 405-08), all overhead doors must be closed during loading operations, and a sweeping program in place to minimize the generation of dust and track out of material. Track out is also managed in accordance with procedures outlined in the facility's standard operating procedures and includes inspecting and removing any residual concentrate from the exterior of the railcars prior to leaving the facility.

#### 1.1.1.3 Humboldt Tailings Disposal Facility (HTDF)

A potential contaminant release from the HTDF could be in the form of water that has elevated metal or salt concentrations that may impact surface water or groundwater quality. The HTDF is a former open pit mine that was allowed to fill with water. Process tailings are sub-aqueously disposed which is the industry best practice for materials that could be potentially acid generating. The anoxic environment minimizes the potential for the generation of ARD.

The HTDF was originally composed of bedrock walls on three sides and alluvial soils on the north end through which groundwater naturally transmitted to the adjacent wetland. A cut-off wall was installed in the alluvial soil to prevent the release of water from the HTDF into groundwater. Therefore, groundwater quality surrounding the HTDF should not be influenced by HTDF operations. Any water that leaves the HTDF passes through the water treatment plant prior to discharge into the environment. Surface water discharge from the HTDF will be treated through the water treatment plant prior to discharge to the Escanaba River and/or nearby wetland.

Groundwater seeps from the HTDF are not expected to occur due to the low permeability of the surrounding Precambrian geologic formation. Furthermore, groundwater and surface water quality and elevations/flow are routinely monitored following requirements of the Part 632 Mining and NPDES permits and will identify changes to surrounding water quality that would be indicative of groundwater release from the HTDF. Contingency planning from an unlikely groundwater release from the HTDF includes:

- Identify the nature and extent of the release,
- Implement additional monitoring to ascertain the extent of release,
- Develop a remedial action plan to bring the facility back into compliance,
- Implement a remedial action plan.

Specific details of the remedial action plan would be developed based on the nature of the release and in concert with agreements with the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

Eagle will monitor water quality in the HTDF during operations and post-closure. The WTP and associated infrastructure will remain in place after tailings disposal has ceased until water quality meets applicable standards. If future monitoring indicates there are elevated metals in the HTDF that could impact surface water one of the following treatment options may be implemented:

- Continue the treatment of the HTDF water through the WTP until water quality conditions in the HTDF meet surface water standards; and/or
- Amend the HTDF with appropriate reagents to reduce elevated metal parameters in order to meet surface water standards.

Specific reagents and application rate(s) would depend on the elevated metal parameters of concern. Past phosphate seeding of HTDF by previous owners was effective for nickel concentration reduction.

#### 1.1.1.4 **Tailings Transport System**

Tailings are transported to the HTDF via slurry contained within a double-cased HDPE pipe conveyance system. The pipe conveyance system consists of a 4-in diameter carrier pipe within an 8-in outer containment pipe. Two tailings lines are available for use, but only one is used at a time. In addition, the tailings lines are equipped with a leak detection system; any water released into the outer piping would drain to the shore vault and trigger an alarm, notifying operations of a potential system breach. The shore vault is also visually inspected twice per day (once per shift) by operators and the Environmental Department checks the tailings lines for signs of leakage once per week.

If a breach is identified, the slurry pumps will be shut down until the source of breach is identified and repaired. The contingency plan for moving tailings to the HTDF facility is to use the second set of tailings lines that are already in place. In the event both lines were down, they could either be pumped into a truck with a sealed cargo area or the tailings will be held within the plant thickener vessel until the pipeline is repaired.

### 1.1.2 Storage, Transportation and Handling of Chemicals

The potential risk associated with chemical use include surface and groundwater quality impacts. Chemicals are brought to the site by certified chemical haulers, meeting Michigan Department of Transportation (MDOT) transportation requirements. The chemicals are stored in secure locations within building(s) or outdoor bulk storage silos designed for that application. Transferring chemicals is conducted by qualified site personnel. Bulk granular products are conveyed pneumatically to the storage silos. Specific procedures for chemical storage and emergency response procedures are included in the facility's Pollution Incident Prevention Plan (PIPP).

Because chemicals will be stored in secure areas, the potential for release into the environment is very remote. If a breach of contaminant vessel does occur, the chemical will be contained within the secondary containment area. The spill or release will be immediately cleaned using the appropriate methods specified in the Safety Data Sheets (SDS). SDS forms are maintained on-site for all chemicals.

### 1.1.3 Fuel Storage and Distribution

There is currently one 3,000-gallon stationary bulk diesel tank located onsite. This tank is used to fuel mobile equipment onsite. A fuel provider refills the tank on an as-needed basis. The stationary tank is located on an asphalt surface where spills or leaks can be captured and absorbed.

In addition, equipment containing fuel includes a backup diesel generator (2,000-gallon capacity) located at the northeast corner of the concentrate loadout facility, a backup diesel generator (1,335 gallons capacity) located by the shore vault, and two refueling tanks located in the beds of pickup trucks (38 and 96-gallon capacities).

In general, fuel spills and leaks will be minimized by the following measures:

- A Spill Prevention Control and Countermeasures Plan (SPCC) has been written and implemented.
- Personnel are trained and responsible for handling fuel using proper procedures and emergency response.
- Regular equipment inspections and documentation of findings.
- Emergency response equipment is staged to quickly respond to unanticipated spills or leaks.

Specific procedures have been prepared as part of the project's SPCC Plan. In addition, a PIPP has been prepared that addresses the potential for spills of fuels and other polluting materials such as water treatment chemicals and mill processing reagents.

Diesel fuel and propane (fuels) are transported to the Humboldt Mill by tanker truck from local distributors. The probability of an accidental release during transportation will be dependent on the location of the supplier(s) and the frequency of shipment. A fuel release resulting from a vehicular accident during transportation is a low-probability event. Transport of fuel in tanker trucks does not pose an unusual risk to the region since tanker trucks currently travel to the region on a regular basis to deliver fuels to gasoline stations located in the communities surrounding the Humboldt Mill.

Three potential release events associated with the surface-stored fuels are a bulk tank failure, mishandling/leaking hoses, and a construction/reclamation phase release.

<u>Bulk Tank Failure</u> – A release may result from a failure of the stationary diesel tank. This type of release is a low probability as it is a double-walled (i.e., secondary containment) fireproof tank that is inspected for signs of leakage or potential failure daily prior to use. In addition, the tank is located and used in an area where asphalt is present, and any spills would be absorbed or contained rather than directed offsite or unprotected location. A spill response trailer is located onsite and contains spill containment and clean-up equipment in the event of a spill. Eagle also has a spill response contractor on call to immediately respond to situations that cannot be handled by onsite personnel.

<u>Mishandling/Leaking Hoses</u> - A release might result from leaking hoses or valves, or from operator mishandling. This type of release is likely to be small in volume and is a low-probability event given that operators will be trained to manage these types of potential releases. Mitigation measures include fueling on an asphalt surface and using secondary containment under connection/fill points. In addition, these small spills will be cleaned up using on-site spill response equipment such as absorbent materials and/or by removing impacted soils.

<u>Construction/Reclamation Phase Release</u> - A major fuel spill during the construction or reclamation phases of a project could occur from a mobile storage tank failure or mishandling fuels. This type of release is also a low probability event given that operators will be trained to manage these types of potential releases and all tanks are required to have secondary containment. As with mishandling or leaking hoses, these small spills will be cleaned up by using on-site spill response equipment such as absorbent materials and/or removing impacted soils.

Absorptive materials may be used initially to contain a potential spill. After the initial response, soil impacted with residual fuel would be addressed. Remedial efforts could include, if necessary, the removal of soil to preclude the migration of fuel to groundwater or surface water. The project's PIPP and SPCC plans address fueling operations, fuel spill prevention measures, inspections, training, security, spill reporting, and equipment needs. In addition, standard operating procedures have been developed which cover fueling operations and spill response activities. All responses to a fuel spill, both large and small, will follow the guidelines dictated by the spill response plan and be reported internally. The tanks will be inspected regularly, and records of spills will be kept and reported to EGLE or other agencies as required.

Contingency plans for responding to fuel spills from tanker trucks are required of all mobile transport owners as dictated by MDOT regulation 49 CFR 130. These response plans require appropriate personnel training and the development of procedures for timely response to spills. The plan must identify who will respond to the spill and describe the response actions to potential releases, including the complete loss of cargo. The plan must also list the names and addresses of regulatory contacts to be notified in the event of a release.

### 1.1.4 Fires

Surface fires can be started by a variety of causes including vehicular incidents, accidental ignition of fuels or flammable chemical reagents, and lightning strikes. Smoking is only allowed in designated areas on the site. Contingency measures include having the required safety equipment, appropriate personnel training and standard operating procedures. In addition, muster points have been established and all employees and visitors are trained on their location. Given these measures, uncontrolled or large surface fires are low-probability events with negligible risk.

Because the Humboldt Mill is situated in a forested region, forest fires started off-site could potentially impact the mill site. The cleared area in the vicinity of the surface facilities serves as a fire break to protect surface facilities. Contingency measures discussed below can be implemented in the event of an off-site forest fire.

In order to minimize the risk of a fire on-site, stringent safety standards are being followed. All vehicles/equipment are required to be equipped with fire extinguishers and personnel is trained in their use. Fire extinguishers are also located near each building exit door and personnel is required to complete a “hot work” permit for tasks involving open flames, heat, and/or sparks. A network of fire hydrants is installed throughout the site and the Mill Emergency Response Team is trained in defensive firefighting techniques to help stop the spread of a fire if it was safe to do so.

On-site firefighting equipment includes:

- An above-ground water storage tank and distribution system for fire suppression
- Five stocked and maintained fire equipment cabinets
- 29 occupant-use fire hose stations throughout the facility
- Dry chemical fire extinguishers located throughout the site
- FireWorks system with multiple heat and smoke detectors that notifies site Security immediately of any fire.

In addition, a Wildfire Response Guideline has been developed in conjunction with Michigan DNR Fire Division to ensure the best possible response to a wildland fire.

Contingency planning for managing materials that oxidize includes training equipment operators on the material characteristics. The temperature of the material is routinely measured and any material exhibiting signs of self-heating is immediately compacted or exposed and spread out depending on the situation. Both methods are proven to mitigate the risks associated with self-heating.

### 1.1.5 Wastewater Collection and Treatment

The major source of water from the facility requiring treatment includes process water and tailings, groundwater infiltration into the HTDF, precipitation, and storm water runoff. The HTDF is sized to provide wastewater storage and equalization capacity. Water from the HTDF is conveyed to the WTP which is composed of several unit processes, including: oxidation, metals precipitation, ultra-filtration, and reverse-osmosis filtration. The final product water is discharged to the Escanaba River and/or nearby wetland area. This discharge is authorized by the State of Michigan under a National Pollutant Discharge Elimination System (NPDES) permit (MI0058649).

The water treatment system is designed to handle various process upset conditions such as power disruption (Section 1.1.9) or maintenance of the various process units. The effluent is continually monitored for key indicator parameters to verify the proper operation. Effluent that does not meet treatment requirements is pumped back to the HTDF for re-treatment. The water level of the HTDF is maintained to provide ample storage capacity that would allow for sufficient time to correct a process upset condition. Potential hazards and chemical reagents associated with the WTP are discussed in Section 1.1.7.

### 1.1.6 Air Emissions

The operations and reclamation phases of the project will be performed in a manner to minimize the potential for accidents or failures that could result in off-site air quality impacts. All phases of the project will incorporate a combination of operating and work practices, maintenance practices, emission controls and engineering design to minimize potential accidents or failures. Below is a description of identified areas of risk and associated contingency measures that may be required. As part of a comprehensive environmental control plan, these contingency measures will assist in minimizing air impacts to the surrounding area.

#### 1.1.6.1 Air Emissions during Operations

During the operation of the mill, potential emissions from the facility will be controlled as detailed in the Mill's current Michigan Air Use Permit (No. 405-08). These controls include the use of building enclosures for material handling, installation of dust collection or suppression systems to control dust during ore crushing and transfer operations, and following prescribed preventive maintenance procedures for the facility. Tailings generated during the milling process are transported to the HTDF via slurry and therefore will not generate particulate matter. Ore brought from off-site is transported in covered trucks to minimize dust emissions. Below is a more detailed discussion of potential airborne risks associated with proposed operations at the facility.

To minimize dust emissions from the COSA and concentrate load-out building, these areas are fully enclosed. Ore transported from the mine site may only be dumped in the COSA when the doors are closed to minimize dust emissions from the building. A sweeping and housekeeping program is in place in the COSA and throughout the crushing circuit including the primary crusher, rock breaker, and conveyor transfer points located in the conveyor transfer station and mill building.

Fabric filter baghouses are used throughout the facility to minimize emissions of dust. Bag houses are located in the Secondary Crusher building and the Fine Ore Bins. Two insertable filter systems are installed in the transfer building. Baghouse malfunction is a possibility and can include a bag break or offset and excessive dust loading. These potential malfunctions are addressed in the malfunction prevention and abatement plan. The plan includes regular inspections and maintenance activities of dust collection and suppression systems which are accomplished by monitoring the pressure drop across the bags, monitoring gas flow, and visual observations of stack emissions to assess opacity per permit conditions. In the event the monitoring program indicates a malfunction, a thorough investigation of the cause will occur. If necessary, ore processing operations will be shut down until the problem is corrected.

During facility operations, Eagle Mine will utilize certain pieces of mobile equipment to move material about the site. Equipment includes front-end loaders, product haul trucks, and miscellaneous delivery trucks. Although the movement of most vehicles across the site is on asphalt surfaces, a comprehensive on-site sweeping and watering program has been developed to control potential fugitive sources of dust. If excessive dust emissions should occur, the facility will take appropriate corrective action, which may include intensifying and/or adjusting the sweeping/watering program to properly address the problem.

#### 1.1.6.2 Air Emissions during Reclamation

Once milling operations are completed at the site, reclamation will commence in accordance with R425.204. Similar to construction activities, there is a moderate risk that fugitive dust emissions could be released during certain re-vegetation activities and during the temporary storage of materials in stockpiles. Similar to controls employed during the construction phase, areas that are reclaimed will be re-vegetated to stabilize soil and reduce dust emissions. If severe wind or an excessive rain event reduces the effectiveness of these protective measures, appropriate action will take place as soon as possible to restore vegetated areas to their previous effectiveness and replace covers as necessary.

To the extent necessary, areas being reclaimed will be kept in a wet state by continuing the watering program. It is anticipated this program should minimize the possibility of excessive dust associated with mobile equipment. In the event fugitive dust is identified as an issue, corrective action will determine the cause of the problem and appropriate action will occur.

### 1.1.7 Spills of Hazardous Substances

Chemical reagents onsite are primarily used for the ore flotation and water treatment plant processes. Table 1.1.7 includes a list of reagents reported under the SARA Tier II Emergency and Hazardous Chemical Inventory that are being used onsite along with the approximate storage volumes and storage location. The storage volume is the calculated volume of chemical within each solution based on percentage.

**Table 1.1.7 Chemical Reagents Used at the Water Treatment Plant & Mill Building**

| Item No. | Chemical Name | Trade Name | CAS No. | Storage Volumes | Storage Areas |
|---|---|---|---|---|---|
| 1 | Hydrochloric Acid/Hydrogen Chloride 31.5% | Muriatic Acid | 7647-01-0 | 900 gal | WTP chemical storage |
| 2 | Sodium Bisulfite 40% | Sodium Bisulfite | 7631-90-5 | 900 gal | WTP chemical storage |
| 3 | Sodium Hydroxide 25% | Sodium Hydroxide/ Caustic Soda | 1310-73-2 | 900 gal | WTP chemical storage |
| 4 | Sodium Hypochlorite 12.5% | Chlorine/Bleach | 7681-52-9 | 900 gal | WTP chemical storage |
| 5 | 1) Ferric Chloride 35%<br>2) Hydrochloric Acid 1% | Ferric Chloride | 1) 7705-08-0<br>2) 7647-01-0 | 7,500 gal | WTP Reactor Area (West of WTP) |
| 6 | 1) Sodium Hydroxide 50%<br>2) Sodium Chloride 5% | Sodium Hydroxide/ Caustic Soda | 1) 1310-73-2<br>2) 7647-14-5 | 8,400 gal | WTP chemical storage |
| 7 | Sulfuric Acid 93.19% | Sulfuric Acid, 66 Deg | 7664-93-9 | 7,600 gal | WTP sulfuric bulk tank |
| 8 | Aluminum chloride hydroxide sulphate | Nalco 8136/PAC | 39290-78-3 | 2,200 gal | WTP chemical storage |
| 9 | 1) Sodium Chloride<br>2) Sodium Sulphide,<br>3) Sodium Hydroxide | Nalmet 1689 | 1) 7647-14-5<br>2) 1313-82-2<br>3) 1310-73-2 | 550 gal | WTP chemical storage |
| 10 | Hydrotreated Light Distillate | Nalclear 7766 Plus/Flocculant | 64742-47-8 | 110 gal | WTP chemical storage |
| 11 | Hydrogen Peroxide 50% | Hydrogen Peroxide | 7722-84-1 | 7,000 gal | WTP reactor Area |
| 12 | Low pH RO cleaner | Citric Acid | 77-92-9 | 4,000 lbs | WTP chemical storage |
| 13 | High pH RO cleaner | Hydrex 4501 | Unknown | 1,600 lbs | WTP chemical storage |

| | | | | | |
|---|---|---|---|---|---|
| 14 | PERMACLEAN-56 | Biocide PC-56 | 10377-60-3<br>26172-55-4<br>2682-20-4 | 550 gal | WTP chemical storage |
| 15 | Sodium carboxymethyl cellulose | CMC/Finnfix 300 | 9004-32-4 | 20 tons | Reagent storage area |
| 16 | Calcium Hydroxide | Hydrated Lime | 1305-62-0 | 29 tons | Lime silo |
| 17 | Optimer 83949 | Flocculant | Unknown | 2 tons | Reagent storage area |
| 18 | Methyl isobutyl carbinol (MIBC) | MIBC/Frother | 108-11-2 | 2.2 tons | MIBC tank |
| 19 | Sodium isopropyl xanthane (SIPX) | SIPX | 140-93-2 | 15 tons | Reagent storage area |
| 20 | Sodium carbonate | Soda Ash | 497-19-8 | 54 tons | Soda ash silo |
| 21 | Carbon Dioxide | Carbon Dioxide/$CO_2$ | 124-38-9 | 6,000 lbs | $CO_2$ Tank |
| 22 | Graymont High Calcium Hydrated Lime | Hydrated Lime | 1305-62-0<br>14808-60-7 | 25 tons | WTP lime storage connex |
| 23 | Depositrol BL5400 | Anti-Scalant | 2809-21-4<br>13598-36-2 | 3,150 lbs | Concentrator Building – Pump Alley |

Chemical storage and delivery systems follow current standards that are designed to prevent and contain spills. All areas in which chemicals are used or stored have been designed and constructed with environmental protection in mind. This includes the development of secondary containment areas for liquids. The secondary containment area is constructed of materials that are compatible with and impervious to the liquids that are being stored. A release in the WTP or concentrator building from the associated piping would be contained within the plant area, neutralized, and sent to the HTDF for disposal. Absorbent materials are available to contain acid or caustic spills. Eagle Mine has an emergency response contractor on call to immediately respond to environmental incidents, assist with clean-up efforts, and conduct environmental monitoring associated with any spills.

Spill containment measures for chemical storage and handling will reduce the risk of a spill from impacting the environment. Due to the low volatility of these chemicals, fugitive emissions from the WTP or concentrator building to the atmosphere during a spill incident are likely to be negligible. Off-site exposures are not expected, and the management and handling of WTP and processing reagents will not pose a significant risk to human health or the environment.

### 1.1.8 Other Natural Risks

Earthquakes – The Upper Peninsula of Michigan is in a seismically stable area. The USGS seismic impact zone maps show the maximum horizontal acceleration to be less than 0.1 g in 250 years at 90% probability. Therefore, the mill site is not located in a seismic impact zone and the risk of an earthquake is minimal. Therefore, no contingency measures are discussed in this section.

Floods - High precipitation events have been discussed previously in the section that describes the HTDF. High precipitation could also lead to the failure of erosion control structures. The impacts of such an event would be localized erosion. Contingency measures to control erosion include sandbag barriers and temporary diversion berms. Long-term or off-site impacts would not be expected. Failed erosion control structures would be repaired or rebuilt. Impacts from high precipitation are reversible and off-site impacts are not expected to occur. Given the considerable planning and engineering efforts to manage high precipitation events, the risk posed by high precipitation is considered negligible.

Severe Thunderstorms or Tornadoes – Severe thunderstorms or tornadoes are addressed in the emergency procedures developed for the Eagle Mine and Humboldt Mill. Storm shelters have been designated and evacuation procedures practiced on an annual basis.

Blizzard – The mill site is designed to accommodate the winter conditions anticipated in the Upper Peninsula of Michigan. The Marquette County Road Commission is responsible for maintaining roadways near the Humboldt Mill. If road conditions deteriorate beyond the capability of the county or township maintenance equipment, employees can be housed onsite in the administrative offices and conference rooms as needed.

Forest Fires – Forest fires were discussed in Section 1.1.4.

### 1.1.9 Power Disruption

Electrical power for the Humboldt Mill is provided by two utility power companies: Wisconsin Electric (WE) Energies and Upper Peninsula Power Company (UPPCO). The mill facility and production buildings are presently served by a 69 kV overhead electric feeder to an on-site UPPCO electrical substation. The substation supplies three underground 13.8 kV feeders: two to our main mill switchgear and one to our fire water system.

The production support buildings and Water Treatment Plant infrastructure for the mill are fed from a WE Energies 25 kV overhead line. These buildings include the Security Building, Administration Building, Mill Services Building, Water Treatment Plant Building which includes Water Treatment Plant Intake Pump Building.

In the event that power is disrupted, backup generators are installed to ensure mill critical loads remain energized. The buildings where "critical loads" have been identified and generators have been installed is the Concentrator Building, which powers essential loads in the Concentrator and Concentrate Load Out Building, Coarse Ore Storage Area, Tailings Vault/Reclaim Pump Structure, Administration Building, Mill Services Building, Security Building and Water Treatment Plant.

In the event the WTP would need to be temporarily shut down during power disruptions, the water level of the HTDF is maintained at a level that provides enough capacity to store water for an extended period of time if necessary.

## 1.2 Emergency Procedures

This section includes the emergency notification procedures and contacts for the Humboldt Mill Site. Per R 425.205(2), a copy of this contingency plan will be provided to each emergency management coordinator having jurisdiction over the affected area (i.e., Marquette County).

Emergency Notification Procedures – An emergency will be defined as any unusual event or circumstance that endangers life, health, property, or the environment. If an incident were to occur, all employees are instructed to contact Security via radio or phone. Security then makes the proper notifications to the facility managers and activates the Eagle Mine Emergency Response Guideline as needed. If personnel on site need to be notified of such an event an emergency toned broadcast via radio and all-call speakers will be made with instructions.

Eagle Mine has adopted an emergency response structure that allows key individuals to take immediate responsibility and control of the situation and ensures appropriate public authorities, safety agencies and the general public are notified, depending on the nature of the emergency. A brief description of the key individuals is as follows:

- Health & Safety Officer: The facility H&S manager and H&S staff are responsible for monitoring activities in response to any emergencies. During an emergency, H&S representatives will manage special situations that expose responders to hazards, coordinate emergency response personnel, mine rescue teams, fire response, and ensure relevant emergency equipment is available for emergency service. This individual will also ensure appropriate personnel are made available to respond to the situation.

- Environmental Officer: The facility environmental manager will be responsible for managing any environmental aspects of an emergency situation. This individual will coordinate with personnel to ensure environmental impact is minimized, determine the type of response that is needed and act as a liaison between environmental agencies and mine site personnel.
- Public Relations Officer: The facility external relations manager will be responsible for managing all contacts with the public and will coordinate with the safety and environmental officers to provide appropriate information to the general public.

In addition to the emergency response structure cited above, Eagle Mine has a Crisis Management Team (CMT) and Plan developed to manage situations that may result in multiple injuries, loss of life, environmental damage, property or asset loss, or business interruption. If a situation is deemed a “crisis” the CMT immediately convenes to actively manage the situation. The CMT meets on a quarterly basis to review and practice plan implementation and annually a third party develops a desktop exercise to challenge and ensure the preparedness of the CMT. The following is a description of the core members and their roles:

**Crisis Management Team – Core Members and Roles**

| **Core Members** | **Role** |
|---|---|
| Team Leader | Responsible for strategy and decision making by the CMT during a crisis and maintaining a strategic overview. |
| Coordinator | Ensures a plan is followed and all logistical/administrative support required is provided. |
| Administrator | Records key decisions and actions and provides appropriate administrative supports to the CMT. |
| Information Lead | Gathers, shares, and updates facts on a regular basis. |
| Emergency Services and Security | Liaises with external response agencies and oversees requests for resources. Maintains a link between the ERT and CMT and oversees and necessary evacuations. |
| Communications Coordinator | Develops and implements the communications plan with support from an external resource. |
| Spokesperson | Conducts media interviews and stakeholder briefings. |

Evacuation Procedures – While the immediate surrounding area is sparsely populated, if it is necessary to evacuate the general public, this activity will be handled in conjunction with emergency response agencies. The Public Relations Officer will be responsible for this notification, working with other site personnel, including the H&S and environmental officers.

In the event evacuation of mill personnel is required, Eagle Mine has developed emergency response procedures for all surface facilities. All evacuation procedures were developed in compliance with MSHA regulations. In addition, the Mill Emergency Response Team (ERT) was formed to assist in emergency response situations should they arise. This team is not required by MSHA but was established to help ensure the safety of employees while at work. The focus of the team is to act as the liaison with first responders as well as the Eagle CMT, providing assistance where needed as they are considered the site experts on our equipment, locations, and emergency procedures. ERT training occurs once per month. Training focuses on fire system familiarization, patient packaging/stokes basket use, EMS support and assistance, emergency equipment familiarization and inventory, and rope and knot work.

In addition to the ERT, security personnel are EMTs and paramedics who are trained in accordance with state and federal regulations. This allows for immediate response to medical emergency situations.

Emergency Equipment – Emergency equipment includes but is not limited to the following:

- ABC Rechargeable fire extinguishers
- Fire cabinets located throughout the site containing hose, nozzles, hydrant wrenches, etc.
- Radios
- First aid kits, stretchers, backboards, and appropriate medical supplies
- Gas detection monitors that detect five gases and LEL
- High angle rescue ropes
- Self-Contained Breathing Apparatus (SCBA)
- Spill Kits (hydrocarbon and chemical)
- Certified EMT's Basic and Paramedics are on site at all times to respond in the event of an emergency.
- A trained Emergency Response Team.

This equipment is located throughout the surface facilities. Fire extinguishers are located at appropriate locations throughout the facility, in accordance with MSHA requirements. Surface facility personnel are also equipped with radios for general communications and emergencies. Other emergency response equipment is located at appropriate and convenient locations for easy access for response personnel.

Emergency Telephone Numbers – Emergency telephone numbers are included for site and emergency response agencies, as required by R 425.205(1)(c). They are as follows:

- Mill Security: (906) 339-7017
- Local Ambulance Services: UP Health Systems Bell. Contact Security at Extension 7017, or by radio using the Emergency Channel, or by dialing 911.
- Hospitals: Marquette General Hospital – (906) 225-3560
  Bell Hospital – (906) 485-2200
- Local Fire Departments: Humboldt Township, Ishpeming Township – 911
- Local Police: Marquette County Central Dispatch – 911
  Marquette County Sheriff Department – (906) 225-8435
  Michigan State Police – (906) 475-9922
- TriMedia 24-hr emergency spill response: (906) 360-1545
- EGLE Marquette Office: (906) 228-4853
- Michigan Pollution Emergency Alerting System: (800) 292-4706
- Federal Agencies: EPA Region 5 Environmental Hotline: (800) 621-8431
  EPA National Response Center: (800) 424-8802
  MSHA North Central District: (218) 720-5448
- MDNR Marquette Field Office: (906) 228-6561
- Humboldt Township Supervisor: (906) 339-4477

### 1.3 Testing of Contingency Plan

During the course of each year, the facility will test the effectiveness of the Contingency Plan. Conducting an effective test will be comprised of two components. The first component will include participation in adequate training programs on emergency response procedures for those individuals that will be involved in responding to emergencies and the second component is the completion of a mock field or desktop exercise.

Training will include the participation of the Safety Officer, Environmental Officer, Public Relations Officer, and other individuals designated to respond to emergencies including the Mill ERT. Individuals will receive appropriate training and information with respect to their specific roles, including emergency response procedures and the use of applicable emergency response equipment.

The second component of an effective Contingency Plan is to conduct desktop exercises or mock field tests. At least one desktop exercise or mock field test will be performed each year which will test the emergency response measures of the contingency plan and crisis management plan in place at Eagle Mine. The Safety Officer will work with the Environmental Officer and Emergency Response Coordinator to first define the situation that will be tested. The types of test situations may include responding to a release of a hazardous substance, fire, or natural disaster such as a tornado. A list of objectives will be developed for planning and evaluating each identified test situation. Date and time will then be established to carry out the test. Local emergency response officials may be involved, depending on the type of situation selected.

Once the test is completed, members of the crisis management team and emergency response team will evaluate the effectiveness of the response and make recommendations to improve the system. These recommendations will then be incorporated into a revision of the facility Contingency Plan and Crisis Management Plan.

# Appendix Q

# Humboldt Mill

# Organizational Chart

**Eagle Mine**
4547 County Road 601
Champion, MI 49814, USA
Phone: (906) 339-7000
Fax: (906) 339-7005
www.eaglemine.com

**Organizational Information**

**Eagle Mine LLC**

January 05, 2023

| | | | |
|---|---|---|---|
| **Registered Address:** | Eagle Mine, LLC<br>1209 Orange Street<br>Wilmington, DE 19801 | **Business Address:** | Eagle Mine, LLC<br>4547 County Road 601<br>Champion, MI 49814 |

**Board of Directors**

| | |
|---|---|
| Darby Stacey | 4547 County Road 601<br>Champion, MI 49814 |
| Teitur Poulsen | 4547 County Road 601<br>Champion, MI 49814 |
| Scott Manninen, CFO | 4547 County Road 601<br>Champion, MI 49814 |

Eagle Mine
a subsidiary of lundin mining

**Eagle Mine**
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**Officers**

| | | |
|---|---|---|
| Theresa Murakami | Treasurer | 4547 County Road 601<br>Champion, MI 49814 |
| Annie Laurenson | Secretary | 4547 County Road 601<br>Champion, MI 49814 |
| Darby Stacey | President/Managing Director | 4547 County Road 601<br>Champion, MI 49814 |
| Scott Manninen | CFO | 4547 County Road 601<br>Champion, MI 49814 |