

### GROUNDWATER- AND SURFACE-WATER MONITORING PLAN

THIS PLAN IS DESIGNED TO MONITOR THE IMPACT OF THE MINING ACTIVITIES ON WATER LEVELS AND WATER QUALITY IN THE VICINITY OF THE MINE (DURING MINING AND POST-MINING), INCLUDING ANY POTENTIAL IMPACTS TO THE OKEFENOKEE SWAMP.

#### 1. LOCATION OF MONITORING STATIONS

##### 1.1 PIEZOMETERS

###### 1.1.1 EXISTING PIEZOMETERS

SIXTY-NINE (69) PIEZOMETERS ARE CURRENTLY INSTALLED WITHIN THE MINE AND SURROUNDING TPM OWNED PROPERTIES OUTSIDE THE MINE FOOTPRINT. THE LOCATIONS ARE SHOWN ON SHEET 14. TWIN PINES MINERALS, LLC (TPM) NO LONGER HAS ACCESS TO THE TMA-OWNED PROPERTY WEST OF THE MINE.

ALL PIEZOMETERS ARE EQUIPPED WITH IN-SITU, INC. RUGGED TROLL 200 NON-VENTED DATA LOGGER/CABLE COMBINATIONS. THESE PIEZOMETERS WERE INSTALLED BETWEEN JANUARY AND MAY 2019, AND THUS HAVE BEEN RECORDING BACKGROUND GROUNDWATER-LEVEL DATA FOR A MINIMUM OF TWO YEARS.

###### 1.1.2 NEW PIEZOMETERS

###### A) LOCATION

- TWENTY-FOUR (24) ADDITIONAL PIEZOMETERS WILL BE INSTALLED PRIOR TO THE BEGINNING OF MINING.
- EIGHTEEN (18) PIEZOMETERS WILL BE INSTALLED TO DEPTHS OF ABOUT 50 FEET BELOW GROUND SURFACE (BGS) AND USED TO MONITOR WATER LEVELS AND/OR WATER QUALITY ACROSS THE MAXIMUM VERTICAL EXTENT OF THE MINE.
  - SIX (6) ADDITIONAL PIEZOMETERS WILL BE INSTALLED TO DEPTHS OF ABOUT 80 FEET BGS IN ORDER TO MONITOR WATER LEVELS AND/OR WATER QUALITY OF THE SURFICIAL AQUIFER BELOW THE MAXIMUM MINING DEPTH.

THESE 24 SHALLOW AND DEEP PIEZOMETERS (50-FOOT AND 80-FOOT DEEP) ARE DESIGNATED AS FOLLOWS:

TABLE 1.1.2. PROPOSED NEW PIEZOMETERS

MPZ-01S	MPZ-04	MPZ-07	MPZ-10D	MPZ-13D	MPZ-16D
MPZ-01D	MPZ-05S	MPZ-08	MPZ-11	MPZ-14	MPZ-17S
MPZ-02	MPZ-05D	MPZ-09	MPZ-12	MPZ-15	MPZ-17D
MPZ-03	MPZ-06	MPZ-10S	MPZ-13S	MPZ-16S	MPZ-18

SHALLOW PIEZOMETERS MPZ-01S, MPZ-02, MPZ-03, MPZ-04, MPZ-05S, MPZ-06, MPZ-07, MPZ-08, MPZ-09, MPZ-10S, MPZ-11, MPZ-12, MPZ-13S, MPZ-14, MPZ-15, MPZ-16S, MPZ-17S, AND MPZ-18 WILL BE DRILLED TO DEPTHS OF ABOUT 50 FEET BGS AND CONSTRUCTED WITH 40 FEET OF 0.010-INCH SLOTTED SCREEN. THE SCREENED INTERVAL OF THESE PIEZOMETERS WILL BE FROM 10 TO 50 FEET BGS. DEEP PIEZOMETERS MPZ-01D, MPZ-05D, MPZ-10D, MPZ-13D, MPZ-16D, AND MPZ-17D WILL BE DRILLED TO DEPTHS OF ABOUT 80 FEET BGS AND CONSTRUCTED WITH 10 FEET OF 0.010-INCH SLOTTED SCREEN. THE SCREENED INTERVAL OF THESE PIEZOMETERS WILL BE FROM 70 TO 80 FEET BGS.

A NEW SHALLOW PIEZOMETER WILL BE INSTALLED APPROXIMATELY EVERY 2,000 FEET IN AN EAST-WEST DIRECTION AND EVERY 1,000 FEET IN THE NORTH-SOUTH DIRECTION. THE SPACING WILL PROVIDE FOUR ROWS OF PIEZOMETERS (APPROXIMATELY 18 PIEZOMETERS), COVERING AN AREA OF ROUGHLY 582 ACRES, OR APPROXIMATELY ONE PIEZOMETER EVERY 32 ACRES. THE APPROXIMATE LOCATIONS OF THE NEW PIEZOMETERS ARE DEPICTED ON SHEET 14, WHICH WILL BE UPDATED AFTER THE NEW PIEZOMETERS ARE INSTALLED. A GENERALIZED CROSS SECTION DEPICTING THE MINING AREA, PROPOSED SHALLOW AND DEEP PIEZOMETERS, AND THE TOP OF THE HAWTHORN GROUP IS SHOWN ON SHEET 15.

ALL PIEZOMETERS WILL BE EQUIPPED WITH IN-SITU, INC. RUGGED TROLL 200 NON-VENTED DATA LOGGER/CABLE COMBINATIONS FOR WATER-LEVEL MONITORING DURING ACTIVE MINING AND THE POST-MINING PERIODS.

###### B) CONSTRUCTION DETAILS - NEW PIEZOMETERS

PIEZOMETERS MPZ-01S, MPZ-02, MPZ-03, MPZ-04, MPZ-05S, MPZ-06, MPZ-07, MPZ-08, MPZ-09, MPZ-10S, MPZ-11, MPZ-12, MPZ-13S, MPZ-14, MPZ-15, MPZ-16S, MPZ-17S, AND MPZ-18 WILL BE DRILLED AND CONSTRUCTED TO A DEPTH OF APPROXIMATELY 50 FEET BGS. THESE PIEZOMETERS WILL BE USED TO MONITOR WATER QUALITY ACROSS THE MAXIMUM VERTICAL EXTENT OF THE MINE. DEEP PIEZOMETERS MPZ-01D, MPZ-05D, MPZ-10D, MPZ-13D, MPZ-16D, AND MPZ-17D WILL BE DRILLED AND CONSTRUCTED TO A DEPTH OF APPROXIMATELY 80 FEET BGS USING A SONIC DRILL RIG. THE DEEP PIEZOMETERS WILL BE USED TO MONITOR WATER LEVELS AND WATER QUALITY BENEATH THE MINE FOOTPRINT. DURING INSTALLATION OF THE NEW PIEZOMETERS, CONTINUOUS SOIL CORES WILL BE COLLECTED AND DESCRIBED BY AN ON-SITE GEOLOGIST. BORING AND WELL CONSTRUCTION LOGS WILL BE PREPARED FOR EACH NEWLY CONSTRUCTED PIEZOMETER.

PIEZOMETERS MPZ-01S, MPZ-02, MPZ-03, MPZ-04, MPZ-05S, MPZ-06, MPZ-07, MPZ-08, MPZ-09, MPZ-10S, MPZ-11, MPZ-12, MPZ-13S, MPZ-14, MPZ-15, MPZ-16S, MPZ-17S, AND MPZ-18 WILL BE CONSTRUCTED WITH 40 FEET OF 0.010-INCH SLOTTED SCREEN, 2-INCH DIAMETER, THREADED-JOINT, SCHEDULE 40 PVC WITH A SCREENED INTERVAL FROM A DEPTH OF 10 TO 50 FEET BGS. FROM THE TOP OF THE SCREEN TO APPROXIMATE LAND SURFACE WILL BE CASED WITH SOLID 2-INCH DIAMETER, SCHEDULE 40 PVC RISER. A FILTER PACK OF 20/40 GRADED FILTER SAND WILL BE PLACED AROUND AND TWO FEET ABOVE THE SCREEN TO A DEPTH OF APPROXIMATELY EIGHT FEET BGS. A TWO-FOOT-THICK BENTONITE PELLET SEAL WILL BE PLACED ABOVE THE TOP OF THE FILTER SAND. THE REMAINING ANNULAR SPACE ABOVE THE BENTONITE SEAL (ABOUT SIX FEET) WILL BE GROUTED TO LAND SURFACE USING A CEMENT/BENTONITE GROUT. A METAL FLUSH-MOUNT, BOLT-DOWN, PROTECTIVE COVER WILL BE INSTALLED OVER THE PIEZOMETER AT LAND SURFACE TO INCLUDE A 2-FOOT X 2-FOOT X 4-INCH-THICK CONCRETE PAD. A TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DETAIL IS SHOWN ON SHEET 15.

DEEP PIEZOMETERS MPZ-01D, MPZ-05D, MPZ-10D, MPZ-13D, MPZ-16D AND MPZ-17D WILL BE CONSTRUCTED WITH 10 FEET OF 0.010-INCH SLOTTED SCREEN, 2-INCH DIAMETER, THREADED-JOINT, SCHEDULE 40 PVC WITH A SCREENED INTERVAL FROM A DEPTH OF 70 TO 80 FEET BGS. FROM THE TOP OF THE SCREEN TO APPROXIMATE LAND SURFACE WILL BE CASED WITH SOLID 2-INCH DIAMETER, SCHEDULE 40 PVC RISER. A FILTER PACK OF 20/40 GRADED FILTER SAND WILL BE PLACED AROUND AND TWO FEET ABOVE THE SCREEN TO A DEPTH OF APPROXIMATELY 68 FEET BGS. A TWO-FOOT-THICK BENTONITE PELLET SEAL WILL BE PLACED ABOVE THE TOP OF THE FILTER SAND. THE REMAINING ANNULAR SPACE ABOVE THE BENTONITE SEAL (ABOUT 66 FEET) WILL BE GROUTED TO LAND SURFACE USING A CEMENT/BENTONITE GROUT. A METAL FLUSH-MOUNT, BOLT-DOWN, PROTECTIVE COVER WILL BE INSTALLED OVER THE PIEZOMETER AT LAND SURFACE TO INCLUDE A 2-FOOT X 2-FOOT X 4-INCH-THICK CONCRETE PAD. A TYPICAL DEEP PIEZOMETER CONSTRUCTION DETAIL IS SHOWN ON SHEET 15.

EACH PIEZOMETER WILL BE DEVELOPED UNTIL THE COLUMN OF WATER IN THE WELL IS RELATIVELY FREE OF VISIBLE SEDIMENT, AND THE PH, TEMPERATURE, TURBIDITY, AND SPECIFIC CONDUCTIVITY HAVE STABILIZED. EACH PIEZOMETER WILL THEN BE FITTED WITH A RUGGED TROLL 200 NON-VENTED DATA LOGGER/CABLE COMBINATION IN ORDER TO CONTINUOUSLY MONITOR GROUNDWATER LEVELS.

###### C) SEQUENCING OF NEW PIEZOMETER INSTALLATION RELATIVE TO PROGRESSION OF MINING

- ONCE INITIATED, MINING WILL ADVANCE AT AN ESTIMATED RATE OF ABOUT 100 TO 200 FEET PER DAY, AND PIEZOMETERS WITHIN THE MINE FOOTPRINT WILL PERIODICALLY BE EXCAVATED AND REINSTALLED DURING THE MINING PROGRESSION. THE GENERAL PROCEDURES FOR THE REMOVAL AND REINSTALLATION OF PIEZOMETERS ARE DISCUSSED BELOW:
- WITHIN ONE TO TWO DAYS OF THE ADVANCING OF THE FACE REACHING A PIEZOMETER, THE TRANSDUCER WILL BE REMOVED, AND THE PIEZOMETER WILL SUBSEQUENTLY BE EXCAVATED BY THE ADVANCING DRAG-LINE EXCAVATOR.
  - WITHIN APPROXIMATELY FIVE TO SEVEN DAYS OF MINING, THE OPEN EXCAVATION PIT WILL BE BACKFILLED WITH POST-PROCESSED SOILS.
  - WITHIN APPROXIMATELY 30 DAYS OF BACKFILLING THE EXCAVATION, A REPLACEMENT PIEZOMETER WILL BE INSTALLED NEAR THE APPROXIMATE LOCATION OF THE ABOVE-REFERENCED EXCAVATED PIEZOMETER. THE REPLACEMENT PIEZOMETER SHOULD BE INSTALLED AT A LOCATION THAT WILL NOT BE RE-EXCAVATED DURING THE NEXT ADJACENT NORTHERN DRAG LINE CUT.
  - THE REPLACEMENT PIEZOMETERS WILL BE RESURVEYED AFTER INSTALLATION AND BEFORE WATER-LEVEL MEASUREMENTS ARE COLLECTED.

REPLACEMENT PIEZOMETERS WILL BE DEVELOPED AND FITTED WITH THE RUGGED TROLL TRANSDUCERS THAT WERE REMOVED FROM THE PREVIOUS PIEZOMETERS IN ORDER TO CONTINUE MONITORING OF GROUNDWATER LEVELS.

THESE PROCEDURES WERE DESIGNED TO ENSURE THAT A FULL COMPLEMENT OF PIEZOMETERS WILL BE MAINTAINED TO MONITOR GROUNDWATER-LEVEL DATA AS MINING PROGRESSES AND RECLAMATION TAKES PLACE.

#### 1.2 STAFF GAUGES

SIX (6) EXISTING STAFF GAUGES WILL BE USED TO MONITOR SURFACE WATER LEVELS (SEE SHEET 14):

TABLE 1.2. SURFACE WATER-LEVEL MONITORING LOCATIONS	
SG02	SG24
SG11	SG26
SG22	SG27

EACH STAFF GAUGE LOCATION IS EQUIPPED WITH IN-SITU, INC. RUGGED TROLL 200 NON-VENTED DATA LOGGER/CABLE COMBINATIONS FOR RECORDING WATER ELEVATIONS.

EACH STAFF GAUGE SEGMENT MEASURES APPROXIMATELY 3.3 FEET IN LENGTH AND IS MOUNTED TO EITHER A METAL POST OR A PRESSURE-TREATED WOOD POST SO THAT THE BASE OF THE GAUGE IS POSITIONED AT GROUND SURFACE. DATA LOGGERS HAVE BEEN INSTALLED AT EACH STAFF GAUGE WITH THE TRANSDUCERS TIP POSITIONED AT THE APPROXIMATE GROUND SURFACE. EACH DATA LOGGER/CABLE COMBINATION HAS BEEN RECORDING BACKGROUND SURFACE-WATER-LEVEL DATA FOR A PERIOD OF BETWEEN 1 TO 2+ YEARS. THESE STAFF GAUGES WILL CONTINUE TO BE USED FOR RECORDING SURFACE WATER ELEVATIONS THROUGHOUT MINING AS WELL AS DURING THE POST MINING PERIOD.

#### 1.3 WEATHER STATIONS

TPM PERSONNEL INSTALLED THREE HOBO RAIN GAUGE DATA LOGGERS AT THE SITE IN NOVEMBER 2018. THE THREE RAIN GAUGE LOCATIONS (RG01, RG02, AND RG03) WERE INSTALLED IN THE NORTHERN, CENTRAL, AND SOUTHERN PORTIONS OF THE TPM OWNED PROPERTIES (SHEET 14). THE DATA LOGGERS FOR EACH RAIN GAUGE RECORD THE ACCUMULATION OF PRECIPITATION IN UNITS OF HUNDRETHS OF AN INCH EVERY 15-MINUTES.

#### 2. GROUNDWATER-LEVEL MONITORING AND ADAPTIVE MANAGEMENT PLAN

##### 2.1 FREQUENCY OF WATER-LEVEL MONITORING

WATER-LEVEL DATA WILL BE RECORDED USING RUGGED TROLL DATA LOGGERS. DATA LOGGERS WILL BE PROGRAMMED TO RECORD DAILY WATER-LEVEL MEASUREMENTS AT EACH OF THE 69 EXISTING (PZ) AND 24 NEW (MPZ) PIEZOMETERS WITHIN THE MINE FOOTPRINT AND ADJACENT TPM-OWNED PROPERTY (SEE TABLE 2.1 AND SHEET 14).

TABLE 2.1. GROUNDWATER-LEVEL MONITORING LOCATIONS

PZ01S	PZ11	PZ20S	PZ28S	PZ46	PZ56S
PZ01D	PZ12S	PZ20D	PZ28D	PZ47	PZ56D
PZ02	PZ12D	PZ21	PZ38	PZ48S	PZ57S
PZ03S	PZ13	PZ22S	PZ39S	PZ48D	PZ57D
PZ03D	PZ14	PZ22D	PZ39D	PZ49	PZ58S
PZ04	PZ15	PZ23	PZ40	PZ50	PZ58D
PZ05	PZ16S	PZ24	PZ41	PZ51S	OWB18S
PZ06	PZ16D	PZ25S	PZ42	PZ51D	OWB1S
PZ07	PZ17S	PZ25D	PZ43	PZ52	OWB1D
PZ08	PZ17D	PZ26	PZ44	PZ53	
PZ09	PZ18	PZ27S	PZ45S	PZ55S	
PZ10	PZ19	PZ27D	PZ46D	PZ56D	
MPZ-01S	MPZ-04	MPZ-07	MPZ-10D	MPZ-13D	MPZ-16D
MPZ-01D	MPZ-05S	MPZ-08	MPZ-11	MPZ-14	MPZ-17S
MPZ-02	MPZ-05D	MPZ-09	MPZ-12	MPZ-15	MPZ-17D
MPZ-03	MPZ-06	MPZ-10S	MPZ-13S	MPZ-16S	MPZ-18

THE DAILY WATER-LEVEL MEASUREMENTS RECORDED WITH THE DATA LOGGERS WILL BE DOWNLOADED MONTHLY TO EVALUATE WATER-LEVEL DATA WITHIN AND ADJACENT TO THE MINE. THE FREQUENCY OF DATA DOWNLOADING MAY BE ADJUSTED (INCREASED OR DECREASED) AS NEEDED DURING THE LIFE OF THE MINE.

##### 2.2 FREQUENCY OF RAIN GAUGE MONITORING

DATA FROM THE THREE ON-SITE RAIN GAUGES WILL BE MANUALLY DOWNLOADED IN THE FIELD BY TPM REPRESENTATIVES OR TPM'S CONSULTANTS ON A MONTHLY BASIS.

##### 2.3 DATA ANALYSIS

FOR THE PURPOSE OF COMPARING PRE- AND POST-MINING GROUNDWATER LEVELS, HOWEVER, SUFFICIENT TIME MUST ELAPSE AFTER THE DRAGLINE EXCAVATOR HAS PASSED TO ENSURE THE POST-MINING DATA IS NOT INFLUENCED BY THE ONGOING MINING TO THE NORTH. TPM ESTIMATES THAT GROUNDWATER IMPACTS WILL EXTEND APPROXIMATELY 1,000 FEET FROM THE EDGE OF THE MINING PIT. THEREFORE, THE COMPARISON OF PRE- AND POST-MINING GROUNDWATER LEVELS WILL BE MADE AFTER THE DRAGLINE EXCAVATOR HAS MOVED APPROXIMATELY 1,000 FEET TO THE NORTH OF A MINED TRANSECT (SEE SHEET 14).

AFTER THE DRAGLINE EXCAVATOR HAS MOVED THE REQUIRED DISTANCE, POST-MINING GROUNDWATER-LEVEL DATA IN THE PIEZOMETERS 1,000 FEET SOUTH OF THE MOVING MINE WILL BE COMPARED TO PRE-MINING WATER-LEVEL DATA. THE POST-MINING GROUNDWATER-LEVEL DATA WILL BE USED TO CALCULATE THE DAILY GROUNDWATER DEVIATION FROM NORMAL, WHICH WILL BE ADDED TO THE HISTORICAL HYDROGRAPH DATA SHOWN ON SHEET 15. THE CRITERIA IN PART 2.4 WILL BE USED TO DETERMINE IF GROUNDWATER HAS BEEN RESTORED, OR IF ADAPTIVE MANAGEMENT IS REQUIRED.

##### 2.4 ACTION LEVELS FOR ADAPTIVE MANAGEMENT

POST-MINING GROUNDWATER LEVELS WILL BE CONSIDERED TO APPROXIMATE PRE-MINING LEVELS AND THE GROUNDWATER TABLE WILL BE CONSIDERED TO HAVE BEEN RESTORED IF:

- POST-MINING GROUNDWATER LEVELS REMAIN WITHIN THE NORMAL RANGE (2.7 FEET ABOVE OR BELOW NORMAL); ESTABLISHED IN THE HISTORICAL HYDROGRAPH DATA SHOWN ON SHEET 15; AND/OR
- POST-MINING GROUNDWATER LEVELS FLUCTUATE UNIFORMLY IN THE NORTH, CENTRAL AND SOUTH SECTIONS;

SUPPORTING DOCUMENTATION DESCRIBING THE RATIONAL FOR RESTORATION OF PRE-MINING GROUNDWATER LEVELS AND THE ±2.7 FEET GROUNDWATER ELEVATION DEVIATION RANGE IS INCLUDED IN EXHIBIT D.

##### 2.5 ADAPTIVE MANAGEMENT AND CONTINGENCY PLANNING

IF THE CONDITIONS DESCRIBED IN PART 2.4 ARE NOT ACHIEVED, TPM WILL NOTIFY THE DIRECTOR WITHIN 30 DAYS OF DETERMINING AN IMPACT CONDITION EXISTS. SUCH NOTICE WILL INCLUDE THE MONITORING DATA ALONG WITH RELEVANT INFORMATION.

NO FURTHER ACTION WILL BE REQUIRED IF THE UNEXPECTED CONDITION CAN BE ATTRIBUTED TO FACTORS UNRELATED TO THE MINING ACTIVITY. IF OTHER CAUSES FOR THE CHANGE IN WATER-LEVEL CONDITIONS CANNOT BE IDENTIFIED, HOWEVER, TPM WILL CONDUCT FURTHER INVESTIGATIONS TO DETERMINE THE SIGNIFICANCE OF THE CHANGE, POTENTIAL CAUSES, AND POTENTIAL SOLUTIONS. A CONTINGENCY PLAN TO RESTORE GROUNDWATER LEVELS TO PRE-MINING CONDITIONS WILL BE PREPARED AND SUBMITTED TO EPD FOR ITS REVIEW AND APPROVAL PRIOR TO IMPLEMENTATION. THE CONTINGENCY PLAN WILL PROPOSE ENGINEERED SOLUTIONS POTENTIALLY INCLUDING THE FOLLOWING:

- IF GROUNDWATER LEVELS ABOVE NORMAL ARE CAUSING GROUNDWATER TO POND ABOVE THE LAND SURFACE, AND IF THESE CONDITIONS CANNOT BE EXPLAINED BY FACTORS UNRELATED TO MINING, THE PROPOSED SOLUTION MAY BE TO PIERCE THE EXISTING BENTONITE LAYER OR OTHERWISE INCREASE ITS HYDRAULIC CONDUCTIVITY, AND/OR TO CEASE OR MODIFY THE SOIL AMENDMENT PLAN GOING FORWARD.
- IF GROUNDWATER LEVELS ARE BELOW NORMAL, AND IF THE CONDITION CANNOT BE EXPLAINED BY FACTORS UNRELATED TO MINING, THE PROPOSED SOLUTION MAY BE TO INCREASE THE PERCENTAGE OF BENTONITE ADDED TO THE LOW-PERMEABILITY LAYER GOING FORWARD; AND, IF NECESSARY AND APPROPRIATE, TO INJECT ADDITIONAL BENTONITE SLURRY WITHIN A DISCRETE SUBSURFACE SOIL INTERVAL (I.E., 7 TO 10 FEET BELOW LAND SURFACE). TPM MAY ALSO PROPOSE OTHER FEASIBLE ENGINEERED SOLUTIONS.

#### 3. WATER-QUALITY MONITORING AND ADAPTIVE MANAGEMENT PLAN

##### 3.1 BACKGROUND DATA

AN IMPORTANT CONSIDERATION IN THE DEVELOPMENT OF THIS MONITORING PLAN IS THAT THE MINING AND BENEFICIATION FACILITIES WILL NOT USE OR ADD CONTAMINANTS WHICH COULD THEN IMPACT THE SITE GROUNDWATER AND SURFACE WATERS FROM EITHER THE MINING OR THE BENEFICIATION PROCESSES. ALSO, THE SITE WILL NOT BE SUBJECT TO ANY OF THE TRADITIONAL/TYPICAL CONTAMINANT MONITORING PROGRAMS SUCH AS RCRA, CERCLA, ETC.

EXTENSIVE SITE CHARACTERIZATION ACTIVITIES, INCLUDING GROUNDWATER AND SURFACE WATER QUALITY MONITORING HAS BEEN PERFORMED IN MARCH 2019 AND FEBRUARY, MARCH-APRIL, MAY, JULY, AUGUST, SEPTEMBER, OCTOBER 2020, JANUARY AND APRIL 2021. THIS DATA AND FUTURE WATER QUALITY MONITORING PERFORMED PRE-MINING, DURING MINING, AND POST-MINING WILL BE USED TO ASSESS WATER QUALITY IMPACTS AS A RESULT OF MINING ACTIVITIES.

##### 3.2 MONITORING LOCATIONS AND FREQUENCY DURING MINING

GROUNDWATER MONITORING LOCATIONS BASED ON REVIEWS OF GROUNDWATER FLOW DATA IN THE MINING AREA, THE FOLLOWING MONITORING LOCATIONS AND SAMPLING FREQUENCY WILL BE ESTABLISHED TO MONITOR GROUNDWATER QUALITY OF THE SURFICIAL AQUIFER BENEATH THE MINING AREA (SHEET 14).

TABLE 3.2-1 GROUNDWATER MONITORING STATION	SAMPLING FREQUENCY AND DURATION <sup>1</sup>		
	DURING MINING <sup>2</sup>	POST MINING <sup>3,4</sup>	
MPZ-01S/D	MPZ-10S/D	QUARTERLY	SEMI-ANNUAL
MPZ-02	MPZ-13S/D		
MPZ-03	MPZ-14		
MPZ-04	MPZ-16S/D		
MPZ-05S/D	MPZ-17S/D		
MPZ-06	MPZ-18		

- BASED ON THE RESULTS OF WATER QUALITY SAMPLING AND THE PROGRESSION OF THE MINE, THE FREQUENCY OF WATER QUALITY SAMPLING AND NUMBER OF MONITORING LOCATIONS MAY PERIODICALLY BE ADJUSTED (I.E. INCREASED OR DECREASED) DURING THE LIFE OF THE MINE (I.E. IF INCREASING CONCENTRATIONS ARE OBSERVED, SAMPLING FREQUENCY MAY BE INCREASED TO BETTER DEFINE THE TRENDS).
- BEGINNING ONE MONTH AFTER MINING BEGINS
- POST-MINING MONITORING WILL BEGIN AT THE END OF ACTIVE MINING AND CONTINUE FOR A PERIOD OF APPROXIMATELY FIVE YEARS
- EPD MAY REQUIRE AN EXTENSION OF THE MONITORING PLAN IF NECESSARY

GROUNDWATER CONSTITUENTS OF POTENTIAL CONCERN (COPC) REVIEW OF EXISTING PRE-MINING GROUNDWATER QUALITY DATA WAS USED TO DEVELOP A CONCISE LIST OF COPCS FOR THE SITE'S MONITORING PROGRAM. THE GROUNDWATER COPCS ARE LISTED IN TABLE 3.2-2 BELOW.

TABLE 3.2-2. WATER QUALITY PARAMETERS AND COPCS TO BE MEASURED IN GROUNDWATER SAMPLES	
PARAMETER / COPC	LABORATORY METHOD
PH	FIELD MEASURED
SPECIFIC CONDUCTIVITY	FIELD MEASURED
WATER TEMPERATURE	FIELD MEASURED
OXIDATION-REDUCTION POTENTIAL (ORP)	FIELD MEASURED
TURBIDITY	FIELD MEASURED
LEAD, TOTAL AND DISSOLVED	EPA 200.8
GROSS ALPHA	EPA 900.0
RADIUM-226 + RADIUM-228	EPA 904.0 & 903.1
ALUMINUM, TOTAL AND DISSOLVED	EPA 200.8
IRON, TOTAL AND DISSOLVED	EPA 200.8
MANGANESE, TOTAL AND DISSOLVED	EPA 200.8
TOTAL DISSOLVED SOLIDS (TDS)	SM2540C OR FIELD MEASURED
ZINC, TOTAL AND DISSOLVED	EPA 200.8

#### SURFACE WATER MONITORING LOCATIONS

THREE EXISTING MONITORING LOCATIONS LISTED BELOW AND SHOWN ON SHEET 14 ARE PROPOSED TO MONITOR WATER QUALITY IN SURFACE WATERS WHICH MAY RECEIVE RUNOFF FROM THE MINING AREA.

TABLE 3.2-3 SURFACE WATER MONITORING STATION	SAMPLING FREQUENCY AND DURATION <sup>1</sup>	
	DURING MINING <sup>2</sup>	POST MINING <sup>3,4</sup>
MSW-BG04	QUARTERLY	SEMI-ANNUAL
MSW-BG05		
MSW-BG06		

- BASED ON THE RESULTS IS OF WATER QUALITY SAMPLING AND THE PROGRESSION OF THE MINE, THE FREQUENCY OF WATER QUALITY SAMPLING AND NUMBER OF MONITORING LOCATIONS MAY PERIODICALLY BE ADJUSTED (I.E. INCREASED OR DECREASED) DURING THE LIFE OF THE MINE (I.E. IF INCREASING CONCENTRATIONS ARE OBSERVED, SAMPLING FREQUENCY MAY BE INCREASED TO BETTER DEFINE THE TRENDS).
- BEGINNING ONE MONTH AFTER MINING BEGINS
- POST-MINING MONITORING WILL BEGIN AT THE END OF ACTIVE MINING AND CONTINUE FOR A PERIOD OF APPROXIMATELY FIVE YEARS
- EPD MAY REQUIRE AN EXTENSION OF THE MONITORING PLAN IF NECESSARY

REVIEW OF EXISTING PRE-MINING BACKGROUND SURFACE WATER QUALITY DATA WAS USED TO DEVELOP A CONCISE LIST OF CONSTITUENTS OF POTENTIAL CONCERN (COPCS) FOR THE SITE'S MONITORING PROGRAM. THE SURFACE WATER COPCS ARE LISTED IN TABLE 3.2-4 BELOW.

TABLE 3.2-4. WATER QUALITY PARAMETERS AND COPCS TO BE MEASURED IN SURFACE WATER SAMPLES	
PARAMETER / COPC	LABORATORY METHOD
PH	FIELD MEASURED
DISSOLVED OXYGEN (DO)	FIELD MEASURED
SPECIFIC CONDUCTIVITY	FIELD MEASURED
WATER TEMPERATURE	FIELD MEASURED
TURBIDITY	FIELD MEASURED
LEAD, TOTAL AND DISSOLVED	EPA 200.8
MERCURY, TOTAL	EPA 1631E
ZINC, TOTAL AND DISSOLVED	EPA 200.8
TOTAL HARDNESS	SM2340B
TOTAL ORGANIC CARBON (TOC)	EPA 200.7
TOTAL PHOSPHORUS	EPA 200.7
TOTAL NITROGEN, TOTAL KJELDAHL (TKN)	EPA 351.2
NITROGEN	EPA 353.2

NOTE: TOTAL NITROGEN = TKN + (NITRATE+NITRITE)

##### 3.3 SAMPLE COLLECTION AND DATA ANALYSIS PROCEDURES

GROUNDWATER-SAMPLING PROCEDURES, CHAIN OF CUSTODY, FIELD PARAMETER MEASUREMENT, AND FIELD QA/QC WILL BE PERFORMED IN ACCORDANCE WITH THE REGION 4 US ENVIRONMENTAL PROTECTION AGENCY (EPA), SCIENCE AND ECOSYSTEM SUPPORT DIVISION OPERATING PROCEDURE, GROUNDWATER SAMPLING (SESDPROC-301-R4), EFFECTIVE APRIL 26, 2017. SURFACE WATER SAMPLING PROCEDURES AND FIELD QA/QC WILL BE PERFORMED IN GENERAL ACCORDANCE WITH THE REGION 4 US ENVIRONMENTAL PROTECTION AGENCY (EPA), SCIENCE AND ECOSYSTEM SUPPORT DIVISION OPERATING PROCEDURE, SURFACE WATER SAMPLING (SESDPROC-201-R4), EFFECTIVE DECEMBER 16, 2016. LOW-LEVEL MERCURY SAMPLING WILL BE PERFORMED IN ACCORDANCE WITH EPA METHOD 1669.

##### 3.3.1 PROCEDURES

EQUIPMENT DECONTAMINATION PROCEDURES ANY REUSABLE SAMPLING EQUIPMENT THAT MAY CONTACT THE INTERIOR OF THE PIEZOMETER, GROUNDWATER, OR SURFACE WATER WILL BE DECONTAMINATED IN THE FIELD IMMEDIATELY PRIOR TO USE, OR IN THE OFFICE/LAB AND PROTECTED USING PLASTIC. FOR SAMPLING EVENTS REQUIRING NON-DEDICATED SAMPLING EQUIPMENT, DECONTAMINATION PROCEDURES WILL CONSIST OF RINSING THE EQUIPMENT ONCE WITH DISTILLED OR DEIONIZED WATER, BRUSHING THE EQUIPMENT WITH A SOLUTION OF DISTILLED OR DEIONIZED WATER AND A PHOSPHATE FREE LABORATORY-QUALITY DETERGENT, AND FINALLY RINSING THE EQUIPMENT WITH DISTILLED OR DEIONIZED WATER.

##### 3.3.2 WATER-LEVEL MEASUREMENTS (PIEZOMETERS ONLY)

PRIOR TO PURGING AND SAMPLING, WATER-LEVEL MEASUREMENTS WILL BE MADE AT EACH PIEZOMETER BY UTILIZING A DEDICATED OR PORTABLE WATER LEVEL INDICATOR, TAPE, OR OTHER SUITABLE MEASURING DEVICE CAPABLE OF ACHIEVING AN ACCURACY OF 0.01 FOOT. THE DEPTH TO WATER IN EACH PIEZOMETER WILL BE MEASURED ON THE SAME DAY AND PRIOR TO PURGING. THE MEASURING DEVICE WILL BE USED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND/OR DIRECTIONS. MEASUREMENTS OF THE DEPTH TO WATER FROM THE TOP OF THE PIEZOMETER CASING (DESIGNATED MONITORING POINT) WILL BE TO THE NEAREST 0.01 FOOT, AND THE VALUE WILL BE RECORDED. TOTAL DEPTHS WILL BE MEASURED AT EACH PIEZOMETER AND RECORDED.

##### 3.3.3 PIEZOMETER PURGING PROCEDURES

PRIOR TO THE COLLECTION OF GROUNDWATER SAMPLES, EACH PIEZOMETER WILL BE PURGED TO ENSURE THAT FRESH AQUIFER WATER IS BEING SAMPLED. PURGING OF EACH PIEZOMETER WILL BE COMPLETED USING EITHER A PERISTALTIC OR ELECTRIC SUBMERSIBLE PUMP. DUE TO THE DEPTHS OF THE PROPOSED PIEZOMETERS AND THE HIGH GROUNDWATER TABLES AT THE SITE (I.E. EXCESSIVE PURGE VOLUMES), LOW-FLOW PURGING PROCEDURES MAY BE UTILIZED. DURING LOW-FLOW PURGING, THE PUMP OR TUBING INTAKE WILL BE LOCATED WITHIN THE SCREENED INTERVAL AND AT A DEPTH THAT WILL REMAIN UNDER WATER AT ALL TIMES. DURING LOW-FLOW PURGING:

- THE PUMPING RATE WILL BE SET AT A SPEED THAT PRODUCES MINIMAL AND STABLE DRAWDOWN WITHIN THE WELL,
  - THE PUMPING RATE WILL BE MEASURED USING A GRADUATED CYLINDER OR GRADUATED BUCKET AND A STOP WATCH,
  - THE GROUNDWATER LEVEL, PUMPING RATE, FIELD PARAMETERS (PH, WATER TEMPERATURE, SPECIFIC CONDUCTIVITY, DISSOLVED OXYGEN, OXIDATION-REDUCTION POTENTIAL, AND TURBIDITY) WILL BE MONITORED AND RECORDED EVERY 10 TO 10 MINUTES (OR AS APPROPRIATE),
  - THE FIELD PARAMETERS WILL BE MEASURED USING A CALIBRATED MULTI-PARAMETER INSTRUMENT AND FLOW-THROUGH CELL,
  - PURGING WILL BE CONSIDERED COMPLETE AND SAMPLING WILL BEGIN WHEN THE FIELD MEASURED PARAMETERS HAVE STABILIZED. STABILIZATION IS CONSIDERED COMPLETE WHEN THREE CONSECUTIVE READINGS ARE WITHIN THE FOLLOWING LIMITS:
- | PARAMETER                     | MAXIMUM VARIATION                  |
|-------------------------------|------------------------------------|
| Turbidity                     | 10% FOR VALUES GREATER THAN 10 NTU |
| DISSOLVED OXYGEN              | 0.2 MG/L OR 10% SATURATION,        |
| OXIDATION-REDUCTION POTENTIAL | 20 MILLIVOLTS,                     |
| SPECIFIC CONDUCTANCE          | 5%,                                |
| PH                            | 0.1 STANDARD UNIT                  |

D) SAMPLE COLLECTION AND PRESERVATION - GROUNDWATER GROUNDWATER SAMPLING IS THE PROCESS OF OBTAINING, CONTAINERIZING, PRESERVING, AND SHIPMENT OF A GROUNDWATER SAMPLE AFTER THE PURGING PROCESS IS COMPLETE. APPROPRIATE DEVICES TO BE USED TO COLLECT GROUNDWATER SAMPLES FROM PIEZOMETERS INCLUDE: PERISTALTIC OR ELECTRIC SUBMERSIBLE PUMPS. ALTERNATIVE SAMPLING DEVICES/METHODS MAY BE UTILIZED IF THE ALTERNATIVE DEVICE/METHOD IS APPROVED FOR USE IN EPA FIELD SAMPLING GUIDANCE LITERATURE.

DURING SAMPLE COLLECTION, EACH PIEZOMETER WILL BE SAMPLED WITH EQUIPMENT AND METHODOLOGIES THAT MINIMIZE THE POTENTIAL FOR ALTERATION OR CONTAMINATION OF THE SAMPLE AND THAT ARE CAPABLE OF OBTAINING A SAMPLE REPRESENTATIVE OF THE FORMATION GROUNDWATER. CARE WILL BE TAKEN TO AVOID PLACING CLEAN SAMPLING EQUIPMENT ON THE GROUND OR ON ANY CONTAMINATED SURFACE. ADDITIONALLY, PERSONNEL WHO CONTACT SAMPLING EQUIPMENT THAT MAY CONTACT THE INTERIOR OF THE MONITORING WELL OR THE GROUNDWATER WILL WEAR NEW POWDERLESS LATEX OR NITRILE GLOVES. GLOVES WILL BE CHANGED BETWEEN SAMPLE LOCATIONS TO AVOID CROSS-CONTAMINATION.

FIELD PERSONNEL RESPONSIBLE FOR SAMPLE COLLECTION WILL RECORD, AT A MINIMUM, THE FOLLOWING:

- DATE, TIME AND TECHNICIAN'S NAME
  - PIEZOMETER NUMBER AND WELL DEPTH
  - WELL CASING MATERIAL AND INSIDE DIAMETER
  - STATIC WATER LEVEL PRIOR TO PURGING
  - SAMPLING EQUIPMENT USED
  - VOLUME OF WATER PURGED PRIOR TO SAMPLING
  - SAMPLE CONTAINER NUMBERS, TYPES, SIZES, AND PRESERVATIVES
  - PH, SPECIFIC CONDUCTANCE, DISSOLVED OXYGEN, OXIDATION-REDUCTION POTENTIAL, TURBIDITY, AND TEMPERATURE OF WATER SAMPLES
  - COMMENTS ABOUT SAMPLE COLOR, ODOR, AND UNUSUAL CHARACTERISTICS
  - COMMENTS ABOUT WEATHER CONDITIONS
  - COMMENTS ABOUT ACCESSIBILITY AND CONDITION OF PIEZOMETER
- GROUNDWATER COLLECTED FROM EACH PIEZOMETER WILL BE SLOWLY DISCHARGED INTO LABORATORY PROVIDED SAMPLE CONTAINERS OF THE APPROPRIATE SIZE AND TYPE, AND WITH THE PRESERVATIVES, IF ANY, APPROPRIATE FOR THE ANALYTICAL TESTS REQUIRED. THE SAMPLE CONTAINER WILL BE LABELED WITH THE FOLLOWING INFORMATION:
- SITE NAME
  - SAMPLE ID
  - PROJECT REFERENCE NUMBER
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