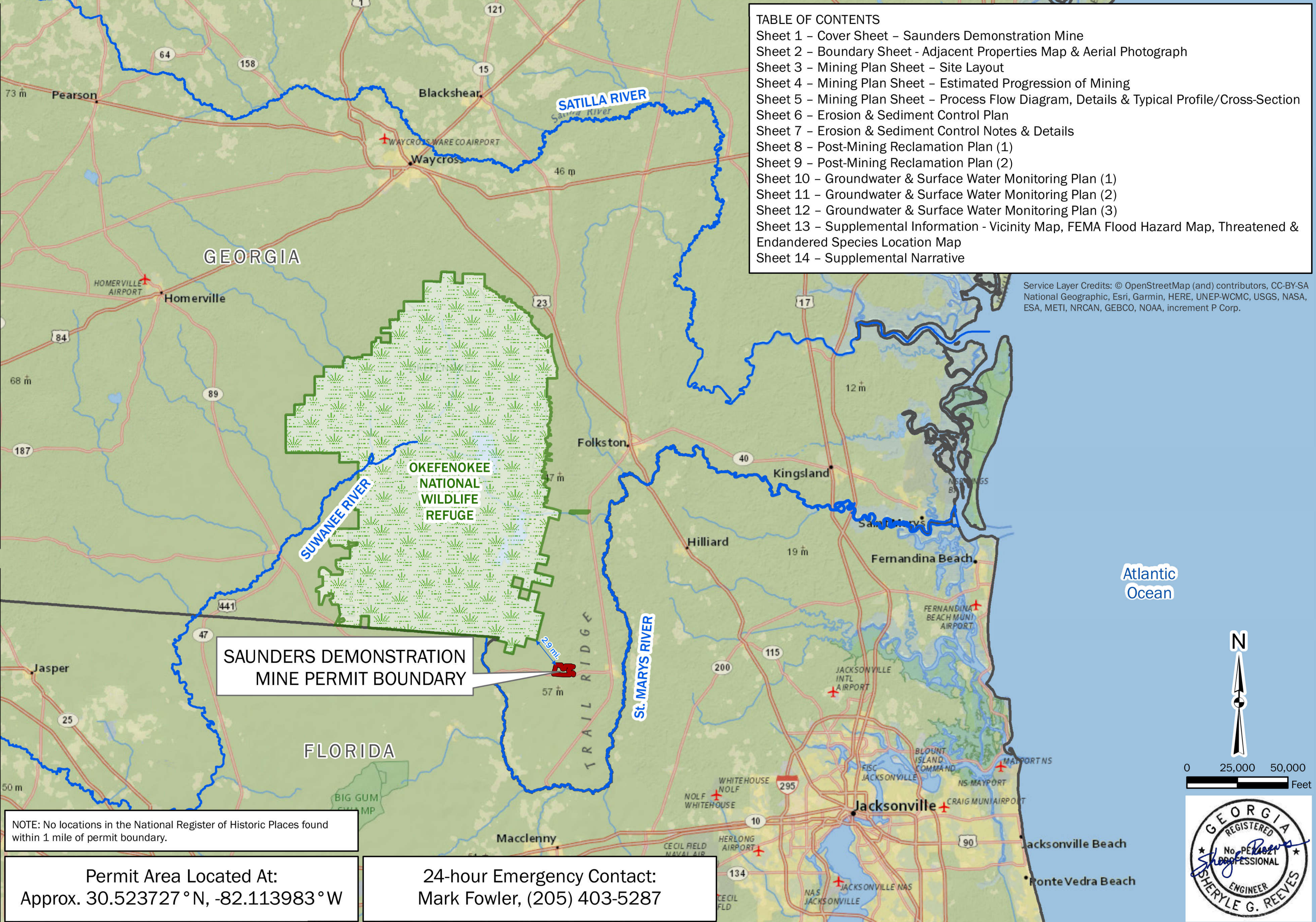
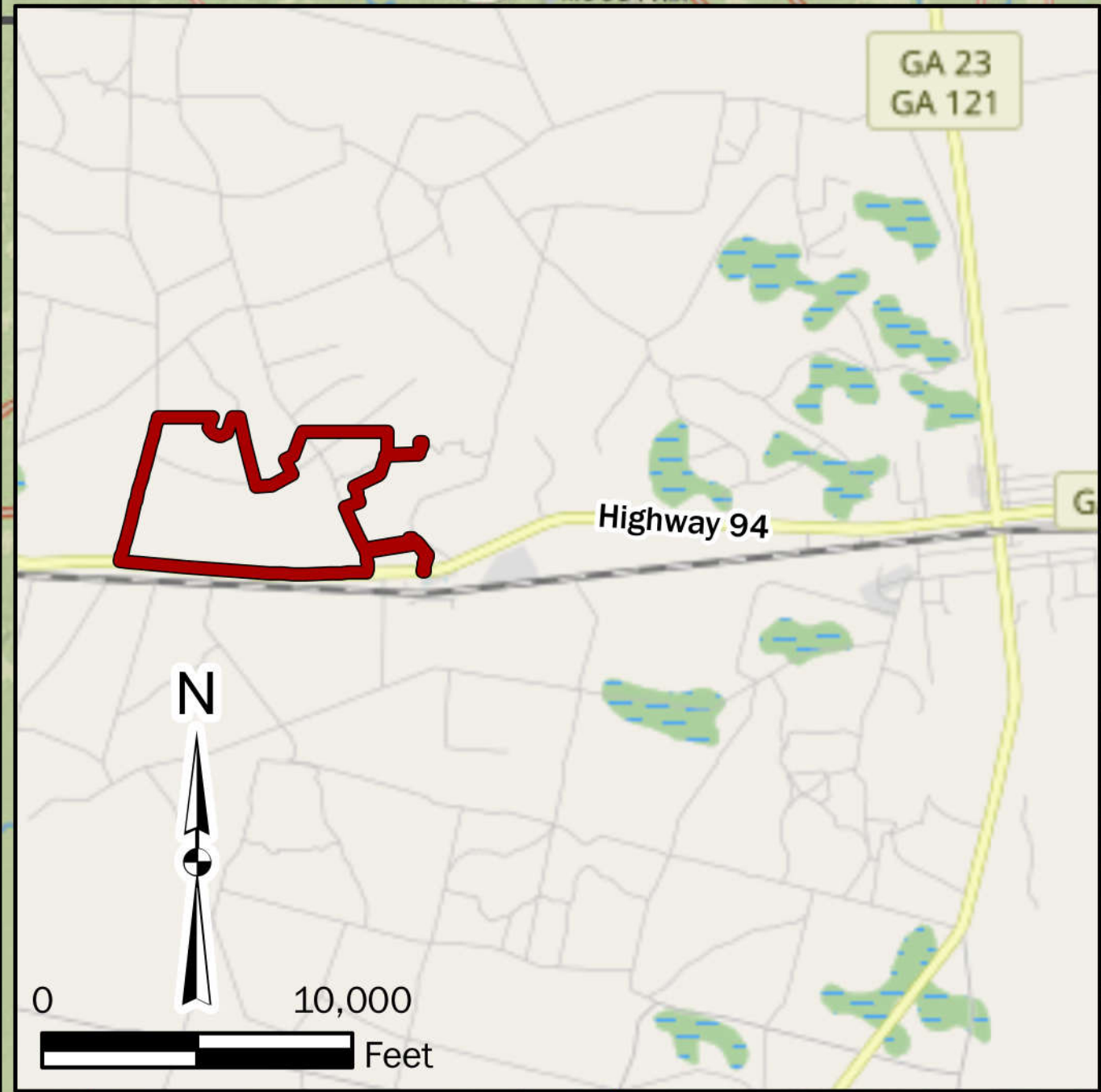
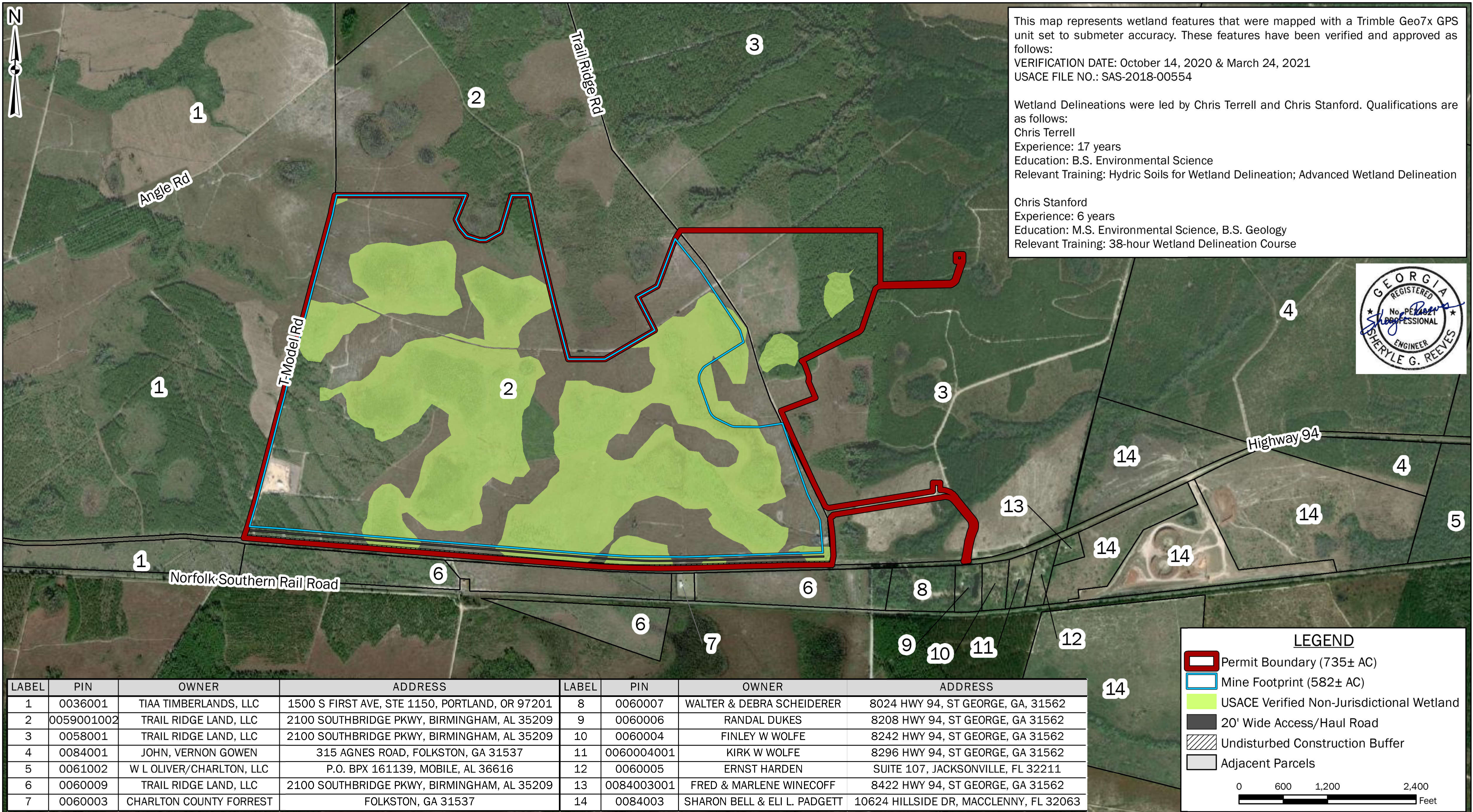




SHEET 1: COVER SHEET - SAUNDERS DEMONSTRATION MINE
TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)
ST. GEORGE, CHARLTON COUNTY, GEORGIA

INSET BASEMAP: Open Street Map; BASEMAP: National Geographic World Map (See Service Layer Credits).

DRAWN BY: DEK
CHECKED BY: SGR
DRAWING DATE: 11/13/2020
REVISION DATE: 9/17/2021
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 25,000 ft



This map represents wetland features that were mapped with a Trimble Geo7x GPS unit set to submeter accuracy. These features have been verified and approved as follows:
VERIFICATION DATE: October 14, 2020 & March 24, 2021
USACE FILE NO.: SAS-2018-00554

Wetland Delineations were led by Chris Terrell and Chris Stanford. Qualifications are as follows:
Chris Terrell
Experience: 17 years
Education: B.S. Environmental Science
Relevant Training: Hydric Soils for Wetland Delineation; Advanced Wetland Delineation

Chris Stanford
Experience: 6 years
Education: M.S. Environmental Science, B.S. Geology
Relevant Training: 38-hour Wetland Delineation Course



LABEL	PIN	OWNER	ADDRESS	LABEL	PIN	OWNER	ADDRESS
1	0036001	TIAA TIMBERLANDS, LLC	1500 S FIRST AVE, STE 1150, PORTLAND, OR 97201	8	0060007	WALTER & DEBRA SCHEIDERER	8024 HWY 94, ST GEORGE, GA, 31562
2	0059001002	TRAIL RIDGE LAND, LLC	2100 SOUTHBRIDGE PKWY, BIRMINGHAM, AL 35209	9	0060006	RANDAL DUKES	8208 HWY 94, ST GEORGE, GA 31562
3	0058001	TRAIL RIDGE LAND, LLC	2100 SOUTHBRIDGE PKWY, BIRMINGHAM, AL 35209	10	0060004	FINLEY W WOLFE	8242 HWY 94, ST GEORGE, GA 31562
4	0084001	JOHN, VERNON GOWEN	315 AGNES ROAD, FOLKSTON, GA 31537	11	0060004001	KIRK W WOLFE	8296 HWY 94, ST GEORGE, GA 31562
5	0061002	W L OLIVER/CHARLTON, LLC	P.O. BPX 161139, MOBILE, AL 36616	12	0060005	ERNST HARDEN	SUITE 107, JACKSONVILLE, FL 32211
6	0060009	TRAIL RIDGE LAND, LLC	2100 SOUTHBRIDGE PKWY, BIRMINGHAM, AL 35209	13	0084003001	FRED & MARLENE WINECOFF	8422 HWY 94, ST GEORGE, GA 31562
7	0060003	CHARLTON COUNTY FORREST	FOLKSTON, GA 31537	14	0084003	SHARON BELL & ELI L. PADGETT	10624 HILLSIDE DR, MACCLENNY, FL 32063



SHEET 2: BOUNDARY SHEET - ADJACENT PROPERTIES MAP & AERIAL PHOTOGRAPH

TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: Maxar, Vivid Imagery, 11/20/2019 (West, 0.5 m Resolution) & 3/24/2018 (East, 0.46 m Resolution).

DRAWN BY: DEK

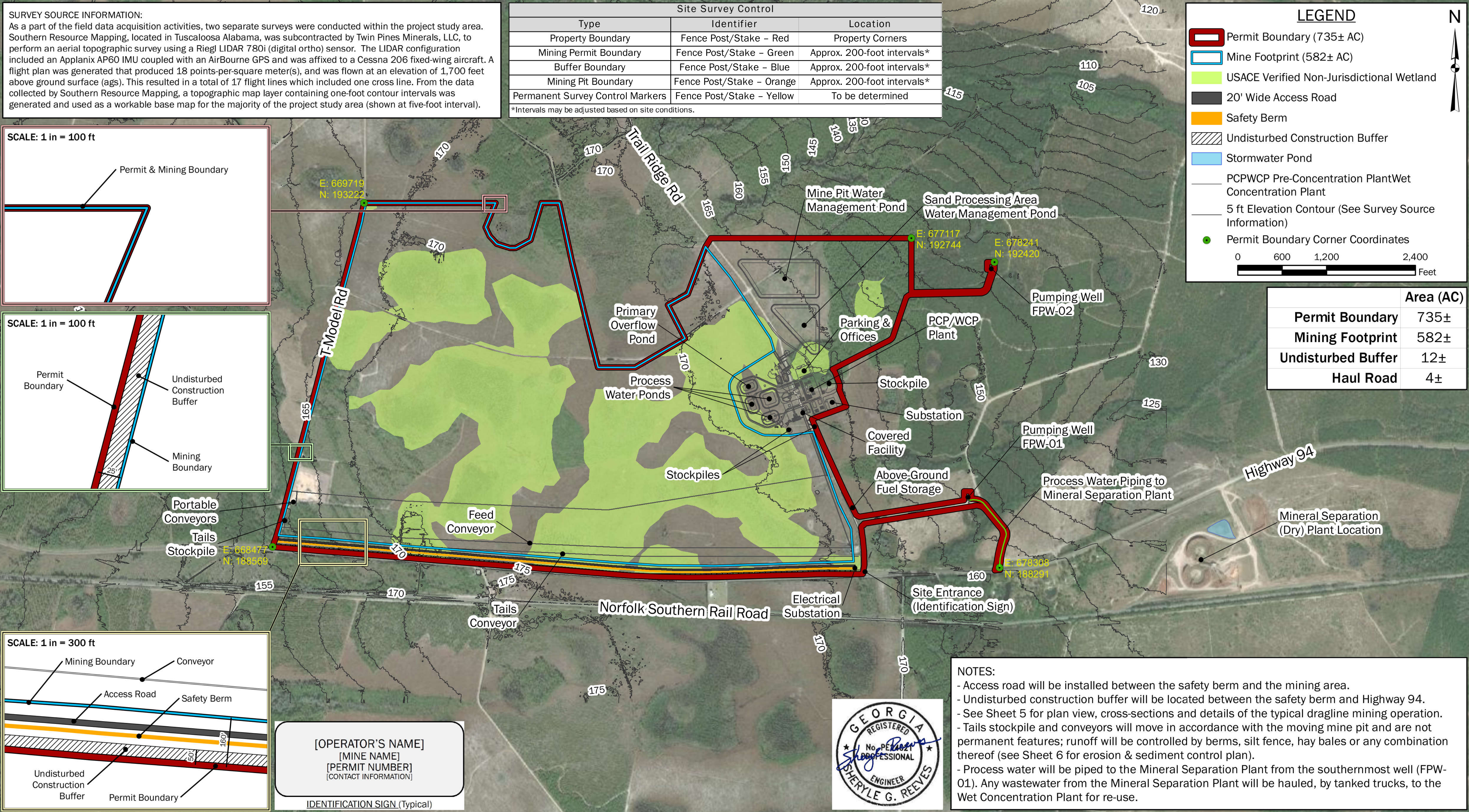
CHECKED BY: SGR

DRAWING DATE: 11/13/2020

REVISION DATE: 9/17/2021

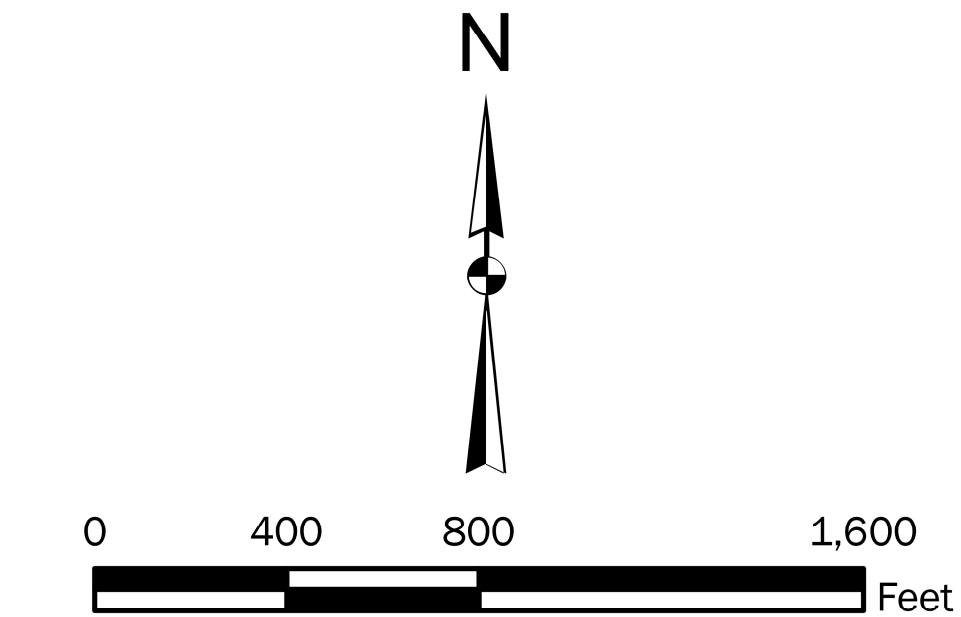
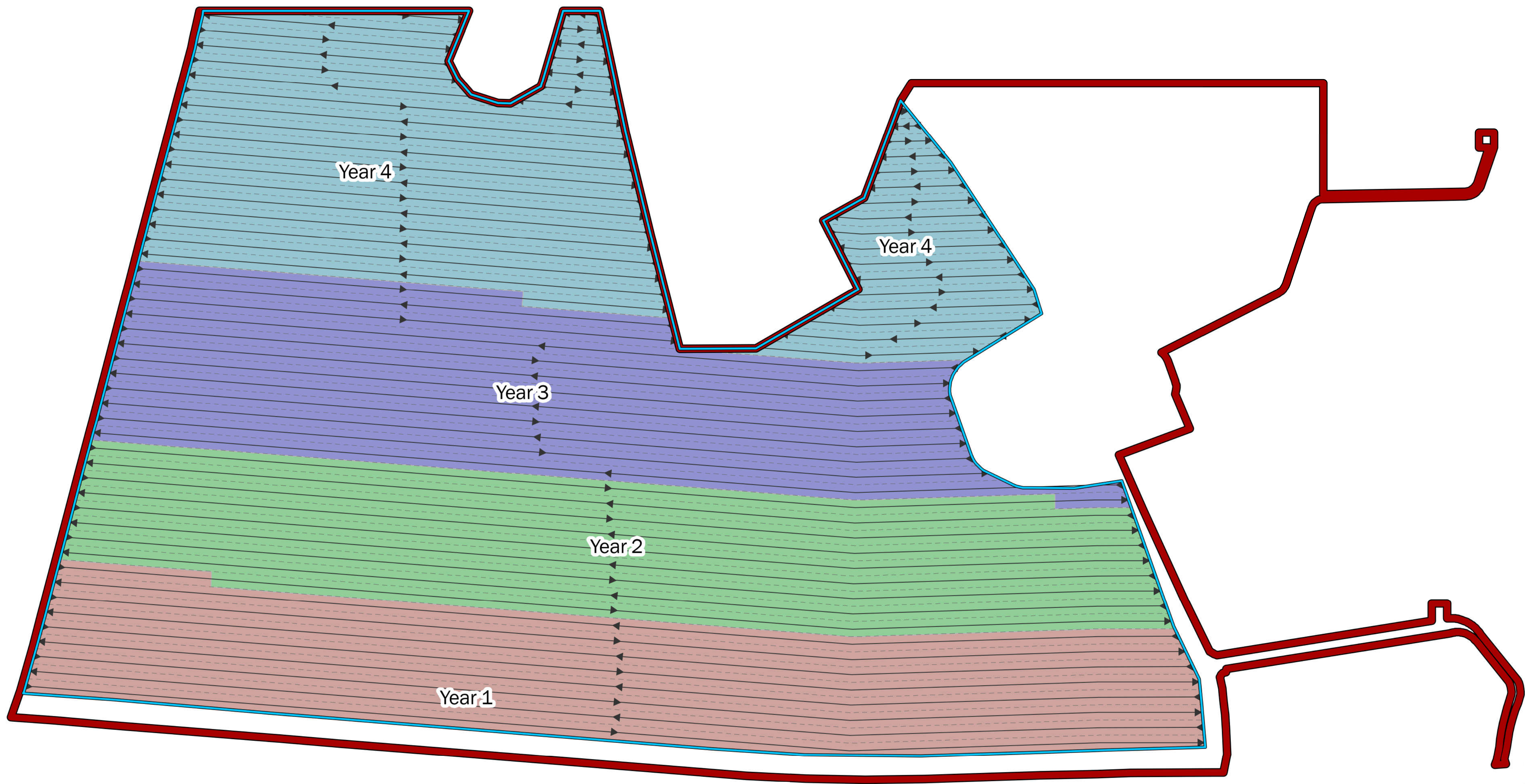
TTL JOB NO.: 000180200804.00

APPROX. SCALE: 1 in = 600 ft



NOTES:

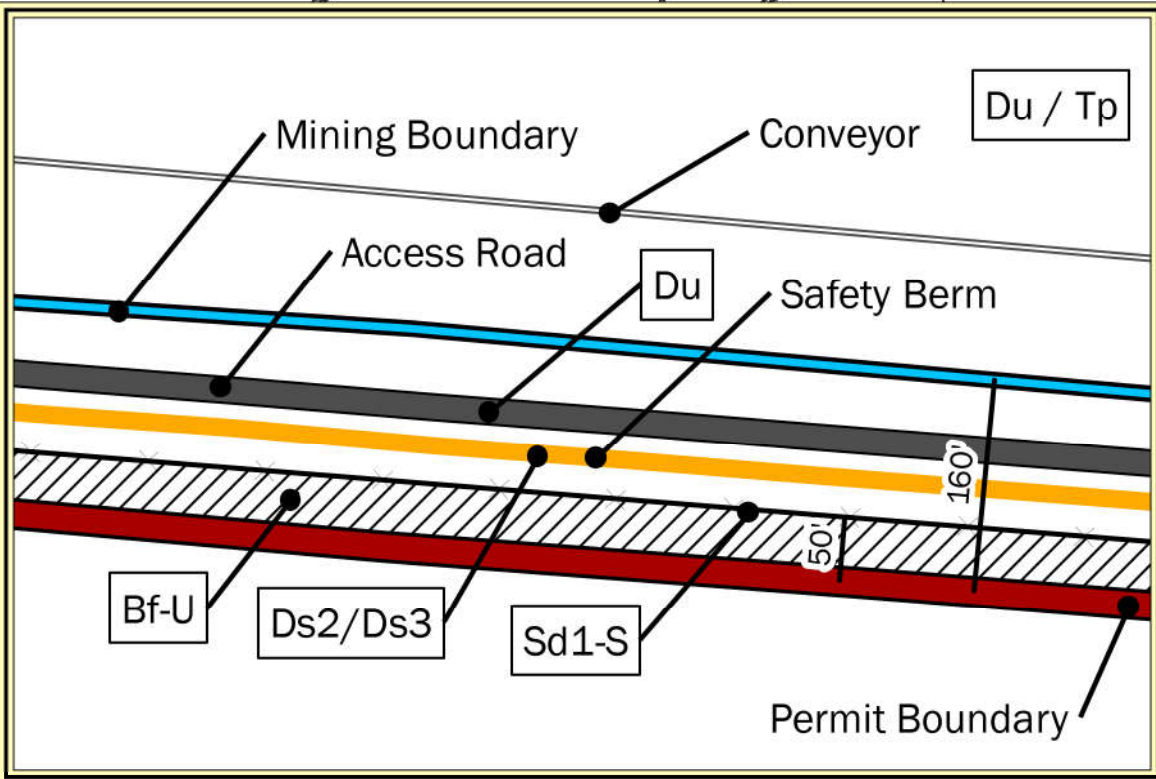
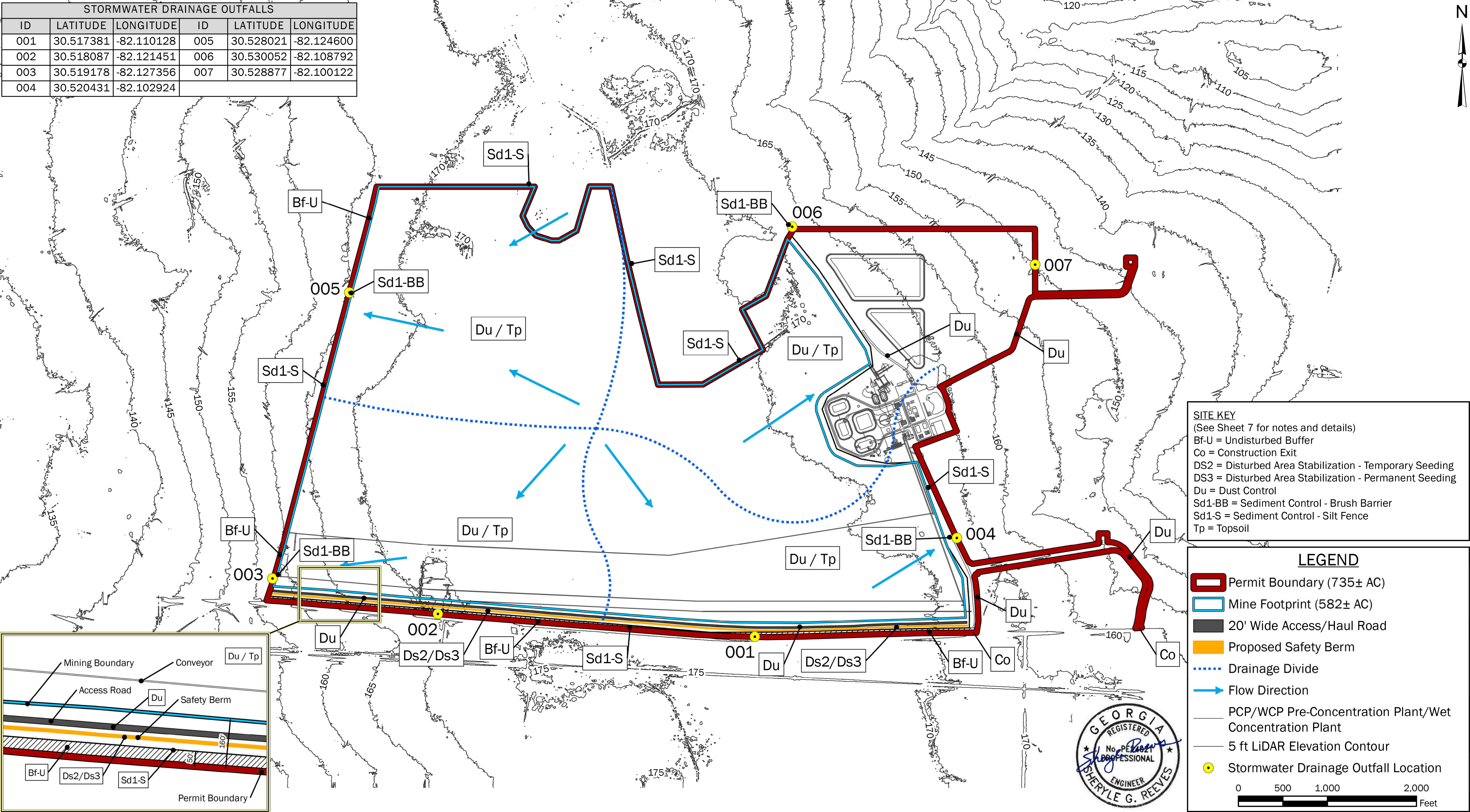
- Estimated timing is based on a mining progress rate of 10-15 acres per month. The illustration represents the average of those values (170 feet per day). Actual timing for extraction of heavy mineral sands is expected to range from 4 to 5 years.
- See Sheet 5 for plan view, cross-sections and details of the typical dragline mining operation.
- Tails stockpile and conveyors will move in accordance with the moving mine pit and are not permanent features.
- See Sheet 6 for information regarding dust control.
- See Sheet 13 for additional information regarding flood prone areas and threatened and endangered species locations.



LEGEND

- Permit Boundary (735± AC)
- Mine Footprint (582± AC)
- Year 1
- Year 2
- Year 3
- Year 4
- East-to-West Dragline Center
- West-to-East Dragline Center
- Edge of Dragline Pass

STORMWATER DRAINAGE OUTFALLS					
ID	LATITUDE	LONGITUDE	ID	LATITUDE	LONGITUDE
001	30.517381	-82.110128	005	30.528021	-82.124600
002	30.518087	-82.121451	006	30.530052	-82.108792
003	30.519178	-82.127356	007	30.528877	-82.100122
004	30.520431	-82.102924			



SHEET 6: EROSION & SEDIMENT CONTROL PLAN
TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)
ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK
CHECKED BY: SGR
DRAWING DATE: 11/13/2020
REVISION DATE: 9/17/2021
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 500 ft

GEORGIA UNIFORM CODING SYSTEM

FOR SOIL EROSION AND SEDIMENT CONTROL PRACTICES
GEORGIA SOIL AND WATER CONSERVATION COMMISSION

STRUCTURAL PRACTICES

CODE	PRACTICE	DETAIL	MAP SYMBOL	DESCRIPTION
Cd	CHECKDAM			A small temporary barrier or dam constructed across a swale, drainage ditch or area of concentrated flow.
Ch	CHANNEL STABILIZATION			Improving, constructing or stabilizing an open channel, existing stream, or ditch.
Co	CONSTRUCTION EXIT			A crushed stone pad located at the construction site exit to provide a place for removing mud from tires thereby protecting public streets.
Sd1	SEDIMENT BARRIER			A barrier to prevent sediment from leaving the construction site. It may be sandbags, bales of straw or hay, brush, logs and poles, gravel, or a silt fence.
Sd3	TEMPORARY SEDIMENT BASIN			A basin created by excavation or a dam across a waterway. The surface water runoff is temporarily stored allowing the bulk of the sediment to drop out.
Sk	FLOATING SURFACE SKIMMER			A buoyant device that releases/drains water from the surface of sediment ponds, traps, or basins at a controlled rate of flow.
St	STORMDRAIN OUTLET PROTECTION			A paved or short section of riprap channel at the outlet of a storm drain system preventing erosion from the concentrated runoff.

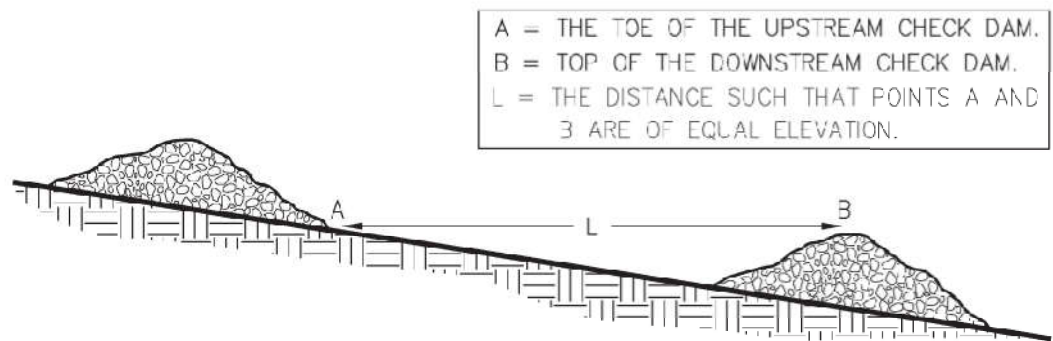
VEGETATIVE PRACTICES

CODE	PRACTICE	DETAIL	MAP SYMBOL	DESCRIPTION
Ds1	DISTURBED AREA STABILIZATION (WITH MULCHING ONLY)			Establishing temporary protection for disturbed areas where seedlings may not have a suitable growing season to produce an erosion retarding cover.
Ds2	DISTURBED AREA STABILIZATION (WITH TEMP SEEDING)			Establishing a temporary vegetative cover with fast growing seedlings on disturbed areas.
Ds3	DISTURBED AREA STABILIZATION (WITH PERM SEEDING)			Establishing a permanent vegetative cover such as trees, shrubs, vines, grasses, or legumes on disturbed areas.
Ds4	DISTURBED AREA STABILIZATION (SODDING)			A permanent vegetative cover using sods on highly erodable or critically eroded lands.
Du	DUST CONTROL ON DISTURBED AREAS			Controlling surface and air movement of dust on construction site, roadways and similar sites.

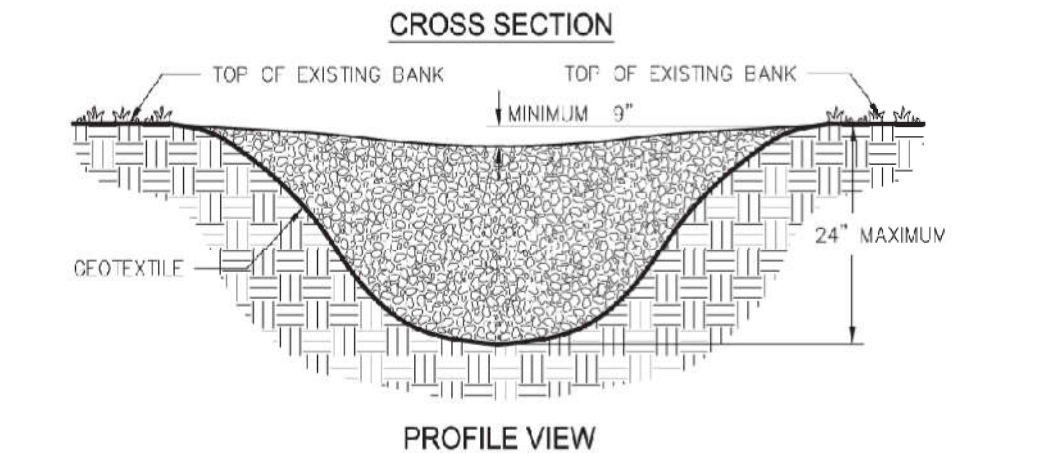


STONE CHECK DAM

SPACING BETWEEN CHECK DAMS

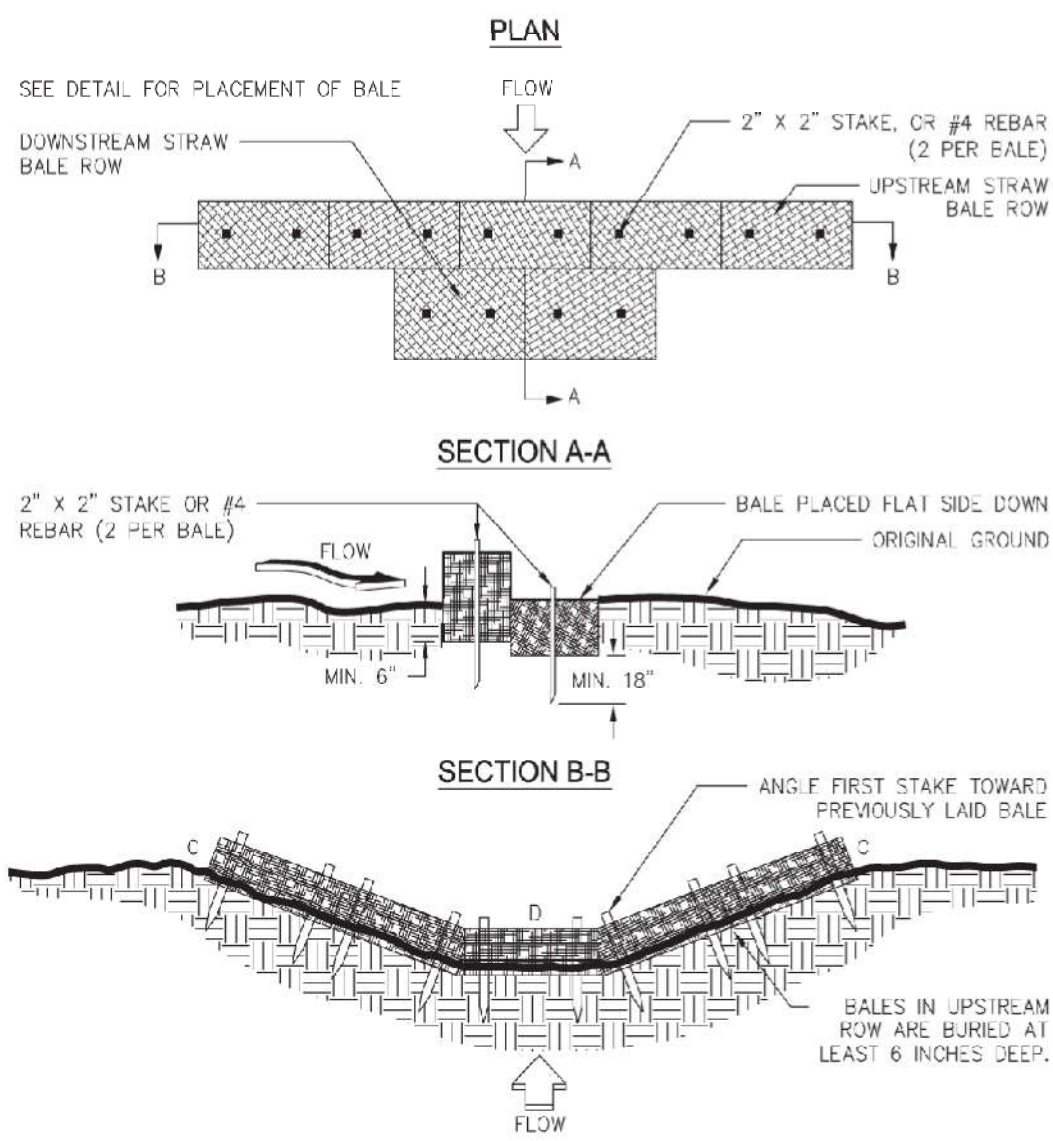


STONE CHECK DAM



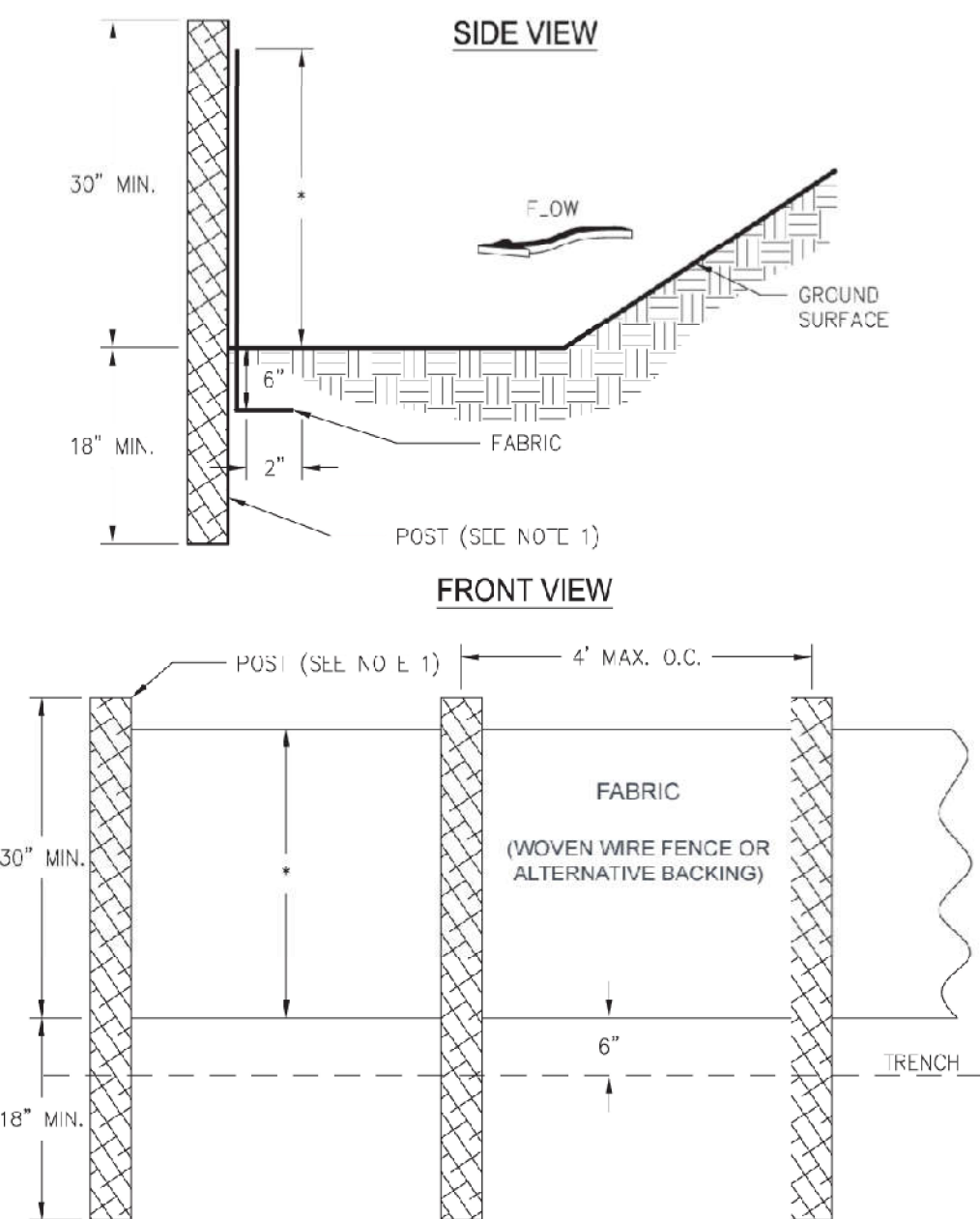
- NOTES:
1. CHECK DAMS ARE TO BE USED ONLY IN SMALL OPEN CHANNELS (THEY ARE NOT TO BE USED IN LIVE STREAMS).
 2. THE DRAINAGE AREA FOR STONE CHECK DAMS SHALL NOT EXCEED TWO ACRES.
 3. THE CENTER OF THE CHECK DAM MUST BE AT LEAST 9 INCHES LOWER THAN THE OUTER EDGES.
 4. THE DAM HEIGHT SHOULD BE A MAXIMUM OF 2 FEET FROM CENTER TO R/W EDGE.
 5. THE SIDE SLOPES OF THE CHECK DAM SHALL NOT EXCEED A 2:1 SLOPE.
 6. GEOTEXTILE SHALL BE USED TO PREVENT THE MITIGATION OF SUBGRADE SOIL PARTICLES INTO THE STONES (REFER TO AASHTO M289-96, SECTION 7.3, TABLE 3).

TYPICAL STRAW BALE CHECK DAM



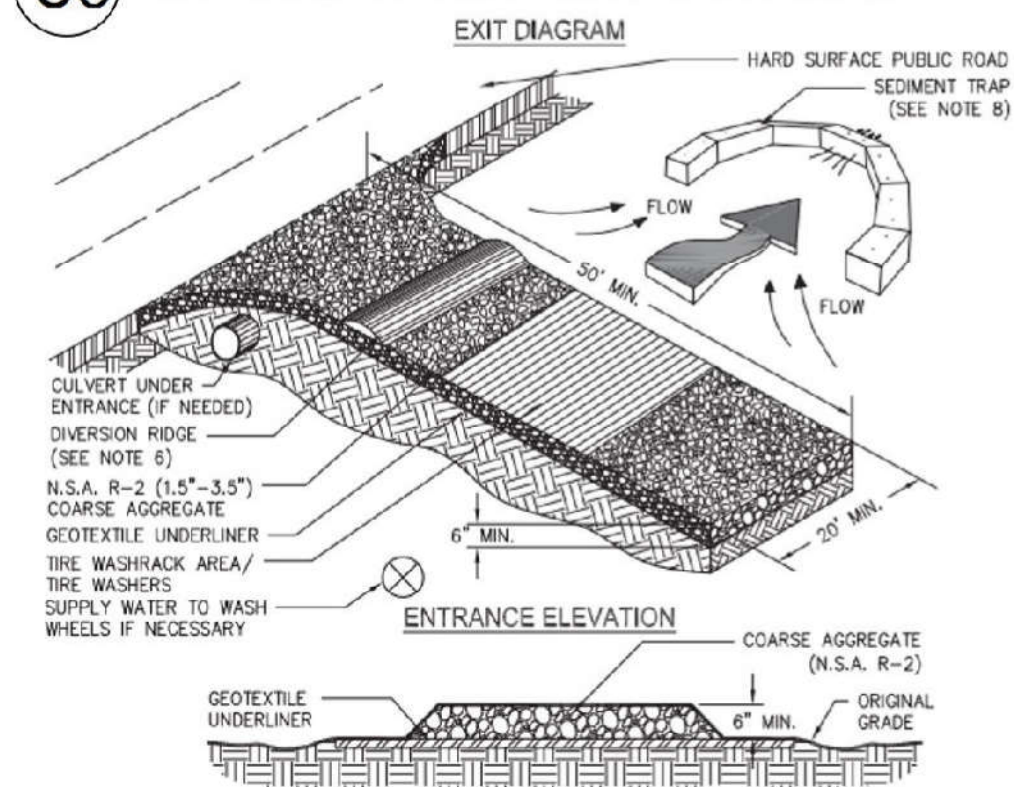
- NOTES:
1. BALES SHOULD BE BOUND WITH WIRE OR NYLON STRING AND SHOULD BE PLACED IN ROWS WITH BALE ENDS TIGHTLY ADJUTING THE ADJACENT BALES.
 2. REMOVE #4 REBAR AFTER STRAW BALES ARE NO LONGER IN PLACE.
 3. POINT C OF SECTION B-B SHOULD ALWAYS BE HIGHER THAN POINT D.
 4. STRAW-BALE CHECK DAMS SHALL NOT BE USED WHERE THE DRAINAGE AREA EXCEEDS ONE ACRE.

Sd1-S SILT FENCE - TYPE C



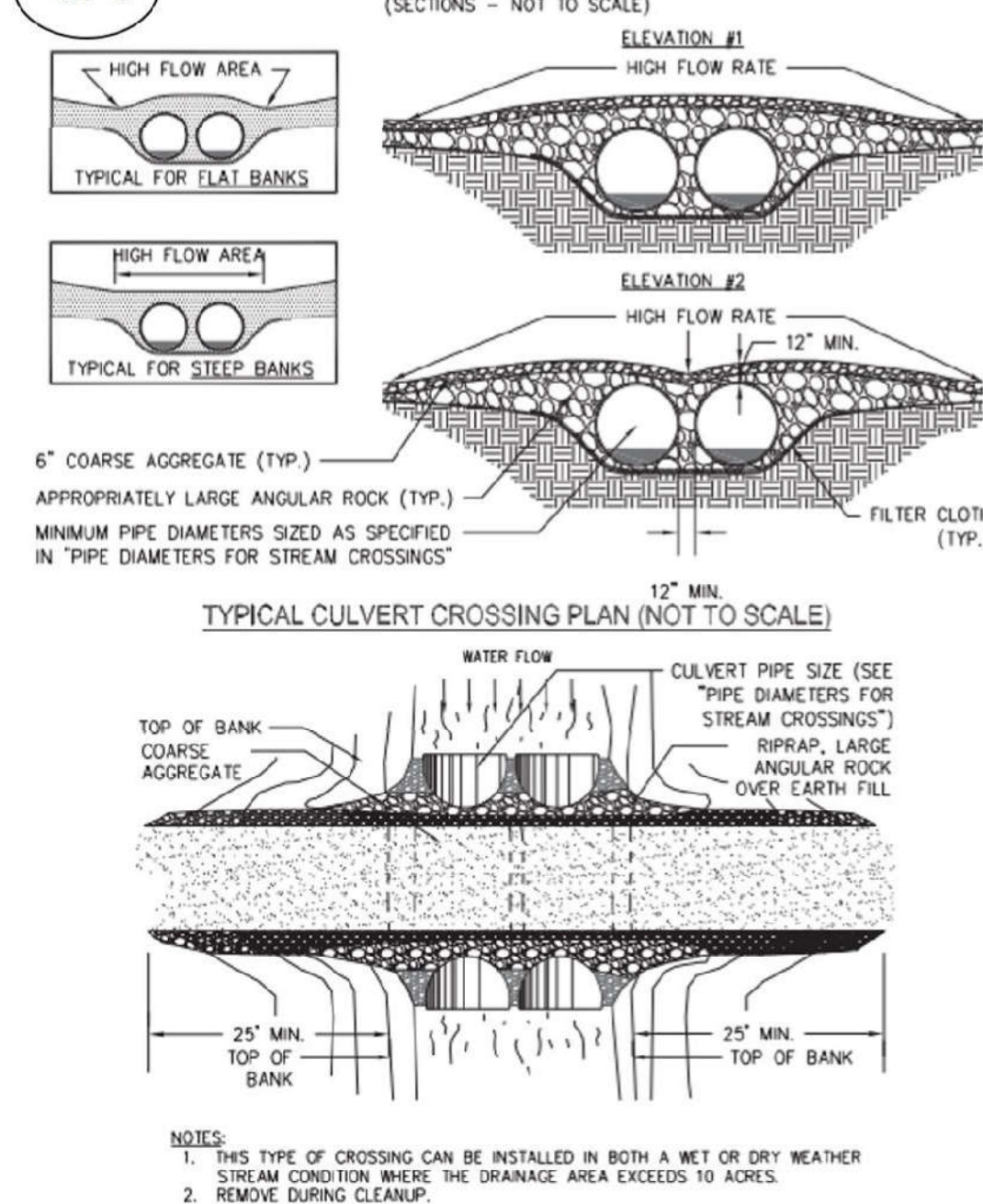
- NOTES:
1. USE STEEL OR WOOD POSTS OR AS SPECIFIED BY THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.
 2. HEIGHT (*) IS TO BE SHOWN ON THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.

Co CRUSHED STONE CONSTRUCTION EXIT

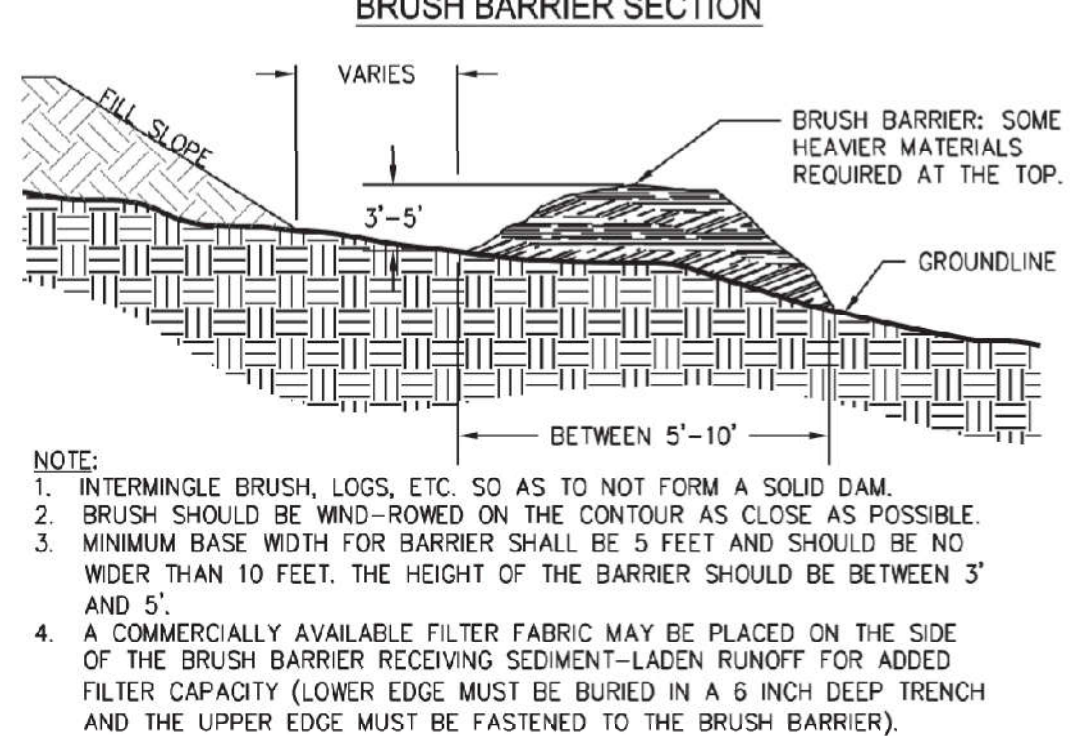


- NOTES:
1. AVOID LOCATING ON STEEP SLOPES OR AT CURVES ON PUBLIC ROADS.
 2. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE.
 3. AGGREGATE SIZE SHALL BE IN ACCORDANCE WITH NATIONAL STONE ASSOCIATION R-2 (1.5"-3.5" STONES).
 4. GRAVEL PAD SHALL HAVE A MINIMUM THICKNESS OF 6".
 5. PAD WIDTH SHALL BE EQUAL FULL WIDTH AT ALL POINTS OF VEHICULAR EGRESS, BUT NO LESS THAN 20'.
 6. A DIVERSION RIDGE SHOULD BE CONSTRUCTED WHEN GRADE TOWARD PADDED AREA IS GREATER THAN 2%.
 7. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES.
 8. WHEN WASHING IS REQUIRED, IT SHOULD BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN (DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE ENTRANCE TO A SEDIMENT CONTROL DEVICE).
 9. WASHRAKES AND/OR TIRE WASHERS MAY BE REQUIRED DEPENDING ON SCALE AND CIRCUMSTANCE. IF NECESSARY, WASHRAKE DESIGN MAY CONSIST OF ANY MATERIAL SUITABLE FOR TRUCK TRAFFIC THAT REMOVE MUD AND DIRT.
 10. MAINTAIN AREA IN A WAY THAT PREVENTS TRACKING AND/OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

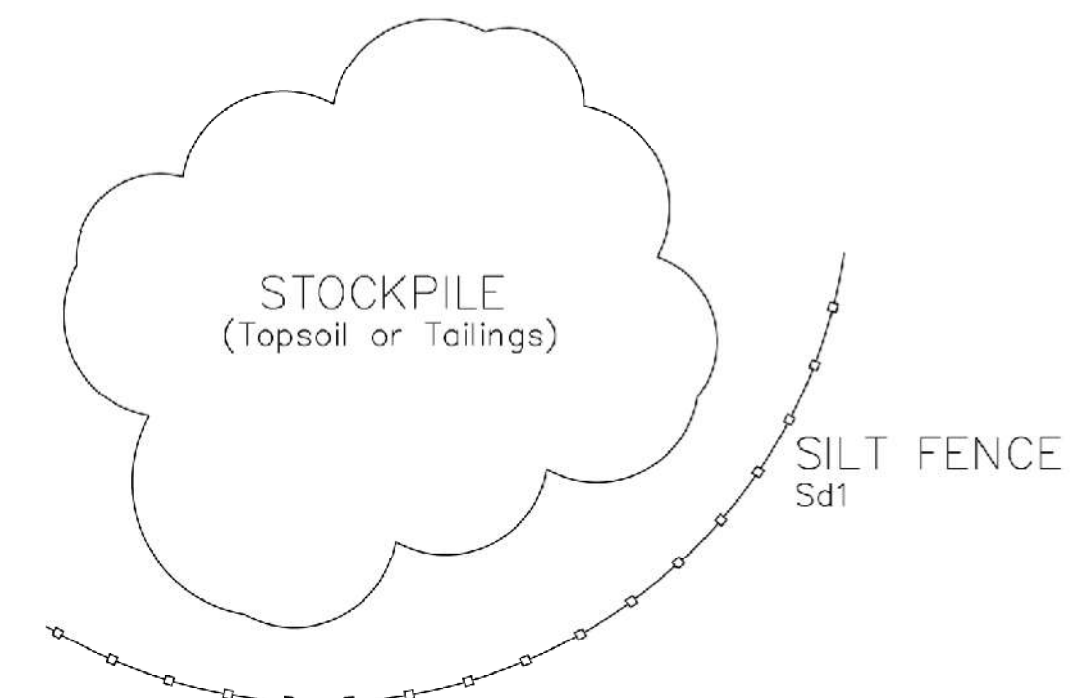
Sr-C CONFIGURATION OF TEMPORARY CULVERT CROSSINGS



Sd1-BB SEDIMENT BARRIERS



STOCKPILE BMP (Typical)



NOTE: Silt fence will be placed on the down-gradient side of the stockpile located outside of the PCP/WCP area if run-off is not or can not be directed toward the mining pit.

EROSION CONTROL NOTES

- EROSION & SEDIMENT CONTROL MEASURES
1. BMPs WILL BE INSTALLED AS DEPICTED IN EROSION AND SEDIMENT CONTROL PLAN SHEET 6 PRIOR TO ANY OTHER CONSTRUCTION OR MINING ACTIVITY AND WILL BE MAINTAINED UNTIL PERMANENT GROUND COVER IS ESTABLISHED.
 2. EROSION CONTROL NOTES:
 - a. THE ESCAPE OF SEDIMENT FROM THE SITE WILL BE PREVENTED BY THE INSTALLATION OF EROSION CONTROL MEASURES AND PRACTICES PRIOR, OR CONCURRENT WITH LAND DISTURBING ACTIVITIES.
 - b. EROSION CONTROL MEASURES WILL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED TO CONTROL OR TREAT THE SEDIMENT SOURCE.
 - c. ANY DISTURBED AREA LEFT EXPOSED FOR A PERIOD GREATER THAN 14 DAYS WILL BE STABILIZED WITH MULCH OR TEMPORARY SEEDING.
 - d. ALL EROSION AND SEDIMENT CONTROL MEASURES WILL CONFORM WITH THE GUIDELINES OF THE "MANUAL FOR EROSION AND SEDIMENT CONTROL."
 - e. DURING CONSTRUCTION AND MINING ACTIVITIES, TPM WILL MAINTAIN CAREFUL SCHEDULING AND PERFORMANCE TO ENSURE THAT LAND STRIPPED OF ITS NATURAL GROUND COVER IS EXPOSED ONLY IN SMALL QUANTITIES, AND PROTECTION IS ESTABLISHED.
 - f. SEDIMENT AND EROSION CONTROL MEASURES MUST BE CHECKED AFTER EACH RAIN EVENT. EACH DEVICE IS TO BE MAINTAINED OR REPLACED IF SEDIMENT ACCUMULATION HAS REACHED HALF THE CAPACITY OF THE DEVICE. ADDITIONAL DEVICES MUST BE INSTALLED IF NEW CHANNELS HAVE DEVELOPED.
 - g. DUST WILL BE CONTROLLED BY APPLYING WATER TO HAUL ROADS AND OTHER HIGH-TRAFFIC AREAS.
 - h. TPM WILL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE PROPER FUNCTIONING.

AUXILIARY EROSION & SEDIMENT CONTROL MEASURES

1. AUXILIARY BMPs INCLUDING DIVERSIONS, DIKES, OR BERMS WILL BE CONSTRUCTED TO RETAIN, DIRECT, AND CONTROL SURFACE WATER RUNOFF FROM AFFECTED AREAS INTO DESIGNED SEDIMENT CONTROL STRUCTURES. SURFACE WATER DISCHARGE WILL BE CONTROLLED AND RELEASED IN A NON-EROSIVE VELOCITY ONTO STABILIZED AREAS OR INTO STABILIZED CHANNELS.
2. CONTAINMENT BERMS WILL BE DESIGNED TO PROVIDE A MINIMUM OF 3 FEET OF FREEBOARD.
3. THE BERM ALONG THE SOUTHERN SITE BOUNDARY WILL BE CONSTRUCTED AS DEPICTED IN TYPICAL CROSS-SECTIONS (SHEET 5). CRESTS WILL BE SLOPED TO DIVERT STORMWATER TOWARD THE MINE AREA. THE TOP AND EXTERIOR SLOPE AND TOE OF ALL BERMS WILL BE GRASSED WITH QUICK-GROWING/GERMINATED GRASSES. SILT FENCING WILL BE INSTALLED ALONG THE EXTERIOR TOE OF THE OUTER BERMS, AND IN ALL AREAS WHERE DEEMED NECESSARY FOR EROSION CONTROL. SILT FENCING WILL BE ARMORED WITH STACKED HAY BALES ABUTTING THE FENCE PERPENDICULAR TO THE DIRECTION OF STORMWATER FLOW, WHERE NECESSARY.
4. AUXILIARY BMPs WILL BE SEEDDED WITH APPROPRIATE GRASSES (BASED ON PLANTING SEASON), AS SOON AS POSSIBLE. EFFORT WILL BE MADE TO UTILIZE NATURAL EXISTING VEGETATION IN THOSE AREAS WHERE BUFFERS ARE PROPOSED OR WHERE PRACTICAL.

TEMPORARY VEGETATION

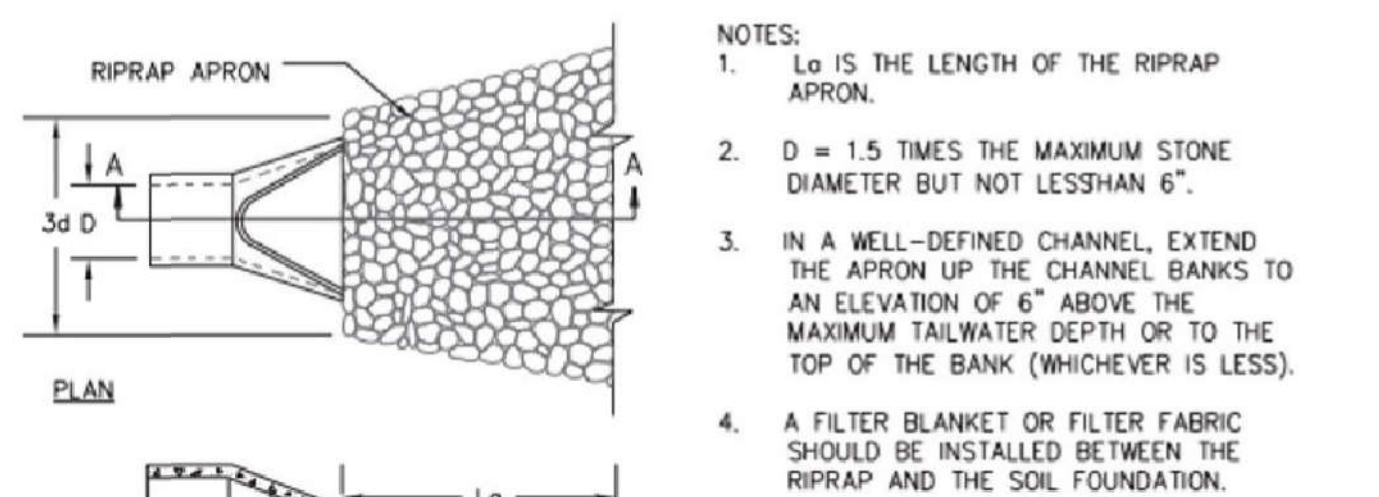
1. DISTURBED AREAS LEFT EXPOSED FOR A PERIOD GREATER THAN 14 DAYS WILL BE STABILIZED WITH MULCH OR TEMPORARY SEEDING.
2. SEEDBED PREPARATION - WHEN A HYDRAULIC SEEDER IS USED, SEEDBED PREPARATION IS NOT REQUIRED. WHEN USING CONVENTIONAL OR HANDSEEDING, SEEDBED PREPARATION IS NOT REQUIRED IF THE SOIL MATERIAL IS LOOSE AND NOT SEALED BY RAINFALL. WHEN SOIL HAS BEEN SEALED BY RAINFALL OR CONSISTS OF SMOOTH CUT SOILS, THE SOIL WILL BE PITTED, TRENCHED OR OTHERWISE SCARIFIED TO PROVIDE A PLACE FOR SEED TO LODGE AND GERMINATE.
3. LIME AND FERTILIZER - AGRICULTURAL LIME IS REQUIRED UNLESS SOIL TESTS INDICATE OTHERWISE. APPLY AGRICULTURAL LIME AT A RATE OF ONE TON PER ACRE. FERTILIZER SHOULD BE APPLIED BEFORE LAND PREPARATION AND INCORPORATED WITH A DISK, RIPPER OR CHISEL.
4. TEMPORARY VEGETATION SPECIES WILL BE PLANTED IN ACCORDANCE WITH TABLE 6-4.1 - TEMPORARY COVER OR COMPANION COVER CROPS, IN THE MANUAL FOR SEDIMENT AND EROSION CONTROL IN GEORGIA, 2016.

NPDES NOTES

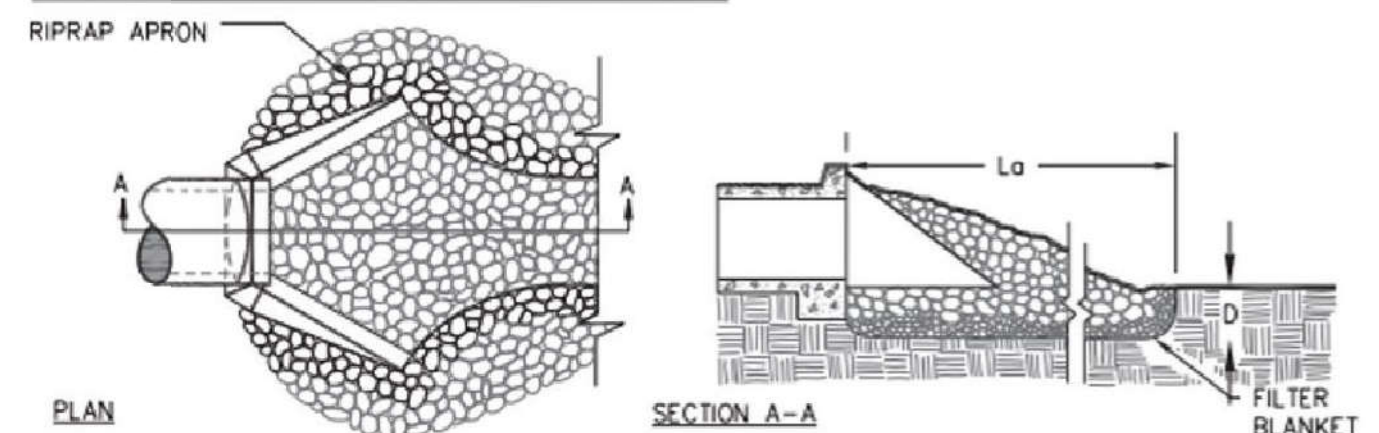
1. STORMWATER FALLING WITHIN THE ACTIVE MINING AREA, TO INCLUDE THE CONVEYORS AND TOPSOIL AND TAILINGS STOCKPILES WILL BE DIRECTED BACK INTO THE MINING PIT AS PRACTICAL. FOR STORMWATER DISCHARGES OFF-SITE, THE FACILITY WILL OPERATE UNDER A DNR-EPD GENERAL PERMIT NO. GA0600000 STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITIES.
2. STORMWATER FALLING WITHIN THE PCP/WCP AREA WILL BE DIRECTED INTO THE PROCESS PONDS AND RECIRCULATED AS PROCESS WATER.
3. ROUTINE DEWATERING OF THE MINE PIT IS NOT ANTICIPATED. AFTER EQUIPMENT SHUTDOWNS OR HEAVY RAIN EVENTS, IF DEWATERING IS NECESSARY, THIS WATER WILL BE PUMPED TO A HOLDING POND AND SUBSEQUENTLY USED FOR PROCESS MAKE-UP WATER.

St RIPRAP OUTLET PROTECTION

PIPE OUTLET TO FLAT AREA -- NO WELL DEFINED CHANNEL



PIPE OUTLET TO WELL DEFINED CHANNEL



SHEET 7: EROSION & SEDIMENT CONTROL NOTES & DETAILS

TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)

ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK

CHECKED BY: SGR

DRAWING DATE: 11/13/2020

REVISION DATE: 9/17/2021

TTL JOB NO.: 000180200804.00

APPROX. SCALE: N.T.S.

RECLAMATION OBJECTIVE

THE RECLAMATION OBJECTIVE IS TO RESTORE THE LAND SURFACE AND GROUNDWATER APPROXIMATELY TO PRE-MINING LEVELS, AND TO REVEGETATE THE SITE WITH PLANT COMMUNITIES ASSOCIATED WITH PINE FLATWOODS OR DEPRESSIONAL WETLANDS.

MINING & RECLAMATION SCHEDULE

UPON PERMIT APPROVAL, TPM ESTIMATES IT WILL TAKE 6 TO 12 MONTHS TO SET-UP FACILITIES AND PREPARE THE SITE PRIOR TO INITIATION OF MINING. MINING OF THE 582 ACRES OF THE DEMONSTRATION MINE SITE IS ANTICIPATED TO TAKE 4 TO 5 YEARS. RECLAMATION WILL BE COMPLETED WITHIN 24 MONTHS AFTER MINING IS COMPLETED. THE TOTAL LIFE OF THE MINE, FROM SET UP TO COMPLETE RECLAMATION, IS ANTICIPATED TO BE 7 TO 8 YEARS.

RECLAMATION PROCEDURES & METHODS

SURFACE TOPOGRAPHY WILL BE RESTORED BY USING POST-PROCESSED SANDS AND MINE TAILINGS (SAND AND HUMATE) TO BACK-FILL THE EXCAVATION PIT. TOP SOIL WILL BE STOCKPILED PRIOR TO MINING AND REPLACED AFTER THE EXCAVATION IS BACK-FILLED.

GROUNDWATER LEVELS ARE EXPECTED TO RETURN NATURALLY AFTER THE DRAGLINE HAS MOVED AT LEAST 1,000 FEET TO THE NORTH. TO ENSURE GROUNDWATER HYDROLOGY IS NOT AFFECTED BY THE HOMOGENIZATION OF SOILS, A LOW PERMEABILITY LAYER WILL BE PLACED FROM 7 TO 10 FEET BELOW THE LAND SURFACE. GROUNDWATER LEVELS WILL BE MONITORED, AND THE ADAPTIVE MANAGEMENT PLAN WILL BE FOLLOWED TO ADDRESS ANY UNEXPECTED OCCURRENCES.

1 - ONCE THE MINE PIT REACHES APPROXIMATELY 500 FEET IN LENGTH, TAILINGS FROM THE WET CONCENTRATION PLANT WILL BE PLACED WITHIN THE PIT. AS THE MINE PIT PROGRESSES, TAILINGS DEPOSITION (BACKFILLING) WILL OCCUR CONTINUOUSLY, CONCURRENT WITH THE RATE OF MINING.

2 - PITS WILL BE FILLED TO THE APPROXIMATE PRE-MINING TOPOGRAPHY AND GRADES - LESS THE DEPTH OF TOPSOIL. HEAVY EQUIPMENT WITH ONBOARD GPS TECHNOLOGY OR A PEDESTRIAN SURVEY CREW UTILIZING GPS TECHNOLOGY WILL VERIFY RECLAIMED ELEVATIONS.

3 - TOPSOIL WILL BE REPLACED AND FINAL GRADING WILL MIMIC THE PRE-MINING SURFACE. TOP SOIL WILL BE REPLACED AFTER THE DRAG LINE HAS PROGRESSED AT LEAST ONE TRANSECT TO THE NORTH OF THE TRANSECT BEING RESTORED. (THIS DISTANCE IS NECESSARY TO ENSURE THE TOP SOIL IS NOT REMOVED WHEN THE ADJACENT TRANSECT IS EXCAVATED.)

4 - GROUNDWATER LEVELS WILL BE RESTORED NATURALLY ONCE THE DRAGLINE HAS MOVED AT LEAST 1,000 FEET TO THE NORTH. MONITORING WELLS WILL BE CHECKED AT SUCH TIME TO ENSURE GROUNDWATER LEVELS HAVE BEEN RESTORED AND/OR TO INITIATE APPROPRIATE ADAPTIVE MANAGEMENT.

5 - REVEGETATION WILL BEGIN WITH THE REPLACEMENT OF TOP SOIL. TEMPORARY VEGETATION/SEEDING (SHEETS 6 & 7) WILL BE USED AS NEEDED AND REQUIRED FOR EROSION CONTROL. EROSION CONTROL MEASURES WILL REMAIN IN PLACE UNTIL ADEQUATE VEGETATIVE COVER HAS BEEN ESTABLISHED.

6 - NATURAL PLANT COMMUNITIES ARE EXPECTED TO DEVELOP FROM THE SEEDBANK IN THE TOPSOIL, WHICH WILL BE PRESERVED AND REPLACED. THEREFORE, NO SUPPLEMENTAL PLANTING OF HERBACEOUS OR SHRUB VEGETATION IS ANTICIPATED. TREES WILL BE PLANTED 1 TO 2 YEARS AFTER THE START OF MINING IN THE APPROPRIATE SEASONS ACCORDING TO THE PRE-MINING HABITAT CLASSIFICATIONS DESCRIBED BELOW AND SHOWN ON SHEET 9. THE GROWING SEASON, AS INDICATED BY NRCS A&GCS WETS TABLE (WETS STATION: FOLKSTON 9 SW GA. YEARS: 1971-2000) FOR THE PROBABILITY OF TEMPERATURES ABOVE 28 DEGREES FAHRENHEIT, IS BETWEEN FEBRUARY 12 AND DECEMBER 20. STABLE GROWTH WILL BE DETERMINED WHEN PLANTED VEGETATION MAINTAINS A SURVIVABILITY RATE OF 50 PERCENT. FORESTED SYSTEMS WILL REQUIRE DECADES TO REACH MATURITY.

MESIC PINE FLATWOODS (UPLAND & NON-JURISDICTIONAL WETLAND)

- MESIC PINE FLATWOODS WILL BE PLANTED WITH LONGLEAF PINE (PINUS PALUSTRIS) AND/OR SLASH PINE (PINUS ELLIOTTI).
- PLANTING WILL OCCUR IN LATE FALL/WINTER AS SITE AND WEATHER/CLIMATIC CONDITIONS ALLOW.
- NO FERTILIZERS WILL BE UTILIZED.
- RECLAMATION WILL BE DEEMED SUCCESSFUL WHERE TREE VEGETATION MAINTAINS A SURVIVABILITY RATE OF 50 PERCENT.

WET PINE FLATWOODS (NON-JURISDICTIONAL WETLAND)

- WET PINE FLATWOODS WILL BE PLANTED SLASH PINE.
- PLANTING WILL OCCUR IN LATE FALL/WINTER AS SITE AND WEATHER/CLIMATIC CONDITIONS ALLOW.
- NO FERTILIZERS WILL BE UTILIZED.
- RECLAMATION WILL BE DEEMED SUCCESSFUL WHERE TREE VEGETATION MAINTAINS A SURVIVABILITY RATE OF 50 PERCENT.

DEPRESSIONAL WETLANDS (NON-JURISDICTIONAL)

- DEPRESSIONAL WETLANDS WILL BE PLANTED WITH POND CYPRESS (TAXODIUM ASCENDENS), SWAMP TUPELO (NYSSA BIFLORA), POND PINE (PINUS SEROTINA), AND/OR SLASH PINE. SUPPLEMENTAL SAPPLINGS INCLUDING LOBLOLLY BAY (GORDONIA LASIANTHUS), SWAMP BAY (PERSEA PALUSTRIS), SWEETBAY (MAGNOLIA VIRGINIANA) MAY BE ADDED TO THE PLANTING SUITE AS INDICATED BY OBSERVED HABITAT CONDITIONS.
- PLANTING WILL OCCUR IN LATE FALL/EARLY SPRING AS SITE AND WEATHER/CLIMATIC CONDITIONS ALLOW.
- NO FERTILIZERS WILL BE UTILIZED.
- RECLAMATION WILL BE DEEMED SUCCESSFUL WHERE TREE VEGETATION MAINTAINS A SURVIVABILITY RATE OF 50 PERCENT.

7 - ALTHOUGH RECLAIMED HABITATS AND THE ASSOCIATED PLANTINGS ARE ANTICIPATED TO FOLLOW THE SCHEDULE OUTLINED IN #4 AND AS SHOWN ON SHEET 9, ACTUAL TREE SPECIES TO BE PLANTED WILL DEPEND ON NATURAL HERBACEOUS/SHRUB RECRUITMENT AND DIRECT OBSERVATION OF HYDROLOGY AND TARGET SPECIES AS OUTLINED IN THE TABLE BELOW. PRIOR TO PLANTING, THE PREVIOUSLY MINED AREA WILL BE MAPPED BASED ON NATURALLY RE-ESTABLISHING PLANT COMMUNITIES. ON-SITE VEGETATION COMMUNITIES WILL BE IDENTIFIED AND MAPPED TO ROUGHLY FOLLOW THE GUIDE TO THE NATURAL COMMUNITIES OF FLORIDA (2010 EDITION).

HABITAT SUMMARY AND PROPOSED PLANTINGS BY TARGET SPECIES OBSERVED DURING VEGETATION MAPPING		
HABITAT	PLANTINGS	TARGET SPECIES OBSERVATIONS
MESIC PINE FLATWOODS	LONGLEAF PINE, SLASH PINE	BUNCHGRASSES (ARISTIDA SP., ANDROPOGON SP., SPOROBOLUS SP., DICHANTHELIUM SP.), SAW PALMETTO (SERENOA REPENS), GALLBERRY (ILEX GLABRA), FETTERBUSH (LYONIA LUCIDA), AND DWARF LIVE OAK (QUERCUS MINIMA).
WET PINE FLATWOODS	SLASH PINE	BUNCHGRASSES (ARISTIDA SP., ANDROPOGON SP., CTENIUM AROMATICUM, MUHLENBERGII SP., SPOROBOLUS SP., RHYNCHOSPORA SP.), LARGE GALLBERRY (ILEX CORIACEA), FETTERBUSH, SWEETBAY, SAW PALMETTO
DEPRESSIONAL WETLAND - DOME/DEPRESSION SWAMP	POND CYPRESS, SWAMP TUPELO	VIRGINIA CHAIN FERN (ANCHISTIA VIRGINICA), ROYAL FERN (OSMUNDA REGALIS), CINNAMON FERN (OSMUNDA CINNAMOMEA), MAIDENCANE (PANICUM HEMITOMON), REDROOT (LACHNANTHES CAROLINIANA), BEAKSEDGES (RHYNCHOSPORA SP.), AND SEDGES (CAREX SP.).
DEPRESSIONAL WETLAND - SHRUB BOG	POND PINE, SLASH PINE	TITI (CYRILLA RACEMIFLORA), BLACK TITI (CLIFTONIA MONOPHYLLA), SWEET PEPPERBUSH (CLETHRA ALNIFOLIA), FETTERBUSH, LARGE GALLBERRY, AND LAUREL GREENBRIER (SMILAX LAURIFOLIA).
DEPRESSIONAL WETLAND - BAYGALL	LOBLOLLY BAY, SWAMP BAY, SWEETBAY	LOBLOLLY BAY, SWAMP BAY, SWEETBAY, FETTERBUSH, DAHOON (ILEX CASSINE), LARGE GALLBERRY, TITI, BLACK TITI, WAX MYRTLE (MYRICA CERIFERA), DOGHOBBLE (LEUCOTHOE SP.), SWEETSPIRE (ITEA VIRGINICA).

8 - RECLAMATION AREAS WILL BE MONITORED FOR TWO YEARS FOLLOWING PLANTING PENDING RELEASE OF THE MINE FROM THE RECLAMATION ACTIVITIES.

PERFORMANCE CRITERIA FOR RECLAMATION

SPECIFIC REQUIREMENTS THAT TPM WILL ADHERE TO FOR THIS RECLAMATION PLAN ARE:

- GRADE ALL PEAKS, RIDGES, AND VALLEYS RESULTING FROM SURFACE MINING AND BACKFILL ALL PITS AND TRENCHES RESULTING FROM SAME IN A MANNER TO MINIMIZE ANY HAZARDOUS EFFECTS OF MINING ADJACENT TO ANY STATE OR COUNTY MAINTAINED PUBLIC ROAD.
- BACKFILL ALL AFFECTED LANDS AS STATED IN THE RECLAMATION PROCEDURES OF THIS PLAN UTILIZING POST-PROCESSED SANDS, MINE TAILINGS (SAND AND HUMATE), AND/OR BORROW FROM AFFECTED (PERMITTED) LAND UNLESS APPROVAL FROM THE DIVISION IS OBTAINED TO UTILIZE OTHER MATERIALS. SOUND ENGINEERING PRINCIPLES SHALL BE APPLIED TO ENSURE THAT AFFECTED LANDS, AS RECLAIMED, MEET THE INTENDED USE.
- APPLY EROSION CONTROL MEASURES TO PROTECT THE TOPSOIL COVER UNTIL AN ADEQUATE VEGETATIVE COVER IS ESTABLISHED. EROSION CONTROL MEASURES MAY INCLUDE SCARIFYING THE LAND SURFACE PARALLEL TO CONTOURS.
- NO HIGHWALLS WILL REMAIN ON SITE.
- ALL AFFECTED LAND WILL BE GRADED TO MIMIC PRE-MINING TOPOGRAPHY AND BLENDED INTO THE EXISTING LANDSCAPE, UNLESS OTHERWISE AMENDED.
- CONSTRUCTED SLOPES WILL NOT EXCEED THREE HORIZONTALS TO ONE VERTICAL (3:1) EXCEPT WHERE MAY BE APPROVED OTHERWISE IN THIS PLAN. FILL AND CUT SLOPES SHALL BE DESIGNED AND CONSTRUCTED TO PROHIBIT SLUMPING OR SHEAR FAILURES. PRIOR TO FINAL GRADING, ALL SLOPES WILL BE BLENDED IN WITH THE ORIGINAL EXISTING TOPOGRAPHY. SLOPE GRADES SHALL BE UNIFORM. MECHANICAL OR VEGETATIVE OR BOTH STABILIZATION MEASURES SHALL BE EMPLOYED AS SOON AS PRACTICAL TO PREVENT EROSION.
- SPOIL OR REFUSE, WHEN USED AS BACKFILL MATERIAL, FOR BERM OR OTHER CONSTRUCTION, WILL BE SEGREGATED AS NECESSARY, EMPLACED AND COMPACTED IN ACCORDANCE WITH SOUND ENGINEERING PRACTICES TO PROVIDE FOR THE PURPOSE INTENDED. ALL NEW LANDFORM STRUCTURES CREATED WITH THE USE OF SPOIL OR REFUSE MATERIALS SHALL BE CONSTRUCTED IN A MANNER TO PROTECT AGAINST FAILURE, SUBSIDENCE AND/OR EROSION AND WILL BE PERMANENTLY STABILIZED UPON COMPLETION OF CONSTRUCTION.
- NO LAKES OR PONDS ARE PROPOSED AS PART OF THE RECLAMATION PLAN.
- THE OPERATOR WILL PREPARE AND FILE A FINAL RECLAMATION REPORT AND REQUEST FOR RELEASE UPON COMPLETION OF RECLAMATION RESPONSIBILITIES ON AFFECTED ACREAGE.

1. SOIL AMENDMENT PLAN

A SOIL AMENDMENT LAYER OF 10.9% BENTONITE WILL BE APPLIED IN A ~3-FOOT-THICK LAYER. THE PURPOSE OF THIS LAYER IS TO ENSURE THAT THE HOMOGENIZATION OF SOILS DUE TO MINING DOES NOT AFFECT OR ALTER THE EXISTING GROUNDWATER DIVIDE.

1.1 PROCEDURES FOR APPLICATION OF THE BENTONITE LAYER

- THE FOLLOWING PROCEDURES WILL BE USED TO INSTALL THE LOW-PERMEABILITY LAYER:
- A COVERED FACILITY WILL BE CONSTRUCTED NEAR WHERE SAND TAILINGS EXIT THE PLANT AND ARE LOADED ONTO THE TAILINGS CONVEYOR. THE BENTONITE AND SAND WILL BE LOADED INTO HOPPERS THAT WILL FEED THE CORRECT BLEND (89.1% SAND/10.9% BENTONITE) TO A MIXING BOX. ONCE BLENDED, THE AMENDED SOIL MIXTURE WILL BE LOADED ONTO THE MAIN TAILINGS CONVEYOR SYSTEM AND TRANSPORTED TO THE OPEN PIT.
 - THE MIXING PROCESS AND TRANSPORT ON THE MAIN TAILINGS CONVEYOR WILL ONLY TAKE PLACE DURING CERTAIN PERIOD(S) OF THE DAY TO ENSURE THE BENTONITE-SAND BLEND IS NOT DILUTED WITH THE SAND-ONLY TAILINGS.

- PRIOR TO PLACEMENT OF THE SOIL AMENDMENT LAYER, THE PIT WILL BE BACKFILLED TO A LEVEL APPROXIMATELY THREE FEET BELOW THE TOP OF THE HUMATE-CEMENTED CONSOLIDATED BLACK SAND AS MAPPED IN SECTION 1.2.

- ONCE THE BLENDED SAND/BENTONITE MATERIAL REACHES THE END OF THE TAILINGS CONVEYOR, IT WILL BE TRANSFERRED TO A PORTABLE CONVEYOR/STACKER THAT WILL CAST THE BLENDED MATERIAL INTO THE OPEN PIT. THE BLENDED SAND/BENTONITE MATERIAL WILL BE PLACED AT A DEPTH THAT COINCIDES, AS CLOSE AS POSSIBLE, WITH THE TOP THREE FEET OF THE MAPPED HUMATE-CEMENTED CONSOLIDATED BLACK SAND (SEE SECTION 1.2). BASED ON EXISTING DATA FROM ON-SITE BORINGS, THE DEPTHS TO THE TOP OF THE HUMATE-CEMENTED CONSOLIDATED BLACK SAND ARE VARIABLE AND ARE ANTICIPATED TO RANGE FROM 8 TO 25 FEET BGS.

- BECAUSE THE SAND/BENTONITE MIXTURE IS VERY COHESIVE, IT CAN BE CAST INTO THE OPEN PIT WHETHER IT IS WET OR DRY, WITHOUT SEPARATING. BECAUSE BACKFILLING WILL OCCUR WITHIN 500 FEET OF THE LEADING EDGE OF THE DRAG LINE, HOWEVER, GROUNDWATER WILL NOT HAVE TIME TO COMPLETELY FILL THE PIT, AND MOST WATER WILL BE ABSORBED BY THE TAILINGS MATERIAL, WHICH WILL BE VERY DRY AND ABSORBENT. IF GROUNDWATER RISES ABOVE THE ELEVATION WHERE THE SAND/BENTONITE MIXTURE WILL BE PLACED, THE MINE PIT WILL TEMPORARILY BE DEWATERED TO ALLOW PLACEMENT OF THE BLENDED SAND/BENTONITE MATERIAL. WATER WITHDRAWN FROM THE ACTIVE MINING PIT WILL BE PUMPED TO THE MINE PIT WATER MANAGEMENT POND AND SUBSEQUENTLY REUSED BY THE FACILITY.

- THE ELEVATION OF THE TOP OF THE BLENDED MATERIAL WILL BE SURVEYED FOLLOWING EACH SOIL AMENDMENT PLACEMENT EVENT.

- SAND-ONLY TAILINGS WILL BE PLACED ABOVE THE SAND/BENTONITE MIXTURE.

- A TOPSOIL LAYER WILL THEN BE PLACED ON TOP OF THE SAND TAILINGS.

1.2 MAPPING THE HUMATE-CEMENTED CONSOLIDATED BLACK SANDS

THE SOIL AMENDMENT IS INTENDED TO MIMIC THE HYDRAULIC CONDUCTIVITY OF CONSOLIDATED BLACK SANDS THAT UNDERLAY PORTIONS OF THE SITE. TO PROVIDE INFORMATION THAT MAY BE NEEDED FOR ANY FUTURE ADAPTIVE MANAGEMENT RESPONSE, THE PRESENCE OR ABSENCE OF THIS SOIL TYPE WILL BE DOCUMENTED AS THE MINING PROGRESSES.

SOIL BORINGS WILL BE PLACED IN A 200-FOOT BY 200-FOOT GRID. ONE SAMPLE WILL BE COLLECTED FROM THE APPROXIMATE CENTER OF EACH GRID CELL BEFORE THE CELL IS EXCAVATED. THE PRESENCE OR ABSENCE OF HUMATE-CEMENTED BLACK SANDS WILL BE NOTED AND DOCUMENTED.

1.2.1. FIELD IDENTIFICATION OF BLACK SANDS

THE FOLLOWING BLACK HUMATE-STAINED SOIL LAYERS HAVE BEEN IDENTIFIED WITHIN THE MINE SITE:

- UNCONSOLIDATED BLACK SANDS,
- SEMI-CONSOLIDATED BLACK TO DARK BROWN SANDS, AND
- CONSOLIDATED BLACK SANDS

THE CONSOLIDATED BLACK SANDS ARE EASILY DISTINGUISHED FROM THE HIGHER PERMEABILITY UNCONSOLIDATED AND SEMI-CONSOLIDATED BLACK SAND LAYERS DUE TO THE FIRM OR STIFF, CEMENTED CHARACTERISTICS OF THE SAND GRAINS (SEE PHOTOGRAPH 1). RESULTS OF LABORATORY PERMEABILITY TESTING OF HUMATE-CEMENTED CONSOLIDATED BLACK SANDS COLLECTED FROM THE SITE INDICATED VERTICAL HYDRAULIC CONDUCTIVITIES RANGING FROM 10⁻⁷ TO 10⁻⁸ CENTIMETERS PER SECOND (CM/S). DIFFERENCES IN THE APPEARANCE OF THE CONSOLIDATED, SEMI-CONSOLIDATED AND UNCONSOLIDATED BLACK SANDS ARE SHOWN IN THE PHOTOGRAPHS PROVIDED BELOW:



PHOTOGRAPH 1. LOW PERMEABILITY HUMATE-CEMENTED CONSOLIDATED BLACK SAND



PHOTOGRAPH 2. SEMI-CONSOLIDATED BLACK SAND



PHOTOGRAPH 3. UNCONSOLIDATED BLACK SAND

AS SHOWN ABOVE, CONSOLIDATED SANDS ARE EASILY RECOGNIZED IN THE FIELD BASED ON THE FOLLOWING CHARACTERISTICS:

- BLACK OR VERY DARK BROWN COLOR
- FIRM OR STIFF CORE SAMPLES THAT MAINTAIN A CYLINDRICAL SHAPE WHEN RETRIEVED FROM THE BOREHOLE (SIMILAR IN APPEARANCE TO PHOTOGRAPH 1, AS COMPARED TO PHOTOGRAPHS 2 AND 3 ABOVE).
- OFTEN DISPLAY A GREASY APPEARANCE ON THE CORE SURFACE UPON REMOVAL FROM THE SAMPLER

1.2.2. DRILLING PROCEDURES

DRILLING WILL BE PERFORMED BY TPM. A SONIC, GEOPROBE, HOLLOW-STEM AUGER OR EQUIVALENT TYPE DRILL RIG WILL BE USED TO COLLECT SOIL SAMPLES CONTINUOUSLY FROM BOREHOLES IN ADVANCE OF THE MINING. THE BORINGS WILL BE DRILLED ALONG THE CENTER LINES OF THE MINING CUTS AND EXTEND TO THE MAXIMUM DEPTH OF MINING (ABOUT 50 FEET BELOW LAND SURFACE). THE FOLLOWING INFORMATION WILL BE RECORDED AT EACH BOREHOLE BY A GEOLOGIST:

- UNIQUE BORING IDENTIFIER
- DATE OF DRILLING (START/END DATE)

- SURVEYED BORING LOCATION AND ELEVATION DATA
- DEPTH TO SATURATED SOILS AS MEASURED IN THE BOREHOLE OR AS IDENTIFIED IN THE CORE
- LITHOLOGIC DESCRIPTIONS OF SUBSURFACE SOIL TO INCLUDE:
 - SOIL TYPE (UNIFIED SOIL CLASSIFICATION SYSTEM)
 - PERCENTAGE OF CLAY VERSUS SAND (VISUAL ESTIMATE)
 - HUMATE PRESENT AND RELATIVE PERCENT (I.E. LOW, MEDIUM, HIGH; VISUAL ESTIMATE)
 - DEGREE OF CONSOLIDATION OF SANDS (UNCONSOLIDATED, SEMI-CONSOLIDATED, OR CONSOLIDATED)
 - SORTING OF SAND
 - DESCRIPTION OF FINE, MEDIUM, COARSE GRAINS PER SANDY SOIL TYPE
 - COLOR DESCRIPTION USING A MUNSELL OR GSA ROCK COLOR CHART
- BORING TERMINATION DEPTH
- PHOTOGRAPHS OF EACH DRILL SAMPLE RETURN INTERVAL. PHOTOGRAPHS WILL BE REFERENCED WITH THE BORING IDENTIFIER, DATE, AND SAMPLE DEPTH INTERVAL

THE BORING DATA WILL BE COMPILED INTO A DATABASE SYSTEM AND USED TO GENERATE SUBSURFACE BORING LOGS AND CROSS SECTIONS.

1.2.3. GROUNDWATER-LEVEL MONITORING PLAN

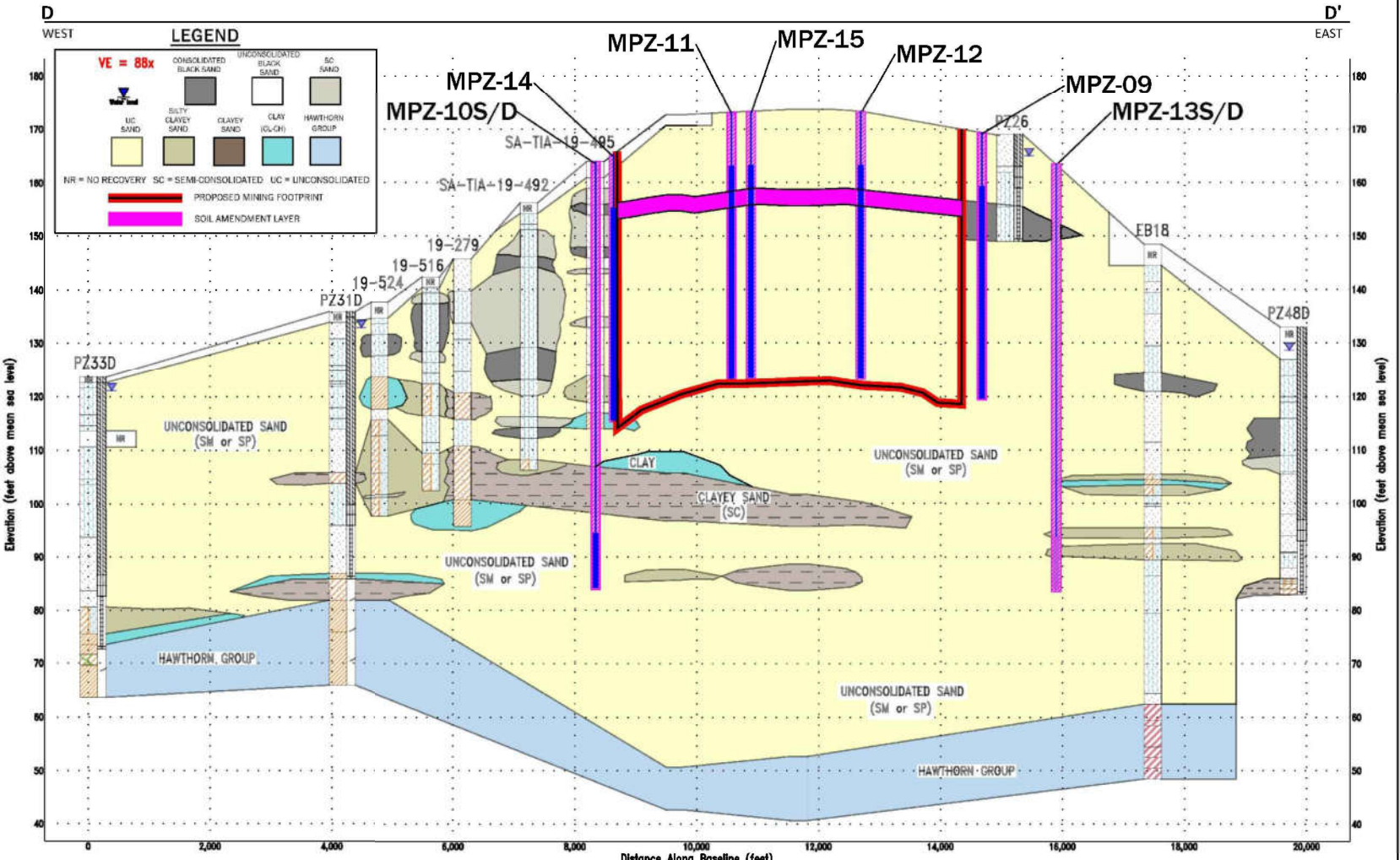
A GROUNDWATER-LEVEL MONITORING PLAN, ACTION LEVELS FOR COMPLIANCE, AND AN ADAPTIVE MANAGEMENT (OR CONTINGENCY) PLAN IF GROUNDWATER LEVELS ARE NOT RESTORED IS INCLUDED IN SECTION 2, SHEET 10 OF THE GROUNDWATER AND SURFACE WATER MONITORING PLAN OF THE SURFACE MINING LAND USE PLAN.

1.2.4. PROCEDURES FOR DISCONTINUING THE SOIL AMENDMENT

TPM WILL SUBMIT THE RESULTS (E.G., SOIL BORING LOGS, CROSS-SECTIONS, ISOPACH MAPS, ETC.) OF THE SUBSURFACE MAPPING OF THE HUMATE-CEMENTED, CONSOLIDATED BLACK SANDS TO EPD. IF THE MAPPING DEMONSTRATES THE ABSENCE OF HUMATE-CEMENTED, CONSOLIDATED BLACK SAND WITHIN AN AREA YET TO BE MINED, TPM WILL REQUEST EPD'S AUTHORITY TO PROCEED WITHOUT THE ADDITION OF THE SOIL AMENDMENT LAYER IN THOSE SPECIFIED AREAS. THE BENTONITE LAYER RECREATING THE HUMATE-CEMENTED, CONSOLIDATED BLACK SAND WILL BE CONTINUOUS UNLESS TPM RECEIVES EPD APPROVAL TO DISCONTINUE APPLICATION OF THE SOIL AMENDMENT LAYER IN THOSE SPECIFIED AREAS.

IT IS IMPORTANT TO NOTE THAT IF THE HUMATE-CEMENTED, CONSOLIDATED BLACK SANDS ARE NOT CONTINUOUS AS DEMONSTRATED BY TPM'S PRIOR INVESTIGATIONS, THE ADDITION OF A CONTINUOUS SOIL AMENDMENT LAYER MAY ADVERSELY IMPACT THE LOCAL GROUNDWATER SYSTEM. POTENTIAL IMPACTS INCLUDE:

- ARTIFICIALLY RAISING THE WATER TABLE ABOVE THE LAND SURFACE LEADING TO PONDING OR INCREASED SURFACE WATER RUNOFF,
- REDUCING DOWNWARD FLOW TO DEEPER PARTS OF THE SURFICIAL AQUIFER,
- REDUCING GROUNDWATER DISCHARGE TO THE WEST AND TO THE EAST OF TRAIL RIDGE.

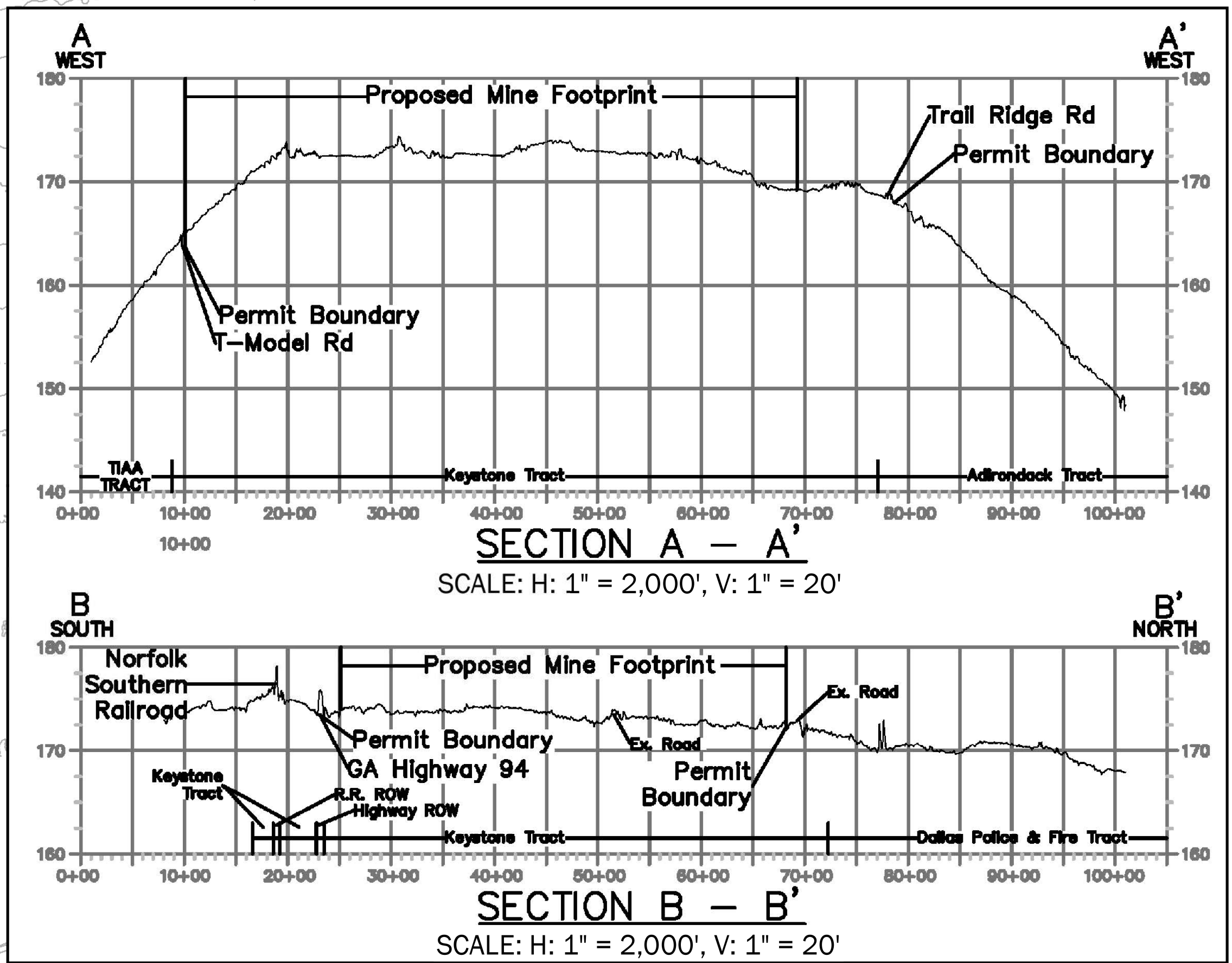
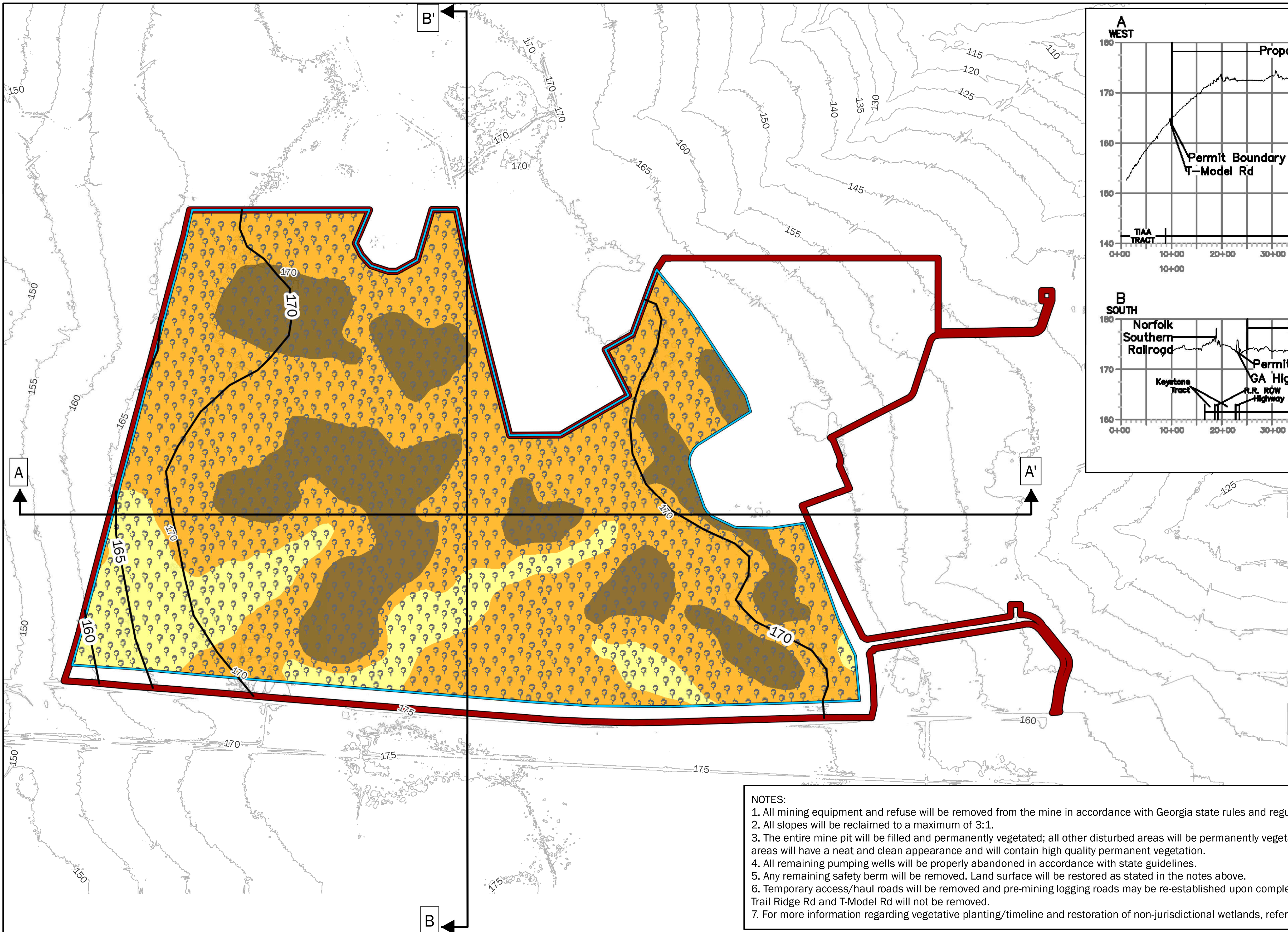


POST-MINING GENERALIZED GEOLOGIC CROSS-SECTION OF THE MINE FOOTPRINT



SHEET 8: POST-MINING RECLAMATION PLAN (1)
TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)
ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK
CHECKED BY: SGR
DRAWING DATE: 11/13/2020
REVISION DATE: 9/17/2021
TTL JOB NO.: 000180200804.00
APPROX. SCALE: N/A



NOTES:

1. All mining equipment and refuse will be removed from the mine in accordance with Georgia state rules and regulations.
2. All slopes will be reclaimed to a maximum of 3:1.
3. The entire mine pit will be filled and permanently vegetated; all other disturbed areas will be permanently vegetated; all land areas will have a neat and clean appearance and will contain high quality permanent vegetation.
4. All remaining pumping wells will be properly abandoned in accordance with state guidelines.
5. Any remaining safety berm will be removed. Land surface will be restored as stated in the notes above.
6. Temporary access/haul roads will be removed and pre-mining logging roads may be re-established upon completion of mining; Trail Ridge Rd and T-Model Rd will not be removed.
7. For more information regarding vegetative planting/timeline and restoration of non-jurisdictional wetlands, refer to Sheet 8.



LEGEND

- Permit Boundary (735± AC)
 - Mine Footprint (582± AC)
 - Vegetative Reclamation Area⁷
 - Reclaimed Habitat Classifications
 - Depressional Wetlands
 - Wet Pine Flatwoods
 - Mesic Pine Flatwoods
 - Post-Mining Elevations (ft AMSL)
 - Pre-Mining LiDAR Elevations (ft AMSL)
- 0 500 1,000 2,000 Feet



SHEET 9: POST-MINING RECLAMATION PLAN (2)
TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)
ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK

CHECKED BY: SGR

DRAWING DATE: 11/13/2020

REVISION DATE: 9/17/2021

TTL JOB NO.: 000180200804.00

APPROX. SCALE: 1 in = 500 ft

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 11. 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 11, 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 12.

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 12.

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 12.

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 OR TWO DAYS OF THE ADVANCING MINE 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 11):

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 11). 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 11).

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	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	PZ45D	PZ55D			
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 ON-GOING 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 11).

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 12. 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 12; AND
- 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 11).

TABLE 3.2-1 GROUNDWATER MONITORING STATION		SAMPLING FREQUENCY AND DURATION ¹	
		DURING MINING ²	POST MINING ^{3,4}
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 TREND).
- 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		LABORATORY METHOD	
PARAMETER / COPC			
PH		FIELD MEASURED	
SPECIFIC CONDUCTIVITY		FIELD MEASURED	
WATER TEMPERATURE		FIELD MEASURED	
OXIDATION-REDUCTION POTENTIAL (ORP)		FIELD MEASURED	
TURBIDITY		FIELD MEASURED	
ARSENIC, TOTAL AND DISSOLVED		EPA 200.8	
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 11 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 ¹	
		DURING MINING ²	POST MINING ^{3,4}
MSW-BG04	MSW-BG05	QUARTERLY	SEMI-ANNUAL
MSW-BG06			

- 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 TREND).
- 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		LABORATORY METHOD	
PARAMETER / COPC			
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 NITROGEN, NITRATE+NITRITE		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-RA), 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-RA), 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.

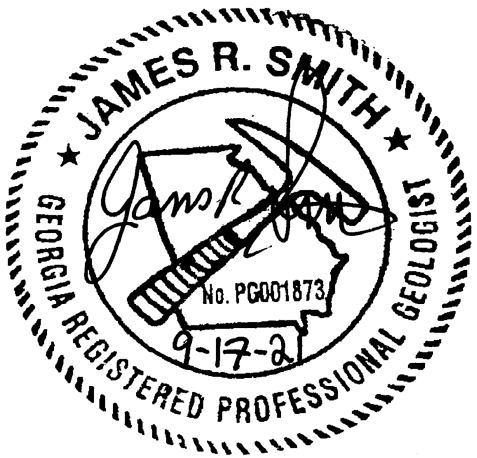
3.3.2

WATER-LEVEL MEASUREMENTS (PIEZOMETERS ONLY)

PRIOR TO PURGING AND SAMPLING, WATER-LEVEL

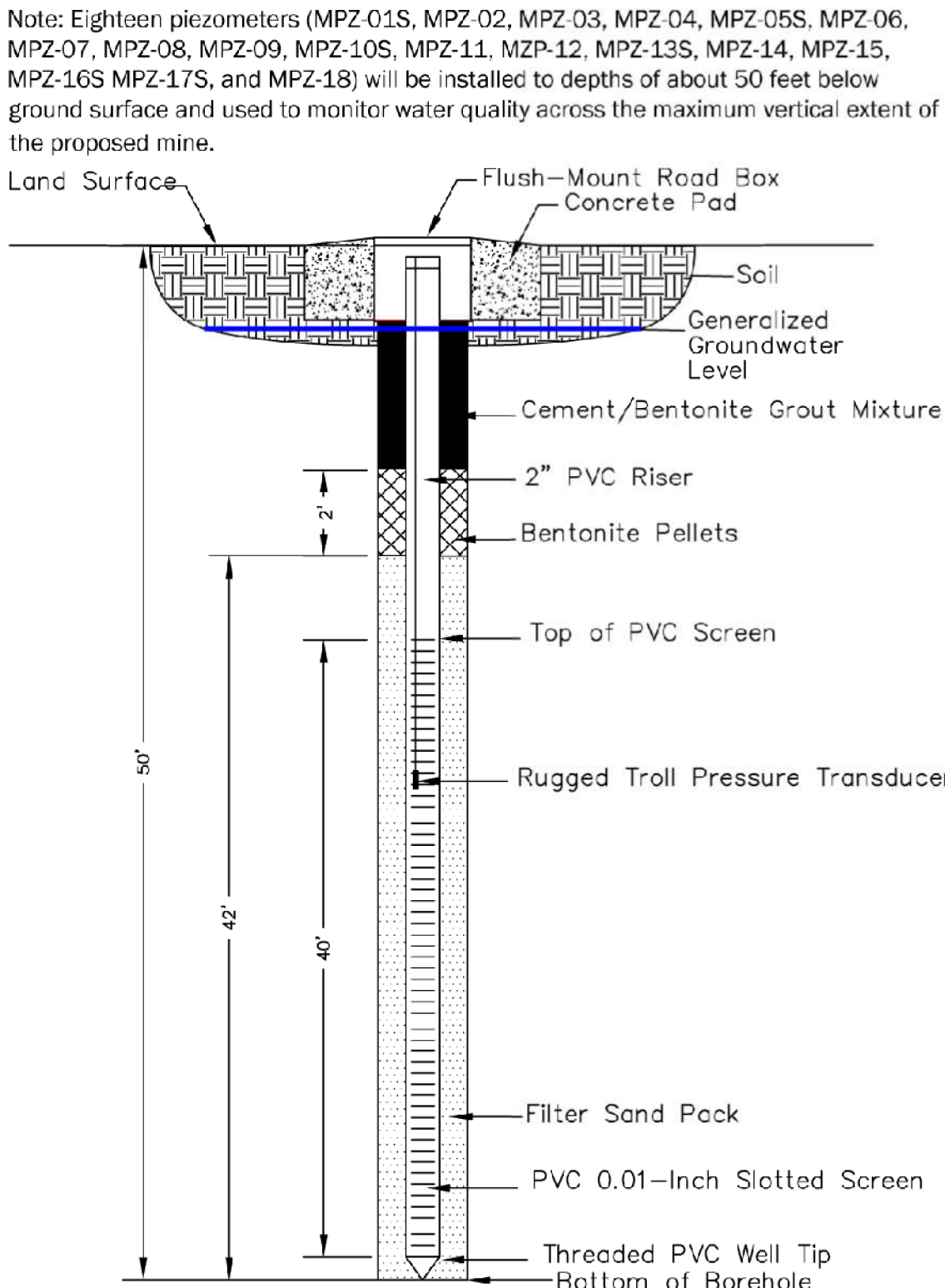
GROUNDWATER MONITORING TABLE					
ID	ELEVATION	QUALITY	ID	ELEVATION	QUALITY
PZ01S	X		PZ48D	X	
PZ01D	X		PZ49	X	
PZ02	X		PZ50	X	
PZ03S	X		PZ51S	X	
PZ03D	X		PZ51D	X	
PZ04	X		PZ52	X	
PZ05	X		PZ53	X	
PZ06	X		PZ55S	X	
PZ07	X		PZ55D	X	
PZ08	X		PZ56S	X	
PZ09	X		PZ56D	X	
PZ10	X		PZ57S	X	
PZ11	X		PZ57D	X	
PZ12S	X		PZ58S	X	
PZ12D	X		PZ58D	X	
PZ13	X		OWB1BS	X	
PZ14	X		OWB1S	X	
PZ15	X		OWB1D	X	
PZ16S	X		MPZ-01S	X	X
PZ16D	X		MPZ-01D	X	X
PZ17S	X		MPZ-02	X	X
PZ17D	X		MPZ-03	X	X
PZ18	X		MPZ-04	X	X
PZ19	X		MPZ-05S	X	X
PZ20S	X		MPZ-05D	X	X
PZ20D	X		MPZ-06	X	X
PZ21	X		MPZ-07	X	X
PZ22S	X		MPZ-08	X	X
PZ22D	X		MPZ-09	X	X
PZ23	X		MPZ-10S	X	X
PZ24	X		MPZ-10D	X	X
PZ25S	X		MPZ-11	X	X
PZ25D	X		MPZ-12	X	X
PZ26	X		MPZ-13S	X	X
PZ27S	X		MPZ-13D	X	X
PZ27D	X		MPZ-14	X	X
PZ28S	X		MPZ-15	X	X
PZ28D	X		MPZ-16S	X	X
PZ38	X		MPZ-16D	X	X
PZ39S	X		MPZ-17S	X	X
PZ39D	X		MPZ-17D	X	X
PZ40	X		MPZ-18	X	X
PZ41	X		PZ45D	X	
PZ42	X		PZ46	X	
PZ43	X		PZ47	X	
PZ44	X		PZ48S	X	
PZ45S	X				

SURFACE WATER MONITORING TABLE		
ID	ELEVATION	QUALITY
SG02	X	
SG11	X	
SG22	X	
SG24	X	
SG26	X	
SG27	X	
MSW-BG04		X
MSW-BG05		X
MSW-BG06		X

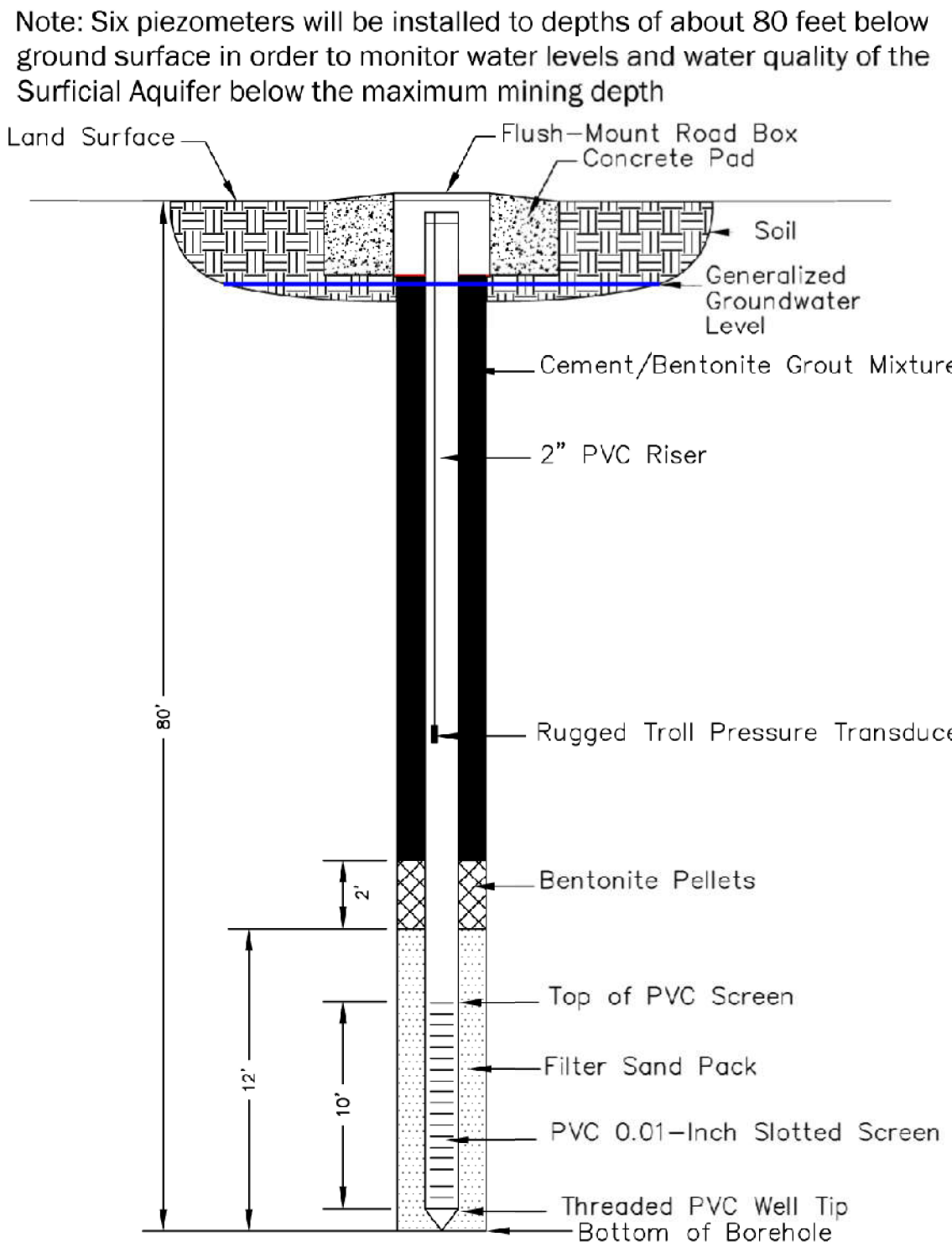


SHEET 12: GROUNDWATER & SURFACE WATER MONITORING PLAN (3)
TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)
ST. GEORGE, CHARLTON COUNTY, GEORGIA

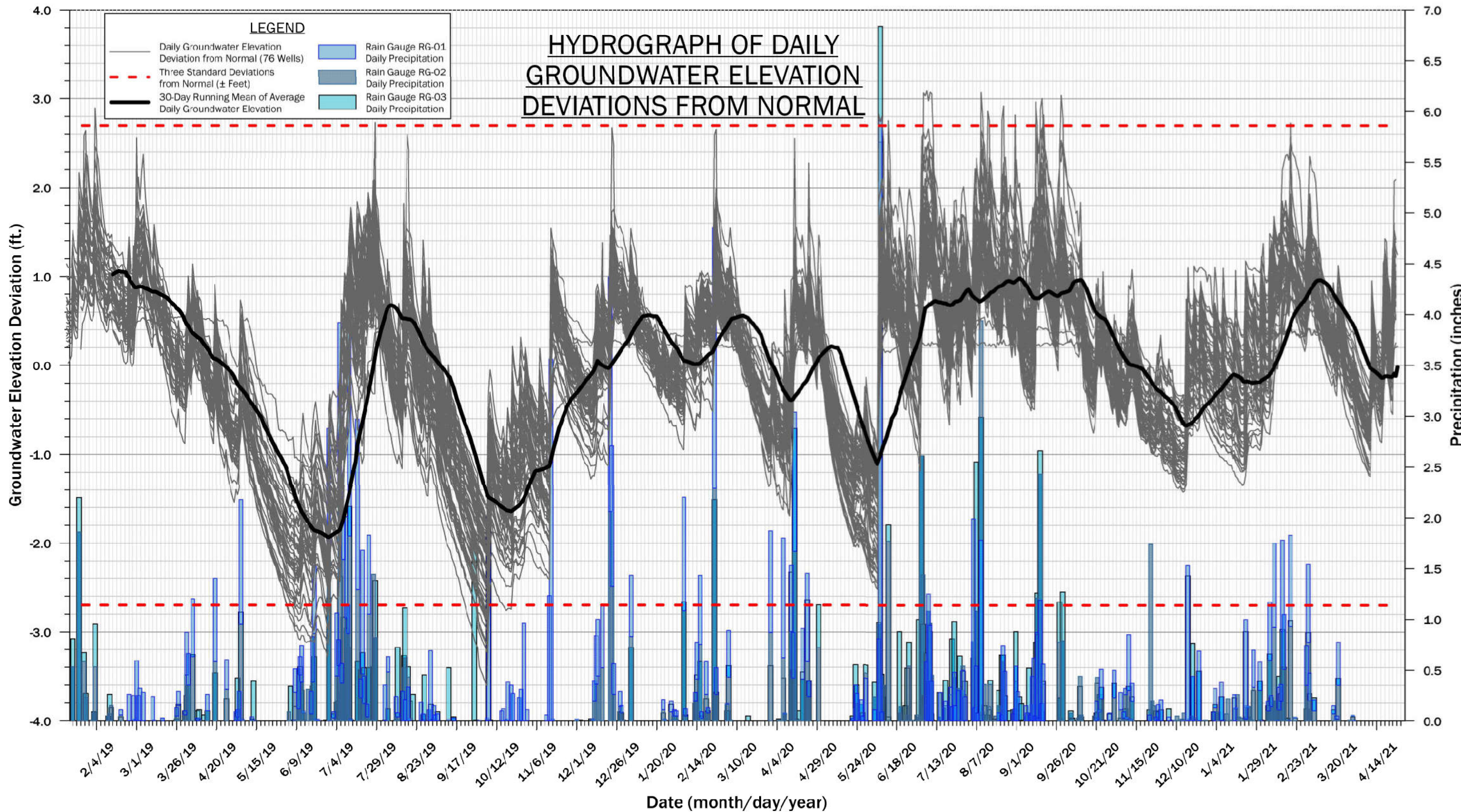
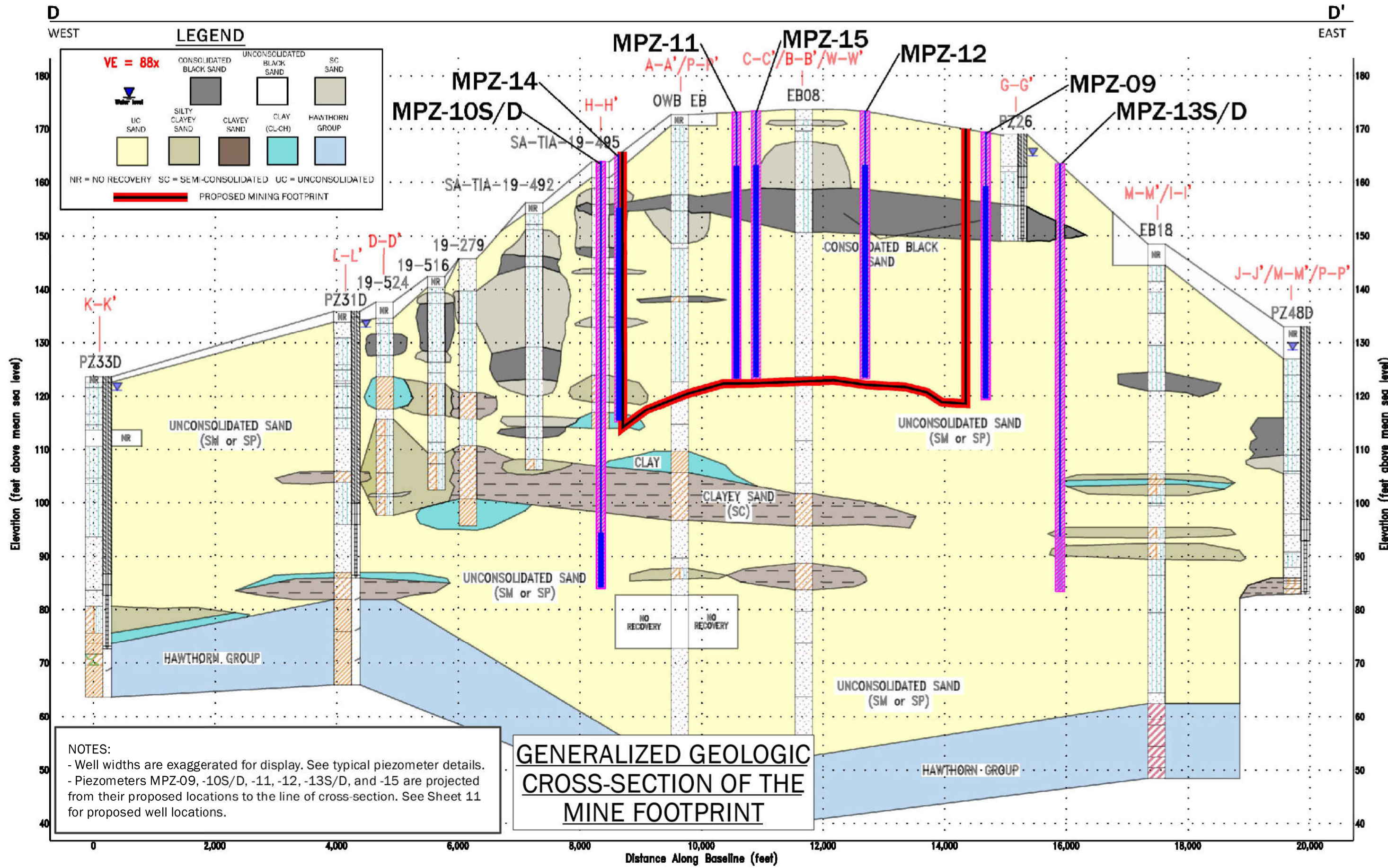
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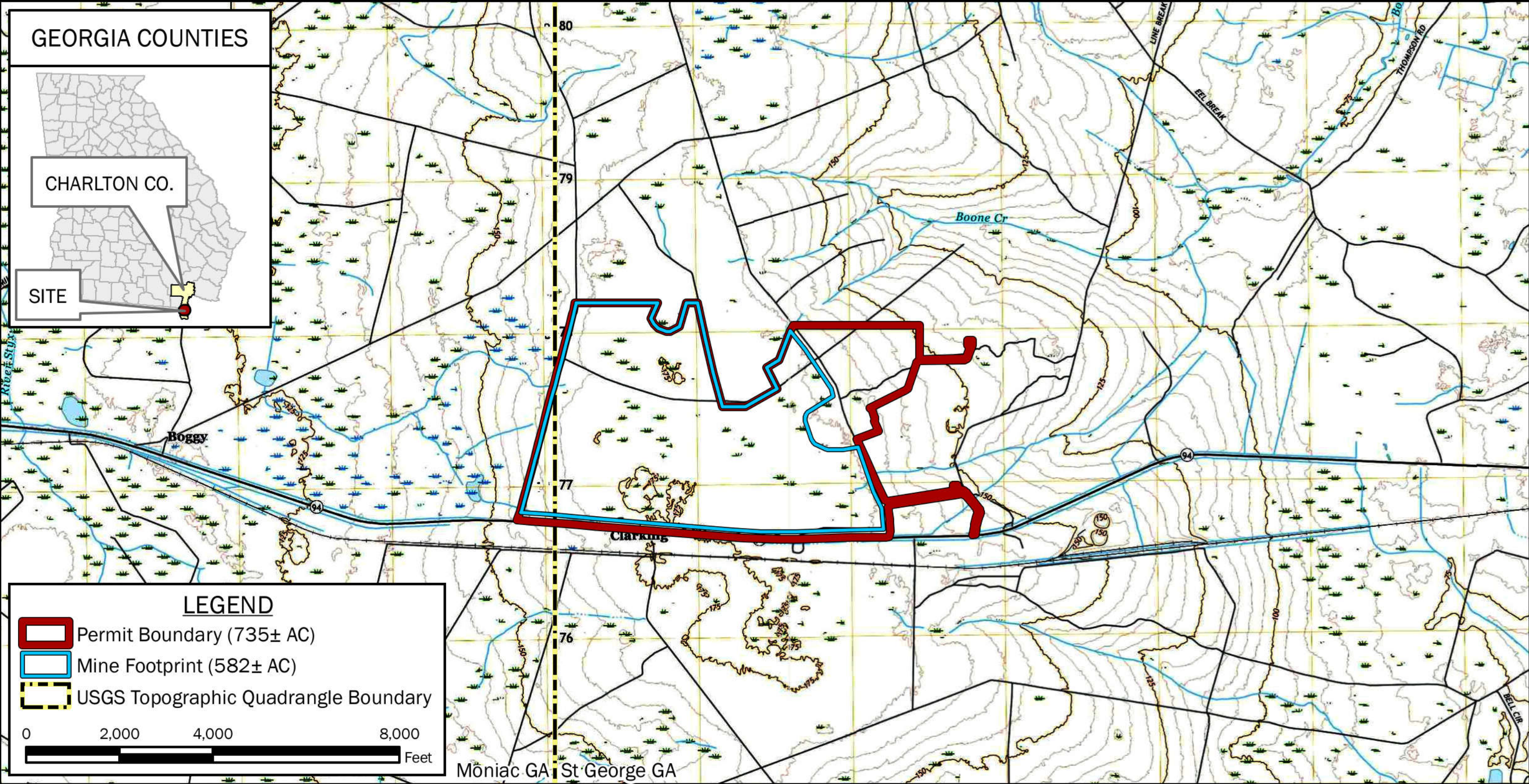


TYPICAL PIEZOMETER DETAIL (50 FEET)

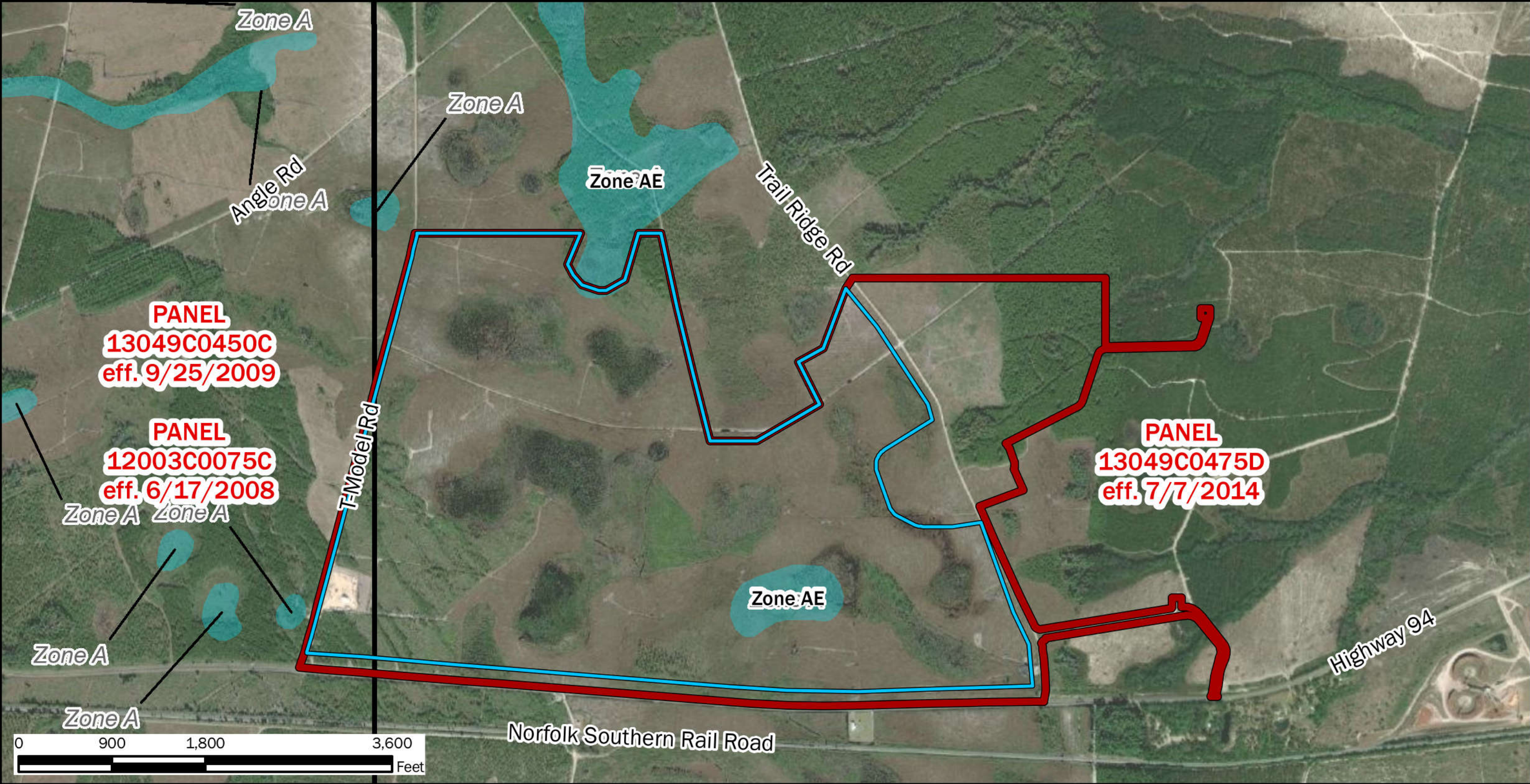


TYPICAL PIEZOMETER DETAIL (80 FEET)

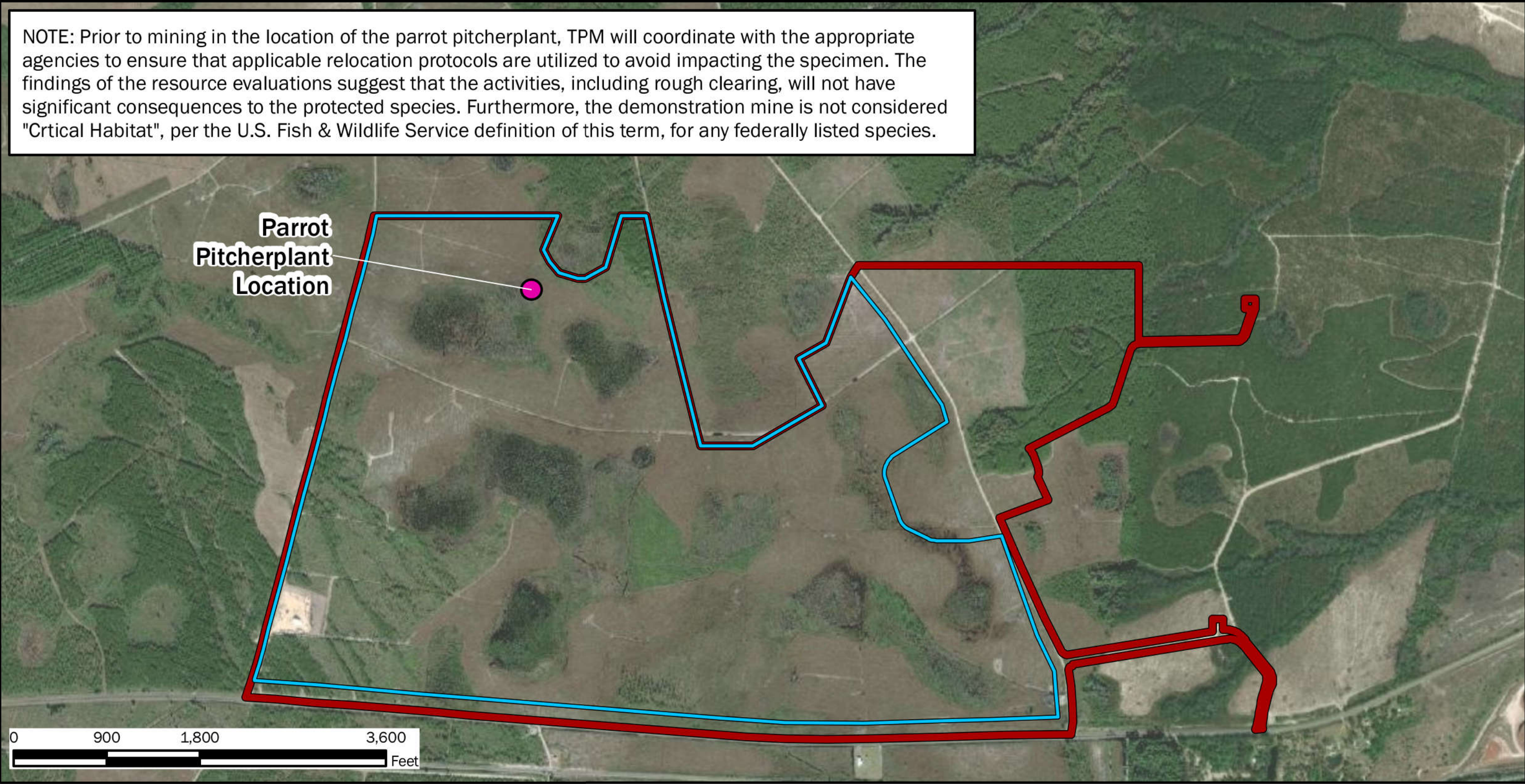




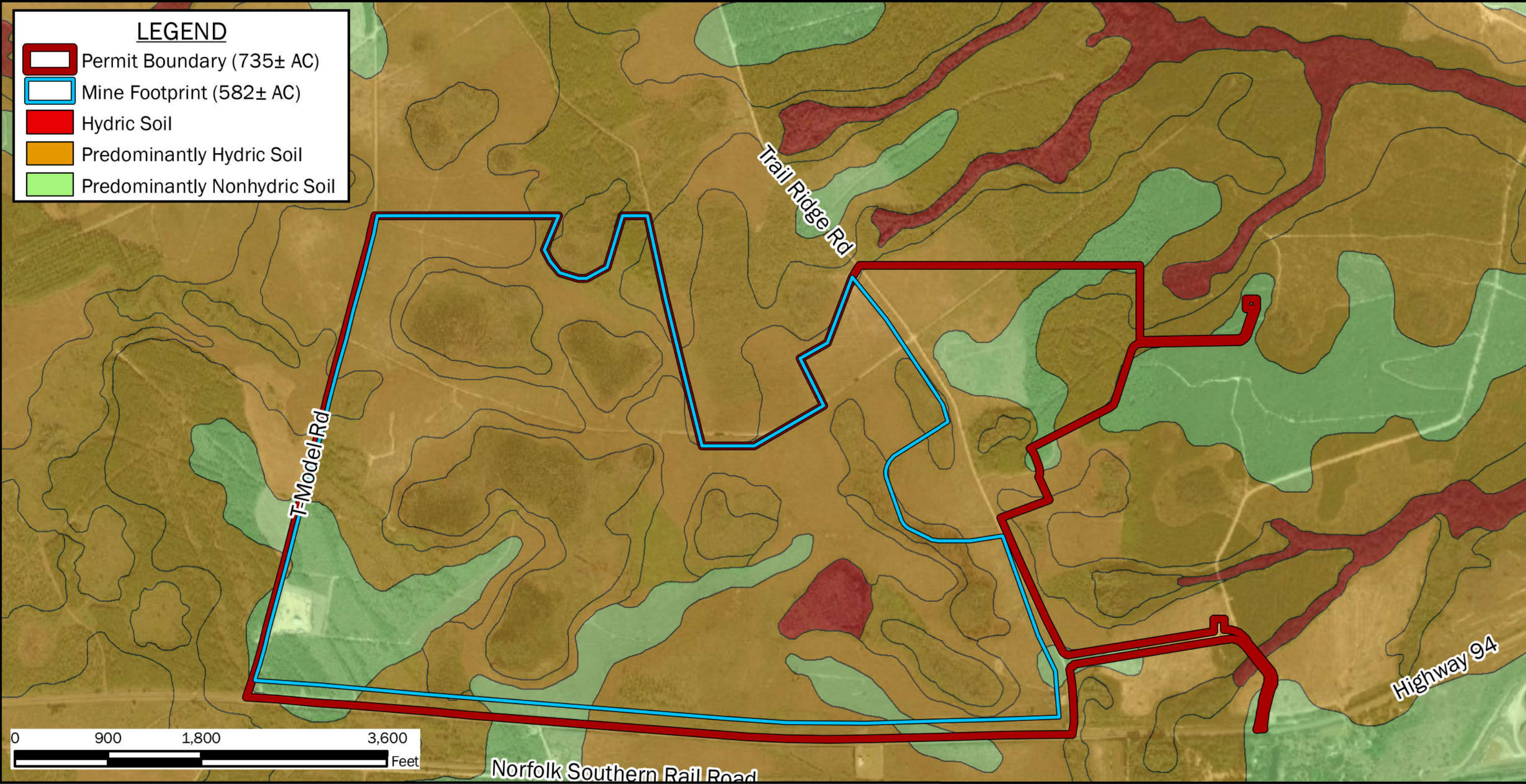
VICINITY MAP



FEMA FLOOD HAZARD MAP



THREATENED & ENDANGERED SPECIES LOCATION MAP



NRCS HYDRIC SOIL RATING MAP



SHEET 13: SUPPLEMENTAL INFORMATION - VICINITY MAP, FEMA FLOOD HAZARD MAP, THREATENED & ENDANGERED SPECIES MAP, NRCS SOILS MAP

TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)

ST. GEORGE, CHARLTON COUNTY, GEORGIA

TOPOGRAPHIC BASEMAP: Moniac (W) & Saint George (E), Georgia, USGS 7.5 Minute Quadrangle Map, 2020 (5-ft Contour Interval). AERIAL BASEMAP: Maxar, Vivid Imagery, 11/20/2019 (West, 0.5 m Resolution) & 3/24/2018 (East, 0.46 m Resolution).

DRAWN BY: DEK
CHECKED BY: SGR
DRAWING DATE: 11/13/2020
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