17 East Main St.
PO Box 431
White Sulphur Springs, MT 59645
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October 26, 2018

Montana Department of Environmental Quality
Hard Rock Mining Bureau
Operating Permit Section
PO Box 200901
Helena, Montana 59620-0901

RE: Update to Mine Operating Permit Application for the Black Butte Copper Project

To: Mr. Herb Rolfes

Tintina Montana, Inc. (Tintina) is submitting this letter to formally update proposed activities associated with the Black Butte Copper Project (Project). The proposed changes for the Project arise from the Montana Pollutant Discharge Elimination System (MPDES) permit application and beneficial water use (water right) permit application for the Project. The updated activities and permitting process associated with the changes are as follows:

- Addition of a Treated Water Storage Pond – MPDES permit;
- Revision to Annual Water Balance – MPDES permit; and
- Addition of a wet well adjacent to Sheep Creek – water right.

Tintina provided a technical memorandum to the Department of Environmental Quality (DEQ) describing the details of the addition of a wet well adjacent to Sheep Creek (Hydrometrics, 2018). An updated water balance was provided to DEQ on August 27, 2018. This letter summarizes the updates to these proposed activities, the resultant changes to the Project's surface disturbance acreage, soil salvage, revegetation, and pre- and post-mine vegetation disturbance. In addition, updated tables and figures associated with these changes are included with the memo.

Treated Water Storage Pond

Tintina is proposing to add a contingency to the water management plan that includes storage of treated water during the seasonal period when the total nitrogen standard is applicable (July 1 to September 30, for Middle Rockies Ecoregion). This proposed contingency includes the addition of a Treated Water Storage Pond (TWSP) to the Project. The TWSP will store treated water from the Water Treatment Plant (WTP) if the effluent from the WTP does not meet the seasonal effluent limits for total nitrogen in the MPDES permit. Design details for the TWSP are

provided in the design memo in Attachment A. A summary of the design, operations, and closure of the facility is provided below.

The proposed TWSP will be located southeast of the WTP and west of Brush Creek as shown on the updated Figure 1.3 included in Attachment B. The design of the TWSP was based on an average seasonal flow rate from the WTP of 405 gallons per minute (gpm). The average seasonal flow rate is slightly larger than the average annual discharge due to minor differences in seasonal flows from Mill Catchment Runoff associated with the seasonal precipitation and evaporation at the site. The TWSP has been designed to store up to 53.7 million gallons of treated water to provide enough temporary storage of treated water from July 1 to September 30, at an average flow rate of 405 gpm. The pond will be lined with a 60-mil HDPE geomembrane liner installed over a 12 oz/yd2 non-woven geotextile cushion.

Treated water from the WTP will be pumped through a 6-inch (150mm) diameter HDPE pipeline to the TWSP for storage. From October 1st to June 30, treated water stored in the TWSP will be pumped back to the WTP via a 6-inch (150mm) diameter HDPE pipeline, where it will be mixed with other WTP effluent. The blended water will be sampled prior to being discharged per the MPDES permit. The construction of the TWSP requires excavation of weathered bedrock and fractured and moderately weathered limestone and shale (Knight Piésold, 2017). Based on geotechnical information (Knight Piésold, 2017), excavated materials should be sufficient for use as embankment fill. Site drainage controls for the TWSP are depicted on the revised Map Sheet 6 included in Attachment B.

As with the other lined ponds on site, monitoring and mitigation measures are recommended to manage possible icing damage of the TWSP throughout the project. The 60-mil HDPE liner is thick and durable and will provide significant protection against puncturing and thorough QA/QC inspections during construction will ensure all welds are completed to standards and are as durable as possible. Annual inspections after the ice thaws would be used to check for liner damage. If damage is observed, it would be a simple process to correct as the pond level would be low or empty to provide access for liner repair.

The TWSP will be operational prior to dewatering the mine workings. This will allow for storage of water (if necessary) during the growing season while there is active dewatering of the underground workings during construction and operations. The pond will remain operational during closure, until the discharge to the UIG is discontinued. Once storage of treated water is not necessary, the TWSP liner will be removed and hauled off-site for disposal or recycling. The disposition of the HDPE liner is summarized in the update to Table 7-1 (see Attachment C). Embankment material will be used to re-shape and reclaim the TWSP disturbance footprint. The footprint of the TWSP will be ripped to relieve compaction, the site regraded, soil placed, and the site seeded. The post closure topography of the TWSP is shown on the updated Figure 7.1 (see Attachment B).

Water Balance Revision

The project water balance was revised at the request of the DEQ Water Protection Bureau to eliminate the ‘Net Precipitation Transfer’ from the Process Water Pond (PWP) to the WTP.

Although Tintina believes the original water balance is a permittable action, we agreed to revise the Project to move the process forward. The original water balance included transferring the net precipitation that falls within the Cemented Tailings Facility (CTF) and the PWP to the WTP at a combined annual average rate of 47 gpm. The updated water balance removes the Net Precipitation Transfer flow stream and increases the amount of water going from the PWP to the mill from 1,995 gpm to 2,042 gpm and reducing the amount of treated water going from the WTP to the mill (stream line 15) from 89.4 gpm to 42.4 gpm. The revised water balance eliminates any routine discharge of process water to the MPDES outfall. Figure 3.44 from the Mine Operating Permit was revised as described above and is included in Attachment B.

In addition, the water balance was revised to show the treated water storage contingency with respect to the MPDES discharge as discussed above. Treated water will be discharged to the alluvial UIG if the effluent water quality meets the total nitrogen effluent limit as described in the Integrated Discharge Permit Application Narrative (Hydrometrics, 2018b). However, if the total nitrogen concentration is greater than the effluent limit, the treated water will be discharged to the TWSP from July 1st to September 30th. Starting October 1st, the stored water will be routed back to the WTP and blended with the WTP effluent prior to discharge to Outfall 001. The storage contingency and seasonal discharge to the MPDES Outfall is shown in Figure 3.44A (see Attachment B).

Wet Well Diversion

Tintina submitted a Water Right Application Package to the Department of Natural Resources and Conservation (DNRC) on September 7, 2018. This application package included a new groundwater beneficial use permit for water put to beneficial use in the mining and milling process, a new high season flow surface water beneficial use permit and six change applications. The new high season flow surface water beneficial use permit and six change applications will be used to mitigate potential adverse effects from the consumptive use of groundwater in the mining and milling process and mitigate potential indirect impacts to wetlands. A portion of the mitigation water will be stored in the Non-Contact Water Reservoir (NCWR). Water stored in the NCWR will be diverted from Sheep Creek through a wet well adjacent to the creek and transferred to the reservoir through a pipeline up to the NCWR.

The majority of the water stored in the NCWR will typically be from the new high season flow surface water right. The high season flow diversion will occur when flows are greater than 84 cubic feet per second (cfs), which is equal to the total flow of the appropriated water rights on Sheep Creek downstream of the diversion. The point of diversion will be located approximately 60 feet west of the private road in the hay meadow adjacent to Sheep Creek (NW ¼, SE ¼, NW ¼, Section 30, Township 12N, Range 07E). The point of diversion will consist of a wet well that consists of an 8-foot concrete manhole which is connected to Sheep Creek through a 22-inch (550 mm) HDPE DR 21 intake pipe. The intake pipe will be extended approximately 6.5 feet into Sheep Creek and be placed on the streambed. The pipe will be equipped with a fish screen over the intake section. The remainder of the intake pipeline will be solid pipe buried beneath the ground surface at an elevation equal to or slightly below the streambed elevation.

When the flow in Sheep Creek exceeds 84 cfs, water will be pumped from the wet well, using a vertical turbine pump, through approximately 7,150 feet of 20-inch (500 mm) HDPE DR17 transfer pipeline to the NCWR. The transfer pipeline will be placed on the ground surface along the access road within the hay meadow and will remain on surface except where it crosses the Sheep Creek County Road 119. The pipeline will cross Brush Creek in an area with narrow wetland fringe areas and be suspended above the wetlands and stream channel. The preliminary design of the NCWR supply system is shown on Figures C6410 and C6450.

The NCWR will be used for mitigation of residual depletion in surface waters during operations and for approximately 20 years after the cessation of mine dewatering. Once it is not necessary to mitigate flows, the wet well, intake pipeline, and transfer pipeline will be reclaimed. Reclamation will include removal of all non-native materials (pipelines, concrete structure, and fill material). Excavations will be filled with sand and gravel material to within one foot below grade. The disturbed land will be covered with up to 1 foot of topsoil and seeded with a pasture grass seed mix, similar to the current vegetation in the hay meadow, and as approved by the landowner.

Revised Project Disturbance

Land disturbance associated with the proposed TWSP include the pond footprint (excavation and fill), the foundation drain infiltration pond, and pump-back piping to the WTP. The pond footprint will encompass approximately 19.6 acres and the foundation drain infiltration pond footprint will be approximately 0.1 acres. Additional disturbance associated with the piping to the WTP was estimated for land that is not disturbed by other facilities, which includes about 1,232 feet of piping. Assuming a 5-foot disturbance width the surface disturbance from the piping to the WTP is estimated at 0.5 acres.

The disturbance associated with the proposed wet well diversion on Sheep Creek was calculated based on the following assumptions:

- Wet Well Excavation:
  - Depth: 10’
  - Base Dimension: 12’x12’
  - Slope: 1:1 (32’x32’ at surface)

- Intake Pipe Excavation:
  - Depth: 8’
  - Length: 45’
  - Base Width: 4’
  - Slope: 1:1 (20’ wide at surface)

- Discharge Pipeline Fill:
  - Height: 8’ (from wet well to 12’)
  - Crest Width: 4’
  - Length: 46’
  - Side Slope: 2:1

The wet well excavation will have a total disturbance area of 1,024 square feet. The excavation for the intake pipe will result in additional disturbance area of 680 square feet. An additional 784 square feet disturbance will be needed to place fill material to support the transfer pipeline until it reaches the existing ground surface. The first 1,970 feet of the transfer pipeline will be placed within the disturbance area of the buried conveyance pipeline associated with the alluvial underground infiltration gallery. The remaining portion of the pipeline (5,181 feet) is assumed to have 20 feet of disturbance width, resulting in a disturbance area of 103,620 square feet. The total disturbance for the Sheep Creek diversion will be 106,108 square feet (2.4 acres). Table 1 summarizes the disturbance associated with the addition of the TWSP and Wet Well.

Table 1. Additional Surface Disturbance Acres

Facility or Activity	Linear Feature Lineal feet	Construction Disturbance Width Feet	Surface Disturbance Acres
Treated Water Storage Pond			**20.2**
Treated Water Storage Pond (TWSP)			19.6
TWSP Foundation Drain Infiltration Pond			0.1
TWSP Pump back Piping to WTP (undisturbed)	1,232	5	0.5
TWSP 8-foot Wildlife Fence	3,879	5	included
Wet Well and Pipeline			**2.4**
Wet Well			<0.1
Discharge Pipeline within UIG Pipeline Excavation	1,970	20	Already disturbed
Discharge Pipeline	5,181	20	2.4

Revisions to Tables 3-2 and 3-13 of the MOP are included in Attachment C. The revised tables also include the change in land disturbance due to the removal of the upland UIGs and the final design of the alluvial UIG (Tintina Montana 2018a).

Soil Salvage, Revegetation, and Vegetation Disturbance

The proposed TWSP and wet well diversion and pipeline along with the removal of the upland UIGs results in changes to the salvageable topsoil and subsoils (Table 7-5); revegetation quantities (Tables 7-6, 7-7, and 7-8) and areas (Figure 7.10); and pre and post-mining vegetation disturbance (Table 7-9). However, the methods used for soil salvage, handling, and redistribution will remain similar to that summarized in Section 7.3.4 of the Mine Operating Permit.

The total volume of salvageable topsoil is about 315,238 cubic yards (241,017 m^3) and salvageable subsoil is about 248,454 cubic yards (189,957 m^3). The changes to the salvageable soils is included in an updated version of Table 7-5 (see Attachment C). Tintina proposes to use the same permanent native revegetation mixtures presented in Tables 7-6 and 7-7 and the interim

vegetation seed mix presented in Table 7-8 of the Mine Operating Permit. The Revegetation Map has been upgraded based on the proposed changes to the Mine Operating Permit (see updated Figure 7.10 in Attachment C). Lastly, an updated summary of mine-related disturbances to pre-mine vegetation types and the post-mine reclamation types is provided in the updated Table 7-9 in Attachment C.

References cited:

Hydrometrics, Inc., 2018. Black Butte Copper – NCWR Diversion on Sheep Creek, Technical Memorandum to Jerry Zieg, Sandfire Resources America, Inc. and Craig Jones, Montana Department of Environmental Quality. August 20.

Knight Piésold Consulting, 2017. 2015 Geotechnical Site-Investigation Report (Rev 4). Prepared for Tintina Resources Inc. VA101-460/3-1. July 6. 377 p. Appendices A through F in Appendix K-4 of Black Butte Copper Project, Mine Operating Permit Application.

Tintina Montana, Inc., 2018a. Update to Proposed Treated Water Disposition for the Black Butte Copper Project. Submitted to: Montana Department of Environmental Quality, Hard Rock Mining Bureau. January 11.

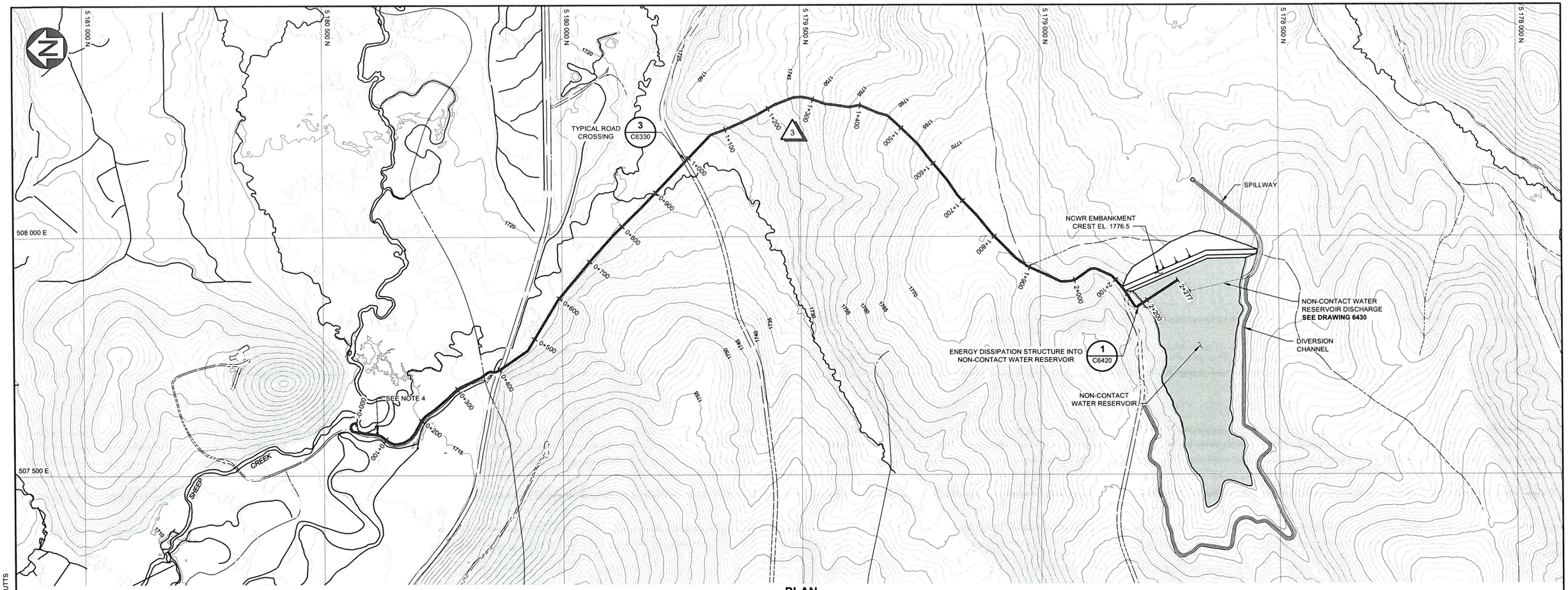
Tintina Montana, Inc., 2018b. Integrated Discharge Permit Application Narrative, Black Butte Copper Project, Meagher County, Montana. Revision 2. Prepared by: Hydrometrics, Inc. Submitted to: Montana Department of Environmental Quality, Water Protection Bureau. April 25.

We would be happy to provide any further information as required and thank you for your review of this update.

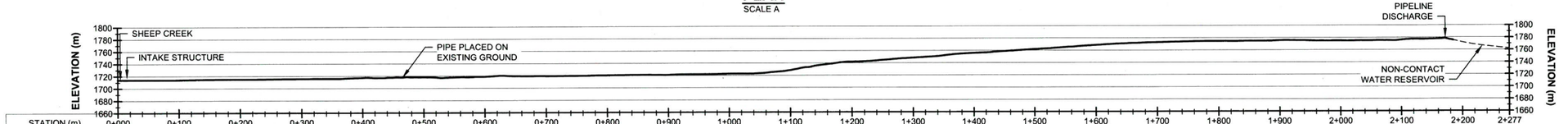
Sincerely,

Jerry Zieg
Sr. Vice President
Tintina Montana, Inc.

FIGURES



PLAN
SCALE A



STATION (m)	0+000	0+100	0+200	0+300	0+400	0+500	0+600	0+700	0+800	0+900	1+000	1+100	1+200	1+300	1+400	1+500	1+600	1+700	1+800	1+900	2+000	2+100	2+200	2+277
GROUND ELEVATION	1714.00	1714.12	1715.00	1715.81	1717.40	1718.30	1718.93	1719.61	1720.65	1721.19	1722.83	1728.45	1742.05	1748.55	1756.03	1762.09	1768.55	1772.89	1774.69	1775.66	1775.00	1776.15	1772.15	
DESIGN ELEVATION	1714.00	1714.12	1715.00	1715.81	1717.40	1718.30	1718.93	1719.61	1720.65	1721.19	1722.83	1728.45	1742.05	1748.55	1756.03	1762.09	1768.55	1772.89	1774.69	1775.66	1775.00	1776.15	1772.15	
DESIGN PROFILE	SLOPE VARIES (0.8% AVG.)											SLOPE VARIES (7% AVG.)										SLOPE VARIES (0% AVG.)		
PIPE DATA	ND 500 mm HDPE DR17 LENGTH = 2171 m																							

PROFILE
SCALE A

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 12.
2. CONTOUR INTERVAL IS 1 METER.
3. DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS NOTED OTHERWISE.
4. THE WATER SUPPLY SOURCE AND STRUCTURE FOR THE NCWR WILL BE DEFINED IN FUTURE DESIGN PHASES AS PART OF TRI'S MITIGATION PLAN.

LEGEND:

NON-CONTACT WATER SUPPLY

PROPOSED ACCESS ROADS

FOR INFORMATION ONLY

SCALE A 80 40 0 100 200 300 400 m

DRG. NO.	DESCRIPTION
C6400	NON-CONTACT WATER RESERVOIR - SUPPLY AND DISCHARGE SYSTEM - P&ID
C6420	NON-CONTACT WATER RESERVOIR - SUPPLY SYSTEM - TYPICAL SECTIONS
C6430	NON-CONTACT WATER RESERVOIR - DISCHARGE SYSTEM - PLAN & PROFILE

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
3	26JUL'18	UPDATED PIPELINE SPECIFICATIONS AND PROFILE	GIM	MJC	KWS	KJS
2	08FEB'18	UPDATED PIPELINE SPECIFICATIONS	KS	RAF	RSS	KJB
1	30JUN'17	ROADS UPDATED	GIM	MJC	KDE	KDE
0	16OCT'15	ISSUED FOR MOP APPLICATION	MAP	KJM	KDE	KDE

REVISIONS

MONTANA
July 26, 2018
KEN J. BROUWER
10020 PE
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

TINTINA RESOURCES INC.

BLACK BUTTE COPPER PROJECT

NON-CONTACT WATER RESERVOIR SUPPLY SYSTEM PLAN AND PROFILE

PROJECT NO.	DRAWING NO.	REVISION
VA101-460/3	C6410	3

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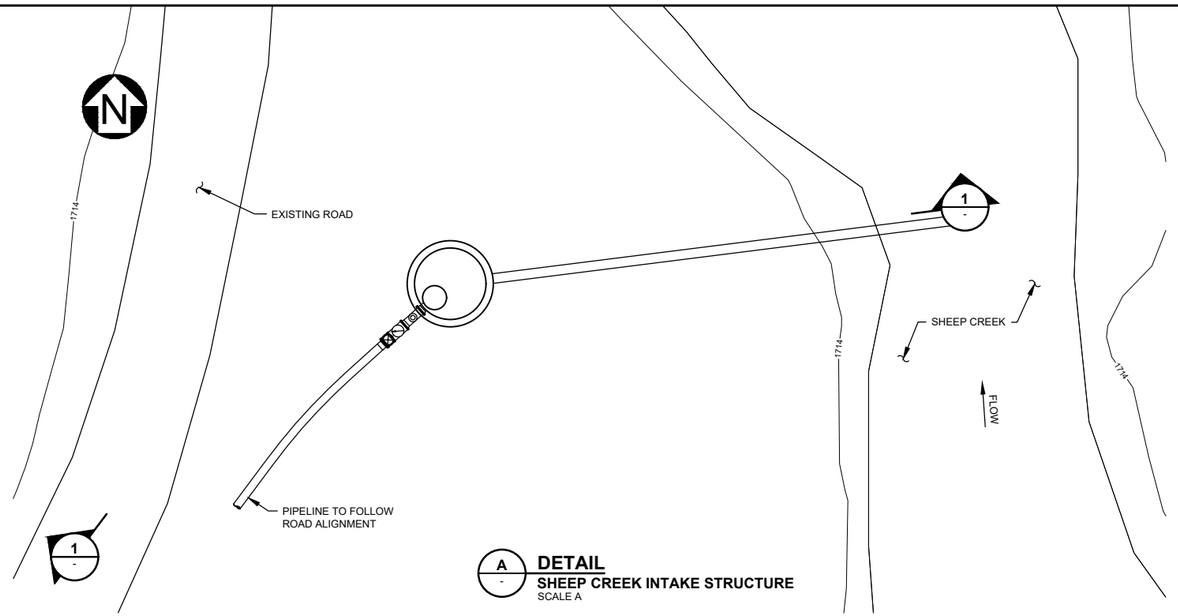
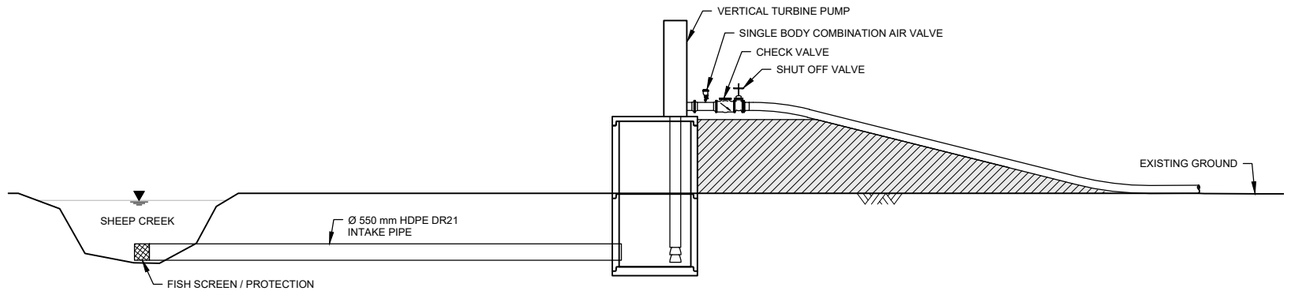
XREF FILE(S): Topo_1m, NCWR, Roads, Hydro, NCWR-SPILL, ACCESS RD AND HAUL RD, IMAGE FILE(S)



A - **DETAIL**
SHEEP CREEK INTAKE STRUCTURE
SCALE A



1 - **SECTION**
SHEEP CREEK INTAKE STRUCTURE
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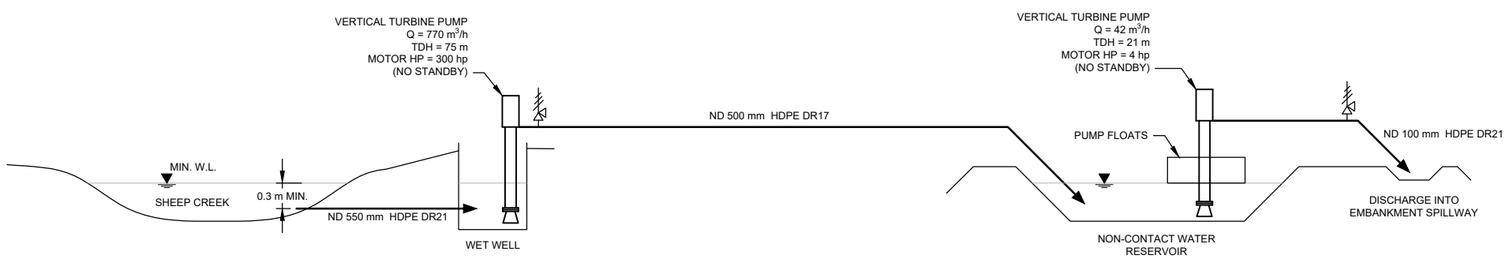

PIPING AND INSTRUMENTATION SCHEMATIC
NTS

LEGEND:

- PIPE
- FLOW DIRECTION
- COMBINATION AIR VALVE
- VERTICAL TURBINE PUMP

NOTES:

1. CONTOUR INTERVAL IS 1 METER.
2. DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS, UNLESS NOTED OTHERWISE.

FOR INFORMATION ONLY

SCALE A 2 1 0 2 4 6 8 10 m

Knight Piésold CONSULTING

TINTINA RESOURCES INC.

BLACK BUTTE COPPER PROJECT

NON-CONTACT WATER RESERVOIR SUPPLY SYSTEM DETAIL, SECTION AND SCHEMATIC

P/A NO.	DRAWING NO.	REVISION
VA101-460/3	C6450	A

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
A	14MAR'18	ISSUED FOR INFORMATION	KS	KJM/WAL	GIM	-
REVISIONS						

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ATTACHMENT A

TREATED WATER STORAGE POND
DESIGN MEMORANDUM

Hydrometrics, Inc.
consulting scientists and engineers

M E M O R A N D U M

DATE: October 18, 2018

TO: Jerry Zieg, Sandfire Resources America, Inc.

FROM: Gregory Lorenson, P.E., Hydrometrics, Inc.
Greg Bryce, Hydrometrics, Inc.

SUBJECT: Treated Water Storage Pond Design

Hydrometrics, Inc. has completed the preliminary design of a Treated Water Storage Pond (TWSP) for the Black Butte Copper Project. The TWSP has been designed as a lined facility and is located to the south of the Contact Water Pond and to the east of the Cemented Tailing Facility. In the event the effluent from the water treatment plant does not meet the seasonal total nitrogen effluent limit (July 1 to September 30) determined in the forthcoming Montana Pollutant Elimination System (MPDES) permit, temporary storage of treated water may be necessary. Therefore, the TWSP has been designed to store up to 204,000 m^3 (53.7 million gallons) of treated water, providing enough temporary storage for treated water from July 1 to September 30 at an average flow rate of 405 gpm. The TWSP will remain in operation throughout the life of the mine. Treated water from the water treatment plant will be pumped through a 6-inch (150mm) diameter HDPE pipeline to the TWSP. Water stored in the TWSP will then be pumped back to the water treatment plant via a 6-inch (150mm) diameter HDPE pipeline, where it will be mixed with the WTP effluent and allow for the blended water to be sampled prior to being discharged per the MPDES permit. A set of drawings that present the layout and details required to construct the TWSP is included as Attachment 1.

As designed, the TWSP will be lined with a 60 mil HDPE geomembrane liner installed over a 12 oz/yd^2 non-woven geotextile cushion. The geotextiles and HDPE geomembrane will be installed over a 300mm thick protective layer of sub-grade bedding material. Details and Specifications for the Liner system are included on the drawings, included as Attachment 1. The construction of the TWSP requires excavation of weathered bedrock and fractured and moderately weathered limestone and shale (2015 Geotechnical Site Investigation Report, Knight Piesold, 2015). Based on geotechnical information (Knight Piesold, 2015), excavated materials appear to be sufficient for use as embankment fill.

Based on seasonal high water levels, the TWSP has the potential to intercept groundwater along the northwestern side of the excavation; therefore, a foundation drain will be constructed to intercept groundwater flow (if present) below the geomembrane liner system and route this collected groundwater to the foundation drain infiltration pond, located to the southeast of the TWSP. The foundation drain system consists of collection trenches and pipes in the excavation cut slopes and along the bottom of the pond. The foundation drain trenches are placed on a 35 meter grid and follow the slope of the pond subgrade. Intercepted groundwater conveyed to the foundation drain infiltration pond will infiltrate back into the groundwater system.

A conservative estimate of groundwater flux (using Darcy's Law) was calculated assuming a maximum of 2.1 meters of saturated thickness, a 250 meter width, a hydraulic conductivity of 1.15 m/day (3.8 ft/day per MW-8 slug test), and a gradient of 0.1. The resulting groundwater flux is estimated at 60 m^3/day (11 gpm). The foundation drain infiltration pond is designed to have a base of 100 m^2. Infiltration tests conducted in the area indicated the average infiltration rate is 2.7 to 3.0 m/day (9 to 10 feet/day) (Tintina Montana, 2017). Based on these infiltration rates, the foundation drain infiltration pond is capable of discharging about 270 m^3/day (50 gal/min) through the base of the infiltration pond, which is approximately 4.5 times greater than the estimated flux that could be captured in the foundation drain.

The TWSP has been designed to contain 204,000 m^3 (53.7 million gallons) of treated water, plus 5,400 m^3 of additional capacity to contain direct precipitation from a 200-year, 24-hour storm event (96mm or 3.78 inches); while maintaining 1 meter of freeboard below the crest. The 1 meter of freeboard provides sufficient storage to contain direct precipitation from the PMP plus a 1 in 100 year snow accumulation, equal to 850mm (33.5 inches) of equivalent rainfall, without overtopping.

The pumping system in the pond is designed to pump water to the water treatment plant, from full capacity to empty, at an average rate of 130 gpm and a maximum rate of 575 gallons per minute from October through June. A vertical turbine submersible pump, located on the northeast side of the pond, will be installed in a 300 mm (12-inch) DR-11 HDPE pipe. Two 150 mm (6-inch) DR-11 HDPE pipelines will be installed from the water treatment plant to the TSWP, one to route treated water from the water treatment plant to the TWSP and one to convey water back to the water treatment plant from the TWSP.

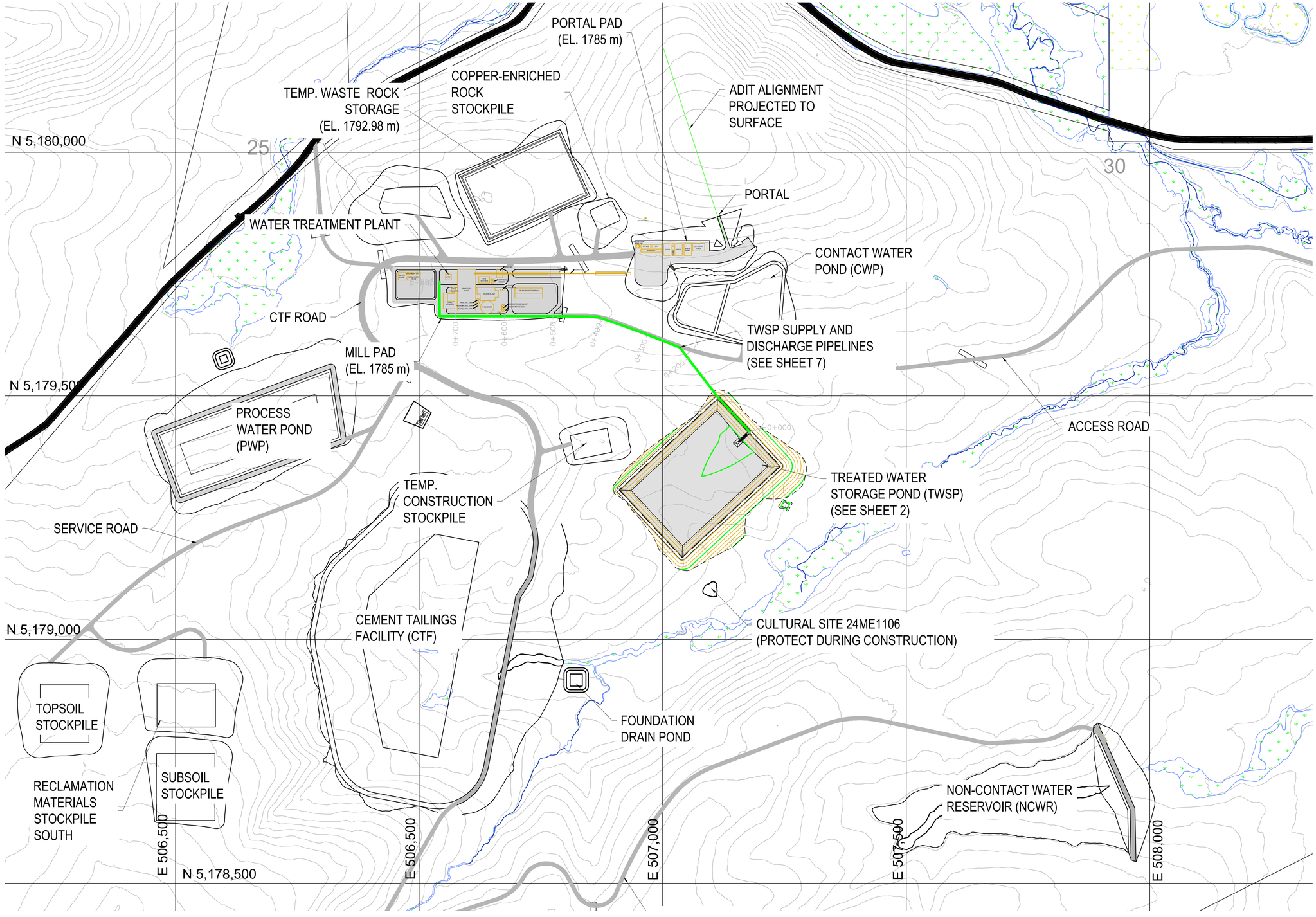
References

Knight Piesold, 2015. 2015 Geotechnical Site Investigation Report. Rev 4. July 6, 2017.

Tintina Montana, Inc., 2017. Mine Operating Permit Application Black Butte Copper Project, Meagher County, Montana. Revision 3: July 14, 2017.

ATTACHMENT 1

DRAWINGS



FOR INFORMATION ONLY

REVISIONS	NO	BY	DATE	DESCRIPTION

REVISIONS	NO	BY	DATE	

SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING
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Project No.: 11048			
DRAWN BY	----	10/17/18	
CHECKED BY			
APPROVED BY			
SCALE: AS NOTED			

Hydrometrics, Inc.
Consulting Scientists and Engineers
Helena, Montana 59601
3020 Bozeman Avenue
(406) 443-4150

SANDFIRE RESOURCES AMERICA, INC.
BLACK BUTTE COPPER PROJECT

TREATED WATER STORAGE FACILITY
GENERAL LOCATION

DRAWING FILE NUMBER	
1104803H004	
AUTOCAD 2018 DRAWING (DWG)	
SHEET NUMBER	REV
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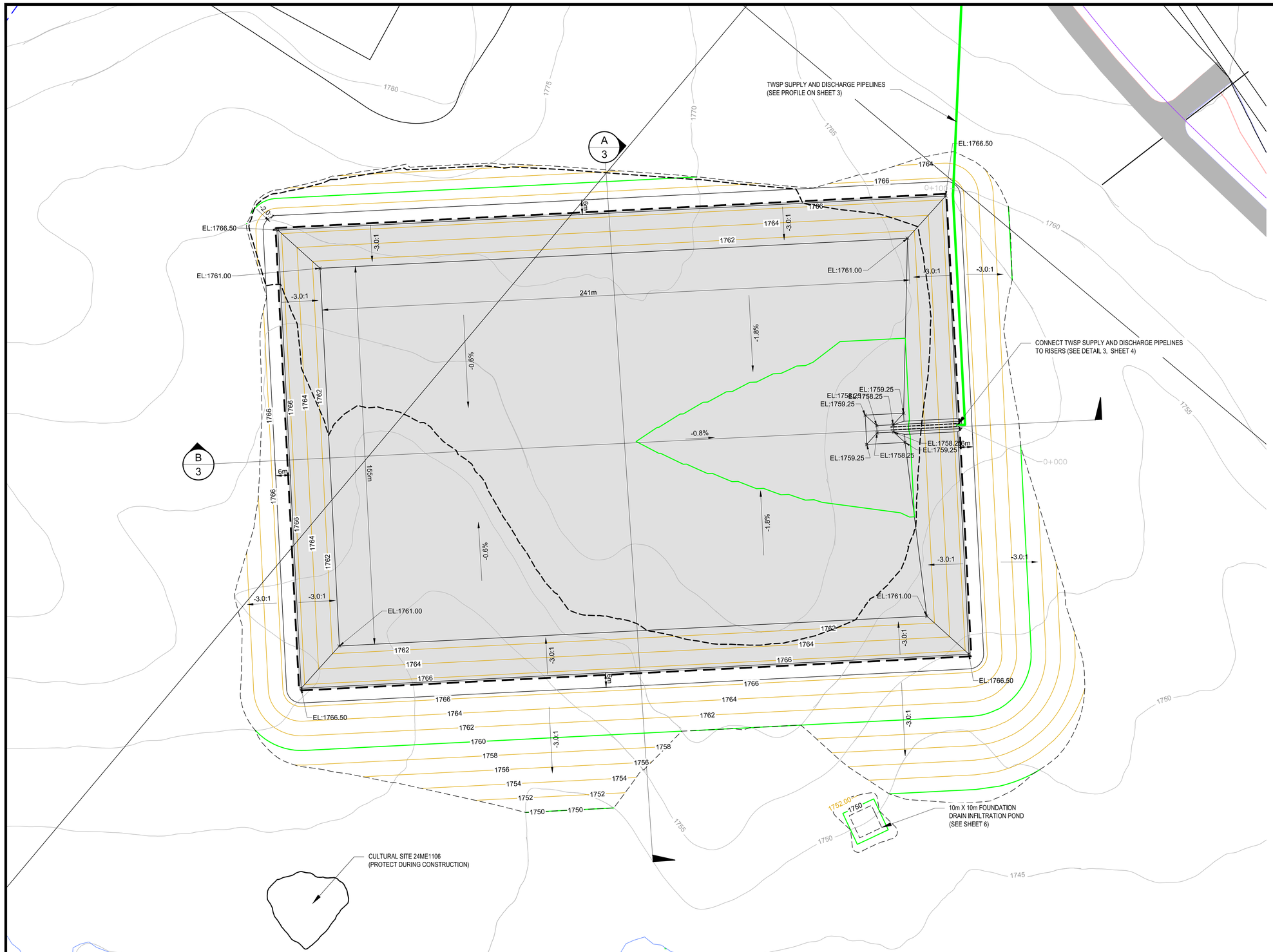

NOTES:

1. COORDINATE SYSTEM: UTM NAD83 ZONE 12N METERS.
2. EXISTING GROUND SURVEY PROVIDED BY SANDFIRE RESOURCES AMERICA, INC.
3. ELEVATIONS SHOWN ARE IN METERS UNLESS OTHERWISE NOTED.
4. POND DESIGN CRITERIA:
   CREST ELEVATION = 1766.5 m
   DESIGN WATER ELEVATION (1 Meter Freeboard) = 1765.5 m
   DESIGN CAPACITY TREATED WATER = 204,000 m^3
   DESIGN CAPACITY 200-YEAR, 24-HR STORM = 5,800 m^3
   TOTAL DESIGN POND CAPACITY = 209,800 m^3
   TOTAL CAPACITY INCLUDING FREEBOARD = 261,272 m^3
5. EARTHWORK VOLUMES:
   CUT: 181,669 m^3
   FILL: 180,491 m^3

MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS:

1. EMBANKMENT FILL
   1.1. EMBANKMENT FILL SHALL BE NEW OR SLIGHTLY WEATHERED BEDROCK FILL WITH A MAXIMUM PARTIAL SIZE OF 300mm OR ⅔ OF THE LIFT THICKNESS, WHICHEVER IS LESS. STUMPS, TREES, RUBBISH, VEGETATION, FROZEN LUMPS, OR OTHER UNSUITABLE MATERIALS SHALL NOT BE PLACED IN THE EMBANKMENT.
   1.2. EACH LIFT OF EMBANKMENT MATERIAL SHALL BE 500mm.
   1.3. EACH LAYER OF EMBANKMENT MATERIAL SHALL BE COMPACTED UNTIL THE IN-PLACE DENSITY EXCEEDS 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY AASHTO T-180, ASTM D 1557 MODIFIED PROCTOR METHOD A, B, C, OR D.
   1.4. EMBANKMENT FILL MATERIAL THAT HAVE MORE THAN 10 PERCENT RETAINED ON THE 75mm SIEVE, OR MORE THAN 30 PERCENT RETAINED ON THE 19mm SIEVE ARE TOO GRANULAR TO TEST BY AASHTO T-180 OR ASTM D 1557. THEREFORE THESE MATERIALS SHALL MEET THE FOLLOWING COMPACTION REQUIREMENTS:
   UNIFORMLY COMPACT THE MATERIAL WITH AT LEAST 6 FULL COVERAGES OF A VIBRATORY ROLLER HAVING A RATED CENTRIFUGAL FORCE OF AT LEAST 30,000 POUNDS PER IMPACT AND AT LEAST 1,000 VIBRATIONS PER MINUTE. LIMIT THE SPEED OF THE VIBRATORY ROLLERS TO LESS THAN 130 FEET PER MINUTE. ENSURE THAT AT LEAST 6 FULL COVERAGES PER 500mm LIFT IS ACHIEVED AND ENSURE THAT MATERIALS OVER 300mm IN DIAMETER ARE REMOVED BEFORE PLACEMENT.

2. SUB-GRADE BEDDING
   2.1. SUB-GRADE BEDDING MATERIAL SHALL BE NEW OR SLIGHTLY WEATHERED BEDROCK FILL WITH A MAXIMUM PARTIAL SIZE OF 25mm (1-INCH). STUMPS, TREES, RUBBISH, VEGETATION, FROZEN LUMPS, OR OTHER UNSUITABLE MATERIALS SHALL NOT BE PLACED IN THE BEDDING MATERIALS.
   2.2. THE SUB-GRADE BEDDING MATERIAL SHALL BE PLACED IN ONE 300mm LIFT.
   2.3. UB-GRADE BEDDING MATERIAL SHALL BE COMPACTED UNTIL THE IN-PLACE DENSITY EXCEEDS 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY AASHTO T-180, ASTM D 1557 MODIFIED PROCTOR METHOD A, B, C, OR D.

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REVISIONS	NO	BY	DATE

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BLACK BUTTE COPPER PROJECT

TREATED WATER STORAGE FACILITY
PLAN VIEW

DRAWING FILE NUMBER
1104803H004
AUTOCAD 2018 DRAWING (DWG)
SHEET NUMBER 2
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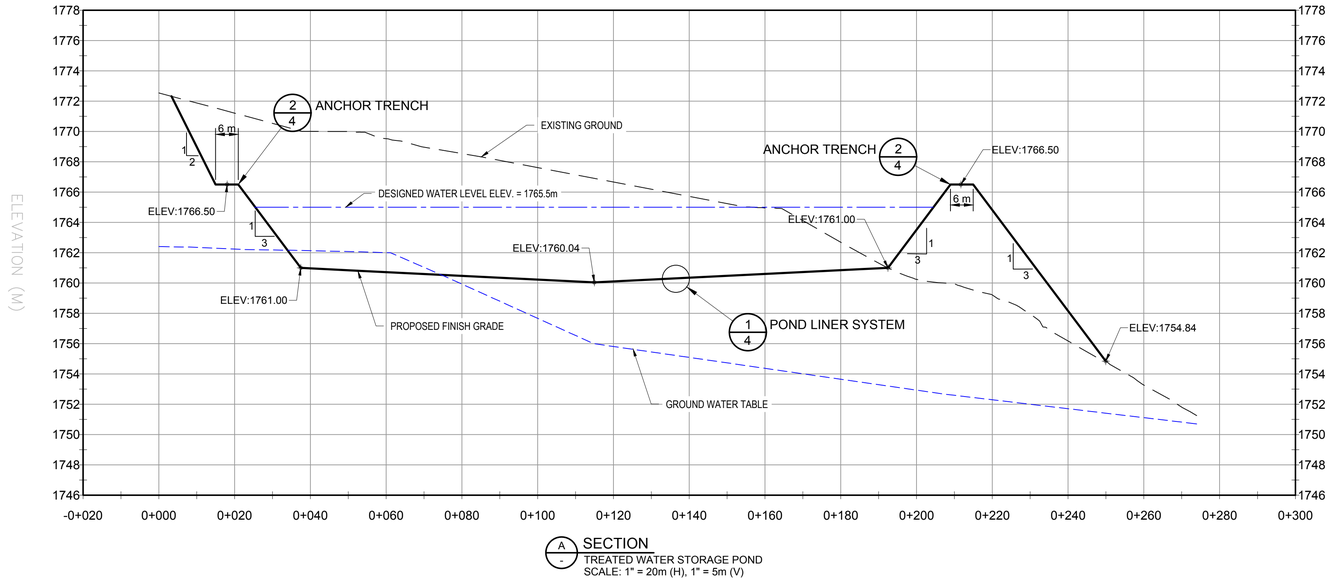
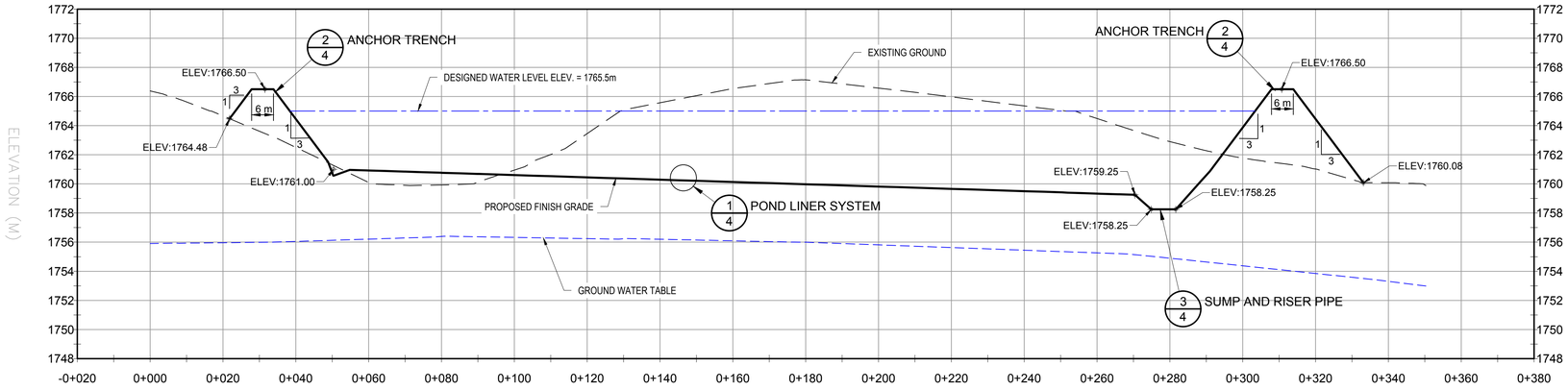


A/- SECTION
TREATED WATER STORAGE POND
SCALE: 1" = 20m (H), 1" = 5m (V)



B/- SECTION
TREATED WATER STORAGE POND
SCALE: 1" = 20m (H), 1" = 5m (V)

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TREATED WATER STORAGE FACILITY
POND SECTIONS

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1104803H004
AUTOCAD 2018 DRAWING (DWG)
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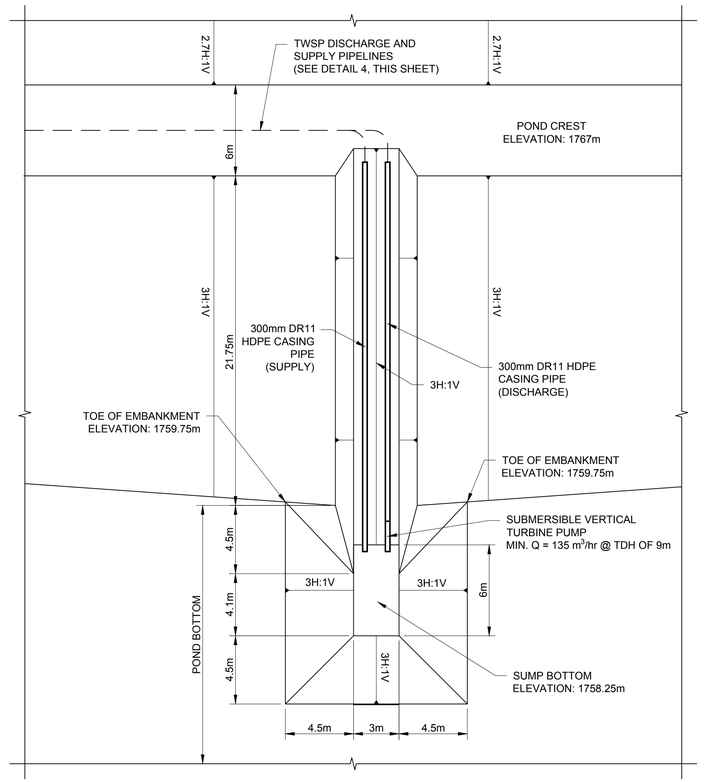
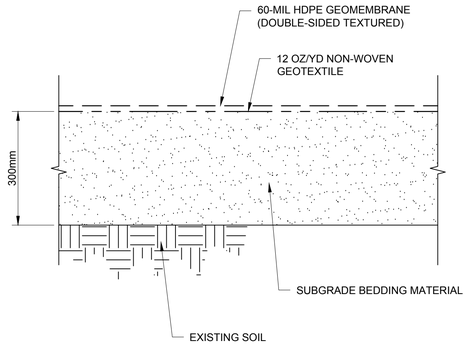
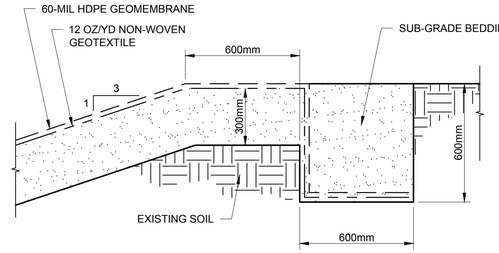


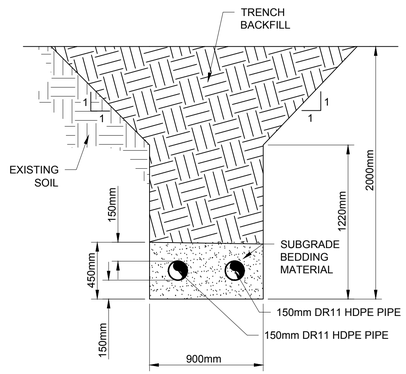
3 DETAIL
POND SUMP AND REISER PIPES
NTS



1 DETAIL
POND LINER SYSTEM
NTS



2 DETAIL
ANCHOR TRENCH
NTS



4 DETAIL
PIPE TRENCH
NTS

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BLACK BUTTE COPPER PROJECT
TREATED WATER STORAGE FACILITY
DETAILS

DRAWING FILE NUMBER	
1104803H003	
AUTOCAD 2018 DRAWING (DWG)	
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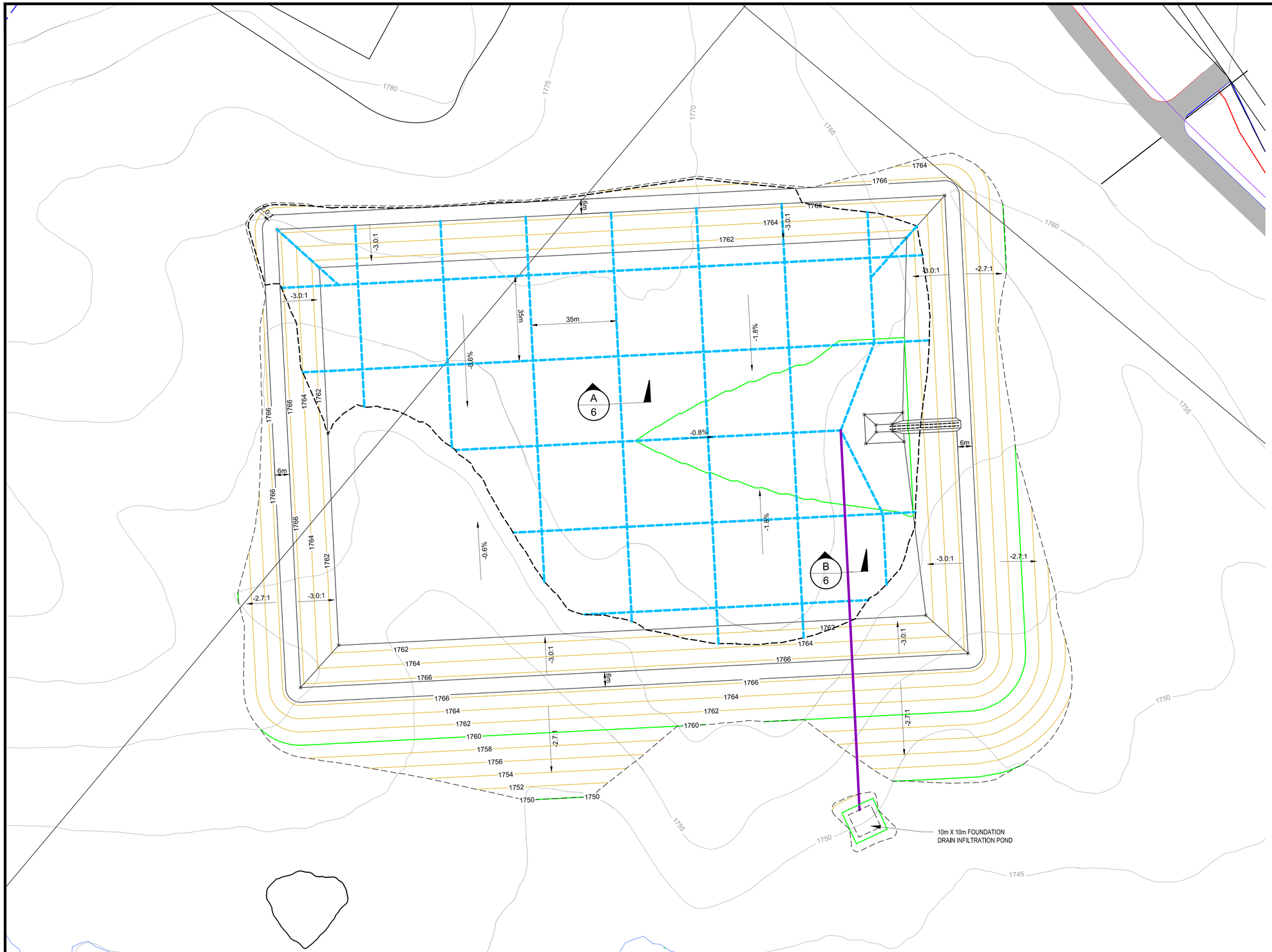

NOTES:

1. COORDINATE SYSTEM: UTM NAD83 ZONE 12N METERS.
2. THE FOUNDATION DRAIN TRENCHES SHALL FOLLOW THE SUBGRADE GRADING TO THE EXTENT FEASIBLE BUT SHALL NOT HAVE A SLOPE LESS THAN 0.5%.
3. THE OUTLET PIPE SHALL EMPTY INTO THE FOUNDATION DRAIN INFILTRATION POND.
4. ALL FOUNDATION DRAIN PIPE SHALL BE 150mm (6-INCH) N-12 DUAL WALL SOIL TIGHT DRAINAGE PIPE (SLOTTED PERFORATED PIPE).
5. THE OUTLET PIPE SHALL BE 200mm (8-INCH) N-12 DUAL WALL WATER TIGHT PIPE

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TREATED WATER STORAGE FACILITY
FOUNDATION DRAIN SYSTEM LAYOUT

DRAWING FILE NUMBER
1104803H004
AUTOCAD 2018 DRAWING (DWG)

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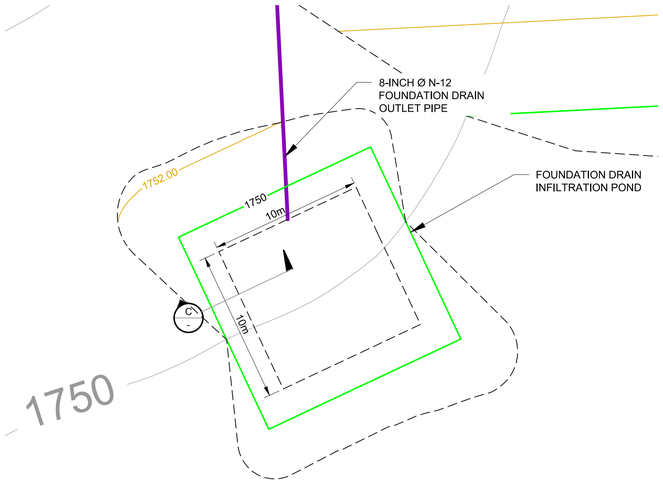


FOUNDATION DRAIN INFILTRATION POND
PLAN VIEW
SCALE: 1" = 5m

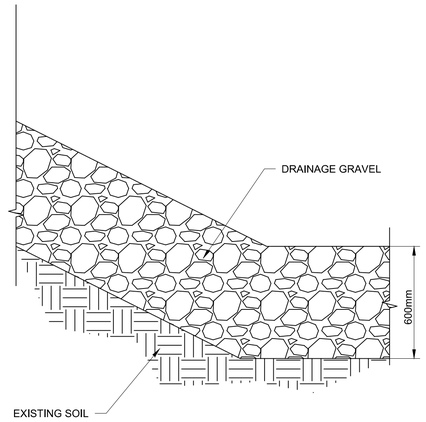
SCALE
(IN METERS)

5 0 5 10 15

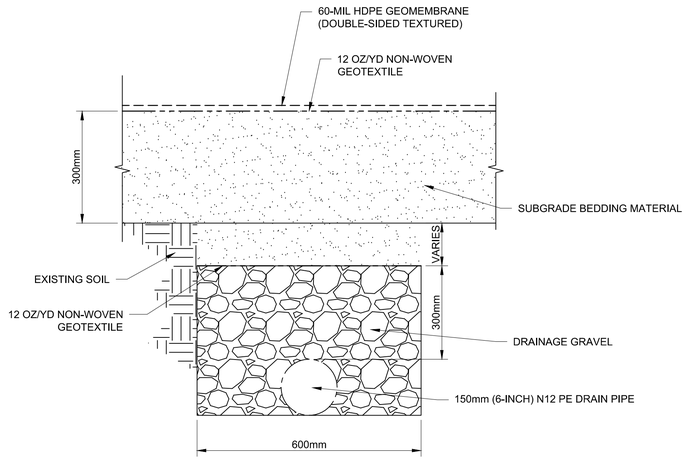
LEGEND

EXISTING CONTOURS (METERS)

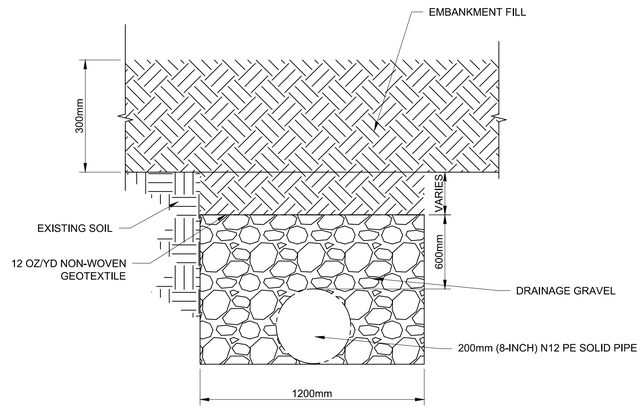
PROPOSED GRADING CONTOURS (METERS)



C/5 SECTION
FOUNDATION DRAIN INFILTRATION POND
TYPICAL SECTION
NTS



A/5 SECTION
FOUNDATION DRAIN TRENCH
NTS



B/5 SECTION
FOUNDATION DRAIN OUTLET PIPE TRENCH
NTS

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BLACK BUTTE COPPER PROJECT
TREATED WATER STORAGE FACILITY
FOUNDATION DRAIN DETAILS

DRAWING FILE NUMBER
1104803H004
AUTOCAD 2018 DRAWING (DWG)
SHEET NUMBER 6
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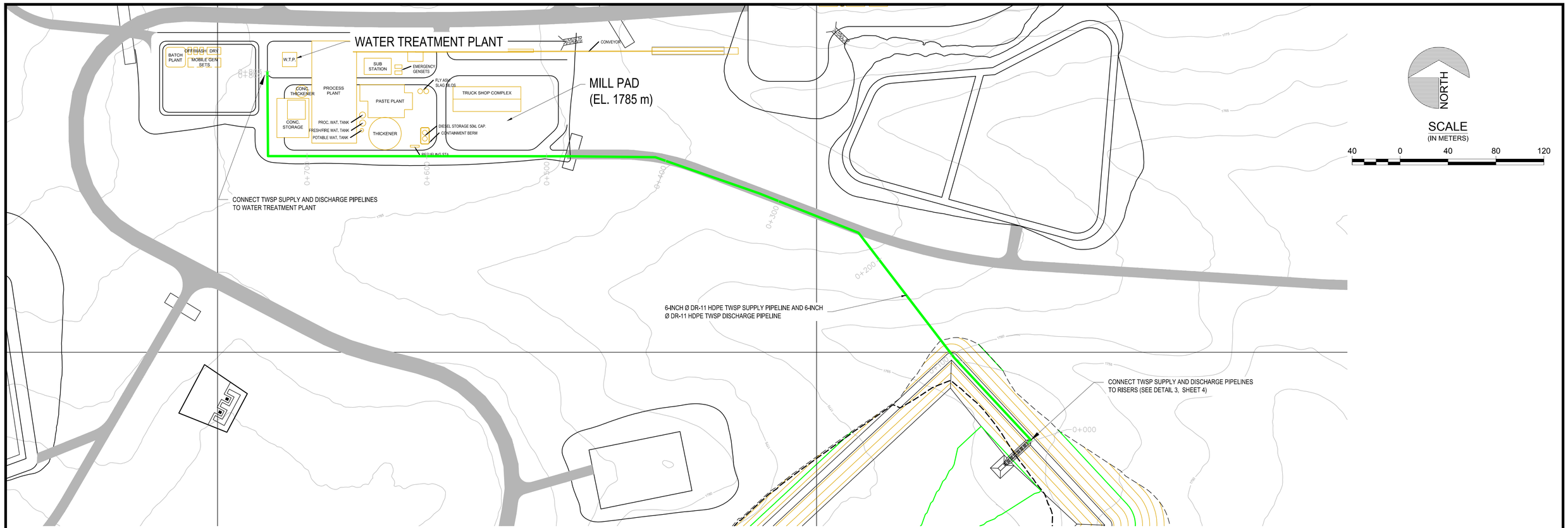
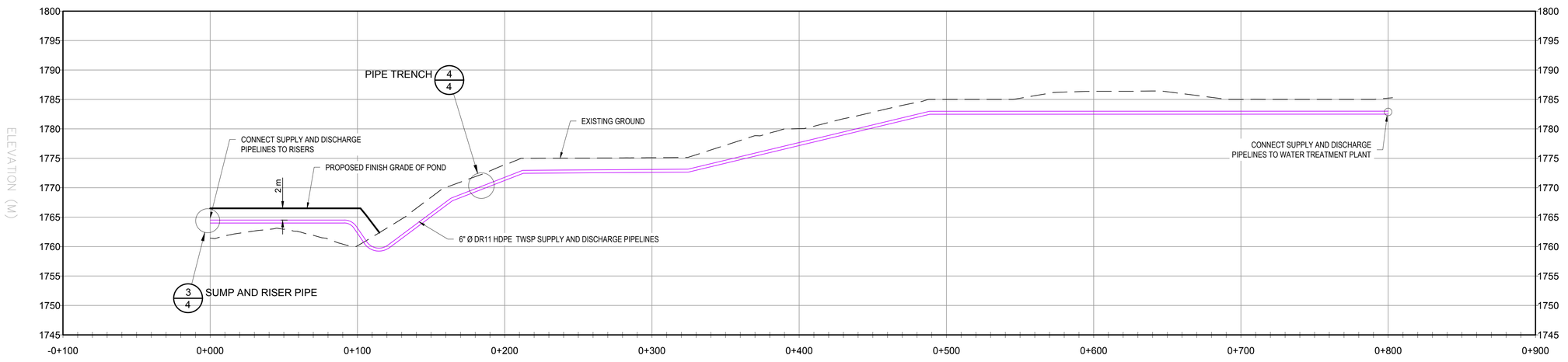


TWSP SUPPLY AND DISCHARGE PIPELINE PLAN VIEW

SCALE: 1" = 40m (H)



TWSP SUPPLY AND DISCHARGE PIPELINE PROFILE

SCALE: 1" = 40m (H), 1" = 10m (V)

FOR INFORMATION ONLY

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REVISIONS	NO	BY	DATE	

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TREATED WATER STORAGE FACILITY
PIPELINE PLAN AND PROFILE

DRAWING FILE NUMBER	
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7	△

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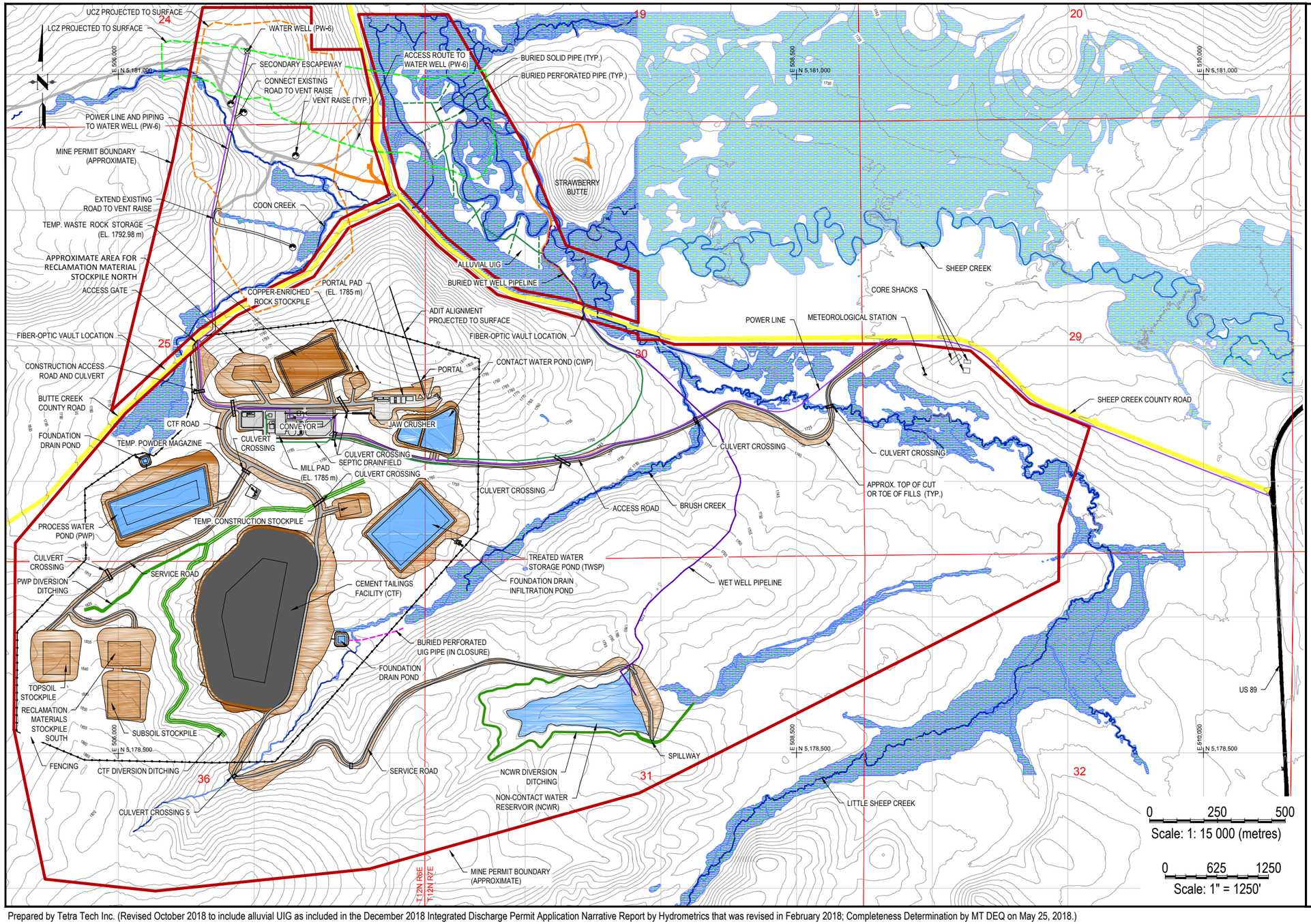
ATTACHMENT B

REVISED MINE OPERATING
PERMIT FIGURES AND SHEETS



LEGEND

- STREAMS
- STREAMS (OUTSIDE PROJECT BOUNDARY: SEE NOTE BELOW)
- WETLANDS
- WETLANDS (OUTSIDE PROJECT BOUNDARY: SEE NOTE BELOW)
- US ROUTE 89
- COUNTY ROAD
- PRIVATE ROAD
- SECTION LINE
- 32 SECTION NUMBER
- E 1,000 / N 1,000 UTM Z12N NAD83 COORDINATES
- MINE PERMIT BOUNDARY (APPROX.)
- NEW MINE ROAD
- NEW FENCE
- POWER LINE ROUTE
- APPROX. TOES / TOP OF CUT
- DIVERSION DITCH
- CULVERT CROSSING
- BURIED UNDERGROUND INFILTRATION GALLERY (UIG) - SOLID PIPE IN CLOSURE
- BURIED ALLUVIAL CONVEYANCE PIPELINE
- ALLUVIAL INFILTRATION TRENCH
- BURIED WATER LINE
- FOUNDATION DRAIN POND
- WET WELL PIPELINE
- BURIED WET WELL PIPELINE
- VENT RAISE
- WATER WELL

Some streams and wetlands shown outside of the project boundary were determined via photo-interpretation and were not delineated according to USACE methodology. These features are presented for display purposes only and do not represent jurisdictional features.

Streams within the project boundary represent jurisdictional features that were determined during field inventory to have an ordinary high water mark (OHWM) consistent with 33 CFR § 328.3.

Topographic base map from US Geological Survey (2011):
Strawberry Butte 7.5 Minute Quadrangle.

Map Projection:	UTM Zone 12N
Map Datum:	NAD83
Contour Interval:	5m

Prepared by Tetra Tech Inc. (Revised October 2018 to include alluvial UIG as included in the December 2018 Integrated Discharge Permit Application Narrative Report by Hydrometrics that was revised in February 2018; Completeness Determination by MT DEQ on May 25, 2018.)

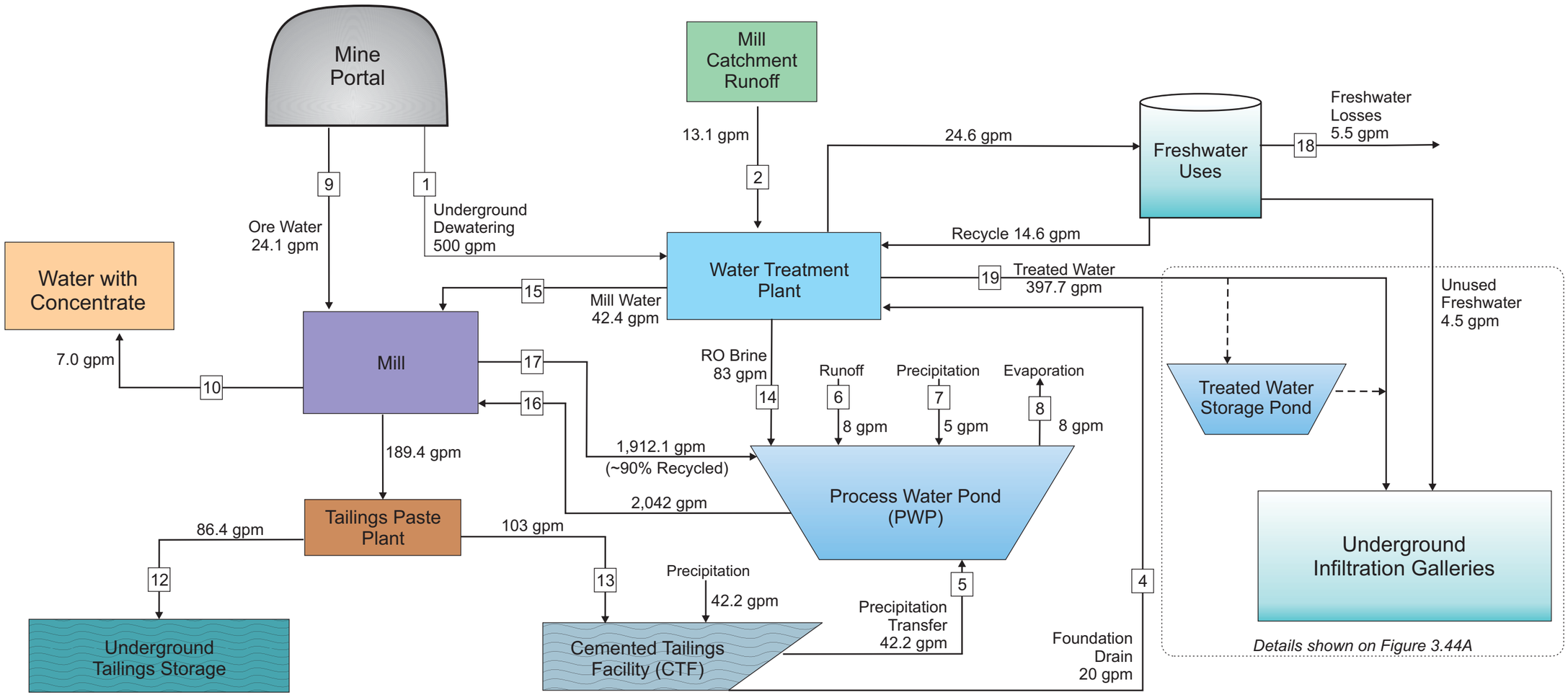
FIGURE 1.3

Facilities Site Plan

Black Butte Copper Project

Mine Operating Permit Application

Meagher County, Montana



Estimated Groundwater Consumptive Use Components

Water use	Consumptive Use	
	gpm	acre-ft/year
PWP Evaporation	8	13
CTF Void Loss	103	166
Underground Tailings Void Loss	86	139
Water Loss to Concentrate	7	11
Freshwater Losses	6	9
Total Consumptive Use	**210**	**339**

NOTES:

1. WATER IN TAILINGS PASTE IS ASSUMED TO BE UNRECOVERABLE.
2. SEEPAGE IS ASSUMED TO BE ZERO AS THE FACILITIES ARE LINED.
3. THE NUMBERS IN THE BOXES CORRESPOND TO TABLE V-1 IN APPENDIX V.

Reference: Modified after Knight Piesold (2017a): Report No. VA101-46-/3-2

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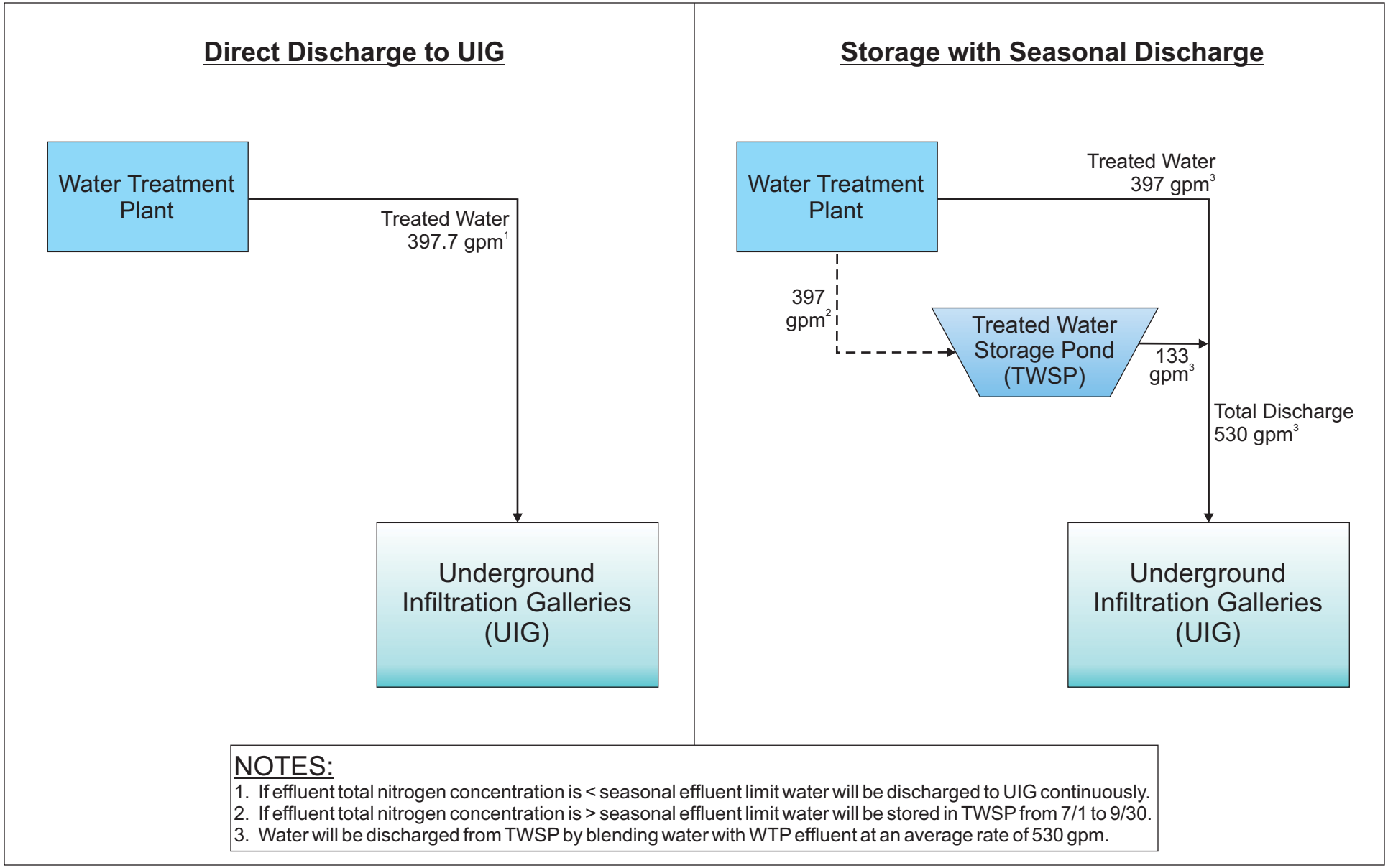
FIGURE 3.44
Annual Water Balance Schematic for Mean Case - Year 6
Mine Operating Permit Application
Black Butte Copper Project
Meagher County, Montana



NOTES:

1. If effluent total nitrogen concentration is < seasonal effluent limit water will be discharged to UIG continuously.
2. If effluent total nitrogen concentration is > seasonal effluent limit water will be stored in TWSP from 7/1 to 9/30.
3. Water will be discharged from TWSP by blending water with WTP effluent at an average rate of 530 gpm.

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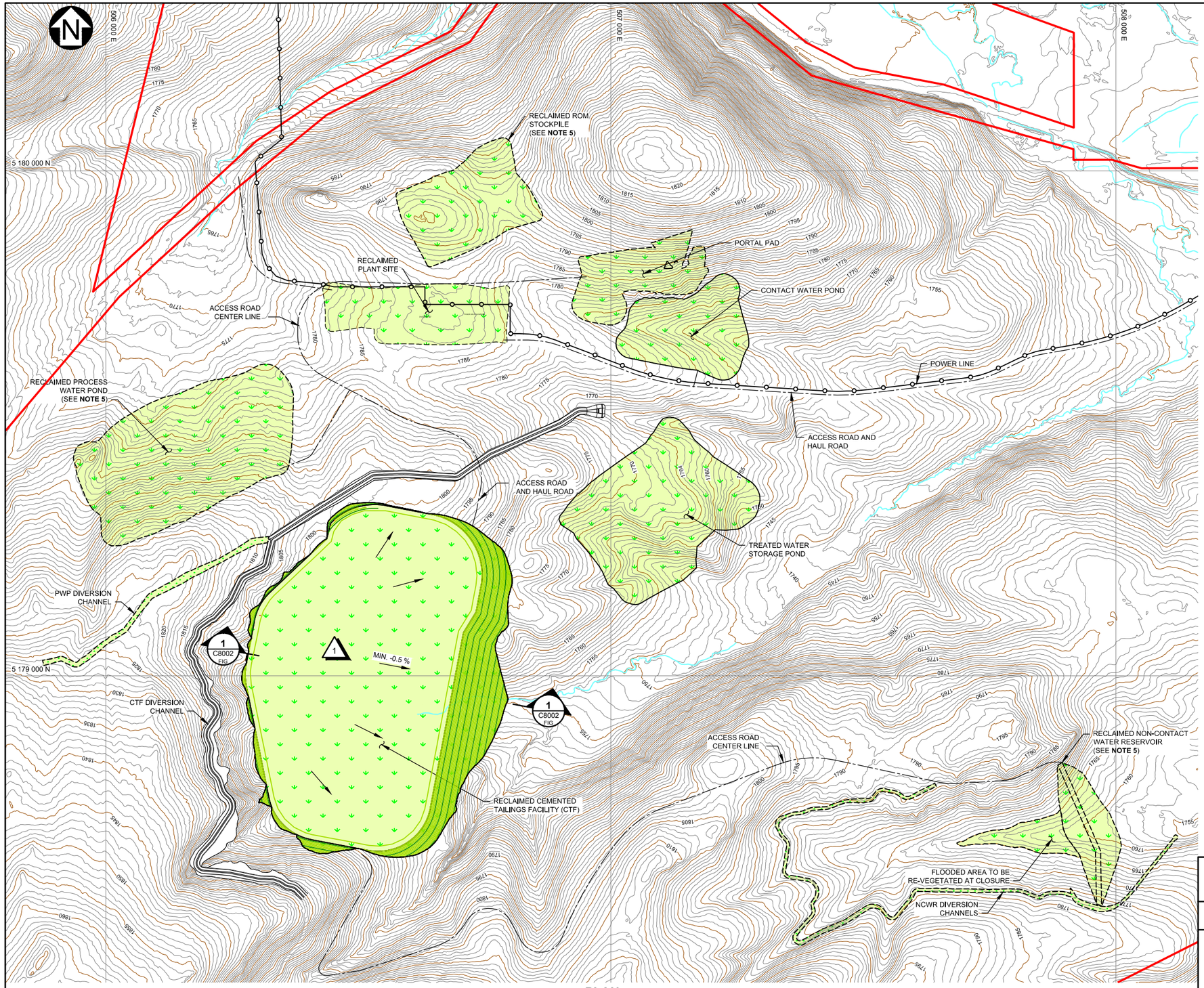
FIGURE 3.44A
MPDES Discharge
Mine Operating Permit Application
Black Butte Copper Project
Meagher County, Montana



PLAN
SCALE A

LEGEND:

- RECLAIMED AREA
- MINE PERMIT BOUNDARY

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 12N.
2. PLAN BASED ON INFORMATION PROVIDED BY TINTINA RESOURCES INC., DATED FEB 03, 2011.
3. EXISTING CONTOUR INTERVAL IS 1 METER. BLUE CONTOUR LINES ON CTF SLOPES ARE 5 METER INTERVAL.
4. DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS NOTED OTHERWISE.
5. FACILITIES HIGHLIGHTED IN YELLOW (EXCEPT FOR THE CTF) WILL BE CONTOURED AT RECLAMATION TO APPROXIMATE THE ORIGINAL TOPOGRAPHY.
6. THE CTF DIVERSION CHANNEL PERIMETERS AND OUT-SLOPING FILL SLOPES WILL BE REVEGETATED FOLLOWING CONSTRUCTION AND WILL REMAIN IN CLOSURE.

80 40 0 100 200 300 400 m
SCALE A

TINTINA RESOURCES

BLACK BUTTE COPPER PROJECT
MINE OPERATING PERMIT APPLICATION

MEAGHER COUNTY, MT

FIGURE 7.1
POST CLOSURE TOPOGRAPHIC MAP

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	24OCT'18	TWSP ADDED	GB	SEF		
1	29APR'16	MINOR REVISIONS	GIM	RAP		
0	16OCT'15	ISSUED FOR MOP APPLICATION	GIM	PP	KJB	KJB

REVISIONS

REVISED DATE: JULY 2017

C8002 | CTF RECLAMATION - SECTION

DRAWING BY KNIGHT PIESOLD: Report No. VA101-460/3-2 Rev 4

SOURCE FIGURE NUMBERS: C8001_r1

SAVED: O:\IT-2\TTBozeman\114-710301A BlackButte 2016\110 2D CADSheetFiles\KP Figures\Fig 7.1 Post Closure Topo Map (C8001_r2), PRINTED: 10/24/2018 11:54:34 AM

R6E
R7E

25
30
29
36
31
32
T 12 N

LEGEND

- Lease Boundary
- Permit Boundary
- Sections
- Roads

Revegetation Type

- Upland Shrub
- Conifer Forest
- Upland Grass
- Hay Meadow
- Disturbance

N

Scale 1" = 1200'

0 600 1200 2400

Feet

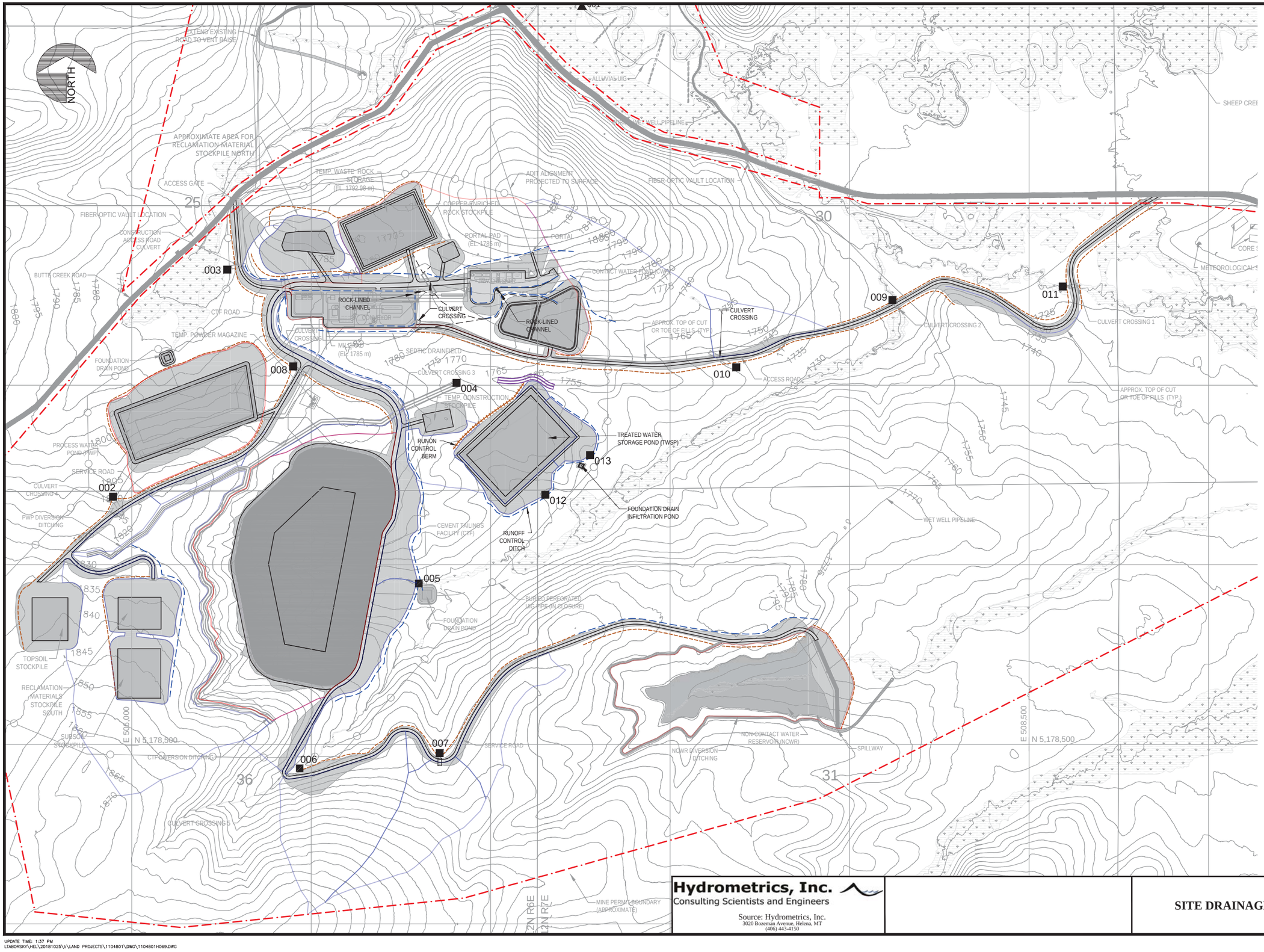
SANDFIRE RESOURCES BLACK BUTTE COPPER AMERICA INC.

Revegetation Map

BBC18_Reclamation_Rev3.dwg | 1:14,400 | 10/26/18

WESTECH ENVIRONMENTAL

Figure 7.10



Hydrometrics, Inc.
Consulting Scientists and Engineers

Source: Hydrometrics, Inc.
3020 Bozeman Avenue, Helena, MT
(406) 443-4150

SITE DRAINAGE CONTROL

DRAWING FILE NUMBER
1104801H069
AUTOCAD 2000 DRAWING (DWG)
MAP SHEET
6

UPDATE TIME: 1:37 PM
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ATTACHMENT C

REVISED MINE OPERATING PERMIT TABLES

Table 3-2. Acres of Surface Disturbance Consolidated by Major Facility

Facility or Activity	Surface Disturbance (Acres)
New Access Roads	57.7
Direct Underground Mine Support	7.9
Temporary Waste Rock Storage (WRS) and copper-enriched rock stockpile	12.1
Contact Water Pond (CWP)	9.0
Mill / Plant Site	9.8
Process Water Pond (PWP)	28.7
Cemented Tailings Facility (CTF)	82.5
Non-Contact Water Reservoir (NCWR)	7.6
Water Supply	6.3
Underground Infiltration Galleries	5.4
Material Stockpiles	32.4
Treated Water Storage Pond	20.2
Wet Well Diversion and Pipeline	2.4
Other / Miscellaneous	0.6
Subtotal	**282.6**
Construction Buffer Zone / Misc. (10%)	28.3
Total Disturbance Acres	**310.9**

Table 3-13. Complete List of Surface Disturbance Acres

Facility or Activity	Linear Feature Lineal feet	Construction Disturbance Width Feet	Surface Disturbance Acres
New Access Roads Sub-total			**57.7**
Main Access road to Mill Site	7,973	84	15.4
Contractor Access Road Butte Creek Road to CTF Road	1,178	98	3.5
CTF Road – Portal to CTF	4,223	164	11.8
Power-line Corridor Parallel to main Access Road (overlap with main access road removed)	7,256	20	4.5
Truck road to Waste Rock Storage Pad	305	98	0.7
Service Road - Truck Road to Soil Stockpiles (Includes Road to PWP)	4,490	98	7.7
Service Road – Main Access to CWP	Already disturbed	__	__
Service Road - CTF to NCWR	6,594	98	13.4
Ventilation Raises New Access Roads	1.081	49	0.7
Direct Underground Mine Support Sub-total			**7.9**
Portal Pad, Including Support Facilities	984	410	6.9
Ventilation Raise Collar Areas (4) (100 x 100', 0.3 acres each) 6-foot Chain Link Fence	100	100 *4	0.9
Pumping Lines to Portal to PWP	992 undisturbed	5	0.1
Pumping Lines to Portal to WTP	2300	5	Already disturbed
Temporary Waste Rock Storage (WRS) Sub-total			**12.1**
Temporary Waste Rock Storage	820	591	10.2
Copper-enriched Rock Storage Pad	295	295	1.9
Drainage Piping WRS to CWP	550	20	Already disturbed
Contact Water Pond (CWP) Sub-total			**9.0**
Contact Water Pond (CWP)	656	656	8.9
CWP Pump back Piping to WTP	2,328	5	Already disturbed
CWP Pump-back Piping to PWP	989 undisturbed	5	0.1
CWP 8-foot Wildlife Fence	2600	5	included
Mill / Plant Site Sub-total			**9.8**
Plant Site (includes Mill, Laydown Area, Substation, Truck / Shop / Admin, Paste Backfill Plant, and Water Treatment Facilities, etc.)	1,312	492	9.8
Primary Crusher and Conveyor			included
Process Water Pond (PWP) Sub-total			**28.7**
Process Water Pond (PWP)			23.9
PWP Foundation Drain Pond			0.4
Pump Back Piping to PWP[1]	50	20	0.0
PWP Diversion Channel			3.7

Facility or Activity	Linear Feature Lineal feet	Construction Disturbance Width Feet	Surface Disturbance Acres
Piping PWP to Mill	1,548	20	0.7
PWP 8-foot Wildlife Fence			included
Cemented Tailings Facility (CTF) Sub-total			**82.5**
Cemented Tailings Facility (CTF)			71.9
CTF Foundation Drain Pond			0.7
CTF Foundation Drain Pond to WTP[1]	420 2,350	20 20	0.2 already disturbed
CTF Pump back Piping to PWP[1]	2,628	20	1.2
Tailings Pumping Supply Mill to CTF	4,423	20	2.0
CTF Diversion Channel	1,002	20	6.5
CTF 8-foot Wildlife Fence			included
Non-Contact Water Reservoir (NCWR) Sub-total			**7.6**
Noncontact Water Reservoir (NCWR**)**			4.7
NCWR Diversion Channel	1,252		2.1
NCWR Spillway Channel	286		0.5
NCWP Piping to Spillway Channel	738	20	0.3
8-foot Wildlife Fence			included
Water Supply Sub-total			**6.3**
Public Water Supply Well and Pipeline (100 x 100’ Pad , 0.3 Acres Includes Water Tank)			0.3
Pipeline Well to WTP	5,913	20	2.7
Powerline Well PW-6 to substation	Same as above		2.7
Water Tanks (Mill) Distribution Lines	1,320	20	0.6
UIG areas Sub-total			**5.4**
Excavated Distribution Line	8,577	20	4
Distribution Line within Mill Pad	850	20	Already disturbed
Bored Distribution Line	350	0	0
Infiltration Gallery	3,140	20	1.4
Stockpiles Sub-total			**32.4**
Top Soil	492	525	8.0
Subsoil	1,083	558	7.0
Excess Reclamation Stockpile (North)	623	492	7.10
Excess Reclamation Stockpile (South)			7.5
Temporary Construction Stockpile			2.8
Treated Water Storage Pond			**20.2**
Treated Water Storage Pond (TWSP)			19.6
TWSP Foundation Drain Infiltration Pond			0.1
TWSP Pump back Piping to WTP (undisturbed)	1,232	5	0.5
TWSP 8-foot Wildlife Fence	3,879	5	included
Wet Well and Pipeline			**2.4**

Facility or Activity	Linear Feature Lineal feet	Construction Disturbance Width Feet	Surface Disturbance Acres
Wet Well			<0.1
Discharge Pipeline within UIG Pipeline Excavation	1,970	20	Already disturbed
Discharge Pipeline	5,181	20	2.4
Other/ Miscellaneous Sub-total			**0.6**
Septic System			0.2
Temp. Powder Magazine			0.4
8-foot Chain Link Fence			included
Barbed Wire Fencing of Active Mine			included
New Monitor well and Piezometer Sites			included
Subtotal			**282.6**
Construction Buffer Zone / Misc.[2] (10% of subtotal, and includes 25 ft perimeter around all facilities)			28.3
Disturbance Acres Total			**310.9**

1. Much of this pipeline is constructed on ground disturbed by a facility; the amount shown is additional disturbance.
2. Includes: chain link and barbed wire fences, monitor wells and piezometer locations, storm water ponds, storm water ditches outside of disturbed areas, rock roll and erosion control berms, etc.

Table 7-1. HDPE Liner and Upper Protective Layer Disposition

Facility	Liner Disposition	Protective Layer Composition	Protective Layer Disposition
CTF	Buried in-place	Screened Waste Rock	Buried In-place Beneath Cemented Tailings
PWP	Buried in-place	None	Pond Sediment, Mixed with Cement, Buried In-place
CWP	Off-site Disposal or Recycling	None	None
TWSP	Off-site Disposal or Recycling	None	None
WRS	To CTF[1]	Excavated Construction Materials	To CTF[1]
Copper-enriched Rock Stockpile	To CTF[1]	Excavated Construction or Screened Waste Rock	To CTF[1]
NCWR	Upstream Embankment Face Only, To CTF[1]	None	None

[1] Disposed of in CTF prior to placing HDPE cover.

Table 7-5. Estimated Soil Salvage Volumes by Disturbance Type (A. Stockpiled and B. Not Stockpiled)

A. Acres of Disturbance and Estimated Salvage Volumes - Soils to be Stockpiled

Soils Map Unit Symbol (MUSYM)	Mine Operations Disturbances (acres)							Pond / Diversion Disturbances (acres)						Soil Salvage Thickness (inches)			Soil Volume (cubic yards)		
	Cemented Tailings Facility (CTF)	Core Shacks and Yard	Mill Pad & Conveyor	Ore Stockpile	Portal Pad and Conveyor	Temporary Powder Magazine	Temporary Waste Rock Storage	Contact Water Pond (CWP)	Foundation Drain Ponds	Non-Contact Water Reservoir (NCWR) - Dam	Process Water Pond (PWP)	Treated Water Storage Pond (TWSP)	Total Disturbance per Soil Unit (acres)	1st Lift	2nd Lift	Total Salvage	1st Lift Volume	2nd Lift Volume	Total Soil Volume
Ad-b													**0.0**	12	24	**36**	-	-	**-**
Ch-b	7.6		8.9	0.6	1.2			1.4	0.4	4.3	4.6	12.9	**41.9**	12	0	**12**	75,711	-	**75,711**
Cl-a													**0.0**	12	24	**36**	-	-	**-**
Cp-c	4.8			1.0	5.7			3.6					**15.1**	12	0	**12**	27,285	-	**27,285**
Cp-d													**0.0**	0	0	**0**	-	-	**-**
Dc-a													**0.0**	12	24	**36**	-	-	**-**
Fa-b													**0.0**	12	24	**36**	-	-	**-**
Hl-b													**0.0**	12	24	**36**	-	-	**-**
Kp-c	35.3								0.7		16.5		**52.5**	12	24	**36**	94,864	189,728	**284,592**
Kp-d													**0.0**	0	0	**0**	-	-	**-**
Lb-b													**0.0**	12	12	**24**	-	-	**-**
Ml-a													**0.0**	12	24	**36**	-	-	**-**
Ml-b													**0.0**	12	24	**36**	-	-	**-**
Pn-b	24.2		0.2	0.3		0.4	7.9			0.4		3.2	**36.6**	12	0	**12**	66,134	-	**66,134**
Rc-b													**0.0**	12	12	**24**	-	-	**-**
Rf-a													**0.0**	12	24	**36**	-	-	**-**
Ry-b													**0.0**	12	24	**36**	-	-	**-**
Se-b													**0.0**	12	24	**36**	-	-	**-**
Wa-b							2.3				2.7		**5.0**	12	12	**24**	9,035	9,035	**18,069**
Wg-b								3.9	0.1			3.5	**7.5**	12	24	**36**	13,552	27,104	**40,656**
Wu-b													**0.0**	12	12	**24**	-	-	**-**
DL		1.8											**1.8**	0	0	**0**	-	-	**-**
Total Acres	**71.9**	**1.8**	**9.1**	**1.9**	**6.9**	**0.4**	**10.2**	**8.9**	**1.2**	**4.7**	**23.8**	**19.6**	**160.4**			**10% Buffer**	**28,658**	**22,587**	**51,245**
																Total Volumes	**315,238**	**248,454**	**563,691**

B. Acres of Disturbance and Estimated Salvage Volumes - Soils to be Stored and Replaced at Site of Salvage (Not Stockpiled)

Soils Map Unit Symbol (MUSYM)	Road Disturbances (acres)					Mine Operations Disturbances (acres)				Pond / Diversion Disturbances (acres)						Soil Salvage Thickness (inches)			Soil Volume (cubic yards)		
	Access Road	Construction Access Road	CTF Road	Road to Vent Raise	Service Road	Buried Pipe - Perforated	Powerline and Pipe to Well PW-6	Temporary Construction Stockpile	Vent Raises	Alluvial Conveyance and Pipeline	CTF Diversion Ditching	NCWR Diversion Ditching	NCWR - Open Water & Spillway	PWP Diversion Ditching	Wet Well Pipeline	Total Disturbance per Soil Unit (acres)	1st Lift	2nd Lift	Total Salvage	1st Lift Volume	2nd Lift Volume	Total Soil Volume
Ad-b							0.1									**0.1**	12	24	**36**	181	361	**542**
Ch-b	5.0	0.8	4.6		0.4					0.6	0.1	1.3	14.6		1.2	**28.6**	12	0	**12**	51678	0	**51678**
Cl-a																**0.0**	12	24	**36**	0	0	**0**
Cp-c			0.2		2.3		0.4				1.7	0.1				**4.7**	12	0	**12**	8493	0	**8493**
Cp-d																**0.0**	0	0	**0**	0	0	**0**
Dc-a	2.9															**2.9**	12	24	**36**	5240	10480	**15720**
Fa-b																**0.0**	12	24	**36**	0	0	**0**
Hl-b					2.9											**2.9**	12	24	**36**	5240	10480	**15720**
Kp-c					5.2						3.6	0.3			0.2	**9.3**	12	24	**36**	16804	33609	**50413**
Kp-d									0.1	0.2					0.1	**0.4**	0	0	**0**	0	0	**0**
Lb-b																**0.0**	12	12	**24**	0	0	**0**
Ml-a	0.3					0.5				0.2					0.2	**1.2**	12	24	**36**	2168	4337	**6505**
Ml-b	0.2					0.3	0.1								0.1	**0.7**	12	24	**36**	1265	2530	**3795**
Pn-b		1.4	7.2		7.6			2.8			3.6	0.3	1.6	0.9	0.2	**25.6**	12	0	**12**	46258	0	**46258**
Rc-b																**0.0**	12	12	**24**	0	0	**0**
Rf-a						0.9				1.1						**2.0**	12	24	**36**	3614	7228	**10842**
Ry-b	1.8															**1.8**	12	24	**36**	3252	6505	**9757**
Se-b																**0.0**	12	24	**36**	0	0	**0**
Wa-b		1.2		0.7	3.6		0.8		0.1					0.3		**6.7**	12	12	**24**	12106	12106	**24213**
Wg-b	4.1									1.0					0.6	**5.7**	12	24	**36**	10300	20599	**30899**
Wu-b							0.3		0.3							**0.6**	12	12	**24**	1084	1084	**2168**
DL										0.3					0.2	**0.5**	0	0	**0**	0	0	**0**
Total Acres	**14.3**	**3.4**	**12.0**	**0.7**	**22.0**	**1.7**	**1.7**	**2.8**	**0.5**	**3.4**	**9.0**	**2.0**	**16.2**	**1.2**	**2.8**	**93.7**			**10% Buffer**	**16768**	**10932**	**27700**
																			Total Volumes	**184452**	**120252**	**304703**

Disturbance Acreage Summary

Stockpiled Soils	160.4
Non-Stockpiled Soils	93.7
No Soil Salvage[1]	29.6
TOTAL DISTURBANCE	**283.7**

Notes:

[1]Soil will not be salvaged in topsoil (8.0 acres), subsoil (7.0 acres) or reclamation material storage areas (North site = 7.1 acres, South site = 7.5 acres) and thus are not included in soil volume calculations