Reclamation Plan

Haile Gold Mine
Kershaw, South Carolina
OceanaGold Corporation

Prepared for:

OCEANAGOLD CORPORATION

6911 Snowy Owl Road, PO Box 128, Kershaw, SC 29067

4/30/2020

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4/30/2020

'Wood' is a trading name for John Wood Group PLC and its subsidiaries

EXECUTIVE SUMMARY

This document is prepared on behalf of Haile Gold Mine, Inc., a wholly-owned subsidiary of OceanaGold Corporation (Haile). This Haile Gold Mine Reclamation Plan is primarily conceptual in nature due to ongoing operations at this time. However, it describes the general procedures and methods for achieving the final reclamation requirements and objectives. In addition, the Reclamation Plan serves as a basis for calculating reclamation costs, identifying long-term post-reclamation monitoring and maintenance requirements, and determining financial assurance for the proposed Haile 2018 Mine Expansion Plan. This version of the Reclamation Plan is intended to support the Supplement Environmental Impact Statement (SEIS) review and federal and state permitting process for Haile's proposed expansion.

As mining activities at the Haile Gold Mine progress, the Reclamation Plan will be continuously refined and expanded, while adhering to the concepts outlined in this document. Detailed reclamation project information will be provided to the South Carolina Department of Health and Environmental Control (DHEC) in advance of conducting the reclamation described in this Reclamation Plan. Appropriate financial assurance will be provided for proposed reclamation and closure activities to ensure that funds for reclamation and closure are available.

Due to its past reclamation successes at the Haile Gold Mine site, Haile has good experience and understanding of the reclamation process, including what vegetation can and will grow at the site. During mining operations, Haile will take every opportunity to perform reclamation concurrent with operations. Concurrent reclamation will be performed on disturbed areas once all planned mining activities in each discrete area are completed and no future mining activity is expected in that area. Final overall reclamation will be completed as soon as practicable after mining activities cease at the facility (even while Haile completes its final ore processing at the Mill). Monitoring and maintenance will be conducted during post-reclamation until the pit lakes fill and stabilize, and Haile will fund any required long-term monitoring and maintenance. In coordination with DHEC, Haile has established an interest-bearing Trust so that funds are available for the long-term monitoring and maintenance needed to ensure continued reclamation success post-closure.

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LIST OF ACRONYMS

ac-ft	Acre Feet
amsl	Above Mean Sea Level
ARD	Acid Rock Drainage
CWTP	Contact Water Treatment Plant
CY	Cubic Yards
DHEC	South Carolina Department of Health and Environmental Control
ft	Feet
FWSA	Fresh Water Storage Area
Haile	Haile Gold Mine, Inc.
HDPE	High Density Polyethylene
HGMC	Haile Gold Mine Creek
HUC	Hydrologic Unit Code
JPAG	Johnny's Potentially Acid Generating Facility
ML	Metal leaching
MSHA	Mining Safety and Health Administration
NAG	Net Acid Generating
NNP	Net Neutralization Potential
NPDES	National Pollutant Discharge Elimination System
OMP	Overburden Management Plan
PAG	Potentially Acid Generating
PMP	Probable Maximum Precipitation Event
SCDNR	South Carolina Department of Natural Resources
TSF	Tailings Storage Facility
WAD	Weak Acid Dissociable (Cyanide)

1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

The Haile Gold Mine Reclamation Plan (Reclamation Plan) has been developed to meet the requirements of Section 48-20-90 of the South Carolina Mining Act. The Reclamation Plan describes methods that will be used to reclaim land disturbed by mining, ore processing operations, and associated activities to a stabilized condition that will provide for the long-term protection of land and water resources, minimize the adverse impacts of mining, and support the intended post-mining land use. The Reclamation Plan meets all applicable regulatory requirements. This version of the Reclamation Plan provides an update to Haile's previous reclamation plan (AMEC, Reclamation Plan, November 2013). This updated revision to Haile's previous Reclamation Plan addresses the proposed expansion of Haile Gold Mine (Haile or Site).

1.2 PROJECT DESCRIPTION

Gold was discovered in the area in the late 1820s. Figure 1 presents the general location of the Site, approximately three miles northeast of the Town of Kershaw in Lancaster County, South Carolina. Open pit and underground mining operations continued sporadically until the early 1990s. Approximately 360,000 ounces of gold were mined and processed during this time. In 1992, Amax Gold Inc. and the Piedmont Mining Company formed Haile Mining Company (unrelated to Haile). Due to the economic conditions at the time, Amax Gold Inc. did not proceed with mining operations. Kinross Gold Corporation acquired the Site in 1998 and was conducting reclamation activities when Romarco Minerals, Inc. (Romarco) acquired the property in late 2007.

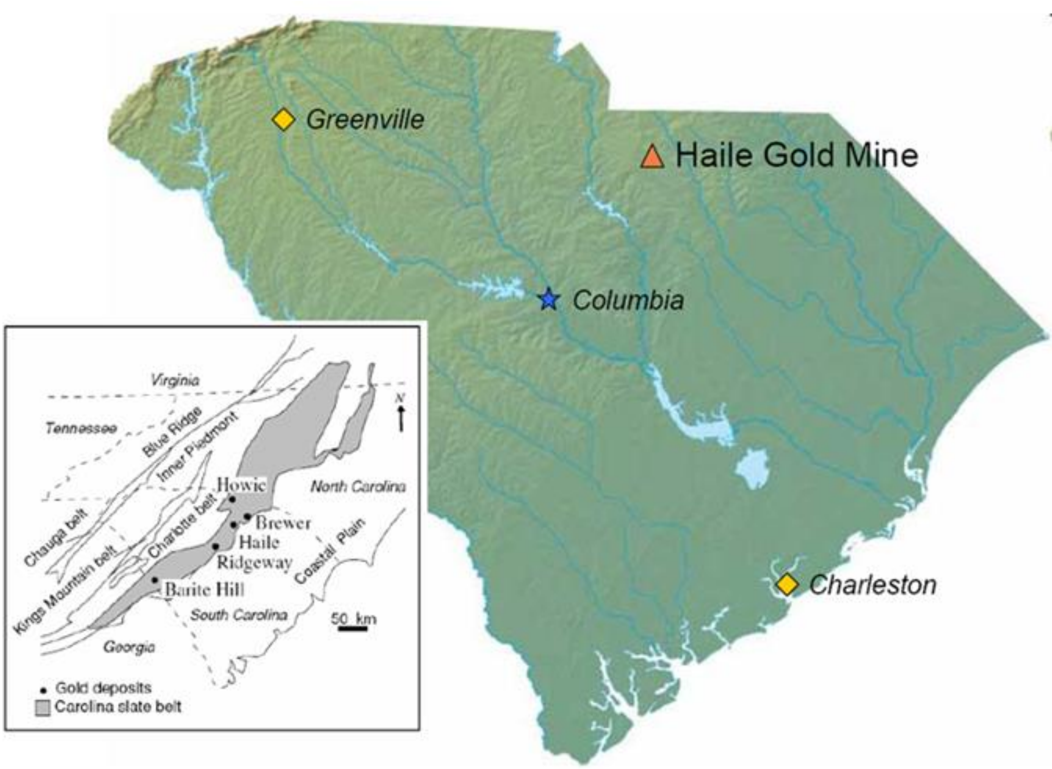
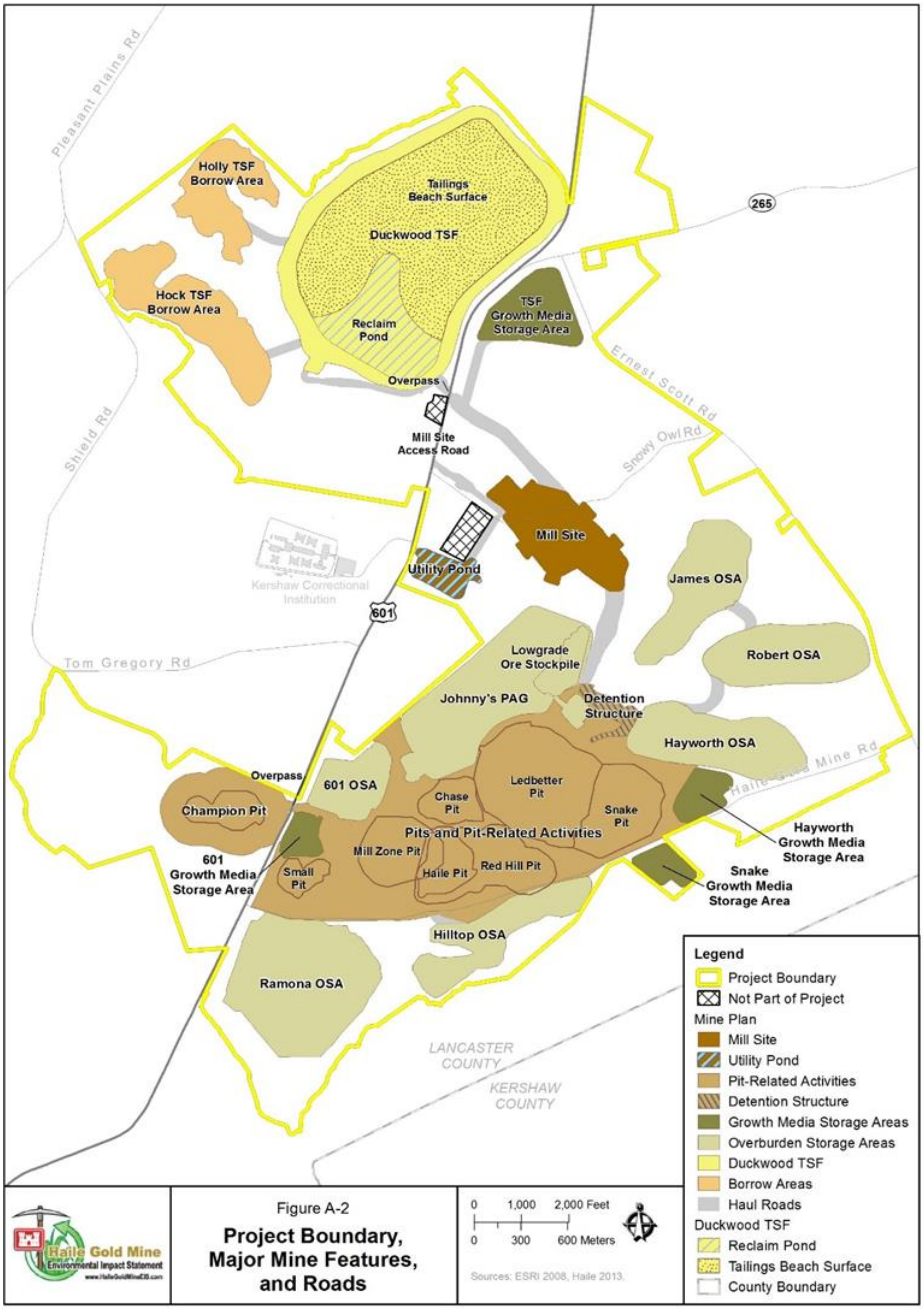


Figure 1: Haile Location in South Carolina

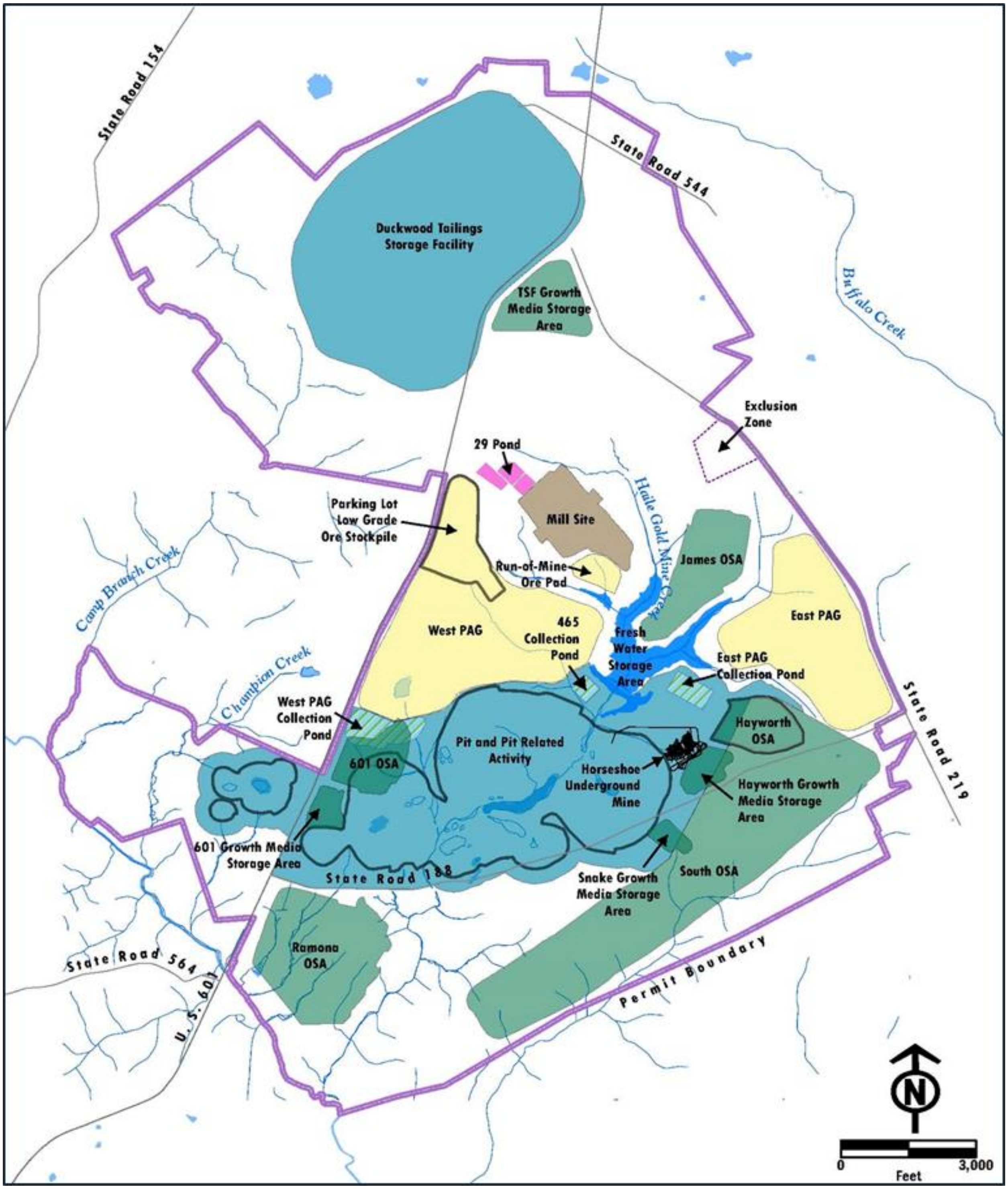
Romarco conducted extensive exploration, developed plans, and began permitting activity for reopening the mine with required permits issued in late 2014. The mine plan included eight open pits, five overburden storage areas (OSAs) (including one potentially acid generating (PAG) storage facility), one tailings storage facility (TSF), four growth media storage areas, a Mill and processing facility, and other ancillary facilities to support mining and processing activities. Many of the proposed mine facilities are (or will be) located at the site of historic mine pits and other previous mining facilities. OceanaGold Corporation (OceanaGold) acquired Romarco in 2015, following acquisition of the necessary permits for construction and operation of the mine.

The plan view Site map in Figure 2 presents the original mine plan facilities as permitted in 2014; Figure 3 shows the proposed mine expansion plan facilities; and Figure 4 shows post-reclamation and closure conditions at the Site based on the proposed mine expansion plan.



Source: Army Corp of Engineers, Haile EIS (2014)

Figure 2: Haile Gold Mine Project Area



Source: Army Corp of Engineers, Haile SEIS (2018)

Figure 3: Proposed Mine Expansion Plan Facilities

Source: OceanaGold SEIS (2019)

Figure 4: Post-Reclamation and Closure Conditions

1.3 PHYSICAL SETTING

The Site is located at 34° 34′ 46′′ N latitude and 80° 32′ 37′′ W longitude. The currently permitted mine plan encompasses approximately 4,552 acres of which approximately 2,612 acres would be disturbed. The proposed mine expansion plan covers an additional 832 acres (bringing the total permitted area to 5,384 acres) of which 3,863 acres will be disturbed.

Prior to mining, the area was characterized by gentle topography and rolling hills, dense networks of stream drainages, and red-brown saprolite soils. Soil data for the areas that may be used as sources for the growth media material indicates that most of the growth media material in this area is composed of Blanton Sand (Appendix A).

The Site topography is the result of dissection by two northeast to southwest-flowing streams, Haile Gold Mine Creek (HGMC) and Camp Branch Creek, and by their generally southeast and northwest-flowing tributaries. The Site is located primarily within the Southeastern Plains (Level III) -Sandhills (Level IV) ecoregion with the southern portions of the Site located within the Piedmont (Level III) -Carolina Slate Belt (Level IV) ecoregion (Grifith et al. 2008). The Site is located within the Lynches sub-basin watershed - Hydrologic Unit Code (HUC) 03040202.

HGMC is the principal stream at the Site. The HGMC drainage basin is approximately 3,000 acres (about 4.90 square miles) and is comprised of small drainage areas that divide the Site. Camp Branch Creek is the second main stream through the northern end of the mine. It has a drainage basin of approximately 2,733 acres (about 4.17 square miles) and includes numerous small tributaries. HGMC basin drains into the southeast-flowing Little Lynches River approximately one mile southwest of the Site and two miles downstream from the confluence of Camp Branch Creek and Little Lynches River. The Little Lynches River, in turn, drains into the Lynches River. A portion of the property is developed (with reclaimed/revegetated mine features) and is wooded with both natural and logged pine and hardwood forests. The elevation of the Site ranges from 350 feet above mean sea level (ft amsl) to 550 ft amsl.

2.0 RECLAMATION REQUIREMENTS

2.1 SITE-WIDE RECLAMATION PLAN

The Haile Gold Mine Reclamation Plan describes the reclamation of disturbed land from mining and ore processing operations to a stabilized condition that will provide for the long-term protection of land and water resources for post-mining land uses. Additional goals include:

- Reducing the environmental impacts of mining.
- Utilizing concurrent reclamation where appropriate throughout the mining process.
- Abating the generation of Acid Rock Drainage (ARD) from the sulfide materials exposed as a result of the mining operations.
- Actively treating and managing water collected from TSF and the Potentially Acid Generating (PAG) storage facilities during drain down.
- Minimizing the need for long-term active water management requirements through the conversion to and use of passive treatment technology at the TSF and the PAG storage facilities.
- Meeting state and federal regulatory requirements.

Refinements to the Reclamation Plan and bond will be provided to the South Carolina Department of Health and Environmental Control (DHEC) in accordance with SC Mining Regulation 89-200.

During mining operations, Haile will perform aspects of the final reclamation activities as part of operational activities. This concurrent reclamation is planned for stabilization and vegetation of the outboard slopes of the TSF and all green OSAs, for backfill and reclamation of certain mine pits, and for grading and reseeding areas where previously reclaimed facilities were removed. Final reclamation of the East and West PAGs, Green OSAs, portions of the TSF, remaining mine pits, and some mine roads and completion of the remaining revegetation efforts will begin once active mining ceases. Final reclamation and revegetation of the Mill Site, the remainder of the TSF, growth media storage areas, and remaining mine roads will begin immediately upon cessation of Mill operations. Reclamation will be completed as expeditiously as practicable and in compliance with South Carolina Mining Regulations 89-80.B:

> *"Reclamation shall be conducted simultaneously with mining whenever feasible and in any event, shall be initiated at the earliest practicable time, but no later than within 180 days following termination of mining on any segment of the mine and shall be completed within two years after completion or termination of mining on any segment of the mine."*

2.1.1 Vegetation Plan

Re-establishing vegetation on impacted lands will be essential to preventing erosion, restoring surface stability, enabling site productivity, providing wildlife forage/cover opportunities, and improving visual/aesthetic values at the Site during operations and reclamation. The vegetation procedures planned for the Site are based on industry standards, site specific experience in South Carolina, and past reclamation success. The Revegetation Plan is found in Appendix B, including Tables 1 and 2, which provide the proposed seed mixes.

Two seed mixes are proposed for use during reclamation. One is a standard seed mix, and the second is a wetland seed mix. Haile currently is not proposing any other plantings. All seed shall be certified free of noxious weeds. The standard seed mix was chosen based on species characteristics, varied soil conditions at the Site, and the planned land use and maintenance of the area. An annual grass is used in the mix, and the specific annual seeds used will change dependent on the time of year the planting is made. The primary goal of revegetation is soil stabilization while a secondary goal is to provide a habitat for wildlife and the natural succession of vegetation. The wetland seed mix will be used where wetlands and riparian areas are part of the reclamation and will result in a community of palustrine emergent wetland vegetation that likely will transition into the more typical characteristic forested wetland community through natural successional processes.

Based on previous experience at the Site, majority of the disturbed surfaces is suitable to sustain vegetation without the need to supplement the soil. Nonetheless, sufficient growth media will be stockpiled during mine development to fully reclaim the Site in accordance with South Carolina Mining Regulation 89-140. Where Haile, in conjunction with the State, determines that growth media is needed to establish vegetation, material will be withdrawn from these storage areas and used during reclamation activities.

Seeds of some vegetation may survive and be available for regeneration from the stored growth media. Haile's current experience with reclamation at the Site demonstrates that native vegetation will emerge at reclamation sites from wind-borne seeds or seed stock in the growth media soils.

During the mine operating period, Haile will consult with the South Carolina Department of Natural Resources (SCDNR) and DHEC; establish vegetation test plots and perform other studies to establish, confirm, and refine appropriate vegetation species and seeding rates; and determine the need for soil amendments and overall vegetation procedures to ensure sustainable vegetation post-closure for the intended land use.

Opportunities for concurrent reclamation are expected to arise within the first several years of expanded mining operation. Previous revegetation success and concurrent reclamation activities will be used to refine revegetation techniques throughout the mine life.

2.1.2 Proposed Facilities

The proposed facilities at the Site addressed in this Reclamation Plan include:

- Backfilled Mine Pits and Underground Mine
- Pit Lakes
- Green OSAs
- PAG storage facilities
- Site surface water management facilities
- TSF
- Mill Site and associated infrastructure
- Roads, on-site power lines, and other ancillary facilities

A plan view Site map that presents the proposed facilities and Site configuration at the end of mine life, prior to final reclamation and closure activities, is shown in Figure 2. Detailed discussion of each facility and the proposed reclamation activities for each facility is presented in Sections 2.3 through 2.9.

2.1.3 Post-Mining Land Use

Consistent with the individual locations that will be reclaimed, and as described in Sections 2.3 to 2.9, the goal of Haile's Reclamation Plan is to return the disturbed areas to a stable condition that can support a productive post-mining land use. After reclamation, assuming such uses are consistent with local zoning laws, most of the Site will be suitable for other uses (i.e., industrial, commercial, residential, and agriculture & forestry), restored to a natural condition (i.e., re-vegetated with re-established wetlands and streams), or reclaimed as pit lakes. Future activities at the TSF and the PAG storage facilities will be limited, consistent with post-closure restrictions. See Figure 5, below.

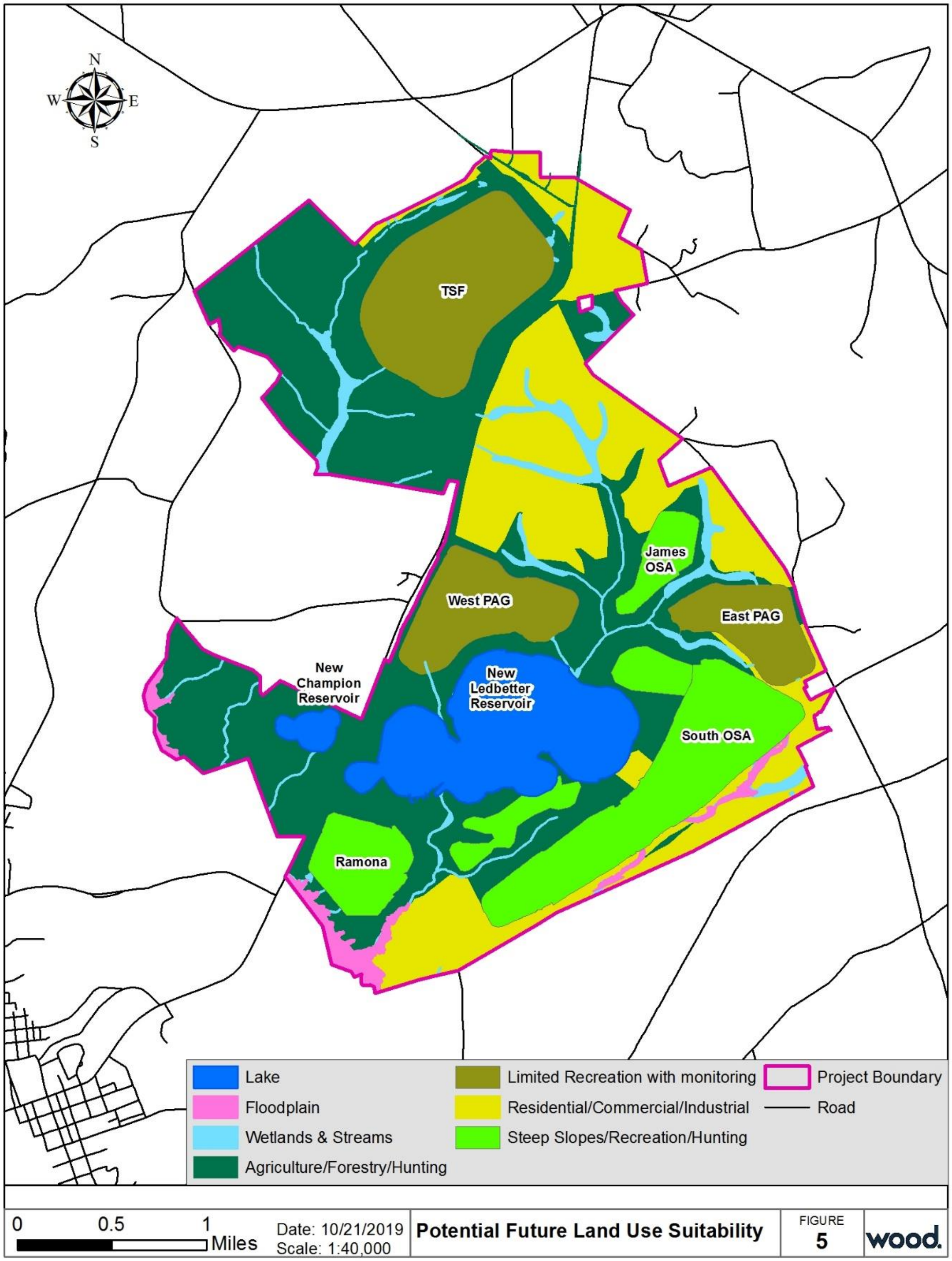


Figure 5: Potential Future Land Use Suitability

2.2 MATERIAL HANDLING REQUIREMENTS

Haile prepared an Overburden Management Plan (OMP) (Schafer, 2015), Baseline Geochemistry Report (Schafer, 2010a), and Addendums to the Baseline Geochemistry Report (Schafer 2010b, Schafer 2012, Schafer 2013a, and Schafer 2019b). These documents address the identified significant differences in the acid generating potential and metal leaching risk of different rock units at the Site. Overburden materials were further subdivided into the material classes defined in Table 1. The OMP presents a plan for classifying overburden based upon its acid generating potential and was used as a guideline for developing operational procedures and reclamation methods to identify, manage, and mitigate the geochemical risk of adversely impacting surface and groundwater resources.

Table 1: Overburden Classification at Haile Gold Mine

Operational Testing Criterion	Abundance	Characteristics	Proposed Management
Red PAG - strongly acid generating overburden			
Net Neutralization Potential (NNP) < -31.25 kg/t as CaCO3	About 38 % of Laminated Unit	When oxidized, contact water will have low pH (< 3.0) and very high metals, sulfate and acidity (>5,000 mg/L)	Stored in geomembrane encapsulated PAG cell, placed in lifts, compacted and Saprolite-lined outside perimeter to reduce oxygen
Yellow PAG - moderately acid generating overburden			
Total Sulfur greater than 0.2 % or NNP < 0 and NNP > -31.25 kg/t as CaCO3	About 22 % of Laminated Unit, 6% of Metavolcanic unit, and 5% Saprolite	If allowed to oxidize, contact water will have low pH (3.0 to 4.0) and low to moderate metals (mostly Fe & Al)	Managed as Red PAG early in mine life before completing first pit, then placed in lifts with lime (as needed) as subaqueous pit backfill
Green Overburden - not acid generating			
Total Sulfur less than 0.2 % and NNP > 0 kg/t as CaCO3	About 40 % Laminated Unit, 94 % Metavolcanics, 95% Saprolite and all Coastal Plain Sand	Contact water may have moderately acidic to alkaline pH (4.0 to 8.0), sulfate low (<1,000 mg/L) metals non- detectable.	Placed in unlined OSAs. Runoff will not require treatment assuming it meets stormwater requirements as expected

NNP Net Neutralization Potential

2.3 BACKFILLED MINE PITS

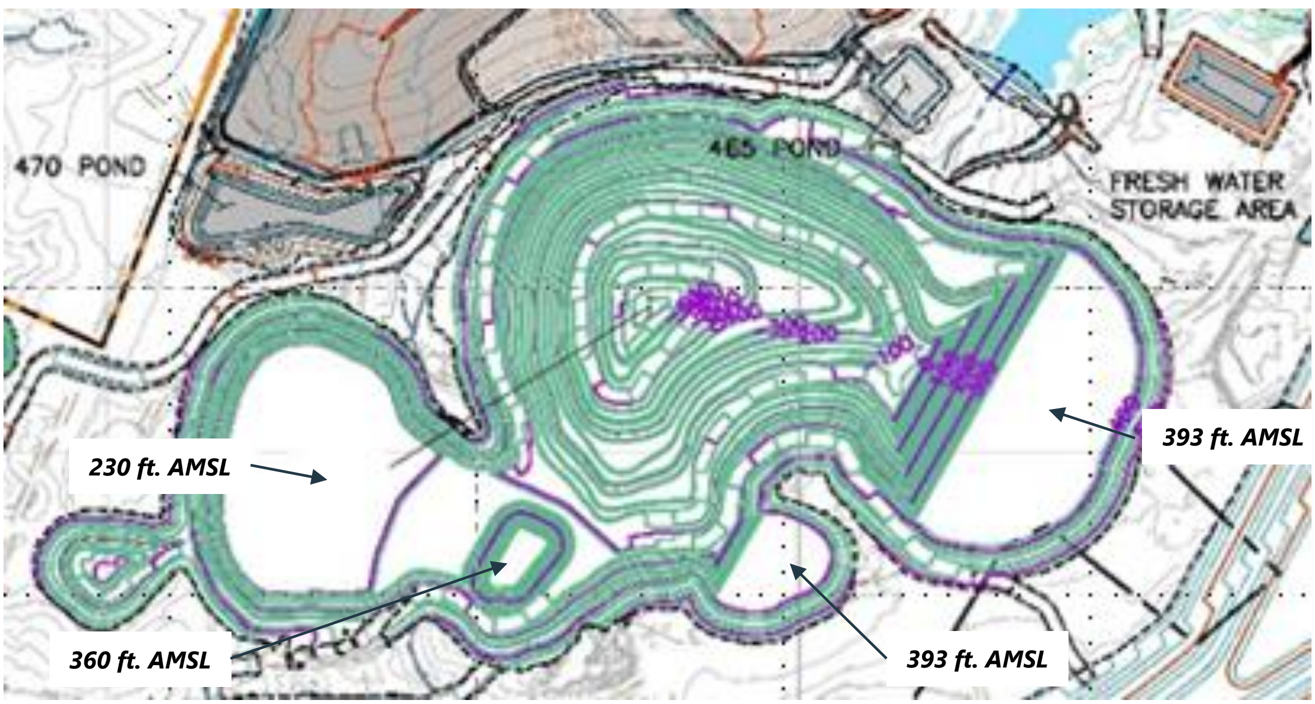
Material has been, or will be, extracted from six mine pits: Mill Zone, Snake, Red Hill, Haile, Ledbetter, and Champion. The final excavation of Mill Zone, Haile, Red Hill, Snake, and Ledbetter will form a combined pit complex.

Table 2: Open Pit Development at Haile Gold Mine

Open Pit	Approximate Surface Area Disturbance (acres)	Approximate Final Pit Floor Elevation* (ft. Mean Sea Level)
Mill Zone Pit - Phase 1	60.0	30 AMSL
Snake Pit - Phase 1 and 2	88.1	- 20 BMSL
Red Hill Pit - Phase 1	47.5	95 AMSL
Haile Pit - Phase 1	42.5	160 AMSL
Snake Pit - Phase 3	57.3	- 300 BMSL
Ledbetter Pit - Phase 1 through 4	163.46	- 690 BMSL
Mill Zone Pit - Phase 2*	65.2	- 310 BMSL
Champion Pit - Phase 1 and 2	41.2	145 AMSL

* Notes:
AMSL – Above Mean Sea Level   BMSL – Below Mean Sea Level

Mill Zone, Snake, Haile, and Red Hill are backfilled with overburden (See Figure 6 and Table 3) to an elevation below original contour. After these pits reach planned depths, mining in them will cease and the pits will be backfilled as part of overburden placement taken from mining of other pits during operations.



Source: Haile Gold Mine (2019)

Figure 6: Pit Backfill Elevations

Table 3: Mine Backfill Material and Elevations

Open Pit	Backfill Material	Final Backfill Elevation (ft.)
Mill Zone Pit	Green and Yellow	230 AMSL
Snake Pit	Green and Yellow	393 AMSL
Red Hill Pit	Green and Yellow	393 AMSL
Haile Pit	Green and Yellow	360 AMSL
Horseshoe Underground	Cemented Green	Internal to Each Stope
Ledbetter Pit	None	None
Champion Pit	None	None
Final Elevation of Pit Lake		403 AMSL

Overburden classified as Yellow Class will be placed as pit backfill. Special precautions are taken when placing Yellow Class overburden in the pits to ensure that this material is permanently inundated with water following the cessation of depressurization pumping. As Yellow Class overburden is placed in the pit as backfill, it will be amended with lime at a rate of 2 lbs. per ton of overburden. The overburden backfill in the mine pits will be constructed and left at the angle of repose, which is approximately 1.5H: 1V. The pit backfill will be constructed with lift heights no greater than 50 feet. Any exterior slopes will be constructed with an overall slope of 3H: 1V or flatter using benches and angle of repose inter-bench slopes.

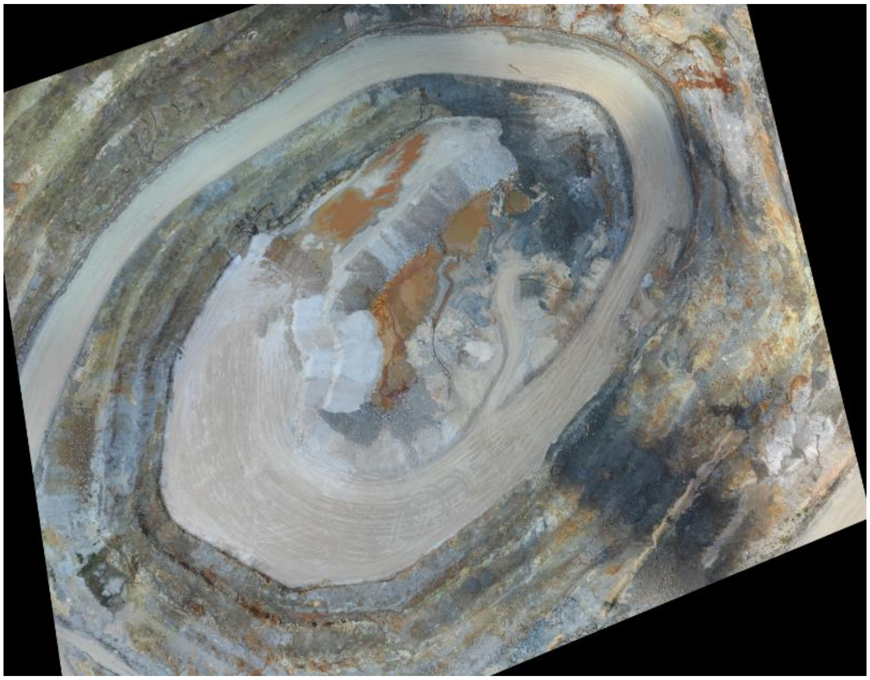
Final reclamation of the backfill will entail contouring the surface with a thin layer (3 to 5 ft.) of green backfill. The top of the backfill will be regraded to minimize impoundment of storm waters and concentration of storm water flow. Occasional large boulders that are uncovered during regrading may be left on the surface to provide topographic diversity, microhabitats for wildlife and vegetation, and to break the linear appearance of the final slope. Ultimately, all backfill will be covered by New Ledbetter Reservoir.

The sloped area to New Ledbetter Reservoir will be seeded using an approved seed mix and appropriate seeding methods. See Section 2.1.1, Vegetation Plan.

A reclamation approach for each pit has been designed to best suit the location, geometry, and timing of mining within the scope of the current mine plan and reclamation concepts. A description of the reclamation approach for each backfilled mine pit is presented below.

2.3.1 Mill Zone Pit

Mill Zone Pit is the first pit to be mined and forms the western lobe of the pit complex. Mining in Mill Zone Pit began in 2015 and extends into 2019. The Mill Zone Pit area mine plan calls for significantly backfilling Mill Zone to approximately 230 ft. amsl, which is about 173 feet below the ultimate Ledbetter Pit Lake water level of 403 ft. amsl (once it reaches equilibrium). Backfill of Mill Zone Pit was initiated in 2019 and will be completed in approximately 2031. See Figure 7: Aerial View of Mill Zone Pit Backfill Benches. The process for backfilling the pit is in a bottom-up progression, where the pit edges can be used to contain the deposited material. Yellow material is mixed with lime to fill the pit floor and then around the edges, leaving a sump in the center for water removal to the Contact Water Treatment Plant. As the filling continues, material is dumped along the edge, the dozer pushes the pile to the center.



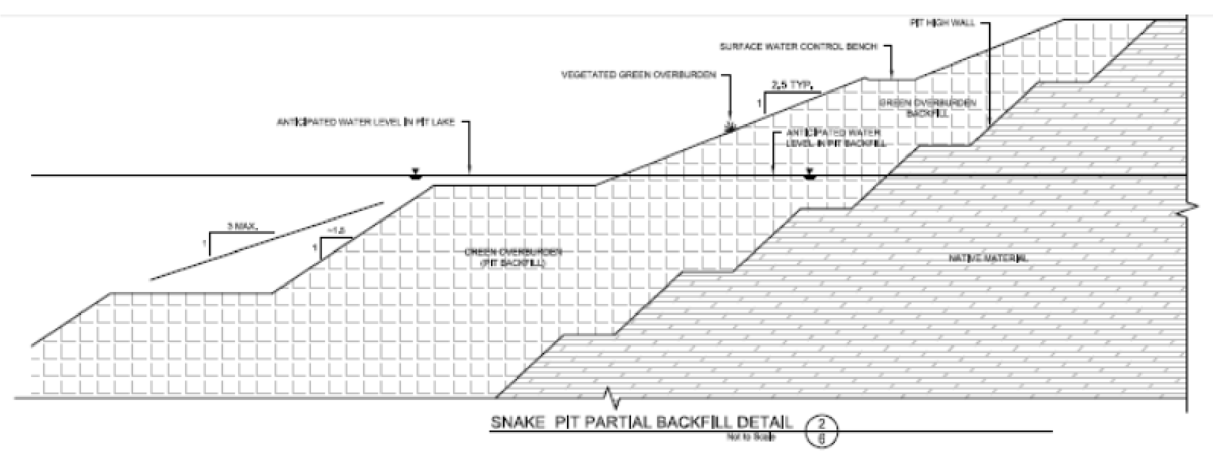
Source: Haile Gold Mine (2019)

Figure 7: Aerial View of Mill Zone Pit Backfill Benches

2.3.2 Snake Pit

The Snake Pit forms the eastern lobe of the pit complex. The Snake Pit will be backfilled to approximately 393 ft. amsl and will be approximately 10 ft. below the ultimate New Ledbetter Reservoir water level.

The western side of the pit will not be backfilled due to safety issues associated with mining activities at the bottom of the adjacent Ledbetter Pit. See Figure 8: Snake Pit Backfill Detail. Backfilling activities will begin immediately after ore in the Snake Pit is exhausted in approximately 2023, and all backfill activities will be completed in approximately 2029.



Source: Haile Gold Mine (2019)

Figure 8: Snake Pit Backfill Detail

2.3.3 Red Hill Pit

The Red Hill Pit forms the eastern lobe of the southern portion of the pit complex. The Red Hill Pit area will be backfilled to approximately 393 ft. amsl and will be approximately 10 feet below the ultimate New Ledbetter Reservoir water level. Backfilling activities will begin immediately after ore is exhausted in approximately 2020, and all backfill activities will be completed in approximately 2026.

2.3.4 Haile Pit

The Haile Pit forms the southern portion of the pit complex. The Haile Pit area will also be backfilled to approximately 360 ft. amsl and will be approximately 43 feet below the ultimate New Ledbetter Reservoir water level. Backfilling activities will begin immediately after ore is exhausted in approximately 2020, and all backfill activities will be completed in approximately 2026.

2.3.5 Horseshoe Underground

Horseshoe Underground is at the north end of Snake Pit. Each stope of the underground operations will be backfilled with green overburden as part of concurrent reclamation and normal progressive level. The void will be backfilled with a cemented mixture on each level with an open void left on the top layer of the last stope. The portals will be sealed, and groundwater will inundate the decline and ventilation drifts. Ultimately, the Horseshoe Underground will be under New Ledbetter Reservoir.

2.3.6 Ledbetter Pit

The Ledbetter Pit is the largest of the pits and is the center of the inter-connected pit complex. Mining in the Ledbetter Pit will begin in 2022 and will be completed in 2031. The Ledbetter Pit will not be backfilled, which will result in a pit lake at the cessation of mining.

The intersection of Haile Gold Mine Creek and the local groundwater regime indicate that a stable pit lake will form and will limit the generation of acidic drainage from the pit highwalls. The estimated surface oxidation within the Ledbetter Pit, which is believed to be the upper extent of acid generating materials, is located below the inundation level.

2.3.7 Champion Pit

Champion Pit is the last pit to be mined and is located on the west side of Highway 601. Mining in Champion Pit begins in 2029 and will be mined for two years, ending in 2030. The Champion Pit[1] will not be backfilled, which will result in a pit lake at cessation of mining.

2.4 PIT LAKES

Ledbetter and Champion Pits will not be backfilled during operations and will be reclaimed as pit lakes with Ledbetter Pit serving as a significant portion of the larger New Ledbetter Reservoir. In this report, "Pit Lake" is used while the pits are filling. Once the water level has stabilized, the naming convention will be converted to "Reservoir".

To ensure safety around the pit lakes, Haile will (1) fully connect the safety berm constructed around most of the perimeter of each pit during operations (except for where the ramp leads into the pits); (2)

[1] Champion is two separate pits that become two separate Pit Lakes during closure – Champion Pit Lake (17 acres) and Champion Southwest Pit Lake (4 acres). Whenever this Plan refers to Champion Pit Lake, it intends to refer to both Champion Pit Lake and Champion Southwest Pit Lake, unless the text clarifies otherwise.

construct fencing around the pit lakes during reclamation; and (3) place appropriate signage at regular intervals on the berm warning of the hazards of the pit highwall and pit lake.

The New Ledbetter Pit Lake will collect water from groundwater, direct precipitation, runoff from highwalls, and some surface water diverted from upper Haile Gold Mine Creek. See Section 2.10.7 for a discussion of the Ledbetter Infill and Diversion Structure that will redirect a portion of flow from Haile Gold Mine Creek for filling Ledbetter Pit Lake. Haile anticipates that it will take approximately 57 years after active mining ceases to fill Ledbetter Pit Lake.

Champion Pit Lake will collect water from groundwater, direct precipitation, and runoff from highwalls, and is expected to take approximately 55 years to fill after active mining ceases, without the benefit of any diverted stream flow. Champion Southwest Pit Lake is predicted to fill in approximately 68 years but is not expected to reach the spill point and therefore will not discharge to adjacent surface water drainages. The water quality will be monitored and managed to ensure it meets applicable requirements. Lime will be added, as necessary, to maintain both pit lakes consistent with background pH levels.

Pit lake water quality studies have been performed based on pre-mining information (Schafer, 2018). They indicate that water quality in the three pit lakes will meet water quality standards. With lime addition, all pit lakes can be maintained consistent with background pH levels.

During operations, as additional information is acquired related to acid generating characteristics of the pit walls and refined groundwater modeling, an additional pit lake study will be performed to refine the predictions of the quantity and water quality of the expected pit lakes before mine closure.

The original topography in the vicinity of New Ledbetter Pit Lake will not allow the entire extents of the pit wall to be inundated. A small portion of pit highwall is expected to remain exposed above the final pit lake.

Upon the filling of Ledbetter Pit Lake, the Freshwater Detention Dam is expected to be breached and the entire flow of Haile Gold Mine Creek will be directed through an engineered inlet structure into New Ledbetter Reservoir with flows exiting the reservoir through an engineered outlet structure into the re-established downstream channel constructed over the backfilled pits and into Lower Haile Gold Mine Creek. The engineered outlet structure will be designed in cooperation with DHEC.

During pit filling and until stability has been achieved, the pit lake water quality in the New Ledbetter Reservoir will be monitored and managed by Haile to ensure water quality meets applicable requirements. Lime will be added, as necessary, to maintain the pit lake background pH levels. Haile currently estimates that lime will be added over the course of the entire 57 years of infilling.

2.5 OVERBURDEN STORAGE AREAS

Upon cessation of mining at the Haile Gold Mine Site, approximately 357 million tons of overburden will be stored in the OSA's. West PAG (which incorporates the existing Johnny's PAG) and East PAG will store a total of about 150 million tons of PAG material, including all Red PAG generated at the site and any Yellow PAG not used as pit backfill. Three Green OSAs (Ramona, James, and Hayworth / South OSAs) will store approximately 207 million tons of non-PAG (or Green) material. Figure 3 shows the location of the two PAG facilities and three Green OSAs.

The proposed mine mass balance for developing the two PAG facilities and three Green OSAs is shown in the Table 4. Final reclamation of the individual OSAs can begin as soon as active placement of overburden on each individual facility ceases. Haile also will concurrently reclaim inactive portions (areas that have met their target capacity) of the OSAs that will not be subject to future disturbance and can do so without adversely impacting mining operations or operator safety. The Green OSAs are anticipated to be reclaimed and closed prior to the end of mining and milling operations, and the East PAG facility will be reclaimed when active mining ceases. Because the West PAG facility will store low grade ore to be processed at the Mill after active mining ceases, that facility cannot be closed until after milling operations cease.

Table 4: OSA Development

Overburden Storage Area	Potential Acid Generation Class	Planned Loading (M Tons)	Base Foot Print (acres)	Notes
Johnnys / West PAG	Yellow / Red	95.8	370	1
East PAG	Yellow / Red	54.3	145	4
601 OSA	Green	2.2	42	6
Ramona OSA	Green	39.9	150	2
James OSA	Green	14.7	66	
Hayworth / South OSA	Green	152.4	442	5
Underground and Pit Backfill	Yellow / Green	113.5	N/A	7
TSF Growth Media	Green	3.3	56	10
601 Growth Media	Green	1.2	15	10
Snake Growth Media	Green	1.0	13	10
Hayworth Growth Media	Green	1.5	19	10
TSF	Green	56.6	153	8/9
Total		527.2	1,590	

Notes:

1. JPAG is being consumed into West PAG.
2. Ramona OSA height is reduced after performing additional geotechnical stability studies.
3. Hilltop OSA is eliminated.
4. Robert OSA is converted into East PAG.
5. Hayworth OSA is consumed into South OSA in 2020.
6. 2.2 M tons of Green overburden has been placed on 601 OSA. This OSA will be partially mined during Mill Zone Phase 2 therefore, no additional material has been planned for this facility.
7. Underground and Pit Backfill has no additional foot print other than the individual Mine Pits.
8. TSF lifts will be green material generated from active mine pits.
9. Disturbance Area is only for the extended TSF footprint.
10. GMSAs are not accounted for in TOTAL line as material will be re-handled onto OSAs and is already accounted for in those tonnages.

Source: Haile 2018.

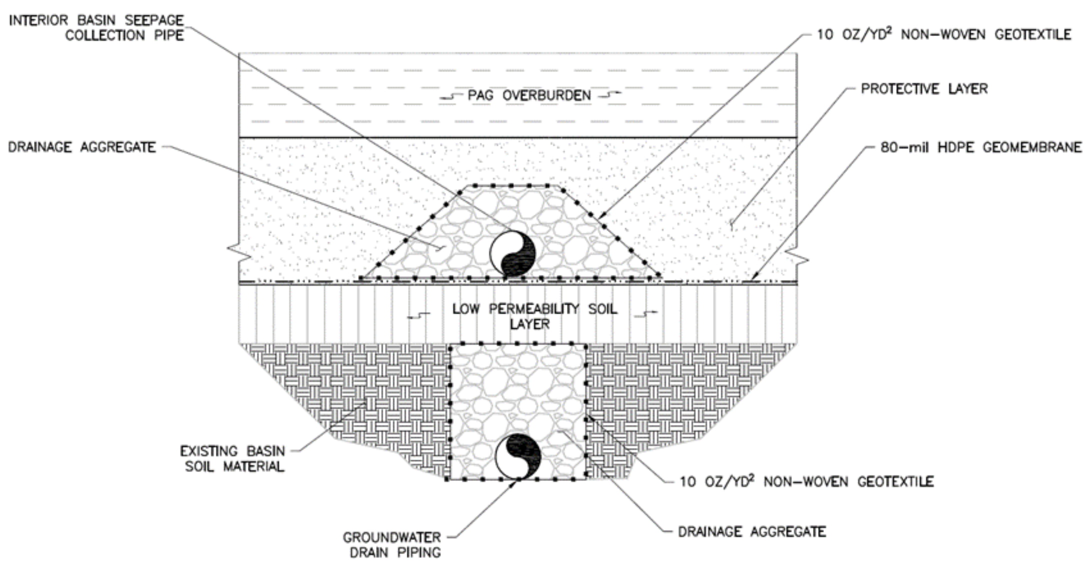
2.5.1 East and West PAG Overburden Storage Area

The West PAG facility (which incorporates the current Johnny's PAG) will be located northwest of the Ledbetter Pit. The East PAG facility will be located east of the Fresh Water Storage Area (FWSA) and north of the South OSA. The two PAG facilities will contain all of the red overburden and any yellow overburden material that is not placed in the pit backfills (see Section 2.3).

Additionally, material from prior mining operations, including spent ore from the existing Chase and South Heap Leach Pads will be placed in the West PAG facility. PAG Material from historic overburden facilities and backfill material from previously backfilled pits that are within the proposed pit footprints will be placed in the West PAG facility. Note there were historic overburden heap leach pads (188 Dump, Snake Pad, South Pad, and Chase Pad) that have been mined out and placed in the Johnnys PAG facility. These will ultimately be incorporated into the West PAG facility.

The West PAG and East PAG facilities will be constructed with an underdrain collection piping system that sits on top of an 80-mil thick, HDPE geomembrane liner underlain with low permeability soils to minimize hydraulic head on the liner, and contain and route seepage to HDPE-lined collection ponds: the 465 and 470 Collection Ponds for the West PAG facility and the 500 Collection Ponds for the East PAG facility. Water collected in these ponds will be piped to the contact water treatment plant.

Figure 9 shows a typical cross section of the PAG facilities underdrain collection system. The HDPE liner would be overlaid with two (2) feet of sand, to protect the liner during operations and removal of the low-grade ore stockpile for processing at the Mill. Collection channels are built within the HDPE-lined facility and surround the PAG facilities to divert untreated surface runoff and seepage from the PAG material to HDPE-lined collection ponds that have been sized to capture the 100-year 24-hour precipitation event. "French drains" with collection pipes are installed below the liner to collect and route groundwater away from the facility.



Source: NewFields (2019)

Figure 9: Typical Cross Section of PAG Facilities Underdrain Collection System

2.5.1.1 Final Grading

During placement of material on the West and East PAG facilities, the overall slope will be constructed at 3H:1V or flatter using benches and angle of repose inter-bench slopes. During operations, mine equipment will add saprolite on the bench faces to lower the inter-bench slopes to 2.5H:1V or flatter. Benches will remain to provide runoff control and limit erosion on the slope face. Any portion – estimated to be approximately 50% – of the PAG that can be safely accessed without impacting overburden placement will be regraded in this manner concurrent with mining activities.

Once final reclamation has begun, any remaining regrading will be performed to achieve the above configuration on all overburden slopes. Additionally, access ramps will be removed or reduced, the top surface will be regraded to promote drainage and minimize erosion, and any additional surface water controls features that are needed for post-closure will be shaped into the overburden surface. Specifically, the benches will be graded to slope back towards the 2.5:1 slope to collect the stormwater in the drainage terrace channel, which directs the flow towards the armored downslope channel off the PAG. Regrading will ensure that the saprolite cover placed over the top and sides of the facility remains intact. During final grading, large boulders that are uncovered during sloping will be buried or removed to ensure a smooth surface for liner placement.

2.5.1.2 Geomembrane Foundation Preparation

The top surface of the regraded PAG will be covered with a minimum five (5) feet of saprolite cover. This top cover along with the 5-foot wedge of saprolite cover on the perimeter slopes and benches will function as the foundation for the geomembrane liner. The geomembrane foundation will be prepared and smooth rolled to provide an even surface for the geomembrane placement. The saprolite cover will be inspected prior to placement of the liner to remove or bury sharp rock protrusion that may damage the liner.

2.5.1.3 Geomembrane Cover

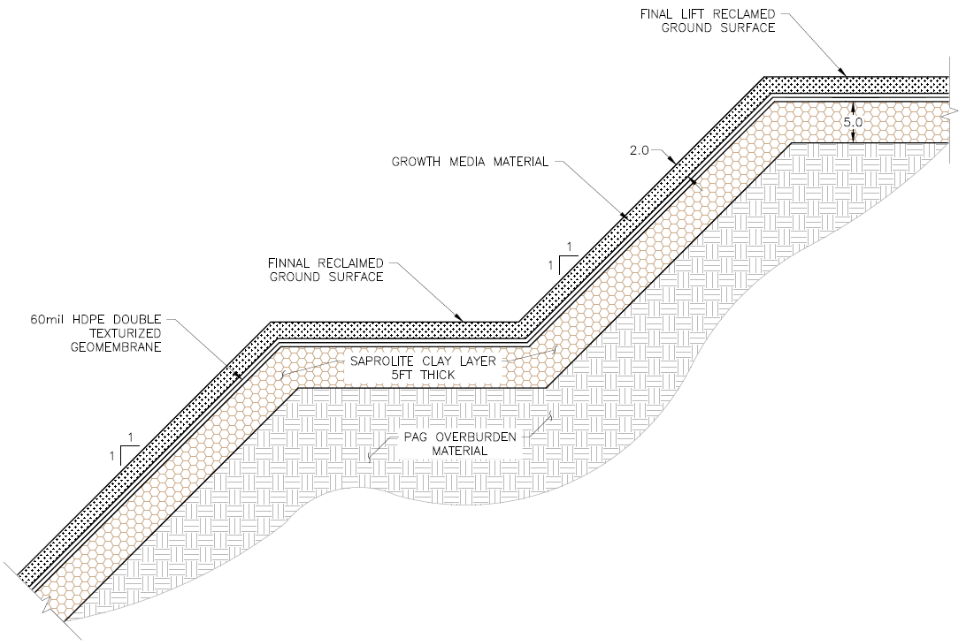
The entire surface of both PAG facilities will be covered with a double textured 60-mil HDPE geomembrane to limit the infiltration of water and restrict oxygen movement. The geomembrane will be anchored as necessary to provide suitable stability on the OSA slopes and will be sealed to the geomembrane liner exposed at the base of the PAG. Approximately 18 million square feet of liner will be required to cover both PAG facilities. See next section for Figure 13: Typical Green Overburden Area Cover Detail.

2.5.1.4 Growth Media and Vegetation

The geomembrane will be covered with a minimum of two (2) feet of growth media to protect the geomembrane from damage, UV radiation, and freezing, and to provide a soil layer for establishing vegetation. Material from growth media storage areas will be placed on the liner using low ground pressure equipment to avoid damage to the geomembrane. The final surface will be vegetated with an approved seed mix and established seeding methods. See Section 2.1.1, Vegetation Plan. OceanaGold will minimize and control woody growth on both PAG facilities via chemical application (i.e., spot spraying) and/or mechanical (i.e., bush hogging) every two to five years, or as otherwise required by DHEC.

Figure 10: Typical Cross Section of PAG Facilities After Reclamation

Figure 10 provides a typical cross-section of the PAG facilities after reclamation. Approximately 1.3 million cubic yards (CY) of growth media will be required to cover the West and East PAG facilities and 413 acres will require revegetation.

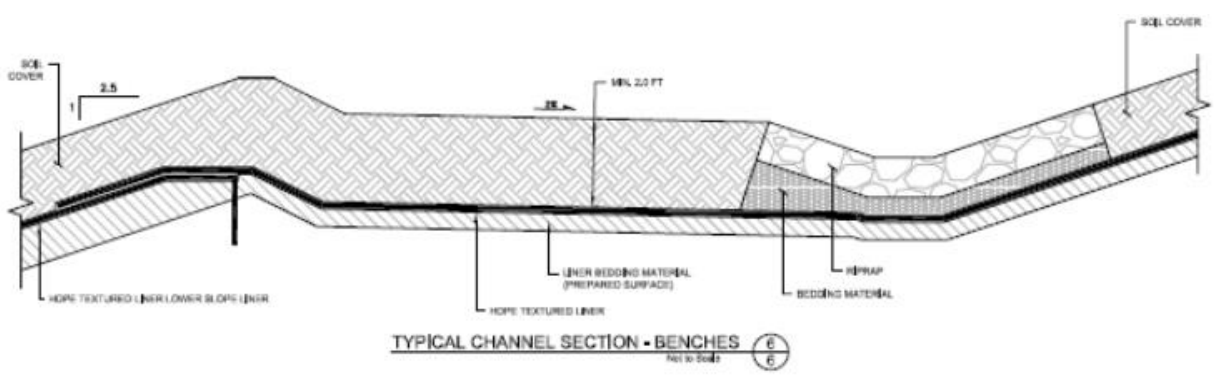


Source: Wood (2019)

Figure 10: Typical Cross Section of PAG Facilities After Reclamation

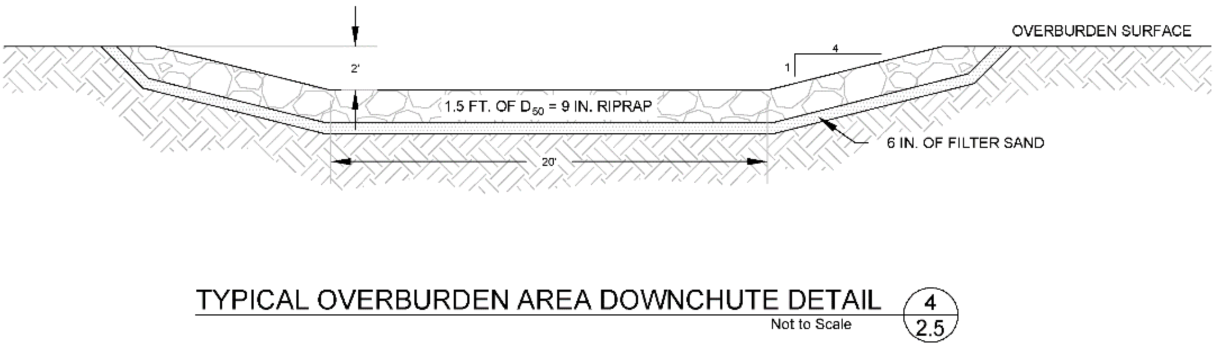
2.5.1.5 Surface Water Controls

During final grading, the surface will be graded to convey runoff from the top and benches towards armored channels located at multiple locations on the PAG. The grading will allow the geomembrane to be placed on the foundation while the full thickness of growth media can be maintained under riprap and filter zone of the channels so that runoff from the PAG can freely enter the channel. Approximately 12,800 feet of armored channel and energy dissipaters will be required to convey surface water flows from the PAG facilities. A typical bench / channel configuration is shown on Figure 11. A typical detail of a PAG/OSA down-chute channel is shown in Figure 12.



Source: NewFields (2019)

Figure 11: Typical Cross Section of Bench / Channel Configuration



Source: NewFields (2019)

Figure 12: Typical Cross Section of Overburden Area Down Chute Detail

2.5.1.6 Post-Closure Water Treatment/ Passive Treatment Cell

After the geomembrane cover is installed in 2031 and infiltration into the PAG is cut off, seepage from the West PAG facility will report to the HDPE-lined 465 and 470 Collection Ponds and from the East PAG facility into HDPE-lined 500 collection pond at a low flow rate and be of poor quality for an extended duration. However, the quantity of seepage is expected to decrease quickly once the HDPE cover is installed and additional precipitation is prevented from infiltrating the PAG material. Haile anticipates that the long-term treatment of this reduced flow will be performed using a passive treatment facility, and that the PAG seepage will transition to passive treatment systems in approximately 2037 (or approximately 5 years after closure). Unless and until the flow is capable of being treated by passive technology, OceanaGold will use the on-site contact water treatment plant to treat and discharge the seepage from the PAG facilities.

Construction and operation of the proposed passive wastewater treatment facility will be regulated by the DHEC. In accordance with South Carolina Regulations 61-67 (Standards for Wastewater Facility Construction), a permit is required prior to commencement of construction of treatment facilities. This permit application must include the engineering design and demonstrate the capability of the system to meet the effluent limitations for the Land Application Permit. Upon completion of construction, and after a final inspection by DHEC, a permit to operate must be issued prior to commencing the passive treatment operation.

OceanaGold expects that these passive treatment systems, constructed within the HDPE-lined collection ponds, will treat the seepage using an anaerobic (no-oxygen) treatment cell filled with organic media containing beneficial bacteria followed by an aerobic (with oxygen) polishing treatment cell and discharge to Haile Gold Mine Creek. The collection ponds currently proposed for the PAG facilities will be of sufficient size to contain a passive treatment system capable of addressing the effluent from their portion of the PAG.

Passive systems use gravity to move the water. Due to the passive (no pumping) nature of the system, the maintenance is expected to be minimal. The media in the cells may require replacement every 20 years or so, depending on the functionality of the cells.

2.5.2 Green OSAs

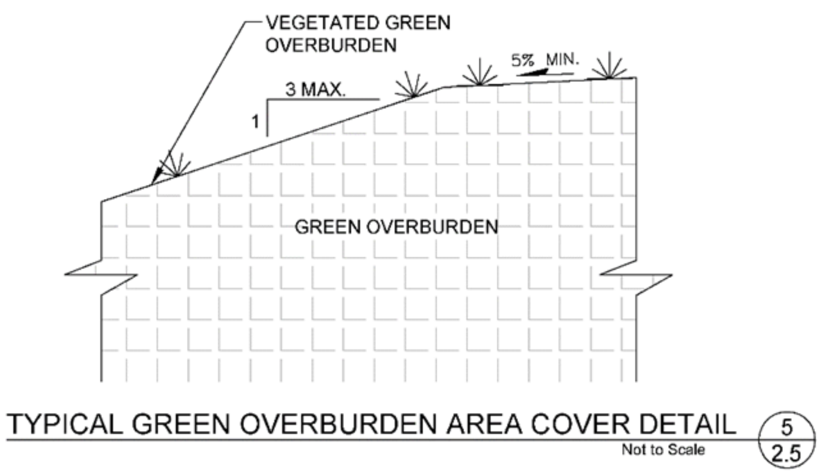
There are three OSAs proposed for the Site that will contain only green overburden material or other inert materials produced by the mine - Ramona, James, and South OSAs. Once placement on any green OSA has ceased, final reclamation of that facility will begin. However, approximately 50 percent of an overburden area can be concurrently reclaimed while active operational placement occurs on other portions of the overburden area. (i.e., by the time Haile has finished filling an OSA, it should already be at least 50% reclaimed).

These Green OSAs will be constructed in phases, as dictated by the generation of green overburden material during mine operations.

2.5.2.1 Final Grading

During placement of material on the Green OSAs, the overall slopes will be constructed at 3H:1V or flatter using benches and angle of repose inter-bench slopes. During operations, mine equipment will push the angle of repose benches down to lower the inter-bench slopes to 2.5H:1V or flatter. Benches will remain to provide surface water control to limit erosion from the slope face. Any portion of the OSA that can be safely accessed without impacting overburden placement will be regraded, followed by storm water control installation, and revegetated concurrent with mining activities.

Once final reclamation of a facility has begun, any remaining regrading will be performed to achieve the above configuration over the remainder of the OSA slopes. Additionally, access ramps will be removed or reduced, the top surface will be regraded to promote drainage and minimize erosion, and any additional surface water control features that are needed for reclamation will be shaped into the overburden surface. Specifically, the benches will be graded to slope back towards the 2.5:1 slope to collect the stormwater in the drainage terrace channel, which directs the flow towards the armored downslope channel off the OSA. (See Figure 13 below) During final grading, occasional large boulders that are uncovered during sloping may be left on the surface to provide topographic diversity, microhabitats for wildlife and vegetation, and to break the linear appearance of the final slope.



Source: NewFields (2019)

Figure 13: Typical Green Overburden Area Cover Detail

2.5.2.2 Vegetation

The surface of the OSAs will be seeded using an approved seed mix and appropriate seeding methods. See Section 2.1.1, Vegetation Plan. The approximate areas requiring vegetation are shown in Table 5.

2.5.2.3 Surface Water Controls

Final grading will include sloping and developing the existing benches to convey runoff towards armored channels at multiple locations on the Green OSAs. The grading will allow runoff from the OSA to freely enter the channel. Estimated channel and energy dissipater lengths to convey surface water flows from the OSA surfaces are shown in Table 5.

Table 5: Green OSA Quantities

Overburden Storage Area	Revegetation Area (acres)	Armored Channel Length (ft)
Ramona	145	4200
South	450	3700
James	77	1850

2.6 SITE SURFACE WATER MANAGEMENT

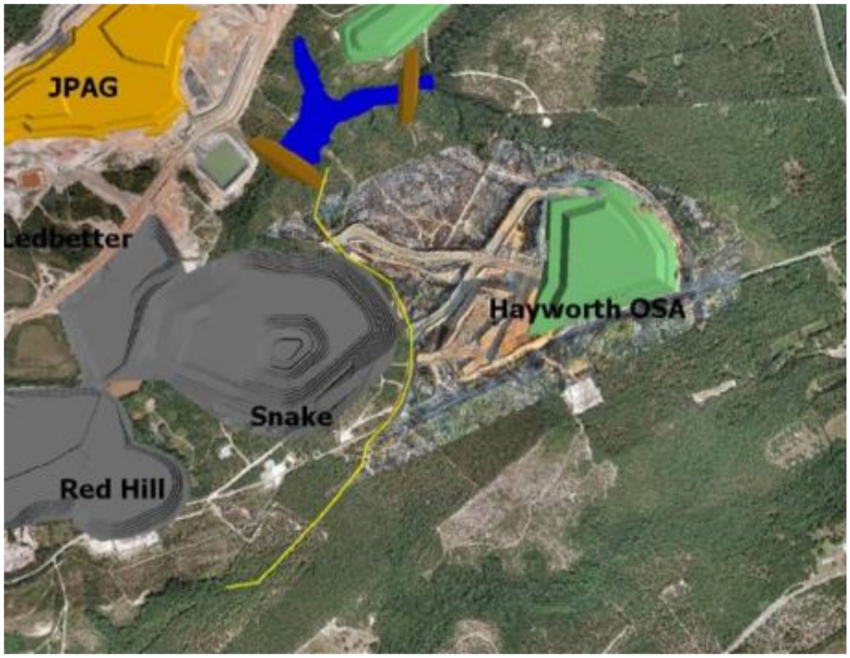
The area in and around the Site is characterized by a number of drainages that are tributary to Haile Gold Mine Creek (HGMC) and Camp Branch Creek, which both ultimately flow into the Little Lynches River. The design and location of the mine facilities has focused on minimizing the impact to existing drainages around the Site. However, the pit complex south of the Mill Site and the Fresh Water Storage Area (FWSA) and pipe diversions will directly impact the main HGMC channel and the North Fork Creek channel during operations. One objective of the Reclamation Plan is to return HGMC to stable post-mining configurations.

2.6.1 Storm and Contact Water Controls and Routing

Key facilities (PAG Cells, OSA's, GMSA's, Process Plant) are constructed and/or proposed at the Site are located out of the major drainages of HGMC and are generally located near the headwaters of the small drainages, which are tributary to HGMC. During initial construction, surface water diversions were constructed around these facilities to divert non-contact runoff around the facilities and into existing drainages. These channels and or pipelines were constructed to convey the flows from both run-on and reclaimed facility runoff from the 100-yr, 24-hr storm event. The channels provide adequate storm water control during operation and reclamation, and may remain in-place, where necessary, as a post-mining feature. With the proposed facilities, the surface water diversion will be constructed similar to the original facilities diversion and are designed to convey the runoff from a 100-yr, 24-hour storm event.

2.6.2 Haile Gold Mine Creek

The development and active mining of the Mill Zone, Haile, Red Hill, Snake and Ledbetter Pits will impact stretches of HGMC. During 2019, flow of upper HGMC through historic Ledbetter Reservoir ceased, and the temporary HGMC around Snake Pit commenced. The diverted flow is pumped through pipes that originate in the Fresh Water Detention Dam – coffer dam . These pipes are routed around Snake Pit and Red Hill Pit and discharge to the Unnamed Tributary that ultimately flows into the natural drainage of HGMC downstream of the active mining pits. See Figure 14 below.



Source: Haile Gold Mine (2019)

Figure 14: Location of the Haile Gold Mine Diversion Pipe (Yellow Line)

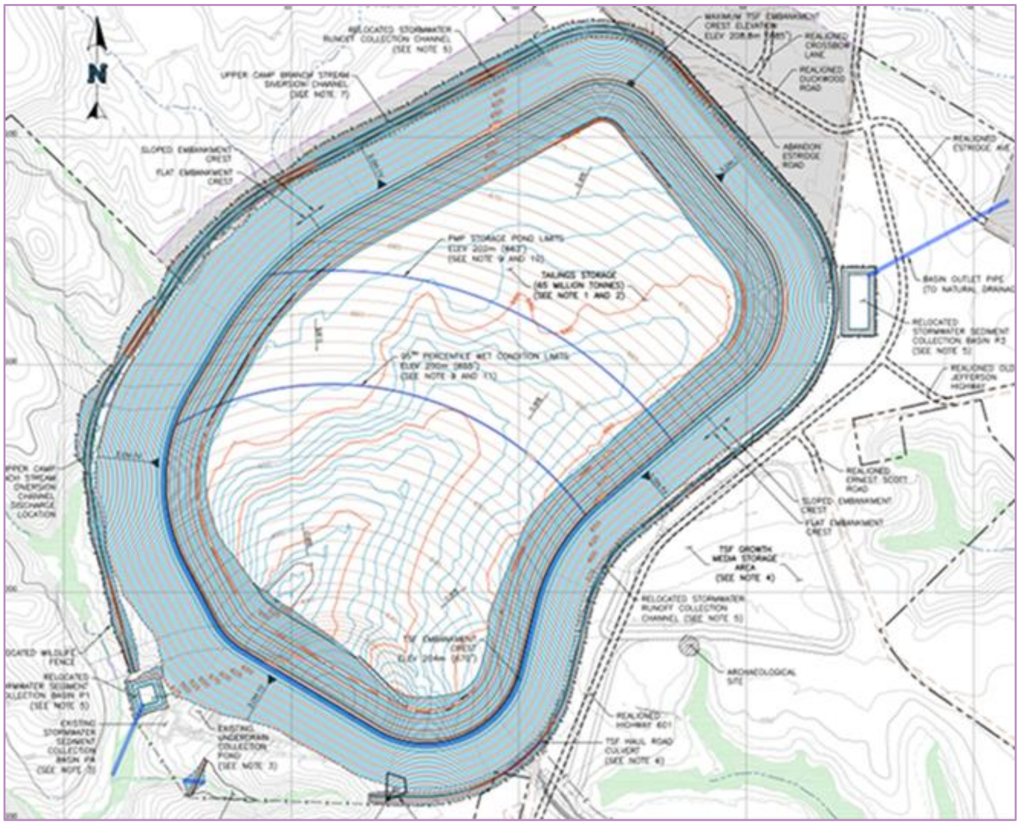
2.6.2.1 Reclamation Activities

At the end of mine life, HGMC flow from upstream of the Ledbetter Pit will be controlled from the FWSA through the diversion pipes to the reconstructed stream channel or diverted to the Ledbetter Pit. Haile will divert flow into the Ledbetter Pit Lake only as may be authorized by the South Carolina DHEC, Bureau of Water, Surface Water Withdrawal Permitting Section standards consistent with State standards for "safe yield" from the creek.

Upon the filling of Ledbetter Pit Lake, the FWSA Dam will be breached with an engineered outlet structure so all flow is directed to the New Ledbetter Reservoir. It is expected that filling of the Ledbetter Pit Lake will take approximately 57 years post-mining and the engineered outlet structure will be designed prior to this time in cooperation with DHEC. The plan is to allow the upper HGMC to flow through the New Ledbetter Reservoir via an engineered outlet structure, into re-established stream channels constructed over the backfilled pits, into the Lower HGMC, and into the Little Lynches River.

2.7 TAILINGS STORAGE FACILITY

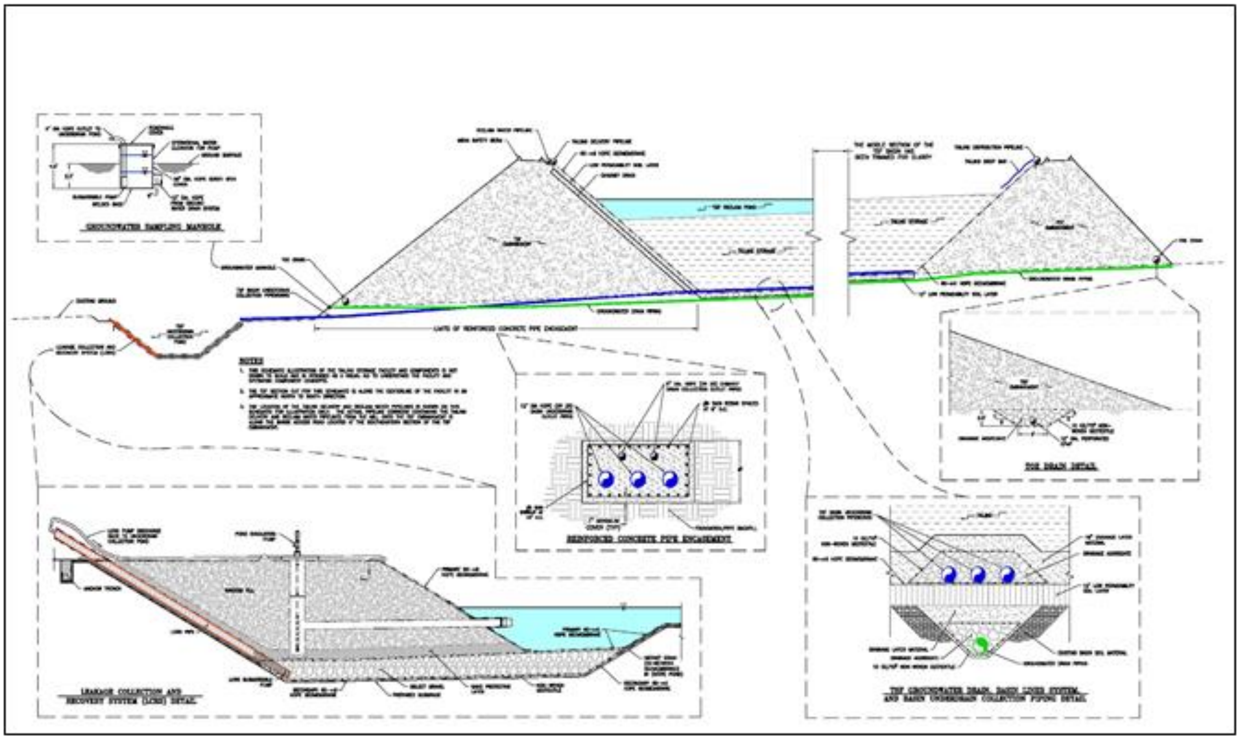
The TSF is located approximately 1.5 miles north of the main mining area. The TSF will be expanded using conventional downstream construction methods to raise the embankment in four stages beyond the current initial embankment. The Site topography is such that to achieve the total storage capacity the embankment will be a four-sided ring dike configuration, approximately 5,500 feet by 3,500 feet along the embankment crest centerline for the longest embankment legs. See Figure 15 below.



Source: NewFields (2019)

Figure 15: Tailing Storage Facility

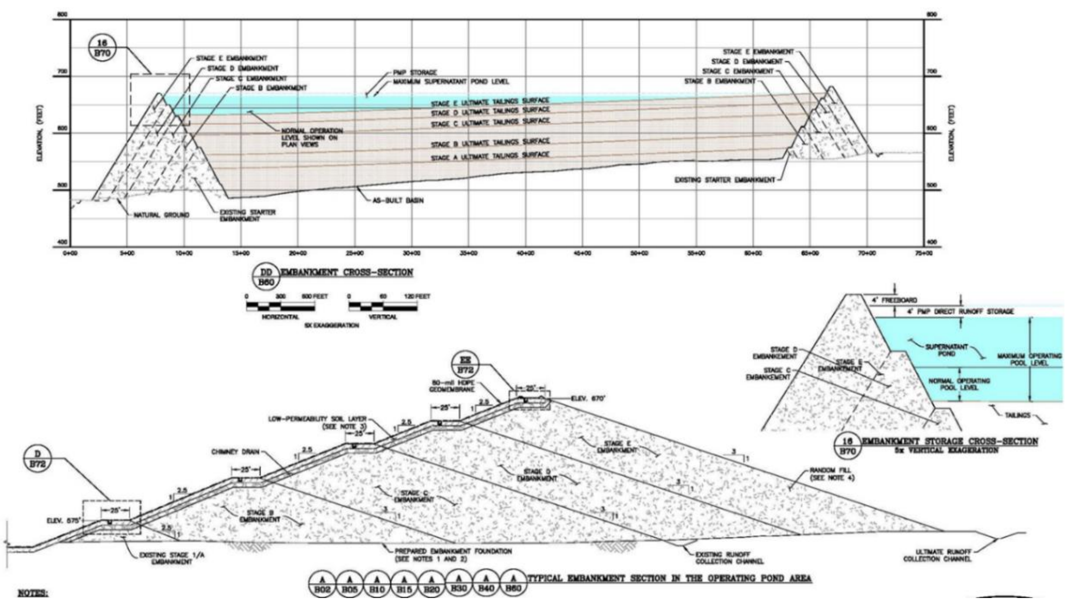
The facility is underlain by a composite liner consisting of a low permeable soil liner and a 60 mil HDPE liner. An underdrain system over the 60 mil HDPE liner system will minimize the hydraulic head on the liner and collect seepage/consolidation water from the tailings and convey it by gravity to the Underdrain Collection Pond at the toe of the southwest embankment. Groundwater will be routed under the TSF in “French Drains” with collection pipes installed below the HDPE and low-permeability soil liner to route groundwater from beneath the facility. See Figure 16 for a cross section view of the TSF underdrain collection system, which feeds the TSF Underdrain Collection Pond, and removes the groundwater from beneath the liner.



Source: NewFields (2019)

Figure 16: Cross Section View of TSF Underdrain Collection System

A starter embankment was constructed to an elevation of 575 ft amsl using structural fill from local sources. As additional capacity is required in the embankment, additional structural fill will be green material from the pits to raise the TSF embankment in a staged manner to an ultimate elevation of 670 ft amsl. The TSF has an ultimate capacity of approximately 72 million tons at an ultimate embankment height of 670 feet amsl. The total TSF Facility (TSF, TSF Underdrain, Service Roads, Diversion Channel and Sediment Control Ponds) will have a footprint of approximately 687 acres.



Source: NewFields (2019)

Figure 17: Cross Section View of TSF Lifts

Tailings slurry from the Mill will be deposited in the TSF from a header and spigot system along the northern dam crest. Spigots will be rotated around the facility to develop sub-aerial deposition with a TSF Reclaim Pond near the southern corner of the impoundment during operation. Reclaim water in the TSF will be pumped from a suction pump placed on ramp to the Mill for re- use in ore processing. Water levels within the TSF will be maintained for adequate free board and storm surge. As the TSF is in the headwaters of Camp Branch Creek, limited diversions channels were needed to direct run-off around the embankment and control sedimentation.

2.7.1 Dry Closure Plan

The dry closure plan of the TSF will focus on isolating the tailings material from exposure to the environment and limiting infiltration of water into the tailings. The reclamation approach consists of the follow general steps, described more fully below.

- Concurrent reclamation of the outboard slopes of the TSF embankment immediately after the establishment of the final embankment downstream raise. In the interim, the outboard slopes of each stage of construction will be seeded using a grass mixture to minimize soil loss and sediment loading to the storm water management system.
- At end of milling, treat and discharge the fluids from the remaining Reclaim Pond located within the TSF impoundment.
- As conditions within the TSF allow, develop a stable tailings surface with positive post-settlement drainage within the TSF Impoundment toward the TSF Reclaim Pond. Any activities within the TSF will maintain the operation constraints of freeboard and probable maximum precipitation (PMP)[2] storage in the impoundment.
- Construct a low permeability cover on the tailings surface. This low permeability cover will consist of an HDPE cover with a minimum of two feet of growth media over the liner. The cover will limit water infiltration into the tailings material and thus reduce long-term seepage to the underdrains. Following placement of the growth media cover, the surface would be revegetated with approved seed mix.
- Provide storm water controls within and off the reclaimed TSF impoundment including an outlet through the embankment on the low point of the reclaimed surface once all tailings are covered to convey all water into Camp Branch Creek
- Treat and discharge post-depositional seepage from the TSF underdrains until the flow has decreased to the level where passive treatment of the seepage is feasible.
- After approval from DHEC, construct a passive treatment system to treat the TSF underdrain discharge.
- Future land use of the TSF will consist of limited recreation, with monitoring.

2.7.2 Detailed Reclamation Components

2.7.2.1 Concurrent Reclamation of the TSF Outboard Embankment Slope

After the initial starter embankment construction, the TSF embankment will be raised as needed to provide operational capacity within the TSF. The outboard slopes of the embankment will be constructed to a final 3H:1V grade. Raises will be performed in a downstream fashion. Outboard slopes of the

2 A PMP event is defined by the American Meteorological Society as "the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage basin at a particular time of year" (AMS, 1959).

embankment will be vegetated to prevent deterioration with an approved seed mix and established seeding methods. See Section 2.1.1., Vegetation Plan.

2.7.2.2 Reduction of the TSF Reclaim Pond Volume

During operations, the volume of the Reclaim Pond within the TSF will fluctuate in response to climatic and operating conditions. Based on water balance modeling (ERC, 2018) and the anticipated final geometry of the tailings surface, the volume of the pool remaining at closure is expected to be approximately 82 million gallons.

The TSF Reclaim Pond will be brought to an absolute minimum value at the end of operations, and the remaining water will be removed during closure by natural evaporation from the open water surface, enhanced evaporation from reclaim water recirculated to the exposed beach, and/or other DHEC approved evaporation methods. However, water balance modeling indicates that the Reclaim Pond volume remaining after closure likely will require an active treatment process.

The mine facilities include a Contact Water Treatment Plant (CWTP) to treat and discharge contact water anticipated at the mine Site during operations. Following reclamation activities, contact water flows will decrease significantly resulting in the CWTP being under-utilized. Haile will use the CWTP to treat and discharge the water stored in the TSF (after modifying and permitting such modifications as necessary) and generated from TSF seepage. Such treatment will occur separately from the ongoing treatment of seepage from Johnny's PAG, which will also occur at the CWTP.

2.7.2.3 Establishment of Positive Drainage in the TSF

One of the objectives of the dry closure is to prevent ponding of storm water runoff on the tailings surface to limit infiltration into the tailings. The geometry of the tailings surface towards the end of mining is expected to consist of mild sloping beaches (approximately 1% grade) towards a pool adjacent to the southeast embankment.

Following completion of tailings deposition, the tailings will continue to consolidate to some final average density. Based on the thickness of tailings, tailings disposal patterns, and control of the location of the pool during operations, the tailings are expected to consolidate differentially over the impoundment area and form a bowl-shaped configuration. The deepest part of the 'bowl' will be in the Reclaim Pond (water pool).

The tailings consolidation under the Reclaim Pond is anticipated to have very low strength. Some random fill is anticipated to be placed over the tailings using low ground pressure equipment to provide a suitable foundation necessary to perform grading and place an HDPE liner on the tailings surface. The Reclaim Pond will also be moved away from the embankment through placement (spigots) of the tailings material prior to the end of milling. The reclamation approach has assumed approximately 610,000 CY of material will be used to fill the reclaim pond area to provide a stable surface. This material will come from growth media stockpiles or green OSAs.

To provide positive drainage from the tailings facility and to facilitate reclamation of the TSF, a channel will be excavated through the tailings from the invert of the bowl to the southern edge of the embankment, although the embankment will not be breached at that time. The channel will be graded to account for consolidation of the tailings so that the final reclaimed surface of the tailings will not pond water post-closure. The surface of the channel will be covered with random fill to provide a stable surface and graded to provide a suitably smooth surface for the HDPE liner.

2.7.2.4 Construct Geomembrane Cover on the TSF

As consolidation in an area of the tailings nears completion, that portion of the tailings will be covered with a smooth HDPE geomembrane laid directly on the tailings surface or foundation layer. The geomembrane will limit infiltration and will reduce long term seepage to the TSF underdrains, allowing the eventual use of passive treatment technology. The geomembrane cover will extend over the entire tailings surface to the edge of the TSF impoundment and will be sealed directly to the exposed TSF geomembrane liner at the perimeter of the TSF. Since the tailing material is fine and contains no foreign materials to potentially puncture the liner, there is no need for a protective clay layer below the liner installation. The tailings will be completely encapsulated within a geomembrane envelope.

Placement of the geomembrane liner will be staged from the northern (upstream) end of the TSF towards the low, southern corner. Placement of the geomembrane cover over the entire TSF surface has been assumed to take place over five annual stages. Each of these stages will occur in a different year, but not necessarily consecutively (as this will be dependent on a number of factors including drain down rate and beach stability). Approximately 18.8M sq. ft. of geomembrane will be required to cover the TSF. Appendix C provides a series of drawings representing the sequence of the TSF cover.

Following placement of the geomembrane cover, a minimum 2-foot thick layer of growth media will be placed over the geomembrane to protect it from damage, UV radiation, and freezing and to provide a soil layer for establishing vegetation. Material from stockpiled growth media will be placed on the geomembrane using low ground pressure equipment to minimize damage to the geomembrane. The growth media will be placed over any exposed geomembrane liner on the interior TSF embankment and the top of the TSF embankment, extending to the outboard slopes of the TSF embankment. The surface the embankment will be graded to allow precipitation on this surface to drain to the outside of the TSF embankment. The final surface will be vegetated with an approved seed mix and established seeding methods. See Section 2.1.1, Vegetation Plan.

Approximately 1.4M CY of growth media will be required to cover the tailings surface and approximately 687 acres of reclaimed tailings and embankment will require revegetation.

2.7.2.5 Stormwater Controls for the TSF

The final geometry of the TSF closure cover has been configured to provide drainage off the cover material. The configuration will force water toward the center of the tailings to a constructed swale or shallow channel on the tailings cover. The anticipated ultimate surface inside the TSF embankment will concentrate precipitation near the center and then grade gently towards the south perimeter. To control the erosion of the final cover, the shallow surface water swale will be constructed down the center of the TSF, with erosion controls if necessary, leading to the post-closure tailings channel described below.

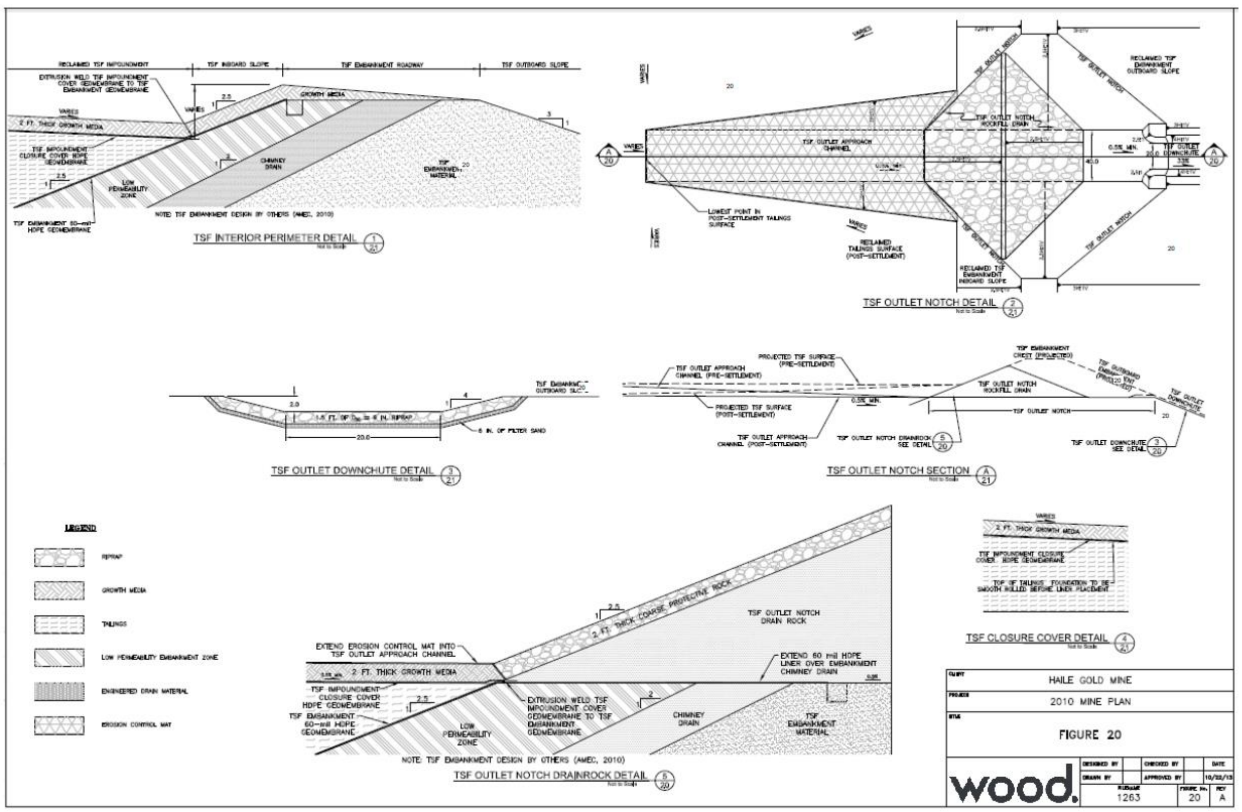
Once the closure cover is in place over the TSF and the tailings have been isolated from the environment, an outlet will be constructed through the embankment such that the bottom of the outlet is at the same elevation as the excavated channel constructed through the tailings as described above. See Figure 17. This will allow all surface water flows to discharge from the surface of the TSF without permanent ponding over the tailings surface or contacting the tailings solids.

All storm water run-off generated in the TSF will discharge down the outboard face of the 3H:1V embankment. To prevent erosive high velocity flows on the embankment, the outlet notch will be filled with a rock drain constructed with durable, inert rock. Flow control will be provided by a central section with zones of increasing particle sizes upstream and downstream. The outermost zone will be large diameter boulder and cobbles within sufficient inlet capacity to prevent plugging from debris during periods of high water.

The rock drain will have the capacity to drain runoff from the PMP within a relatively short time (i.e., 2 to 3 weeks) while allowing runoff from average annual peak precipitation to drain without creating significant ponding over the closure cover. A notch approximately 40 feet wide and 28 feet deep, filled with coarse sand and gravel to within 6 ft of the embankment crest, will be engineered to meet these hydraulic criteria. Design of the channel and gravel drain will be optimized in final design of the TSF closure system.

A channel will be constructed to convey the flow from the notch to existing drainages adjacent to the toe of the TSF embankment. The rockfill outlet drain will reduce the PMP flow rate to this channel to less than 100 cubic feet per second, a smaller channel would be required (approximately 20 feet bottom width with 15-inch thick riprap for erosion protection). The outlet notch will be armored to minimize erosion of the closure cover. An energy dissipater and conveyance channel will convey the flow to Camp Branch Creek.

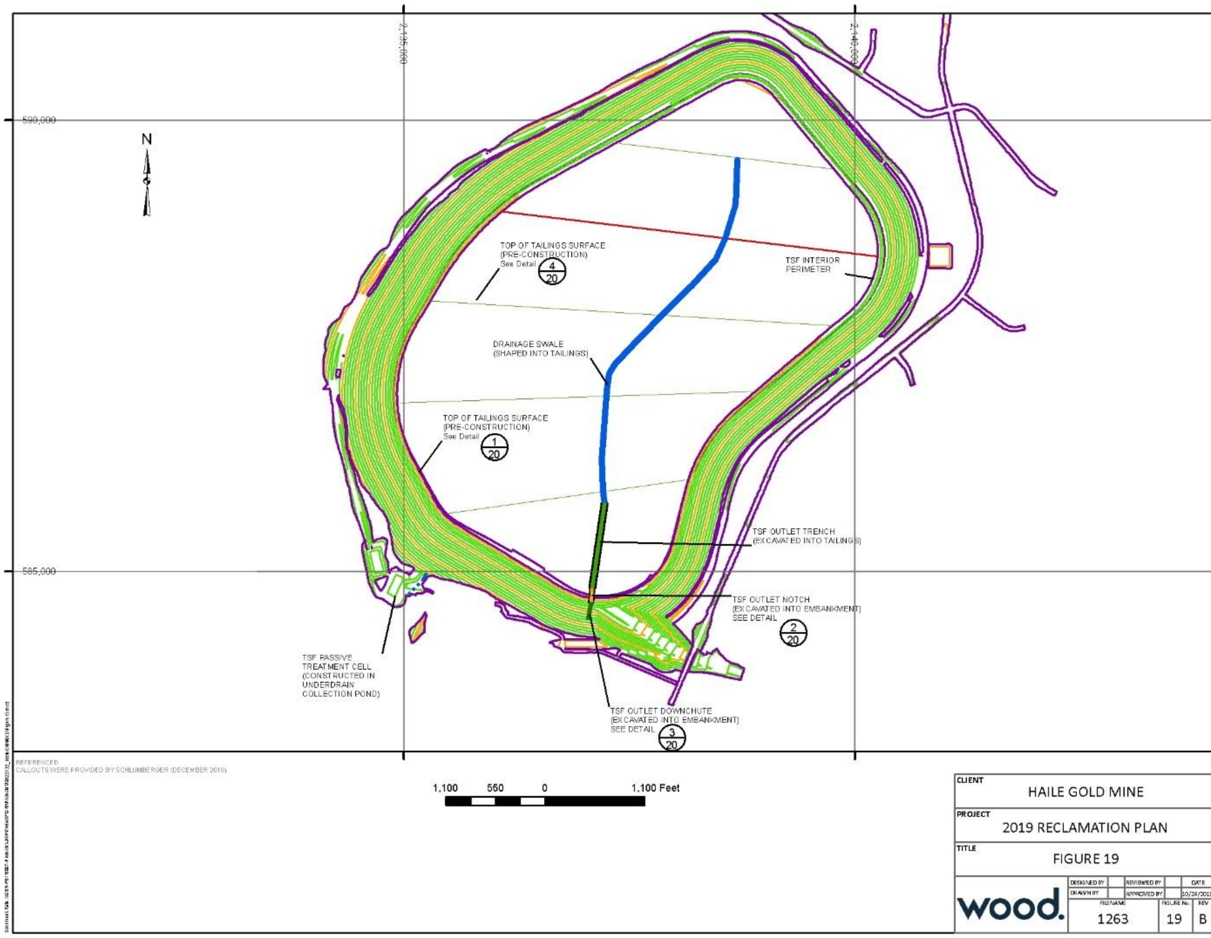
Typical details of the surface water controls are shown in Figure 18.



Source: Wood (2019)

Figure 18: Cross Section View of TSF Surface Water Controls

The general configuration of the TSF surface is shown in Figure 19. The final reclaimed surface elevation of the TSF cover will be such that precipitation from the PMP onto the TSF will be safely discharged through the TSF embankment notch and constructed channel down the embankment face and into the natural drainage.



Source: Wood (2019)

Figure 19: Plan View of TSF Surface Water Collection Channel

2.7.2.6 Treatment of Collected Underdrain Seepage

Water seepage through the tailings will be intercepted by the operational underdrains in the TSF and collected in the TSF Underdrain Collection Pond. The water in the Underdrain Collection Pond will be treated and discharged using a modified version of the existing Haile Gold Mine Contact Water Treatment Plant. As the geomembrane cover is installed and the tailings approach ultimate density, the infiltration/seepage rates are expected to ultimately decrease to less than 15 gpm. Drain down would continue to be collected in the TSF Underdrain Collection Pond and treated as provided for under the modified NPDES permit until the seepage is determined to be at the point where a passive treatment cell can treat the volume of flow from the seepage collection system. As described for the PAG facilities, the passive treatment cell will improve the water chemistry of the seepage to acceptable levels for state permitting requirements. As with all passive treatment systems, the nature of the organic strata must be specifically tailored to the effluent stream and permitted by DHEC.

2.8 MILL SITE AND ASSOCIATED INFRASTRUCTURE

As facility components of the Mill Site are no longer needed and decommissioned, remaining materials, equipment, and buildings will be removed. Non-hazardous and nontoxic solid waste such as lumber and non-salvageable metal scrap will be removed from the Site and either recycled or disposed of at an appropriate facility. Hazardous and toxic materials such as reagents, petroleum products, acids, and solvents will be removed from site by licensed transporters and either returned to the vendor, sold or disposed of at approved facilities.

Equipment and piping not needed for the reclamation and monitoring process will be rinsed, as necessary, prior to being sold, salvaged or disposed in an approved manner.

No buildings are currently planned to remain at the Site when the Mill ceases production. As the various Site components cease operation, associated buildings will be emptied, dismantled, and removed from the Site.

The administration building, CWTP and Security buildings will remain until final closure and reclamation activities are completed at the TSF. Mine and Mill Site facilities are likely to be the earliest facilities to be salvaged and removed during reclamation and closure. Final reclamation will result in the removal of all permanent buildings from the Site, with only an office trailer remaining for use by long term care and maintenance staff. Ultimately, this trailer will be removed when no longer needed.

All buildings proposed for the Site will be constructed with metal framing, and the net salvage value of the buildings is anticipated to be positive. However, for the reclamation cost estimate, no salvage value for building materials has been assumed.

Approximately 38,000 CY of concrete foundations were poured in construction of the Process Plant, including the new ISA Mill and Tower Mill. These will include building slabs, foundations, and sidewalks. The Reclamation Plan assumes that one third of the concrete will be broken in place and buried as part of the Site regrading effort. The remaining two thirds of the concrete at the Site will remain in place and will be buried during regrading of the Site.

Reclamation of building and equipment sites will be completed by grading the sites for positive drainage and covered with a minimum of two feet of growth media. The final surface will be vegetated with an approved seed mix and established seeding methods.

Approximately 5,250 CY of growth media will be required to cover the building and equipment sites and 118 acres at the Process Plant and 20 acres at the Horseshoe Surface Operations will require vegetation.

2.9 ROADS, POWER LINES AND MISCELLANEOUS FACILITIES

2.9.1 Roads

Operations at the Haile Gold Mine will require roads and traffic areas to be constructed for operations. Except for some paved areas near the entrance facility, Snowy Owl Road and portions of State Road 188, all mine roads are anticipated to be dirt or gravel. Approximately 216 acres of road disturbance, including haul and service (access) roads, would be reclaimed. Some roads would remain open during post-mining monitoring. The total road disturbance includes all haul roads and light vehicle roads that are constructed during operation.

During closure, most of the roads and parking areas will be reclaimed, as will all unused light duty service roads around the Site. All haul roads will be reclaimed, although a narrow width of some of the haul roads will remain for access to facilities during post-closure.

For this Reclamation Plan, it is assumed that an area equal to the identified road and parking areas will be reclaimed. It is understood that some mine site service roads will remain open for post closure use, as well as some of the operational facility access roads.

Reclamation will consist of scarifying to loosen the soils and break up the gravel road surface, followed by pushing the berm material over the road surface and regrading to promote positive drainage. The final surface will be vegetated with an approved seed mix and established seeding methods. See Section 2.1.1, Vegetation Plan.

2.9.2 Surface Water Controls and Ponds

Surface water controls at the Site will be reclaimed at closure once they are no longer needed. These structures will be sediment control structures are located downstream of the various OSAs and haul roads. These facilities will be reclaimed and vegetated as the need for the sediment controls is eliminated by the reclamation of the facilities. Unneeded sediment control structures will be regraded to promote positive drainage and vegetated with an approved seed mix and established seeding methods. See Section 2.1.1, Vegetation Plan.

Other facilities that will be reclaimed may include surface water controls that may be armored to limit erosion. Erosion control features that are not required for post-closure will be broken up and buried in place as part of the regrading effort to promote positive drainage. Unneeded surface water features will be regraded to promote positive drainage and vegetated with an approved seed mix and established seeding methods.

The PAG Collection Ponds (465, 470 and 500 Ponds), 29 Pond, Process Event Pond, and TSF Underdrain Collection Pond at the Site are lined with geomembrane liners to limit seepage and to protect the environment. As the 29 Pond and Process Event Pond are decommissioned, any water in the pond will be removed and disposed of through treatment or transferred to the TSF. West PAG Ponds (465 Pond and 470 Pond), East PAG Pond (500 Pond) and TSF Underdrain Collection Pond will be used for passive treatment cells for the PAG facilities and the TSF, respectively. Sediments remaining in the ponds will be analyzed to determine suitability for disposal. Depending on the results of the analysis, any sediments in the 29 Pond and/or Process Event Pond may be buried in place; removed and placed in the lined TSF with processed tailings; or removed and placed in the lined West or East PAG facility.

Once the pond sediments have been addressed, the pond liner will be cut to eliminate the ability to impound water and the liners folded into the pond. The ponds will be regraded to promote positive drainage and vegetated with an approved seed mix and established seeding methods. See Section 2.1.1, Vegetation Plan.

2.9.3 Electrical Power Facilities

Approximately 25,850 feet of power line is anticipated at the mine Site. All transformers are pad mounted and readily available for salvage or reuse elsewhere. Throughout reclamation, electrical power will be required in ever decreasing amounts. As final closure is completed, the only power anticipated for the mine Site will be utility power to the portable trailer needed for long-term care and maintenance personnel.

Lynches River Rural Electric Cooperative (Lynches River), along with their engineering and construction partner, Central Electric Power Cooperative (Central Electric) supplies the power to the mine. A 69-kV overhead power line (main line) to and within the Project Site and a 69 kV / 24.9 kV substation located at the Mill Site have been constructed to serve the mine. Central Electric has an existing 69 kV power line known as the Heath Springs to Flat Bush transmission line that runs in an east - west direction north of the proposed Site. A new connecting 69 kV line of approximately 4.5 miles has been constructed to run from near the intersection of this line and Duckwood Road north of US Highway 903 to a substation on the Site property. Most of the new line at the Mill Site runs within or alongside of the existing Duckwood Road and US Highway 601 utility right-of-way.

For the purposes of reclamation costs, the approximately 24,450 feet of ancillary overhead power lines on Site will be removed at closure and reused or disposed in an approved facility, although a small portion of the low voltage power line will, in fact, remain as described above. As the main line is not Haile's power line, it will not be something that they can remove.

2.9.4 Pipelines

Approximately 88,250 feet of pipeline including the tailings pipeline corridor has been constructed at the Site. Additional pipelines will be constructed as needed to convey flows around the Site for pit depressurization, contact water treatment, and dust control supply. When mining activities cease, pit depressurization flows will cease, but water treatment for the PAG facilities and the TSF seepage will continue to be required until passive treatment cells can be developed for these facilities; water treatment for contact water will also be required until the source areas are reclaimed. Throughout reclamation and closure, pipelines will be required in ever decreasing amounts. As final closure is completed, the only pipelines anticipated to remain will be used to collect and convey flows to the passive treatment facilities and the detention dam is converted to Fresh Water Retention Dam drainage pipeline.

For the purposes of reclamation costs, it is assumed that the two tailings pipelines (Tailing Feed Line from the Process Plant to TSF and Reclaim Water Line from TSF to Process Plant) will be removed and reused at Site. Therefore, there is no cost incurred for Reclamation.

2.9.5 Growth Media Storage Areas

During development of the mine, growth media storage areas have been developed to store growth media for use during reclamation. These facilities are graded and vegetated as part of ongoing mine sediment control practices. As certain facilities around the mine are reclaimed, growth media will be removed from the storage areas and placed on the facilities (e.g., TSF and PAG facilities) to support vegetation; Green OSA's are not anticipated to require growth media to support vegetation, but this will be confirmed by test plots during initial years of mine operations. However, placement of six inches of growth media over the facilities where growth media is not anticipated has been included in the bond estimate. If not all the stored growth media is consumed during the reclamation activities, the remainder will remain in the same configuration as developed. If necessary, remaining growth media storage areas will be graded and seeded. See Section 2.1.1, Vegetation Plan.

The growth media storage area locations will be concurrently reclaimed as these areas are exhausted. Reclamation of these exhausted storage areas will include regrading to promote positive drainage and revegetating with an approved seed mix and established seeding methods.

2.9.6 Low Grade Ore Stockpile

Low grade ore mined during operations and not processed will be placed on the low-grade ore stockpile, located in the northern portion of the West PAG facility. The low-grade stockpile will be placed atop two feet of sand, overlain on the HDPE-liner and low permeability soil foundation and seepage collection system that comprise the West PAG facility. Based on the current mining and processing schedule, this stockpile will be removed and processed in 2032 and 2033, leaving the liner and drainage system intact. If this material is not processed, the ore will be left on the West PAG facility and reclaimed in the same manner as the overburden on the facility.

This area of the West PAG facility is anticipated to be the last area to be reclaimed and covered with geomembrane and is estimated to be completed during 2033. During reclamation, the portion of the West PAG that contained the low-grade ore stockpile will be regraded to promote positive drainage. A minimum of one-foot protective layer of saprolite from local borrow sources will be placed over the regraded overburden to provide a suitable foundation for the geomembrane cover. The area of the low-grade stockpile will be reclaimed as part of the West PAG facility.

2.9.7 Fresh Water Storage Area Retention Structure

Construction of the Fresh Water Detention Dam structure is expected to be completed in 2020. This structure is placed in the upper reaches of Haile Gold Mine Creek at the same location and as part of the crossing of the new haul road. The Retention and Diversion Structure will have the capacity to detain up to 100-year storm event above the retention elevation of water at 470 RL. When empty it can hold a 250-year storm event. It will allow for pumped flow of HGMC into the diversion pipes around the mine pits. Stormwater exceeding the design event would flow through the Retention Structure emergency spillway into Ledbetter Pit. This water would become contact water and would be pumped to the HDPE-lined 29 Pond for use at the Mill as process water or treated at the CWTP and released.

During reclamation, the structure, pump and pipes will remain in place above the reconstructed lower Haile Gold Mine Creek channel. The structure may either be removed and replaced with a low head dam or modified to function as a low head dam during post-mining. The intent of the low head dam is to maintain, at a minimum, regulated minimum in stream flows while allowing the remaining stream flows to flow into Ledbetter Pit Lake to expedite pit filling. Upon the filling of the Ledbetter Pit Lake, the dam will be breached to enable all streamflow to flow into the New Ledbetter Reservoir. Flow exiting the reservoir will be through an engineered outlet structure into the re-established downstream channel. It is expected that filling of the Ledbetter Pit Lake will take approximately 57 years post-mining and the engineered outlet will be designed prior to this time in cooperation with DHEC.

The disturbed area of the dam will be regraded to promote positive drainage and vegetated with an approved seed mix and established seeding methods. See Section 2.1.1, Vegetation Plan.

3.0 POST-MINING MONITORING REQUIREMENTS

The Site has three active drainages (Haile Gold Mine Creek, Camp Branch Creek and Champion Creek River), and one secondary (Unnamed Tributary) drainage to the Little Lynches River as shown in FSource: Army Corp of Engineers, Haile EIS (2014)

Figure 2. Most of the mine facilities are along the Haile Gold Mine Creek watershed. The TSF, and TSF associated facilities are in the Camp Branch Creek watershed. Post-mining monitoring will be necessary to ensure the Site reclamation and closure features are performing as intended and the Site has been successfully reclaimed for sustainable post-mining land use.

3.1 POST-MINING CARE AND MAINTENANCE

The reclamation designs for the facilities at the Site were developed to reduce the need for long-term care and maintenance. Haile anticipates that DHEC will require staged-level monitoring at the Site that will be reduced or terminated (for specific facilities) over the life of the mine, based upon demonstrating that reclamation and closure designs meet physical and chemical performance standards on a facility-by-facility basis. See Appendix C for further details on reclamation, closure, and bonding.

Specifically, Haile anticipates that by the end of mining and milling operations in 2031 the following facilities will have been reclaimed and closed: Green OSAs (Ramona and, James), Horseshoe Underground, and the backfilled Mine Pits (Mill Zone, Snake, Red Hill and Haile Pits). There will be minimal post-mining monitoring or maintenance requirements for these facilities.

Haile anticipates that South OSA, Mill Site, except for the Contact Water Treatment Plant, and certain other ancillary facilities will be reclaimed by 2037, after which time there will be minimal monitoring or maintenance requirements for these areas. Haile anticipates that the Contact Water Treatment Plant and remaining ancillary facilities at the Mill Site will be reclaimed and closed by approximately 2060 (once the TSF and PAG facilities have transitioned to passive treatment and the CWTP is no longer needed to treat the seepage), after which time there will be minimal monitoring or maintenance requirements for these facilities. Haile anticipates that the majority of the roads, pipelines, electrical lines and surface water controls also will have been reclaimed and closed by 2060, after which time there will be no monitoring or maintenance requirements for these facilities.

For the pit lakes, which will begin filling in 2030 (Champion) and 2031 (New Ledbetter), Haile anticipates that lime (to maintain a neutral pH until the water level inundates any potential acid generating material in the pit walls) will need to be added to the Ledbetter Pit Lake and Champion Pit Lakes after filling commences in each of the pits. Water quality in the pit lakes will be monitored during pit refilling and until the New Champion and New Ledbetter Reservoir reach equilibrium and achieve chemical stability. Haile is funding a long-term trust for any ongoing monitoring and management that DHEC deems necessary based on pit lake physical and chemical stability.

Haile anticipates that the outer embankment of the TSF will be seeded and stabilized as part of construction (i.e., during operations). Haile estimates that the TSF will have been reclaimed and the dam outlet notch and down chute constructed in 2039 and will transition to a passive treatment system in 2053. Once transitioned to a passive treatment system, Haile anticipates that long-term monitoring and management obligations at the TSF will consist of erosion control and removal of woody growth above the HDPE liner (approximately every 2-5 years), and the replacement of the organic media within the passive treatment cell (occurring approximately every 20 years, depending on the functionality of the cell).

Haile anticipates that the East PAG facility will be reclaimed in 2031 and the West PAG facility reclaimed in 2033. With transitions to a passive treatment system in 2035 and 2037, respectively. Once transitioned to a passive treatment system, Haile anticipates that long-term monitoring and management obligations at the PAG facilities will consist of erosion control and removal of woody growth above the HDPE liner (approximately every 2-5 years), and the replacement of the organic media within the passive treatment cells (occurring approximately every 20 years, depending on the functionality of the cells).

Surface water stations and groundwater wells are monitored as part of normal operations from 2015 to 2033. Post-mining monitoring and maintenance will consist of surface and groundwater monitoring on a Site-wide basis during closure and post-closure as deemed necessary by DHEC, based on site conditions and monitoring results at the time, and will be funded by the long-term trust established by Haile. See Section 3.2, below, for further details. However, it is expected that the intensity and frequency of the surface and groundwater monitoring would be decreased over time as performance standards are achieved, until eliminated. Contractor, sampling costs and a repair budget have been included in the post-mining monitoring and maintenance budget to accomplish these tasks. See Appendix D.

Importantly, however, DHEC and Haile will be better able to determine appropriate post-mining monitoring and management obligations, as well as the appropriate length of time for which these activities should occur, once reclamation activities are underway and more Site-specific information is available.

3.2 POST-MINING WATER QUALITY MONITORING

Haile will continue to work closely with DHEC to identify the appropriate frequency, duration, and constituent list during this post-mining and post-closure water quality monitoring. These are specified in NPDES State permits.

The Site-wide post-mining monitoring program is outlined in the Haile Gold Mine Monitoring and Management Plan. This plan may require further modifications based on further data and trends in the Site operational water quality plan. In addition, monitoring will be coordinated with requirements of State permits in effect. Overall objectives are to demonstrate that receiving waters are meeting water quality criteria. Secondarily, the plan will provide early warning of potential water impacts and a means of identifying contaminant sources. Finally, the plan will identify contingency actions that will be employed if monitoring objectives are not satisfied.

As Haile approaches the end of mine life, Haile will develop a detailed post-mining monitoring plan based on a continuation of the operational monitoring plan, and which will be informed by the monitoring that occurs during mining. The plan will include sampling sites in surface and groundwater that provide upgradient and downgradient monitoring and will, among other requirements:

- Identify specific groundwater and surface water monitoring locations.
- Identify constituents to be monitored at each location.
- Specify monitoring frequency for each location.
- Specify sampling procedures.

The post-mining monitoring plan will be designed to assure:

- Surface and groundwaters are monitored upgradient and downgradient of permanent post-mining features.
- There is monitoring in place between any potential sources of contamination and receiving waters that allows for adequate identification of potential sources of contaminant migration.
- All discharges are monitored in accordance with applicable regulation.
- Post-mining monitoring for a period specified by regulation or agency requirements.

Groundwater monitoring will be used to determine the performance of closed facilities that have the potential for subsurface discharges. A number of groundwater and surface water monitoring points, selected from those remaining at mine closure, will be designated for continued post-mining monitoring. These points will be selected in consultation with DHEC for their ability to provide pertinent information on upgradient and downgradient water quality.

For purposes of bond calculations, it is assumed that 27 groundwater sites and 13 surface water sites, exclusive of monitoring at the pit lakes, will be monitored in the vicinity of the mine, processing facilities, and TSF. For purposes of bond calculations, the frequency and number of monitoring sites has been varied to respond to expected Site conditions between 2032 and when the pit lakes reach equilibrium and chemical stability. Actual monitoring locations will be designated in plans submitted to DHEC before final reclamation commences.

Based on early post-mining monitoring, the parameter list and sampling frequency may be adjusted to reflect the observed conditions. The parameters analyzed will be selected based on parameters observed during operations and their potential to adversely impact water quality downstream.

4.0 RECLAMATION COST AND BOND ASSURANCE

Appendix C provides Haile's reclamation costs and bond assurance calculations. Although the costs are presented by year through approximately 2065 in Tables 1-7 of Appendix D, the actual timing of the posting of financial assurance, as well as the portion of the financial assurance posted within time periods is subject to regulation by, and further discussions with DHEC.

5.0 REFERENCES

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Appendix A: AMEC (Wood), Soil Erosion Modeling Report (2013)

HAILE GOLD MINE INC.
SOIL EROSION MODELING
JOHNNY'S PAG AND TSF
FINAL REPORT

August 08, 2013

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Project 7420136300E

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ATTACHMENTS

1.0 INTRODUCTION

AMEC Environment & Infrastructure, Inc. (AMEC) has conducted an analysis of soil erosion and sediment delivery for Johnny's PAG and Tailing Storage Facility (TSF) at the Haile Gold Mine near the town of Kershaw in Lancaster County, South Carolina. The analysis was completed using the RUSLE2 computer program Version 1.26.6.4. The following is a description of AMEC's findings.

2.0 SOIL SURVEY DATA

U.S. Department of Agriculture (USDA) Soil Web Survey data was used to prepare customized soil resource reports for both the TSF and Johnny's PAG.

The result of the soil survey for the Johnny's PAG site indicates that the majority of the site (approximately 85%) is composed of Blanton Sand (BnB and BnC) with slopes varying from 0 to 15% and the remaining approximately 15% is composed of Rutlege and Blaney loamy sand. AMEC also reviewed the soil data for the areas that may be used as sources for the growth media material. The soil survey shows the majority of the growth media material in this area is composed of Blanton Sand with Hydrologic Soil Group "A".

The soil survey for the TSF indicates that approximately 75% of the soil in this area is Blanton Sand with slopes varying from 0 to 15% and the remaining 25% is composed of Rutlege loamy sand and Wagram sand. The soil materials in this site have Hydrologic Soil Group A and are moderately well drained. Detailed soil reports for the TSF and Johnny's PAG sites are presented in Attachment A.

3.0 SURFACE AREA CALCULATIONSE

Existing drawing sheets from the Draft Project Description (Appendix A, submitted to the USACE on February 22, 2013) were used to calculate the approximate surface areas for each site upon closure.[1] Johnny's PAG will be composed of 3 acres of relatively flat areas (plateau) and 141 acres of terraces (benches) and slopes for a total of 144 acres. The elevation will change from 760 feet (ft) on the plateau to 520 ft at the base of the slope with an average slope of approximately 33%.

The TSF will have an area of approximately 394 acres with elevation varying from over 630 ft to 610 ft at the outlet. The tailing surface will have a relatively flat slope (less than 0.5%).

Attachment B illustrates the area calculations for each site and subarea.

[1] The acreage calculation does not included ancillary facilities around the overburden (ditches, channels, roads, ponds, etc.), and thus is slightly different from the 159 acres reported elsewhere for the footprint of Johnny's PAG. The approximately 394 acres indicated for the TSF represents the estimated acreage for the tailings surface and does not include the disturbance associated with the embankment or ancillary facilities associated with the TSF. The total disturbance footprint including the embankment and ancillary facilities is approximately 524 acres.

4.0 SOIL EROSION AND SEDIMENT DELIVERY COMPUTATIONS

The Revised Universal Soil Loss Equation (RUSLE2) computer program was used to compute soil loss and sediment delivery for each site.[2]

The analysis was performed for the following conditions:

1. Johnny's PAG with no vegetation cover and an average slope of 33%.
2. Johnny's PAG plateau area with vegetation cover similar to Haile's proposed seed mix.[3]
3. Johnny's PAG slope areas (average slope of 33%) and drainage terrace channels with vegetation cover similar to Haile's proposed seed mix.
4. TSF with an average slope of 0.5%, and vegetation cover similar to Haile's proposed seed mix.

The results of these analyses are summarized as follows:

- Johnny's PAG with no vegetation cover and an average slope of 33%: soil loss 53.2 tons/acre/year
- Johnny's PAG plateau areas with vegetation cover similar to Haile's proposed seed mix: soil loss 0.57 tons/acre/year
- Johnny's PAG slope areas (average slope of 33%) and drainage terrace channels with vegetation cover similar to Haile's proposed seed mix: soil loss 2.41 tons/acre/year
- TSF with an average slope of 0.5%, and vegetation cover similar to Haile's proposed seed mix: soil loss 0.12 tons/acre/year

Figure 1 illustrates monthly variations of rainfall and monthly soil loss per acre for both Johnny's PAG and TSF reclamation areas.

[2] The RUSLE model automatically defines the precipitation based on county. The mean annual precipitation used in the RUSLE model is 42 inches, while the mean annual precipitation that Haile's consultant ERC has presented in previous reports to the USACE is 45.68 inches, which are generally similar. For conservatism, however, the RUSLE soil loss estimates have been increased by 8%, which is the percentage that the mean monthly site precipitation exceeds the RUSLE precipitation.

[3] The RUSLE2 model has only select vegetation species mixes available. The seed mix utilized was the one that most closely resembled Haile's proposed seed mix. The seed mix used in the model is provided in Attachment C.

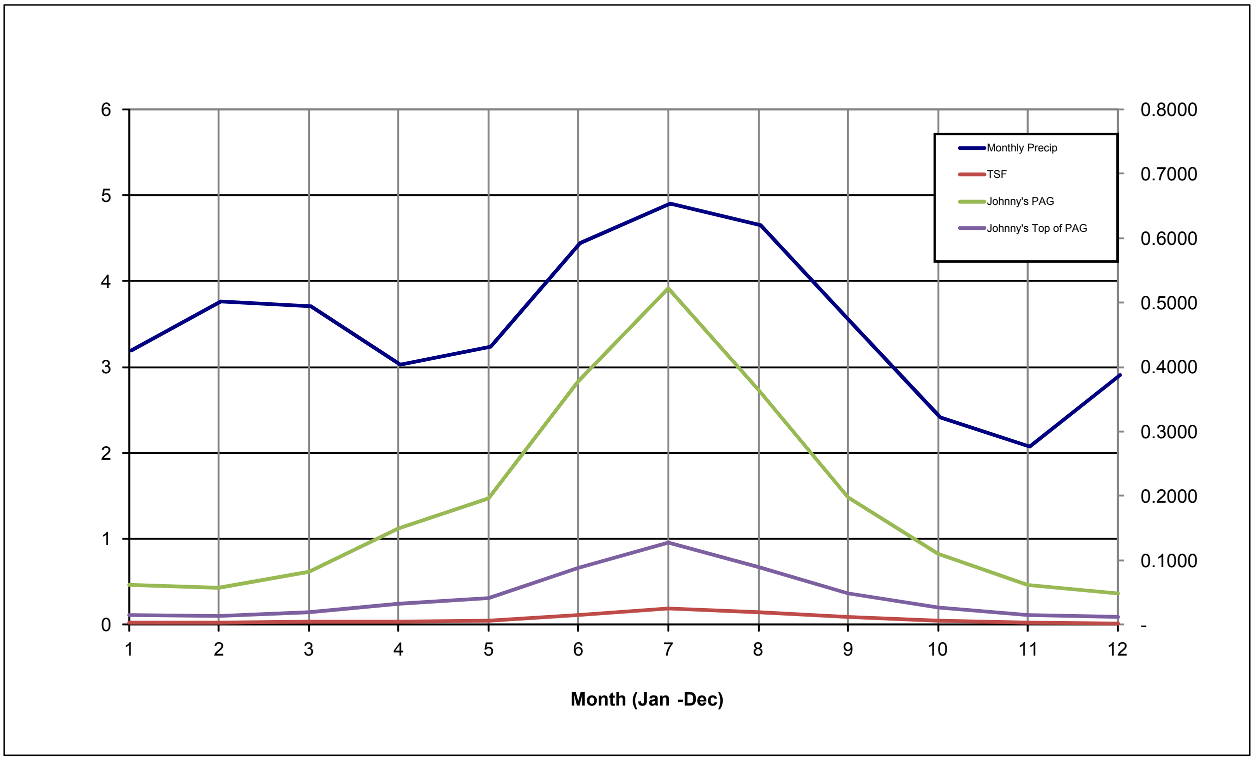

Figure 1 - Average Monthly Rainfall and Soil Loss Johnny's PAG & TSF (Haile Gold Mine Lancaster County, SC)

Attachment C presents the detailed input and output for the RUSLE2 model with calculated monthly soil losses for each scenario. Appendix C also identifies the seed mix used in the calculation.

Tables 1 through 3 show soil loss and sediment delivery computations for both reclamation sites, and include total annual sediment delivery from each site. Table 2 provides the computations for both Johnny's PAG plateau and slope areas.[4]

[4] The RUSLE2 model program runs the analysis for Johnny's PAG as one facility but separates the top surface from the side slopes. Thus, the results for Johnny's PAG (without vegetation cover and with vegetation cover) are provided in the first Tables 1 and 2, respectively.

Table 1 - Table 1 - Erosion Loss and Sediment Delivery for Johnny's PAG - No Vegetation / Bare Land Scenario

Johnny's PAG Area Calculation			Johnny's PAG Erosion Loss and Sediment Delivery						
Elevation Interval	Reclamation Area (sqft)	Bench Area (sqft)	PAG Areas (acres)	Terraces Areas (acres)	Total Areas in each Intervals (acres)	Soil Loss (t/ac/yr)	Soil Loss (Tons/Yr)	Sediment Delivery (t/ac/yr)	Sediment Delivery (Tons/Yr)
760_Plateau	130,581		3.00		3.0	59	176.87	59	176.87
						Johnny's Plateau Area	**177**		**177**
Johnny's PAG Area									
760-740	131,097	30,967	3.0	0.71	3.7	59	219.51	59	219.51
740_Plateau	49,942		1.1	0.00	1.1	59	67.64	59	67.64
740-720	297,638	65,141	6.8	1.50	8.3	59	491.37	59	491.37
720-700	339,033	70,447	7.8	1.62	9.4	59	554.62	59	554.62
700-680	365,160	75,339	8.4	1.73	10.1	59	596.63	59	596.63
680-660	388,247	79,966	8.9	1.84	10.7	59	634.17	59	634.17
660-640	411,331	84,556	9.4	1.94	11.4	59	671.66	59	671.66
640-620	434,378	89,185	10.0	2.05	12.0	59	709.14	59	709.14
620-600	456,899	93,622	10.5	2.15	12.6	59	745.66	59	745.66
600-580	478,778	97,887	11.0	2.25	13.2	59	781.07	59	781.07
580-560	500,032	102,124	11.5	2.34	13.8	59	815.59	59	815.59
560-540	520,824	106,005	12.0	2.43	14.4	59	849.01	59	849.01
540-520	482,925	75,052	11.1	1.72	12.8	59	755.75	59	755.75
520-STACK EDGE	325,788		7.5		7.5	59	441.27	59	441.27
	6,152,365					**Johnny's PAG Area**	**8333**		**8333**
Total	**6,282,946**	**Sq Ft**	**122**	**22**	**144**		**8,510**		**8,510**
							Total Soil Loss per Year =	**8,510 Tons per year**	
							Total Sediment Delivery=	**8,510 Tons per Year**	

Table 2 - Erosion Loss and Sediment Delivery for Johnny's PAG - Hydroseeding and Vegetation Management Scenario

Johnny's PAG Area Calculation			Johnny's PAG Erosion Loss and Sediment Delivery						
Elevation Interval	Reclamation Area (sqft)	Bench Area (sqft)	PAG Areas (acres)	Terraces Areas (acres)	Total Areas in each Intervals (acres)	Soil Loss (t/ac/yr)	Soil Loss (Tons/Yr)	Sediment Delivery (t/ac/yr)	Sediment Delivery (Tons/Yr)
760_Plateau	130,581		3.00		3.0	0.53	1.59	0.5	1.50
						Johnny's Plateau Area	**1.6**		**1.5**
Johnny's PAG Area									
760-740	131,097	30,967	3.0	0.71	3.7	2.23	8.30	2	7.44
740_Plateau	49,942		1.1	0.00	1.1	2.23	2.56	2	2.29
740-720	297,638	65,141	6.8	1.50	8.3	2.23	18.57	2	16.66
720-700	339,033	70,447	7.8	1.62	9.4	2.23	20.96	2	18.80
700-680	365,160	75,339	8.4	1.73	10.1	2.23	22.55	2	20.22
680-660	388,247	79,966	8.9	1.84	10.7	2.23	23.97	2	21.50
660-640	411,331	84,556	9.4	1.94	11.4	2.23	25.39	2	22.77
640-620	434,378	89,185	10.0	2.05	12.0	2.23	26.80	2	24.04
620-600	456,899	93,622	10.5	2.15	12.6	2.23	28.18	2	25.28
600-580	478,778	97,887	11.0	2.25	13.2	2.23	29.52	2	26.48
580-560	500,032	102,124	11.5	2.34	13.8	2.23	30.83	2	27.65
560-540	520,824	106,005	12.0	2.43	14.4	2.23	32.09	2	28.78
540-520	482,925	75,052	11.1	1.72	12.8	2.23	28.56	2	25.62
520-STACK EDGE	325,788		7.5		7.5	2.23	16.68	2	14.96
	6,152,365					**Johnny's PAG Area**	**315**		**282**
Total	**6,282,946**	**Sq Ft**	**122**	**22**	**144**		**318**		**285**
							Total Soil Loss per Year =	**318 Tons per year**	
							Total Sediment Delivery=	**285 Tons per Year**	

Table 3 - Erosion Loss and Sediment Delivery for TSF - Hydroseeding and Vegetation Management Scenario

Tailing Storage Facility (TSF) Sediment Loss and Delivery Calculation Area Calculation					
Elevation Interval	**Reclamation Area (sqft)**	**Soil Loss (t/ac/yr)**	**Soil Loss (Tons/Yr)**	**Sediment Delivery (t/ac/yr)**	**Sediment Delivery (Tons/Yr)**
Greater than 630	21.86	0.106	2.32	0.091	1.99
630-625	67.22	0.106	7.13	0.091	6.12
625-620	95.18	0.106	10.09	0.091	8.66
620-615	90.85	0.106	9.63	0.091	8.27
615-610	79.47	0.106	8.42	0.091	7.23
Less than 610	38.91	0.106	4.12	0.091	3.54
Total	**393.5**		**42**		**36**
		Total Soil Loss per Year =		**42 Tons per year**	
		Total Sediment Delivery=		**36 Tons per Year**	

6.0 REFERENCES

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Stormwater Management Design manual, Greenville County, South Carolina, August 2010

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USDA - Natural Resources Conservation Service, Web Soil Survey, February 2012

User's Guide, Revised Universal Soil Loss Equation, Version 2, USDA-Agricultural Research Service, Washington D.C., January 2003

5.0 SUMMARY

The average depth of soil loss per year for each scenario is expected to be as follows:

- Johnny's PAG with no vegetation cover and an average slope of 33%: depth of soil loss approximately 11.3 millimeters (0.445 inches)per year
- Johnny's PAG plateau areas with vegetation cover similar to Haile's proposed seed mix: depth of soil loss approximately 0.11 millimeters (0.0043 inches) per year
- Johnny's PAG slope areas (average slope of 33%) and drainage terrace channels with vegetation cover similar to Haile's proposed seed mix: depth of soil loss approximately 0.43 millimeters (0.0169 inches) per year
- TSF with an average slope of 0.5%, and vegetation cover similar to Haile's proposed seed mix: depth of soil loss approximately 0.022 millimeters (0.0009 inches) per year

ATTACHMENT A

Soil Reports for Johnny’s PAG and TSF

United States Department of Agriculture

NRCS

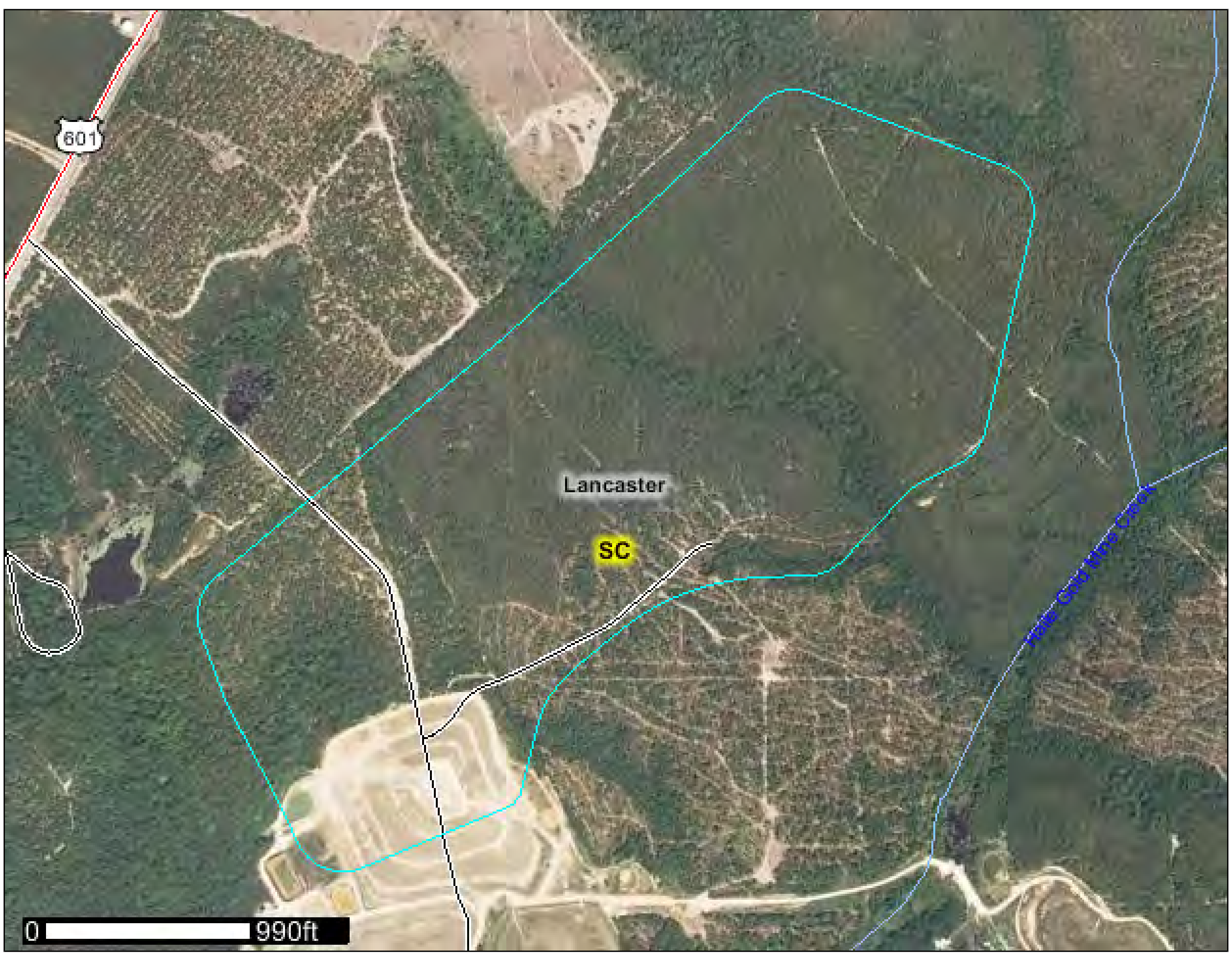
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Lancaster County, South Carolina

Johnny's PAG



July 9, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:9,870 if printed on A size (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 500 1,000 2,000 3,000

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:9,870 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lancaster County, South Carolina
Survey Area Data: Version 14, Oct 5, 2011

Date(s) aerial images were photographed: 6/11/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Lancaster County, South Carolina (SC057)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BlC	Blaney sand, 6 to 10 percent slopes	1.0	0.6%
BnB	Blanton sand, 0 to 6 percent slopes	101.9	62.2%
BnC	Blanton sand, 6 to 15 percent slopes	35.6	21.7%
Ru	Rutlege loamy sand	10.1	6.2%
VbC	Vaucluse and Blaney loamy sands, 6 to 10 percent slopes	1.6	1.0%
VbD	Vaucluse and Blaney loamy sands, 10 to 15 percent slopes	13.6	8.3%
Totals for Area of Interest		**163.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lancaster County, South Carolina

BlC—Blaney sand, 6 to 10 percent slopes

Map Unit Setting

Landscape: Sandhills
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Blaney and similar soils: 100 percent

Description of Blaney

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3s
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Sand
4 to 26 inches: Sand
26 to 50 inches: Sandy clay loam
50 to 72 inches: Sandy loam

BnB—Blanton sand, 0 to 6 percent slopes

Map Unit Setting

Landscape: Sandhills
Elevation: 50 to 250 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F

Frost-free period: 192 to 247 days

Map Unit Composition

Blanton and similar soils: 100 percent

Description of Blanton

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy marine deposits

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3s
Hydrologic Soil Group: A

Typical profile

0 to 7 inches: Sand
7 to 63 inches: Sand
63 to 72 inches: Loamy sand

BnC—Blanton sand, 6 to 15 percent slopes

Map Unit Setting

Landscape: Sandhills
Elevation: 50 to 250 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Blanton and similar soils: 100 percent

Description of Blanton

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Sandy marine deposits

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4s
Hydrologic Soil Group: A

Typical profile

0 to 7 inches: Sand
7 to 63 inches: Sand
63 to 72 inches: Loamy sand

Ru—Rutlege loamy sand

Map Unit Setting

Elevation: 0 to 300 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Rutlege and similar soils: 100 percent

Description of Rutlege

Setting

Landform: Depressions, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4w
Hydrologic Soil Group: B/D

Typical profile

0 to 21 inches: Loamy sand
21 to 60 inches: Loamy sand

VbC—Vaucluse and Blaney loamy sands, 6 to 10 percent slopes

Map Unit Setting

Landscape: Sandhills
Elevation: 100 to 450 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Vaucluse and similar soils: 55 percent
Blaney and similar soils: 45 percent

Description of Vaucluse

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 3 inches: Loamy sand
3 to 11 inches: Loamy sand
11 to 16 inches: Sandy clay loam

16 to 32 inches: Sandy clay loam
32 to 53 inches: Sandy loam
53 to 72 inches: Loamy fine sand

Description of Blaney

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3s
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Sand
4 to 26 inches: Sand
26 to 50 inches: Sandy clay loam
50 to 72 inches: Sandy loam

VbD—Vaucluse and Blaney loamy sands, 10 to 15 percent slopes

Map Unit Setting

Landscape: Sandhills
Elevation: 100 to 450 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Vaucluse and similar soils: 55 percent
Blaney and similar soils: 45 percent

Description of Vaucluse

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 3 inches: Loamy sand
3 to 11 inches: Loamy sand
11 to 16 inches: Sandy clay loam
16 to 32 inches: Sandy clay loam
32 to 53 inches: Sandy loam
53 to 72 inches: Loamy fine sand

Description of Blaney

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4s
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Sand
4 to 26 inches: Sand
26 to 50 inches: Sandy clay loam
50 to 72 inches: Sandy loam

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Lancaster County, South Carolina

Tailing Storage Facility

June 15, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

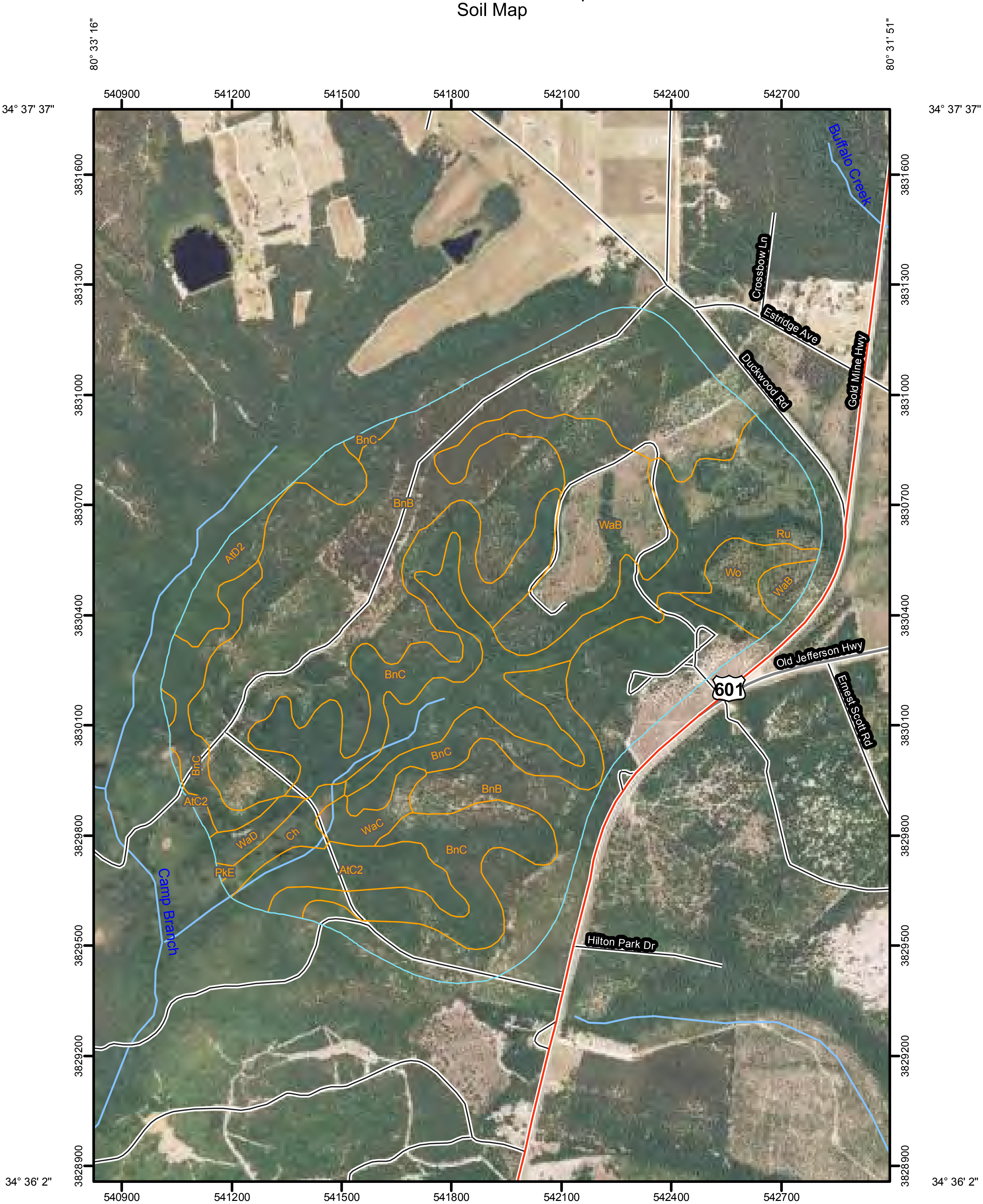
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

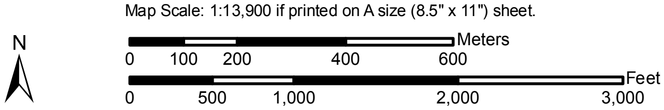
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:13,900 if printed on A size (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:13,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lancaster County, South Carolina
Survey Area Data: Version 14, Oct 5, 2011

Date(s) aerial images were photographed: 6/11/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Lancaster County, South Carolina (SC057)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AtC2	Appling and Chesterfield soils, 6 to 10 percent slopes, eroded	18.2	3.6%
AtD2	Appling and Chesterfield soils, 10 to 15 percent slopes, eroded	14.0	2.8%
BnB	Blanton sand, 0 to 6 percent slopes	231.6	45.8%
BnC	Blanton sand, 6 to 15 percent slopes	102.7	20.3%
Ch	Chewacla soils	6.7	1.3%
PkE	Pickens slaty silt loam, 10 to 25 percent slopes	0.3	0.1%
Ru	Rutlege loamy sand	63.0	12.5%
WaB	Wagram sand, 2 to 6 percent slopes	46.9	9.3%
WaC	Wagram sand, 6 to 10 percent slopes	6.6	1.3%
WaD	Wagram sand, 10 to 15 percent slopes	4.5	0.9%
Wo	Worsham fine sandy loam	10.8	2.1%
Totals for Area of Interest		**505.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lancaster County, South Carolina

AtC2—Appling and Chesterfield soils, 6 to 10 percent slopes, eroded

Map Unit Setting

Landscape: Piedmonts
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Appling and similar soils: 100 percent

Description of Appling

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Clayey residuum weathered from granite and gneiss

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.9 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 7 inches: Fine sandy loam
7 to 30 inches: Clay
30 to 46 inches: Sandy clay
46 to 72 inches: Silty clay loam

AtD2—Appling and Chesterfield soils, 10 to 15 percent slopes, eroded

Map Unit Setting

Landscape: Piedmonts
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F

Frost-free period: 192 to 247 days

Map Unit Composition

Appling and similar soils: 100 percent

Description of Appling

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Clayey residuum weathered from granite and gneiss

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 7 inches: Fine sandy loam
7 to 30 inches: Clay
30 to 46 inches: Sandy clay
46 to 72 inches: Silty clay loam

BnB—Blanton sand, 0 to 6 percent slopes

Map Unit Setting

Landscape: Sandhills
Elevation: 50 to 250 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Blanton and similar soils: 100 percent

Description of Blanton

Setting

Landform: Marine terraces

Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy marine deposits

Properties and qualities
Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 3s
Hydrologic Soil Group: A

Typical profile
0 to 7 inches: Sand
7 to 63 inches: Sand
63 to 72 inches: Loamy sand

BnC—Blanton sand, 6 to 15 percent slopes

Map Unit Setting
Landscape: Sandhills
Elevation: 50 to 250 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition
Blanton and similar soils: 100 percent

Description of Blanton

Setting
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy marine deposits

Properties and qualities
Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)

Depth to water table: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4s
Hydrologic Soil Group: A

Typical profile

0 to 7 inches: Sand
7 to 63 inches: Sand
63 to 72 inches: Loamy sand

Ch—Chewacla soils

Map Unit Setting

Landscape: River valleys
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Chewacla and similar soils: 90 percent
Minor components: 5 percent

Description of Chewacla

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: High (about 11.7 inches)

Interpretive groups

Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
Land capability (nonirrigated): 3w
Hydrologic Soil Group: C

Typical profile

0 to 7 inches: Silt loam
7 to 38 inches: Silt loam
38 to 50 inches: Silty clay loam
50 to 65 inches: Silty clay loam

Minor Components

Wehadkee

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

PkE—Pickens slaty silt loam, 10 to 25 percent slopes

Map Unit Setting

Landscape: Piedmonts
Elevation: 350 to 1,000 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Manteo and similar soils: 100 percent

Description of Manteo

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Silty residuum weathered from argillite and serecite schist

Properties and qualities

Slope: 10 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 7e
Hydrologic Soil Group: C/D

Typical profile

0 to 7 inches: Channery silt loam
7 to 20 inches: Extremely channery silt loam
20 to 26 inches: Bedrock

Ru—Rutlege loamy sand

Map Unit Setting

Elevation: 0 to 300 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Rutlege and similar soils: 100 percent

Description of Rutlege

Setting

Landform: Depressions, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4w
Hydrologic Soil Group: B/D

Typical profile

0 to 21 inches: Loamy sand
21 to 60 inches: Loamy sand

WaB—Wagram sand, 2 to 6 percent slopes

Map Unit Setting

Landscape: Sandhills
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Wagram and similar soils: 100 percent

Description of Wagram

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy and sandy marine deposits

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 2s
Hydrologic Soil Group: A

Typical profile

0 to 8 inches: Sand
8 to 25 inches: Sand
25 to 74 inches: Sandy clay loam

WaC—Wagram sand, 6 to 10 percent slopes

Map Unit Setting

Landscape: Sandhills
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F

Frost-free period: 192 to 247 days

Map Unit Composition

Wagram and similar soils: 100 percent

Description of Wagram

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy and sandy marine deposits

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3s
Hydrologic Soil Group: A

Typical profile

0 to 8 inches: Sand
8 to 25 inches: Sand
25 to 74 inches: Sandy clay loam

WaD—Wagram sand, 10 to 15 percent slopes

Map Unit Setting

Landscape: Sandhills
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Wagram and similar soils: 100 percent

Description of Wagram

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Loamy and sandy marine deposits

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4s
Hydrologic Soil Group: A

Typical profile

0 to 8 inches: Sand
8 to 25 inches: Sand
25 to 74 inches: Sandy clay loam

Wo—Worsham fine sandy loam

Map Unit Setting

Landscape: River valleys
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Worsham and similar soils: 100 percent

Description of Worsham

Setting

Landform: Depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Clayey alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 5w
Hydrologic Soil Group: D

Typical profile

0 to 6 inches: Fine sandy loam
6 to 16 inches: Sandy clay loam
16 to 45 inches: Clay loam
45 to 60 inches: Sandy loam

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United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Lancaster County, South Carolina

Fill Materials Soil Classifications

July 9, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


80° 32' 24"
80° 31' 50"
34° 35' 12"
34° 34' 54"
542190
542280
542370
542460
542550
542640
542730
542820
542910
543000
3827310
3827220
3827130
3827040
3826950
3826860
3826770
BnC
BnB
Ru
Haile Gold Mine Creek
BlC
BnB
Ru
Map Scale: 1:4,140 if printed on A size (8.5" x 11") sheet.
N
Meters
0 50 100 200 300
Feet
0 200 400 800 1,200

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout
Borrow Pit
Clay Spot
Closed Depression
Gravel Pit
Gravelly Spot
Landfill
Lava Flow
Marsh or swamp
Mine or Quarry
Miscellaneous Water
Perennial Water
Rock Outcrop
Saline Spot
Sandy Spot
Severely Eroded Spot
Sinkhole
Slide or Slip
Sodic Spot
Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other

Special Line Features

Gully
Short Steep Slope
Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

MAP INFORMATION

Map Scale: 1:4,140 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lancaster County, South Carolina
Survey Area Data: Version 14, Oct 5, 2011

Date(s) aerial images were photographed: 6/11/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Lancaster County, South Carolina (SC057)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BlC	Blaney sand, 6 to 10 percent slopes	29.6	52.1%
BnB	Blanton sand, 0 to 6 percent slopes	25.3	44.4%
BnC	Blanton sand, 6 to 15 percent slopes	1.2	2.2%
Ru	Rutlege loamy sand	0.7	1.3%
Totals for Area of Interest		**56.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lancaster County, South Carolina

BlC—Blaney sand, 6 to 10 percent slopes

Map Unit Setting

Landscape: Sandhills
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Blaney and similar soils: 100 percent

Description of Blaney

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3s
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Sand
4 to 26 inches: Sand
26 to 50 inches: Sandy clay loam
50 to 72 inches: Sandy loam

BnB—Blanton sand, 0 to 6 percent slopes

Map Unit Setting

Landscape: Sandhills
Elevation: 50 to 250 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F

Frost-free period: 192 to 247 days

Map Unit Composition

Blanton and similar soils: 100 percent

Description of Blanton

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy marine deposits

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3s
Hydrologic Soil Group: A

Typical profile

0 to 7 inches: Sand
7 to 63 inches: Sand
63 to 72 inches: Loamy sand

BnC—Blanton sand, 6 to 15 percent slopes

Map Unit Setting

Landscape: Sandhills
Elevation: 50 to 250 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition

Blanton and similar soils: 100 percent

Description of Blanton

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Sandy marine deposits

Properties and qualities
Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 4s
Hydrologic Soil Group: A

Typical profile
0 to 7 inches: Sand
7 to 63 inches: Sand
63 to 72 inches: Loamy sand

Ru—Rutlege loamy sand

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 38 to 53 inches
Mean annual air temperature: 49 to 73 degrees F
Frost-free period: 192 to 247 days

Map Unit Composition
Rutlege and similar soils: 100 percent

Description of Rutlege

Setting
Landform: Depressions, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy marine deposits

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Low (about 4.0 inches)

Interpretive groups

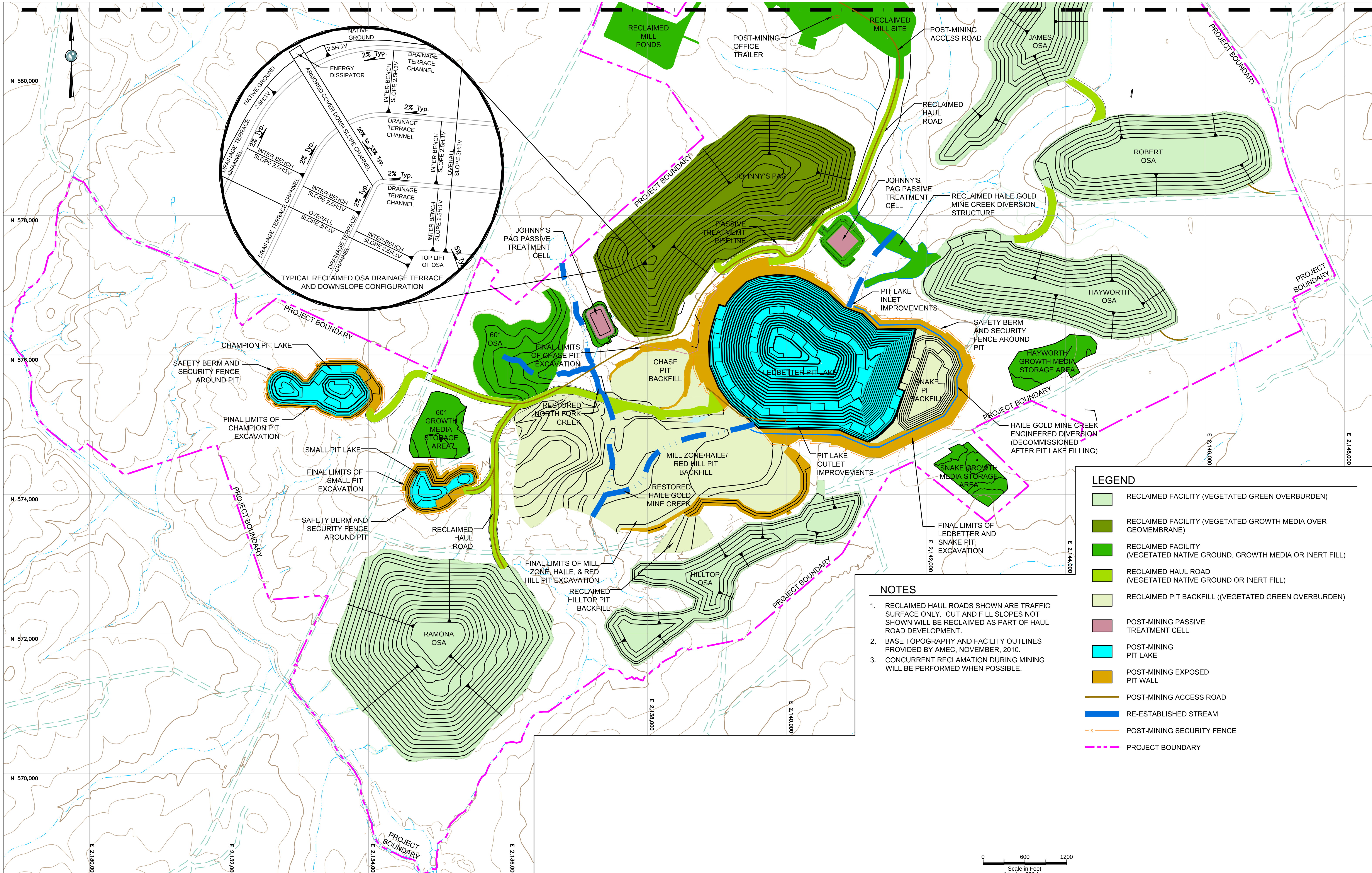
Farmland classification: Not prime farmland
Land capability (nonirrigated): 4w
Hydrologic Soil Group: B/D

Typical profile

0 to 21 inches: Loamy sand
21 to 60 inches: Loamy sand

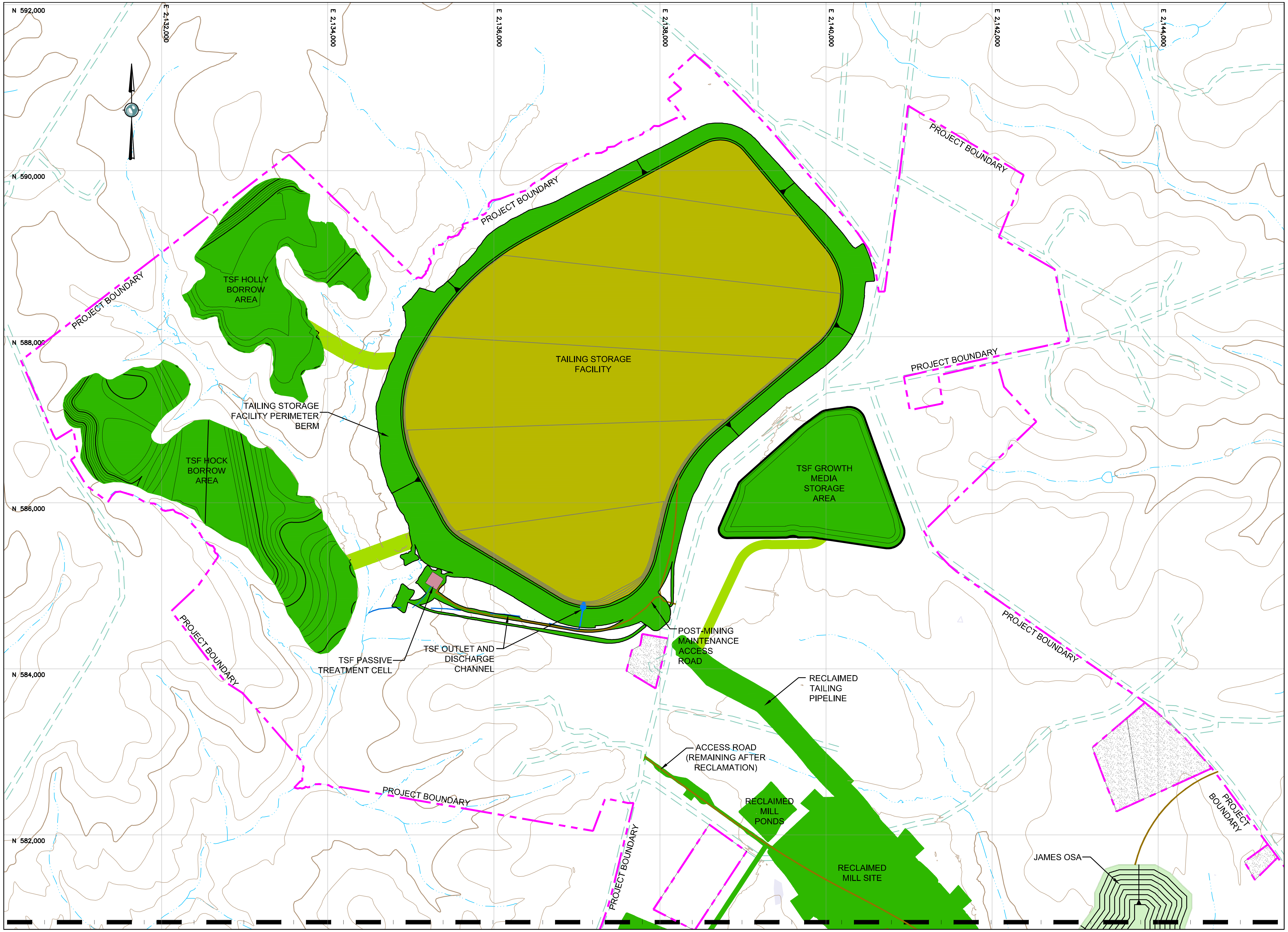
ATTACHMENT C

RUSLE 2 Model Input and Output



NOTES

1. RECLAIMED HAUL ROADS SHOWN ARE TRAFFIC SURFACE ONLY. CUT AND FILL SLOPES NOT SHOWN WILL BE RECLAIMED AS PART OF HAUL ROAD DEVELOPMENT.
2. BASE TOPOGRAPHY AND FACILITY OUTLINES PROVIDED BY AMEC, NOVEMBER, 2010.
3. CONCURRENT RECLAMATION DURING MINING WILL BE PERFORMED WHEN POSSIBLE.



LEGEND

- RECLAIMED FACILITY (VEGETATED GREEN OVERBURDEN)
- RECLAIMED FACILITY (VEGETATED GROWTH MEDIA OVER GEOMEMBRANE)
- RECLAIMED FACILITY (VEGETATED NATIVE GROUND, GROWTH MEDIA OR INERT FILL)
- RECLAIMED HAUL ROAD (VEGETATED NATIVE GROUND OR INERT FILL)
- POST-MINING ACCESS ROAD
- PROJECT BOUNDARY

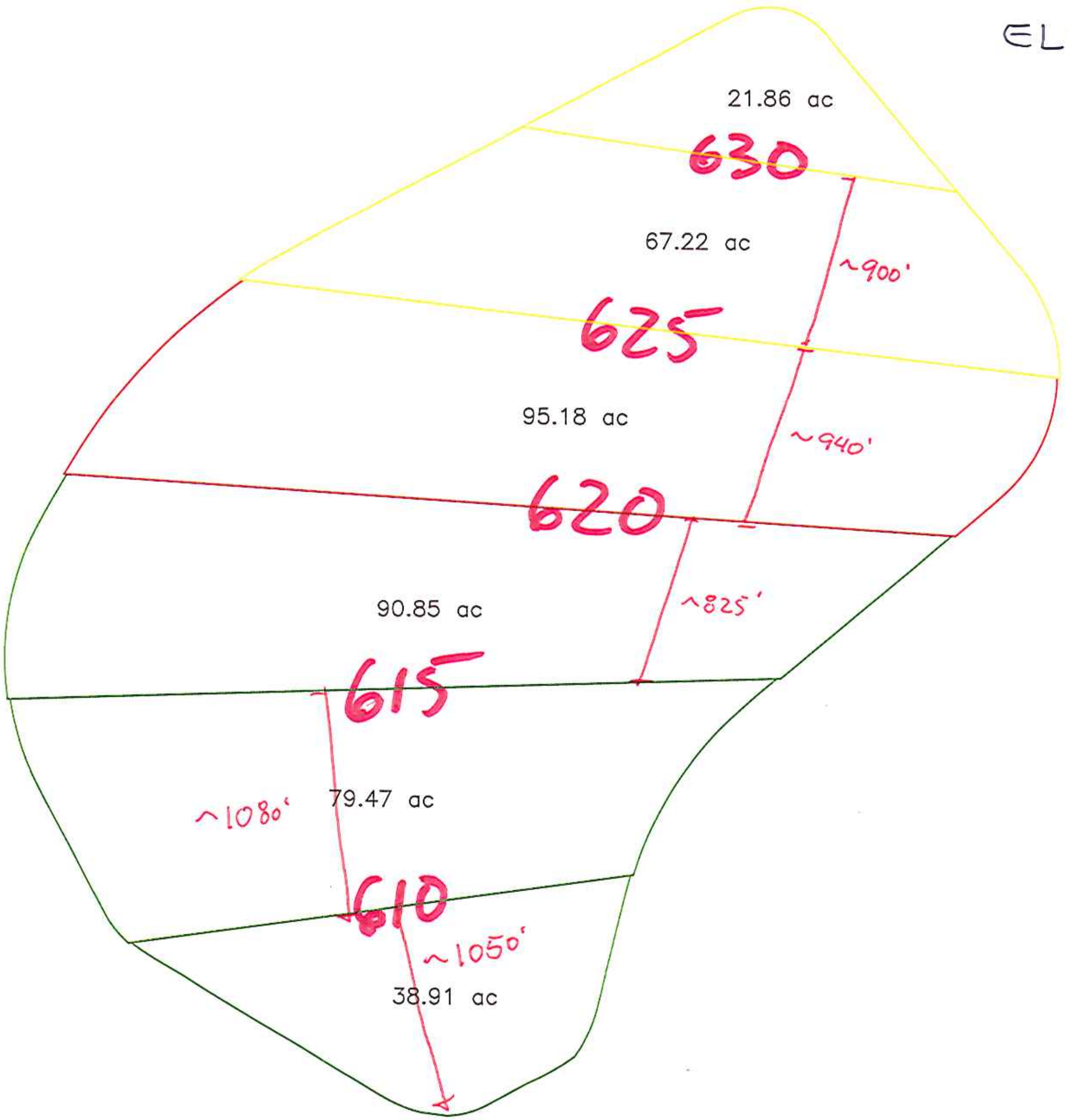
NOTES

1. RECLAIMED HAUL ROADS SHOWN ARE TRAFFIC SURFACE ONLY. CUT AND FILL SLOPES NOT SHOWN WILL BE RECLAIMED AS PART OF HAUL ROAD DEVELOPMENT.
2. BASE TOPOGRAPHY AND FACILITY OUTLINES PROVIDED BY AMEC, NOVEMBER, 2010.
3. CONCURRENT RECLAMATION DURING MINING WILL BE PERFORMED WHEN POSSIBLE.

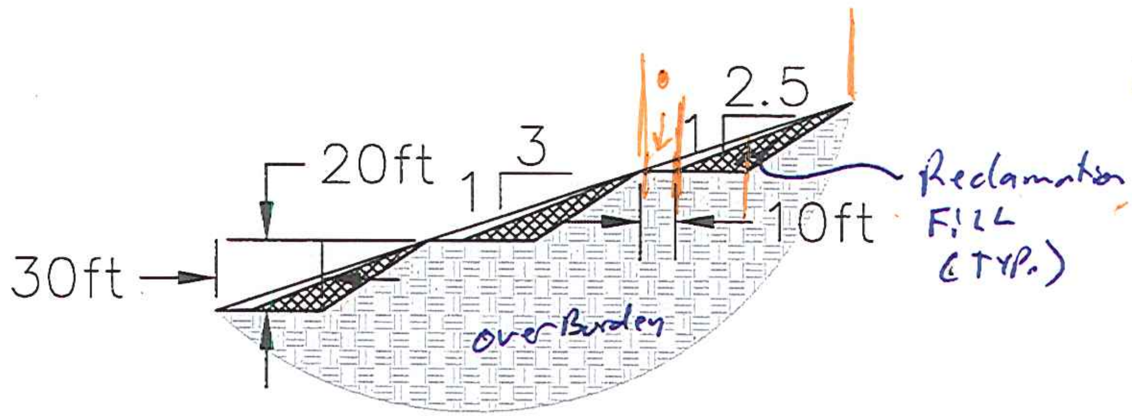
0 600 1200
Scale in Feet
1 inch = 600 feet

DUCKWOOD TSF AREA &

ELEVATION CONTOURS

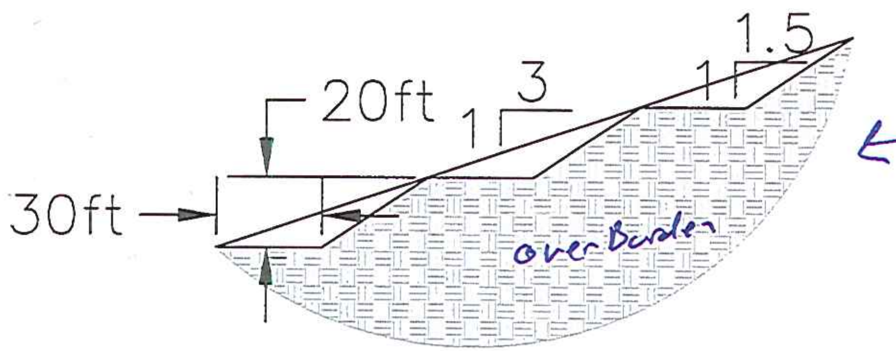


JOHNNY'S PAG



Johnnys PAG
Reclamation Surface

~~10~~ 10 ft Benches width
2.5:1 Bench Slopes
3:1 overall slope
20 ft high Benches



Johnny's PAG
Stacking Layout

30 ft Benches width
20 ft high Benches
1.5:1 Bench slopes
3:1 overall slope

S:\CAD\1263B - Haile Final Design C3D\DELV\20130605-Johnny's Pag Stacked 1s 5s and break lines\Johnnys PAG Fully Stacked.dwg, 6/5/2013 5:49:37 PM

RUSLE2 Expanded Profile Erosion Calculation Record

Info: **JOHNNY'S PAG – BARE LAND (NO OPERATION)**

File: profiles\Haile Gold Mine Lancaster Co SC.JOHNNYOVERBURDEN.BARELAND.33%

Inputs:
Location: South Carolina\USA\South Carolina\Lancaster County
Soil: Lancaster, SC\BnC Blanton sand, 6 to 15 percent slopes\Blanton sand 100%
Slope length (horiz): 50.0 ft
Avg. slope steepness: 33 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*

Contouring: default
Strips/barriers: default
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 59 t/ac/yr
Detachment on slope: 59 t/ac/yr
Soil loss for cons. plan: 59 t/ac/yr
Sediment delivery: 59 t/ac/yr

Crit. slope length: -- ft
Surf. cover after planting: -- %

Soil conditioning index (SCI): -4.5
Avg. annual slope STIR: 11
Wind & irrigation-induced erosion for SCI: 0 t/ac/yr

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

Table D-1 Johnny's PAG Monthly and Annual Soil Loss (Bare Land and no vegetation Management)

CALCULATION OF MONTHLY SOIL LOSS							
Johnny's PAG (3:1 Slope and terraces areas (33% slope) -Bare Land						Sorting by Month	
		Days per Period	Tons/ac/period	Tons/ac/month		Month	Tons/ac/month
2/15/2000	20	15	0.821917808			1	2.17
3/1/2000	27	14	1.035616438		3.15	2	1.93
3/15/2000	50	1	0.136986301			3	3.15
3/16/2000	45	16	1.97260274			4	2.22
4/1/2000	27	15	1.109589041		2.22	5	4.09
4/16/2000	27	15	1.109589041			6	6.49
5/1/2000	42	15	1.726027397		4.09	7	10.19
5/16/2000	54	16	2.367123288			8	7.27
6/1/2000	70	15	2.876712329		6.49	9	4.60
6/16/2000	88	15	3.616438356			10	3.13
7/1/2000	120	15	4.931506849		10.19	11	2.22
7/16/2000	120	16	5.260273973			12	1.83
8/1/2000	94	14	3.605479452		7.27		
8/15/2000	88	1	0.24109589				
8/16/2000	78	16	3.419178082				
9/1/2000	69	1	0.189041096		4.60		
9/2/2000	68	1	0.18630137				
9/3/2000	61	13	2.17260274				
9/16/2000	50	15	2.054794521				
10/1/2000	40	15	1.643835616		3.13		
10/16/2000	34	16	1.490410959				
11/1/2000	29	15	1.191780822		2.22		
11/16/2000	25	15	1.02739726				
12/1/2000	21	15	0.863013699		1.83		
12/16/2000	22	16	0.964383562				
1/1/2001	25	15	1.02739726		2.17		
1/16/2001	26	16	1.139726027				
2/1/2001	29	14	1.112328767		1.93		
2/15/2001							
					49.29	49.29 ton/ac/year	

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
2/15/0	Bulldozer, clearing/cutting		0
3/15/0	Bulldozer, filling/leveling		0
8/15/0	Disk, tandem light finishing		0
9/1/0	default		0
9/2/0	No operation		0
9/3/0	No operation		0
1/1/1	default		0

Period Start Date	*Operation*	*PLU*	*Avg. surf. cover, %*	*Avg. SC subfactor*	*Avg. CC subfactor*	*Avg. roughness, in.*	*Avg. SR subfactor*	*Avg. C factor*	*EI, %*
2/15/0	Bulldozer, clearing/cutting	0.45	0	1.0	1.0	0.28	0.97	0.44	2.3
3/1/0		0.45	0	1.0	1.0	0.28	0.97	0.44	3.0
3/15/0	Bulldozer, filling/leveling	1.0	0	1.0	1.0	0.24	1.00	1.00	0.23
3/16/0		1.00	0	1.0	1.0	0.24	1.00	1.00	3.3
4/1/0		1.00	0	1.0	1.0	0.24	1.00	1.00	2.7
4/16/0		1.00	0	1.0	1.0	0.24	1.00	0.99	2.6
5/1/0		0.99	0	1.0	1.0	0.24	1.00	0.99	3.9
5/16/0		0.99	0	1.0	1.0	0.24	1.00	0.99	5.1
6/1/0		0.99	0	1.0	1.0	0.24	1.00	0.98	5.9
6/16/0		0.98	0	1.0	1.0	0.24	1.00	0.98	7.0
7/1/0		0.98	0	1.0	1.0	0.24	1.00	0.98	8.9
7/16/0		0.98	0	1.0	1.0	0.24	1.00	0.97	9.3
8/1/0		0.97	0	1.0	1.0	0.24	1.00	0.97	7.0
8/15/0	Disk, tandem light finishing	1.0	0	1.0	1.0	0.26	0.98	0.98	0.47
8/16/0		1.00	0	1.0	1.0	0.26	0.98	0.98	7.0
9/1/0	default	1.00	0	1.0	1.0	0.26	0.99	0.98	0.40
9/2/0	No operation	1.00	0	1.0	1.0	0.26	0.99	0.98	0.39
9/3/0	No operation	1.00	0	1.0	1.0	0.26	0.99	0.99	4.6
9/16/0		1.00	0	1.0	1.0	0.25	0.99	0.98	4.6
10/1/0		0.99	0	1.0	1.0	0.25	0.99	0.98	3.8
10/16/0		0.99	0	1.0	1.0	0.25	0.99	0.98	3.4
11/1/0		0.99	0	1.0	1.0	0.25	0.99	0.98	2.6
11/16/0		0.98	0	1.0	1.0	0.25	0.99	0.98	2.3
12/1/0		0.98	0	1.0	1.0	0.25	0.99	0.97	1.7
12/16/0		0.98	0	1.0	1.0	0.24	0.99	0.97	1.9
1/1/1	Man #2: default	0.97	0	1.0	1.0	0.24	0.99	0.97	1.8
1/16/1		0.97	0	1.0	1.0	0.24	1.00	0.96	2.0
2/1/1		0.96	0	1.0	1.0	0.24	1.00	0.96	2.0

Period Start Date, m/d/y	*Operation Name*	*Man soil loss rate, t/ac/yr*	*Man sed del. rate*	*EI, %*
2/15/0	Bulldozer, clearing/cutting	20	20	2.3
3/1/0		27	27	3.0
3/15/0	Bulldozer, filling/leveling	50	50	0.23
3/16/0		45	45	3.3
4/1/0		27	27	2.7
4/16/0		27	27	2.6
5/1/0		42	42	3.9
5/16/0		54	54	5.1
6/1/0		70	70	5.9
6/16/0		88	88	7.0
7/1/0		120	120	8.9
7/16/0		120	120	9.3
8/1/0		94	94	7.0
8/15/0	Disk, tandem light finishing	88	88	0.47
8/16/0		78	78	7.0
9/1/0	default	69	69	0.40
9/2/0	No operation	68	68	0.39
9/3/0	No operation	61	61	4.6
9/16/0		50	50	4.6
10/1/0		40	40	3.8
10/16/0		34	34	3.4
11/1/0		29	29	2.6
11/16/0		25	25	2.3
12/1/0		21	21	1.7
12/16/0		22	22	1.9
1/1/1	Man #2: default	25	25	1.8
1/16/1		26	26	2.0
2/1/1		29	29	2.0

Table D-2 Johnny's PAG (Plateau Areas) Monthly and Annual Soil Loss (Hydroseeding and Vegetation Management)

CALCULATION OF MONTHLY SOIL LOSS						
Johnny's PAG (5% slope area Top of Overburden) - Hydroseeding					Sorting by Month	
		Days per F	Tons/ac/pe	Tons/ac/month	Month	Tons/ac/month
4/1/2000	0.58	14	0.022247	0.03	1	0.01
4/15/2000	1.1	1	0.003014		2	0.01
4/16/2000	0.56	1	0.001534		3	0.02
4/17/2000	0.17	14	0.006521		4	0.03
5/1/2000	0.36	15	0.014795	0.04	5	0.04
5/16/2000	0.62	16	0.027178		6	0.09
6/1/2000	0.94	15	0.03863	0.09	7	0.13
6/16/2000	1.2	15	0.049315		8	0.09
7/1/2000	1.5	15	0.061644	0.13	9	0.05
7/16/2000	1.5	16	0.065753		10	0.03
8/1/2000	1.2	15	0.049315	0.09	11	0.01
8/16/2000	0.93	16	0.040767		12	0.01
9/1/2000	0.68	15	0.027945	0.05		
9/16/2000	0.5	15	0.020548			
10/1/2000	0.36	15	0.014795	0.03		
10/16/2000	0.27	16	0.011836			
11/1/2000	0.2	15	0.008219	0.01		
11/16/2000	0.16	15	0.006575			
12/1/2000	0.13	15	0.005342	0.01		
12/16/2000	0.14	16	0.006137			
1/1/2001	0.17	15	0.006986	0.01		
1/16/2001	0.17	16	0.007452			
2/1/2001	0.17	14	0.006521	0.01		
2/15/2001	0.18	14	0.006904			
3/1/2001	0.24	15	0.009863	0.02		
3/16/2001	0.21	16	0.009205			
4/1/2001						
				0.53	0.53 ton/ac/year	

RUSLE2 Expanded Profile Erosion Calculation Record

Info: JOHNNY'S PAG TOP AREAS –GRASS COVERAGE

File: profiles\Haile Gold Mine Lancaster Co SC.JOHNNYOVERBYRDEN_TOP.HYDROSEEDING.5%

Inputs:
Location: South Carolina\USA\South Carolina\Lancaster County
Soil: Lancaster, SC\BnC Blanton sand, 6 to 15 percent slopes\Blanton sand 100%
Slope length (horiz): 100 ft
Avg. slope steepness: 5.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 37\CMZ 37\d.Construction Site Templates\Hydro seeding	Turfgrass, spring seed	tons	1.50
Strip/Barrier Managements\Bahiagrass; not harvested	Permanent cover not harvested\Bahiagrass, not harvested	lb	8000

Contouring: a. rows up-and-down hill
Strips/barriers: Width as pct of slope length\1-Bahiagrass buffer midslope 10 pct. of slope length
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 0.65 t/ac/yr
Detachment on slope: 0.65 t/ac/yr
Soil loss for cons. plan: 0.59 t/ac/yr
Sediment delivery: 0.56 t/ac/yr

Crit. slope length: -- ft
Surf. cover after planting: 35 %

Soil conditioning index (SCI): 0.22
Avg. annual slope STIR: 73
Wind & irrigation-induced erosion for SCI: 0 t/ac/yr

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
4/1/0	Disk, tandem secondary op.		36
4/15/0	Disk, tandem secondary op.		16
4/16/0	Harrow, spike tooth		35
4/16/0	Hydro-seeder	Turfgrass, spring seed	35
4/17/0	Add mulch		93
1/1/1	begin growth	Permanent cover not harvested\Bahiagrass, not harvested	0
4/1/0	Disk, tandem secondary op.		36
4/15/0	Disk, tandem secondary op.		16
4/16/0	Harrow, spike tooth		35
4/16/0	Hydro-seeder	Turfgrass, spring seed	35
4/17/0	Add mulch		93

Period Start Date	*Operation*	*PLU*	*Avg. surf. cover, %*	*Avg. SC subfactor*	*Avg. CC subfactor*	*Avg. roughness, in.*	*Avg. SR subfactor*	*Avg. C factor*	*EI, %*
4/1/0	Disk, tandem secondary op.	0.24	35	0.34	0.88	0.34	0.93	0.066	2.5
4/15/0	Disk, tandem secondary op.	0.25	16	0.60	0.96	0.34	0.93	0.14	0.16
4/16/0	Harrow, spike tooth								0
4/16/0	Hydro-seeder => Turfgrass, spring seed	0.25	35	0.34	0.98	0.30	0.96	0.081	0.16
4/17/0	Add mulch	0.30	90	0.075	1.00	0.30	0.96	0.021	2.5
5/1/0		0.38	85	0.083	0.98	0.29	0.96	0.030	3.9
5/16/0		0.48	76	0.094	0.93	0.28	0.97	0.041	5.1
6/1/0		0.56	66	0.10	0.86	0.28	0.97	0.049	5.9
6/16/0		0.62	56	0.11	0.71	0.27	0.98	0.049	7.0
7/1/0		0.67	46	0.13	0.57	0.27	0.98	0.047	8.9
7/16/0		0.69	38	0.14	0.51	0.26	0.98	0.049	9.3
8/1/0		0.69	32	0.15	0.46	0.26	0.99	0.048	7.5
8/16/0		0.67	27	0.17	0.42	0.25	0.99	0.046	7.0
9/1/0		0.64	24	0.17	0.40	0.25	0.99	0.043	5.4
9/16/0		0.58	22	0.18	0.38	0.25	0.99	0.039	4.6
10/1/0		0.52	20	0.18	0.37	0.25	0.99	0.034	3.8
10/16/0		0.46	19	0.18	0.36	0.25	0.99	0.030	3.4
11/1/0		0.41	18	0.18	0.35	0.25	0.99	0.026	2.6
11/16/0		0.36	23	0.16	0.42	0.25	0.99	0.024	2.3
12/1/0		0.32	29	0.14	0.50	0.25	0.99	0.022	1.7
12/16/0		0.32	31	0.14	0.55	0.24	0.99	0.024	1.9
1/1/1	Bahiagrass, not harvested	0.33	30	0.14	0.55	0.24	0.99	0.025	1.8
1/16/1		0.32	29	0.14	0.51	0.24	1.00	0.023	2.0
2/1/1		0.30	28	0.15	0.47	0.24	1.00	0.021	2.0
2/15/1		0.29	26	0.16	0.42	0.24	1.00	0.020	2.3
3/1/1		0.28	24	0.17	0.40	0.24	1.00	0.019	3.2
3/16/1		0.26	22	0.17	0.39	0.24	1.00	0.018	3.3

Period Start Date, m/d/y	*Operation Name*	*Man soil loss rate, t/ac/yr*	*Man sed del. rate*	*EI, %*
4/1/0	Disk, tandem secondary op.	0.58	0.58	2.5
4/15/0	Disk, tandem secondary op.	1.1	1.1	0.16
4/16/0	Harrow, spike tooth			0
4/16/0	Hydro-seeder => Turfgrass, spring seed	0.56	0.56	0.16
4/17/0	Add mulch	0.17	0.17	2.5
5/1/0		0.36	0.36	3.9
5/16/0		0.62	0.62	5.1
6/1/0		0.94	0.94	5.9
6/16/0		1.2	1.2	7.0
7/1/0		1.5	1.5	8.9
7/16/0		1.5	1.5	9.3
8/1/0		1.2	1.2	7.5
8/16/0		0.93	0.93	7.0
9/1/0		0.68	0.68	5.4
9/16/0		0.50	0.50	4.6
10/1/0		0.36	0.36	3.8
10/16/0		0.27	0.27	3.4
11/1/0		0.20	0.20	2.6
11/16/0		0.16	0.16	2.3
12/1/0		0.13	0.13	1.7
12/16/0		0.14	0.14	1.9
1/1/1	Bahiagrass, not harvested	0.17	0.17	1.8
1/16/1		0.17	0.17	2.0
2/1/1		0.17	0.17	2.0
2/15/1		0.18	0.18	2.3
3/1/1		0.24	0.24	3.2
3/16/1		0.21	0.21	3.3

Table D-3 Johnny's PAG (33% Slope) Monthly and Annual Soil Loss (Hydroseeding and Vegetation Management)

CALCULATION OF MONTHLY SOIL LOSS						
Johnny's PAG (3:1 Slope and terraces areas (33% slope) -Hydroseeding					Sorting by Month	
		Days per F	Tons/ac/period	Tons/ac/month	Month	Tons/ac/month
4/1/2000	2.5	14	0.095890411	0.15	1	0.06
4/15/2000	4.8	1	0.013150685		2	0.06
4/16/2000	2.8	1	0.007671233		3	0.08
4/17/2000	0.84	14	0.032219178		4	0.15
5/1/2000	1.7	15	0.069863014	0.20	5	0.20
5/16/2000	2.9	16	0.127123288		6	0.38
6/1/2000	4.2	15	0.17260274	0.38	7	0.52
6/16/2000	5	15	0.205479452		8	0.36
7/1/2000	6.3	15	0.25890411	0.52	9	0.20
7/16/2000	6	16	0.263013699		10	0.11
8/1/2000	4.8	15	0.197260274	0.36	11	0.06
8/16/2000	3.8	16	0.166575342		12	0.05
9/1/2000	2.8	15	0.115068493	0.20		
9/16/2000	2	15	0.082191781			
10/1/2000	1.5	15	0.061643836	0.11		
10/16/2000	1.1	16	0.048219178			
11/1/2000	0.85	15	0.034931507	0.06		
11/16/2000	0.67	15	0.027534247			
12/1/2000	0.53	15	0.021780822	0.05		
12/16/2000	0.61	16	0.026739726			
1/1/2001	0.73	15	0.03	0.06		
1/16/2001	0.71	16	0.031123288			
2/1/2001	0.72	14	0.027616438	0.06		
2/15/2001	0.79	14	0.03030137			
3/1/2001	1	15	0.04109589	0.08		
3/16/2001	0.93	16	0.040767123			
4/1/2001						
				2.23	2.23 ton/ac/year	

RUSLE2 Expanded Profile Erosion Calculation Record

Info: **JOHNNY'S PAG – HYDROSEEDING – GRASS COVERAGE**

File: profiles\Haile Gold Mine Lancaster Co SC.JOHNNYOVERBYRDEN.HYDROSEEDING.33%

Inputs:
Location: South Carolina\USA\South Carolina\Lancaster County
Soil: Lancaster, SC\BnC Blanton sand, 6 to 15 percent slopes\Blanton sand 100%
Slope length (horiz): 50.0 ft
Avg. slope steepness: 33 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 37\CMZ 37\d.Construction Site Templates\Hydro seeding	Turfgrass, spring seed	tons	1.50
Strip/Barrier Managements\Bahiagrass; not harvested	Permanent cover not harvested\Bahiagrass, not harvested	lb	8000

Contouring: a. rows up-and-down hill
Strips/barriers: Width as pct of slope length\1-Bahiagrass buffer midslope 10 pct. of slope length
Diversion/terrace, sediment basin: 1 Diversion 2.0% grade in middle of RUSLE slope
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 2.3 t/ac/yr
Detachment on slope: 2.3 t/ac/yr
Soil loss for cons. plan: 2.3 t/ac/yr
Sediment delivery: 2.0 t/ac/yr

Crit. slope length: -- ft
Surf. cover after planting: 35 %

Soil conditioning index (SCI): 0.093
Avg. annual slope STIR: 73
Wind & irrigation-induced erosion for SCI: 0 t/ac/yr

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
4/1/0	Disk, tandem secondary op.		36
4/15/0	Disk, tandem secondary op.		16
4/16/0	Harrow, spike tooth		35
4/16/0	Hydro-seeder	Turfgrass, spring seed	35
4/17/0	Add mulch		93
1/1/1	begin growth	Permanent cover not harvested\Bahiagrass, not harvested	0
4/1/0	Disk, tandem secondary op.		36
4/15/0	Disk, tandem secondary op.		16
4/16/0	Harrow, spike tooth		35
4/16/0	Hydro-seeder	Turfgrass, spring seed	35
4/17/0	Add mulch		93

Period Start Date	Operation	PLU	Avg. surf. cover, %	Avg. SC subfactor	Avg. CC subfactor	Avg. roughness, in.	Avg. SR subfactor	Avg. C factor	EI, %
4/1/0	Disk, tandem secondary op.	0.24	35	0.27	0.88	0.34	0.93	0.054	2.5
4/15/0	Disk, tandem secondary op.	0.25	16	0.54	0.96	0.34	0.93	0.12	0.16
4/16/0	Harrow, spike tooth								0
4/16/0	Hydro-seeder => Turfgrass, spring seed	0.25	35	0.29	0.98	0.30	0.96	0.069	0.16
4/17/0	Add mulch	0.30	90	0.055	1.00	0.30	0.96	0.016	2.5
5/1/0		0.38	85	0.062	0.98	0.29	0.96	0.023	3.9
5/16/0		0.48	76	0.072	0.93	0.28	0.97	0.031	5.1
6/1/0		0.56	66	0.080	0.86	0.28	0.97	0.038	5.9
6/16/0		0.62	56	0.087	0.71	0.27	0.98	0.038	7.0
7/1/0		0.67	46	0.098	0.57	0.27	0.98	0.036	8.9
7/16/0		0.69	38	0.11	0.51	0.26	0.98	0.038	9.3
8/1/0		0.69	32	0.12	0.46	0.26	0.99	0.037	7.5
8/16/0		0.67	27	0.13	0.42	0.25	0.99	0.036	7.0
9/1/0		0.64	24	0.13	0.40	0.25	0.99	0.033	5.4
9/16/0		0.58	22	0.13	0.38	0.25	0.99	0.029	4.6
10/1/0		0.52	20	0.14	0.37	0.25	0.99	0.025	3.8
10/16/0		0.46	19	0.14	0.36	0.25	0.99	0.022	3.4
11/1/0		0.41	18	0.14	0.35	0.25	0.99	0.019	2.6
11/16/0		0.36	23	0.11	0.42	0.25	0.99	0.017	2.3
12/1/0		0.32	29	0.100	0.50	0.25	0.99	0.016	1.7
12/16/0		0.32	31	0.096	0.55	0.24	0.99	0.017	1.9
1/1/1	Bahiagrass, not harvested	0.33	30	0.098	0.55	0.24	0.99	0.018	1.8
1/16/1		0.32	29	0.10	0.51	0.24	1.00	0.016	2.0
2/1/1		0.30	28	0.10	0.47	0.24	1.00	0.015	2.0
2/15/1		0.29	26	0.11	0.42	0.24	1.00	0.014	2.3
3/1/1		0.28	24	0.12	0.40	0.24	1.00	0.014	3.2
3/16/1		0.26	22	0.13	0.39	0.24	1.00	0.013	3.3

Period Start Date, m/d/y	*Operation Name*	*Man soil loss rate, t/ac/yr*	*Man sed del. rate*	*EI, %*
4/1/0	Disk, tandem secondary op.	2.5	2.5	2.5
4/15/0	Disk, tandem secondary op.	4.8	4.8	0.16
4/16/0	Harrow, spike tooth			0
4/16/0	Hydro-seeder => Turfgrass, spring seed	2.8	2.8	0.16
4/17/0	Add mulch	0.84	0.84	2.5
5/1/0		1.7	1.7	3.9
5/16/0		2.9	2.9	5.1
6/1/0		4.2	4.2	5.9
6/16/0		5.0	5.0	7.0
7/1/0		6.3	6.3	8.9
7/16/0		6.0	6.0	9.3
8/1/0		4.8	4.8	7.5
8/16/0		3.8	3.8	7.0
9/1/0		2.8	2.8	5.4
9/16/0		2.0	2.0	4.6
10/1/0		1.5	1.5	3.8
10/16/0		1.1	1.1	3.4
11/1/0		0.85	0.85	2.6
11/16/0		0.67	0.67	2.3
12/1/0		0.53	0.53	1.7
12/16/0		0.61	0.61	1.9
1/1/1	Bahiagrass, not harvested	0.73	0.73	1.8
1/16/1		0.71	0.71	2.0
2/1/1		0.72	0.72	2.0
2/15/1		0.79	0.79	2.3
3/1/1		1.0	1.0	3.2
3/16/1		0.93	0.93	3.3

Table D-4 Tailing Storage FacilityMonthly and Annual Soil Loss (Hydroseeding and Vegetation Management)

CALCULATION OF MONTHLY SOIL LOSS						
Tailing Storage Facility (0.5%)					**Sorting by Month**	
		Days per P	Tons/ac/pe	Tons/ac/month	Month	Tons/ac/month
4/1/2000	0.083	14	0.003184	0.005	1	0.0030
4/15/2000	0.15	1	0.000411		2	0.0030
4/16/2000	0.091	1	0.000249		3	0.0044
4/17/2000	0.031	14	0.001189		4	0.0050
5/1/2000	0.061	15	0.002507	0.007	5	0.0068
5/16/2000	0.099	16	0.00434		6	0.0148
6/1/2000	0.15	15	0.006164	0.015	7	0.0255
6/16/2000	0.21	15	0.00863		8	0.0195
7/1/2000	0.3	15	0.012329	0.025	9	0.0115
7/16/2000	0.3	16	0.013151		10	0.0063
8/1/2000	0.25	15	0.010274	0.019	11	0.0035
8/16/2000	0.21	16	0.009205		12	0.0024
9/1/2000	0.16	15	0.006575	0.012		
9/16/2000	0.12	15	0.004932			
10/1/2000	0.085	15	0.003493	0.006		
10/16/2000	0.065	16	0.002849			
11/1/2000	0.048	15	0.001973	0.003		
11/16/2000	0.037	15	0.001521			
12/1/2000	0.027	15	0.00111	0.002		
12/16/2000	0.029	16	0.001271			
1/1/2001	0.035	15	0.001438	0.003		
1/16/2001	0.035	16	0.001534			
2/1/2001	0.037	14	0.001419	0.003		
2/15/2001	0.041	14	0.001573			
3/1/2001	0.054	15	0.002219	0.004		
3/16/2001	0.049	16	0.002148			
4/1/2001						
				0.106	0.106 ton/ac/year	

RUSLE2 Expanded Profile Erosion Calculation Record

Info: **TAILING STORAGE FACILITY**

File: profiles\Haile Gold Mine Lancaster Co SC.TSF.DUCKWOOD

Inputs:
Location: South Carolina\USA\South Carolina\Lancaster County
Soil: Lancaster, SC\BnC Blanton sand, 6 to 15 percent slopes\Blanton sand 100%
Slope length (horiz): 1000 ft
Avg. slope steepness: 0.50 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 37\CMZ 37\d.Construction Site Templates\Hydro seeding	Turfgrass, spring seed	tons	1.50
Strip/Barrier Managements\Bahiagrass; not harvested	Permanent cover not harvested\Bahiagrass, not harvested	lb	8000

Contouring: a. rows up-and-down hill
Strips/barriers: Width as pct of slope length\1-Bahiagrass buffer midslope 10 pct. of slope length
Diversion/terrace, sediment basin: 1 Diversion 0.5% grade at bottom of RUSLE slope
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 0.10 t/ac/yr
Detachment on slope: 0.10 t/ac/yr
Soil loss for cons. plan: 0.095 t/ac/yr
Sediment delivery: 0.091 t/ac/yr

Crit. slope length: -- ft
Surf. cover after planting: 39 %

Soil conditioning index (SCI): 0.38
Avg. annual slope STIR: 73
Wind & irrigation-induced erosion for SCI: 0 t/ac/yr

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
4/1/0	Disk, tandem secondary op.		47
4/15/0	Disk, tandem secondary op.		23
4/16/0	Harrow, spike tooth		39
4/16/0	Hydro-seeder	Turfgrass, spring seed	39
4/17/0	Add mulch		94
1/1/1	begin growth	Permanent cover not harvested\Bahiagrass, not harvested	0
4/1/0	Disk, tandem secondary op.		47
4/15/0	Disk, tandem secondary op.		23
4/16/0	Harrow, spike tooth		39
4/16/0	Hydro-seeder	Turfgrass, spring seed	39
4/17/0	Add mulch		94

Period Start Date	*Operation*	*PLU*	*Avg. surf. cover, %*	*Avg. SC subfactor*	*Avg. CC subfactor*	*Avg. roughness, in.*	*Avg. SR subfactor*	*Avg. C factor*	*EI, %*
4/1/0	Disk, tandem secondary op.	0.21	46	0.31	0.90	0.34	0.93	0.056	2.5
4/15/0	Disk, tandem secondary op.	0.22	23	0.56	0.96	0.35	0.93	0.11	0.16
4/16/0	Harrow, spike tooth								0
4/16/0	Hydro-seeder => Turfgrass, spring seed	0.22	39	0.36	0.98	0.30	0.96	0.076	0.16
4/17/0	Add mulch	0.26	94	0.094	1.00	0.30	0.96	0.023	2.5
5/1/0		0.34	92	0.095	0.99	0.29	0.96	0.031	3.9
5/16/0		0.43	91	0.095	0.97	0.29	0.97	0.038	5.1
6/1/0		0.50	88	0.096	0.95	0.28	0.97	0.045	5.9
6/16/0		0.56	86	0.097	0.91	0.27	0.98	0.048	7.0
7/1/0		0.61	83	0.100	0.86	0.27	0.98	0.052	8.9
7/16/0		0.63	79	0.10	0.84	0.26	0.98	0.054	9.3
8/1/0		0.64	76	0.11	0.81	0.26	0.99	0.056	7.5
8/16/0		0.63	72	0.11	0.78	0.26	0.99	0.056	7.0
9/1/0		0.60	69	0.12	0.76	0.25	0.99	0.053	5.4
9/16/0		0.55	66	0.12	0.73	0.25	0.99	0.049	4.6
10/1/0		0.49	64	0.13	0.71	0.25	0.99	0.044	3.8
10/16/0		0.44	61	0.13	0.69	0.25	0.99	0.040	3.4
11/1/0		0.39	59	0.14	0.68	0.25	0.99	0.035	2.6
11/16/0		0.34	61	0.13	0.70	0.25	0.99	0.031	2.3
12/1/0		0.30	63	0.12	0.74	0.25	0.99	0.027	1.7
12/16/0		0.30	63	0.12	0.76	0.25	0.99	0.028	1.9
1/1/1	Bahiagrass, not harvested	0.31	62	0.12	0.76	0.24	0.99	0.029	1.8
1/16/1		0.31	61	0.13	0.73	0.24	0.99	0.028	2.0
2/1/1		0.29	60	0.13	0.70	0.24	1.00	0.026	2.0
2/15/1		0.28	58	0.14	0.67	0.24	1.00	0.026	2.3
3/1/1		0.27	56	0.14	0.65	0.24	1.00	0.025	3.2
3/16/1		0.26	54	0.15	0.63	0.24	1.00	0.024	3.3

Period Start Date, m/d/y	*Operation Name*	*Man soil loss rate, t/ac/yr*	*Man sed del. rate*	*EI, %*
4/1/0	Disk, tandem secondary op.	0.083	0.083	2.5
4/15/0	Disk, tandem secondary op.	0.15	0.15	0.16
4/16/0	Harrow, spike tooth			0
4/16/0	Hydro-seeder => Turfgrass, spring seed	0.091	0.091	0.16
4/17/0	Add mulch	0.031	0.031	2.5
5/1/0		0.061	0.061	3.9
5/16/0		0.099	0.099	5.1
6/1/0		0.15	0.15	5.9
6/16/0		0.21	0.21	7.0
7/1/0		0.30	0.30	8.9
7/16/0		0.30	0.30	9.3
8/1/0		0.25	0.25	7.5
8/16/0		0.21	0.21	7.0
9/1/0		0.16	0.16	5.4
9/16/0		0.12	0.12	4.6
10/1/0		0.085	0.085	3.8
10/16/0		0.065	0.065	3.4
11/1/0		0.048	0.048	2.6
11/16/0		0.037	0.037	2.3
12/1/0		0.027	0.027	1.7
12/16/0		0.029	0.029	1.9
1/1/1	Bahiagrass, not harvested	0.035	0.035	1.8
1/16/1		0.035	0.035	2.0
2/1/1		0.037	0.037	2.0
2/15/1		0.041	0.041	2.3
3/1/1		0.054	0.054	3.2
3/16/1		0.049	0.049	3.3

Appendix B: Revegetation Plan and Seed Mixes

Revegetation Plan & Seed Mixes

Re-establishing vegetation on impacted lands will be essential to preventing erosion, restoring surface stability, providing site productivity, and providing wildlife forage/cover opportunities as well as visual/aesthetic values at the Haile Gold Mine Project Site during operations and reclamation. The vegetation procedures planned for the Haile Site are based on industry standards, Site specific experience in South Carolina, and past reclamation success.

Two seed mixes are proposed to be used at Haile. One is a standard seed mix and the second is a wetland seed mix. Haile is not currently proposing any "other plantings." All seed shall be certified noxious weed-free. The standard seed mix was chosen based on species characteristics, varied soil conditions at Site, and the planned land use and maintenance of the area. An annual grass is used in the mix and will change dependent on the time of year the planting is made. The primary goal of revegetation is soil stabilization while a secondary goal is to provide a habitat for wildlife and the natural succession of vegetation.

Standard Seed Mix

The standard seed mix has been developed to be broadcast seeded or hydroseeded at 75-100 pounds per acre. The seeding rate has been developed based on the recommended rates from the seed distributor. This seeding rate is considered appropriate for anticipated Site conditions, seasonal seeding variability, anticipated application methods and the need for rapid erosion control. The recommended seeding rate may be adjusted (either higher or lower) based upon Site-specific testing and evaluation of successful germination.

The individual plant species selected are generally known to establish quickly in South Carolina and germinate over a wide time period during the year and are commercially available. As a mix, the plant species selected for permanent cover are intended to complement each other in long-term establishment while ultimately developing a diverse native community. The seed mixes are from data and information gathered from consultants in South Carolina and are intended to aid erosion control and establishment of a grassland community. A forest community is not proposed or considered appropriate as the initial reclamation community due to long-establishment period, limited initial erosion control protection, and limited wildlife habitat diversity. A forest community will, however, evolve over time.

The Standard Seed Mix is proposed to be used year-round on all areas to be reseeded at the Haile Site except where the wetland seed mix is specified (see below). These areas are shown on the reclamation maps. However, optimal planting time for the long-term species is approximately October 15 through May 31. Seeding that occurs outside of the optimal planting window may potentially result in lower or slower germination rates. To promote vegetation success and minimize erosion during reseeding, two different annual grasses are used: Browntop millet (summer, April thru September) and Rye Grain (winter, September thru April). Browntop millet is a warm season annual grass that can be planted during spring and summer months. This species germinates quickly, provides dense ground cover and produces abundant biomass and seed. Rye Grain is a cool season annual grass that can be planted fall through spring providing a rapid winter cover.

Standard Seed Mix*

Common Name	**Scientific Name**	**Approximate Percent of Mix**
Purple Top	*Tridens flava*	20%
Partidge Pea	*Chamaecrista fasciculata*	10%
Shyleaf Vetch	*Aeschynomene Americana L.*	15%
Showy Ticktrefoil	*Desmodium canadense*	3%
Switchgrass	*Panicum virgatum*	20%
Indiangrass	*Sorghastrum nutans*	10%
White Clover	*Trifolium repens*	10%
Rye Grain[1] / Browntop Millet[2]	*Secale cereale/ Erograstiscurvula*	10%
Oxeye Sunflower	*Heliopsis helianthoides*	2%

*Spread at 30 - 40 pounds per acre

*The seeds and mix in the table may vary based upon ecotype, availability, and success of a variety of seed.

[1]Cool season mix

[2]Warm season mix

Wetland Seed Mix

The Wetland Seed Mix has been developed to be broadcast seeded or hydroseeded at 20-25 pounds per acre. The Wetland Seed Mix includes species adapted to soil conditions ranging from mesic to hydric in areas that are considered wetlands and/or riparian on Site. The wetland and riparian areas on Site are generally considered as having seasonally saturated soils. This will include areas immediately around permitted culvert installations and stream restoration work. Prolonged inundation is not typical of the wetlands and riparian areas characteristic of the Site. Species in the Wetland Seed Mix will prevent soil erosion, provide long-term vegetative cover, and provide general wildlife habitat. The Wetland Seed Mix will result in a community of palustrine emergent wetland vegetation that will likely transition in to the more typical characteristic forested wetland community through natural successional processes.

Wetland Seed Mix*

Common Name	**Scientific Name**	**Approximate Percent of Mix**
Riverbank wild rye	*Elymus riparius*	25%
Fox sedge	*Carex vulpinoidea*	17%
Switchgrass	*Panicum virgatum*	15%
Fowl bluegrass	*Poa palustris*	20%
Deer tongue	*Dichanthelium clandestinum*	8%
Bidens	*Bidens aristosa*	7%
Soft rush	*Juncus effusus*	4%
Duck potato	*Sagittaria latifolia*	2%
Lizards tail	*Saururus cernuus*	2%

*Spread at 20-25 pounds per acre
* The seeds and mix in the table may vary based upon ecotype, availability, and success of a variety of seed.

Appendix C: TSF Reclamation Figures

Table A1 – Stage 1 Filling Curve

Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)
535	0	0
536	18,035	6,012
537	79,807	51,272
538	113,537	147,450
539	152,382	279,934
540	196,921	454,110
541	248,515	676,329
542	308,637	954,363
543	376,421	1,296,331
544	606,963	1,783,456
545	879,366	2,522,424
546	1,156,502	3,537,200
547	1,443,159	4,834,388
548	1,754,466	6,430,669
549	2,094,815	8,352,797
550	2,457,272	10,626,431
551	2,823,443	13,264,670
552	3,192,529	16,270,767
553	3,574,878	19,652,669
554	3,969,082	23,422,931
555	4,377,898	27,594,751

Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)
556	4,794,109	32,179,180
557	5,215,454	37,182,483
558	5,640,342	42,608,994
559	6,067,084	48,461,410
560	6,485,751	54,736,664
561	6,904,898	61,430,895
562	7,326,494	68,545,550
563	7,749,422	76,082,519
564	8,174,605	84,043,587
565	8,602,112	92,431,037
566	9,026,097	101,244,292
567	9,446,775	110,479,930
568	9,863,052	120,134,095
569	10,272,140	130,200,998
570	10,672,165	140,672,514
571	11,063,177	151,539,599
572	11,446,167	162,793,728
573	11,823,125	174,427,865
574	12,193,935	186,435,918
575	12,672,822	198,868,528

Table A2 – Stage 2 Filling Curve

Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)
558	0	0
559	2,803	934
560	49,089	22,142
561	133,546	110,009
562	178,469	265,474
563	228,861	468,618
564	283,981	724,543
565	344,454	1,038,275
566	410,160	1,415,103
567	481,058	1,860,241
568	725,231	2,459,224
569	1,011,552	3,323,655
570	1,330,925	4,491,248
571	1,674,513	5,990,682
572	2,035,410	7,842,711
573	2,402,473	10,059,118
574	2,774,123	12,645,190
575	3,185,927	15,622,841
576	3,628,980	19,027,891
577	4,030,374	22,855,814
578	4,442,157	27,090,411
579	4,862,590	31,741,200
580	5,290,790	36,816,385
581	5,725,487	42,323,093
582	6,165,905	48,267,430
583	6,608,609	54,653,408
584	7,051,622	61,482,326
585	7,504,675	68,759,298
586	8,121,340	76,570,277
587	8,578,798	84,919,302
588	9,037,969	93,726,688
589	9,497,501	102,993,473
590	9,955,929	112,719,288
591	10,411,710	122,902,257
592	10,864,029	133,539,325
593	11,310,049	144,625,616
594	11,747,721	156,153,809
595	12,175,413	168,114,739
596	12,593,883	180,498,798
597	13,005,063	193,297,721
598	13,408,772	206,504,124
599	13,803,826	220,109,945
600	14,188,335	234,105,586

Table A3 – Stage 3 Filling Curve

Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)	Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)
587	0	0	609	5,513,614	38,094,005
588	7,087	2,362	610	5,977,248	43,837,876
589	53,425	29,019	611	6,447,980	50,049,003
590	134,196	119,784	612	6,925,494	56,734,319
591	248,071	308,025	613	7,407,059	63,899,247
592	304,357	583,760	614	7,890,299	71,546,654
593	366,007	918,468	615	8,373,911	79,677,560
594	432,906	1,317,457	616	8,859,102	88,292,928
595	504,943	1,785,920	617	9,347,724	97,395,248
596	582,013	2,328,942	618	9,838,440	106,987,284
597	664,018	2,951,507	619	10,329,987	117,070,500
598	941,868	3,750,413	620	10,820,963	127,645,025
599	1,259,976	4,847,485	621	11,309,894	138,709,553
600	1,610,414	6,279,101	622	11,796,134	150,261,714
601	2,051,270	8,105,504	623	12,276,895	162,297,428
602	2,459,148	10,357,633	624	12,750,251	174,810,255
603	2,881,802	13,025,317	625	13,214,118	187,791,749
604	3,308,309	16,117,921	626	13,667,582	201,231,961
605	3,736,630	19,638,218	627	14,112,719	215,121,517
606	4,169,897	23,589,502	628	14,549,525	229,452,085
607	4,610,114	27,977,666	629	14,977,294	244,214,978
608	5,057,842	32,809,915	630	15,394,114	259,400,206

Table A4 – Stage 4 Filling Curve

Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)
606	0	0
607	419	140
608	31,545	12,007
609	95,892	72,819
610	192,974	214,451
611	322,609	469,482
612	385,146	822,898
613	452,983	1,241,504
614	526,029	1,730,555
615	604,194	2,295,216
616	687,390	2,940,561
617	775,531	3,671,579
618	1,072,559	4,591,619
619	1,410,752	5,829,419
620	1,784,110	7,423,202
621	2,184,680	9,404,219
622	2,606,811	11,796,859
623	3,047,015	14,620,911
624	3,494,085	17,888,912
625	3,941,080	21,604,253
626	4,391,568	25,768,546
627	4,847,932	30,386,416
628	5,310,906	35,464,075
629	5,781,617	41,008,671
630	6,260,499	47,028,142
631	6,893,903	53,602,800
632	7,394,177	60,745,380
633	7,899,310	68,390,733
634	8,407,337	76,542,737
635	8,915,919	85,203,120
636	9,425,128	94,372,465
637	9,937,136	104,052,468
638	10,451,296	114,245,604
639	10,966,597	124,953,518
640	11,481,692	136,176,677
641	11,995,149	147,914,161
642	12,506,424	160,164,058
643	13,012,761	172,922,814
644	13,512,334	186,184,577
645	14,003,141	199,941,586
646	14,483,312	214,184,137
647	14,954,205	228,902,268
648	15,415,962	244,086,766
649	15,868,203	259,728,303
650	16,309,455	275,816,628

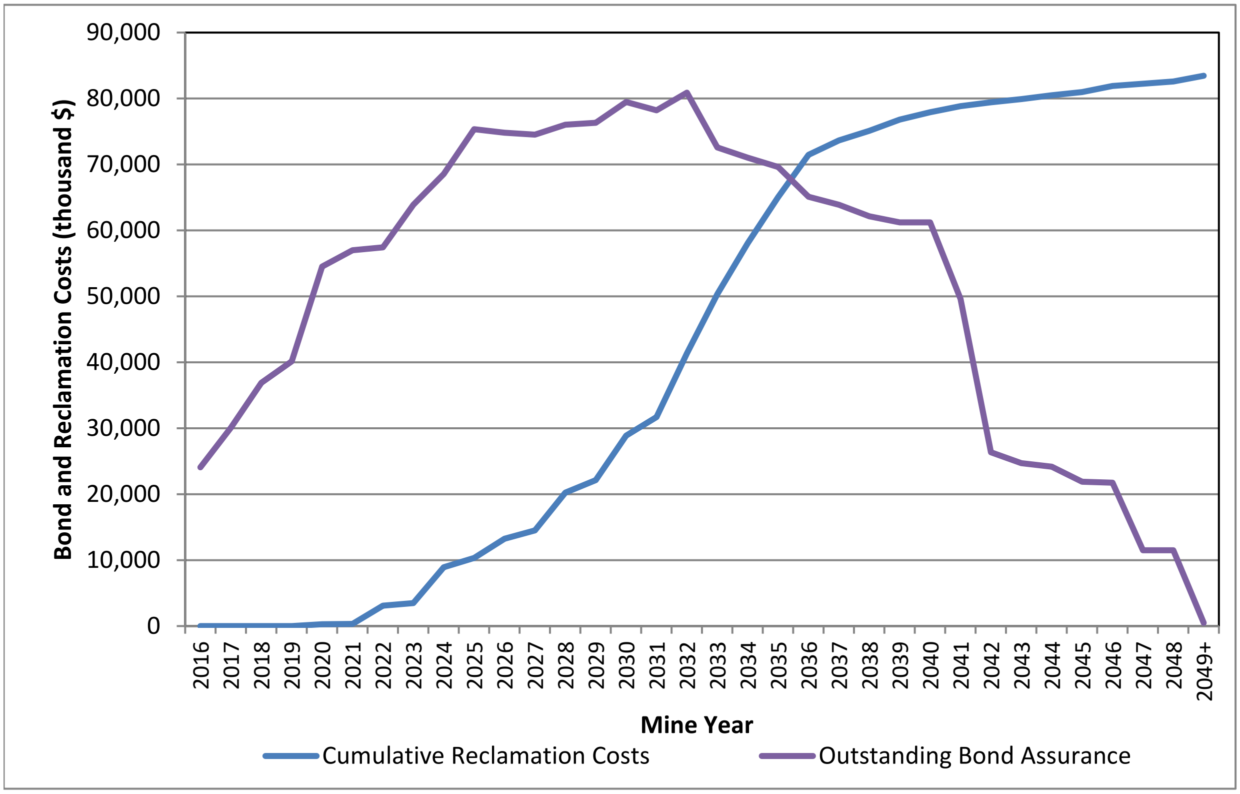
Table A5 – Stage 5 Filling Curve

Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)
628	0	0
629	15,738	5,246
630	64,195	42,485
631	145,113	144,427
632	258,478	343,515
633	404,245	672,172
634	473,237	1,110,460
635	547,517	1,620,385
636	627,017	2,207,203
637	711,650	2,876,090
638	801,325	3,632,134
639	895,976	4,480,344
640	1,213,498	5,531,075
641	1,572,665	6,920,282
642	1,967,970	8,686,910
643	2,392,849	10,863,861
644	2,841,832	13,477,987
645	3,308,936	16,550,411
646	3,787,326	20,095,852
647	4,266,712	24,120,491
648	4,745,826	28,624,636
649	5,228,900	33,610,048

Elevation (ft)	Area (ft^2)	Pond Volume (ft^3)
650	5,716,730	39,081,050
651	6,211,336	45,043,373
652	6,713,434	51,504,132
653	7,222,916	58,470,754
654	7,740,019	65,950,732
655	8,262,465	73,950,552
656	8,788,578	82,474,721
657	9,315,976	91,525,717
658	9,843,393	101,104,192
659	10,373,019	111,211,241
660	10,904,568	121,848,927
661	11,437,483	133,018,893
662	11,970,446	144,721,846
663	12,502,064	156,957,139
664	13,031,880	169,723,195
665	13,557,145	183,016,843
666	14,076,089	196,832,648
667	14,586,770	211,163,319
668	15,087,124	225,999,563
669	15,577,543	241,331,242
670	16,058,193	257,148,502

Appendix D: Reclamation Costs and Bond Assurance Calculations – Spreadsheet

Figure 1
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Bonding and Reclamation Charts



Notes:

- The Tailings Storage Facility will be capped by 2042 and it is anticipated that interstitial water reporting to the underdrain collection system will continue to be treated actively until flows decrease to the point that passive treatment is feasible. Therefore, release of the TSF bond would occur in five stages - 1) in 2042, after construction of Passive Treatment Facility; 2) in 2047, after five years of water treatment; 3) in 2052, after ten years of water treatment; 4) in 2057, after 15 years of water treatment; and 5) in 2062, after 20 years of water treatment.

- Release of Bonding for New Champion Reservoir would occur in 2086 (approx. 55 years after end of active mining).

- Release of Bonding for New Ledbetter Reservoir would occur in 2088 (approx. 57 years after end of active mining).

Figure 2
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Bond Recovery Chart

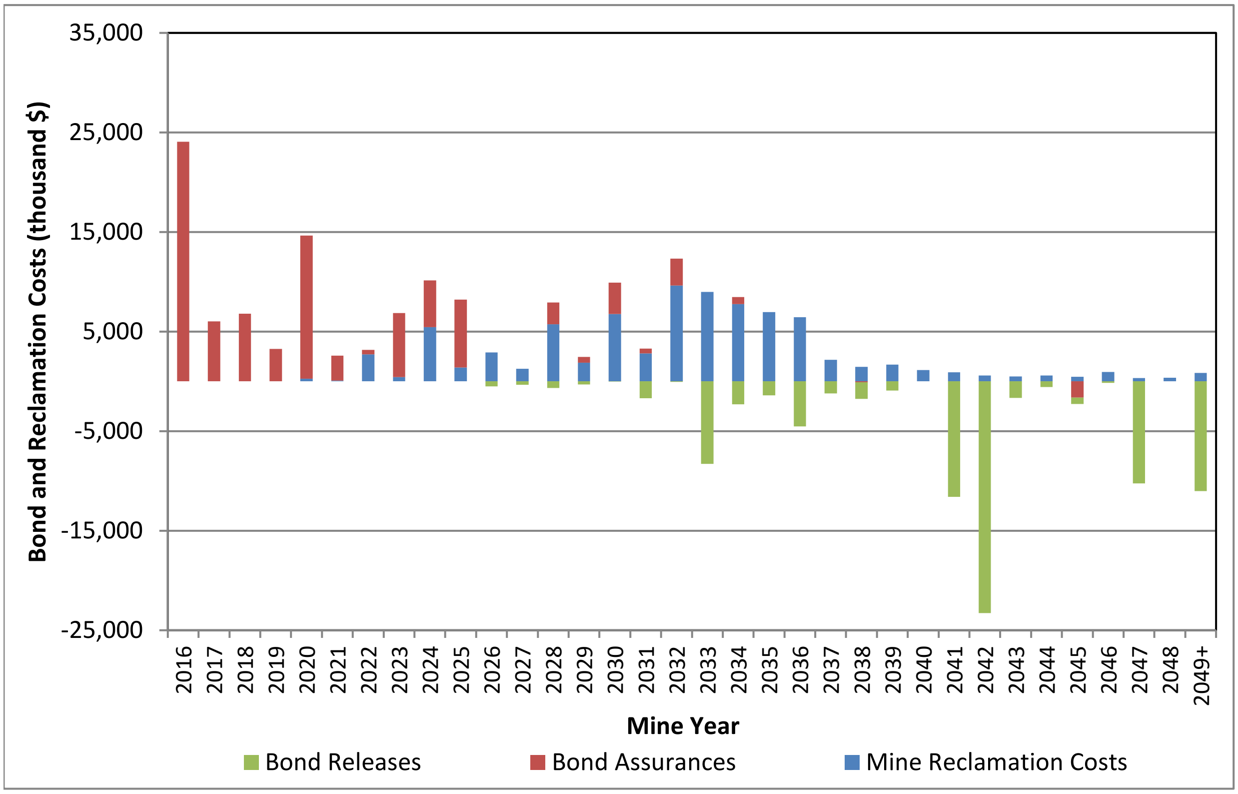


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Figure 3
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Bonding and Reclamation Bridge

Note:

* Haile is investing $10M in a trust that is managed and invested by the South Carolina Department of Revenue (DOR) for the costs of long-term, post-closure care and unanticipated closure contingencies at the mine. This trust will be fully funded by the end of active mining in 2031; thus, depending on, the DOR's investment strategy, these funds may be worth more than $10M initially invested by the time they are needed.

TABLE 1
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Summary of Bonding and Reclamation Costs

Year	Reclamation Costs (thousand $)	Bond (thousand $)			
		Bond Placed	Required Assurance	Release	Cumulative Outstanding
2016	-	24,069	24,069	-	24,069
2017	-	6,031	6,031	-	30,100
2018	-	6,789	6,789	-	36,889
2019	-	3,247	3,247	-	40,136
2020	269	14,597	14,374	-	54,510
2021	82		2,487	-	56,997
2022	2,724		426	-	57,423
2023	424		6,441	-	63,864
2024	5,446		4,687	-	68,551
2025	1,403		6,800	-	75,351
2026	2,910		-	(518)	74,832
2027	1,257		-	(334)	74,499
2028	5,728		2,210	(664)	76,045
2029	1,874		578	(307)	76,315
2030	6,765		3,149	(7)	79,457
2031	2,817		464	(1,694)	78,227
2032	9,641		2,701	(37)	80,891
2033	8,990		-	(8,295)	72,596
2034	7,749		732	(2,289)	71,039
2035	6,951		-	(1,407)	69,632
2036	6,455		-	(4,513)	65,119
2037	2,159		-	(1,220)	63,899
2038	1,471		(92)	(1,677)	62,131
2039	1,690		-	(914)	61,217
2040	1,132		-	-	61,217
2041	905		-	(11,588)	49,628
2042	585		-	(23,263)	26,365
2043	501		-	(1,665)	24,700
2044	579		-	(552)	24,148
2045	472		(1,641)	(616)	21,891
2046	933		-	(135)	21,756
2047	326		-	(10,254)	11,502
2048	356		-	-	11,502
2049+	859		-	(11,019)	483
Total	83,452		83,452	(82,969)	

Notes: Costs reflect anticipated totals at the end of the calendar year.
Costs include 12.0% indirect costs

Haile is investing $10M in a trust that is managed and invested by the South Carolina Department of Revenue (DOR) for the costs of long-term, post-closure care and unanticipated closure contingencies at the mine. This trust will be fully funded by the end of active mining in 2031; thus, depending on, the DOR's investment strategy, these funds may be worth more than $10M initially invested by the time they are needed.

TABLE 2
OceanaGold - Haile Gold Mine
Reclamation Bridge
Cost Breakdown Table by Facility or Activity

Total Reclamation Cost = $ 83,453,000

Facility	2015 FEIS Assurance (thousand $)	Bonding Paid through Oct 1, 2020
Bond Assurance	**$55,000**	**$54,510**
Trust	**$10,000**	**$2,600**
Interest		**$223**
Open Pits		
Mill Zone Pit (47 Acres)	$269	$269
Haile Pit (40 Acres)	$229	$229
Red Hill Pit (36 Acres)	$206	$206
Ledbetter Pit (101 Acres)	$51	$51
Snake Pit (77 Acres)	$206	$206
Chase Pit (23 Acres)	$132	$0
Mill Zone 2 *(Not Included)*	$0	$2,669
Champion Pit (24 Acres)	$2	$0
Small Pit (14 Acres)	$2	$0
Overburden Areas		
Johnny's PAG	$9,922	$7,365
Johnny's PAG Water Management	$16	$16
601 OSA	$219	$219
Ramona OSA	$1,038	$1,038
Hayworth OSA	$579	$651
Hilltop OSA	$420	$420
James OSA	$445	$445
Robert OSA	$524	$8,703
		$0
Site Surface Water Management		
Stormwater and contact water controls	$189	$189
Re-establish Drainages	$1,040	$1,040
TSF		
TSF Outboard Embankment	$0	$0
TSF Impoundment	$16,160	$14,011
TSF Outlet Notch	$103	$90
TSF Down chute	$9	$8
TSF Water Management	$0	$0

Facility	2020 SEIS Calculated Assurance (thousand $)	Additional Reclamation Required (thousand $)	Notes
Reclamation and Interest	**$83,452**	**$28,942**	
Trust	**$10,000**	**$7,400**	
Open Pits			**$2,658**
Mill Zone Pit (60 Acres)	$220	($49)	Includes Lime Amendment of 4.2 M tons Partial Backfill and Pit Crest Slope & Vegetation
Haile Pit (43 Acres)	$313	$84	Includes Lime Amendment of 6.2 M tons Backfill and Pit Crest Slope & Vegetation
Red Hill Pit (47 Acres)	$193	($13)	Includes Lime Amendment of 3.7M tons Backfill and Pit Crest Slope & Vegetation
Ledbetter Pit (164 Acres)	$179	$129	No Backfill - Converts to Ledbetter Reservoir
Snake Pit (145 Acres)	$2,693	$2,487	Includes Lime Amendment of 53.8 M tons Backfill and Pit Crest Slope & Vegetation
Chase Pit (NA)	$0	$0	Pit eliminated and now part of Ledbetter Pit
Mill Zone 2 Extension (66 Acres)	$2,669	$0	Includes Lime Amendment of 45.6 M tons Backfill and Pit Crest Slope & Vegetation
Champion Pit (36 Acres)	$18	$18	Pit Crest Reclamation
Small Pit (N/A)	$0	$0	Pit eliminated and now part of Mill Zone 2 Extension
Overburden Areas			**$4,854**
Johnny's / West PAG	$11,911	$4,547	Includes West PAG
Johnny's / West PAG Water Management	$610	$594	Includes West PAG
601 OSA	$48	($171)	Reduced footprint and volume
Ramona OSA	$1,178	$140	
Hayworth / South OSA	$1,010	$359	Includes South OSA
Hilltop OSA	$0	($420)	Stockpile Eliminated
James OSA	$501	$56	
East PAG	$8,202	($501)	Roberts OSA is now East PAG with liner
East PAG Water Management	$249	$249	
Site Surface Water Management			**$339**
Stormwater and contact water controls	$407	$218	Includes South OSA
Re-establish Drainages	$1,161	$121	Includes South OSA
TSF			**$13,067**
TSF Outboard Embankment	$172	$172	
TSF Impoundment	$26,893	$12,882	TSF Surface Area expanded - 44 M tons to 72 M tons
TSF Outlet Notch	$99	$9	
TSF Down chute	$11	$3	
TSF Water Management	$0	$0	

OceanaGold - Haile Gold Mine
Reclamation Bridge
Cost Breakdown Table by Facility or Activity

Pre-mining Facilities Subtotal		
Chase Hill Leach Pad	$0	$0
South Leach Pad	$0	$0
Hilltop Backfill	$0	$0
Mill Site and Associated Infrastructure		
Dismantle Plant and Mill and Water Treatment Plant	$773	$773
Reclaim Mill Site	$385	$385
Service/Construction Roads	$401	$401
Roads, Powerlines and Other Facilities		
Remove Haul Roads	$366	$366
Ponds and Surface Water Controls	$0	$0
Powerlines	$214	$214
Pipelines	$140	$140
Growth Media Stockpiles and Borrow Areas	$896	$1,425
Low Grade Ore Stockpile	$0	$0
HGMC Detention and Diversion Structure	$57	$0
Well Abandonment	$166	$166
Passive Treatment System Construction		
JPAG Passive Cell Construction	$915	$567
TSF Passive Cell Construction	$551	$551
Wastewater Treatment (JPAG + TSF)		
JPAG Wastewater Treatment	$400	$297
TSF Wastewater Treatment	$8,072	$4,191
Operational Contingency		
Pit Surface Grading & Reveg	$2,603	$2,604
Closure (11-37)		
Mine Site Closure Maintenance and Monitoring	$1,345	$1,345
TSF Site Closure Maintenance and Monitoring	$626	$626
Ledbetter Pit Lake	$4,172	$2,606
Small Pit Lake	$203	$0
Champion Pit Lake	$956	($192)
Maintenance and Monitoring Post Closure Trust *	$10,000	$2,600

Pre-mining Facilities Subtotal			$0
Chase Hill Leach Pad	$0	$0	
South Leach Pad	$0	$0	
Hilltop Backfill	$0	$0	
Mill Site and Associated Infrastructure			$799
Dismantle Plant and Mill and Water Treatment Plant	$1,288	$515	Includes CN triple wash and Test (Cyanide Code). Includes U/G Surface Ops, ISA Mill, Tower Mill, Pebble Crusher, Preaeration Thickener, 3rd Cyanide Destruct Tank and Additional Warehouse
Reclaim Mill Site	$724	$338	Includes 29 Pond
Service/Construction Roads	$346	($55)	Administration Building Parking Lot eliminated
Roads, Powerlines and Other Facilities			$474
Remove Haul Roads	$555	$189	
Ponds and Surface Water Controls	$0	$0	
Powerlines	$261	$47	
Pipelines	$139	($1)	Reallocation of HDPE pipelines for long-term monitoring.
Growth Media Stockpiles and Borrow Areas	$1,119	($307)	
Low Grade Ore Stockpile	$89	$89	
HGMC / Unnamed Tributary Diversion	$121	$121	Unnamed Tributary Diversion Channel
Well Abandonment	$500	$335	Increased number of wells
Passive Treatment System Construction			$324
East & West PAG Passive Cell Construction	$962	$395	Additional Passive Cell at West PAG
TSF Passive Cell Construction	$481	($70)	
Wastewater Treatment (PAG Cells + TSF)			$5,023
East / West PAG Wastewater Treatment	$668	$371	
TSF Wastewater Treatment	$8,844	$4,653	
Operational Contingency			($1,641)
Pit Wall Grading & Reveg (Permiter x 600 m)	$963	($1,641)	
Closure (11-37)			$3,046
Mine Site Closure Maintenance and Monitoring	$1,029	($316)	
TSF Site Closure Maintenance and Monitoring	$534	($92)	
Ledbetter Pit Lake	$5,607	$3,001	Additional Lime Amendment for Pit Lake
Small Pit Lake	$0	$0	
Champion Pit Lake	$260	$452	
Maintenance and Monitoring Post Closure Trust	$10,000	$7,400	

TABLE 3
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Bond Assurance Amount Summary Table

Bond Assurance Annual Breakdown (thousand $)

Facility	Bond Assurance (thousand $)				EIS 2016	EIS 2017	EIS 2018	EIS 2019	EIS 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	Required Under EIS	Paid + Interest	Required Under SEIS	Outstanding for SEIS																			
Bond Amount Less Indirects	**49,108**	**48,670**	**74,511**	**25,841**	21,490	5,385	6,062	2,899	12,834	2,221	380	5,751	4,184	6,071	-	-	1,973	516	2,811	415	2,412	-	654
Indirect Costs	**5,893**	**5,840**	**8,941**	**3,101**	2,579	646	727	348	1,540	266	46	690	502	729	-	-	237	62	337	50	289	-	78
Total Bond Amount	**55,000**	**54,510**	**83,453**	**28,942**	24,069	6,031	6,789	3,247	14,374	2,487	426	6,441	4,687	6,800	-	-	2,210	578	3,149	464	2,701	-	732
Open Pits Subtotal																							
Mill Zone Pit	269	269	220	(49)	269	-	-	-	-	-	(49)	-	-	-	-	-	-	-	-	-	-	-	-
Haile Pit	229	229	313	84	-	-	-	229	-	-	84	-	-	-	-	-	-	-	-	-	-	-	-
Red Hill Pit	206	206	193	(13)	-	-	-	-	206	-	(13)	-	-	-	-	-	-	-	-	-	-	-	-
Ledbetter Pit	51	51	179	129	-	-	-	-	51	-	129	-	-	-	-	-	-	-	-	-	-	-	-
Snake Pit	206	206	2,693	2,487	206	-	-	-	-	2,487	-	-	-	-	-	-	-	-	-	-	-	-	-
Chase Pit	132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mill Zone2 Pit	-	2,669	2,669	0	-	-	-	-	2,669	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small Pit	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Champion Pit	2	-	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-
Overburden Areas Subtotal																							
West PAG Red/Yellow Overburden Area	9,922	7,365	11,911	4,547	5,654	498	-	-	1,213	-	-	-	4,547	-	-	-	-	-	-	-	-	-	-
West PAG Overburden Water Treatment	16	16	610	594	16	-	-	-	-	-	-	-	-	-	-	-	-	-	594	-	-	-	-
East PAG Red/Yellow Overburden Area	524	8,703	8,202	(501)	524	-	3,770	-	4,409	-	-	-	-	-	-	-	(501)	-	-	-	-	-	-
East PAG Overburden Water Treatment	-	-	249	249	-	-	-	-	-	-	-	-	-	-	-	-	249	-	-	-	-	-	-
Ramonas Green Overburden Area	1,038	1,038	1,178	140	1,038	-	-	-	-	-	-	-	140	-	-	-	-	-	-	-	-	-	-
South Green Overburden Area	579	651	1,010	359	-	-	-	579	72	-	-	-	-	359	-	-	-	-	-	-	-	-	-
Hilltop Overburden Area	420	420	-	(420)	-	-	-	420	-	-	-	-	-	-	-	-	-	-	(420)	-	-	-	-
James Green Overburden Area	445	445	501	56	-	-	445	-	-	-	56	-	-	-	-	-	-	-	-	-	-	-	-
601 Green Overburden Area	219	219	48	(171)	219	-	-	-	-	-	-	-	-	-	-	-	(171)	-	-	-	-	-	-
Site Surface Water Management Subtotal																							
Stormwater and contact water controls	189	189	407	218	189	-	-	-	-	-	218	-	-	-	-	-	-	-	-	-	-	-	-
Re-establish Drainages	1,040	1,040	1,161	121	1,040	-	-	-	-	-	-	-	-	-	-	-	121	-	-	-	-	-	-
TSF Subtotal																							
TSF Outboard Embankment	-	-	172	172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	172	-	-
TSF Impoundment	16,160	14,011	26,893	12,882	12,928	-	-	1,083	-	-	-	6,441	-	6,441	-	-	-	-	-	-	-	-	-
TSF Outlet Notch	103	90	99	9	-	83	-	7	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-
TSF Downchute	9	8	11	3	-	7	-	1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
Pre-mining Facilities Subtotal																							
Chase Hill Leach Pad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Leach Pad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilltop Backfill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Site and Associated Infrastructure Subtotal																							
Dismantle Plant and Mill	773	773	1,288	515	-	773	-	-	-	-	-	-	-	-	-	-	515	-	-	-	-	-	-
Reclaim Plant Site	385	385	724	338	-	385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	338	-	-
Plantsite Roads	401	401	346	(55)	-	401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(55)	-	-
Roads, Powerlines and Other Facilities Subtotal																							
Remove Haul Roads	366	366	555	189	-	366	-	-	-	-	-	-	-	-	-	-	-	189	-	-	-	-	-
Ponds and Surface Water Controls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Powerlines	214	214	261	47	-	214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47
Pipelines	140	140	139	(1)	-	140	-	-	-	-	-	-	-	-	-	-	-	-	(1)	-	-	-	-
Growth Media Stockpiles	896	1,425	1,119	(307)	-	896	-	-	530	-	-	-	-	-	-	-	-	-	-	-	(307)	-	-
Low Grade Ore Stockpile	-	-	89	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89	-	-	-	-
Ledbetter Diversion	57	-	121	121	-	-	-	-	-	-	-	-	-	-	-	-	121	-	-	-	-	-	-
Well Abandonment	166	166	500	335	-	166	-	-	-	-	-	-	-	-	-	-	-	-	335	-	-	-	-
Passive Treatment System Construction Subtotal																							
East & West PAG Passive Cell Construction	915	567	962	395	567	-	-	-	-	-	-	-	-	-	-	-	395	-	-	-	-	-	-
TSF Passive Cell Construction	551	551	481	(70)	551	-	-	-	-	-	-	-	-	-	-	-	(70)	-	-	-	-	-	-
Wastewater Treatment Post Closure Subtotal																							
East & West PAG Water Treatment	400	297	668	371	-	248	-	-	49	-	-	-	-	-	-	-	-	371	-	-	-	-	-
TSF Water Treatment	8,072	4,191	8,844	4,653	-	-	2,521	-	1,670	-	-	-	-	-	-	-	1,551	-	1,551	-	1,551	-	-
Operational Contingency Subtotal																							
Pit Wall Grading and Revegetation	2,603	2,604	963	(1,641)	868	-	-	868	868	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post-Closure Subtotal																							
Mine Site Post-closure monitoring	1,345	1,345	1,029	(316)	-	1,293	-	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(316)
TSF Site Post-closure monitoring	626	626	534	(92)	-	626	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ledbetter Pit Lake	4,172	2,606	5,607	3,001	-	-	-	-	2,606	-	-	-	-	-	-	-	-	-	1,000	-	1,000	-	1,000
Small Pit Lake	203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Champion Pit Lake	956	(192)	260	452	-	(64)	-	(64)	(64)	-	-	-	-	-	-	-	-	-	-	452	-	-	-

Facility	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049+
Bond Amount Less Indirects	-	-	-	(82)	-	-	-	-	-	-	(1,466)	-	-	-	-
Indirect Costs	-	-	-	(10)	-	-	-	-	-	-	(176)	-	-	-	-
Total Bond Amount	-	-	-	(92)	-	-	-	-	-	-	(1,641)	-	-	-	-
Open Pits Subtotal															
Mill Zone Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haile Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Hill Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ledbetter Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Snake Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chase Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mill Zone2 Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Champion Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Overburden Areas Subtotal															
West PAG Red/Yellow Overburden Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West PAG Overburden Water Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East PAG Red/Yellow Overburden Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East PAG Overburden Water Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramonas Green Overburden Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Green Overburden Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilltop Overburden Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
James Green Overburden Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
601 Green Overburden Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Surface Water Management Subtotal															
Stormwater and contact water controls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Re-establish Drainages	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Subtotal															
TSF Outboard Embankment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Impoundment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Outlet Notch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Downchute	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-mining Facilities Subtotal															
Chase Hill Leach Pad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Leach Pad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilltop Backfill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Site and Associated Infrastructure Subtotal															
Dismantle Plant and Mill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reclaim Plant Site	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plantsite Roads	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Roads, Powerlines and Other Facilities Subtotal															
Remove Haul Roads	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ponds and Surface Water Controls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Powerlines	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Growth Media Stockpiles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Low Grade Ore Stockpile	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ledbetter Diversion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well Abandonment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Passive Treatment System Construction Subtotal															
East & West PAG Passive Cell Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Passive Cell Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wastewater Treatment Post Closure Subtotal															
East & West PAG Water Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Water Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operational Contingency Subtotal															
Pit Wall Grading and Revegetation	-	-	-	-	-	-	-	-	-	-	(1,641)	-	-	-	-
Post-Closure Subtotal															
Mine Site Post-closure monitoring	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Site Post-closure monitoring	-	-	-	(92)	-	-	-	-	-	-	-	-	-	-	-
Ledbetter Pit Lake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small Pit Lake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Champion Pit Lake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

TABLE 4
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Bond Release Annual Summary Table

			Bond Release Annual Breakdown (thousand $)																																	
Facility	Bonded Reclamation Costs (thousand $)		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049+
Bond Releases Less Indirects	**74,079**		-	-	-	-	-	-	-	-	-	-	463	298	593	274	6	1,513	33	7,406	2,044	1,256	4,029	1,089	1,497	816	-	10,347	20,771	1,486	493	550	121	9,156	-	9,838
Indirect Costs	**8,889**		-	-	-	-	-	-	-	-	-	-	56	36	71	33	1	182	4	889	245	151	484	131	180	98	-	1,242	2,492	178	59	66	14	1,099	-	1,181
Total Bond Releases	**82,969**		-	-	-	-	-	-	-	-	-	-	518	334	664	307	7	1,694	37	8,295	2,289	1,407	4,513	1,220	1,677	914	-	11,588	23,263	1,665	552	616	135	10,254	-	11,019
Open Pits Subtotal		**6,286**																																		
Mill Zone Pit	220		-	-	-	-	-	-	-	-	-	-	-	187	-	-	-	-	-	-	-	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haile Pit	313		-	-	-	-	-	-	-	-	-	-	-	-	-	266	-	-	-	-	-	-	-	47	-	-	-	-	-	-	-	-	-	-	-	-
Red Hill Pit	193		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	164	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	-	-	-
Ledbetter Pit	179		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	152	-	-	-	-	-	-	-	27	-	-	-	-	-	-	-	-
Snake Pit	2,693		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,289	-	-	-	-	-	-	-	404	-	-	-	-	-	-	-
Mill Zone2 Pit	2,669		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,269	-	-	-	-	-	-	-	400	-	-	-	-	-
Small Pit	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Champion Pit	18		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	-	3	-	-	-	-	-	-
Overburden Areas Subtotal		**23,710**																																		
West PAG Red/Yellow Overburden Area	11,911		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,125	-	-	-	-	-	-	-	1,787
West PAG Overburden Water Treatment	610		-	-	-	-	-	-	-	-	-	-	518	-	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East PAG Red/Yellow Overburden Area	8,202		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,972	-	-	-	-	-	-	-	1,230	-	-	-	-	-	-	-	-
East PAG Overburden Water Treatment	249		-	-	-	-	-	-	-	-	-	-	-	-	212	-	-	-	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramonas Green Overburden Area	1,178		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,001	-	-	-	-	-	-	-	177	-	-	-	-	-	-	-	-	-	-
South Green Overburden Area	1,010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	858	-	-	-	-	-	-	-	151	-	-	-	-	-
James Green Overburden Area	501		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	426	-	-	-	-	-	-	-	75	-	-	-	-	-	-	-	-	-	-
601 Green Overburden Area	48		-	-	-	-	-	-	-	-	-	-	-	-	-	41	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Surface Water Management Subtotal		**1,568**																																		
Stormwater and contact water controls	407		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	346	-	-	-	-	-	-	-	61	-	-	-	-	-	-
Re-establish Drainages	1,161		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	987	-	-	-	-	-	-	-	174	-	-	-	-	-	-
TSF Subtotal		**27,176**																																		
TSF Outboard Embankment	172		-	-	-	-	-	-	-	-	-	-	-	147	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Impoundment	26,893		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22,859	-	-	-	-	4,034	-	-
TSF Outlet Notch	99		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84	-	-	-	-	-	-	-	-	15	-	-
TSF Downchute	11		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	2	-	-
Pre-mining Facilities Subtotal		**-**																																		
Chase Hill Leach Pad	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Leach Pad	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilltop Backfill	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Site and Associated Infrastructure Subtotal		**2,358**																																		
Dismantle Plant and Mill	1,288		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,095	-	-	-	-	-	-	-	193	-	-	-	-	-	-	-	-
Reclaim Plant Site	724		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	615	-	-	-	-	-	-	-	109	-	-
Plantsite Roads	346		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	294	-	-	-	-	-	-	-	52	-	-	-
Roads, Powerlines and Other Facilities Subtotal		**2,784**																																		
Remove Haul Roads	555		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	472	-	-	-	-	-	-	-	83	-	-	-
Ponds and Surface Water Controls	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Powerlines	261		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	222	-	-	-	-	-	-	-	39	-	-	-	-
Pipelines	139		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	139
Growth Media Stockpiles	1,119		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	951	-	-	-	-	-	-	-	168	-	-	-	-
Low Grade Ore Stockpile	89		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76	-	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-
Ledbetter Diversion	121		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-
Well Abandonment	500		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500
Passive Treatment System Construction Subtotal		**1,442**																																		
East & West PAG Passive Cell Construction	962		-	-	-	-	-	-	-	-	-	-	-	-	144	-	-	-	-	-	-	-	-	-	817	-	-	-	-	-	-	-	-	-	-	-
TSF Passive Cell Construction	481		-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	409	-	-	-	-
Wastewater Treatment Post Closure Subtotal		**9,511**																																		
East & West PAG Water Treatment	668		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	568	-	-	-	-	-	-	100	-	-	-	-	-	-
TSF Water Treatment	8,844		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,327	-	-	-	-	-	7,517
Operational Contingency Subtotal		**963**																																		
Pit Wall Grading and Revegetation	963		-	-	-	-	-	-	-	-	-	-	-	-	144	-	-	-	-	-	-	-	818	-	-	-	-	-	-	-	-	-	-	-	-	-
Post-Closure Subtotal		**7,431**																																		
Mine Site Post-closure monitoring	1,029		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	875	-	154
TSF Site Post-closure monitoring	534		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	454	-	80
Ledbetter Pit Lake	5,607		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,766	-	841
Champion Pit Lake	260		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	221	-	39

Notes:

* Bond Release Calculated as follows:
  - 85% released 2 years following completion of physical stability.
  - 15% released following completion of chemical stability.
* Costs reflect bond releases anticipated at the end of the calendar year.
* Passive Treatment Systems (East and West PAG and TSF) will be constructed and capitalized prior to Mine Closure and are considered as an Operational Cost.
* Hilltop Pit will be reclaimed with Haile Pit. Reclamation of Small Pit is included into Mill Zone Phase 2.
* Champion and Ledbetter Pits are converted to Pit Lakes. Monies associated with Pit Lake Water Management are included in Post Closure (Rows 69 and 70).
* Haile is investing $10M in a trust that is managed and invested by the South Carolina Department of Revenue (DOR) for the costs of long-term, post-closure care and unanticipated closure contingencies at the mine. This trust will be fully funded by the end of active mining in 2031; thus, depending on, the DOR's investment strategy, these funds may be worth more than $10M initially invested by the time they are needed.

TABLE 5
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Total Reclamation Costs Annual Summary Table

			Mine Reclamation Costs Annual Breakdown (thousand $)																																		
Facility	Mine Reclamation Costs (thousand $)		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049 +
Direct Mine Reclamation Costs	**74,311**		-	-	-	-	41	73	2,432	378	4,862	1,253	2,598	1,122	5,114	1,674	6,040	2,515	8,608	8,027	6,919	6,206	5,763	1,928	1,314	1,509	1,011	808	522	448	517	421	833	291	318	767
Indirect Costs	**8,917**		-	-	-	-	5	9	292	45	583	150	312	135	614	201	725	302	1,033	963	830	745	692	231	158	181	121	97	63	54	62	51	100	35	38	92
Total Mine Reclamation Costs	**83,229**		-	-	-	-	46	82	2,724	424	5,446	1,403	2,910	1,257	5,728	1,874	6,765	2,817	9,641	8,990	7,749	6,951	6,455	2,159	1,471	1,690	1,132	905	585	501	579	472	933	326	356	859
Open Pits Subtotal		**6,286**																																		
Mill Zone Pit	220		-	-	-	-	46	51	51	51	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haile Pit	313		-	-	-	-	-	-	-	99	99	99	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Hill Pit	193		-	-	-	-	-	-	-	-	-	-	85	90	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ledbetter Pit	179		-	-	-	-	-	-	-	-	-	-	-	-	-	-	179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Snake Pit	2,693		-	-	-	-	-	-	-	-	-	385	511	511	633	511	116	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mill Zone2 Pit	2,669		-	-	-	-	-	-	-	-	-	-	-	-	-	-	665	665	665	675	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small Pit	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Champion Pit	18		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Overburden Areas Subtotal		**23,710**																																		
West PAG Red/Yellow Overburden Area	11,911		-	-	-	-	-	-	2,445	41	1,869	-	1,869	-	1,869	41	1,869	-	1,910	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West PAG Overburden Water Treatment	610		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	124	105	90	76	65	55	47	49	-	-	-	-	-	-	-	-	-	-
East PAG Red/Yellow Overburden Area	8,202		-	-	-	-	-	-	-	-	2,755	-	-	-	2,693	-	2,755	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East PAG Overburden Water Treatment	249		-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	42	36	30	26	22	19	25	-	-	-	-	-	-	-	-	-	-	-	-
Ramonas Green Overburden Area	1,178		-	-	-	-	-	31	178	208	178	178	256	86	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Green Overburden Area	1,010		-	-	-	-	-	-	-	-	73	108	108	108	135	108	108	108	108	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
James Green Overburden Area	501		-	-	-	-	-	-	27	-	279	-	-	-	195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
601 Green Overburden Area	48		-	-	-	-	-	-	24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Surface Water Management Subtotal		**1,568**																																		
Stormwater and contact water controls	407		-	-	-	-	-	-	-	-	-	-	64	126	-	126	-	-	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Re-establish Drainages	1,161		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Subtotal		**27,176**																																		
TSF Outboard Embankment	172		-	-	-	-	-	-	-	-	172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Impoundment	26,893		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,026	7,131	6,315	4,210	4,210	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Outlet Notch	99		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSF Downchute	11		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-mining Facilities Subtotal		**-**																																		
Chase Hill Leach Pad	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Leach Pad	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilltop Backfill	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Site and Associated Infrastructure Subtotal		**2,358**																																		
Dismantle Plant and Mill	1,288		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,288	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reclaim Plant Site	724		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	138	53	533	-	-	-	-	-	-	-	-	-	-	-	-	-
Plantsite Roads	346		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93	93	161	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Roads, Powerlines and Other Facilities Subtotal		**2,784**																																		
Remove Haul Roads	555		-	-	-	-	-	-	-	-	-	-	-	-	-	-	309	-	-	-	-	245	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ponds and Surface Water Controls	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Powerlines	261		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	131	-	-	131	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pipelines	139		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	46	-	-	-	-	-	-	-	-	-	-	-	46
Growth Media Stockpiles	1,119		-	-	-	-	-	-	-	-	-	633	-	336	-	45	-	6	-	-	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Low Grade Ore Stockpile	89		-	-	-	-	-	-	-	-	-	-	-	-	-	-	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ledbetter Diversion	121		-	-	-	-	-	-	-	-	-	-	-	-	121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well Abandonment	500		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500	-	-	-
Passive Treatment System Construction Subtotal		**1,442**																																		
East & West PAG Passive Cell Construction	962		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	481	-	481	-	-	-	-	-	-	-	-	-	-
TSF Passive Cell Construction	481		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	481
Wastewater Treatment Post Closure Subtotal		**9,511**																																		
East & West PAG Water Treatment	668		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	36	136	115	98	83	71	47	40	-	-	-	-	-	-	-	-	-	-
TSF Water Treatment	8,844		-	-	-	-	-	-	-	-	-	-	-	-	-	1,043	626	407	285	213	182	1,355	962	896	793	617	571	443	66	63	60	57	57	54	51	48
Operational Contingency Subtotal		**963**																																		
Pit Wall Grading and Revegetation	963		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	80	80	80	80	80	80	-	80	-	80	-	80	-	80	-	80	-
Post-Closure Subtotal		**7,431**																																		
Mine Site Post-closure monitoring	1,029		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103	103	103	103	103	103	103	103	103	103	-	-	-	-	-	-	-	-	-
TSF Site Post-closure monitoring	534		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	11	11	11	11	96	96	96	96	96	-	-	-	-
Ledbetter Pit Lake	5,607		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	379	379	379	379	379	379	379	355	355	331	331	331	308	284	260	213	189
Champion Pit Lake	260		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	95

TABLE 6
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Cost Breakdown Table

Facility		Item	Quantity	Units	Rate		Bonded Cost	Unit Cost Item or custom cost
							$83,453,000	
Open Pits								
	Mill Zone Pit							
		Lime Amendment	4,210	ktons	$42	T	$177,873	Lime Ammendment
		Slope Grading and Smoothing	10.1	ac	$365	Acre	$3,677	Slope Grading and Smoothing
		Revegetate Edge Slope	10.1	ac	$1,500	Acre	$15,095	Revegetate
		Indirect Costs					$23,597	
		Subtotal					**$220,242**	
	Haile Pit							
		Lime Amendment	6,270	ton	$42	T	$264,908	Lime Ammendment
		Slope Grading and Smoothing	7.8	ac	$365	Acre	$2,850	Slope Grading and Smoothing
		Revegetate Edge Slope	7.8	ac	$1,500	Acre	$11,701	Revegetate
		Indirect Costs					$33,535	
		Subtotal					**$312,994**	
	Red Hill Pit							
		Lime Amendment	3,700	ton	$42	T	$156,325	Lime Ammendment
		Slope Grading and Smoothing	8.6	ac	$365	Acre	$3,125	Slope Grading and Smoothing
		Revegetate Edge Slope	8.6	ac	$1,500	Acre	$12,827	Revegetate
		Indirect Costs					$20,673	
		Subtotal					**$192,950**	
	Ledbetter Pit							
		Slope Grading and Smoothing	86	ac	$365	Acre	$31,324	Slope Grading and Smoothing
		Revegetate Edge Slope	86	ac	$1,500	Acre	$128,591	Revegetate
		Indirect Costs					$19,190	
		Subtotal					**$179,104**	
	Snake Pit							
		Lime Amendment	53,800	ton	$42	T	$2,273,050	Lime Ammendment
		Operational Bench Knockdown (40 ft bench)	144,049	CY	$0.75	C.Y.	$108,748	Overburden Bench Pushdown
		Revegetate Edge Slope	15.2	ac	$1,500	Acre	$22,745	Revegetate
		Indirect Costs					$288,545	
		Subtotal					**$2,693,088**	
	Mill Zone2 Pit							
		Lime Amendment	56,176	ton	$42	T	$2,373,436	Lime Ammendment

	Facility	Item	Quantity	Units	Rate		Bonded Cost	Unit Cost Item or custom cost
		Slope Grading and Smoothing	5.2	ac	$365	Acre	$1,890	Slope Grading and Smoothing
		Revegetate Edge Slope	5.2	ac	$1,500	Acre	$7,761	Revegetate
		Indirect Costs					$285,970	
		Subtotal					**$2,669,058**	
	Small Pit							
			0	ea	$0.00	ea.	$0	$ -
		Indirect Costs					$0	
		Subtotal					**$0**	
	Champion Pit							
			9	ac	$365.39	Acre	$3,219	Slope Grading and Smoothing
			9	ac	$1,500.00	Acre	$13,215	Revegetate
		Indirect Costs					$1,972	
		Subtotal					**$18,406**	
Overburden Areas								
	West PAG Red/Yellow Overburden Area							
		Foundation layer smooth roll	1,188,825	sy	$0.05	S.Y.	$59,832	Subgrade Preparation
		60 mil HDPE textured	10,699,425	sq ft	$0.78	S.F	$8,345,552	HDPE 60 mil dbl textured
		Growth Media Import	792,550	CY	$2.21	C.Y.	$1,750,993	Import and Place Growth Media
		Revegetate	245.6	ac	$1,500	Acre	$368,437	Revegetate
		6 in sand filter under downchute	1,967.59	CY	$24.73	C.Y.	$48,651	Import and Place Sand or Gravel
		12-in Riprap downchute, 18-in thick	5,903	CY	$10.46	C.Y.	$61,745	Import and Place Riprap
		Indirect Costs					$1,276,225	
		Subtotal					**$11,911,434**	
	West PAG Overburden Water Treatment							
		Treat seepage during closure	26,280	kgal	$4.21	Kgal	$110,639	Treat ARD Seepage
		Treat seepage post-closure	101,180	kgal	$4.21	Kgal	$425,966	Treat ARD Seepage
		Conveyance Pipe	4,240	LS	$1.89	L.F.	$8,035	2" Pipe in Trench
		Indirect Costs					$65,357	
		Subtotal					**$609,997**	
	East PAG Red/Yellow Overburden Area							
		Foundation layer smooth roll	814,725	sy	$0.05	S.Y.	$41,004	Subgrade Preparation
		60 mil HDPE textured	7,332,525	sq ft	$0.78	S.F	$5,719,370	HDPE 60 mil dbl textured
		Growth Media Import	543,150	CY	$2.21	C.Y.	$1,199,989	Import and Place Growth Media
		Revegetate	168.3	ac	$1,500	Acre	$252,497	Revegetate
		6 in sand filter under downchute	1,967.59	CY	$24.73	C.Y.	$48,651	Import and Place Sand or Gravel
		12-in Riprap downchute, 18-in thick	5,903	CY	$10.46	C.Y.	$61,745	Import and Place Riprap
		Indirect Costs					$878,791	
		Subtotal					**$8,202,047**	
	East PAG Overburden Water Treatment							
		Treat seepage during closure	10,512	kgal	$4.21	Kgal	$44,256	Treat ARD Seepage
		Treat seepage post-closure	40,472	kgal	$4.21	Kgal	$170,387	Treat ARD Seepage
		Conveyance Pipe	4,240	LS	$1.89	L.F.	$8,035	2" Pipe in Trench
		Indirect Costs					$26,721	

Facility		Item	Quantity	Units	Rate		Bonded Cost	Unit Cost Item or custom cost
		Subtotal					**$249,398**	
	Ramonas Green Overburden Area							
		Operational Bench knockdown (50 ft bench)	1,043,191	ac	$0.75	C.Y.	$787,541	Overburden Bench Pushdown
		Revegetate	103.5	ac	$1,500	Acre	$155,185	Revegetate
		6 in sand filter under downchute	1,944	CY	$24.73	C.Y.	$48,079	Import and Place Sand or Gravel
		12-in Riprap downchute, 18-in thick	5,833	CY	$10.46	C.Y.	$61,019	Import and Place Riprap
		Indirect Costs					$126,219	
		Subtotal					**$1,178,042**	
	South Green Overburden Area							
		Revegetate	568.9	ac	$1,500	Acre	$853,361	Revegetate
		6 in sand filter under downchute	856	CY	$24.73	C.Y.	$21,178	Import and Place Sand or Gravel
		12-in Riprap downchute, 18-in thick	2,569	CY	$10.46	C.Y.	$26,877	Import and Place Riprap
		Indirect Costs					$108,170	
		Subtotal					**$1,009,586**	
	James Green Overburden Area							
		Revegetate	266.2	ac	$1,500	Acre	$399,287	Revegetate
		6 in sand filter under downchute	856	CY	$24.73	C.Y.	$21,178	Import and Place Sand or Gravel
		12-in Riprap downchute, 18-in thick	2,569	CY	$10.46	C.Y.	$26,877	Import and Place Riprap
		Indirect Costs					$53,681	
		Subtotal					**$501,022**	
	601 Green Overburden Area							
		Revegetate James	28.7	ac	$1,500	Acre	$43,070	Revegetate
		Indirect Costs					$5,168	
		Subtotal					**$48,238**	
Site Surface Water Management								
	Stormwater and contact water controls							
		Regrading ponds and channels	194.8	ac	$365	Acre	$71,178	Slope Grading and Smoothing
		Revegetate	194.8	ac	$1,500	Acre	$292,199	Revegetate
		Indirect Costs					$43,605	
		Subtotal					**$406,982**	
	Re-establish Drainages							
		Abandon temporary channel	3,375	ea	$132	Acre	$444,137	Channel Restoration
		Channel Restoration at South OSA	4,500	ea	$132	Acre	$592,183	Channel Restoration
		Indirect Costs					$124,358	
		Subtotal					**$1,160,678**	
TSF								
	TSF Outboard Embankment							

	Facility	Item	Quantity	Units	Rate		Bonded Cost	Unit Cost Item or custom cost
		Revegetate	102.6	ac	$1,500	Acre	$153,899	Revegetate
		Indirect Costs					$18,468	
		Subtotal					**$172,367**	
	TSF Impoundment							
		Import and place foundation	604,691	CY	$2.41	C.Y.	$1,457,403	Import Soil and LGP Push
		Smooth roll subgrade	3,325,080	sy	$0.05	S.Y.	$167,348	Subgrade Preparation
		60 mil HDPE Smooth	29,925,720	sq ft	$0.55	S.F	$16,459,146	HDPE 60 mil smooth
		Growth Media Import	2,216,720	CY	$2.21	C.Y.	$4,897,433	Import and Place Growth Media
		Revegetate	687.0	ac	$1,500	Acre	$1,030,497	Revegetate
		Indirect Costs					$2,881,419	
		Subtotal					**$26,893,246**	
	TSF Outlet Notch							
		Excavate Notch	7,000	CY	$0.73	C.Y.	$5,118	Channel Excavation
		Rockfill Drain - Control	3,250	CY	$24.73	C.Y.	$80,360	Import and Place Sand or Gravel
		Rockfill Drain - Protective	250	CY	$10.46	C.Y.	$2,615	Import and Place Riprap
		Indirect Costs					$10,571	
		Subtotal					**$98,664**	
	TSF Downchute							
		Channel Excavation	1,778	CY	$0.73	C.Y.	$1,300	Channel Excavation
		6 in sand filter	93	CY	$24.73	C.Y.	$2,289	Import and Place Sand or Gravel
		10-in Riprap, 15-in thick	231	CY	$10.46	C.Y.	$2,421	Import and Place Riprap
		Excavate Channel	3,081	CY	$0.73	C.Y.	$2,253	Channel Excavation
		Revegetate Channel	1.3	ac	$1,500	Acre	$1,970	Revegetate
		Indirect Costs					$1,228	
		Subtotal					**$11,461**	
Pre-mining Facilities								
	Chase Hill Leach Pad							
		Seedbed Prep	3.3	ac	$244	Acre	$0	Scarify
		Revegetate	3.3	ac	$1,500	Acre	$0	Revegetate
		Indirect Costs					$0	
		Subtotal					**$0**	
	South Leach Pad							
		Seedbed Prep	3.7	ac	$244	Acre	$0	Scarify
		Revegetate	3.7	ac	$1,500	Acre	$0	Revegetate
		Indirect Costs					$0	
		Subtotal					**$0**	
	Hilltop Backfill							
		Revegetate	12.3	ac	$1,500	Acre	$0	Revegetate
		Indirect Costs					$0	
		Subtotal					**$0**	

Facility		Item	Quantity	Units	Rate		Bonded Cost	Unit Cost Item or custom cost
Plant Site and Associated Infrastructure								
	Dismantle Plant and Mill							
		Salvage Mill site	23,000,000	$	5%	x CAP EX	$1,150,000	Mill and Process Plant Salvage
		Indirect Costs					$138,000	
		Subtotal					**$1,288,000**	
	Reclaim Plant Site							
		Rubilize and remove concrete slab	12,000	CY	$4.74	CY	$56,932	Concrete Demolition
		Bury concrete in place	24,000	Cy	$4.74	CY	$113,864	Concrete Demolition
		Growth media import	177,821	CY	$2.21	C.Y.	$392,862	Import and Place Growth Media
		Revegetate Building Sites	55.1	ac	$1,500	Acre	$82,647	Revegetate
		Indirect Costs					$77,557	
		Subtotal					**$723,862**	
	Plantsite Roads							
		Scarify Roads	142.1	ac	$244	Acre	$34,617	Scarify
		Remove culverts	4,650.00	ft	$13.16	L.F.	$61,192	Remove Culverts and Regrade
		Revegetate Roads	142.1	ac	$1,500	Acre	$213,168	Revegetate
		Indirect Costs					$37,077	
		Subtotal					**$346,055**	
Roads, Powerlines and Other Facilities								
	Remove Haul Roads							
		Scarify Roads	246.3	ac	$244	Acre	$60,001	Scarify
		Remove culverts	5,000.00	ft	$13.16	L.F.	$65,798	Remove Culverts and Regrade
		Revegetate Roads	246.3	ac	$1,500	Acre	$369,475	Revegetate
		Indirect Costs					$59,433	
		Subtotal					**$554,707**	
	Ponds and Surface Water Controls							
		Regrade Ponds	3.3	ac	$365	Acre	$0	Slope Grading and Smoothing
		Revegetate	3.3	ac	$1,500	Acre	$0	Revegetate
		Indirect Costs					$0	
		Subtotal					**$0**	
	Powerlines							
		Dismantal and remove Powerline	26,400	ft	$8.83	L.F.	$233,112	Remove and Demo Powerline
		Indirect Costs					$27,973	
		Subtotal					**$261,085**	
	Pipelines							
		Demo Pipelines	85,500	ft	$1.45	L.F.	$124,139	Remove and Demo Pipeline
		Indirect Costs					$14,897	
		Subtotal					**$139,036**	
	Growth Media Stockpiles							
		Regrade Snake Pit GM Stockpile	11.5	ac	$61	Acre	$697	Seed bed Prep
		Revegetate Snake Pit GM Stockpile	11.5	ac	$1,500	Acre	$17,177	Revegetate

Facility		Item	Quantity	Units	Rate		Bonded Cost	Unit Cost Item or custom cost
		Revegetate 601 GM Stockpile	14.3	ac	$1,500	Acre	$21,477	Revegetate
		Regrade 601 GM Stockpile	14.3	ac	$61	Acre	$872	Seed bed Prep
		Revegetate Hayworth Site GM Stockpile	0.0	ac	$1,500	Acre	$0	Revegetate
		Regrade Hayworth GM Stockpile	0.0	ac	$61	Acre	$0	Seed bed Prep
		Revegetate Plant Site GM Stockpile	3.6	ac	$1,500	Acre	$5,454	Revegetate
		Regrade Plant Site GM Stockpile	3.6	ac	$61	Acre	$221	Seed bed Prep
		Revegetate TSF GM Stockpile	56.1	ac	$1,500	Acre	$84,194	Revegetate
		Regrade TSF GM Stockpile	56.1	ac	$61	Acre	$3,418	Seed bed Prep
		Revegetate TSF Borrow Areas	574.9	ac	$1,500	Acre	$862,403	Revegetate
		Regrade Perimeter of TSF Borrow Areas	48.6	ac	$61	Acre	$2,962	Seed bed Prep
		Indirect Costs					$119,865	
		Subtotal					**$1,118,742**	
	Low Grade Ore Stockpile							
		Regrade Ore Stockpile	15.1	ac	$365	Acre	$5,521	Slope Grading and Smoothing
		Foundation layer import and place	24,381	CY	$2.89	C.Y.	$70,514	Import and Place Clay
		Subgrade preparation	73,142	sy	$0.05	S.Y.	$3,681	Subgrade Preparation
		Indirect Costs					$9,566	
		Subtotal					**$89,282**	
	Ledbetter Diversion							
		Remove Embankment	47,360	CY	$0.73	C.Y.	$34,625	Channel Excavation
		Seedbed prp	47.2	ac	$61	Acre	$2,873	Seed bed Prep
		Revegetate	47.2	ac	$1,500	Acre	$70,765	Revegetate
		Indirect Costs					$12,991	
		Subtotal					**$121,254**	
	Well Abandonment							
		Abandon groundwater monitoring wells	63	ea	$7,091	Well	$446,750	Well Abandoment
		Indirect Costs					$53,610	
		Subtotal					**$500,360**	
Passive Treatment System Construction								
	East & West PAG Passive Cell Construction							
		East PAG Passive System	1	LS	$429,283	L.S.	$429,283	Passive Treatment Cell
		West PAG Passive System	1	LS	$429,283	L.S.	$429,283	Passive Treatment Cell
		Indirect Costs					$103,028	
		Subtotal					**$961,594**	
	TSF Passive Cell Construction							
		TSF Passive System	1	LS	$429,283	L.S.	$429,283	Passive Treatment Cell
		Indirect Costs					$51,514	
		Subtotal					**$480,797**	
Wastewater Treatment Post Closure								
	East & West PAG Water Treatment							
		East PAG Water Treatment	40,472	kgal	$4.21	Kgal	$170,387	Treat ARD Seepage
		West PAG Water Treatment	101,180	kgal	$4.21	Kgal	$425,966	Treat ARD Seepage

Facility		Item	Quantity	Units	Rate		Bonded Cost	Unit Cost Item or custom cost
		Indirect Costs					$71,562	
		Subtotal					**$667,915**	
	TSF Water Treatment							
		Treat and Discharge Supernatant	863,446	kgal	$5.06	Kgal	$4,369,038	Treat Supernatant Solution
		Treat Seepage during closure	513,281	kgal	$5.06	Kgal	$2,597,203	Treat Supernatant Solution
		Treat Seepage post-closure	183,751	kgal	$5.06	Kgal	$929,780	Treat Supernatant Solution
		Indirect Costs					$947,523	
		Subtotal					**$8,843,544**	
Operational Contingency								
	Pit Wall Grading and Revegetation		573	Acre	$1,500.00	Acre	$859,453	Revegetate
		Indirect Costs					$103,134	
		Subtotal					**$962,587**	
Post-Closure								
	Mine Site Post-closure monitoring							
		On-site maintenance and inspection	10	yrs	$75,500	yr	$755,000	Post-closure Maintenance
		Passive Treatment Cell Replacement	40	yrs	$0	yr	$0	Passive Treatment Cell Preplacement
		Groundwater sampling and analysis	320	ea	$315	Ea	$100,800	Post-closure GW Sample
		Surface Water sampling and analysis	200	ea	$315	Ea	$63,000	Post-closure SW Sample
		Indirect Costs					$110,256	
		Subtotal					**$1,029,056**	
	TSF Site Post-closure monitoring							
		On-site maintenance and inspection	5	yrs	$75,500	yr	$377,500	Post-closure Maintenance
		Passive Treatment Cell Replacement	40	yrs	$0	yr	$0	Passive Treatment Cell Preplacement
		Groundwater sampling and analysis	156	ea	$315	Ea	$49,140	Post-closure GW Sample
		Surface Water sampling and analysis	160	ea	$315	Ea	$50,400	Post-closure SW Sample
		Indirect Costs					$57,245	
		Subtotal					**$534,285**	
	Ledbetter Pit Lake							
		Lime Ammendment	118,500	T	$42	T	$5,006,625	Lime Ammendment
		Indirect Costs					$600,795	
		Subtotal					**$5,607,420**	
	Champion Pit Lake							
		Lime Ammendment	5,500	T	$42	T	$232,375	Lime Ammendment
		Indirect Costs					$27,885	
		Subtotal					**$260,260**	

Table 7
OceanaGold - Haile Gold Mine
Closure Cost Estimates
Unit Cost Assumptions

Indirect Costs % of sub total	12.0%
Include Indirects in Reclamation Costs	Yes
Include Indirects in Bond Assurance	Yes

Item	Unit cost	per	
Channel Excavation	$ 0.73	C.Y.	Trackhoe Excavation @ 1.5 C.Y. bucket = 60 cy/hr (Production estimates from Lodestone Time Study, 2018). Assuming a 40 hr week with no overtime.
Channel Restoration	$ 131.60	Acre	Trackhoe Excavation @ 1.5 C.Y. bucket = 60 cy/hr (Production estimates from Lodestone Time Study, 2018). Assuming a 40 hr week with no overtime.
Clear and Grub	$ 475.00	Acre	Average of 2019 Clear and Grub unit prices from previous bids excluding outliers for TSF 2nd Lift and East PAG Phase 1.
Compact Cohesive Soil	$ 0.59	C.Y.	Smooth roller, 6" lifts, 2 passes. Width per roll is 6 feet and 40" Diameter Roll. 31.41 cuft. X 2 passes = 2.33 c.y / cycle 48 cycles/hr.
Concrete Demolition	$ 4.74	CY	Trackhoe Excavation @ 1.2 C.Y. bucket = 15 cy/hr (Production estimates from Lodestone Time Study, 2019). Assuming a 40 hr week with no overtime.
Demo Plastic Liner	$ 0.07	S.F	Trackhoe Excavation @ 10 sq ft. in a 1.5 C.Y. bucket = 100 cy/hr. Production estimates from Lodestone Time Study, 2019. Assuming a 40 hr week with no overtime.
Geotextile 12 oz	$ 2.15	S.Y.	Geosynthetic soil stabilization, geotextile fabric, woven 200lb tensile strength (Agru Quote 2019). Price includes QA/QC services from Terracon.
HDPE 60 mil dbl textured	$ 0.78	S.F	Average of the 60mil double textured HDPE liner bids excluding outliers. Agru Quote 2019 for East PAG Phase 1 was the low bid. Price includes QA/QC services from Terracon.
HDPE 60 mil smooth	$ 0.55	S.F	Average of the 60mil smooth HDPE liner bids excluding outliers. Agru Quote 2019 for East PAG Phase 1 was the low bid. Price includes QA/QC services from Terracon.
HDPE 80 mil dbl textured	$ 1.41	S.F	Average of the 80mil double textured HDPE liner bids excluding outliers. Agru Quote 2019 for East PAG Phase 1 was the selected bid. Price includes QA/QC services from Terracon.
Import Soil and LGP Push	$ 2.41	C.Y.	Material Provided on site. 345D Loader Excavation @ 6 cy bucket = 44 Cu. Yd. / hr from stockpile. Assumed haulage cycle time = 6 cycles/hr. Truck requirements @ 40 tons /truck = 6 trucks. Dozer placement @ 400 cy/hr. (normal 520 lcy/hr limited by haulage and groundpressure; D8 LGP with universal blade). 735D Water truck for moisture control. Assuming a 40 hr week with no overtime.
Import and Place Clay	$ 2.89	C.Y.	Material Provided on site. 345D Loader Excavation @ 5 cy bucket = 44 Cu. Yd. / hr from stockpile. Assumed haulage cycle time = 5 cycles/hr. Truck requirements @ 40 tons /truck = 6 trucks. Dozer placement @ 400 cy/hr. (normal 520 lcy/hr limited by haulage and groundpressure; D8 LGP with universal blade). 735D Water truck for moisture control. Assuming a 40 hr week with no overtime.
Import and Place Growth Media	$ 2.21	C.Y.	Material Provided on site. 345D Loader Excavation @ 6 cy bucket = 48 Cu. Yd. / hr from stockpile. Assumed haulage cycle time = 6 cycles/hr. Truck requirements @ 40 tons /truck = 6 trucks. Dozer placement @ 400 cy/hr. (normal 520 lcy/hr limited by haulage and groundpressure; D8 LGP with universal blade). 735D Water truck for moisture control. Including $67,870 / year labor (Haile Accounting, 2019) assuming a 40 hr week.
Import and Place Inert Layer	$ 1.66	C.Y.	Material Provided on site. 345D Loader Excavation @ 6 cy bucket = 48 Cu. Yd. / hr from stockpile. Assumed haulage cycle time = 8 cycles/hr. Truck requirements @ 40 tons /truck = 6 trucks. Dozer placement @ 400 cy/hr. (normal 520 lcy/hr limited by haulage and groundpressure; D8 LGP with universal blade). 735D Water truck for moisture control. Assuming a 40 hr week with no overtime.
Import and Place Organic Layer	$ 4.05	C.Y.	Material Provided on site. 345D Loader Excavation @ 6 cy bucket = 48 Cu. Yd. / hr from stockpile. Assumed haulage cycle time = 3 cycles/hr. Truck requirements @ 40 tons /truck = 6 trucks. Dozer placement @ 400 cy/hr. (normal 520 lcy/hr limited by haulage and groundpressure; D8 LGP with universal blade). 735D Water truck for moisture control. Assuming a 40 hr week with no overtime.

Item	Unit cost	per	
Import and Place Riprap	$ 10.46	C.Y.	Rip rap 18" (SRCE 2017)
Import and Place Sand or Gravel	$ 24.73	C.Y.	Sand & Gravel purchase cost FOB mine @ $22.50/C.Y.($24/cy quote from construction cost 2013 Estimate adjusted for inflation); Loading from stockpile using loader @ 400 C.Y./hr; Hauling to site @ 10 min/load using Three 25 cy trucks; and D8 dozer placement @ 400 cy/hr (normal 520 lcy/hr limited by loader production). 1 980 Loader (see "Import Soil and LGP Push" for pricing details per SCRE 2017) $158.28/hr. 3 740 trucks (See "Import Soil and LGP Push" for 740 pricing breakdown). Per truck total $150.82/hr * 3= $.452.46/hr total. D8 Dozer (see "Import soil and LGP Push" for D8 pricing breakdown per SRCE 2017); $184.31/hr. Total Equipment cost $795.05/hr total / 400C.Y./hr = $1.98/C.Y. Equipment + $25.76/C.Y. purchase = $27.74/C.Y. total.
Lime Ammendment	$ 42.25	T	Per Wake Stone bulk quote January 15, 2020 - $20.00 / ton with $22.25 / ton delivery = $42.25 / ton. (Hi-Cal Ag Lime Mined at Loris, SC 29569)
Mill and Process Plant Salvage	5%	x CAP EX	5% of purchase price typical 0% assumed per 2013 estimate
Mill and Process Plant Salvage Value	$ 184.66	T	Total Cost for Process Mill Salvage is $1,939,000. Estimated tons = 10,500 tons from Haile Projects and Bill of Ladings.
Passive Treatment Cell	$ 429,283	L.S.	Based on historic costs for Chase Leach Pad previous Haile Mine BMP facilities; adjusted for inflation April 2013 to March 2018 (see note 2).
Remove and Demo Pipeline	$ 1.45	L.F.	10-18" surface pipe removal. No salvage value assumed. Assume D8 Dozer (D8 pricing is $169.56/hr) @ 100 ft / hr. = $1.70 / ft.
Remove and Demo Powerline	$ 8.83	L.F.	Double pole power line assumed no substations. No material salvage value assumed.
Revegetate	$ 1,500.00	Acre	Seed Mix = $610.00/50 lb bag. 75 lb Seed/ac. Lime=$173/ton. 3 ton/ acre. Lime and fertilizer costs from Quotes.
Scarify	$ 243.59	Acre	Scarify subsoil, 8" deep, - Large commercial 75 Hp dozer with scarified = $185.44/hr * 1.2 hrs. / acre.
Seed bed Prep	$ 60.90	Acre	Same cost as scarifying @ $222.53/acre but only 2" deep = $55.63 / acre
Slope Grading and Smoothing	$ 365.39	Acre	D8 Dozer, ideal conditions, 200 foot push;
Subgrade Preparation	$ 0.05	S.Y.	Rate used by Contour to do the anchor trench off Snowy Owl Road, December 7, 2017.
Supply and Place Erosion Control Mat	$ 11.06	S.Y.	Temporary erosion control mat unit price based on average of previous bid prices adjusted for inflation July 2015 to March 2018 (see note 2).
Treat Supernatant Solution	$ 5.06	Kgal	See water treatment cost below with the addition of nanofiltration and sulfate air sparge.
Treat ARD Seepage	$ 4.21	Kgal	See below.
Overburden Bench Pushdown	$ 0.75	C.Y.	Majority of Costs for this item are incurred operationally - Assumed D-8 dozer with universal blade @ 200' push = 520 lcy/hr; Cat Performance Handbook 25th Edition. (see "Import soil and LGP Push" for D8 pricing breakdown per SRCE 2017); $184.31/hr / 520lcy/hr = $0.35/C.Y.
Salvage Chainlink Fencing - 8 ft.	$ 1.89	L.F.	Fence demolition to remove fence up to 8' high, gates, fabric and accessories $1.89/LF.
Remove Culverts and Regrade	$ 13.16	L.F.	Selective demolition, metal drainage piping, CMP, steel, 30"-36", diameter, excludes excavation (RS Means line #024113400180) - $11.74/L.F. Assume 3 C.Y./L.F excavation (see "Channel Excavation" calculation above). Finish grading on gentle slopes to reistablish drainage (RS Means line #312216103300) $0.18/S.Y. assume 3 S.Y./ L.F. $23.41/L.F. total.
Post-closure GW Sample	$ 315.00	Ea	Test America actual cost per sample.
Post-closure SW Sample	$ 315.00	Ea	Test America actual cost per sample.
Post-closure Maintenance	$ 75,500.00	yr	Contractor Labor cost
Passive Treatment Cell Preplacement	$ -	yr	Assume 50% cost to replace every 20 yrs.
2" Pipe in Trench	$ 1.89	L.F.	2" PE Pipe material and installation $2.97/L.F. (RS Means Line #331413201160).Trench excavation 6" wide 18" deep with chain trencher$ 0.67/L.F. (RS Means Line #312316140350). Trench backfill by hand including compaction $1.81/L.F. (RS Means Line #312316141350).

Item	Unit cost	per	
Well Abandoment	$ 7,091.27	Well	Avg. per well estimated cost to abandon monitoring wells, 40 8" dewatering wells with average depth of 450 ft, grout and backfill, including the removal of line shaft pumps, total cost $466,469; 11 2" monitoring wells with avg depth of 130 ft, grout and backfill, total cost $25,984; 12 4" monitoring wells with avg depth of 500 ft, grout and backfill, total cost $33,686; 4 1" Piezometer wells with average depth of 225 ft, grout and backfill, $9,879. $10,732.07 mob/demob. Well remediation costs from SRCE 2017 Mobilization cost is from the 2013 estimate and has been adjusted for inflation April 2013 to March 2018 (see note 2).

NOTES

1. All RS Means Line costing information was taken from the 2018 Heavy Construction Online Cost Data sheets adjusted for Rock Hill, SC assuming an open shop unless otherwise noted

2. All inflation calculations made by using the United States Department of Labor Bureau of Labor Statistics CPI inflation Calculator which can be found at https://www.bls.gov/data/inflation_calculator.htm