SAUNDERS DEMONSTRATION MINE
SURFACE MINING LAND USE PLAN

Twin Pines Minerals, LLC

TWIN PINES MINERALS, LLC
PROPOSED HEAVY MINERALS MINE
SAINT GEORGE, CHARLTON COUNTY, GEORGIA

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SURFACE MINING LAND USE DEVELOPMENT PLAN
TWIN PINES MINERALS, LLC
SAUNDERS MINE
CHARLTON COUNTY, GEORGIA

I. INTRODUCTION

Twin Pines Minerals, LLC (TPM) is submitting this Surface Mining Permit Application and associated Land Use Development Plan to secure a mining permit to conduct the proposed heavy mineral sands (HMS) mining demonstration project at the proposed Saunders Mine site located near St. George, Charlton County, Georgia. The HMS sedimentary deposits occupy a portion of a relict beach ridge along Trail Ridge in Charlton County. The proposed mining project consists of approximately 1,041.7 acres (898-acre mining area) as depicted on the U.S. Geological Survey (USGS) 7.5-minute Topographic Maps of Moniac and Saint George, Georgia (**Figure 1**). **Figure 2** is an aerial photograph depicting the site location and adjacent property owners. The TPM project includes the extraction of the high-quality HMS reserves in a safe, cost effective, and environmentally sound manner for export by truck and rail to national and international customers. The principal heavy minerals to be extracted in this proposed HMS operation are zircon, titanium minerals (ilmenite, leucoxene, rutile), and staurolite.

This document is intended to provide supplemental information to the Surface Mining Land Use Plan (SMLUP) Form.

II. PURPOSE AND NEED

The purpose of this demonstration mining project proposed by TPM is to gather data required to evaluate a groundwater hydrology model completed during the development of this project. This evaluation is necessary to demonstrate that HMS mining can be accomplished in an environmentally sensitive area with negligible impact to the site and surrounding resources. An additional purpose is to develop a high-quality HMS reserve to produce HMS concentrate products including titanium mineral concentrates and zircon concentrates to meet global demands in a safe, cost effective, and environmentally sound manner.

The TPM mining plan and the associated groundwater and surface water monitoring plan will be used to confirm the ability of HMS mining to be conducted within close proximity to sensitive environmental resources. As the economic locations for mining HMS within the United States are becoming scarce, it is vital that new mines be developed in such a manner as to minimize environmental impacts. TPM has completed extensive geologic and hydrogeologic evaluations of the Saunders Tract which culminated with the production of a groundwater hydrology model demonstrating that mining can be safely conducted within the demonstration area with negligible impact to the site, the surrounding area, and the Okefenokee Swamp. Small scale projects, such as the one proposed, that can demonstrate sound environmental practices for extracting heavy mineral resources in environmentally sensitive locations, represents good stewardship of the environment.

HMS deposits contain the primary ores of titanium dioxide (TiO2) for the pigment industry and zircon (ZrSiO2) used in refractory products. TiO2 is primarily obtained from mining and processing the minerals ilmenite, rutile, and leucoxene. Leucoxene, not technically a mineral, is a higher quality derivative of ilmenite resulting from the preferential weathering and leaching of iron therefore increasing the TiO2 percentage to greater than 70 percent. Zircon is recovered as a co-product from the processing of HMS deposits.

III. MINE INFORMATION

The proposed mining area consists of one mining block (Saunders Tract) bound by Georgia Hwy 94 to the south, Trail Ridge Road to the east, and surveyed boundaries on the north and west. The approximately 1,041.7-acre permitted area will generally consist of the approximately 898-acre mining area, wet processing plant, material transport road, and dry processing plant, as shown on the Site Layout Map (**Figure 3**). TPM expects to mine approximately 25-40 acres per month once all infrastructure is in place and produce an HMS concentrate on-site. Mineral sands, titanium minerals - ilmenite, leucoxene and rutile, zircon, and staurolite occur in the upper 50 ft of sand in the Trail Ridge physiographic landform, which is an ancient beach ridge in Charlton County. After the HMS products have been separated, the final products will be containerized, bulk shipped or loaded on truck or rail dependent upon customer requirements.

The center of the site is located near latitude 30.523804 and longitude -82.118589. According to the USGS Topographic Map, the elevation at the site ranges from approximately 120 to 175 ft above mean sea level. The proposed mine site has historically been used for silviculture operations.

IV. OPERATOR AND OWNER INFORMATION

Twin Pines Minerals, LLC will be the operator of the Saunders Mine site. The Saunders Mine site property is owned by Trail Ridge Land Company (which is owned by Twin Pines Minerals); TIAA Timberlands I, LLC; and joint private owners Rodney & Sidney Bell and Eli & Sharon Padgett.

V. GENERAL MINING INFORMATION

TPM expects to begin construction upon obtaining the required authorizations and mining operations are expected to be conducted for a 6-year period. The proposed mining operation is expected to provide approximately 200 direct jobs and additional supporting subcontractor jobs. An estimated mining production timeline is provided as **Figure 4A**. A progression of site clearing time line is included as **Figure 4B.**

TPM is committed to protecting the environment and minimizing impacts to local citizens. Current work at the site includes the initial environmental screening to evaluate baseline conditions, developing an effective water management strategy, and identifying other environmental and operational concerns. The northern boundary of the site is located approximately 2.7 miles southeast from the nearest boundary of the Okefenokee Swamp National Wildlife Refuge, providing a substantial buffer of protection for this sensitive resource. TPM reclamation plans are to restore land uses to the original pre-mining conditions, planted pine, or natural conditions which existed prior to conversion to timber silviculture land usage. The reclamation process will

begin immediately after mining in individual dragline cuts has been completed. Within 1 to 2 weeks of mining, the drag line cuts will be refilled with sand tailings. Thereafter, topsoil will be replaced to stabilize the reclaimed area and vegetative cover will be replanted within an 18-24-month period, depending on the planting season.

The proposed mining operation is designed to be water-efficient by recycling and recirculating water to minimize the amount required from the Upper Floridan Aquifer (UFA). Water will not be withdrawn from any natural surface water body. Water within the active mining pit is anticipated to be withdrawn only during upset conditions, i.e. equipment maintenance/failure, after hurricane. When possible, water withdrawn from the mining pit will be used for make-up water at the Pre-Concentration Plant (PCP) and Wet Concentration Plant (WCP).

TPM will operate the mine to be a low-impact neighbor to nearby residents. The active mining area will be designed so it will be surrounded by an approximately 5-foot high berm and buffers to minimize potential disturbances (noise and dust). TPM has been in contact with area stakeholders, including Charlton County, Georgia EPD, and concerned citizens during the planning process for the proposed mining operation.

TPM has developed a mineral sand mining technique using a dragline excavator, conveyor system for materials transport, and land-based permanent processing plants. This mining technique is different from conventional "wet mining", which utilizes a dredge and floating concentrator to mine and process heavy mineral-bearing sands. In general, a dragline is a more efficient method for moving bulk material where long mining cuts and pits can be utilized. Employing elongated cuts allows for simultaneous mining the mineral sands and tailings placement to occur in the same pit. This process will allow reclamation to occur at a faster rate as backfilling and rough grading may occur up to +/-500 ft behind the dragline dig face. This should allow reclamation to begin within days of mining, where typical methods take several months to greater than a year.

The dragline method involves a large crane-like earthmoving machine equipped with a bucket to scoop material. The large-capacity bucket swings from cables on the end of the boom, scooping material that is then moved to adjacent areas. Draglines are electrically powered and run by two employees, an operator and an oiler. When mining is occurring, measures must be taken to protect the areas adjacent to the mine property. Berms are constructed to ensure that muddy water does not leave the mine property and affect local waterways.

A conveyor system is utilized to transport mined material to the PCP and WCP. Haul trucks will be used to transport the HMS concentrate from the WCP to the Mineral Separation Plant. The locations of the mineral processing plants are depicted on **Figure 3.** The mineral processing plants are situated so that mineral processing activities are located close to the mining areas, which decreases material transport distances and energy demands. Recycled process water ponds will also be constructed adjacent to the processing plant creating an efficient method for process water reuse and recirculation. **Figure 5** depicts the Mine Water Balance, the process water flow diagram for the proposed mining operation.

Mining will commence after the topsoil has been removed from the designated 100 ft dragline mining cut and conveyor system area within the Saunders Tract mining area. Once the topsoil removal process has been completed, the conveyor system will be installed. The dragline excavator will then excavate and temporarily stockpile the mined material. The material will then be transferred onto the conveyor

system for transport to the processing plant. After processing, the tailings will be temporarily stockpiled adjacent to the processing plant. The tailings will then be transported back to the open mining cut via a tailings conveyor system. The reclamation area will then be recontoured, covered with topsoil and revegetated to meet reclamation standards. The operation is a continuous process and while the dragline is operating, backfilling of the cut is occurring as well.

Mine Progression

The mining sequence will be divided into separate phases. These phases are described as follows:

Site Preparation

- Clearing
- Topsoil removal
- Construction of permanent processing plants and infrastructure

Mining

- Excavation
- Heavy Mineral Sand processing

Reclamation

- Tailings placement
- Tailings contouring to mimic per-mining topography
- Topsoil return
- Vegetation planting

Site Preparation

To initiate mining activities, the project area will be delineated by survey markers, boundary markers, and flagging in the field to indicate the locations of permanent infrastructure and mining boundaries. A pre-mining survey based off of LiDAR will be used to create a topographic surface that will serve as a guide for design elevations for all post-mining reclamation. All merchantable timber will be harvested prior to beginning of mining activities. Timber will be harvested on average 4 to 6 months prior to initiating operations. Timber that is not merchantable and timber scraps will be removed by TPM and all areas within the limits of clearing and mining will be root raked, windrowed, and burned with Division of Forestry and/or county permits. Clearing will only be conducted in areas where active mining will be conducted within 2 weeks, to maintain a minimal amount of disturbed land at one time.

The first step of the clearing process with be clearing for the feed conveyor along a 50 ft corridor along the north section of the initial mining area and clearing for the construction of the permanent facilities. Once clearing for the feed conveyor is completed, clearing for the Tails conveyor and berm to the south will be performed. Once the areas have been cleared, the permanent facilities and infrastructure will be constructed/installed along with the berms, stormwater controls, and other best management practices for sediment control.

The permanent facilities will consist of an interior road system, wet processing facility, and dry processing facility, described further in the next section. Recycled process water pond(s) will be constructed adjacent to the processing plant. TPM will also install a two deep make up water wells to provide make-up water during times of need as seen on **Figure 3.**

The feed and tailings conveyors will be constructed for the entire length of the mining corridor to near the eastern boundary of the mine area, where they will turn to the north towards the mineral processing plant, located near the northeastern portion of the mining area. The berms will be constructed along the perimeter of the disturbed area to mitigate erosion and contain stormwater. Generally, one foot of topsoil within each mining cell will be removed by heavy equipment and transported to the berms/topsoil storage piles around the perimeter of the mining area. Additionally, silt fencing and hay bales will also be utilized in appropriate locations for additional erosion control.

The topsoil storage piles/mining perimeter berms will serve to prevent stormwater runoff and muddy water within the active cut from leaving the site as well as preserve "seed banks" for native vegetation and a planting medium for later reclamation. Topsoil removal will be conducted 2 weeks in advance of mining activities. The topsoil storage piles will be stabilized with an internal three horizontal to one vertical (3H:1V) slope and an external four horizontal to one vertical (4H:1V) slope and seeded to prevent erosion. As noted previously, silt screens and hay bales will be utilized along the outside of the topsoil storage piles to control post construction erosion.

The first step in the mining process will be rough clearing of the mining corridor ahead of the dragline. The mining corridor will be approximately 450 ft north to south which will allow for mining of 3 pits before relocating the feed/tailings conveyors. This corridor will be cleared immediately ahead of the dragline. This clearing will extend +/-500 ft ahead of the mining and progress as the dragline advances. The clearing of this 450 ft north to south corridor is required to facilitate the advancement of the apron feeder and mobile conveyors as mining progresses to the east in the initial pit.

Excavation, Processing, and Tailings Return

Excavation of the mining cuts will commence after the topsoil is removed. The mining process proceeds as follows: The dragline moves through the mining area excavating approximately 100-foot wide by 50-foot deep cuts, in an east to west or west to east direction as shown on **Figure 6A.** A mining cut profile/cross-section is included as **Figure 6B.** Mining rates are anticipated to vary from approximately 100-200 ft of pit length excavation per day. The excavated material is stockpiled nearby. It is then transferred to an apron feeder which feeds to a screen. This removes roots and other large objects. The material is then transferred to a pit/feed conveyor system. The oversized organic material will be placed near the screen area for future deposit into the mining pit during the reclamation process. The pit/feed conveyor system feeds a mainline feed conveyor system. The mainline feed conveyor system will incline (or feed a stacker conveyor) and then feed the trommel (screen). The trommel feeds the PCP.

In the PCP, spiral centrifuges concentrate and separate the heavy mineral sands from the lighter clays and quartz sand and then feeds the WCP. The WCP further reduces and separates the material for processing. Process water is recovered from the tailings and heavy minerals sands via a series of dewatering screens and cyclones throughout the process. Humate is also separated from the process

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SURFACE MINING LAND USE DEVELOPMENT PLAN (1)
TWIN PINES MINERALS
ST. GEORGE, CHARLTON COUNTY, GEORGIA

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