U. S. STEEL KEETAC TAILINGS STORAGE FACILITY PROJECT

1. INTRODUCTION

The United States Steel Corporation (U. S. Steel) Minnesota Ore Operations (Project Proponent or the Proponent) is proposing to augment its existing Tailings Storage Facility (TSF) for its Keetac taconite mining operation in Keewatin, St. Louis and Itasca Counties, Minnesota (Project).

The Project would involve vertically raising existing tailings retention dikes and water retention dams to increase safe tailings storage capacity for ongoing taconite processing operations. The Project does not propose any changes to the permitted mining or processing activities, though it has been designed to meet the potential needs of tailings storage generated through the anticipated Keetac life of mine, which would extend beyond the current Permit to Mine.

1.1PURPOSE AND NEED

Proponent's Purpose and Need: The Keetac Mine has taconite reserves to support mining through 2048 (at current mining rates) as approved under the Permit to Mine. There are also additional taconite resources beyond the Permit to Mine reserves that, in the future, may also be economical to mine. Taconite mined at Keetac is processed and tailings are stored in an existing TSF. At current mining rates, the existing TSF is estimated to meet its design safe storage capacity by approximately 2028. Thus, U. S. Steel needs a longer-term solution to safely manage tailings generated by the Keetac Mine under the existing Permit to Mine, and with capacity for the ultimate life of mine.

1.2 PROJECT BACKGROUND AND SUMMARY

The Keetac Mine extracts taconite (low-grade magnetic iron ore) from open pit mines in the sub crop of the Biwabik Iron Formation of the Mesabi Iron Range. Taconite generally contains iron oxides, quartz, iron silicates, and iron carbonate minerals. The taconite is processed on-site to concentrate iron content and form taconite pellets that can be sold and shipped to steel mills to be melted down into steel.

Tailings are a byproduct from processing. Tailings produced at Keetac are piped to an existing TSF (Figure 1.1-1).

Keetac underwent environmental review in 2010 for a proposed expansion of operations, which was assessed under the National Environmental Policy Act and the Minnesota Environmental Policy Act. This proposed Project is unrelated to the actions proposed in the

2010 EIS, and although the expansion of the plant did not occur, details of the operations and the expansion are available in the Environmental Impact Statement (EIS).[1]

This document describes and assesses a new Project to augment the existing TSF to safely accommodate tailings generated through ongoing mining and processing operations. Because there is no proposed change to the mining and processing operations from that previously assessed and permitted, this document does not address them further.

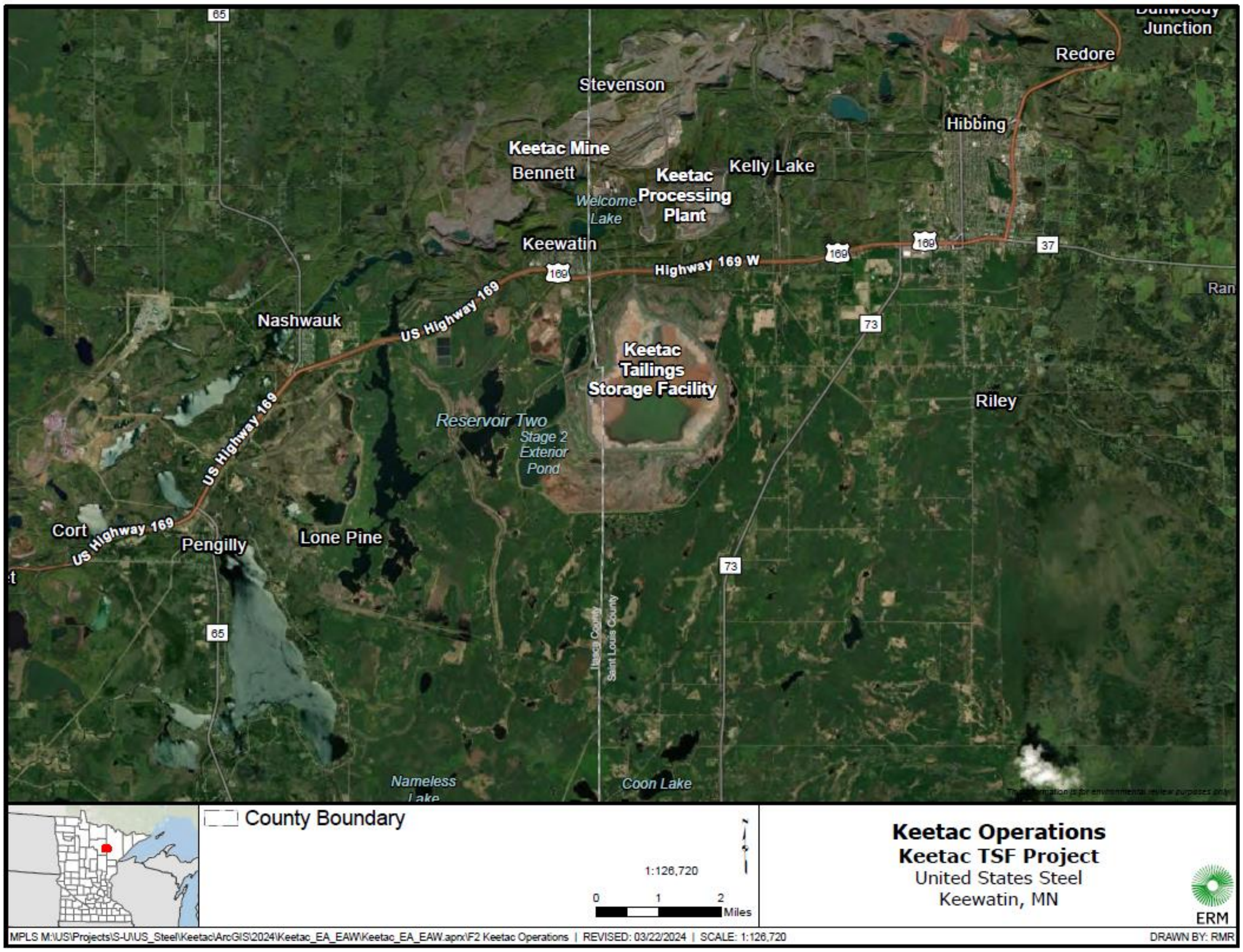

FIGURE 1.2-1: KEETAC OPERATIONS

Tailings were first discharged to the TSF in 1967. The TSF has subsequently been developed in 3 stages, each one leveraging natural topography, supplemented by constructed perimeter dikes. Stage 1 comprised approximately 1,560 acres and was the sole tailings deposition location from 1967 until the Stage 2 Exterior was constructed in the 1980s. The Stage 2 Exterior expanded the TSF to the south by constructing clay core perimeter dams

[1] Available at: https://www.dnr.state.mn.us/input/environmentalreview/keetac/index.html

and created a new approximately 4,300-acre deposition area. Stage 2 Exterior was utilized for tailings storage for 10+ years until it was idled in 1993. During that time, the Stage 2 Interior was constructed, which raised portions of the Stage 1 area and the Stage 2 area to create an internal basin (i.e., the Stage 2 Interior). The Stage 2 Interior is 2,500 acres and has been the active TSF since that time. Most of the Stage 2 Interior dike was constructed upon tailings that had been deposited into the Stage 2 Exterior. An additional area was originally planned for Stage 3 that has not been used. Stage 3 is reflected in the mining area (as defined in the Permit to Mine), and all stages described above are shown on Figure 1.1-2.

The TSF operates under Minnesota Department of Natural Resources (DNR) Dam Safety Permit No. 2022-0721. The permit authorizes construction and operation of the TSF to its safe design parameters, as shown in Table 1.1-1. Currently, tailings are mostly discharged to the Stage 2 Interior with some strategic placement in the Stage 2 Exterior. Stage 1 is near the design storage capacity and cannot accept additional tailings. Vertical expansion of the existing Stage 2 Exterior to the south of the Stage 2 Interior is the desired tailings storage area for longer term tailings storage for Keetac.

The current operation delivers total tailings at a rate of approximately 16,000 gallons per minute via a 22-inch diameter pipeline that can deliver total tailings around the entire perimeter of Stage 2 Interior. Only one discharge location is active at any one time. During direct reduction (DR)-grade pellet production an additional 10% of tailings are generated and are discharged to the northern portion of the facility via a dedicated DR tailings line. The tailings slurry settles within the TSF according to particle size. Coarse material deposits near the discharge point while the fines travel downstream toward the center of the TSF. Keetac uses this natural segregation process to provide coarse borrow material which is used for upstream construction of the dikes.

At current mining rates, the Stage 2 Interior is anticipated to soon reach its designed and permitted height. The Proponent was approved via the 2021 Permit to Mine amendment to raise the Stage 2 Exterior dikes and construct an internal diversion berm within the Stage 2 Exterior footprint (referred to as Phase 1 in the Permit to Mine amendment application). These features, constructed in 2022, created freeboard and allowed for short-term, controlled deposition of tailings into the Stage 2 Exterior, with the intent to improve the stability of the Stage 2 Interior basin embankments. The Proponent began discharging tailings into the Stage 2 Exterior in July 2023. Capacity at the current design of the Stage 2 Interior and permitted Stage 2 Exterior will occur by 2028. A second phase of vertical expansion of the Stage 2 Exterior is required to provide longer term storage to align with Keetac life of mine (Phase 2).

The Project described in this document represents Phase 2. It is designed to vertically raise the Stage 2 Exterior dams and dikes to allow for long-term controlled deposition of tailings into the existing Stage 2 Exterior. Vertically raising the existing dams and dikes would be achieved using downstream and modified centerline construction methods, which would extend the dam and dikes beyond the current TSF footprint.

The intent of Keetac Phase 2 Project is to not only to align the TSF with Keetac's mine life but also to reduce risk and improve the safety of the TSF - with the ultimate goal of zero harm to the people and environment. While the DNR does not specify factor of safety criteria for analysis, USS along with GEI (Engineer of Record) have selected a minimum factor safety criteria for evaluation of Phase 2 that meets or exceeds industry standards and is defensible to independent review. Results from stability analysis throughout the life of Phase 2 have factors of safety higher than the minimum criterion and provide further evidence of the robustness of design. Keetac currently has over 190 piezometers, 40 inclinometers, and 3 shape accelerator arrays (SAA) to help measure the performance of the facility. During the life of Phase 2, continual improvement of geotechnical monitoring will take place. Additional geotechnical investigations, piezometers (to measure pore pressure), inclinometers and SAA (to measure horizontal deformations), observation wells (to measure water levels and water quality), settlement monitoring devices (to measure vertical displacements), and adoption of new technologies will be installed to monitor the health and performance of the facility as per USS Tailings Management System.

The Project would occur in stages to align with the Keetac life of mine predicted from permitted reserves through 2048. At current mining rates, total tailings delivered to the TSF are anticipated to be approximately 340 million long tons. However, the ultimate dam configuration considered what storage would be required to accommodate tailings from surrounding mineral resources beyond the current permitted reserves (this proposal does not involve any change in mining or processing from what has been permitted). At full design capacity (estimated year 2063, and 590 million long tons of delivered tailings at current mine rates), the Stage 2 Exterior dikes and dams would be 1,580 feet elevation (5 feet lower than the height of the Stage 2 Interior dike) and accommodate 225,000 acre-feet of fine tailings storage. This Project does not propose to increase the permitted life of mine.

The Project would also involve building new infrastructure for tailings separation and tailings dewatering. The infrastructure would produce coarse tailings for use in dam and dike construction and thickened fine tailings for discharge to the TSF.

Using the dewatered coarse fraction of the tailings for construction would have a smaller environmental footprint than developing off-site natural borrow sources to obtain dam and dike construction materials, reduce the amount of tailings storage required within the basin footprint, and enhance water management for the Keetac facility. The addition of the fine tailings thickener allows for increased water recycling (by reducing water loss to pore space during deposition) and provides better management for fugitive dust (by increasing trafficability of fine tailings and reducing surface area per discharge point).

Other associated infrastructure, such as roads and pipes, would be constructed as part of the Project.

Construction is proposed to begin in the winter of 2026-2027 and would take 2 years. Vegetation clearing would occur during the winter months to minimize potential impact on bats and migratory birds. The TSF would be built in stages throughout operations. Similarly, temporary workspaces would be utilized in stages of six months or less. Outside of site preparation, it is anticipated construction would occur throughout the entire calendar year.

The Project would permanently impact 608.6 acres and would temporarily impact 89.7 acres of land (Figure 6.4). However, most impacts would occur within the existing mining area. Of the 608.6 acres of permanent impacts, only 108.1 acres are located outside of the existing mining area. Of the 89.7 acres of temporary impacts, only 30.6 acres are located outside of the existing mining area.

TSF stages and dike and dam stages and heights are shown in Table 1.1-1. Table 1.1-2 provides impact acreages for each Project component both within and outside of the Permit to Mine area.

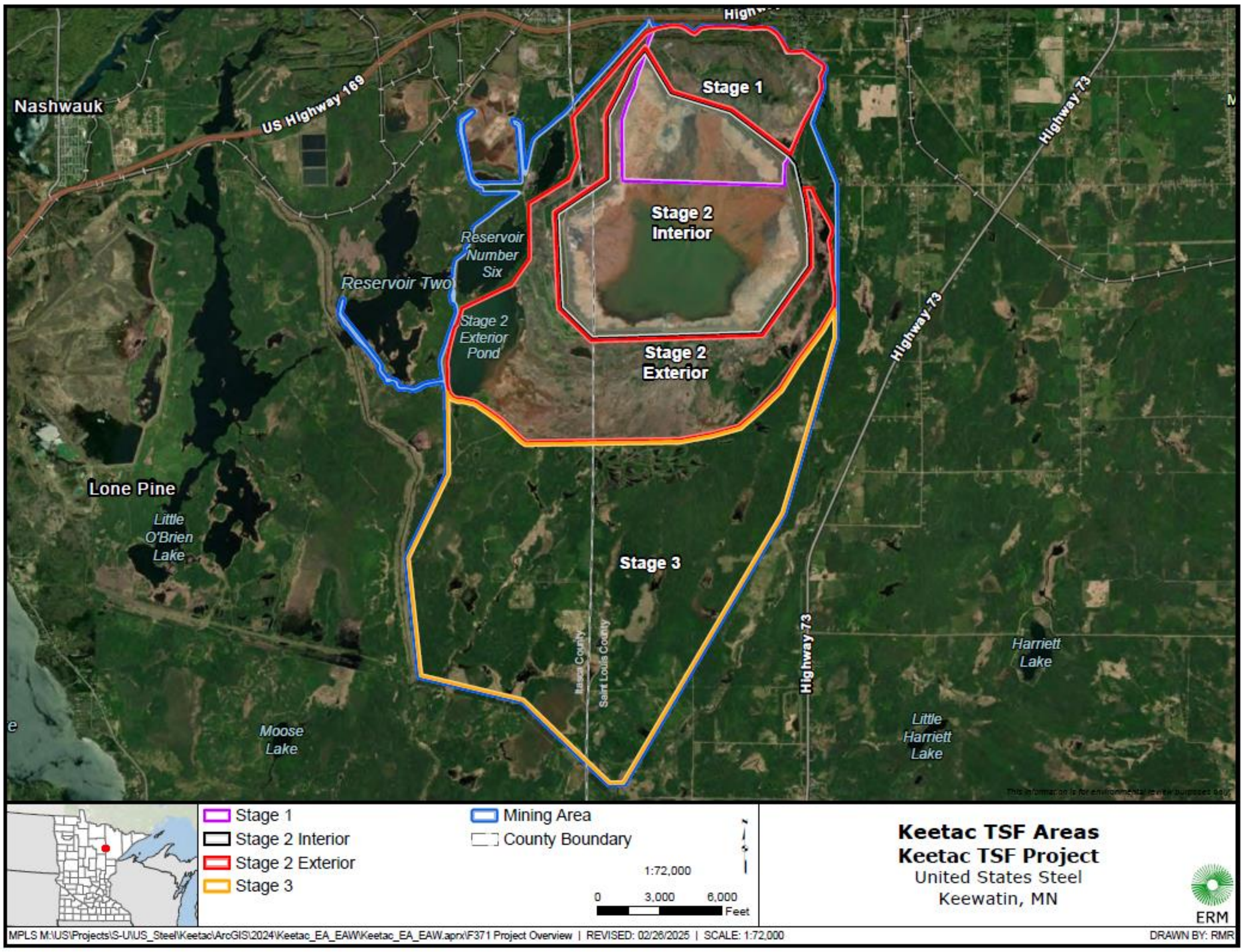

FIGURE 1.2-2: KEETAC TSF AREAS

TABLE 1.2-1: TSF STAGES AND DIKE AND DAM HEIGHTS

Stage	Current Permitted Height (feet)	Current Actual Height (feet)	Proposed Maximum Height (feet)	Estimated Date Maximum Height would be Reached
Stage 1	1,500	1,500	1,500	at Capacity
Stage 2 Interior	1,585	1,553-1,580	1,585N/A	2028
Stage 2 Exterior	1,470 South 1,510 East	1,465 South 1,495 East	1,580	2063*

*The Project's proposed design would accommodate tailings through the current 2021 Permit to Mine period (2048) and allow for additional capacity for potential future mining of surrounding resources.

TABLE 1.2-2: PROJECT IMPACT ACREAGES

Area of Impact*	Permanent Impact Areas			Total Permanent Impact Area	Total Temporary Impact Area	Total Impact Area
	Permanent Impacts (Dike and Dam footprints)	Pipeline and Separation and/or Dewatering Infrastructure	Permanent Access Road			
Portion inside of the Permit to Mine (acres)	434.6	28.2	37.7	500.5	59.1	**559.6**
Portion outside of the Permit to Mine (acres)	81.8	13.3	12.9	108.1	30.6	**138.7**
Total Acres	**516.4**	**41.5**	**50.7**	**608.6**	**89.7**	**698.3**

2. PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW

The Project would involve increasing the capacity of the existing TSF by vertically raising the existing perimeter dikes (to retain tailings), and dams (to retain pond water). Vertically raising the dikes and dams would be achieved using modified centerline and downstream construction methods that would extend the TSF's horizontal footprint by approximately 275 to 350 feet to the south, as well as 500 feet east of the Permit to Mine boundary and 700 feet west of the Permit to Mine boundary.

The Project would allow for the safe discharge of tailings within the existing footprint of the Stage 2 Exterior basin. The ultimate crest elevation of Stage 2 Exterior would be 1,580 feet, 5 feet lower than the ultimate elevation of the Stage 2 Interior. A cross section of the TSF dike is shown on Figure 2.1-1 and the dam is shown on Figure 2.1-2. Project's horizontal footprint is shown in Figure 2.1-3.

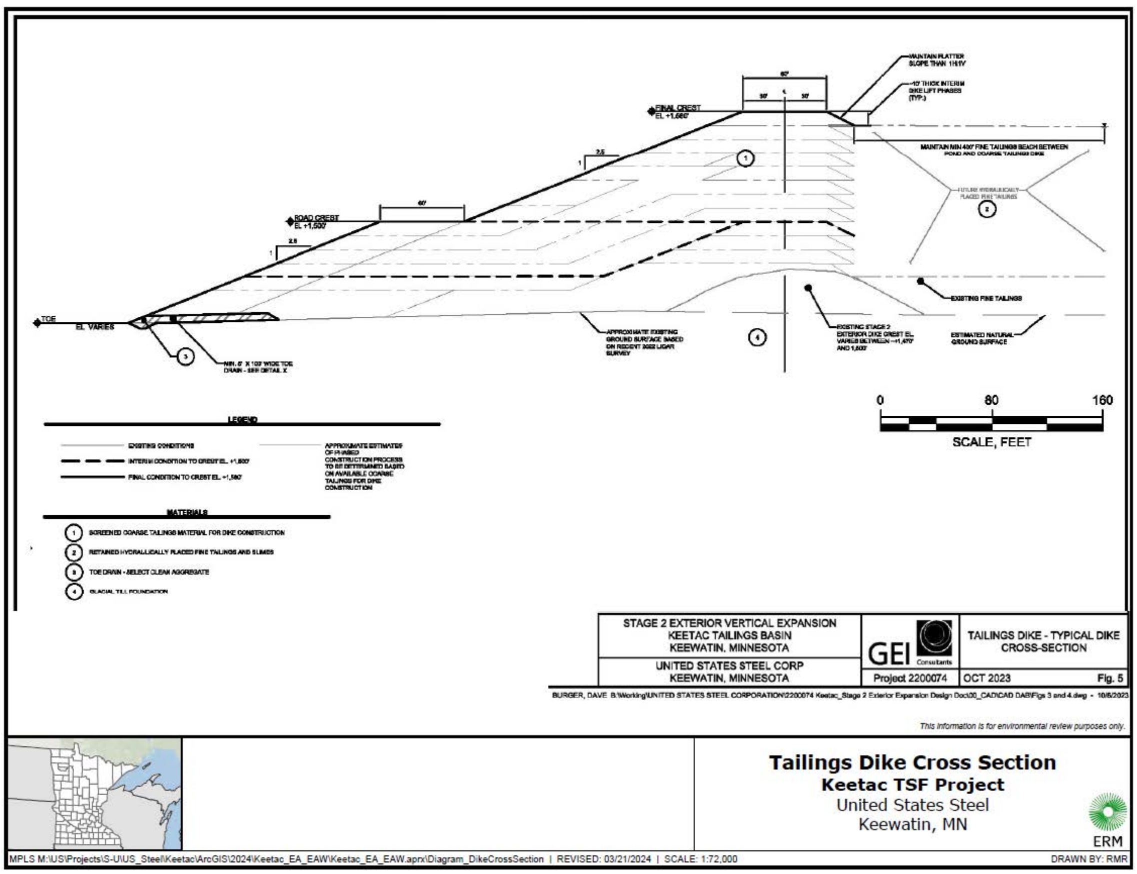

FIGURE 2.1-1: TAILINGS DIKE TYPICAL CROSS SECTION—MODIFIED CENTERLINE CONSTRUCTION

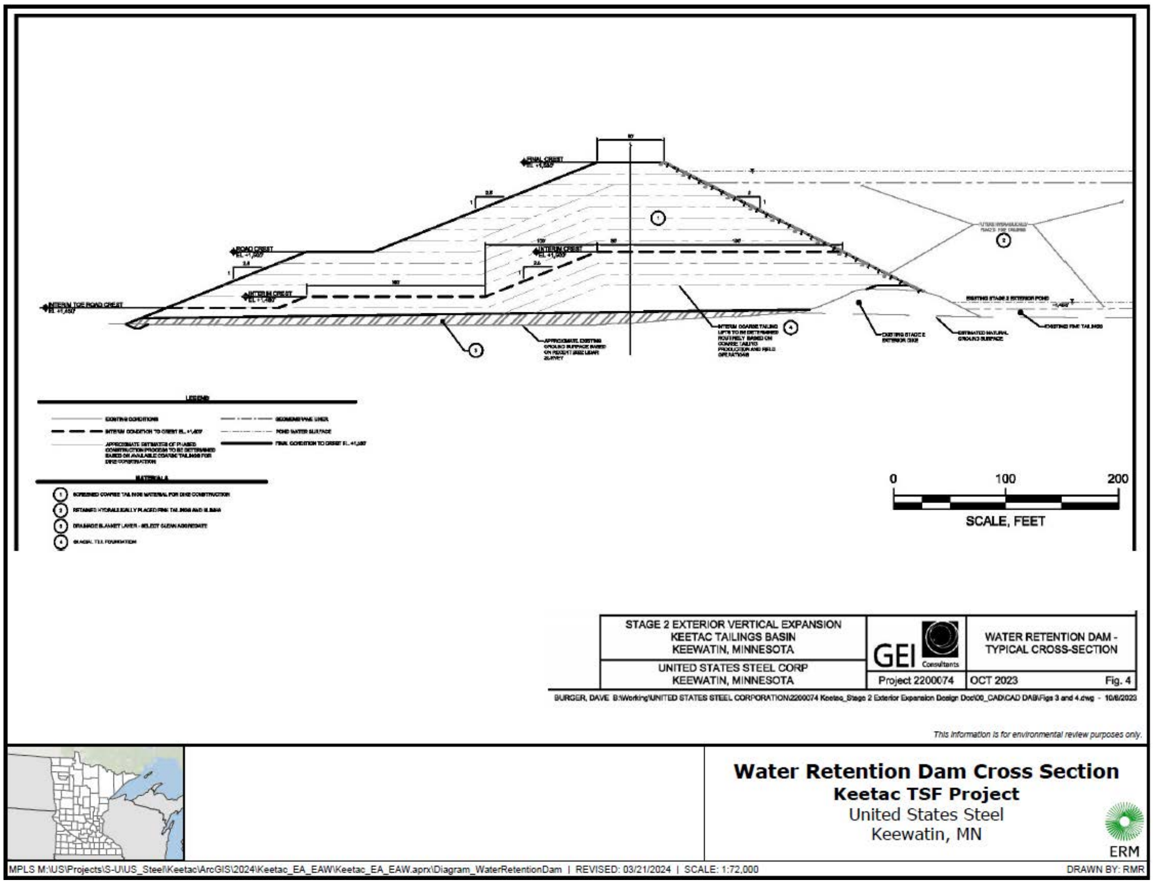

FIGURE 2.1-2: WATER RETENTION DAM TYPICAL CROSS SECTION—DOWNSTREAM CONSTRUCTION

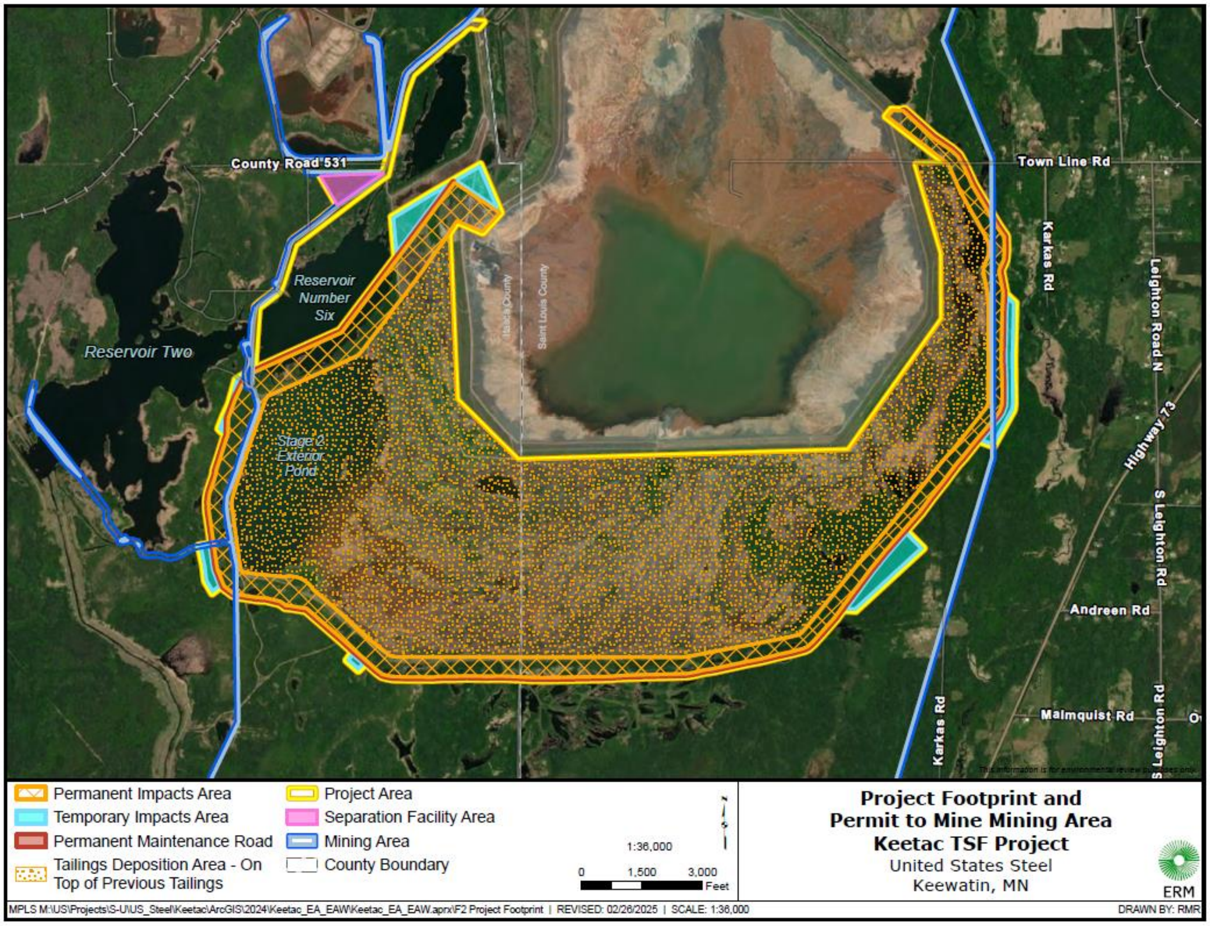

FIGURE 2.1-3: PROJECT FOOTPRINT

The Project includes new infrastructure to separate and/or dewater the coarse tailings located near the TSF. The coarse tailings would be transported to the TSF for use in the construction of the dams and dikes. This would minimize the need for fill or borrow material to be sourced off-site and maximize the use of tailings for safe construction.

Aboveground pipes would be used to transport tailings and water from the separation and/or dewatering infrastructure to the TSF. Electrical distribution lines may need to be upgraded to connect the separation and/or dewatering infrastructure to the grid. The separation and/or dewatering infrastructure would also have maintenance areas, fuel storage, parking, and septic facilities. Roads would be built for access around the new dikes and dams. A permanent access and maintenance road would be constructed along the outer perimeter of the dikes and dams.

2.2 DESIGN STANDARDS AND MANAGEMENT PLANS

The Project has been designed according to the State of Minnesota Administrative Rules in Chapter 6115 that regulate new and existing dam safety permits. In addition to compliance with state dam safety regulations, the designs have also taken into consideration global industry dam safety and tailings management best practices. Standards from the following organizations and agencies were considered and/or incorporated into the design and management of the Project:

- Global Industry Standard on Tailings Management (GISTM)
- International Committee on Large Dams and US Committee on Large Dams
- Mining Association of Canada (MAC)
- Canadian Dam Association (CDA)
- US Society on Dams (USSD)
- US Army Corps of Engineers (USACE)
- US Bureau of Reclamation (USBR)
- Natural Resources Conservation Service (NRCS)
- Federal Energy Regulatory Commission (FERC)
- Mine Safety and Health Administration (MSHA)
- Federal Emergency Management Agency (FEMA)
- State of Minnesota Administrative Rules Chapter 6115 (New and Existing Dam Safety)

The TSF is also managed in accordance with an Operation, Maintenance, and Surveillance (OMS) Plan developed by the Proponent.

2.3 CONSTRUCTION

Sitework would start with vegetation clearing, then proceed to earthworks (e.g., grading), and construction of roads, buildings, pipelines, decant structure, then vertical expansion of dams/ and dikes. The construction period of the separation and/or dewatering infrastructure, decant and associated infrastructure would be from 2026 to 2028.

The full Project footprint would be impacted during construction to prepare for the permanent Project features as well as use of the temporary construction areas.

The dikes and dams would continue to be raised in stages as planned to maintain sufficient freeboard as tailings are deposited through the life of the Keetac Mine (up to their design crest height of 1,580 feet). Work would happen 24 hours a day.

2.3.1 VEGETATION CLEARING AND TOPSOIL MANAGEMENT

Vegetation clearing would occur during winter months beginning in the winter of 2025/2026 and be completed in the winter of 2026/2027. This timing would allow for the avoidance of potential impact to bats, and for time to stage construction of the dikes and dams to ensure enough freeboard for ongoing tailings deposition into the Stage 2 Exterior basin.

Site preparation activities would need to be completed prior to vertically raising the dams and dikes. Typical site preparation activities would include grubbing any vegetation, stripping (removal of debris, loose rock, organic material, and unsuitable material), topsoil excavation (stockpile for progressive reclamation), and clearing. Site preparation will be completed using mechanical equipment common for such activities. This could include dozers, excavators, haul trucks, logging equipment, and loaders.

Trees and vegetation would be felled and cleared by logging equipment and trees where applicable would be logged and sold. Stripped top-soil removal volume would be minimal because much of the Project footprint outside of the currently impacted Stage 2 Exterior footprint has been previously utilized as a borrow source for dam/ and dike construction. Excavated material will be stockpiled in temporary construction areas (see section below) and any topsoil would be managed to retain function, and later used for reclamation.

Once the foundational site is prepared both the water retention dam and the dike will be mechanically raised in lifts using typical construction equipment that could include haul trucks, dozers, graders, sheepsfoot rollers, and excavators.

During construction Keetac shall establish and maintain erosion control features until the project is completed. General practices below will be used, where applicable:

1. Minimize disturbed areas and sequence work to minimize exposure time.
2. Use Temporary vegetation, mulch or other cover to protect areas during construction.
3. Utilize stone check dams, haybale dikes, or sit fence to trap sediment.
4. Reduce volume and velocity of water crossing disturbed areas by using diversion dams, berms, or other facilities.

Additionally, site stabilizations measures will be ongoing as applicable. For example, once final grade is reached for any one construction stage, topsoil will be placed to a minimum depth of 6 inches on the slope then fertilized, seeded, and mulched. In some cases, hydroseeding may be used for greater effectiveness.

2.3.2 TEMPORARY CONSTRUCTION AREAS

Temporary impact areas are required to allow for more space for laydown and staging of equipment, parking and turn around, and stockpiling of vegetation and soil.

The temporary construction areas have been selected based on strategic construction needs to minimize environmental impacts and achieve efficiency and the required space for construction. Wetlands and water bodies would be avoided as best as possible to minimize impacts to those features. All excavated materials will be stored in upland stockpiles in compliance with the Dam Safety Permit.

The temporary construction areas would be used for no longer than 6 months and restored after use including recontouring, seeding for vegetation, and restoring hydromorphic functions. Soil compaction in temporary workspaces would be mitigated through tilling and supplementation with organic materials. Exposed soils would be seeded and monitored until 70 percent coverage is achieved in accordance with Minnesota construction permit requirements.

2.3.3 SEPARATION AND/OR DEWATERING INFRASTRUCTURE

The dewatering infrastructure would include an industrial building housing hydroseperators, screw classifiers, and dewatering screens necessary to separate and dewater the tailings by size. Inside the industrial building, it is also proposed to include a workers dry and meeting space. A fine tailings thickener, conveyors, load-out bin, and minimal haul truck service area would be located near the building. The building and associated infrastructure is proposed to be constructed north of Reservoir No. 6 to minimize new environmental impacts.

The conceptual footprint for the dewatering equipment would include haul truck parking, employee parking, and the building all within 13 acres. The infrastructure dimensions are 33,600 sf. A conceptual configuration of the infrastructure is shown on Figure 2.3-1 and Figure 2.3-2.

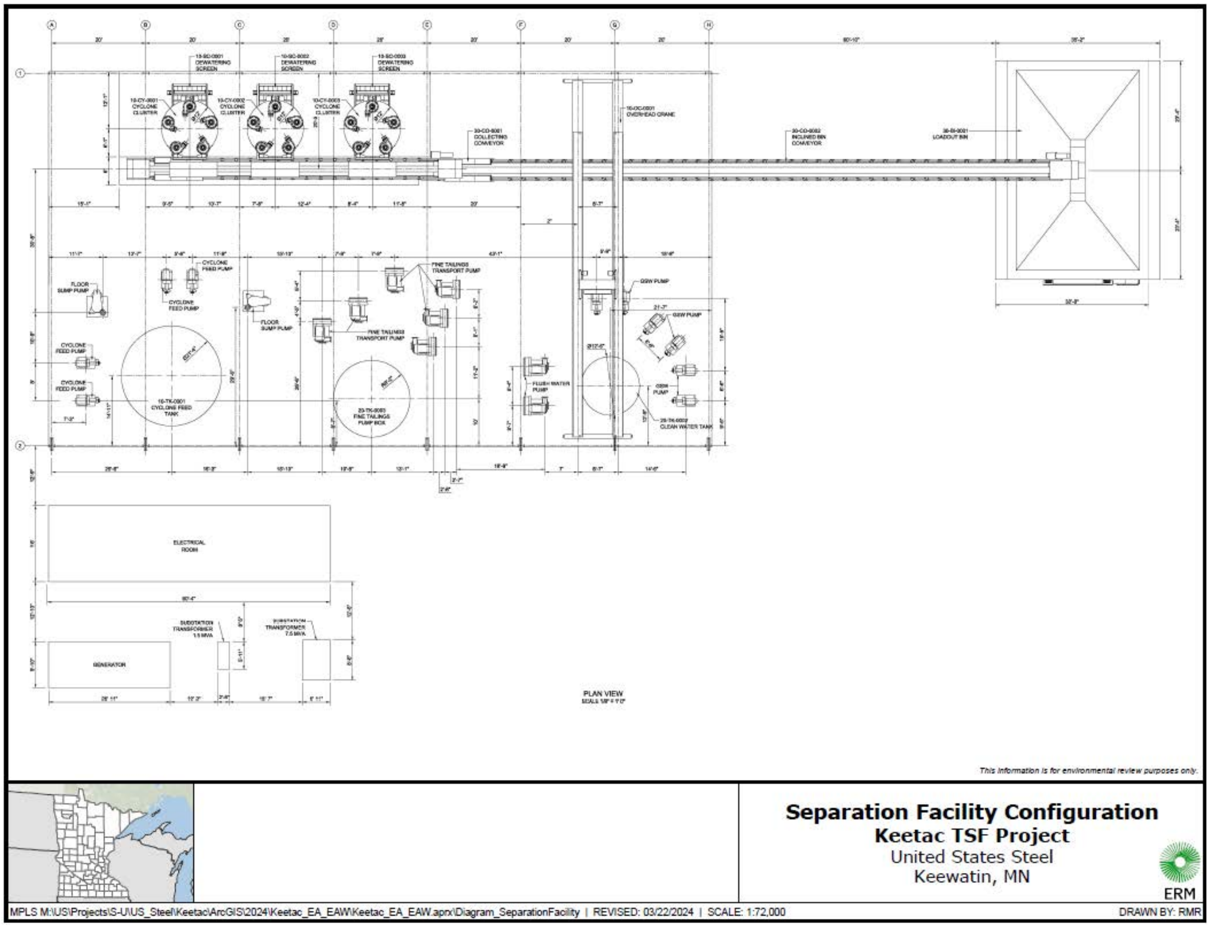

FIGURE 2.3-1: SEPARATION AND/OR DEWATERING INFRASTRUCTURE CONFIGURATION

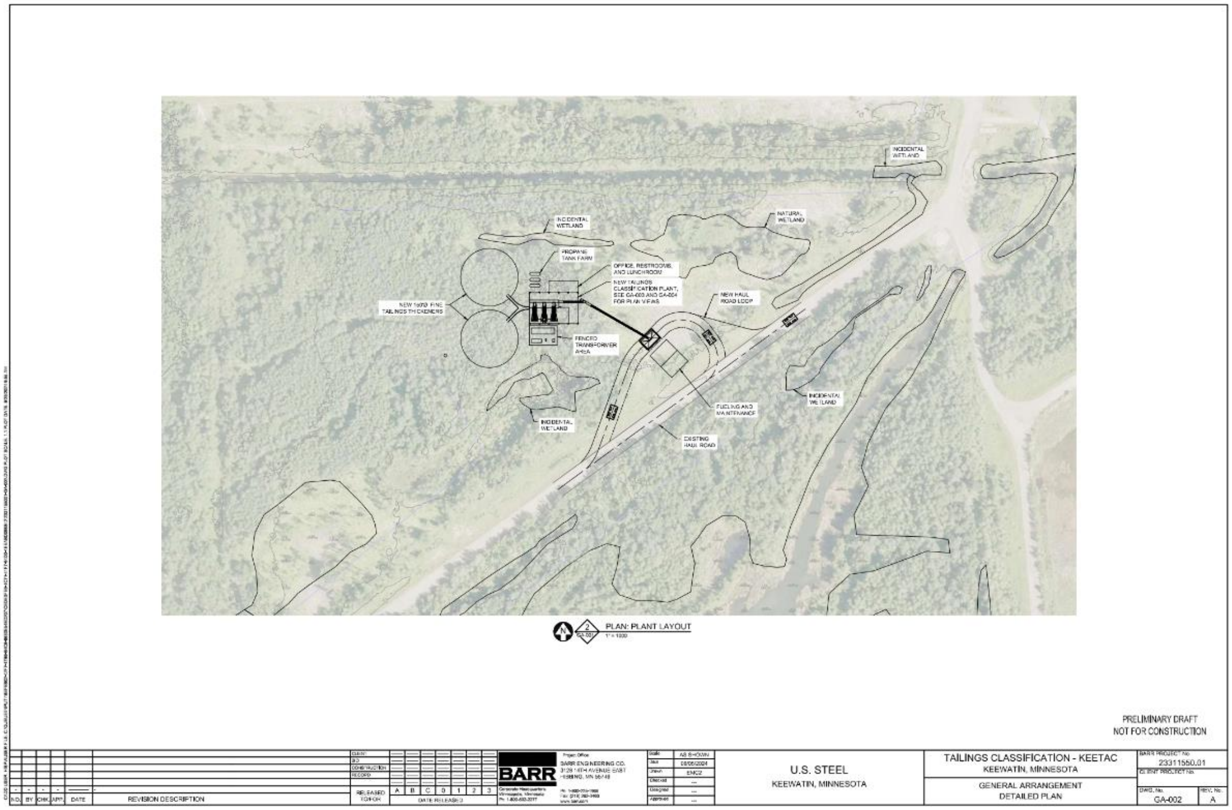

FIGURE 2.3 2: SEPARATION AND/OR DEWATERING FACILITY INFRASTRUCTURE

Infrastructure equipment would be appropriate for the objects of separating coarse from fine material (if needed) and dewatering the coarse material for use. Current design included include cyclone clusters, each with cyclone units, dewatering screens, collection conveyors, and load out bins, a tailings pump box, and pipelines. Additional equipment associated with the tailings' separation and/or dewatering infrastructure could include a clean water tank, spillage sump pumps, an overhead crane for maintenance and installation, and utilities rooms Support facilities for employees such as offices, break rooms, bathroom facilities, and a gravel parking area would be included.

2.3.4 DIKES AND DAMS

Existing Stage 2 Exterior dikes would be vertically raised above the existing dikes to retain tailings. Likewise existing Stage 2 Exterior dams would be vertically raised above the existing dams to retain water. Downstream dams and modified centerline dikes are described by their construction methods. In this context, dams are considered to be hydraulic retaining features designed to store water while dikes are features designed to store tailings. Construction of each would be staged in phases through the life of the Keetac Mine to the ultimate design height. Construction and tailings deposition is discussed further in Section 2.4.2 below.

The dikes are proposed to be constructed using a modified centerline construction method. Modified centerline dams are built in stages starting with the foundation but are raised vertically from the centerline of the original dam. Centerline construction allows for vertical expansion of the dike ensuring that the entire dike footprint is founded on a firm foundation while minimizing downstream impacts outside of the currently permitted Stage 2 Exterior footprint. A depiction of a modified centerline dike is shown on Figure 2.3-2.

Water retention dams are required in the Stage 2 Exterior basin where the basin pond will be maintained against the perimeter. These dams would be constructed using a downstream construction method and would include a seepage reduction feature. Downstream dams are also built in stages, starting with a foundation and then adding layers of material downstream. This method ensures that the entire dam is on a stable foundation and is robust enough to store large amounts of water. The Phase 2 water retention dam will be constructed using downstream methods to vertically raise the existing embankment. The water retention dam will be constructed primarily of coarse tailings material.

A general depiction of a downstream dam is shown on Figure 2.1-2. The design and operation plan for vertical expansion of the Stage 2 Exterior basin includes maintaining a fine tailings beach upstream of the dikes to limit seepage from the basin. The design of the water retention dam includes a seepage reduction feature along the upstream face of the dam to lower the phreatic surface and limit seepage through the dam. The seepage reduction feature will consist of either a linear low-density polyethylene (LLDPE) geomembrane or an inclined mechanically placed soil-cement blanket consisting of a mixture of coarse tailings and cement to limit seepage losses from the basin. The Phase 2 dike will be constructed using modified centerline methods and be constructed of coarse tailings. Figure 2.3-3 shows the extent of dike and water retention dam around the Stage 2 Exterior perimeter.

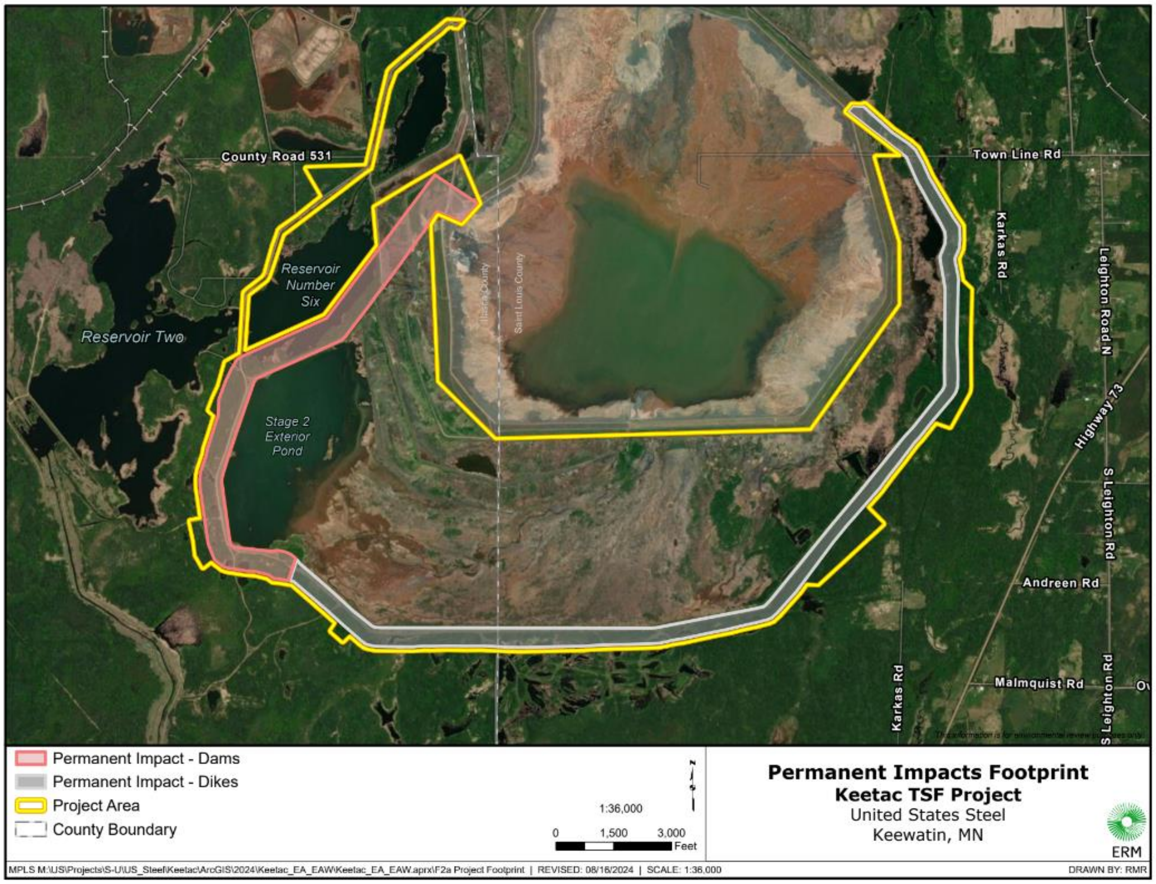

FIGURE 2.3-3: DIKE AND DAM CONSTRUCTION AREAS

The footprint necessary to vertically raise the dikes and dams would extend 275 feet to 350 feet out from the current Stage 2 Exterior downstream toe. Founding the entire dike and water retention dam embankments on natural firm incompressible low permeability soils provides stable embankments. A reinforced concrete gravity drop decant structure would include bulkheads and a sluice/roller gate to control the basin pond elevation. Gravity would convey water into the downstream polishing ponds prior to returning to the plant as make-up water for use in processing.

2.3.5 SUPPORTING INFRASTRUCTURE (ROADS, PIPELINES, POWER LINES)

The Project would require supporting infrastructure to convey materials, power, and to allow for safe access to the respective facilities.

The separation and/or dewatering infrastructure would require electrical supply that would be provided via upgraded distribution from the existing power grid on-site. The Proponent is engaging Minnesota Power to provide this distribution upgrade/maintenance.

At the TSF, energy needs would increase slightly over existing operations during the Project construction. The TSF would require energy to operate the separation and/or dewatering infrastructure and to pump tailings. Electricity needs would be met by extending the available 22kV high voltage electrical powerline 4,700 feet to the tailings separation and/or dewatering infrastructure.

Approximately 2 mobile generators may be used during overnight hours for lighting in areas where construction is occurring or otherwise as needed for safe operation.

Tailings are currently conveyed from the Processing Plant to the TSF via a 22-inch diameter pipeline that connects to a spigot pipe system, which distributes tailings into the TSF. A new pipeline would be constructed to convey the fine tailings from the separation and/or dewatering infrastructure around the perimeter of Stage 2 Exterior basin for distribution. The pipeline will be installed above ground on wooden blocks one to two feet above the ground along existing infrastructure corridors, like the existing pipelines. Fixed frame haul trucks would convey the coarse tailings from the separation and dewatering infrastructure to the TSF 24 hours a day, seven days a week. The exact size of the haul trucks is to be determined. Preliminary haulage assessments indicate five Cat 785 mining trucks would adequately handle the coarse tailings material and dam construction while reducing the environmental impacts when compared to fewer but larger haul trucks.

A new permanent road would be built with suitable road material produced during foundation preparation around the Stage 2 Exterior for access to the TSF and infrastructure for maintenance and operations. The road would be mechanically built using coarse tailings using the same equipment for site preparation and dam/dike construction. The vertical expansion design for the Stage 2 Exterior includes installation of geotechnical instrumentation at select transects along the perimeter to monitor performance. Installation of geotechnical instrumentation is a Best Management Practice (BMP) and allows for confirmation of performance per the design intent prior to staged construction to vertically raise the perimeter dike and dam embankments. and seepage quality.

2.3.6 STORMWATER MANAGEMENT

The Minnesota Pollution Control Agency regulates stormwater associated with construction and industrial activities under the National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) permits. Industrial stormwater associated with the TSF is regulated under NPDES permit MN0055948 and a Stormwater Pollution Prevention Plan (SWPPP), last updated August 30, 2023. This SWPPP is reviewed annually and would be modified to reflect the upcoming construction.

A construction stormwater permit will be obtained to address stormwater runoff associated with initial dam construction. A separate SWPPP will be developed specific to the construction activities. Application of the SWPPP would reduce the risk of stormwater-related pollutants entering the environment. The updated SWPPP would identify potential harmful discharges because of the construction activity and create a plan to reduce the risk of pollutants leaving the construction site. It would also include measures to minimize erosion and transport of suspended solids and erosion. The updated plan would include additional inspections, the installation of sedimentation and erosion control devices (BMPs) where necessary to control sediment transport, spill prevention and response, and a timeline of stabilization.

Industrial Stormwater Control Measures included pursuant to the NPDES/SDS permit include several different BMPs, including sediment removal from the upper settling basins. Other BMPs outlined in the SWPPP include routine inspections of the BMPs, site conditions and of stormwater runoff. Several other Stormwater Control Measures included are Spill Prevention and Response, Exposure Reduction, Preventative Maintenance, Elimination of Unauthorized Non-Stormwater Discharges and Employee Training. A log of documented BMP issues and corrective actions is attached to the current SWPPP.

2.4 OPERATION

2.4.1 SEPARATION AND/OR DEWATERING INFRASTRUCTURE

The separation and/or dewatering infrastructure would operate 24 hours a day. Tailings would be pumped from the Processing Plant into to the separation and/or dewatering equipment.

Once separated (by cyclone, other equipment, or the processing plant the coarse tailings would be dewatered and discharged onto a collection conveyor and then onto a bin conveyor. The bin conveyor would then move the tailings to the loadout bin that would funnel the coarse tailings into haul trucks.

The remaining water and fine tailings would be drained via gravity to a fine tailings pump box. The fine tailings would then be pumped from the fine tailings pump box and distributed to the TSF Stage 2 Exterior.

If there is a shutdown of the separating equipment, the entire tailings stream would be pumped to the Stage 2 Exterior.

2.4.2 TAILINGS DEPOSITION AND RAISING DIKES AND DAMS

Tailings would be deposited into the Stage 2 Exterior basin in a controlled manner, distributed progressively from multiple spigots that are connected to the pipeline system that extends around the perimeter. Based on current mining rates, tailings are currently pumped at 16,000 gallons per minute to the TSF. This would be expected to decrease under the Project because the coarse tailings would be removed and dewatered prior to disposal at the TSF. Based on these factors, it is expected that the height of the tailings in the Stage 2 Exterior dams/dikes would increase by approximately 3 feet per year up to the maximum design elevation of 1,580 feet.

The Proponent would progressively raise the dikes and dams to maintain at least 7 feet of freeboard. Approximately 1 to 3 million tons of coarse tailings would be placed annually for dike and dam construction and would maintain a buffer for storing the design storm events. Climate change events including 100-Year Storms and Probable Maximum Precipitation over a 24-hour period have been considered in the design.

Vegetative cover would be established on the downstream slopes of the dam and dike embankments periodically as the basin is vertically raised.

2.4.3 WATER MANAGEMENT

2.4.3.1 TAILINGS WATER

The design and operation plan for the Stage 2 Exterior basin includes discharging of fine tailings slurry from multiple discharge points located along the east, southeast and northwest perimeter of the Stage 2 Exterior basin dike. Tailings particles within the tailings slurry would settle out within the basin with water draining toward the interior basin pond that would be retained against the southwest water retention dam.

Consistent with the current operation of the TSF, the basin pond would function as a detention basin to allow for settling of exceptionally fine suspended tailings particles within the pond prior to releasing the water through the decant structure into Reservoir No. 6., and recirculating to the plant for make-up water.

Reservoir No. 6 would continue to receive released pond water from the Stage 2 Exterior basin. Reservoir No. 6 has 2 existing outfalls that can discharge water to Reservoir Np. 2. Reservoir No. 2 is next to Reservoir No. 6, separated by County Road 531. These outfalls would remain in place during and after construction of the Project. Outfall SD005 uses a culvert outfall to discharge water to Reservoir No. 2, and outfall SD001 contains 4 emergency overflow pipes that transfer water to Reservoir No. 2 in emergencies. These outfall locations are monitored through routine inspections.

2.4.3.2 STORMWATER

Stormwater would continue to be managed at the Project area under the NPDES/SDS permit, construction stormwater permitting and the SWPPPs discussed in Section 2.3.6 above.

The Upper West Swan River and Hay Creek watershed boundary runs along the eastern crest of the existing Stage 2 Exterior berm (Figure 12.1). The Project has been designed to maintain the same preexisting crest alignment as the dikes are elevated, so stormwater runoff will continue to flow to the same watersheds as it did pre-construction (Figure 12.6). Therefore, even though construction of the dikes will encroach into the Upper West Swan watershed, the Project's dikes will not change the watershed boundary (Figure 2.4-1).

Currently, process water (not slurry) is discharged into the historic Stage 1 impoundment when an East tailings pipeline needs to be drained. This water drains to the south-east corner of the impoundment and then flows south into the Stage 2 Exterior via culvert under a road and the existing berm. As described below, the Stage 2 Exterior basin outflows into Reservoir No. 6 (a process water waterbody) which has a permitted outfall that is part of the Mississippi River watershed.

The Project will raise the dikes around Stage 2 Exterior and the culvert currently allowing water from the historic Stage 1 impoundment area would need to be removed. U.S. Steel will cease discharging all process water into the historic Stage 1 impoundment, so any new water would be rainfed. Rainwater from the Stage 1 impoundment would then naturally flow to the east and into the Upper West Swan River watershed similar to pre-mining conditions. The changes to the watershed boundary as a result of the Project are shown in Figure 12.7.

Construction of the Project and this change in rainwater runoff flow into the Upper West Swan would result in a net increase in catchment for the Great Lakes watershed of 669.9 acres. The catchment for the Hay Creek watershed (part of the Mississippi River watershed) would be reduced by an equivalent amount. However, the loss of water to the Mississippi would be negligible given the proportion of the watershed that this represents; it will be partially offset by process water remaining within the TSF, including the additional water added through ongoing tailings deposition, and because the removed area was flowing into Reservoir No. 6 which is used for mine process water as discussed below.

The Stage 2 Exterior basin is designed to be a closed system with no direct discharges to surface waters. Runoff from within the basin will be directed to the interior pond and ultimately to Reservoir No. 6 via a decant structure. This allows for settling of suspended tailings particles before the water is released.

The only potential routes for basin water to reach downstream water bodies are through the existing permitted outfall from Reservoir No. 6 via Reservoir No. 2 North - SD005 (culvert outfall) and into Reservoir No. 2. The outfall is monitored and has specific discharge limits and requirements set in the facility's NPDES/SDS permit.

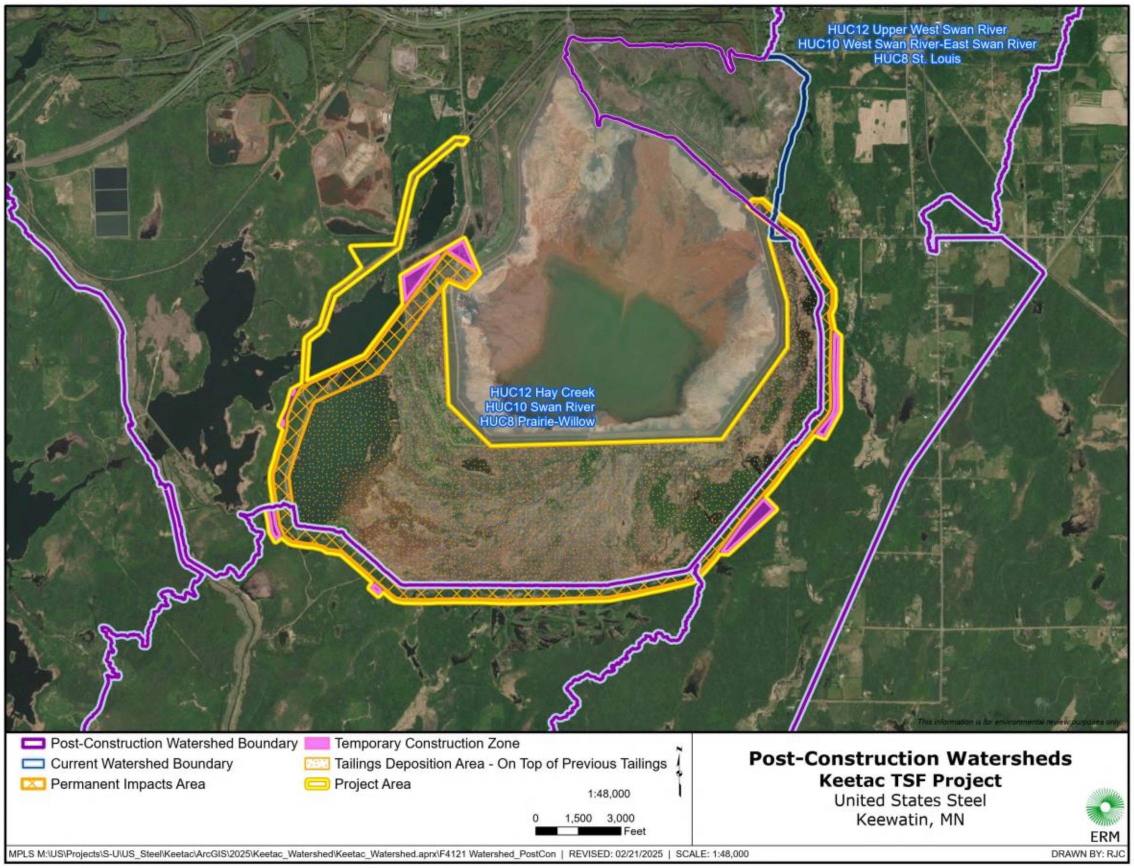

FIGURE 2.4-1: WATERSHEDS

2.5 EMISSIONS, DUST, DISCHARGES, AND WASTES

Overall, in operations, the energy usage is not anticipated to be significantly different from the existing operations because additional energy use at the separation and/or dewatering infrastructure is made up through efficiencies gained in pumping.

The Project would use 4 operating 777E (100-ton) haul trucks and one water truck, operating 24 hours a day. Two mobile generators would also be used for lighting. These combustion sources would generate air emissions. Emissions would also be indirectly generated through power used for the separation and/or dewatering infrastructure as well as pumping tailings and water.

Dust (particulates) could be generated from exposed surfaces, especially during dry periods, and on roads. The Proponent would implement the Fugitive Dust Control Plan to minimize dust from the TSF. Dust generation on the TSF would be minimized by maximizing the water pond area, mulching, and vegetating exposed surfaces (either permanently or temporarily), through non-vegetative methods described in Minnesota Rules, part 6130.3700, and by modifying tailings operations.

Tailings would be stored within the TSF. Stormwater is discussed in Section 2.4.3 (Water Management) above.

It is possible that unplanned events could result in additional discharges or spills. These are discussed in Section 2.7 (Risks) below. If a discharge or spill would occur, the Proponent would follow protocol as outlined in the spill prevention, control and countermeasure plan.

General construction waste would be disposed of in accordance with the existing waste management practices at Keetac.

2.6 WORKFORCE

Approximately 10 additional employees and contractors would be required for construction would be required for ongoing operations specific to the separation and/or dewatering infrastructure and the TSF. It is expected that staff needed for the Project would be sourced from the existing community workforce.

2.7 RISKS (UNPLANNED EVENTS)

The Project involves inherent risks that, if not managed, could have an adverse effect on environmental and human health. Potential unplanned events (e.g., an accident) are described below. Note that these are not addressed in the impact assessment because these are not planned to occur as part of construction or routine Project operations and would be managed to be avoided so no impact should occur.

2.7.1 DIKE AND DAM GEOTECHNICAL STABILITY

It is very unlikely that the TSF would have a failure or breach. The basin dikes and water retention dams have been designed to meet or exceed accepted minimum factor of safety values used in the mining industry and for conventional dam structures regulated by the State of Minnesota DNR Dam Safety. Using downstream and modified centerline construction methods for the water retention dams and dikes allows for the embankments to be supported on a firm incompressible foundation.

The water retention dam design includes a seepage reduction feature to maintain a suppressed water level through the embankment. A tailings beach will also be maintained between the basin pond and the dikes to function as a seepage reduction feature and maintain a suppressed water level through the embankment.

Geotechnical instrumentation will be used to monitor overall performance of the dikes and water retention dams. Annual dam safety inspections will also be performed by the design engineer of record and the owner to allow for engineering inspection of the basin. The OMS Plan has been developed and is implemented at the TSF to reduce risk exposures. The OMS Plan includes monitoring reports and geotechnical data, routine maintenance details for equipment, and surveillance procedures. This would be updated for the Project. An emergency action plan has also been prepared to execute in the event of a dam break.

2.7.2 FUEL, LUBRICANTS AND OTHER CHEMICAL STORAGE AND TRANSPORT

Fuel would be stored within the separation and/or dewatering infrastructure to maintain operation of the mobile machinery. Fuel and other fluid would be transported and used as needed. Unplanned leaks or accidents resulting in spills of pollutants could occur. The Proponent would follow protocols in the spill prevention, control, and countermeasure rule. As detailed in the spill prevention, control, and countermeasure rule, routine inspections of storage tanks would take place to prevent unplanned leaks.

2.7.3 PROJECT TRAFFIC

There is inherent risk with traffic at any site, and there could be an incident on-site involving other vehicles, machinery, or impact to people of the environment.

2.8 CLOSURE

The TSF operates under a DNR-issued Permit to Mine (last amendment, dated April 6, 2022), which states the Project Proponent would construct, operate, close, and reclaim the Keetac mineland (including TSF). Mineland reclamation activities would occur both during ongoing operations and during deactivation activities for final closure.

At the TSF, reclamation activities are to be conducted at the interior and exterior portion of the dikes and dams as they are completed according to Minnesota Rules, part 6130.3600 and in accordance with the Dam Safety Permit. The Proponent is required to prepare a reclamation plan that must conform to Minnesota Rules Chapter 6130 for taconite and iron ore mineland reclamation.

Vegetative cover will be established on the downstream slopes of the dams and dikes in a staged manner as vertical expansion of the basin occurs. Following vertical expansion to the permitted elevation and after operations cease, reclamation activities will commence within the basin interior. The conceptual closure design includes establishing a vegetative cover on the basin surface and maintaining a small pond (due to precipitation runoff) against the water retention dam. The decant structure would be utilized to allow for passive release of water from the basin to the downstream polishing ponds.

The Proponent would engage respective stakeholders to establish an objective for the end land use and formalize a reclamation plan. In accordance with Minnesota Rules, part 6130.4100, the TSF would need to be deactivated so that it is nonpolluting, is stable, is free of hazards, minimizes the need for fencing, has current land use and future land use potential which recognizes the needs of the surrounding area, and is maintenance free to the maximum extent possible.

At closure, all surface water should be drained from the basin unless otherwise approved by the commissioner. The TSF must also be shaped and contoured to ensure permanent drainage away from the interior of the basin in a manner that would not result in erosion or adversely affect structural stability, and to maximize topographic relief. Provisions would also be made for the continued maintenance of all dams and overflow or seepage control structures.

Once all site activities are completed at an area, the Proponent would be required to establish vegetation within the first possible growing season. Reclamation techniques such as grading, disking, seeding or planting, fertilizing, and mulching would be used in the establishment of vegetation. Seed mixes would be designed to achieve early stabilization and long-term cover. When necessary to control dust, temporary seeding may be used. In areas where erosion is a concern, mulch would be used to hasten stabilization. Removal of equipment, facilities and structures would be accomplished, and provisions made for subsequent use and continued maintenance where necessary. Areas exposed during such removal (i.e., the building sites) would be vegetated.

After 3 growing seasons (5 growing seasons if it is a south or west facing slope) the surface would be repaired or replaced if 90 percent ground cover, consisting of living vegetation and its litter, has not been established. The repair or replacement would take place during the next normal planting period after it is determined that 90 percent ground cover has not been established. Minnesota Rules, part 6130.3600, subpart 4B requires that within 10 growing seasons post closure, the area would have a vegetative community with characteristics similar to those in an approved reference area and be self-sustaining, regenerating, or at a stage in a recognized vegetation succession which provides wildlife habitat or other uses such as pasture or timber land. This is required before a mining deactivation release can be granted (Minnesota Rules, part 6130.3600, subp. 4B). The reclamation process would include creation of wetlands where feasible, to replace some of the wetland functions and values lost through mining activities.

At least 2 years prior to formal deactivation of any portion of the mineland, the subsequent land use would need to be presented to and approved by the commissioner of the DNR.

3. PROJECT ALTERNATIVES

3.1 IDENTIFICATION AND ASSESSMENT OF PROJECT ALTERNATIVES

Several alternatives were identified and evaluated for the Project. The alternatives ranged from continuation of operations at the existing TSF (raising the TSF higher than current design), to off-site storage in unused mine pits, to completely changing tailings processing technology to allow for dry stack tailings.

Each alternative was evaluated against the following criteria:

- Does the alternative meet the Project purpose and need (Section 1.4)
- Is it practicable considering the following:
  - Availability:
    - Is the option available in time for disposal to meet the purpose of uninterrupted operations at Keetac?
    - Is there adequate capacity for the volume of tailings storage required through the permitted life of the Keetac Mine (typically about 5,570 ac-ft per year)?
    - Are land and mineral rights available and allow encumbrance by tailings?
  - Technical feasibility:
    - Does the appropriate technology exist to perform the alternative?
    - Can the Project be engineered (are site conditions amenable)?
    - Are logistics feasible?
    - Would it meet risk and safety criteria for construction, operation, and closure?
    - Can it conform with Minnesota Rules Chapter 6130
  - Financial feasibility. Is it feasible to build and operate without putting the business viability of the Keetac operations at risk? Potential cost influencer could include:
    - Scale or complexity;
    - Distance to convey materials;
    - Cost of land or mineral rights; or
    - New technology or construction costs.
- What are the potential environmental and social consequences, and would the alternative be less environmentally damaging than other alternatives?

If the alternative clearly did not meet the Purpose and Need, was not practicable, and/or had greater environmental or social consequences than another practicable alternative it was eliminated from further consideration.

Through this process, the preferred alternative became apparent in concept and further refined and designed to meet Project needs and minimize environmental impact, thus becoming the proposed Project.

Table 3.1-1 provides a summary of the alternatives and the outcomes of their evaluation. The sections below describe each alternative and its evaluation in more detail. Red cells were considered prohibitive to the Project.

Table 3.1-1: Summary of Alternative Analysis

Alternative	Purpose and Need	Practicality	Environmental and Social Consequences
No Action	**Does not Meet the Purpose and Need:** The Keetac operation would need to prematurely shut down during 2028 due to filling of the Stage 2 Interior basin to the ultimate elevation of +1,585 feet.	**Not Practicable:** Feasible until 2028 when the current active Stage 2 Interior basin is filled with tailings to the ultimate elevation of +1,585 feet.	Job losses associated with halted productivity.
Alternative 1: On-Site Vertical Expansion of the Stage 2 Exterior Area (Upstream Construction)	**Does not Meet the Purpose and Need:** Would not allow for safe tailings storage unless extremely expensive stability improvement measures are made to achieve adequate stability for the upstream dike embankment.	**Not Practicable:** Available and within permitted footprint but would not meet minimum safety requirements. Use of natural borrow materials to buttress the dike embankments to achieve adequate stability would require development of natural borrow sources from outside the basin which would result in environmental impacts, additional permitting, and high costs to improve stability.	Greater environmental footprint compared to other vertical expansion alternatives. Increased stability risks relative to centerline or downstream construction methods.
Alternative 2: On-site In-pit Tailings Disposal	**Does not Meet the Purpose and Need:** This method would interfere with Keetac mining activities.	**Not Practicable:** No Keetac Mine pits are available to accept tailings. To accept the volume of tailings needed large dams would need to be constructed in low areas surrounding Keetac's pits. Keetac does not have homogenous ownership of the pit area.	Minimal environmental footprint (if a practicable location was available). Hydrogeological and geotechnical conditions would need to be assessed. Dams would also be needed to contain tailings in certain areas of pit.

Alternative	Purpose and Need	Practicality	Environmental and Social Consequences
Alternative 3: Off-site Brownfield (Mine Pit) Tailings Disposal	**Could Meet the Purpose and Need:** If a site was available and ready for use in time to allow for continuous operations at Keetac.	**Not Practicable:** There are no available pits within a reasonable distance of Keetac that are of sufficient volume to accept Keetac tailings. Surface and mineral rights are not available in time and would be cost prohibitive when combined with the logistical obstacles for moving tailings to such a location.	Minimal environmental footprint though hydrogeological and geotechnical conditions at the pit or pits would need to be assessed (if a practicable location was available).
Alternative 4: Dry Stack Tailings	**Could Meet the Purpose and Need:** If a site was available and ready for use in time to allow for continuous operations at Keetac.	**Not Practicable:** Additional infrastructure would be required and significant increased logistical and operational cost for such a large volume of tailings makes this alternative prohibitive.	Would require a new footprint and impacts to wetlands likely. Energy intensive operation would increase GHG.
Alternative 5: On-site Greenfield Horizontal Expansion into Permit to Mine Stage 3 TSF Area	**Could Meet the Purpose and Need:** If permitting and construction could be completed in time to allow for continuous operations at Keetac.	**Could be Practicable:** Land is available but would require significant new infrastructure of dams and dikes and significant environmental impacts. Necessary permitting requirements and timeline would also likely result in Mine Stage 3 TSF not being available for tailings storage by 2028.	The environmental footprint would be increased, and more wetlands and waterbodies would be impacted compared to other alternatives (including the Alternative 6 – the proposed Project), requiring more environmental review.
Alternative 6: On-site Expansion of the Existing Stage 2 Exterior Area (Downstream and Modified Centerline Construction)—Proposed Project	**Meets the Purpose and Need**	**Practicable:** Land is available and this option provides for safe, timely storage.	Environmental footprint impacts for dike/dam construction, temporary workspaces, and separation and/or dewatering infrastructure. Would have greater stability compared to Alternative 1 (upstream).

Alternative	Purpose and Need	Practicality	Environmental and Social Consequences
Alternative 7: Off-site Greenfield Tailings Disposal	**Could Meet the Purpose and Need:** If a site was available and ready for use in time to allow for continuous operations at Keetac.	**Not Practicable:** No suitable land has been identified as being available. If land did exist, the cost of purchase, new construction, and operational logistics would be prohibitive. It is also highly likely that permitting requirements and timeline would not allow this option to be ready to store tailings by 2028.	Environmental impacts for construction, temporary workspaces, and tailings transport.

3.2 NO ACTION ALTERNATIVE

The No Action Alternative would result from the USACE not issuing a permit for the discharges of dredged and fill material into wetlands of the United States.

In this case, the Proponent would continue to disposal of tailings within the existing available TSF footprint until the designed (safe) storage capacity is reached in 2028. Because there are wetlands immediately adjacent to and surrounding the existing TSF, no additional augmentation involving an increase in footprint to achieve safe tailings storage capacity could be possible. Also, because of the extent of wetlands in the region, there are not any practical upland areas that could be used as a new TSF. Any new location would result in impact to wetland.

Under this scenario, capacity would be expected to be reached around 2028, which is well short of the Proponent's authorization under the Permit to Mine (2048). In this case, the Keetac mining operations would shut down after 2028 and put into reclamation resulting in hundreds of job losses and socio-economic impact until or unless alternative tailings storage options become available in the future. Thus, the No Action Alternative would not meet the Purpose and Need.

3.3 ALTERNATIVE 1: ON-SITE VERTICAL EXPANSION OF THE EXISTING STAGE 2 EXTERIOR AREA (UPSTREAM CONSTRUCTION)

Alternative 1 would utilize upstream construction for vertical expansion of the existing Stage 2 Exterior. This would require using the upstream tailings construction method to raise the dike and dam over the existing tailings that have been previously deposited within the Stage 2 Exterior basin.

The upstream construction method would require discharging tailings at the perimeter of the Stage 2 Exterior area, directing them to flow toward the interior of the TSF. Coarse tailings would deposit first, creating a beach that would be compacted and used as the foundation for future dam raises. The dam would be raised progressively and inwardly on top of the coarse tailings as shown on Figure 3.3-1. The tailings basin would be raised vertically, eventually reaching a similar height to the existing Stage 2 Interior.

The existing tailings materials within the Stage 2 Exterior have extremely low undrained shear strengths, are susceptible to liquefaction and are unsuitable for support of upstream dike construction. Therefore, downstream stability improvements would be needed to buttress the toe of the upstream dikes. A large volume of natural borrow sources from outside of the basin footprint would be needed to construct the buttress (downstream stability improvements). The addition of the buttress would result in horizontal expansion of the TSF which would have environmental impact, as would the sourcing of the off-site fill (direct impact as borrow areas, as well as transport related impacts such as emissions). Their requirements would also increase construction costs.

This alternative is not considered feasible because it would not offer safe tailings storage option without significant buttressing, which would require more fill material, and a greater environmental footprint compared to other vertical expansion alternatives (e.g., Alternative 6, the proposed Project). Thus, this alternative has been eliminated from further consideration.

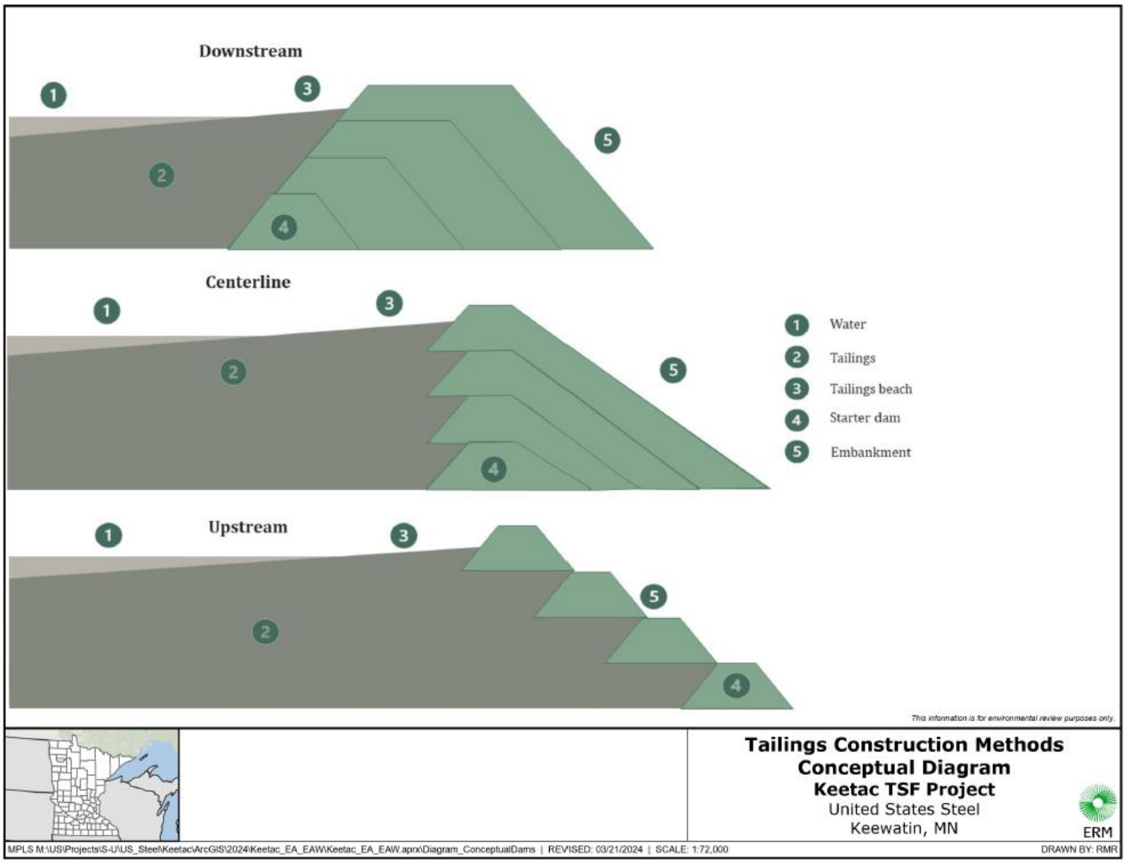

FIGURE 3.3-1: CONCEPTUAL DIAGRAMS OF DAM CONSTRUCTION METHODS

3.4 ALTERNATIVE 2: ON-SITE IN-PIT TAILINGS DISPOSAL

Alternative 2 would involve disposal of tailings into the Keetac Mine pit. This option could have significant advantages from an environmental and cost perspective. However, mining is still active in most of the mine pit. Areas with thinner ore resources have been used for in-pit waste dumps and would not have the capacity for tailings.

The area needed to contain the designed life of mine tailings would be large and require several dams to contain the tailings from overflowing into adjacent mining areas (e.g., Hibbing Taconite's Pit). Additionally, the nature of mining taconite involves blending material for homogenous feed to the plants requiring the use of all ore within the mine footprint, which would prevent compartmentalization and use of some areas for tailings storage. Further, historically mineral rights owners have not allowed the encumbrance of potential future reserves by tailings storage. Mineral rights at Keetac are held by 50-100 owners through whom Keetac negotiates. U. S. Steel would also need to possess the necessary mineral rights to allow tailings storage.

3.5 ALTERNATIVE 3: OFF-SITE BROWNFIELD (MINE PIT) TAILINGS DISPOSAL

Alternative 3 would involve disposing of tailings at a brownfield (previously disturbed) location off-site from the Keetac Mine and operational area. The off-site area would need to be available, accessible, and of suitable capacity to accommodate the volume of tailings needed to be managed to support ongoing operations at Keetac.

This alternative could have environmental advantages, including adding no additional footprint impacts for the storage area as disposal would occur at a previously disturbed footprint. Some footprint disturbance may be required to construct appropriate infrastructure to transport tailings to the disposal area (via pipeline), or if a supplemental area is required because the primary brownfield area is not large enough.

If an off-site brownfield area (or areas) were of sufficient scale, and available to accept tailings, the costs of site preparation requirements could be highly variable depending on the site. In concept, an abandoned mine pit could require less engineering or fill materials than a new TSF, so this could be cost advantageous. However, the site preparation costs for this option could also be greater. For example, there may be existing infrastructure that needs to be removed, or in the case of an abandoned mine pit, it could be flooded with water that would need to be removed and managed. The site could also be contaminated, which would need to be addressed prior to new use for tailings storage. Hydrogeological conditions would need to be determined to assess risks of tailings and groundwater interaction and discharge off-site, and lining or other controls may be needed to prevent tailings contact with water entering the environment. Geotechnical conditions would need to be assessed to determine that disposal could be done safely, and additional dams or reinforcement could be required.

Availability and accessibility for Alternative 3 would require U. S. Steel being able to feasibly gain surface and mineral rights for the disposal area, and as needed for the transport corridor for tailings from the Keetac processing facility to the new disposal area. Because of the volume of tailings requiring disposal, this would create a significant encumbrance on land and mineral owners, which is very rarely acceptable to mineral owners, because it makes access to their minerals more difficult. For negotiation with mineral rights holders to be successful, it would require an infeasible cost agreement.

The brownfield option for tailings storage would be abandoned/unused mine pits. While other surface brownfield sites might be available, the cost of addressing any potential existing contamination and repurposing for new storage dams would be cost prohibitive (compared to on-site options). Therefore, the siting of potential off-site disposal options focused on mine pits within a 10-mile radius of the Keetac Processing Plant. Ten miles were used as the distance because there are several mine pits within this area and transporting tailings further than this would become cost prohibitive. There are additional mine pits to the northeast around Mountain Iron and Virginia, Minnesota and to the southwest near Holman and Bovey, Minnesota; however, access and transport would be more cost prohibitive for these given the distance and logistics to transport the tailings. Some of these abandoned mine pits such as the Sherman Group Tailings Basin are used as recreational areas so are not available.

Forty-seven pits were identified within a 10-mile radius of the Keetac processing facility, as shown on Figure 3.51. These were each screened for potential use under Alternative 3. Of the 47 pits, 43 were closed (so potentially available for use) and 30 of the closed pits were either fully or partially flooded. From a capacity perspective, none had sufficient volume for the anticipated Keetac tailings. Further, U. S. Steel does not own the mineral rights at any of the closed pits, which further limits feasibility.

Since many of the closed pits are flooded, water removal costs and plans would be needed.. Access may additionally be limited to these locations due to surface ownership.

None of the evaluated pits would be practicable to use as a tailings storage option for Keetac. None of the closed pits had the capacity on their own (or in logical groupings of multiple pits) to accept the volume of Keetac tailings needed. Further, the Proponent does not have agreements with the respective surface and mineral owners, and if possible, to come to agreement would also increase costs.

For these reasons, off-site brownfield storage options were not considered practicable (cost prohibitive and not available) and were not considered further.

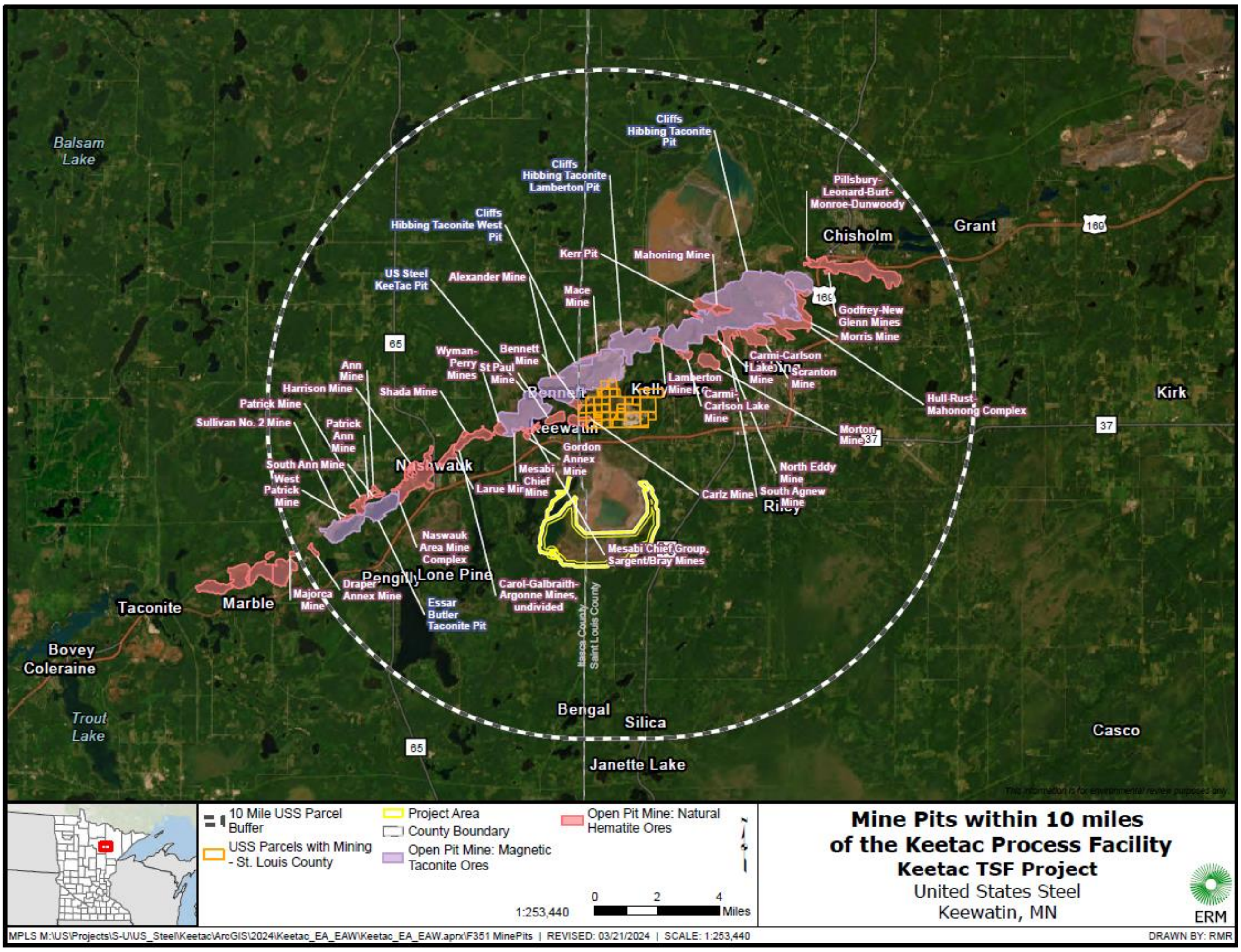

FIGURE 3.5-1: MINE PITS WITHIN 10 MILES OF THE KEETAC PROCESSING FACILITY

3.6 ALTERNATIVE 4: DRY STACK TAILINGS

Alternative 4 involves adding a new tailings process at Keetac to allow for dry stack tailings storage. Tailings would be dewatered through a process of belt, drum, pressure plate, and vacuum filtration systems. The resultant "dry" tailings would be a stable product that would require transport by conveyor or truck to the end storage area. Dry tailings cannot be transported through pipelines because that requires the materials to have fluid properties to flow and be pumped. The tailings would then be deposited, spread, and compacted in the storage area to form an unsaturated deposition pile that could be stacked without dams or containment.

Dry stack tailings can offer environmental advantages over wet tailings storage as they are more stable and do not have the same inherent risks of dam failure or downstream consequence if a geotechnical failure were to occur. Dewatering could remove residual process chemicals from tailings and the water extracted from the tailings could also be recycled for use in processing. Because dewatering reduces the overall volume of tailings, the resultant footprint required would also be smaller than a greenfield wet tailings options (e.g. smaller than what is assessed in Alternative 5), but it would still be the same size or larger than Alternative 6—the proposed Project and would require additional fill material from office borrow areas.

Disadvantages of this alternative include additional processing, transportation, and site management requiring greater energy as well as higher operational costs compared to wet tailings management. The operating cost for dry stacking is 3 times higher or greater than conventional TSF storage (Crystal et al. 2018). Also, it would not be technically possible to safely stack dry tailings on top of the existing Keetac TSF area, so a new storage location would be required either off-site, which is not practicable (e.g., Alternative 3), or on-site (e.g., Alternative 5). Dry stack facilities are also often used for small scale operations in non-freezing environments that produce less than 20,000 tons of tailings per day. Keetac produces approximately double the volume of daily tailings and is in an environment that drops below freezing. Additionally, there are climatic issues with dry stacking infrastructure and re-saturation of deposited dry tailings.

Dry stack tailings management would represent a significant process change for the Keetac Mine and would require additional Project infrastructure, energy, and capital costs. Even if it were practicable, it would have a larger environmental impact footprint than the proposed Project (Alternative 6), and more indirect impacts through process changes and transportation. For these reasons, this alternative was eliminated from consideration.

3.7 ALTERNATIVE 5: ON-SITE GREENFIELD HORIZONTAL EXPANSION INTO PERMIT TO MINE STAGE 3 TSF AREA

Alternative 5 would involve using the Stage 3 TSF Expansion Area as included in the Permit to Mine (1986). This area extends to the south of the current TSF, as shown on Figure 1-22, and is largely greenfield—although it is within the Permit to Mine footprint, it has not yet been used for mining purposes.

Use of this area would require construction of about 9.75 miles of additional dams and dikes to retain tailings to expand the existing TSF beyond the Stage 2 Exterior into greenfield. This design would spread tailings over a broad area (Stage 2 and Stage 3 exterior areas) resulting in a TSF that would be lower in height compared to an option with a smaller footprint.

Using the full Stage 3 area would have a new impact on 5,219 acres of largely greenfield land including 3,269 acres of waterbodies and wetlands (based on National Wetland Inventory data). This alternative could be configured in multiple ways to leverage smaller portions of the Stage 3 area and avoid any potentially sensitive areas as best as possible. However, impacts to wetlands and waterbodies would be unavoidable because the tailings would flow into the lowest points on the landscape. As such, the design leverages natural topography, and it would be impractical (not feasible) to construct an upland-only TSF.

Therefore, expansion of the existing TSF into the defined Stage 3 area would result in a much larger permanent impact footprint into greenfield than any other alternative, and would have the largest direct environmental impact (e.g., wetland impacts, native habitat impacts, and potential species impacts). Further, of the alternatives considered, this would require the largest amount of dam/dike construction. Due to the increased footprint and additional construction required, this alternative would have a greater financial cost compared to the proposed Project. Due to the extent of impacts to greenfield, this alternative would also likely trigger the need for an EIS and associated regulatory approvals that could take longer than the expected life of the Stage 2 Interior Basin, preventing it from meeting the Project purpose from a timing and availability perspective.

The environmental impacts, cost, and timing constraints of this alternative resulted in it not being pursued further.

3.8 ALTERNATIVE 6: ON-SITE EXPANSION OF THE EXISTING STAGE 2 EXTERIOR (DOWNSTREAM AND MODIFIED CENTERLINE CONSTRUCTION)—PROPOSED PROJECT

Alternative 6 consists of vertically raising the existing Stage 2 Exterior dams and dikes using downstream and modified centerline construction to allow for tailings deposition into the existing Stage 2 Exterior area. The footprint would need to extend out horizontally to support modified centerline and downstream construction for vertical expansion.

The dam centerline would migrate downstream while the dam is raised vertically as shown on the typical cross sections. Figure 2.1-2. Tailings would be stored in the existing Stage 2 Exterior area which has previously been used for tailings deposition. The dams/dikes would be raised vertically over time, to an elevation of near 1,580 feet and horizontally extend from the existing toe approximately 275 feet to 350 feet.

This alternative also includes new tailings separation and/or dewatering infrastructure so that coarse tailings could be separated and used for construction, while fine tailings would be discharged to the TSF. Separating and using the coarse tailings for construction would minimize reliance on using natural borrow materials off-site and eliminate disturbance and potential environmental impacts related to off-site borrow sources. Because the coarse tailings would be used for construction, there would be an overall reduction in annual tailings volume deposited into the TSF. The separation and/or dewatering infrastructure would be more economical to build and operate than ongoing sourcing of off-site fill. The location of the separation and/or dewatering equipment and associated infrastructure (e.g., pipes in and out) could have additional footprint impacts.

This alternative would be practicable to design, construct, and manage. The surface and mineral rights for this alternative are already available to U. S. Steel, therefore the land is available and, permitting pending, the construction could begin with time to allow for tailings deposition and continuous mining at Keetac. As discussed for Alternative 1, downstream and centerline construction methods are preferred over upstream construction due to their enhanced structural integrity. So, this alternative could achieve safe storage for Keetac tailings. Most of the infrastructure to implement this alternative is in place given its proximity to and use of the existing TSF.

Environmentally, Alternative 6 would result in some footprint impacts for the construction of the dikes and dams as they extend outside of the existing TSF footprint, and there would also be temporary construction laydown areas, and other permanent roads and infrastructure required.

Overall, impacts would be greater than Alternative 1, 2, and 3 (these alternatives were determined to be impracticable), and less than the (potentially) practicable Alternatives 7, 5, and 4. Therefore, this option is the preferred alternative.

Once selected as the preferred alternative, the Proponent considered design adjustments to further enhance the Project and further minimize environmental impacts. Significant consideration was given for the seepage reduction features that are included in the downstream dam portion. The seepage reduction feature chosen in the proposed Project (linear low-density polyethylene liner) limits earthwork, haulage, and outside borrow sources, all of which would create larger environmental impacts associated with clay cores or clay upstream blankets. Another alternative included in-situ slurry wall, which would require utilizing enormous quantities of bentonite and additional equipment.

3.9 ALTERNATIVE 7: OFF-SITE GREENFIELD TAILINGS DISPOSAL

Alternative 7 would involve storing tailings off-site from the Keetac Permit to Mine area at a greenfield location (i.e., an available area that has not been previously disturbed).

This alternative would have permanent environmental footprint impacts like those addressed in Alternative 5, would require U. S. Steel to find available and suitable land area and acquire surface and mineral rights, and would have additional logistical requirements to transport tailings to this area, resulting in greater costs and impacts than Alternative 5.

This alternative would offer no environmental advantages over any of the other alternatives and would cost more than several if not all the other alternatives. Finally, permitting and construction timelines for Alternative 7 could not be completed prior to 2028 when Stage 1 Interior basin becomes filled and additional tailings storage is required. Therefore, Alternative 7 was eliminated from further consideration.