ENVIRONMENTAL ASSESSMENT WORKSHEET

Note to reviewers: This Environmental Assessment Worksheet (EAW) provides information about a project that may have the potential for significant environmental effects. The Minnesota Department of Natural Resources (DNR), the Responsible Governmental Unit (RGU), prepared this EAW to determine whether an Environmental Impact Statement (EIS) should be prepared. Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the EQB Monitor. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS. A copy of this EAW may be obtained by calling (651) 259-5162. An electronic version of the EAW is available on the DNR Website www.dnr.state.mn.us/input/environmentalreview/keetac/index.html.

1. **Project title:** Keetac Expansion Project

2. **Proposer:** U. S. Steel - Minnesota Ore Operations
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4. **Reason for EAW preparation** (check one)

☑ **EIS scoping** ☐ **Mandatory EAW** ☐ **Citizen petition** ☐ **RGU discretion** ☑ **Proposed volunteered**

If EAW or EIS is mandatory give EQB rule category subpart number and subpart name.

The proposed project is a mandatory EAW under Minnesota Rules, part 4410.4300, subpart 11 (metallic mineral mining and processing), because it is both an expansion of a stockpile, tailings basin, or mine by 320 or more acres (Minnesota Rules, part 4410.4300, subpart 11, item B), and an expansion of a metallic mineral plant processing facility capable of increasing production by 25 percent per year or more (item C). An EIS is not mandatory; however, U. S. Steel and the DNR have agreed that a discretionary EIS should be prepared for the Expansion Project in accordance with Minnesota Rules, part 4410.2000, subpart 3, item B.

Therefore, this is a Scoping EAW in accordance with Minnesota Rules, part 4410.2100, subpart 2. A Draft Scoping Decision Document has also been developed and accompanies this Scoping EAW.

5. **Project Location** County: St. Louis Itasca City/Township: Cities of Hibbing, Keewatin and Nashwauk Townships of Lone Pine and Nashwauk

Section 4 (NW, SW)	Township 56N	Range 21W
Section 5	Township 56N	Range 21W
Section 6	Township 56N	Range 21W
Section 7	Township 56N	Range 21W
Section 8 (most)	Township 56N	Range 21W
Section 9 (NW)	Township 56N	Range 21W
Section 17 (NW)	Township 56N	Range 21W
Section 18 (NW, NE)	Township 56N	Range 21W
Section 1 (NE, SE, SW)	Township 56N	Range 22W
Section 2 (SE)	Township 56N	Range 22W
Section 11 (NE, SE)	Township 56N	Range 22W
Section 12	Township 56N	Range 22W
Section 13 (NW, NE)	Township 56N	Range 22W
Section 7 (SW, SE)	Township 57N	Range 21W
Section 8 (SW, SE)	Township 57N	Range 21W
Section 9 (NW, SE, SW)	Township 57N	Range 21W
Section 13 (SW)	Township 57N	Range 21W
Section 16 (most)	Township 57N	Range 21W
Section 17	Township 57N	Range 21W
Section 18	Township 57N	Range 21W
Section 19 (NW, NE, SE)	Township 57N	Range 21W
Section 20	Township 57N	Range 21W
Section 21 (NW, SW)	Township 57N	Range 21W
Section 29 (SW)	Township 57N	Range 21W
Section 30 (SE)	Township 57N	Range 21W
Section 31 (most)	Township 57N	Range 21W
Section 32 (most)	Township 57N	Range 21W
Section 33	Township 57N	Range 21W
Section 10 (SE)	Township 57N	Range 22W
Section 11 (SE, SW)	Township 57N	Range 22W
Section 12	Township 57N	Range 22W
Section 13	Township 57N	Range 22W
Section 14	Township 57N	Range 22W
Section 15 (most)	Township 57N	Range 22W
Section 22 (most)	Township 57N	Range 22W
Section 23	Township 57N	Range 22W
Section 24 (NW, NE, SW)	Township 57N	Range 22W
Section 26 (NW, NE)	Township 57N	Range 22W
Section 27 (NW, NE)	Township 57N	Range 22W
Section 36 (SE)	Township 57N	Range 22W

Figure 5-3 includes the sections, townships, and ranges for the areas located within the proposed project boundary.

Attach each of the following to the EAW:

- County map showing the general location of the project (see Figure 5-1);
- U. S. Geological Survey (USGS) 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable) (see Figure 5-2); and
- Site plan showing significant project and natural features (see Figure 5-3).

Additional Figures

- Figure 5-4 Plant Features Map
- Figure 5-5 Permit to Mine Boundaries
- Figure 6-1 Plant Layout Plan
- Figure 9-1 Zoning and Shoreland Ordinances
- Figure 10-1 Land Cover
- Figure 12-1 Public Waters
- Figure 12-2 Wetland Resources
- Figure 12-3 Soil Survey Map
- Figure 12-4 Wetland Impacts
- Figure 13-1 Dewatering Sump and Discharge Locations
- Figure 13-2 Current Facility Water Flow
- Figure 13-3 Current Facility Water Flow Diagram
- Figure 13-4 Mine Pit Dewatering – 2012
- Figure 13-5 Mine Pit Dewatering – 2016
- Figure 13-6 Mine Pit Dewatering – 2021
- Figure 13-7 Mine Pit Dewatering – 2026 to 2036
- Figure 13-8 Well Location Map – County Well Index Data
- Figure 13-9 Piezometric Levels – County Well Index Data
- Figure 17-1 Major Watersheds
- Figure 17-2 Surface Water Features and Flow Directions
- Figure 17-3 Plant Site Surface Water Flow Diagram
- Figure 17-4 Stormwater Drainage Map
- Figure 18-1 Current NPDES/SDS Permit Outfall Discharges to Surface Water
- Figure 19-1 Soils Types
- Figure 20-1 Aboveground Storage Tank Locations
- Figure 23-1 Process Flow Diagram

Appendices

A: Preliminary Estimate of Controlled Emission Rates from Project

B: Initial List and Controlled Emission Rates of Chemical of Potential Interest for Human Health Screening Level Risk Assessment

6. **Description**

a. Provide a project summary of 50 words or less to be published in the EQB Monitor.

U. S. Steel proposes to restart an idled production line and expand the mine pit at its Keetac taconite mine and processing facility. The proposed project would increase Keetac's iron pellet production output by 3.6 million tons to a total output of 9.6 million tons per year.

b. Give a complete description of the proposed project and related new construction. Attach additional sheets as necessary. Emphasize construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes. Include modifications to existing equipment or industrial processes and significant demolition, removal or remodeling of existing structures. Indicate the timing and duration of construction activities.

Overview

Figures 5-1 and 5-2 show the general location of the Keetac facility in Northeast Minnesota. The existing facility straddles the Itasca/St. Louis County line. The Keetac Expansion Project area is divided into two main sections: (1) the mining and stockpile areas as well as the processing plant itself (North Project Area); and (2) the tailings basin area (South Project Area). A tailings pipeline connects the two sections over Truck Highway 169. The taconite pellet processing plant and most of the tailings basin are located in St. Louis County, but a large part of the mine pit area is located in Itasca County. Most of the new pit and stockpile expansion is in St. Louis County. The processing plant is located approximately one mile northeast of Keewatin, in Sections 18 and 19 of Township 57N, Range 21W.

Iron ore mining and taconite pellet production have been on-going at Keetac site since 1967, when the original Phase I taconite processing plant began operation. In 1977, the Phase II expansion added a second grate-kiln pellet line. The Phase I facility, however, was idled in December 1980 under the ownership of National Steel Pellet Corporation. U. S. Steel purchased the National Steel Corporation in 2003, including the Keetac facility. Currently, there is one operational pellet producing line (Phase II) with annual production of approximately 6.0 million net tons per year. U. S. Steel proposes to increase the capacity at the Keetac facility by restarting the Phase I line and upgrading the mining, concentrating, and agglomerating processes. The restart of the idled facility would involve the installation of energy-efficient technologies in addition to new emission controls. The proposed project would increase Keetac's iron pellet production output by 3.6 million tons to a total output of 9.6 million tons per year (TPY). The proposed project would increase the mine, waste rock stockpile, and tailings basin areas by a total of approximately 1,250 acres.

Proposed Action: Restart the idled Phase I production line and upgrade mining, concentrating and agglomerations processes.

In this Scoping EAW, the U. S. Steel proposal will be referred to as "the proposed project" or the "Expansion Project." The Expansion Project is generally defined as the increment change beyond what is allowed under the existing permit to mine.

There is currently adequate crushing capacity for both current operations and the Expansion Project. The current mine could also be used to feed both the existing operations and the Expansion Project, but this would reduce the life of the mine and therefore an expansion of the mine is proposed. In addition, the existing public transportation, railroad and electrical infrastructure are adequate for both the existing Phase II and the Expansion Project.

An overview of the project area, including preliminary plans for the mine expansion, stockpile area options, and tailings basin are shown in Figure 5-3. The plant and its associated infrastructure, such as the tailings pipeline, are shown in Figure 5-4. Finally, the existing DNR Permit to Mine area includes approved waste rock stockpile areas and tailings basin areas that U. S. Steel does not intend to use for the proposed Expansion Project. The Permit to Mine boundaries are shown on Figure 5-5.

Pellet Production Plant

The indurating furnace equipment from the idled Phase I line will be refurbished using leading edge technology for taconite pellet production. U. S. Steel plans to use natural gas and biomass as fuel for the indurating furnace with coal and fuel oil as backup fuels. U. S. Steel plans to use as much biomass as is available on the market, or a mixture of biomass and natural gas. U. S. Steel has not yet proposed a fuel mixture, and is still in the process of researching biomass availability and limitations. The refurbished Phase I line will maximize heat recovery from the

process, thereby minimizing fuel usage. In addition, the design of the heat recovery process, combined with segregation of the exhaust streams off of the pre-heat sections, allows for cost-effective treatment and minimization of air pollutants.

Proposed Action: Refurbish the Phase I Line furnace and grate-kiln and potentially change the mixture of fuels used at Keetac.

Mining, Concentrating, and Agglomerating Equipment

Upgrades to the mining, concentrating, and agglomerating processes will be needed to supply the refurbished and restarted indurating furnace equipment. Therefore, the project will include purchase of additional mining equipment and installation of additional processing equipment. Additional process water will also be needed. The height of the tailings basin will increase to accommodate the additional tailings, but the tailings basin footprint will change only slightly (see Figure 5-3). The mine plan will also be amended in order to maintain 25 years of permitted capacity for the facility.

Proposed Action: Install additional concentrating and agglomerating equipment and use additional mining equipment.

Mine

The Keetac Mine is currently the farthest west active iron taconite mine within the Mesabi Iron Range in northeastern Minnesota. The Mesabi Iron Range has been producing iron ore since the late 19th century and remains today the largest source of iron ore produced in the United States. The Expansion Project includes a contiguous expansion of the Keetac Mine, mostly into the eastern sections of the mine pit area that are located in St. Louis County (see Figure 5-3).

The mine is located in the Biwabik Iron Formation of the Mesabi Iron Range. It outcrops east-northeast over 100 miles from the City of Grand Rapids to the City of Babbitt and varies in width from one to three miles, dipping southeast five to seven degrees, and has a thickness from 300 to 700 feet. The formation is divided into four layered members. From top to bottom, these are Upper Slaty, Upper Cherty, Lower Slaty, and Lower Cherty. The Virginia formation and glacial material lay above the iron formation and the Pokegama formation lay below the iron formation. Beneath the Pokegama formation is the Giants Range batholith, also known as "greenstone." It is a complex multi-lithic magmatic intrusion containing schist, granite, gabbros, quartz-feldspar porphyry intrusions, quartz monzonites, diorites, granodiorites, and tonalites.

The Virginia Formation is a Middle Precambrian (2,500 to 1,600 million years ago) sedimentary body chiefly composed of black to dark gray argillite, argillaceous siltstone, and a very fine grained graywacke with minor components of chert, limestone, and chertysideritic iron formation as well as a periodic inter-formational argillite pebble conglomerate contained in a limestone of similar composition. The graywacke, siltstone, and argillite all have main framework grains of quartz and sodium plagioclase with some microcline, orthoclase, and rock fragments. Those framework grains are contained in a 15 to75 percent matrix of muscovite, chlorite, opaques (including graphite), plagioclase, and quartz. The deposition of these minerals is believed to have begun chemically and then shifted to clastic; the rapidity of this change is unknown. The contact between the Biwabik and Virginia formation consists of interbedded chert, limestone, argillite, and chert contained in a zone that ranges from less than 10 feet in thickness to 30 feet.

The Biwabik Iron Formation, which is under the Virginia Formation, is the uppermost bedrock at the Keetac Mine. It is generally covered by a ten- to 150–foot-thick layer of glacial drift that contains soil and rocks deposited during the recession of the last glaciers. The low-grade magnetic iron ores, known as taconite, are mined or will be mined from the Upper Cherty and

Lower Cherty members. The Upper Cherty ore is highly transitional and has a thickness ranging from 0 to 90 feet, roughly equal to 0 to 15 percent of the total formation thickness. The Lower Cherty ores are typically 120 to 160 feet, roughly equal to 25 to 30 percent of the total iron formation. These members are subdivided into a number of primary and secondary units, based on texture, layering, and variable distribution of the iron-bearing mineral suite.

Proposed Action: Mine taconite from the Upper Cherty and Lower Cherty members.

The minerals found within the Upper and Lower Cherty magnetic taconite ore horizons are essentially the same. As identified by x-ray powder diffraction and microscopic studies, the minerals are overall fine-grained, intimately intergrown, and consist of quartz, magnetite, hematite, sideritic and ankeritic iron carbonates, and iron silicates, chlorite, minnesotaite and stilpnomelane. Trace amounts of greenalite, talc, apatite, chamosite, and pyrite-marcasite have been noted in some individual specimens. Hematite occurs both as a primary mineral and as a secondary oxidation product after magnetite. All major iron-bearing minerals are present in each horizon ore unit. They may occur in various combinations and are generally disseminated in quartz-rich layers and concentrated in thinner iron-rich layers.

Based on work by Hanna Mining Company, then National Steel Pellet Company, and now U. S. Steel Keetac, the ore is expected to have the mineral percentages represented in Table 6-1.

Table 6-1: Ore Composition

Mineral	Mean Composition	Variability*
Iron oxides	28%	18-38%
Quartz	42%	33-55%
Iron silicates	15%	3-24%
Iron carbonates	15%	<1-23%
Total	**100%**	

*Extremes in variability are related to secondary oxidation and leaching of the uppermost ore units. Detailed information on the mineralogy and petrology of the ore will be included in the application to the DNR for the Permit to Mine.

Mine Plan

As is typical, mine planning and detailed design are being prepared for 25-year horizon. The 25-year plan is the proposed project for purposes of this environmental review, and any proposed project beyond the 25 years will require additional environmental review at that time. Likewise, permits are only being requested for a 25-year mining program.

The contiguous expansion of U. S. Steel's Keetac taconite ore body will be mined by open-pit methods. Mining will continue to expand into the ores located north, northeast, and west of the plant, including into some areas that are outside the current permit-to-mine pit limit (shown as proposed pit-limit expansion areas in Figure 5-3). U. S. Steel currently plans to begin stripping and mining activities in the expansion area west of the plant during the initial 5-year period of the new mine plan (2012 to 2017). Mining activity is not currently planned in the expansion areas to the east and northeast of the plant until the second 5-year period (2017 to 2022). Detailed plans will be developed for the DNR permit-to-mine. Some of the property in the new mine pit and stockpile areas are currently controlled by the State and other property owners. These areas are included within the identified ambient air quality boundary for evaluation. Keetac feels

reasonably sure that control and development of these parcels will be successfully negotiated with all parties involved.

Proposed Action: Expand the mine pit mostly to the northeast.

The current mine plan is preliminary; U. S. Steel will prepare a detailed mine model and stockpiling plan for inclusion in the EIS. Roughly 32 million tons of crude ore per year total will be mined at a strip ratio of about 1:1. The maximum depth of mining will be limited by economic conditions as the mine is developed, but is assumed to be 500 to 600 feet below the adjacent ground surface.

After overburden is removed, waste rock and taconite ore will be drilled, blasted, and loaded into mine trucks by diesel-hydraulic shovels. There are both economic and environmental considerations that provide incentive for efficient blasting practices. Measures that will be used to make blasting as efficient as possible include:

- Proper hole depth and size must be calculated to contain the energy of the explosive;
- Adequate boosters must be used to ensure that the explosive charge is totally detonated;
- In wet holes, water resistant explosive is used displacing the water; and
- After placement of the explosives, the hole must be collared and backfilled properly to ensure that the energy is contained and directed outward.

The raw ore will be trucked to the primary crusher. Waste rock will either be placed in waste rock stockpiles or used to construct dikes and haul roads. During and following each phase of mining, reclamation of the overburden slopes and stockpiles will be completed according to DNR mineland reclamation requirements.

Waste Rock and Overburden Stockpiles

U. S. Steel proposes to stockpile overburden and waste rock in existing stockpiles, new stockpiles, and in-pit stockpiles. Figure 5-3 shows the location of two new proposed stockpile areas as well as stockpile areas already included in the existing DNR Permit to Mine. Detailed stockpile planning will be completed following the preparation of a mine model and a detailed 25-year mine plan. This will be submitted as part of the application for a Permit to Mine and will be available in time for use in preparation of the Draft EIS.

Proposed Action: Expand stockpile areas.

As pit development progresses, U. S. Steel will also evaluate the feasibility of additional in-pit stockpiling for aquatic enhancement upon pit closure. A major factor in determining the feasibility of in-pit stockpiling is the management of mineral rights. There are many general classes of waste rock (e.g., magnetic lean ore, non-magnetic lean ore, non-iron bearing rock, glacial drift, and Cretaceous rocks). Different fee owners have different material classifications, and it may or may not be possible to mix stockpiles by rock type and fee owner.

Haul Roads

U. S. Steel will use the existing haul roads to transport stripping material to the stockpile area and taconite ore from the mine to the crusher wherever possible. As the mine pits are expanded and if in-pit stockpiling begins, existing mine pit and inter-pit haul roads will be utilized. Some new haul roads will be needed for transport of materials to the new stockpiles. However, existing haul road alignments and existing disturbed areas will be utilized as much as possible in order to minimize possible impacts to wetlands to the greatest extent practicable. The existing haul roads are shown in Figure 5-4 as part of the Access Roads.

Proposed Action: Expand the network on in-pit haul roads and haul roads outside of pits.

Dewatering

U. S. Steel is currently permitted to pump water from the mine area in order to conduct mining operations, facilitate the disposal of tailings, and maintain surface waters. The affected water bodies include those in:

- The O'Brien Creek Watershed;
- The major parts of Hay Creek and Welcome Creek Watersheds in Itasca County;
- The upper reaches of Hay Creek; Welcome Creek; and the upper reaches of East and West Swan River Watersheds in St. Louis County; and in
- Existing mines and open pits.

Additional mine dewatering volumes will be necessary as the boundaries of the mine area increase. However, U. S. Steel intends to stay within the water appropriation volume limits that are currently permitted by the DNR during the life of the proposed project.

Process make-up water is currently pumped from Reservoir Five. As mining activities progress to the east, Reservoir Five will be dewatered and eliminated. After Reservoir Five is eliminated, water will be pumped directly from the Russell Pit to the plant for use as plant makeup water (see Figures 13-4 through 13-7). Additional details regarding mine dewatering are discussed in Item 13.

Proposed Action: Increase processing plant's water use.

Crusher, Concentrator, and Pellet Plant

The refurbished and new processing equipment will be located at the existing plant site alongside current operations. The plant and its associated infrastructure are shown in Figure 5-4. A preliminary layout of the plant additions is shown in Figure 6-1.

An existing road on the south side of the plant provides access to the plant from Trunk Highway 169. A rail siding on the south side of the plant provides access to the existing Burlington Northern Santa Fe tracks about one mile south of the plant and one mile east of the City of Keewatin. With the increase in production, the number of rails cars will increase but no modifications to the siding or the main rail line will be necessary for this project.

The crude ore will be trucked from the pits to the primary crusher for size reduction to approximately eight inches in diameter. The existing crushers currently in operation have adequate capacity to process the additional ore associated with the project. No new crushing equipment will be added. The crushed ore will be conveyed to the existing crude ore storage building. The existing crude ore storage building will be expanded to accommodate the additional crushed ore.

Proposed Action: Increase haul truck and ore crushing activity. Increase crude ore storage.

The ore concentration and agglomerating processes will be very similar to existing equipment in Phase II. A simplified flow diagram for the taconite production process is provided in Figure 23-1. From the crude ore storage area, crushed ore will be conveyed to the concentrator where the magnetic iron oxide minerals (concentrate) will be separated from the nonmagnetic waste (tailings). In the concentrator, the ore will pass through a series of wet mills that will grind the

rock to a flour-like consistency. Magnetic separators will separate the magnetic iron minerals (concentrate) from the waste rock. Concentrate will be pumped to the pellet plant. Waste rock (tailings) from the concentrator will be pumped to the tailings thickeners where excess water will be removed by sedimentation. There are currently three thickeners in operation. One large or two smaller thickeners will be added as part of this proposed project. The tailings slurry will be pumped to the tailings basin for disposal. A second tailings pipeline similar in size to the existing pipeline and a second return water line will be installed as part of the proposed project.

Proposed Action: Increase ore concentration and agglomeration activity, and add of one or more thickeners.

In the pellet plant, wet iron oxide concentrate will be dewatered in vacuum filters, mixed with binder and limestone, and then converted to unfired pellets in balling drums. The unfired pellets will be moved to an indurating furnace and fired into hardened iron oxide pellets. The Phase I furnace that is being refurbished as part of the Expansion Project is a grate-kiln furnace. The fired pellets will be cooled and conveyed to a stockpile and loaded into rail cars for shipping. Additional information on the plant equipment and processes will be provided in the EIS.

Proposed Action: Increase firing of pellets and increase pellet transport.

Tailings Basin

About 13 million long-tons per year (MLTY) of taconite process tailings are currently pumped to the existing tailings basin. The tailings basin is located south of the mine area and plant site, approximately one mile southeast of the City of Keewatin (see Figure 5-3). An additional 9 MLTY of tailings will result from the Expansion Project concentrating process and this will also be pumped as slurry to the existing tailings basin. The overall 2,400-acre footprint of the active tailings basin will increase slightly (increase shown as dashed line on Figure 5-3). However, the overall height of the tailings in the basin will increase by approximately 30 feet compared to what would occur without the Expansion Project. The tailing basin dikes will be reinforced, as necessary to support the additional tailings to be placed in the basin.

Proposed Action: Increase tonnage of tailings and basin height and slightly increase basin footprint.

There will be a modification to how the basin is operated to reduce beach area. This modification to the tailings basin will also result in reduced air emissions. By reinforcing the tailing basin dikes, additional water can be stored in the basin. This will significantly reduce the exposed beach area where air emissions occur. In addition, this modification will improve accessibility to the exposed beach area because the exposed beach will only occur around the perimeter of the basin rather than in the middle of the basin. The improved access should enable better vegetation and mulching of the exposed areas, which will further decrease fugitive dust emissions.

Connected Actions

U. S. Steel expects to purchase biomass, natural gas, coal, and fuel oil from a supplier through existing infrastructure. Similarly, electricity will be obtained from local utilities from existing sources through existing transmission lines. The current access to Trunk Highway 169 is adequate for the proposed project and no improvements are expected to be necessary. Existing rail access (see Figure 5-4) is also adequate for the proposed project. Therefore, no significant connected actions are expected to occur as a result of this project.

Proposed Treatment of Topic in EIS

The EIS will include a complete project description, including the timing of all phases of construction and operation. The status of all project-related mineral rights will be presented in the EIS. The EIS will show the location of permitted and proposed mine pit, stockpile, plant and tailings basin locations. A cross-section of the final tailings basin configuration will also be shown.

c. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

The purpose and need of the project is to provide increased supplies of iron ore pellets to steel production facilities.

d. Are future stages of this development including development on any outlots planned or likely to happen? ☑ Yes ☐No
If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

Continued mining of the ore deposit in the area is likely even past the 25-year term of the current mine plan, but no specific plans for future expansion beyond this time frame have been developed.

e. Is this project a subsequent stage of an earlier project? ☐Yes ☑No If yes, briefly describe the past development, timeline and any past environmental review.

7. Project magnitude data

Total Project Area (See Figure 5-3):	12,915 acres
North Project Area	7,247 acres
Mine and Stockpile Area (total): (all mine and stockpile areas are located within the North Project Area)	6,024 acres
South Project Area (Tailings Basin and surrounding area):	5,661 acres

Expanded project area (Subset of Total Project Area)

Total expanded mine, stockpile, and tailings area:	1,250 acres
Expanded mine pit limit area:	621 acres
New stockpile areas:	530 acres (shown in shaded-green cross-hatch within solid green line on Figure 5-3).
Approximate expanded tailings basin area:	100 acres

Number of residential units:
Unattached: 0 Attached: 0 Maximum units per building: 0

Commercial, industrial, or institutional building area (gross floor space): total square feet:
Crushed ore storage expansion: 24,806
Grinding area expansion: 78,092
New thickener: 175,601
New biomass storage: 6,678
TOTAL: 285,177

Indicate areas of specific uses (in square feet):

Office: 0	Manufacturing: 0
Retail: 0	Other Industrial: 285,177
Warehouse: 0	Institutional: 0
Light Industrial: 0	Agricultural: 0
Other Commercial (specify): 0	

Building heights:
Crushed ore storage expansion: 102 feet
Grinding area expansion: 116 feet
New thickener: Height to be determined during final design
New biomass storage: 30 feet

If over 2 stories, compare to heights of nearby buildings:

The surrounding buildings form the existing portions of the Keetac facility plant, and range in height from approximately 35 feet to approximately 144 feet. There are no other existing buildings in the proposed project boundary.

Proposed Treatment of Topic in EIS
The topic is not significant, but it will be discussed briefly in the EIS using updated information. The EIS will provide updated calculations of project magnitude data that are available as project-related designs are further developed.

8. **Permits and approvals required**. List all known local, state and federal permits, approvals and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure.

Table 8-1: Permits and Approvals Required

Unit of Government	Type of Application	Status
U. S. Army Corps of Engineers (USACE)	Section 404 Permit for Wetland Impacts	To be applied for. Section 7 Endangered Species Act Consultation with U. S. Fish & Wildlife Service will be completed by USACE as part of Section 404 Permit Section 106 National Historic Preservation Act consultation with Minnesota State Historical Society (SHPO) will be completed by USACE as part of Section 404 Permit.

Unit of Government	Type of Application	Status
Minnesota Department of Natural Resources	Permit to Mine	Substantial change amendment, noticed to the public.
	Water Appropriation Permit	To be amended.
	Dam Safety Permit	To be amended.
	Public Waters Permit	To be amended.
	Minnesota Wetland Conservation Act	To be amended.
	Burning Permit (land clearing)	To be applied for if needed.
	Endangered Species Takings Permit	To be applied for if needed.
Minnesota Pollution Control Agency	Part 70 Operating Permit – Major Permit Modification	To be applied for.
	NPDES/SDS Permit for industrial wastewater discharge and stormwater discharge for industrial activity	To be amended.
	NPDES/SDS General Stormwater Discharge Permit for Construction Activity	To be applied for.
	NPDES/SDS Stormwater Permit for Industrial Activity and new stormwater permit program	To be applied for if needed.
	Section 401 Water Quality Certification	To be applied for in conjunction with USACE Section 404 Permit Application.
	Waste tire storage permit	To be amended as needed.
	Storage Tank Permit (fuel tanks)	To be amended.
	Solid Waste Permit	To be amended.
	Hazardous Waste Generator License	To be amended.
Minnesota Department of Health	Radioactive Material Registration (low-level radioactive materials in measuring instruments)	To be amended.
St. Louis County	Building permit	To be applied for if needed.
	Zoning Variances	To be applied for if needed.
Itasca County	Building permit and permit for construction in a shoreland area	To be applied for if needed.
	Zoning Variances	To be applied for if needed.
City of Hibbing	Building permit and permit for construction in a shoreland area	To be applied for if needed.
	Zoning Variances	To be applied for if needed.
City of Keewatin	Building Permit and permit for construction in a shoreland area	To be applied for if needed.
	Zoning Variances	To be applied for if needed.

Unit of Government	Type of Application	Status
City of Nashwauk	Building Permit and permit for construction in a shoreland area	To be applied for if needed (mining in a shoreland is subject to the Minnesota Mineland Reclamation Act, however, not local zoning).
	Zoning Variances	To be applied for if needed.

Proposed Treatment of Topic in EIS
The EIS will identify project-related permits and approvals

9. **Land use.** Describe current and recent past land use and development on the site and on adjacent lands. Discuss project compatibility with adjacent and nearby land uses. Indicate whether any potential conflicts involve environmental matters. Identify any potential environmental hazards due to past site uses, such as soil contamination or abandoned storage tanks, or proximity to nearby hazardous liquid or gas pipelines.

The general area of the project and nearby natural features are shown in Figure 5-3. Municipal and county zoning designations in the area are shown in Figure 9-1. The existing land use and projected changes in the project area are also quantified below, in Item 10 (see Figure 10-1).

In general, most of the land within the Expansion Project area has been previously excavated or otherwise altered by past and present mining activities. The nearest residences are in the City of Keewatin and in the residential area along the eastern edge of the facility property near Kelly Lake. The planned expansion of the mine and stockpile area to the east will bring industrial operations closer to the residences on Kelly Lake.

Potential Land Use Conflicts
Potential impacts from re-activating and extending mining operations that could conflict with existing land uses include possible changes to water levels in local lakes, pits, and water wells, increasing local traffic, and noise and vibration from blasting and mining activities. These topics are discussed in more detail in response to the respective items in this Scoping EAW.

Mine and Stockpile
The proposed mine and stockpile locations are shown on Figure 5-3. Because the proposed expansion will largely take place north and east of the City of Keewatin, potential impacts to City residents due to mining activities and stockpiles should be minimal. As described in Item 6, however, the proposed project will accelerate the mine area expansion and use of stockpile areas in the eastern pit area in St. Louis County. Therefore, mining activity will occur sooner in the project areas along Kelly Lake and Snowshoe Lake than it otherwise would have without the proposed project. Methods to avoid or reduce noise, dust, or other possible nuisance impacts on nearby residents will be evaluated in detail in the EIS. The use of the currently permitted stockpile area in the northwest part of the proposed project is likely to change as a result of the proposed project. However, there are no residential areas near that stockpile area.

Plant Site
Figure 6-1 shows the general layout of Keetac mining operation components in the vicinity of the plant site. These include a new tailings thickener, grinding area, and crushed ore storage. The plant area is bordered on the south by Welcome Lake. The City of Keewatin is approximately one mile southwest of the plant. Although the potential for noise or other possible impacts to

nearby residents will be evaluated in the EIS, plant operation impacts on nearby residents are not anticipated to be a major issue.

Tailings Basin

The active tailings basin area will be slightly expanded in order to strengthen basin dikes as required (the expanded area is shown as a dashed line on Figure 5-3 and other figures). In addition, U. S. Steel is currently developing detailed plans to reduce or eliminate periodic dust problems for nearby residents due to the tailings basin. These ongoing efforts will be described in the EIS, and the dust mitigation plans will be adjusted to accommodate any changes in the tailing basin due to the Expansion Project. Additionally, there is an area south of the active tailings basin that is also currently permitted for use as a tailings basin in the Keetac Permit to Mine (see Figure 5-5). However, Keetac is not proposing to use this area for tailings as part of the proposed project.

Potential Environmental Hazards On or Near the Site

The Minnesota Pollution Control Agency (MPCA) contaminated site data indicate the presence of potentially contaminated sites in the project vicinity. These sites, listed below, are not expected to conflict or interfere with the proposed project.

- Keetac is in the process of completing a Leak Site Investigation for the removal of a 415-gallon underground storage tank (UST) (MPCA Leaksite No. 16602). MPCA has agreed with Keetac's recommendation for closure of the leak site upon completion of a Conceptual Corrective Action Design Worksheet and soil excavation of the contaminated area.
- Keewatin Dump Site. This dump is located south of the City of Keewatin and was listed on MPCA's 1980 Statewide Open Dump Inventory.
- Former Butler Taconite Plant. This site is on Trunk Highway 169 west of U. S. Steel's control property. A voluntary cleanup of the site was conducted. The property was listed by the U. S. Environmental Protection Agency (USEPA) as a "No Further Remedial Action Planned (NFRAP)" site and was removed from the USEPA's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) system.
- Inland Steel Mining Co. St. Paul Mine was operated from 1956 to 1964. This site is included because of the possible use of solvents and greases on site; but it is a low priority site for MPCA inspection and has a low hazard potential. The property was listed by USEPA as a NFRAP site and was removed from the USEPA's CERCLA system.
- National Steel Pellet Co. Dump. This un-permitted dump was identified on MPCA's 1980 Statewide Open Dump Inventory.
- Kelly Lake Dumps I and II. These un-permitted dumps were identified on MPCA's 1980 Statewide Open Dump Inventory.

No other records of potential environmental hazards have been identified. Based on the historical use of portions of the project site for mining and processing activities, it is possible that smaller, unidentified environmental hazards (e.g., small spills) exist within the project boundaries. If such environmental hazards are discovered during facility development, they will be dealt with under the appropriate regulatory program.

Proposed Treatment of Topic in EIS

The EIS will discuss potential land use conflicts to nearby residences and water bodies. The EIS will include a map of nearby potential environmental hazards and discuss their proximity to and potential impacts from the Expansion Project. Potential land use conflicts will be addressed with respect to other environmental considerations of the project, including physical alteration of water resources, noise blasting impacts, new haul roads and traffic.

10. **Cover types**. Estimate the acreage of the site with each of the following cover types before and after development. **If Before and After totals are not equal, explain why.**

The existing cover types for the project area are shown on Figure 10-1. The project area is divided into a North Project Area consisting of the mine pit, plant, and stockpile areas and the South Project Area consisting of the tailings basin and surrounding wetland and potential wetland mitigation areas. Acreages are approximate and are based on the following sources:

1. the USGS National Landcover Database (2001);
2. the Keetac wetland delineations;
3. the 2007 DNR Mine Features Mapping; and the
4. 2006 Minnesota Department of Administration Aerial Photography.

Due to differences in soils, habitat value, and vegetation, the cover types that have been previously disturbed by mining activity are tabulated separately from those with no apparent previous disturbance. The current land cover in the mining-related and/or barren areas is broken out below as reclaimed or barren.

Table 10-1: Cover Types—North Project Area

Cover Type	BEFORE (acres)			AFTER (acres)
	Altered Areas*	Natural Areas**	TOTAL	
Agriculture	0.0	0.6	0.6	0.1
Developed Low Intensity	0.0	4.6	4.6	1.8
Developed Medium Intensity	0.0	0.5	0.5	0.1
Forest	312.8	1,076.6	1,389.4	233.0
Grassland	0.0	28.6	28.6	5.7
Mining Related and/or Barren	3,977.8	---	3,977.8	6,634.6
Open Water	0.0	38.9	38.9	5.0
Shrubland	455.3	437.0	892.3	154.3
Wetland	93.1	820.9	914.0	211.9
TOTAL	**4,839.0**	**2,407.7**	**7,246.7**	**7,246.7**

*Areas disturbed by previous mining activity

**Areas not disturbed by previous mining activity

Table 10-2: Cover Types—South Project Area

Cover Types	BEFORE (acres)			AFTER (acres)
	Altered Areas*	Natural Areas**	TOTAL	
Developed Low Intensity	0.0	0.0	0.0	0.0
Developed Medium Intensity	0.0	0.0	0.0	0.0
Forest	185.2	90.1	275.4	275.4
Grassland	379.4	18.3	397.6	397.6
Reclaimed Grassland	0.0	0.0	0.0	400.0
Mining Related and/or Barren	3,323.0	---	3,323.0	1,870.6
Open Water	953.9	2.5	956.5	2,023.8
Shrubland	119.8	4.2	124.1	124.1
Wetland	584.8	0.0	584.8	570.0
TOTAL	**5,546.1**	**115.1**	**5,661.4**	**5,661.4**

*Areas disturbed by previous mining activity
**Areas not disturbed by previous mining activity

Table 10-3: Cover Types—Tailings Pipeline

Cover Types	BEFORE (acres)	AFTER (acres)
Developed Low Intensity	0.1	0.1
Developed Medium Intensity	0.4	0.4
Forest	0.0	0.0
Grassland	0.0	0.0
Mining Related and/or Barren	5.8	5.8
Open Water and Wetlands	0.0	0.0
Shrubland	1.4	1.4
TOTAL	**7.6**	**7.6**

Table 10-4: Cover Types—Total

Cover Types	BEFORE (acres)	AFTER (acres)	CHANGE (acres)
Agriculture	0.6	0.1	-0.5
Developed Low Intensity	4.7	1.9	-2.8
Developed Medium Intensity	0.9	0.5	-0.4
Forest	1,664.8	508.4	-1,156.4
Grassland	426.2	403.3	-22.9
Reclaimed Grassland	0.0	400.0	400.0
Mining Related and/or Barren	7,306.6	8,511.0	1,204.4
Open Water	995.4	2,028.8	1,033.4
Shrubland	1,017.8	279.8	-738.0
Wetlands	1,498.8	781.9	-716.9
TOTAL	**12,916**	**12,916**	

*Includes the sum of altered and natural areas

Proposed Treatment of Topic in EIS

Project-Specific Analysis
Specific mining and plant site details will be addressed during EIS preparation. The EIS will include updated cover type information and "before and after" cover type maps, and will describe the conversion of existing land cover types that will result from project implementation and reclamation.

Cumulative Effects Analysis

Harvesting of Biomass
U. S. Steel has expressed interest in utilizing biomass as its primary fuel source for its pellet plant. Biomass is the material in the forest not traditionally used in pulpwood or sawtimber markets, and typically includes shrubs, small-diameter trees, branches, and woody debris. Biomass is growing in popularity as the price and concern over the emissions of petroleum-based fuels increases.

Several biomass projects have recently began or are under consideration in Minnesota's Iron Range. Laurentian Energy Authority (LEA), a joint powers public authority formed between the municipalities of Virginia and Hibbing, operates two energy biomass plants. Cleveland Cliffs also recently announced that it is investigating construction of a biomass pellet plant in the Iron Range.

While biomass is generally considered "carbon neutral," harvesting can have some environmental impacts. Specifically, improper removal of biomass can impact wildlife habitat and biodiversity, soil, water quality, and cultural resources. These impacts can be avoided through the use of biomass harvesting Best Management Practices (BMPs). Minnesota Statutes § 216B.2424 requires the Minnesota Forest Resources Council (MFRC) to adopt guidelines "using the most recent available scientific information regarding the removal of woody biomass from forest lands, to sustain the management of forest resources . . .with particular attention to soil productivity, biological diversity, and wildlife habitat." The "Biomass Harvesting Guidelines for Forestlands, Brushlands and Open Lands" were published in December 2007 and outline voluntary BMPs for

biomass harvesters to follow. It should be noted that MFRC guidelines do not include woody biomass harvested in high conservation value forests like native plant communities or sites of biodiversity significance.

Approach to Evaluation
Because biomass is gaining in popularity as a fuel source in the Iron Range and throughout Minnesota, the EIS will address the viability of using biomass as a fuel at Keetac. The EIS will also identify the current and planned biomass projects in the Iron Range and those facilities that do or intend to use biomass as their primary fuel sources. Because harvesters will follow the MFRC guidelines, possible environmental impacts will be limited and are not anticipated to be cumulative.

Data Needs for Cumulative Effects Analysis
- Current and planned Iron Range biomass energy facilities' capacities and harvest volumes;
- Biomass energy facilities' harvesting methods and locations; and
- Current and planned Iron Range facilities using biomass as fuel source, and approximate fuel requirements.

11. Fish, wildlife and ecologically sensitive resources

a. Identify fish and wildlife resources and habitats on or near the site and describe how they would be affected by the project. Describe any measures to be taken to minimize or avoid impacts.

Fisheries
The potential water quality impacts to streams are discussed in Item 18. The mine pit dewatering, tailings basin seepage/discharge and processing water needs could alter water flows or water levels of several water bodies that have fishery resources. Surface water resources in or immediately adjacent to the proposed project area are named below, along with their DNR Public Waters numbers where applicable.

Mississippi River Watershed
The La Rue Mine Pit is a former ore pit with approximately 300 acres of surface area that has filled with surface runoff and groundwater (see Figure 13-2). It is a DNR-designated trout water for rainbow trout. None of the La Rue Mine Pit is within the proposed project area, but it is immediately west of the final Keetac Pit Limit. The La Rue Mine Pit is adjacent to Shada, Argonne, Galbraith, and Leach mine pits and is shown on Figure 17-2. (The La Rue, Shada, Argonne, Galbraith and Leach mine pits are actually a series of interconnected pits that are one water body.)

Swan Lake (Public Water 31-67-P) is an approximately 2,500-acre lake that is near, but not within, the project area (see Figure 5-1). The shores of Swan Lake are developed and the lake has fairly good water quality. Data from the summer of 2000 showed total phosphorus levels at or below 30 micrograms per liter (µg/L), indicating a mesotrophic status. The lake is reported to have large populations of walleye, northern pike, and black crappie. The proposed project is not expected to affect Swan Lake's fishery, but potential impacts will be evaluated in the EIS.

O'Brien Reservoir (also referred to as Reservoir Four) is an approximately 85-acre widening of the O'Brien Creek located north of O'Brien Lake and Trunk Highway 169 in Itasca County. It contains crappies, bluegill, northern pike and walleye. Located on U. S. Steel property, U. S. Steel allows the City of Keewatin to maintain a park on the Reservoir, and the DNR maintains a boat launch.

Welcome Lake (69-902-P) is a 28-acre lake that straddles the Itasca County/St. Louis County line. It is immediately south of the Keetac plant and north of the City of Keewatin. Hay Lake (31-37-W) is south of the tailings basin, as shown on Figure 5-2. Existing water flow in the area is shown in Figure 13-2. Water from Welcome Lake flows south out of the lake immediately into Carlz Pit (no DNR Public Water number), a 91-acre basin. Carlz Pit has no outfall. Welcome Creek flows south from the 10 settling basins at the Keetac facility to Reservoir Two North (31-1228P), a 60-acre basin. From Reservoir Two North, water either flows south into Reservoir Six (31-1229-P, 171 acres) or into Reservoir Two (31-1039-P, 452 acres) when Reservoir Six is full.

From the southwest edge of Reservoir Two, water enters a diversion channel and flows approximately 3.4 miles to its confluence with Hay Creek. The diversion channel begins approximately 2.6 miles north-northwest of Reservoir Two, at the south end of O'Brien Reservoir (Reservoir Four; 31-1225-P). Hay Creek flows from a point near the southern edge of the existing tailings basin southward through Hay Lake, then westward approximately 2.5 miles to Swan Lake. Hay Lake is a 30-acre basin. Hay Creek enters Hay Lake at its north edge and exits the lake from the west edge.

Immediately northwest of the mining area limit is an unnamed wetland MN (31-38-W). This is an 11-acre basin.

Lake Superior Watershed
West Swan River flows along the eastern edge of the control property boundary, lying mainly outside of the boundary in the north and crossing onto the control property in the south. West Swan River turns eastward near the southern limit of the Keetac property and eventually meets East Swan River approximately 18 miles southeast of the project area.

The mine pits in the project area are not managed for fisheries and are not open to the public.

Mercury
Sulfate will be discussed in the EIS because of its ability to increase mercury (Hg) uptake in fish. Under anaerobic conditions some bacteria utilize the oxygen in sulfate (SO_4) thereby reducing sulfide (SO_3), and in the process methylate mercury. Methylmercury is the form taken up by aquatic biota such as fish. An increase in sulfate loading to surface water may increase methylmercury formation if a number of environmental conditions and factors combine to support increased methylation.

Proposed Treatment of Topic in EIS

Project-Specific Analysis
The EIS will include a qualitative description of fisheries resources and angling activity in the Swan Lake, Welcome Lake, Hay Lake, and the four unnamed lakes, as well as Hay Creek and West Swan River. The EIS will discuss the potential impacts to fisheries and angling that could result from varying water levels and flows. The EIS will suggest mitigation strategies where warranted, and will describe long-term mine pit reclamation strategies to provide fisheries habitat when mining ceases.

A project-specific qualitative analysis will discuss any sulfate air emissions and water discharges from the Keetac plant as a result of the proposed project and any terrestrial and aquatic system changes that could release mercury and/or create sulfate. The sulfate analysis will be considered with the "Potential Local Mercury Deposition and Evaluation of Bioaccumulation in Fish in the Keewatin, Minnesota Area" analysis in the cumulative effects analysis section below. It is not

expected that sulfate in rivers and lakes near the proposed project would increase as a result of the Expansion Project.

Cumulative Effects Analysis

Aquatic Habitat and Fisheries

Potential loss of aquatic habitat and fisheries may occur as a result of hydrologic alterations, water quality degradation and increased erosion and associated sedimentation. Additionally, impacts could occur from chemical (water quality, temperature, etc.) or physical barriers that exert a biological effect constraining dispersal, movement or foraging. For example significant increases in stream flow may change channel stability, erode banks and increase sediment load, thereby inundating downstream riffle habitats and affecting invertebrate productivity. These changes can subsequently affect species diversity and the growth of sport and non-sport fish.

Watersheds across the Iron Range have experienced significant changes from mining, logging, transportation and other construction projects (residential and commercial development). Watersheds have been severed and natural drainage patterns have been affected. The cumulative effects to stream geomorphological processes and subsequent effects to aquatic habitat and fisheries have been substantial. Understanding the potential for further possible impacts is essential to developing adequate mitigation plans to provide sustainable resources into the future.

Approach to Evaluation

Results from the proposed cumulative effects analysis of water quality and water flow changes and associated stream channel changes will be used to evaluate cumulative effects to aquatic habitat and fisheries. Any significant impacts identified in these analyses will be considered with respect to chemical or physical barriers that affect aquatic ecosystems. No additional past, present and reasonably foreseeable actions will be included for this cumulative effects analysis, besides the actions that are included in the water quality, water flow and associated stream channel change analysis. The geographic scope of this analysis will duplicate that of the water quality, water flow and associated stream channel changes analysis that includes Swan River and Swan Lake.

Data Needs for Cumulative Effects Analysis

- Information on affected aquatic habitats and fisheries that will be developed as part of the project-specific impact analysis of the EIS;
- Conclusions from water quality cumulative effects analysis; and
- Conclusions from water flow and associated stream channel changes cumulative effects analysis.

Potential Local Mercury Deposition and Evaluation of Bioaccumulation in Fish in the Keewatin, Minnesota Area

Mercury emissions, deposition, and bioaccumulation in fish tissue have been a focus of state and national research efforts, state and federal regulations, and the public interest for more than a decade. As a result of this attention, there is an emphasis to reduce mercury emissions on state and national levels whenever possible, either through voluntary efforts or through regulations. The primary impacts of mercury air emissions result when mercury is deposited to land and water, a portion of the deposited mercury changes to methylmercury and then this form of mercury is taken up by the aquatic biota. Due to a combination of atmospheric mercury loading and the high methylation efficiency of Minnesota lakes, many lakes in the state contain fish with elevated concentrations of mercury. Elevated levels of mercury in fish trigger the Minnesota Department of Health (MDH) to issue fish consumption advisories to restrict the amount and types of fish eaten.

Because of mercury contamination in fish, many Minnesota lakes have been listed as impaired, and are therefore subject to Minnesota's USEPA-approved Total Maximum Daily Load (TMDL). The TMDL acknowledges the current impairment and establishes a statewide goal of reducing current mercury emissions to 789 pounds from Minnesota sources. Strategies to implement the TMDL were recommended by an advisory group process that concluded in June 2008. This advisory group provided methods and a timetable for reducing emissions from Minnesota's emitting sources.

Given the public interest and concerns about mercury emissions from existing and proposed sources and the potential increases in fish mercury concentrations, and the fact that the recommendation of the TMDL advisory group includes an assessment of cumulative local impacts, a cumulative analysis for potential impacts related to mercury deposition and bioaccumulation in fish will be provided in the EIS.

Approach to Evaluation

The goal of this analysis is to determine if the potential local deposition of mercury from the proposed project will significantly increase mercury contamination of fish, either alone or as a result of the cumulative local deposition with other nearby new or proposed emission sources. The completion of the analysis will fulfill the TMDL Implementation Strategy requirement that new and expanding sources with a net increase in mercury emissions at the proposed site provide an analysis of cumulative local impacts.

This assessment will be conducted using the MPCA Mercury Risk Estimation Method (MMREM) for the Fish Consumption Pathway. MMREM is a simplified screening method to assess the effect of an emission source by calculating the potential incremental increase in mercury deposition contributed by that source above the statewide background deposition rate to a watershed from a facility's modeled average air concentrations due to local dispersion. Sources to be included in this cumulative effects analysis include those with significant mercury emissions within 12.4 miles (20 kilometers) of the Expansion Project (i.e., the project area). For multiple sources within 12.4 miles, the cumulative impact at water bodies can be calculated by summing superimposed, independently calculated deposition resulting from each facility. Existing sources are defined as currently operating facilities. Emissions from existing sources are already expressed as a part of the background mercury deposition and observed mercury concentration in fish (if data are available from fish collected five or more years after the facility began operation). The most recent fish concentration data should be selected to represent current conditions and establish baseline date to compare to facility start-up dates. If any of the existing sources started operations within 5 years prior to the date of the selected fish concentration value (i.e., the baseline date), that sources must be included in the cumulative assessment.

Planned new emission sources on proposed projects will also be included in the assessment. Planned new emissions sources are those that have been issued air emission permits authorizing construction, but have not yet started operating, or they are sources that have submitted an air quality permit application, or projects undergoing environmental review. The MMREM calculation should include the incremental local deposition using mercury emission rates and speciation profiles developed during the planned new source's air quality permitting process. A protocol for the cumulative effects analysis will be prepared and presented to the agencies for review and approval.

Data Needs for Cumulative Effects Analysis

This assessment will require the following data for the proposed project:

- Estimated upper-bound mass mercury emission rates for each combustion source;

- Mercury speciation profile for each proposed source [percent Hg(0), Hg(II), and Hg(p)];
- Air dispersion modeling to identify the geographic pattern of potential average annual mercury concentrations for the proposed project;
- Identification of specific lakes and watersheds potentially most impacted by the project; and
- Data on mercury in fish that the state monitoring program has obtained from water bodies within 6.2 km of the proposed project.

Data required from recently started sources and planned new mercury emission sources within 12.4 miles of the proposed project includes the:

- Description and location of each source;
- Mercury mass emission rates for each source;
- Speciation profiles for each source; and
- Dispersion modeling results or stack parameters and other data in order to conduct air dispersion modeling.

Wildlife

The undisturbed portions of the project area provide habitat for a variety of wildlife species. Upland areas support species common to second-growth forests, including white-tailed deer, snowshoe hare, gray wolves, and ruffed grouse and other bird species. The wetland areas provide habitat for songbirds, furbearers, amphibians, and other wetland species. Large animals may include deer, moose, coyotes, fox, Canada lynx, and bobcats.

Birds may include bald eagles, cormorants, swans, osprey, and hawks. On the west side of the reclaimed Keetac tailings basin, sharp-tailed grouse have established a stable population. Long-term reclamation will restore habitat value and corridors for wildlife movement for a limited number of species in upland areas and the tailings basin, but during active mining the project area will lose nearly all habitat value. The project area will not be available for hunting, trapping, or other wildlife-oriented recreation during production.

Proposed Treatment of Topic in EIS

Project-Specific Analysis

The EIS will include a qualitative description of wildlife species present in the project area and describe potential project impacts. The EIS will discuss mitigation, as warranted, through long-term mineland reclamation strategies and preservation of available wildlife corridors within or near the mining area.

Cumulative Effects Analysis

Wildlife Habitat

Since the State of Minnesota was established in 1858, its ecosystems have all been affected by both human and natural disturbances. The drastic reduction in native prairie, which has been converted to row-crop agriculture, is a well-known example of human disturbances. Much of the forested areas in the northern part of the state are still forested and appear to have been less impacted by disturbance in that they remain forested with native species. However, both human activities (e.g., mining, urbanization and logging) and natural disturbances (e.g., fire, windstorms, and insect infestation) have altered the character of the original ecosystems in the Arrowhead Region.

Assessment of the cumulative effects of any single human activity such as mining in the forested northern areas of the state is therefore difficult because that specific impact must be separated from all the other human and natural disturbances that have occurred. An assessment of cumulative effects on wildlife and wildlife habitats is not only constrained by the available data, (as are all such analyses), but by the interacting effects of human and natural disturbances.

In addition to general habitat loss, mining activity on the Iron Range has created a unique impact on the landscape in the Arrowhead Region. The locations and orientation of mineralized deposits, and thus the mining activities, are in a relatively narrow, linear band from Ely to Grand Rapids. The length and extent of 125 years of mining activity and associated infrastructure (shear-walled mine pits, stockpiles, haul roads and railroads, tailings basins, and associated structural development) in its entirety could potentially cause a landscape barrier that severs wildlife travel corridors. These landscape barriers may have impacts on dispersal, migration, and/or seasonal movements of large mammals, small to medium mammals, and reptiles/amphibians.

Each additional lost travel corridor through the Iron Range could potentially push this cumulative impact over a threshold. Once beyond that threshold, species' normal/historic movement and dispersal patterns could be altered forever. Negative consequences would be both short- and long-term, including effects on genetic distribution, food procurement, summer/winter range accessibility, annual dispersal and other yet unknown or unforeseen outcomes.

This landscape impact is not limited to wildlife. The Iron Range human population will be both impacted by, and in direct competition for, the remaining available travel corridors on the landscape. This remaining space is, or will be, needed for our communities and infrastructure. Planned mining development is the key to providing for a sustainable landscape on the Iron Range.

Approach to Evaluation

The approach to evaluation of habitat loss and landscape barriers will be to choose an appropriate analysis area, a baseline time and condition, and then: (1) assess the cumulative disturbance (habitat loss) of past and current mining and associated infrastructure development on that baseline condition; and (2) assess the presence of landscape barriers caused by past, current, and proposed future actions on dispersal, migration, and/or seasonal movements of large mammals, small to medium mammals, and reptiles/amphibians. Using other available information, a qualitative description of the habitat in areas disturbed by mining and habitat changes that were not associated with mining (e.g., logging, fire, windstorms, and insect infestation) will also be provided.

Marschner's map of the original vegetation of Minnesota that was recreated by Miron Heinselman in 1975 will be used to define the baseline vegetation condition. This map was compiled from the original land surveys of Minnesota during the period 1850 to 1905 at a 1:500,000 scale. Marshner mapped 16 vegetative/ecosystem categories, ranging from marshes to pine groves. The map therefore is the best representation of the original ecosystems of Minnesota before the impact of Europeans. Aerial photography will also be used to identify human-induced landscape barriers. Early aerial photography (~1930s) will be compared with recent aerial photographs to identify and illustrate the trends in landscape barriers. It is reasonable to assume that prior to human disturbance habitat barriers were minimal.

The quality of historical records generally is directly proportional to the area considered (i.e., the average of small-scale errors tends toward zero as increasingly large areas are considered). The geographic boundary for impact analysis of habitat loss will therefore be necessarily large encompassing the Arrowhead Region (e.g., Cook, Lake, St. Louis, Carleton, Aitkin, Itasca, and Koochiching counties).

For finer discrimination, albeit with more potential error, cumulative effects due to barriers will be focused on habitats within a proximity of the iron formation that are likely to impact wildlife that use those habitats. A buffer of 15 miles around the Iron Range will be used to focus this evaluation. Travel corridors that exist as part of the current condition will be identified and compared with the reasonably foreseeable conditions to locate opportunities for maintaining travel corridors. Identification of wildlife corridors will proceed primarily as a continuation of work initiated in the May 1, 2006 Emmons & Olivier resources report, "Cumulative Effects Analysis on Wildlife Habitat and Travel Corridors in the Mesabi Iron Range and Arrowhead Regions of Minnesota." The findings of this report will be combined with more recent data sources, including the DNR Mine Features, to refine understanding of the extent and utilization of wildlife corridors in the area.

The actual acres of the various ecosystems mapped by Marshner that have been disturbed by past and current mining and infrastructure development will be tabulated as will the relative loss by ecosystem category. These tabulations will also be summarized by ecological subsection. The area disturbed will be derived from the "Forested Areas" map from the Manitoba Remote Sensing Centre (16 classes, including Urban/Industrial, Gravel Pits and Open Mines, and Roads and Improved Trails and Rail Lines), 2003 Mine Features Geographic Information System (GIS) mapping layer available from the DNR. If those map layers are not suitable, then information from the "1990 Census of the Land" (nine categories including Urban and rural development and Mining) will be used. A similar assessment will be carried out overlaying a GIS layer of the projected cumulative disturbance 30 years in the future (total time of construction, operation and closure of current mining proposals) as related to proposed future actions identified above.

An interpretation of the extent of habitat barriers will be performed for small-and-medium sized mammals, large mammals, and reptiles/amphibians. In addition, an interpretation of habitat loss will be performed for species listed as threatened by U. S. Department of the Interior. All of these assessments will be qualitative and will be informed by previously completed studies in northern Minnesota (see below).

Previous assessments will be used to provide perspective on those changes in ecosystems that are associated with the cumulative effects of mining in contrast to those associated with other human and natural disturbances (e.g., logging, fire, windstorms, and insect infestations). These assessments were not specifically targeted on the mining areas of the state, but instead considered either the entire forested area of the state or a sub-area in northern Minnesota. The following assessments will be reviewed to provide a brief qualitative perspective on ecosystem changes not related to mining:

- Friedman, S. K. 2001. Landscape scale forest composition and spatial structure: A comparison of the pre-settlement General Land Office Survey and the 1990 forest inventory in northeastern Minnesota. Ph.D. thesis, University of Minnesota, St. Paul. Friedman reconstructed the pre-settlement forest vegetation in northeastern Minnesota using General Land Office Survey Records and assessed change in this forest following the introduction of logging and the suppression of fire;
- Minnesota Generic Environmental Impact Statement Study on Timber Harvesting and Forest Management in Minnesota (GEIS). The GEIS analyzed impacts resulting from timber harvesting and associated management activities in Minnesota, such as logging, reforestation, and forest road construction. Four sections of the GEIS may be useful in describing forest change not related to mining, including: Section 5.2.1 Forest Area and Cover Type Abundance, Section 5.2.4 Forest Fragmentation, Section 5.6.1 Forest Resources - Extent, Composition, and Condition, and Section 5.7.4 Cumulative Unmitigated Significant Impacts; and

- The MFRC Landscape Project. The MFRC Landscape Project is a landscape level program and coordination effort. As part of the proposed project, a number of reports have been generated that may be used in this evaluation of cumulative effects. All reports are available from the MFRC website http://www.frc.state.mn.us/Info/MFRCdocs.html, and include:
    - Changes in disturbance frequency, age and patch structure from pre-European settlement to the present in north central and northeastern Minnesota. LT-1203a;
    - Contemporary forest composition and spatial patterns of north central and northeastern Minnesota: An Assessment using 1990s LANDSAT data (accompanying maps/plates). LT-1203b;
    - Changes in forest spatial patterns from the 1930s to the present in north central and northeastern Minnesota: An analysis of historic and recent air photos (accompanying maps/plates). LT-1203c;
    - Potential future landscape change on the Nashwauk Uplands in northeastern Minnesota: an examination of alternative management scenarios using LANDIS. LT-1203d;
    - Background paper: relationships between forest spatial patterns and plant and animal species in northern Minnesota (Report) (Appendices). LT-1203f; and
    - Forest Plan Revision Final Environmental Impact Statement for Chippewa and Superior National Forests. As part of their comprehensive planning process, the U. S. Forest Service (USFS) developed an EIS that discussed changes in forest conditions with time. Appendix H is a cumulative review that is most relevant. This document can be found at http://www.superiornationalforest.org/analyses/2004Plan/feis/index.shtml.

Data Needs for Cumulative Effects Analysis

- Marschner's map of the original vegetation of Minnesota – available from the DNR Data Deli (http://maps.dnr.state.mn.us/deli/);
- The land cover map "Forested areas" from the Manitoba Remote Sensing Centre – available from the Minnesota Land Management Information Center (http://www.lmic.state.mn.us/chouse/land_use_comparison.html);
- The land cover map "1990s Census of the Land" – available from the Minnesota Land Management Information Center;
- The map: "Ecological Subsections of Minnesota" – available from the DNR Data Deli;
- 2007 Mine Features GIS mapping layer available from DNR;
- In addition, the reports cited above (Friedman, GIES, MFRC, and USFS) are necessary and available as noted;
- Early aerial photographs (~1930s), and recent aerial photographs (2004);
- Friedman, S. K. 2001. Landscape scale forest composition and spatial structure: A comparison of the pre-settlement General Land Office Survey and the 1990 forest inventory in northeastern Minnesota. Ph.D. thesis, University of Minnesota, St. Paul; and
- Heinselman, M.L. 1975. Interpretation of Francis J. Marschner's Map of the Original Vegetation of Minnesota. USDA, USFS, North Central Forest Experiment Station, St. Paul, MN. Available from: DNR - Division of Forestry's digitized GIS layer of Marschner's map.

b. Are any state-listed (endangered, threatened or special concern) species, rare plant communities or other sensitive ecological resources such as native prairie habitat, colonial waterbird nesting colonies or regionally rare plant communities on or near the site?
Yes ☑ No ☐

If yes, describe the resource and how it would be affected by the project. Indicate if a site survey of the resources has been conducted and describe the results. If the DNR Natural Heritage and Nongame Research program has been contacted give the correspondence reference number: 20080589. License Agreement No.: LA-425. Describe measures to minimize or avoid adverse impacts.

The Minnesota Natural Heritage database was searched in March 2008 to determine if any rare plant or animal species or other significant natural features are known to occur within the project area.

Animals
Listed animal species include:

Bald eagle (*Haliaeetus leucocephalus*) is a state special concern species that is no longer on the federal list of threatened and endangered species. The bald eagle was removed from the federal threatened species list in June 2007. The Natural Heritage Information System (NHIS) indicates that a bald eagle nest is located approximately 3.2 miles west of the existing tailings basin. However, the bald eagle remains federally protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. No direct impact to nesting eagles is anticipated.

Gray wolf (*Canis lupus*) is a state special concern species that is also no longer on the federal list. The site may be part of the overall range of the gray wolf. According to the U. S. Fish and Wildlife Service (USFWS) website, the gray wolf is recovering nationwide, including in Minnesota. The gray wolf was de-listed by the USFWS in March 2007. However, Section 4(g) of the Endangered Species Act requires USFWS to monitor gray wolf populations for a minimum of five years. Any gray wolves potentially present in the project area would be part of the Western Great Lakes Distinct Population Segment (WGLDPS). The Minnesota portion of the post-delisting monitoring for the WGLDPS includes the project area.

Canada lynx (*Lynx Canadensis*) is a federally threatened species that has been documented in St. Louis County. The site may be part of the overall range of the Canada lynx. The Canada lynx was put on the federal threatened species list in March 2000. Several unverified sightings of Canada lynx have been reported since 2000 within approximately 5 to 10 miles of the project site. The home range of the Canada lynx ranges from 20 to 94 square miles. Field studies to determine the presence of lynx in the project area will be conducted in late 2008 to early 2009. A wildlife biologist who specializes in lynx surveys conducted a brief, preliminary lynx field assessment in the vicinity of the Keetac iron ore mine site in late May 2008. The wildlife biologist spent two days evaluating conditions on the site. There was little snow on the ground, but he found areas with promising lynx habitat, including a "sustainable forest area." He will return to survey this area in the winter, when tracking conditions are more suitable.

Plants
The search found two locations of the tubercled rein-orchid (*Platanthera flava*), one location of the pallid moonwort (*Botrychium pallidum*), and one location of the blunt-lobed grapefern

(*Botrychium oneidense*), all Minnesota endangered species. In addition, two locations of the state-threatened St. Lawrence grapefern (*Botrychium rugulosum*) were located within the control boundary west of an unnamed wetland (DNR Public Water 31-38-W) to the west of the final pit limit.

Additional listed plant species are known to occur immediately adjacent to the project area. Field surveys to determine the presence of plant species listed as endangered or threatened at the state or federal levels will be conducted between June and September of 2008. During these surveys the previously surveyed areas will be examined to verify the presence of listed plant species.

Species designated as species of special concern are not legally protected by the State of Minnesota, but efforts will be taken to avoid them or minimize impacts. The least moonwort, (*Botrychium simplex*), special concern species, was identified at three locations south of Trunk Highway 169 and northwest of the tailings basin. Other populations of special concern species are known to occur nearby but outside of the project's limits.

Proposed Treatment of Topic in EIS

Project-Specific Analysis
The EIS will include the results of the rare plant survey and database search results, describe potential impacts to state- and federally-threatened or endangered species or species of special concern and suggest mitigation, if warranted. Existing information will be evaluated and additional information collected if necessary to support state and federal regulatory requirements for threatened and endangered species and species of special concern. Potential mitigation strategies and alternatives will be evaluated to avoid or minimize any identified impacts.

Field studies will be conducted in late 2008 to early 2009 to determine the presence of Canada lynx in the project area. An interim report will be submitted as part of the EIS that summarizes information regarding lynx habitat, sitings, and other recent studies. In addition, a second report will be submitted that summarizes the findings from the winter survey.

Cumulative Effects Analysis

Loss of Threatened and Endangered Species
The environmental review process for the Expansion Project will need to address potential cumulative effects to federal- and state-listed species. Cumulative effects were addressed for both the Minnesota Steel and PolyMet Mining (NorthMet) projects through semi-quantitative analyses. The Minnesota Steel report was part of their EIS that was determined to be adequate in August 2007.

Minnesota's Endangered Species Rules (parts 6212.1800 to 6212.2300) impose a variety of restrictions, a permit program, and several exemptions pertaining to species designated as endangered or threatened. The federal Endangered Species Act of 1973, as amended (16 U.S.C. §1531 - 1544) requires the U. S. Department of the Interior to identify species as endangered or threatened according to a separate set of definitions, and imposes a separate set of restrictions pertaining to those species.

Sensitive species potentially affected by the project include the federally-threatened Canada lynx the federally de-listed gray wolf and several vascular plant species listed by the DNR as endangered, threatened or of special concern. The "Post-Delisting Monitoring Plan for the WGLDPS of the Gray Wolf (Canis lupus)" was published in April 2008. This plan will need to be

reviewed to determine whether cumulative effects associated with the project would have implications for the monitoring of the gray wolf.

It is possible that the development and operation of the project could result in the taking of a limited number of state-listed threatened or endangered species. However, until field surveys are conducted, this will not be known with any certainty. Should the taking of listed species be proposed as a result of the project, a cumulative effects analysis will be performed to assess the cumulative loss of those specific species populations.

Previous Studies
Several studies have been conducted in recent years for projects similar to the Expansion Project. Most of these studies provide relevant data and information to assess cumulative effects associated with the proposed project. These studies include the following:

- "2007 Canada Lynx Assessment: Final Report", prepared for Minnesota Steel Industries (MSI) by ENSR Corporation, April 2007 – This report provides recent data on the presence and distribution of lynx in the immediate vicinity of the project. The report found that "The proposed project may affect lynx found in the vicinity of the project site, but the project would not adversely affect lynx populations or their critical habitat. Lynx likely do not reside in the study area. However, lynx could travel through the area and it is reasonably foreseeable that mine project activities could impact movements through the area";
- "Cumulative Effects Analysis on Wildlife Habitat and Travel Corridors in the Mesabi Iron Range and Arrowhead Regions of Minnesota", prepared by Emmons-Olivier for DNR, May 2006 – Information within this report would help address potential cumulative effects to Canada lynx and gray wolf populations;
- "2005 Botanical Survey: Minnesota Steel Industries, LLC", prepared for MSI by Barr Engineering Co., August 2005. – The botanical survey report would provide additional information on the distribution of sensitive plant species in the area immediately west of the Keetac project;
- "Minnesota Steel Botrychium Transplant Strategy", prepared for DNR and MSI by Barr Engineering Co., September 2006 – the transplant strategy for the Minnesota Steel project includes a lengthy discussion of the life history and statewide distribution of Botrychium species in Minnesota. Many Botrychium species have endangered, threatened or special concern status, and it is likely that one or more Botrychium species will be encountered on the project; and
- Additional botanical studies conducted for other Iron Range mining projects – Barr has conducted field surveys and prepared botanical reports for several other mining projects on the Iron Range, and within the area for which cumulative effects to sensitive species would be assessed.

Approach to Evaluation
The various botanical and wildlife reports that have been submitted for the Minnesota Steel, PolyMet and other mining projects will be reviewed to determine the extent of relevant information for assessing cumulative effects to sensitive species. Possible additional work to supplement these reports is discussed below.

1. Conduct additional lynx surveys. Additional field surveys should be conducted to fill in gaps in the fieldwork conducted for the Minnesota Steel lynx assessment. The additional surveys, combined with the Minnesota Steel data (which covered most of a 6-mile radius around the Minnesota Steel project), should be sufficient to produce a report with findings that would be incorporated into the Keetac cumulative impact assessment. Preliminary work planning the lynx field surveys began in April 2008 and the surveys

will be conducted in late 2008 or early 2009, as part of the EIS, when appropriate snowfall is available for tracking;
2. Contact the DNR Natural Heritage Database for local records of listed species. A request was made to the DNR in February 2008. The requested data was provided in early March 2008;
3. Conduct Keetac-specific botanical surveys. Field surveys for Minnesota-listed plant species were conducted in June and August 2008. The results of these surveys will be combined with discussions on the distribution of specific plant species to provide the local, regional and statewide assessments of a given species rarity and vulnerability to the cumulative impact of mining-related activities; and
4. Coordinate with USFWS to determine needs for gray wolf compliance. It is expected that the proposed activities would have no direct or cumulative bearing on the WGLDPS monitoring program.

Losses from other proposed projects with the potential to affect the species of interest discussed above would also be included in the analysis if the necessary species population information is available at the time of the analysis and can be provided by the DNR.

Known records of each potentially affected species will be compiled within the state from the NHIS and a distribution map for each species will be prepared. The data will be compiled to summarize the number of known populations, approximate numbers of plants and locations. The baseline condition would also include a description of how land use conditions affecting the various species have changed over time and how they are likely to change in the future; both with and without the proposed projects.

Impacts related to past, present, and reasonably foreseeable future actions would be evaluated through a semi-quantitative summary of the number of populations and individuals of each species that may be affected and the magnitude of those effects based on the knowledge of the species within the state. This evaluation will include determining whether the various species are particularly vulnerable to decline. The magnitude of the effects will be evaluated within the context of the state, the affected region, and the DNR regulatory program.

Data Needs for Cumulative Effects Analysis

- NHIS records for the potentially affected species (acquired March 2008);
- Statewide takings permit information for the potentially affected species;
- Life history information for the potentially affected species (available for most species in existing reports);
- Available threatened and endangered species survey information for reasonably foreseeable future projects; and
- Land cover and habitat characteristics for the proposed project site before the proposed project and the likely land cover and habitats that will be present after the project is complete.

Table 11a-1: **Rare Species Present Within or Near the U. S. Steel Site**

Common Name	Scientific Name	State Status[1]	Minnesota Steel Observations	Approximate # of Individuals	Habitat where found
Pale moonwort	*Botrychium pallidum*	E	1 population	4	Formerly disturbed area, <15% tree cover
Ternate grapefern	*Botrychium rugulosum (ternatum)*	T	2 populations	8	Formerly disturbed area, <15% tree cover
Least grapefern	*Botrychium simplex*	SC	3 populations	~350	Full to shady exposure, edge of alder thicket,
Matricary grapefern	*Botrychium matricariifolium*	Trk	4 populations (not all populations recorded)	55+ (2 populations not enumerated)	Openings in second-growth forest
Tubercled rein-orchid	*Platanthera flava*	E	2 populations	90 +	Moist meadow, moist quaking aspen stand

[1] E - Endangered, T - Threatened, SC - Species of Concern, Trk - Tracked

12. **Physical impacts on water resources.** Will the project involve the physical or hydrologic alteration — dredging, filling, stream diversion, outfall structure, diking, and impoundment — of any surface waters such as a lake, pond, wetland, stream or drainage ditch?
☑ Yes ☐ No
If yes, identify water resource affected and give the DNR Public Waters Inventory (PWI) number(s) if the water resources affected are on the PWI: See Below. Describe alternatives considered and proposed mitigation measures to minimize impacts.

Affected Lakes and Streams

Public waters and watercourses in the vicinity of the project are shown on Figure 12-1. Direct physical impacts to water bodies other than mine pits will be limited. Indirect impacts may occur via watershed changes and mine dewatering. The dewatering plans for the proposed project were described in response to Item 6b. Water use and supply for the project are discussed in response to Item 13 and impacts to water bodies due to dewatering and other flow changes are discussed in response to Items 17 and 18. Water bodies potentially impacted are listed in Table 12-1.

Table 12-1: Potentially Affected Waters

Name	Public Waters Inventory Status/ID	Type of Impact
O'Brien Reservoir (Reservoir Four)	31-1225P	Possible change in flow due to mine dewatering
O'Brien Creek	Public water stream	Possible change in flow due to mine dewatering
Swan Lake	31-67P	Possible change in flow in the lake due to mine dewatering and plant make-up water fluctuations
Swan River	Public water stream	Possible change in flow due to mine dewatering and plant make-up water fluctuations
Welcome Lake	69-902W	No changes anticipated
Welcome Creek	Public water stream	Possible change in flow due to mine dewatering and plant make-up water fluctuations
Hay Lake	31-37W	Possible change in flow and plant make-up water fluctuations

Name	Public Waters Inventory Status/ID	Type of Impact
Hay Creek	Public water stream	Possible change in flow from seeps to Upper Hay Creek as tailings basin expands
Kelly Lake	69-901P	Possible change in flow due to stormwater runoff
Snowshoe Lake	69-900W	Possible change in flow due to stormwater runoff
Unnamed Lake (Reservoir Two North)	31-1228P	Possible change in flow due to mine dewatering plant make-up water fluctuations
Reservoir Five	Not a public water	Possible change in flow due to mine dewatering and plant make-up water fluctuations
Unnamed Lake (Reservoir Six)	31-1229P	Possible change in flow due to plant make-up water fluctuations
Unnamed Lake (Reservoir Two)	31-1039P	Possible change in flow due to mine dewatering
Unnamed Wetland	31-38W	Reduction in watershed area due to mine dewatering

The geomorphology of rivers and streams are directly related to the magnitude, timing, duration, and rate of change in water flow. Changes in stream flow due to the proposed project have the potential to affect stream geomorphology. The degree of flow change combined with the sensitivity of the stream channel to flow changes can be used to determine what level of impact would likely occur. If the water balance completed for the EIS indicates a significant increase in water discharge to receiving waters, a hydrologic evaluation will be completed for the project (see response to Item 13) that can be used to identify how the proposed project would change flow in affected streams. An analysis of stream sensitivity will be needed to determine if predicted flow changes would impact stream geomorphology. The Rosgen methodology for assessing stream channel shape and processes is a recognized hierarchical framework that can be used to determine the impacts of hydraulic alteration to stream geomorphology.

Proposed Mitigation Measures to Compensate For Unavoidable Impacts to Lakes and Streams

A detailed project water balance and watershed yield will be conducted to help quantify changes to stream flow and lake water levels during mining and after closure. The EIS will address potential impacts in detail, especially for Swan Lake. The objective of this analysis will be to retain the present water level fluctuation regime for Swan Lake. The EIS will also propose a conceptual post-mining watershed reclamation plan to assure an adequate flow of water after mining ceases. Pit dewatering during mining and post-mining outflow from the pits will be controlled to prevent unacceptable fluvial-geomorphic impacts.

Wetlands and Water Bodies

Overview of Affected Wetlands

The projected un-permitted wetland impacts for the proposed project are shown on Figure 12-4. Wetlands are defined as transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands extend to water depths in which vegetation normally persists (typically 6 to10 feet in depth). Deepwater habitats are present where water is too deep to support emergent vegetation. Former mine pits are mapped as deepwater habitats and are exempt from jurisdiction under the Minnesota Wetlands Conservation Act (WCA). Wetlands that have formed on artificial land surfaces created from past mining activities are considered incidental and are also not under the jurisdiction of the WCA. However, the USACE may claim Clean Water Act (CWA) jurisdiction over wetlands and deepwater habitats that have either formed on artificial land surfaces or have been impacted by

past mining activities, depending on the isolated nature of those features. Isolated wetlands may be considered non-jurisdictional by the USACE.

Some of the wetlands within the project area have been previously delineated and are intended to provide preliminary information for commencement of environmental review by the USACE and the DNR. However, additional information requests by the USACE are anticipated and additional data collection and submissions will be completed. Wetland replacement plans will also be reviewed by the DNR under the WCA through Minnesota Rules, chapter 8420. For mining projects this work is reviewed as part of the issuance of the Permit to Mine. Impacts to public waters are also reviewed by the DNR under the Public Waters Work Permit Program through Minnesota Rules, chapter 6115. Authorization of activities through an Individual Permit under Section 404 of the CWA requires Section 401 Water Quality Certification, which is administered by the MPCA. The MPCA also administers Wetland Standards and Mitigation through Minnesota Rules, part 7050.0186.

Most of the wetlands within the project areas have either been developed on disturbed mine lands or are natural wetlands that have been impacted by past mining activities. Figure 10-1 shows the general areas of the project that are composed primarily of disturbed or artificial land surfaces that resulted from past mining operations. Wetlands and water resources present throughout the project site are shown on Figure 12-2. Hydric soils within much of the project area are shown on Figure 12-3.

The current project configuration has been developed to utilize previously disturbed areas and to reduce wetland impacts. Using “upstream construction” methods or “stacking” of tailings will minimize the size of the future tailings basin. These methods will allow a smaller footprint for the basin. U. S. Steel will continue to look for ways to avoid and minimize wetland impacts, particularly in planning the location of stockpiles.

The wetlands that have been delineated to date are a subset of the potential overall wetland impacts. Additional areas within the Keetac project areas will be disturbed before and after production begins. These areas include:

- Tailings basin;
- Mine pit expansion area; and
- Lean ore, waste rock, and overburden stockpile areas.

The remaining wetland resources in these areas have been mapped using off-site delineation methods and were field-verified in the summer of 2008. Wetlands will be identified, delineated, characterized and mapped in these areas so that appropriate avoidance, minimization, and mitigation can be developed. Wetlands identified within the project area will also be characterized as natural or created during the field investigations.

Wetland Impacts

The projected un-permitted wetland impacts for the proposed project are shown on Figure 12-4. A summary of all potential wetlands and deepwater habitats in the project area is provided in Table 12-2. U. S. Steel currently estimates that a total of 604.5 acres of wetlands would be impacted by the proposed project including: plant facilities, mining activities, tailings basin, and rock and overburden stockpiling. In addition, approximately 72.0 acres of wetlands and 46.0 acres of deepwater habitats that have been permitted (i.e., authorized to be impacted) under previous efforts are expected to be affected by the proposed project. A summary of potential wetland impacts resulting from the proposed project by wetland type cannot be provided at this time due to the lack of wetland classification data in areas where field verification has not been completed. A more detailed approximation of wetland impacts associated with each major project

component will be determined following the completion of field wetland delineations and project planning.

Wetland Impacts of Mine Operations
The proposed mine expansion area would impact 217.1 acres of wetlands within 16 wetlands previously not authorized to be impacted. In addition, the mine pit expansion will impact a total of 35.2 acres of wetlands previously authorized to be impacted (Figure 12-4). The mine pit expansion would impact only one mine pit that was not previously authorized to be impacted encompassing approximately 46.0 acres.

Development of the mine pit would require dewatering. After mining has been completed, the mine pit would be allowed to fill with water and may be partially developed into shallow-water habitat, if in-pit disposal of waste rock and overburden are feasible and pursued.

In addition to direct impacts of pit development, there is the potential that mine pit dewatering could indirectly impact wetlands. However, there are numerous examples of wetlands thriving on the rim of mine pits for many years and it appears probable that there will not be significant indirect wetland drainage impacts resulting from mine pit dewatering.

Nonetheless, U. S. Steel conducted a study that began in the summer of 2008 to evaluate the potential for wetland drainage impacts. This study placed shallow wells in existing wetlands near the proposed mining areas to establish a baseline for evaluating any future changes to wetlands.

Wetland Impacts of Plant Facilities
No wetland impacts are expected from proposed changes associated with the processing plant.

Wetland Impacts of Stockpiles
The Expansion Project would require two new stockpile areas that are not currently permitted in Keetac's Permit to Mine. A large area to the east of the plant and mine pit (East Stockpile Area), and a smaller area immediately south of the mine pit west of the City of Keewatin (South Stockpile Area) will be needed (see Figure 5-3 and Figure 12-4). The smaller new stockpile area to the west of Keewatin is expected to result in 3.9 acres of wetland impacts within one wetland previously not authorized to be impacted. The larger proposed stockpile area to the east of the Keetac plant is anticipated to impact 395.7 acres within 17 wetlands that are not currently authorized to be impacted.

Approximately one- quarter of that wetland area is located on disturbed mine features. As shown in Figure 12-4, the Expansion Project will also impact some wetlands in areas that are currently approved for use for stockpiles in the existing Keetac Permit to Mine in the northwest portion of the project area. This area includes approximately 24.1 acres of wetlands that were permitted through previous wetland permitting efforts.

Wetland Impacts of Tailings Basin
The proposed tailings basin design minimizes impacts to wetlands by minimizing its footprint expansion. The total wetland impacts for the project life of the tailings basin is estimated to be 15.0 acres (Figure 12-4), of which 2.0 acres are mitigation wetlands that were developed to mitigate previous wetland impacts and 13.0 acres are mitigation wetlands that are currently being monitored for acceptance in U. S. Steel's wetland bank.

Table 12-2: Potential Wetland Impacts and Mitigation Banking Summary Expansion Project[1]

	Impacts			
Activity	**Permitted (Acres)**	**Un-permitted (Acres)**	**Wetland Mitigation Area at 1.25:1 (Acres)**	**Wetland Mitigation Balance (Acres)[2]**
Wetland Mitigation Credits		-	-	394.7
Wetlands				
Mine Area	35.2	202.9	253.6	141.1
South Stockpile Area	0.0	3.9	4.9	136.2
East Stockpile Areas	0.0	395.7	494.6	-358.4
Northwest Stockpile Area	24.1	0.0	0.0	-358.4
Tailings Basin Expansion Area[3]	13.0	2.0	2.5	-360.9
Deepwater Habitats				
Mine Area	45.9	0.0	0.0	NA
Total Wetland Impacts	**72.3**	**604.5**	**755.6**	**-360.9**
Deepwater Habitats within Project Limits[4]	**45.9**	**0.0**	**0.0**	**NA**

[1] Final delineation and monitoring of wetland mitigation areas have not been completed. Actual bank balance will not be known until after final delineation and monitoring is approved.
[2] Estimated – does not include previous mitigation completed in basin.
[3] Wetland mitigation areas currently being monitored for banking are just removed from the mitigation balance; it is assumed that no mitigation will be required (needs to be negotiated).
[4] When mining operations cease, mine pits will be allowed to refill with water. These reclaimed mine pits are proposed to provide compensation for the loss of deepwater habitats during the project.

Proposed Mitigation Measures to Compensate for Unavoidable Wetland Impacts

State and federal wetland laws include mitigation guidelines that place a preference on restoring drained wetlands over wetland creation and other methods of mitigation. There are also specific criteria and guidelines regarding wetland mitigation credit allocation for various methods of wetland mitigation. There are four main categories of mitigation methods considered as appropriate in northern Minnesota:

1. Restoration of Impacted Wetlands – This category includes completely drained wetlands, partially drained wetlands, and wetlands with at least a 20-year history of agricultural production. This is the preferred method for wetland mitigation. Credits are allocated in a range from 25 percent (of the area restored) for partially drained wetlands, to 33 to100 percent for cropped wetlands (depending on the cropping history) to 100 percent for completely drained wetlands.
2. Enhancement – This category includes the restoration of native vegetative communities within existing wetlands and upland buffers where vegetation is dominated by invasive or non-native vegetation. Credit is allocated at 25 to 33 percent for wetland enhancement and 10 to 25 percent for upland buffers. This method typically requires the development of a management plan and maintenance and monitoring for up to 10 years. This method is losing favor as an acceptable mitigation method.

3. Preservation – This method includes actions that would permanently preserve high-value wetlands that are under demonstrable threat and may require some restoration component. Preservation is typically accomplished through the recording of a permanent conservation easement over the threatened wetland. Credit allocation is currently suggested at 12.5 percent of the area preserved.
4. Creation – This is the least preferred method from a regulatory standpoint due primarily to the high risk of failure. This method is the least utilized for large mitigation projects, typically due to higher costs for wetland establishment. Wetland creation involves the construction of wetland areas from existing non-wetland areas. Wetland creation is often the most feasible method for on-site wetland compensation that may include the development of wetlands within a tailings basin. Credit allocation is suggested at 50 to 100 percent of the created wetland area.

The primary focus of the wetland mitigation plan for the first 5 years of the project is the continued development of approximately 395 acres of mitigation wetlands within closed areas of the tailings basin that were identified in a permit application in 2005 as areas suitable for wetland banking. Any mitigation wetlands developed to compensate for unavoidable wetland impacts will be protected with permanent conservation easements. Additional compensatory wetland mitigation will be needed for the project. Wetland mitigation planning for the expected wetland mitigation deficit of approximately 360.9 acres will be started in 2008 and an overall proposed mitigation plan will be included as part of the EIS. For impacts to lakes, pits and streams, as outlined in the initial table in this section, mitigative measures include possible augmentation pumping to maintain stream flows and modifications to streams and lake outlets to increase flow capacity.

For wetland impacts, the overall mitigation program will be defined at the beginning of the project and implemented in ongoing increments of approximately 5 years, as has been done at other Iron Range mines. During the initial permitting of the project, specific wetland mitigation projects will be identified to provide compensatory mitigation for impacts that are expected to occur during the first 5 years of the project. Additional potential wetland mitigation opportunities will be identified to compensate for unavoidable wetland impacts expected during proposed life of the project.

The following proposed protocols are aimed at identifying suitable compensatory mitigation for unavoidable wetland impacts resulting from the project. The final mitigation search protocol will be negotiated with state and federal agencies as part of the EIS process.

Proposed Search Protocol for Wetland Mitigation Sites

In general, mitigation opportunities closest to the project site would be given preference. The development of potential wetland mitigation projects would focus first on the minor project watershed and then the major project watershed, the Mississippi River – Grand Rapids Watershed. Should there be a net loss of wetlands within the minor or major watershed, the effect this may have on water quality and ecology within those watersheds would be evaluated through the cumulative effects analysis.

If on-site wetland mitigation opportunities are insufficient to compensate for the unavoidable wetland losses, a search protocol for wetland mitigation site would be prepared and submitted to the MPCA, DNR, and USACE. The search protocol would be conducted based on protocols used in previous projects approved by the the USACE, MPCA, and DNR in the region. For wetlands that cannot be mitigated on-site, the next priority for mitigation sites would be off-site locations, first within the major watershed, and then within adjacent watersheds. The watersheds adjacent to the project watershed include:

1. St. Louis River,
2. Little Fork River,
3. Big Fork River,
4. Mississippi River – Headwaters,
5. Leech Lake River,
6. Pine River,
7. Mississippi River – Brainerd, and
8. Kettle River.

Initial analysis has been completed to identify mitigation opportunities. A GIS analysis has been performed to identify potential wetland mitigation sites within the proposed project watershed and adjacent watersheds. The primary goal of this analysis was to identify potentially drained wetlands located primarily on private or tax-forfeit land. On federal lands, the granting of permanent conservation easements is generally not allowed. Based on past experiences, gaining the rights to conduct wetland mitigation on state land is uncertain, typically requiring an exchange of land and/or legislative approval to place a permanent conservation easement over the land. Therefore, opportunities on federal- and state-owned land will not be given priority in the search for compensatory wetland mitigation. The identification of potential wetland mitigation sites was established by overlaying and evaluating numerous existing spatial data sources (primarily from public domain sources) to identify those sites with the greatest potential.

The GIS analysis was conducted by establishing specific filtering criteria to identify potential wetland mitigation sites. The general filtering criteria included the following:

1. Land slopes of equal to or less than 1 percent slope based on an analysis of the USGS 30-meter digital elevation model,
2. Areas mapped as peat or lacustrine geomorphology,
3. Private or county tax-forfeit property,
4. Areas within 1.1 miles of a ditch, and ultimately, and
5. Areas meeting all of the above criteria with at least 100 contiguous acres.

The first phase of the analysis identified approximately 267 areas (including 144 areas less than 20 acres in size and 57 sites between 20 acres and 100 acres) within the major project watershed meeting the first four criteria listed above, regardless of size. Next, the adjacent watersheds were analyzed using the same criteria. That effort resulted in the identification of 1,272 potential wetland restoration areas within the eight adjacent watersheds including 640 areas less than 20 acres in size and 338 areas between 20 acres and 100 acres in size. The primary factor limiting the number of possible wetland restoration sites within the project major watershed is the lack of wetland drainage and the presence of the Hill River and Savanna State Forests within the watershed. Many of the potential wetland restoration areas were then evaluated by reviewing aerial photographs to determine if the analysis identified areas containing impacted wetlands that may have potential for wetland restoration. The majority of the sites evaluated, were determined to be natural wetlands that had not been significantly impacted, and therefore, had little wetland mitigation potential. The potential wetland restoration sites that were determined to have been impacted by past drainage or other human activities were generally larger areas.

Therefore, the next step in the analysis was to narrow down the sites identified to those of 100 acres or more. This GIS analysis resulted in the development of a map containing potential wetland restoration areas greater than 100 acres. This analysis identified 66 areas in the Mississippi River - Grand Rapids Watershed and 294 areas in adjacent watersheds. These 360 potential mitigation areas represent those with the highest potential for mitigation in the study area.

This analysis resulted in several findings. First, a large proportion of the study area is in state, federal, or tribal ownership, and therefore was determined to represent minimal potential for a private enterprise (U. S. Steel) to conduct compensatory wetland mitigation. Second, many of the large wetland systems within the study area have not been affected by historic drainage or other significant alterations. Finally, some of the study area is characterized by surface geology that is not indicative of large wetland systems prone to be easily drained. This includes much of St. Louis County, which is mapped with surface geology characterized by steep, igneous bedrock terranes, rolling till plains, and rolling to undulating areas of supraglacial drift. These geomorphological associations are also typically associated with steeper land slopes.

In addition to conducting a GIS analysis to identify potential wetland mitigation sites, agency staff involved in wetland permitting and banking have been contacted to determine if they are aware of other potential wetland mitigation opportunities. Landowners in the region who have expressed an interest in wetland mitigation or banking have also contacted to identify other potential sites. Also, properties available for sale in the area have been reviewed for wetland mitigation potential.

Should insufficient on-site wetland mitigation be identified, potential wetland restoration areas within the major project watershed using the proposed protocols described above may be evaluated to identify those that are reasonable, practicable, and environmentally beneficial replacement opportunities (M.R. 8420.0543,E). Sites would be prioritized based on the methods included in the state and federal regulatory rules and guidance. Reasonable, practicable, and environmentally beneficial opportunities include those that:

1. Take advantage of naturally occurring hydrologic conditions and require minimal landscape alteration;
2. Have a high likelihood of becoming a functional wetland in perpetuity;
3. Do not adversely affect other habitat types important in maintaining the overall biological diversity of the area; and
4. Are available and capable of being done considering cost, existing technology, and logistics consistent with the overall project purpose.

U. S. Steel will prepare a detailed wetland mitigation plan to compensate for the unavoidable impacts to wetlands and to comply with the no-net-loss provisions of the WCA rules and Section 404(b)(1) guidelines of the CWA. Both state and federal wetland laws require that unavoidable wetland impacts be mitigated in-kind, on-site, and ahead of time when practicable. The specific guidelines for each of these factors are:

1. Location – within the project watershed;
2. Wetland type – of the same wetland type as the impacted wetlands using the Eggers and Reed wetland classification system; and
3. Schedule –mitigation must be completed at least one full growing season before the impacts occur.

If all three factors are met, the federal guidance suggests a minimum compensatory mitigation at a 1:1 ratio. For each factor that is not complied with, the suggested ratio increases by 0.25 up to a maximum of 1.5:1. The mitigation plan will be developed consistent with the replacement standards specified in the WCA rules and the USACE compensatory mitigation guidelines.

It is proposed that detailed wetland mitigation plans be developed consistent with the criteria outlined below during the initial permitting of the proposed project. It is anticipated that specific wetland mitigation opportunities will be identified during development of the EIS. The development of these opportunities will likely include the following:

1. The identification of the properties required for completing the wetland mitigation projects;
2. An analysis of the location requirements in the WCA and the CWA for each project including the proposed mitigation ratios that would apply;
3. A description of the existing wetland resources within each project area;
4. A conceptual plan for restoring/creating wetland resources within each project area;
5. A description of the wetland resources that will be restored, created, or preserved;
6. A summary of the wetland areas that will be restored, created, or preserved;
7. A preliminary schedule for conducting the wetland mitigation activities;
8. A monitoring program to track success of each wetland mitigation project;
9. Additional information regarding deed restrictions or conservation easements that will be recorded; and
10. Assurances from the landowners regarding their willingness to either participate in the mitigation project or to sell the property needed for the project.

It is proposed that restored or created wetlands be designed in accordance with the following design criteria, where practicable:

1. Side slopes of the wetland and buffer strip are not steeper than 5:1 and preferentially at least 10:1 as averaged around the perimeter of the wetland;
2. The wetlands are constructed with an irregular shape to establish points and bays consistent with the local landscape;
3. Bottom contours are undulating to provide variable water depth that will support a variety of wetland plants;
4. Non-adjustable control structures are installed to maintain appropriate hydrologic conditions; and
5. Water levels are established at a depth not to exceed 6.6 feet.

Proposed Treatment of Topic in EIS

Project-Specific Analysis

The proposed project has the potential to significantly affect surface and groundwater resources in the project area both during and after mining. A detailed project water balance and watershed yield will be conducted to help quantify impacts on stream flow and lake water levels throughout mining and after closure. The EIS will include a major discussion of this topic including:

- Impacts to open water areas and wetlands throughout the proposed project; and
- Dam safety issues.

A Level 1 Rosgen analysis of stream geomorphology will be completed on O'Brien Creek to identify any potential stream reaches that may be sensitive to changes in stream flow. This information will be compared with the stream flow change information (described in Item 13) to identify any stream reaches that require further evaluation for impacts. If this further evaluation identifies any significant adverse impacts due to changes in water flow, monitoring and mitigation will be developed. Macro invertebrates will also be surveyed on O'Brien Creek and a macro invertebrate monitoring program discussed.

Wetland delineations, mitigation sites, and feasibility of wetland mitigation will be evaluated in the EIS. The potential for indirect wetland impacts due to the proposed project will also be evaluated in the EIS.

The EIS will suggest monitoring and mitigation where necessary to better define potential impacts and avoid or minimize known impacts.

Cumulative Effects Analysis

Stream Flow and Lake Level Changes

Cumulative effects to the physical character of streams and lakes can occur from increases or decreases in flow or changes in the pattern of flow. The causes can include both point discharges (e.g., mine dewatering discharges) and changes in watershed runoff caused by land use changes (e.g., removal of vegetation). Flow changes can cause erosion, sedimentation, low-flow conditions, and high water velocities all of which can impact aquatic biota. Changes in frequency of bankfull flow can cause stream degradation. Changes to streams may accumulate over time, even for non-contemporaneous impacts. For example, a stream may become eroded and degraded by one project and then further eroded by a second project.

Changes in water management at Keetac may result in changes in area hydrology due to pit expansion. When mining ceases at Keetac and adjacent mining operations, dewatering activities will cease and mine pits to fill with water. This progression of activities will result in changes in area hydrology over time. Changes in area hydrology need to be considered with respect to other mining operations and the timing of their closure activities.

Flow impacts to streams and lakes are regulated under the DNR's program for appropriations of water and for work in public waters. Physical impacts to wetlands are also regulated by the USACE, DNR, and MPCA.

Approach to Evaluation

A quantitative assessment of possible cumulative effects due to changes in water flow will be performed for upper Swan River and Swan Lake.

Evaluation of hydrologic changes could be done with two major types of models. Changes in short-term flow patterns (e.g., storm runoff) are typically analyzed using hydrologic simulations models such as TR-20, HEC-1 (now HEC/HMS) or SWMM. Long-term flow patterns are most readily analyzed using models such as WATBUD, SWMM (in continuous simulation mode) model. As mentioned above, the changes to the long-term flow regime are more likely to have impacts so the latter class of models would be best.

Based on land use and land cover data from the cumulative effects studies for wildlife and wetlands, a pre-settlement hydrologic model can be created. Direct calibration of this model will not be possible. The only readily available historic data is USGS gauging data from the years 1964 to 1990. This period already includes significant disturbance of natural watershed conditions because of mining and timber harvesting activities. The model, therefore, will be evaluated for reasonableness by comparing reference watersheds that are largely undisturbed to the watersheds potentially impacted by the proposed project. The model will then be modified and calibrated. This analysis will include the effects of past and present actions (through 1990), including:

- Existing Butler Taconite pits and preceding natural ore pits. Modification of land use (including wetland loss) by past mining practices within the upper Swan River watershed, and proposed changes by MSI;
- Operation of Keetac pits and tailings basins and predecessor natural ore mining operations;
- Construction and operation of the Swan Lake weir;
- Typical timber harvest activities on county and private lands; and
- Existing runoff from the development of cities of Nashwauk and Keewatin, including operation of wastewater treatment plants.

The hydrologic models will be modified to include actions since the date of the monitoring and potential future actions including:

- Minnesota Steel discharges to upper Swan River;
- Minnesota Steel appropriations for process water and stream augmentation from Pits 1 and 2;
- Long-term flow management of Hibbing Taconite Company's (HTC's) pits during and after filling of pits, particularly with regard to inter-basin transfer of water;
- Changes in runoff quantity due to future development of the cities of Keewatin and Nashwauk;
- Any reasonably foreseeable changes to discharges from Nashwauk and Keewatin POTWs due to development and/or treatment system changes;
- Any potential changes in water discharge from Keetac discharges in the upper Swan River watershed;
- Any reasonably foreseeable changes to timber harvest activities on state and county lands and private lands; and
- Changes to watersheds and reclamation/restoration possibilities, including HTC's contribution to a combined pit at the east end of Keetac's pit.

The threshold of significance for this cumulative impact assessment for streams will be the likelihood of major change in stream morphology as defined by the Rosgen classification method or other applicable methods (Rosgen, 1994). This analysis will be based on stream reconnaissance completed in 2005 by Minnesota Steel Industries as a base condition, which will then be modified by predicted changes in stream flow.

The threshold for evaluation of cumulative effects to Swan Lake will be significant changes to the range or frequency of high- and/or low-water conditions in the lake as determined by the annual maximum and minimum stage-probability relationships for the lake.

Data Needs for Cumulative Effects Analysis

- Flow data for Swan River at or above the Swan Lake outlet;
- Lake level data for Swan Lake;
- Discharge data for Nashwauk and Keewatin POTWs;
- Discharge data for Butler Taconite;
- Historic air photos or GIS coverages showing modification of land use (including wetland loss) by past mining practices within the upper Swan River watershed;
- Discharge data from Keetac and evaluation of changes to Keetac discharges from resulting from the Expansion Project;
- Data on typical timber harvest activities, state and county lands and private lands;
- Estimates of existing and future land use for the cities of Nashwauk and Keewatin; and
- Estimates of future Minnesota Steel discharges from mine pits and tailings basins, during project development, operation and closure, including long-term flow management of pits during and after filling of pits.

<u>Potential for Inter-basin Transfer of Water in the U. S. Steel – Keetac and Hibbing Taconite Mining Area</u>

The state of Minnesota contains four continental watersheds. Water flows north (Red River of the North Basin), south (Mississippi River Basin), east (Great Lakes Basin), and west (Missouri River Basin) from our state. Minnesota is the headwaters of three of these basins. The junction of these three major watersheds is located north of Hibbing in the northeast portion of the state.

The divide that separates water flow to the Arctic Ocean from all other drainages in North America, is known as the Northern Divide. In northern Minnesota, the Northern Divide is commonly known as the Laurentian Divide.

The Laurentian Divide is a high crest of low, rocky hills and separates the Red River and Rainy River basins from the Mississippi River and Lake Superior basins. Streams on the north slope of the divide flow through Canada to Hudson Bay and on to the Arctic Ocean. On the opposite side of the divide, streams flow south to Lake Superior and the Atlantic Ocean or the Mississippi River and the Gulf of Mexico.

Due to on-going mining activities and geologic conditions at the Keetac and HTC mines, there is the potential for water to be transferred between the Lake Superior watershed and the Mississippi River watershed. The inter-basin transfer of water has environmental as well as legal implications. Therefore, the potential for transfer of water between watersheds will be studied during the EIS process. It should be noted that the existing permit to mine for the HTC mine allows mining activities along and across the watershed divide and therefore the potential for inter-basin transfer exists regardless of the Expansion Project. Although HTC's activity is already permitted, the analysis of the potential inter-basin transfer may influence Keetac mining operations.

The Keetac operation is directly adjacent to the HTC operation. Kleffman Road (County Road 60) forms the watershed divide in this area and separates waters that flow to Lake Superior from those of that flow to the Mississippi River.

In this area, a large fault called the Lamberton trends northwest to southeast and is believed to act as a significant subsurface hydrologic conduit between the mining pits on either side of the watershed divide and Kleffman Road, thereby potentially connecting HTC and Keetac operations. This assumption is adopted from Maki et al (2001) who provide this background:

> "A north-south strip of oxidized iron formation may be left in place under Kleffman Road. The Lamberton fault bisects this oxidized material in a northwest to southeast direction under the road. Conversations with HTC employees revealed that when pumping was initiated in the Carmi-Carson Pit [Lake Superior watershed], the Lamberton Pit [Mississippi River watershed] water [level] dropped significantly, indicating a significant hydrologic connection between the two pits".

Currently, HTC pit operations in the Lamberton Pit on the west side of Kleffman Road have broken into the Section 18 Pit operated by U. S. Steel Keetac. Therefore, when mining and subsequent dewatering activities cease, this pit complex will fill with water. Upon filling, the surface waters will find the lowest topographic elevation of the pit complex rim and outflow (runout). With the imminent pit complex extending to the watershed divide at Kleffman Road coupled with the highly transmissive properties of the Lamberton fault, the connection of these two major continental watersheds will be absolute. Therefore, it is important for the proposed Expansion Project to evaluate their future mine pit footprint. Again, the conditions that may cause an inter-basin transfer of water already exist and would not be caused by the proposed project.

Approach to Evaluation

The EIS will discuss the potential for an inter-basin transfer of water between the Lake Superior and Mississippi River watersheds. The footprint area of current and future mining pits associated with the Keewatin Taconite and HTC operations will be evaluated to identify key future pit water runouts. This EIS will validate and update information for runouts identified in Herr and Gleason (2007) within both mine pit complexes on either side of the watershed divide. This information

and subsequent protection of identified areas under a Permit to Mine will set the stage for mine closure evaluation and intended compliance with the State of Minnesota's Mineland Reclamation Rules, part 6130.2200. The protection of runout locations and elevations within each watershed on either side of the Lamberton fault will be critical to assuring equal distribution of flows to both the Lake Superior and Mississippi River watersheds and reduce the likelihood of the inter-basin transfer of water. Possible downstream impacts will not be evaluated because water quantities stemming from this issue are not expected to change due to mitigation.

Loss of Wetlands

The Minnesota WCA Rules (Minnesota Rules, chapter 8420) regulate the draining, filling, and excavating of wetland resources to maintain no net loss. The rules include a permit program to allow for unavoidable wetland impacts requiring replacement of lost wetland resources at ratios ranging from 1:1 to 1.5:1. Section 404 of the CWA regulates the discharge of dredged or fill material to waters of the U.S., which includes wetlands hydraulically connected to navigable waters or interstate waters. An MPCA 401 Water Quality Certification is also required as part of the Section 404 permit process. The 404 permit program includes provisions for allowing unavoidable wetland impacts that must be mitigated at minimum ratios ranging from 1:1 to 1.5:1.

The development and operation of the plant, mine and tailings basin would result in the loss of wetland resources. Therefore, an analysis will be performed to assess the cumulative loss of those specific wetlands and the past and projected loss of other wetlands in the Welcome Creek, Hay Creek and O'Brien Creek watersheds.

Approach to Evaluation

A semi-quantitative analysis of cumulative effects to wetlands will be performed. Because several of the primary functions performed by wetlands are directly related to watershed processes, the analysis will be performed on a watershed basis. The baseline condition for wetland resources will be established using the approach described below.

The National Wetland Inventory (NWI) data will be used to help establish the baseline wetland condition in the undisturbed areas of the watersheds affected by the project since it is the best data representing the extent of wetland resources in the affected watersheds. In the areas of the watersheds that have been significantly altered, wetlands will be mapped and classified to the extent feasible using a number of historic data resources layered in a GIS including:

- Previous wetland delineations conducted prior to mining activities;
- 1930s aerial photographs;
- Original USGS 7.5 minute quadrangle topography maps from the early 1950s, prior to the onset of taconite mining activities; and
- DNR GIS data that incorporates notes from the original survey of the area and includes detailed wetland vegetation information.

The baseline condition will also include a description of how conditions affecting wetlands have changed over time and how they are likely to change in the future, both with and without the proposed project.

A similar wetland mapping effort may be conducted to establish wetland conditions at an interim point in time (such as 1970) to help track trends in wetland loss.

The next step will be to prepare maps of wetland resources, as they exist at the present time, before the start of any further projects in the affected watersheds. This wetland mapping will be prepared using information from the NWI and from site-specific wetland surveys that have been conducted within the areas of the affected watersheds. This wetland mapping will be compared to

the historic wetland (baseline) mapping to quantify the effects of past activities on wetland resources within the analysis area.

Losses from other proposed projects with the potential to affect wetland resources in the affected watersheds will also be included in the analysis if wetland impact information is available at the time of the analysis.

Impacts related to past, present, and reasonably foreseeable future actions will be evaluated. This will be accomplished through a quantitative summary of the number of acres of wetland types that may be have been affected in the past and may be affected in the future and the magnitude of those effects within the watershed. Trends that may be discernible from evaluating the data will be determined. This evaluation will include determining whether various wetland types are particularly vulnerable to rapid degradation. The magnitude of the effects will be evaluated within the context of the overall wetland resources within the watershed.

Alternative configurations of the proposed project may be evaluated to determine if the projected impacts can be minimized. Unavoidable wetland impacts will be mitigated in accordance with the state and federal wetland permitting programs. The tailing basin wetland bank will be used to mitigate wetland impacts.

Data Needs for Cumulative Effects Analysis

- NWI maps for the affected watersheds;
- 1930s, 1970s and most recent good quality aerial photographs;
- Original USGS 7.5 minute quadrangle topography maps from the early 1950s, prior to the onset of significant mining activities;
- DNR GIS data that incorporates notes from the original survey of the area and includes detailed wetland vegetation information;
- Wetland inventories from past and proposed projects within the watershed;
- Wetland mitigation plans for the past and reasonably foreseeable future projects; and
- Evaluation of proposed wetland losses from the Expansion Project. This must include an understanding by U. S. Steel and the agencies regarding the implications of the 1968 land exchange agreement.

13. **Water Use.** Will the project involve installation or abandonment of any water wells, connection to or changes in any public water supply or appropriation of any ground or surface water (including dewatering)?
    ☑ Yes ☐ No
    If yes, as applicable, give location and purpose of any new wells; public supply affected, changes to be made, and water quantities to be used; the source, duration, quantity and purpose of any appropriations; and unique well numbers and DNR appropriation permit numbers, if known. Identify any existing and new wells on the site map. If there are no wells known on site, explain methodology used to determine.

<u>Current Surface and Groundwater Appropriations</u>

U. S. Steel is currently permitted by DNR (Permit No. 65-0351) to appropriate water in the mine area to conduct mining operations, facilitate the disposal of tailings, and maintain surface waters within:

- The O'Brien Creek Watershed;
- The major parts of Hay Creek and Welcome Creek watersheds in Itasca County;
- The upper reaches of Hay Creek; Welcome Creek; and the upper reaches of East and West Swan River watersheds in St. Louis County; and
- Existing mines and open pits.

The locations of currently permitted mine sumps that are associated with Keetac (Keetac and HTC) are presented on Figure 13-1. Under the permit conditions of Keetac's appropriation permit, all water from dewatering currently discharges to Reservoir Five, with the exception of the Mesabi Chief Pit. The Mesabi Chief Pit discharges to O'Brien Creek, which flows into O'Brien Reservoir (Reservoir Four). Figure 13-2 shows the current mine pit dewatering operations.

HTC, which has mine pits located just northeast of the Keetac pits, is currently permitted (Permit No. 2002-2059) to conduct mine dewatering activities at the Stevenson Pit (labeled as the Lamberton Sump in Figure 13-1). Water from the Lamberton Sump is discharged to evaporation ponds located on U. S. Steel property under an agreement between U. S. Steel and HTC. During extremely wet conditions, the evaporation ponds overflow to Reservoir Five. According to Keetac facility personnel, water flow from the evaporation ponds to Reservoir Five rarely occurs. Table 13-1 lists Keetac's currently permitted water appropriation limits and mine sumps. At a maximum elevation, Reservoir Five flows to the 10 settling basins at the plant site. The 10 settling basins flow to a drainage ditch that then reports to Welcome Creek. Welcome Creek flows south through the City of Keewatin to Reservoir Two North located west of the Keetac tailings basin.

U. S. Steel is also permitted to appropriate water (Permit No. 65-1138) from a well at the facility. Water from this well is used for potable and sanitary uses. Details on this well are provided later in this discussion.

Table 13-1: DNR Water Appropriations Permit No. 65-0351 – Permitted Appropriation Volumes

Appropriation Location/Discharge Location	Volume (GPM)*	Volume (MGY)**
Section 18 Mine "N-3" to Reservoir 5	900	---
Bennett Mine "N-4" to Reservoir 5	3,000	---
Section 18 Mine "N-7" to Reservoir 5	2,500	---
Stevenson Mine to Reservoir 5	2,400	---
Mesabi Chief Mine to O'Brien Creek and Reservoir 4 (O'Brien Reservoir)	4,000	---
TOTAL	**12,800**	**6,728.8**

* Gallons Per Minute
**Million Gallons Per Year

Processing Plant Consumptive Uses

In general, U. S. Steel recycles the majority of its water as part of taconite processing operations. Figure 13-3 is a water flow diagram of Keetac's current water management system. Reservoir Five is used by U. S. Steel to replace water that is consumed by taconite processing operations. Reservoir Six contains water that is comprised, in part, of water that is recovered from the tailings deposition process, facility stormwater, process water, etc. (see Item 18). Water from Reservoir Six is pumped to the processing plant (Wolf Hill Head Tank) for process water use. The following paragraphs provide a discussion of water use at Keetac and how water uses would be impacted by the proposed project.

Crusher

Crushing operations at Keetac use a relatively small quantity of water for existing dust control and dust collector equipment. This water is discharged via a sump to the Section 18 Pit. Minor losses of water occur in the crusher due to evaporation. Otherwise, water used in the crusher is recycled following discharge to the Section 18 Pit, which is pumped to Reservoir Five. Dry

controls will be used to control dust emissions on new material handling equipment so the proposed project will not likely result in major increases in water use at the crusher.

Concentrator
The concentrator primarily utilizes water to transport tailings in a slurry form to the tailings basin for disposal. The concentrator obtains the majority of its water via recycle from Reservoir Six through the Wolf Hill Head Tank, which consists largely of water that has been collected from Keetac. The proposed project will require additional water for transport of additional fine tailings that are generated due to the increase in ore processing. However, because most of the water is recycled, there will not be a significant increase in makeup water demand in the concentrator due to the proposed project.

Pellet Plant
In the pellet plant, water is primarily consumed when moist pellets are dried (prior to induration) and fired (indurated) resulting in water loss to the atmosphere. The wet scrubber currently operating on Phase II incurs additional evaporation losses. Treated blowdown water from the Phase II wet scrubber is discharged to the tailings basin (discussed below).

The proposed project will result in additional losses of water due to the processing of additional pellets. Keetac is proposing dry emission controls for the Expansion Project. Thus, no additional water losses will occur due to additional air emission controls in the pellet plant.

Tailings Basin
Tailings slurry from the concentrator and wet scrubber blowdown from the pellet plant is pumped from the plant area and spigotted into the tailings basin. As tailings are deposited by settling, water is trapped in the pore spaces of the deposited tailings ("voids loss") resulting in a loss of water. Additionally, there are evaporation losses from the open water surface of the tailings basin. Because the project will involve the processing of additional ore and an expanded area of open water, additional water losses will be incurred in the tailings basin due to voids loss, and evaporation.

Based on preliminary estimates prepared by U. S. Steel, there should be sufficient water available during the proposed project to conduct taconite processing operations. U. S. Steel will prepare a detailed facility water balance to thoroughly evaluate the necessary volumes of water that are required during the proposed project.

Project Surface and Groundwater Appropriations
This section provides a chronology of the anticipated changes in surface and groundwater appropriations that will occur as a result of this project, based on a preliminary mine plan. Figure 13-2 shows the current pit pumping operations at Keetac. The project will include the progression of mining in the west and east portions of the mine pit, as it is currently, with expansion of mining activities in the east portion of the mining area. Additional mine dewatering activities will be necessary as the boundaries of the mine area increase. Expanded mining activities are currently anticipated to begin in the first quarter of 2012. An overview of the highlights of potential changes to water management that are potentially relevant to water appropriations is provided below. Table 13-2 provides a summary of past (actual) and future (estimated) annual pit dewatering pumping volumes. Table 13-2 also shows that based on the preliminary estimates no additional water beyond that which U. S. Steel is currently permitted to appropriate will be needed for the project. The following presents a description of the major highlights of pit dewatering activities during the project.

2012 to 2016 (Initiation of Expanded Mining Activities):

- Section 18 Pit will be pumped to Russell Pit in lieu of pumping to Reservoir Five;
- Russell Pit will be pumped to Reservoir Five;
- Stevenson Pit would be pumped to Reservoir Five in lieu of overflowing to Section 18 Pit;
- Crusher process water would be discharged to Bennett Pit in lieu of Sump Number One;
- Reservoir Five will be completely drained. In lieu of the Reservoir Five, water will be piped from the Russell Pit directly to the plant for makeup water use. Water not used for makeup water use will be pumped to the ten settling basins;
- Current dewatering discharges from HTC Pit to Keetac will be terminated to allow stockpile development and dewatering operations,
- A new water line will be constructed to pump additional water from Reservoir Six to the processing plant; and Continue to pump water from the Mesabi Chief, Aromac, and Perry Pits to O'Brien Creek. Note that U. S. Steel will obtain a DNR water appropriation permit modification to dewater these pits prior to 2012 under the current approved mine plan. This action is not part of the Expansion Project.

Figure 13-4 shows the anticipated pit pumping required for mine operation in year 2012.

2017 to 2021:

- Water from HTC will flow directly to the plant diversion ditch in lieu of flowing to Reservoir Five; and
- The Stevenson Pit will be pumped directly to the plant diversion ditch, in lieu of pumping to Section 18/Reservoir Five; and
- Crusher process water will continue to be routed to the Bennett Pit;

Continue to pump water from the Mesabi Chief, Aromac and Perry Pits to O'Brien Creek.
Figure 13-5 presents a site map that shows the anticipated pit pumping required for mine operation in year 2016.

2022 to 2026:

- The mine has progressed through the area occupied by Reservoir Five;
- The Section 18 Pit is pumped to Russell Pit;
- The Russell Pit water is used for plant makeup water with unused water being pumped to the ten settling basins;
- Crusher process water will continue to be routed to the Bennett Pit; and
- Continue to pump water from the Mesabi Chief, Aromac, and Perry pits to O'Brien Creek.

Figure 13-6 presents a site map that shows the anticipated pit pumping required for mine operation in year 2021.

2027-2036:

- Both Stevenson and Carmi pits are pumped to the 10 Settling Basins; and
- HTC closure of the mine portion that was dewatering into the Keetac pit.

Figure 13-7 presents a site map that shows the anticipated pit pumping required for mine operation in year 2026-2036.

Based on a preliminary evaluation conducted by U. S. Steel, the annual volumes of dewatering that will be necessary to conduct mining operations will increase during the life of the project.

However, these volumes are significantly less than what is allowed by existing appropriations permits.

Aromac Pit and Perry Pit

The Aromac Pit and Perry Pit appropriations are not included on U. S. Steel's current water appropriations permit. As noted above, U. S. Steel will need to obtain DNR approval to conduct dewatering at these locations prior to 2012 based on their current mine plan. Planned dewatering of these two pits is separate from and unrelated to this Expansion Project.

Existing Wells and Public Water Supply

The Keetac facility has two water supply wells (Unique Well Nos. 249517 and 248614) that currently supply water for potable and sanitary use at the facility and emergency pellet process cooling. These wells are approximately 485 and 400 feet deep with a bottom elevation of 1,009 and 983 feet above mean sea level (AMSL), respectively. U. S. Steel does not anticipate that the proposed project would require the installation of any additional water supply wells or require additional potable water at the Keetac facility. However, U. S. Steel is prepared to resolve any water supply issues.

Wells in the vicinity of the project are shown on Figure 13-8 and groundwater levels are shown in Figure 13-9. The municipal wells closest to the Keetac facility are located in the City of Keewatin, approximately 0.5 miles south and east of the Mining Area Limit. Two domestic drinking water wells are approximately 1.5 miles south of the Mining Area Limit boundary. Nine other domestic drinking water wells are located between 1.7 and 2.2 miles of this boundary. These wells range in depth from thirty to 380 feet, with bottom elevations ranging from 1,131 to 1,485 feet AMSL. The water elevations of these wells range from 1,467 to 1,511 feet AMSL.

The City of Keewatin has two operating municipal wells (Unique Well Nos. 192359 and 228828) and one newly-constructed municipal well (Unique Well No. 751520), which will come on-line in 2008. Those wells are located between 0.5 and 0.7 miles from the Final Keetac Pit Limit. These wells range in depth from 473 to 615 feet, with bottom elevations ranging from 984 to 857 feet MSL. The static water level of these wells as recorded on September 12, 2007 are as follows: Well No. 192359 is 1,276 feet AMSL; Well No. 228828 is 1,289 feet AMSL; and Well No. 751520 is 1,276 feet AMSL. The eventual lowest mine pit elevation is projected to be 925 feet AMSL. U. S. Steel will develop a contingency plan with the City of Keewatin to specify remedies that will be implemented if city wells are impacted.

In addition, according to the City of Nashwauk wellhead protection plan, the nearby La Rue Mine Pit Lake supplies water to the to City of Nashwauk wells via groundwater seepage. DNR hydrologic information in the area, however, indicates that the dewatering of Keetac mine pits is not likely to affect the City of Nashwauk water supply.

Proposed Treatment of Topic in EIS

It is not anticipated that groundwater modeling will be necessary or effective to evaluate potential hydrogeologic impacts of the proposed Keetac mining operation on the City of Keewatin municipal water supply wells. Instead, the EIS will discuss a contingency plan and monitoring program to mitigate potential impacts to the municipal wells in the City of Keewatin. The plan will identify mitigation measures that U. S. Steel will agree to implement. Mitigation may include replacing water to ensure the City's water supply pursuant of Minnesota Rules, part 6115.0730.

The EIS will also discuss a monitoring program to track La Rue Pit complex and Perry Pit water levels. If impacts to the City of Nashwauk wells are recorded, monitoring data from the La Rue and Perry pits can help identify a hydrologic connection, if any, between the Perry Pit (which will

be dewatered by U. S. Steel), the La Rue Pit and City of Nashwauk wells. A well interference resolution with the City of Nashwauk could be explored if an impact occurs which is linked to the proposed project.

U. S. Steel will conduct further mine site hydrologic evaluations to determine the potential mine dewatering rates required to conduct mining operations in the future. U. S. Steel will evaluate the hydrologic impacts of increasing volumes of water discharged to O'Brien Creek as a result of project. U. S. Steel will prepare a detailed facility water balance to evaluate the anticipated volumes of makeup water necessary for taconite processing operations. This information will provide more accurate accounting of water use during the life of the project. This information will be available to the DNR to conduct evaluations that will be included as part of the EIS.

Table 13-2: Actual and Estimated Annual Pit Dewatering Volumes (MGY)

Mine Dewatering Sump/Discharge Locations	2005	2006	2007	2012	2016	2021	2026	2031	2036
Stevenson/Carmi to Reservoir 5*	0	0	420	53	473	1,209	1,472	1,472	1,472
Section 18 Pit to Reservoir 5*	403	307	265	420	368	315	210	210	210
Bennett/Russell to Reservoir 5*	893	1,091	1,253	1,472	1,261	1,261	788	788	788
Mesabi Chief Pit to O'Brien Creek	1,254	1,518	795	1,051	788	788	788	788	788
Aromac Pit to O'Brien Creek**	-	-	-	210	368	368	368	368	368
Perry Pit to O'Brien Creek **	-	-	-	420	420	420	420	420	420
Total Appropriations to Reservoir 5	**1,296**	**1,398**	**1,938**	**1,945**	**2,102**	**2,785**	**2,470**	**2,470**	**2,470**
Total Appropriations to O'Brien Reservoir via O'Brien Creek	**1,254**	**1,518**	**795**	**1,681**	**1,576**	**1,576**	**1,576**	**1,576**	**1,576**
Total Keetac Appropriations	**2,550**	**2,916**	**2,733**	**3,626**	**3,678**	**4,361**	**4,046**	**4,046**	**4,046**

* Reservoir 5 will be drained prior to 2016 and will no longer be a discharge point. See Item 13 for details.

** U. S. Steel estimates that pumping of the Perry and Aromac Pits is anticipated to commence in 2008 and 2009 pending MPCA and DNR approval.

Note: Permit No. 65-0351 currently allows an annual volume of 6,728.8 MGY to be pumped at specified instantaneous flow rates.

14. **Water-related land use management district.** Does any part of the project involve a shoreland zoning district, a delineated 100-year flood plain, or a state or federally designated wild or scenic river land use district?
☑ Yes ☐ No
If yes, identify the district and discuss project compatibility with district land use restrictions.

Figure 9-1 shows the shoreland zones within the project area. Shorelands are avoidance areas for mining activities pursuant to Minnesota Rules, part 6130.1300.

Itasca County designates shoreland overlay districts in its zoning ordinance for County Public Waters to implement the current shoreland standards described in Minnesota Rules, chapter 6120. These shoreland zones are designated within 1,000 feet and 300 feet of lakes and streams, respectively. Within shorelands, the County zoning ordinance requires a 200-foot setback for mining-related activities. Itasca County, through its zoning ordinance, has also designated certain waters with specific classifications, shown in Table 14-1.

Table 14-1: Itasca County Shoreland Overlay Districts

Lake/Stream Name	Shoreland Zoning Classification
Hay Creek	Natural Environment I
Hay Lake	Natural Environment I
O'Brien Creek	Tributary
O'Brien Lake	Natural Environment I
Swan Lake	Recreational Development II
Welcome Creek	Tributary
Unnamed Wetland 31-38-W	Natural Environment I

The City of Hibbing also designates shoreland zones within 1,000 feet and 300 feet of lakes and streams, respectively. The City of Hibbing has designated certain waters with specific classifications, which are listed below in Table 14-2. For each of the City's shoreland districts, mineral exploration is a conditionally permitted use. Additionally, the setbacks outlined in Table 14-2 apply to shoreland zones within the City of Hibbing. Of the following shoreland overlay districts, the Welcome Lake overlay district falls within the proposed project boundary. Welcome Lake is subject to a 1,000-foot shoreland zone, and the processing plant is located just outside of this zone. As a Natural Environment lake, development adjacent to Welcome Lake must also meet a 200-foot setback. The existing processing plant is located approximately 1,000 feet from the shores of Welcome Lake and will therefore meet the setback requirement. There is also one small existing structure (Pellet Loading Drive House) at the south side of the plant which is located approximately 360 linear feet from the shores of Welcome Lake. This Pellet Loading Drive House will not be expanded as part of the proposed project. This structure appears to meet the required setback.

Table 14-2: City of Hibbing Shoreland Zoning Setback Requirements

Lake/Stream Name	Shoreland Zoning Classification	Setback Requirement (feet)
Kelly Lake	General Development	75
West Swan River	Tributary	100
Welcome Lake	Natural Environment	200

The City of Keewatin and the City of Nashwauk do not have a shoreland zoning ordinance.

St. Louis County has designated shoreland zones within 1,000 feet and 300 feet of lakes and streams, respectively. St. Louis County has not designated any shoreland zones within or near the proposed project boundary.

None of the project components are within a designated 100-year floodplain. Impacts to local water bodies outside the project boundary are described in response to Items 17 and 18.

There are no designated wild and scenic rivers within the project area.

Proposed Treatment of Topic in EIS
The project's relationship to water-related Land Use Management Districts will be discussed briefly in the EIS. Each municipality's shoreland zoning ordinance will be reviewed and compared to the project's proposed land use within the shoreland zone.

15. **Water surface use.** Will the project change the number or type of watercraft on any water body?
    ☐ Yes ☑ No
    If yes, indicate the current and projected watercraft usage and discuss any potential overcrowding or conflicts with other uses.

No impacts to water surface use are predicted from the proposed project and no displacement would occur.

Proposed Treatment of Topic in EIS
This topic will not be discussed in the EIS.

16. **Erosion and sedimentation.** Give the acreage to be graded or excavated and the cubic yards of soil to be moved: acres: 621 (mine area expansion only); Cubic Yards Mined: 414,380,000 (mine expansion area only).
    Describe any steep slopes or highly erodible soils and identify them on the site map. Describe any erosion and sedimentation control measures to be used during and after project construction.

Overview
Most of the site is self-contained and there will be little erosion and sedimentation from the Keetac facility as a result of the proposed project.

The approximate acreage breakdown is provided in response to Item 10. The cubic yards to be moved include ore, waste rock, and surface overburden over the 25-year life of the project.

The slopes of new mine areas would be sloped to reclamation standards. The surface overburden portion of pit walls are required to have a setback of at least 20 feet from the rock portion of the pit wall, slopes no steeper than 2.5 to 1, 60-foot maximum lift height with 30-foot-wide benches in the surface overburden portions of the pit wall, and vegetation to meet cover standards. Benches are required to be engineered with an adequate width to manage stormwater runoff received from the slopes above them.

The DNR Permit to Mine requires stockpiles and pit slopes to withstand a 100-year storm event without failure, and to minimize erosion. Vegetation is required for surface overburden stockpiles, benches, tops of rock and ore stockpiles, pit overburden slopes, dikes and dams, and cuts, pits, trenches, and other disturbed areas. Vegetation is required in the first normal planting period following the time when the area is no longer scheduled to be disturbed.

The final exterior slopes of rock and lean ore stockpiles shall have benches and lifts with no lift being more than 30 feet in height and no bench less than 30 feet wide, construction of drainage channels, 2 feet of surface overburden on rock flats, and vegetation to meet reclamation standards.

Surface overburden stockpiles are required to have 30-foot-wide benches at 40-foot maximum lift height, slopes of 2.5 to 1 or shallower, and drainage control systems capable of handling surface runoff without erosion and vegetation.

Stormwater protection relative to construction areas is discussed in greater detail in response to Item 17. Additional flow volumes to O'Brien Creek and the diversion ditch reporting to Hay Creek are not anticipated to be in excess of what is already permitted by MPCA and DNR. However, the potential for changes in flow at these locations will be evaluated in the EIS.

Proposed Treatment of Topic in EIS

U. S. Steel will prepare a detailed facility water balance that will be used to evaluate Keetac's potential need to discharge additional water from the facility. If necessary, the EIS may address runoff in downstream sensitive areas as part of the larger issue of surface water runoff and overall water quality impacts of the project.

17. **Water Quality: Surface Water Runoff**

a. Compare the quantity and quality of site runoff before and after the project. Describe permanent controls to manage or treat runoff. Describe any stormwater pollution prevention plans.

Overview

Most surface runoff (Item 17) and wastewater discharges (Item 18) are mixed within the project and cannot easily be discussed separately. Stormwater discharges from exterior portions of the project are discussed in response to this question. Stormwater discharges to the process water system and surface waters are discussed in Item 18.

The majority of the Keetac facility is located within the Upper Mississippi Watershed area, as shown on Figure 17-1. The watershed boundaries in this figure are based on topographic map information and known site features that define the location of the watershed divide. The majority of stormwater in operational areas of Keetac currently report to the Upper Mississippi Watershed.

Figure 17-2 shows the location of water bodies and flow direction at the Keetac facility. The discussion below provides an overview of the current stormwater management at the Keetac facility and a description of anticipated changes and impacts to stormwater quantity and quality that would result from the proposed project.

Plant Site

Figure 17-3 presents a plant site stormwater flow map. The plant site includes several equipment maintenance shops and storage buildings, general office building, water supply treatment plant, fuel storage area, crude ore storage building, concentrator, pellet plant, process thickeners, laboratory, power substation, coal, concentrate and pellet stockpile areas, and pellet load-out area.

Stormwater in the plant site area currently flows to the Bennett Pit, Welcome Lake or to the plant site diversion ditch system located east of the plant. The diversion ditch system manages the flow of both process water and stormwater and is discussed further in Item 18. It is important to ensure that the water quality in Welcome Lake and the Carlz Mine Pit Lake is not degraded, because groundwater seepage

from the Carlz Pit Lake is believed to contribute to the capture areas for Keewatin Well 2 (Unique Number 228828) as well as Keetac's Well 1 (Unique Number 249517).

Plant stormwater is managed per the requirements of U. S. Steel's industrial stormwater pollution prevention plan (SWPPP). Petroleum products at the Keetac facility are managed as required by a facility spill prevention countermeasure and containment (SPCC) plan, which provides plans and requirements for the storage of petroleum products and the containment and cleanup of spills. This plan is updated every 3 years and is certified by a licensed professional engineer. The facility also maintains a Facility Response Plan (FRP), which outlines a plan to respond to a major fuel or oil spill to surface water.

Chemical dust suppressants are occasionally applied on the roads in the plant area. U. S. Steel's National Pollution Discharge Elimination System/State Disposal System (NPDES/SDS) permit for the plant site allows for the usage of magnesium chloride and lignosulfanate at a maximum rate of 11,000 gallons per year (GPY).

The proposed project will result in the potential construction of new buildings or building additions at the plant site. MPCA's new General Construction Stormwater Permit will become effective on August 1, 2008. Prior to the start of the project, U. S. Steel will evaluate the applicability of and comply with all construction stormwater permit requirements that will apply when construction begins, such as: preparation of a construction stormwater pollution prevention plan, an assessment of the potential sources for sediment and pollutant discharges from the site, identification of the party responsible for implementation of BMPs and the BMPs to be implemented. BMPs, which address erosion prevention practices and minimize production of sediment will be considered. These include seeding and mulching practices and any special measures for steep slopes and highly erodible soils (e.g., terracing, silt fence, erosion control fabric and ditch checks), as necessary. The new General Construction Stormwater Permit will require a program of inspection and management to ensure that the construction stormwater pollution prevention plan is being implemented and record-keeping procedures to show that inspection and maintenance have been done.

The proposed project is not expected to impact the current stormwater management practices or water quality related to stormwater runoff from the plant site. U. S. Steel will continue to manage stormwater runoff in compliance with the facility SWPPP and industrial stormwater rules.

Mine and Stockpile Areas

Figure 17-4 presents stormwater flow direction associated with the mine and stockpile areas. The majority of the surface water from current active mining areas and stockpiles is collected in sumps and pumped to Reservoir Five. Waste rock stockpile drainage in the northwest portion of the mine site flows to unnamed wetlands and creeks that flow to O'Brien Reservoir.

For the mine expansion, waste rock stockpiles will be constructed east of Reservoir Five. Keetac will manage all stormwater runoff in compliance with the facility SWPPP and industrial stormwater rules prior to discharge from the facility.

More details regarding the use and water management of this mine area stormwater is provided in Item 12 and Item 18, respectively.

Tailings Basin

The tailings basin consists of two parts: Stage 1, which has been largely re-vegetated; and Stage 2, which is currently active and is not vegetated. A clay dike is present at the perimeter of the inactive area of the

Keetac tailings basin which confines and directs stormwater to the Stage 2 pond. Figure 17-4 shows the directions of stormwater flow associated with the tailings basin area. Water in the Stage 2 pond is decanted and gravity-fed to Reservoir Six. Water from Reservoir Six is used for make-up water in the pellet plant. Additional details regarding the management of water in Reservoir Six are provided in Item 18.

The proposed project includes increasing the elevation and minimally expanding the footprint of the existing tailings basin in order to strengthen the dike. However, this modification would occur well within the confines of the outer clay dike and should not result in any changes to the current direction of surface water flow or quality of stormwater from the tailings basin dike and tailings basin perimeter areas. Surface drainage from the exterior of the tailing basin dikes flows to West Swan River, Reservoir Two, Reservoir Two North, Welcome Creek, unnamed wetlands, and into Hay Creek, which flows into Swan Lake.

b. Identify routes and receiving water bodies for runoff from the site; include major downstream water bodies as well as the immediate receiving waters. Estimate impact runoff on the quality of receiving waters.

See Item 18.

Proposed Treatment of Topic in EIS

Stormwater flow from the plant site is not expected to change as a result of the proposed project. Hydrologic studies to determine the volume of stormwater runoff from new waste rock stockpiles will be conducted by U. S. Steel prior to completion of the draft EIS.

18. **Water Quality: Wastewaters**

a. Describe sources, composition and quantities of all sanitary, municipal and industrial wastewater produced or treated at the site.

As stated in Items 17 and 18, wastewater discharges are mixed within much of the Keetac facility and cannot easily be discussed separately. Stormwater discharges from exterior portions of the project were discussed in response to Item 17. Stormwater discharges to the process water system and surface waters are discussed below.

Wastewater Treatment Plants/Water Treatment Plants

A water flow diagram showing Keetac's current water management operations is presented in Figure 13-3 (Item 13). The following paragraphs provide a summary of various wastewater treatment plants and facilities relative to the Keetac facility.

U. S. Steel operates an activated sludge wastewater treatment plant (WWTP) for the treatment of domestic wastewater at the facility. Plant effluent is discharged to Reservoir Five as permitted by U. S. Steel's NPDES/SDS Permit No. MN0031879. Biosolids from the Keetac WWTP are periodically transferred to the City of Keewatin's publicly owned treatment works (POTW). U. S. Steel does not anticipate that the Keetac WWTP will require an expansion due to the proposed project.

Keetac operates a water treatment plant at the plant site to treat well water for potable and sanitary uses. Filter backwash is discharged through existing Outfall SD001 to Welcome Lake.

Process water drainage is collected in the bottom of two coarse crushers located in the Section 18 Pit. Water collected at Crusher Number One is pumped to a sump and discharged to Reservoir Five. Crusher Number Two process water is pumped to the Section 18 Pit, and then to Reservoir Five. A septic tank/drainfield system is utilized to treat sanitary wastewater generated at the coarse crushers employee shower and change house facility at a rate of less than 10,000 GPD.

A re-circulating wet scrubber facilitates the treatment of waste gas from the Phase II grate/induration kiln. Blowdown from the wet scrubber is discharged to a wastewater treatment system. Solids produced in scrubber wastewater treatment are dewatered by filter presses and disposed of in a permitted off-site facility. Treated water and filtrate from the filter presses is discharged to the tailings basin.

Floor drain overflow from the pellet plant and concentrator is discharged to the Bennett Pit. This discharge may also include emergency overflow process wastewater from the concentrator during a power failure. All steam cleaning and floor drain wastewater from the truck shops and plant/machine/ welding shops are treated by an oil/water separator and sedimentation tank that overflows to the Bennett Pit. Sludge from shop areas is disposed of off site in permitted facilities as required by law. Oils collected in the oil/water separator are reclaimed for refining and reuse by a permitted off-site waste handler.

Parallel tailings slurry pipelines exist on the north side of the concentrator and follow the diversion ditch system east and south before crossing Trunk Highway 169 toward the tailings basin. Tailings slurry is piped under pressure to the tailings basin for disposal. Segments of these pipelines do not have spill containment berms, and some leaks from pipelines north of Trunk Highway 169 may flow toward the diversion ditch. Tailings slurry is pumped through the pipelines, which include three dump valve drainage points north of Trunk Highway 169. These dump valve points discharge to detention basins and ponds used to contain tailings and process wastewater that is drained during normal and emergency shutdown situations. Two of the dump points overflow to the diversion ditch system, while the other drains to a non-discharging infiltration basin. Sediments that collect in these detention basins and ponds are typically removed every two years and hauled by truck to the tailings basin for disposal, as authorized by NPDES/SDS Permit No. MN0055948.

Wastewater flow to the tailings basin consists of tailings slurry associated with ore beneficiation processing in the concentrator and treated blowdown water from the waste gas wet scrubber. The estimated average wastewater flow rate is 20 million GPD. An average of 13 MLTY of dry tailings are disposed of in the tailings basin.

b. Describe waste treatment methods or pollution prevention efforts and give estimates of composition after treatment. Identify receiving waters, including major downstream water bodies, and estimate the discharge impact on the quality of receiving waters. If the project involves on-site sewage systems, discuss the suitability of site conditions for such systems.

U. S. Steel is permitted (NPDES/SDS Permit No. MN0031879) to dewater the Mesabi Chief Pit and discharge water to O'Brien Creek, which flows to O'Brien Reservoir (Reservoir Four). Note that prior to the start of the proposed project, U. S. Steel plans to modify this permit as necessary to allow dewatering discharge from the Perry and Aromac Pits to O'Brien Creek. O'Brien Reservoir (Reservoir Four) flows to a diversion ditch that flows into Hay Creek. Hay Creek flows into Swan Lake prior to discharging to the Mississippi River via the Swan River.

All water collected in sumps as part of pit dewatering activities at the Mine Site (see Item 18a above) flow into Reservoir Five, with the exception of mine pit dewatering at the Mesabi Chief Pit. Figure 18-1 presents the locations of all wastewater discharges to surface water at Keetac. Reservoir Five is used for plant makeup water. At a maximum elevation, Reservoir Five overflows to the diversion ditch system, which consists of a series of ten sedimentation basins and a conveyance channel. This system provides for additional water treatment of stormwater runoff water from the plant area; nearby inactive and active waste rock stockpile areas; and overflow from Reservoir Five. The diversion ditch system discharges to Welcome Creek.

Keetac's WWTP currently discharges chlorinated effluent to Reservoir Five. When Reservoir Five is drained and no longer used as part of Keetac water management operations in 2016, U. S. Steel anticipates that WWTP effluent will be pumped into the plant as additional process makeup water.

Welcome Creek flows through the City of Keewatin. The City of Keewatin discharges stormwater and wastewater treatment plant effluent to Welcome Creek within City limits. Welcome Creek then flows to Reservoir Two North located on the Keetac property. Reservoir Two North overflows to either Reservoir Two or Reservoir Six (see Figure 13-2).

The interior tailings dikes are constructed of coarse tailings spigotted from tailings pipelines. The exterior dikes are constructed of clay starter dikes with sand and gravel chimney drains. Tailings slurry from the concentrator and treated wet scrubber blowdown from the pellet plant is pumped from the plant area and spigotted into the tailings basin where tailings are deposited by sedimentation and water is clarified. Following tailings deposition, clarified water is gravity fed from a decant tower on the south side of the Stage 2 interior tailings basin to the secondary exterior pond for additional clarification via sedimentation. An overflow structure on the west side of the secondary exterior pond drains water from the secondary pond to Reservoir Six. Water is pumped from Reservoir Six back to the Wolf Hill Head Tank located at Keetac for process water use.

As permitted by NPDES/SDS Permit No. MN0055948, water in Reservoir Six can be discharged via a siphon to Reservoir Two. Reservoir Six can also overflow to Reservoir Two. U. S. Steel's NPDES/SDS permit allows a discharge of water from Reservoir Six to Reservoir Two equal to or less than the annual net precipitation at the facility minus the calculated annual evaporation from the tailings basin water pool area. Reservoir Two is discharged to a diversion channel that reports to Hay Creek.

The water bodies listed in Table 18-1 are located downstream of Keetac and are also included MPCA's Draft 2008 Impaired Waters List (303(d) List).

Table 18-1: Impaired Waters Downstream of the Expansion Project

Water Body Name	Impairment
O'Brien Reservoir (Reservoir 4)	Aquatic consumption – mercury in fish tissue
Swan River	Aquatic consumption – mercury in fish tissue
Mississippi River (from Swan Lake to Sandy River) *	Aquatic consumption – mercury in fish tissue
Swan River (Swan Lake to Mississippi River)	Aquatic consumption – mercury in fish tissue
Swan River (Swan Lake to Mississippi River)	Aquatic life - low dissolved oxygen

* Additional impaired reaches of the Mississippi were not included in this table.

Tables 18-2 through 18-5 below provide a summary of discharge monitoring report (DMR) data reported from the year 2000 through March 2008 for NPDES/SDS permit outfalls that discharge directly from the Keetac facility to surface waters. These data summaries are based on information obtained from the MPCA DMR database.

Based on DMR information, U. S. Steel has achieved compliance with permit limits and water quality standards, with the exception of diversion ditch system discharge to Welcome Creek. Keetac exceeded NPDES/SDS turbidity and total-suspended-solids-limits at this location and is currently addressing the problem as required by NPDES/SDS permit requirements.

The proposed project may include additional use of flocculants, water softening agents, microbiocides, corrosion inhibitors, descalers, etc. due to the increase in material processed and quantities of process water used in Keetac's taconite processing operations. Additional kiln slag inhibitor agents may also be used to operate the Phase I line kiln.

The proposed project will include an additional pumping system from Reservoir Six to the processing plant in 2016. Other major facility water management modifications during the project will be related to mine dewatering and water appropriations management that is discussed in Item 13. Based on a preliminary water balance analysis, U. S. Steel does not propose to discharge additional water to the current receiving water bodies beyond the limits contained in the current NPDES/SDS permits.

c. If wastes will be discharged into a publicly owned treatment facility, identify the facility, describe any pretreatment provisions and discuss the facility's ability to handle the volume and composition of wastes, identifying any improvements necessary.

See responses to Items 18a and 18b above.

d. If the project requires disposal of liquid animal manure, describe disposal technique and location and discuss capacity to handle the volume and composition of manure. Identify any improvements necessary. Describe any required setbacks for land disposal systems.

Not Applicable.

Table 18-2: Mesabi Chief Pit Discharge to O'Brien Creek (NPDES/SDS Permit No. MN0031879)

Parameter	Units	Monitoring Frequency	Permit Limit/ WQ Standard	Discharge Monitoring Results		
				Minimum	Maximum	Average
Flow	CFS	Monthly	Monitor Only	3.24	200.88	111.26
Dissolved Iron – Monthly Avg.	mg/L	Monthly	1.0	0.03	0.17	0.04
Dissolved Iron – Daily Max.	mg/L	Monthly	2.0	<0.03	0.17	0.04
Turbidity	NTU	Monthly	25	<0.2	23.0	3.3
pH	SU	Monthly	6.5 - 8.5	6.84	8.1	7.41
Mercury (ng/L)	ng/L	Quarterly	6.9[1]	1.4	5.2	2.5
Oil and Grease - Quarterly Avg.	mg/L	Quarterly	0.5	<0.40	0.50	0.48
Oil and Grease – Daily Max.	mg/L	Quarterly	5.0	0.40	0.50	0.50
Total Suspended Solids – Quarterly Avg.	mg/L	Quarterly	20	1.5	8.5	3.48
Total Suspended Solids – Daily Max.	mg/L	Quarterly	30	1.0	14.4	2.22
Specific Conductance	µhms/cm	Quarterly	1,000[2]	420	702	490

[1] No permit limit is specified. A water quality standard of 6.9 ng/L applies to Class 2C waters (Minnesota Rules, part 7050.0220, subpart 5a).
[2] No permit limit is specified. A water quality standard of 1,000 µmhs/cm applies to Class 4A waters (Minnesota Rules, part 7050.022, subpart 3a).

Table 18-3: Diversion Ditch System Discharge to Welcome Creek (NPDES/SDS Permit No. MN0031879)

Parameter	Units	Monitoring Frequency	Permit Limit/ WQ Standard	Discharge Monitoring Results		
				Minimum	Maximum	Average
Flow	MGD	Twice Per Month	Monitor Only	6	271	63
Turbidity - Daily Max.	NTU	Twice Per Month	Monitor Only	7.7	150	44.7
Turbidity- Monthly Avg.	NTU	Twice Per Month	25	6.6	102.5	35.4
Temperature - Daily Max.	Deg F	Twice Per Month	Monitor Only	33	72	54
Temperature - Monthly Avg.	Deg F	Twice Per Month	Monitor Only	33	72	52
pH		Monthly	6.5 - 8.5	6.8	8.3	7.5
Total Suspended Solids – Daily Max.	mg/L	Monthly	30	<2.0	34	12
Total Suspended Solids – Monthly Avg.	mg/L	Monthly	20	1.8	30.5	10.4
Dissolved Iron - Daily Max	mg/L	Monthly	2.0	0.03	2.1	0.32
Dissolved Iron - Monthly Avg.	mg/L	Monthly	1.0	0.03	2.1	0.22
Nitrogen Ammonia (as N) - Daily Max.	mg/L	Monthly	Monitor Only	0.01	0.02	0.01
Nitrogen Ammonia (as N) - Monthly Avg.	mg/L	Monthly	Monitor Only	<0.01	0.02	0.01
Specific Conductance	µmhs/cm	Quarterly	1,000[1]	318	784	688
Oil and Grease - Daily Max.	mg/L	Quarterly	5.0	<0.40	0.50	0.50
Oil and Grease - Quarterly Avg.	mg/L	Quarterly	0.5	<0.40	0.50	<0.48
Mercury	ng/L	Quarterly	6.9[2]	0.05	1.9	0.83

Note: Shaded values indicate that the NPDES/SDS permit limit was exceeded.
[1] No permit limit is specified. A water quality standard of 1,000 µmhs/cm applies to Class 4A waters (Minnesota Rules, part 7050.0220, subpart 3a).
[2] No permit limit is specified. A water quality standard of 6.9 ng/L applies to Class 2C waters (Minnesota Rules part 7050.0220, subpart 5a).

Table 18-4: Reservoir 6 Emergency Overflow (NPDES/SDS Permit No. MN0055948)

Parameter	Units	Monitoring Frequency	Current Permit Limit	Discharge Monitoring Results		
				Minimum	Maximum	Average
Flow	MGD	Monthly	Monitor Only	(See Note)	(See Note)	(See Note)
Fluoride	mg/L	Monthly	Monitor Only	0.35	1.7	1.14
pH		Monthly	6.5 – 9.0	8.1	8.7	8.3
Total Suspended Solids – Daily Max.	mg/L	Monthly	30	<1.0	8.0	3.4
Total Suspended Solids – Monthly Avg.	mg/L	Monthly	20	<1.0	8.0	3.4
Dissolved Iron - Daily Max.	mg/L	Monthly	2.0	<0.03	0.52	0.09
Dissolved Iron - Monthly Avg.	mg/L	Monthly	1.0	<0.03	0.08	0.43
Nitrate Plus Nitrite	mg/L	Monthly	Monitor Only	0.14	5.1	1.53
Sulfate	mg/L	Monthly	Monitor Only	52	77.6	64.0
Specific Conductance	µmhs/cm	Monthly	Monitor Only	534	686	594
Mercury	ng/L	Monthly	Monitor Only	<0.40	0.50	0.48

Note: Per an agreement with National Steel Pellet Company (former Permittee) and MPCA, water samples for this location were collected at the Reservoir Six pumphouse when no flow occurred at this location. Because no flow has occurred at this location during the periods applicable to this summary table, water quality data reflects that of Reservoir Six.

Table 18-5: Reservoir 6 Overflow Weir (NPDES/SDS Permit No. MN0055948)

Parameter	Units	Monitoring Frequency	Current Permit Limit	Discharge Monitoring Results		
				Minimum	Maximum	Average
Flow	MGD	Monthly	Monitor Only	0	676.6	59
Fluoride	mg/L	Monthly	Monitor Only	0.35	1.9	1.25
pH		Monthly	6.5 – 9.0	6.5	8.9	8.0
Total Suspended Solids – Daily Max.	mg/L	Monthly	30	<1.0	14.4	4.8
Total Suspended Solids – Monthly Avg.	mg/L	Monthly	20	<1.0	11.4	4.0
Dissolved Iron - Daily Max.	mg/L	Monthly	2.0	<0.03	0.52	0.07
Dissolved Iron - Monthly Avg.	mg/L	Monthly	1.0	<0.03	0.43	0.06
Nitrate Plus Nitrite	mg/L	Monthly	Monitor Only	0.14	5.1	1.68
Sulfate	mg/L	Monthly	Monitor Only	52	109	70.1
Specific Conductance (uhms/cm)	µmhs/cm	Monthly	Monitor Only	463	958	625
Mercury	ng/L	Monthly	Monitor Only	<0.20	2.2	1.2

Proposed Treatment of Topic in EIS

Project-Specific Analysis

Under the proposed project, U. S. Steel does not plan to make any significant operational changes that are anticipated to affect the quantity of wastewater discharged from the Keetac facility including groundwater. U. S. Steel will conduct a water chemistry balance for processing water and tailings basin operations that will evaluate potential water quality changes to Welcome Creek, Reservoir Two, and the discharge from the tailings basin through the life of the proposed project. The EIS will include a discussion of impaired waters that may be impacted by the project and how the project will affect these impairments. This analysis will include, but will not be limited to, phosphorus. Potential water quality changes due to potential increases in the use of chemicals in facility water treatment and to control kiln slag will be evaluated in the EIS and considered during NPDES/SDS permitting.

Cumulative Effects Analysis

Water Quality Changes

Cumulative water quality impacts can occur from point or non-point discharges of pollutants to a water body. For most water bodies, cumulative effects occur through simultaneous or near-simultaneous discharges that are in reasonable geographic proximity. Accumulation of pollutants in sediments is an exception to this generalization. Point discharges of industrial or municipal wastewater are regulated under the MPCA's NPDES/SDS permit program. Non-point discharges above natural background levels occur when land use changes increase area export of pollutants. In the project vicinity, these changes include filling of wetlands and construction of mining and facilities and urban development that may produce lower-quality runoff. Impacts of both point and non-point discharges can be mitigated by treatment.

U. S. Steel currently discharges wastewater to the diversion ditch from intermittent releases from the tailings basin and possibly from Mesabi Chief Pit dewatering. No new discharge points are planned. The detailed water and chemistry balances will determine if there would be significant changes in quantity or quality of the discharge. Based on preliminary estimates no significant changes are expected, but this will be studied in detail in the EIS.

Approach to Evaluation

A quantitative assessment of cumulative water quality impacts will be performed for the Upper Swan River and Swan Lake. U. S. Steel's process water would be managed so that any intermittent discharge from the basin would meet chronic aquatic toxicity-based standards, but levels of dissolved solids, hardness, chlorides, sulfate, and possibly some metals, such as manganese, may be elevated above natural background levels. Other common pollutants such as biological oxygen demand, bacteria, and suspended solids are not expected to be present in significant quantities in the discharges. The actual construction of the Expansion Project can be expected to generate sediment, but this impact is readily mitigated by construction stormwater BMPs and would be short in duration. Therefore, this impact is not proposed as a suitable subject for a cumulative impact analysis.

A number of models are available to analyze generation, fate, and transport of pollutants in streams. Models recently used in Minnesota EISs and NPDES/SDS permitting procedures include HSPF and QUAL2E and dilution models. Because dissolved solids, hardness, chlorides, sulfates and metals are largely conservative substances and a loss of these substances is not expected over the long term, an initial practical evaluation could be conducted using a conservative dilution

model of the stream water quality. If this indicates that potential cumulative effects may be experienced, a more comprehensive model could then be applied. It appears likely that the initial modeling phase will be required for the NPDES/SDS permit and will be available to the EIS contractor. In this phase, O'Brien Creek, the diversion ditch and Swan Lake will be modeled using the hydrologic loading of water from tributary subwatersheds (see previous discussion of cumulative effects of flow changes) for dry, normal and wet conditions. The background loading of pollutants from the watershed will be estimated based on historic and recent monitoring results. For each hydrologic scenario, loading from the Minnesota Steel facility will be included and the resultant concentrations will be calculated as a simple dilution model. Upstream additions of pollutants from other discharges will be evaluated for past, present and future actions by other parties.

The models will first be calibrated to existing conditions using monitoring data from 1999 through 2001 and 2005. This will inherently include the effects of past and present actions (through the date of monitoring), including:

- Existing discharges from Nashwauk and Keewatin POTWs;
- Residual impacts of past tailings disposal by Butler Taconite and predecessor operations;
- Other existing sources within the former Butler Taconite Company site (e.g., waste rock piles tributary to Swan Lake);
- Modification of land use (including wetland loss) by past mining practices within the upper Swan River watershed above Swan Lake;
- Typical timber harvest activities on state and county lands and private lands;
- Existing rural and residential development in the Swan Lake watershed;
- Existing discharges (overflow) from natural ore and taconite pits;
- Existing discharge from Keetac; and
- Existing runoff from the development of the cities of Nashwauk and Keewatin.

The water quality models will than be modified to include actions since the date of the monitoring and potential future actions including:

- Minnesota Steel pit and tailings basin discharges;
- Implementation of the Regional Mercury TMDL;
- Any reasonably foreseeable changes to discharges from Nashwauk and Keewatin POTWs due to development and/or treatment system changes; and
- Any reasonably foreseeable changes to timber harvest activities, state and county lands and private lands.

Minnesota water quality standards were promulgated to protect human health and aquatic life. The threshold for this cumulative effects assessment will be Minnesota's chronic aquatic toxicity-based standards applicable to the respective waters being evaluated. The future conditions scenarios will be completed for both operation and post-closure conditions, assuming that all other reasonably foreseeable actions have been completed.

Data Needs for Cumulative Effects Analysis

- Estimates of current and future hydrologic loadings from subwatersheds (see previous cumulative effects discussion for flow);
- Water quality monitoring data for O'Brien Lake, O'Brien Creek, and Swan Lake;
- Any reasonably foreseeable changes to discharges from Keewatin or Nashwauk POTW's due to development and/or treatment system changes;
- Estimate of reasonable scenarios of area and frequency of future timber harvests within the upper Swan River;

- Current discharge monitoring data for the Keewatin Taconite facilities and any reasonably foreseeable changes in discharges;
- Proposed Minnesota Steel pit and tailings basin discharges, including post-closure discharges;
- Proposed HTC discharges to Keetac pits, including post –closure discharges and the inter-basin transfer of water;
- Historic air photos or GIS coverages showing modification of land use (including wetland loss) by past mining practices within the upper Swan River watersheds;
- Data on typical present and future timber harvest activities on state and county lands and private lands;
- Data on existing and potential future rural and residential development in the upper Swan River watershed;
- Data on land use or other factors affecting existing or potential future runoff from the development of the cities of Keewatin and Nashwauk; and
- Implementation plan for the Regional Mercury TMDL.

19. **Geologic Hazards and Soil Conditions**

a. Approximate depth (in feet) to ground water: (See below) minimum unknown average
Approximate depth (in feet) to bedrock: (See below) minimum unknown average
Describe any of the following geologic site hazards to ground water and also identify them on the site map: sinkholes, shallow limestone formations or karst conditions. Describe measures to avoid or minimize environmental problems due to any of these hazards.

The elevation of groundwater in the vicinity of the Keetac facility is discussed in Item 13, Water Use. Groundwater elevations based on MDH records, are presented on Figure 13-9 (Item 13). These data were obtained from the County Well Index (CWI), which is a database of well construction records maintained jointly by the MDH and the Minnesota Geological Survey. The CWI data can vary from current conditions because the measurements are taken from different aquifers over different time periods. In addition, the wells listed in the CWI database are likely not the only wells in the project vicinity that could be affected by the project; there are likely additional private wells in the area that are not in the current CWI database.

None of the listed conditions listed in the instructions of Item 19a are present on the site; however groundwater will flow into active mining areas where it combines with surface stormwater and dewatered as described in Item 13. In addition, the DNR is currently mapping underground mine workings (former natural mine tunnels) in parts of the Mesabi Iron Range. Mine workings have not yet been mapped by the DNR west of Section 18 on the Keetac property. However, some limited information does exist for the Mississippi Two and Bennett pits.

Mine pit water quality is discussed in Item 18. Depth to the water table around the mine site is unknown. Very little water is observable draining from the overburden or rock walls in the pits. Bedrock depth is zero only in disturbed areas. Minimum overburden thickness is probably closer to 20 or 25 feet in undisturbed areas.

b. Describe the soils on the site, giving NRCS (SCS) classifications, if known. Discuss soil granularity and potential for groundwater contamination from wastes or chemicals spread or spilled onto the soils. Discuss any mitigation measures to prevent such contamination.

Soil types derived from the Itasca County Soil Survey information are listed in Table 19-1 and shown on Figure 19-1. Soil textures include primarily loamy sand, sandy loam, silt loam, and

organic soils in the undisturbed areas. The previously disturbed areas are highly variable including some areas with bedrock at the surface to other areas containing deep deposits of glacial overburden.

Stockpiling volumes and methods are being addressed in the mine model and mine plan, which will be completed prior to the preparation of the draft EIS. Figure 5-3 (Item 5) presents a map showing the potential locations of stockpiles and the extent of mining for the proposed project. The stockpiles would store three classes of materials: surface overburden, waste rock, and lean ore. The properties of waste rock and lean ore are well known and would not require special procedures. The surface overburden, including soils, would be managed in accordance with Minnesota Rules, parts 6130.1000 and 6130.2700 (the standards for surface overburden stockpile design and construction) and Minnesota Rules, part 6130.3600 (the standards for vegetation of mine features) and any other applicable regulations.

Soils are cataloged in Table 19-1. Soils in the mine area (which will be the soils to be stockpiled) include Nashwauk fine sandy Loam and Keewatin silt loam, as well as udorthents. Udorthents are areas where soils have been stripped and highly disturbed such as cut-and-fill operations or gravel pits. In this context, nearly level udorthents are areas that have been stripped for mining and very steep udorthents are piles of excavated material. No special measures are anticipated to deal with these soils.

The remaining area comprising over 80 percent of the area to be stripped is predominantly silt loam and sandy loam soils. The soils are formed on glacial moraines; subsoils would be glacial till typical of the Mesabi Range. The upper horizons of these soils can be erodible, but overall the stripped material should present no major obstacles to forming stockpile pads for rock and lean ore or to creation of surface stockpiles.

Table 19-1: Project Boundary Soil Summary

Soil Symbol	Soil Type	Hydrologic Group	Area (Acres)		
			North Project Area	South Project Area	Tailings Pipeline
---	Data Missing	---	---	3,135.4	---
1003B	Udorthents, loamy (cut and fill land)	B	657.7	24.5	6.0
1021A	Rifle soils, 0 to 1 percent slopes	D	27.2	---	---
1022A	Greenwood soils, 0 to 1 percent slopes	D	5.4	---	---
1041	Pits, mine	---	573.8	---	---
1042	Dumps, mine	---	354.4	---	---
1043	Udorthents, loamy (cut and fill land)	B	---	87.9	---
1043C	Udorthents, nearly level to rolling	B	334	223.7	---
1043F	Udorthents, very steep	B	313.3	---	---
1044	Slickens	---	53.9	698.6	---
1048	Dumps, iron mine	---	713.4	---	1.1
1049	Pits, iron mine	---	630.8	---	---
1050	Tailings basin	---	246.6	920.8	0.5
19-1B	Buhl loam, 1 to 5 percent slopes	D	---	13.4	---

Soil Symbol	Soil Type	Hydrologic Group	Area (Acres)		
			North Project Area	South Project Area	Tailings Pipeline
19-4A	McQuade-Dora, depressional-Fayal, depressional, complex, 0 to 2 percent slopes	D	---	22.1	---
458E	Menahga loamy sand, 10 to 30 percent slopes	A	---	12.9	---
544	Cathro muck	A/D	29.1	---	---
614	Blackhoff muck	D	14.7	---	---
619 [1]	Keewatin silt loam	C	588.8	14.6	---
620B	Cutaway loamy sand, 0 to 8 percent slopes	B	0.1	---	---
622B [2]	Nashwauk fine sandy loam, 1 to 10 percent slopes	C	1,131.4	80.5	---
622E	Nashwauk fine sandy loam, 12 to 35 percent slopes	C	63.9	---	---
625	Sandwick loamy fine sand	B	60	---	---
628 [3]	Talmoon silt loam	D	37.2	---	---
655	Bearville loamy sand	C	5.6	---	---
798	Sago and Roscommon soils,	D	24.8	17.2	---
867B	Menahga and Graycalm soils, 0 to 8 percent slopes	A	---	250.5	---
B32A	McQuade-Dora, depressional-Fayal, depressional, complex, 0 to 2 percent slopes	D	---	21.4	---
B34B	Majestic-Hibbing complex, 2 to 8 percent slopes	C	43.0	---	---
F12B	Eagles nest-Babbitt complex, 1 to 8 percent slopes, bouldery	C	24.3	---	---
F13A	Babbitt, bouldery-Aquepts, rubbly, complex, 0 to 3 percent slopes	C	28.8	---	---
F15E	Rollins cobbly sandy loam, 18 to 35 percent slopes, stony	A	9.3	---	---
F2B	Eaglesnest-Wahlsten complex, 2 to 8 percent slopes, bouldery	C	108.4	---	---
F34A	Cathro-muck, depressional, 0 to 1 percent slopes	D	0.5	---	---
F3D	Eveleth-Eaglesnest-Conic complex, 6 to 18 percent slopes, bouldery	C	23.3	---	---
F41B	Wurtsmith-Friendship complex, MLRA 93, 1 to 4 percent slopes	A	91.3	---	---
F42A	Meehan sandy loam, 0 to 2 percent slopes	A	5.9	---	---
F43A	Roscommon muck, depressional, MLRA93, 0 to 1 percent slopes	A	58.2	---	---
F5B	Babbitt, bouldery-Wahlsten, bouldery-Aquepts, rubbly, complex, 0 to 8 percent slopes	C	2.4	---	---

Soil Symbol	Soil Type	Hydrologic Group	Area (Acres)		
			North Project Area	South Project Area	Tailings Pipeline
F6B	Soudan-Eaglesnest-Babbitt complex, 1 to 8 percent slopes, bouldery	C	275.4	---	---
F7B	Biwabik-Graycalm complex, 1 to 8 percent slopes	A	193.8	---	---
GP	Pits, gravel-Udipsamments complex	---	43.7	---	---
M-W	Water, miscellaneous	---	442.5	---	---
W	Water	---	29.6	137.9	---
		Total Acreage[4]	**7,246.6**	**5,661.4**	**7.6**

[1] Prime farmland if drained.
[2] Prime farmland.
[3] Farmland of statewide importance.
[4] Values may not add exactly due to rounding.

Proposed Treatment of Topic in EIS

The EIS will include a discussion of the potential for groundwater contamination from process chemicals and hazardous materials used or stored at the project site and seepage from the tailings basin. Measures to prevent and contain spills from processing materials and maintenance and repair of mining equipment will be identified in the EIS, covered under Item 20. The EIS will also include a discussion of the potential impacts to prime and unique farmland under Item 25.

20. **Solid Wastes, Hazardous Wastes, Storage Tanks**

a. Describe types, amounts and compositions of solid or hazardous wastes, including solid animal manure, sludge and ash, produced during construction and operation. Identify method and location of disposal. For projects generating municipal solid waste, indicate if there is a source separation plan; describe how the project will be modified for recycling. If hazardous waste is generated, indicate if there is a hazardous waste minimization plan and routine hazardous waste reduction assessments.

Plant operations that use fuel and require storing hazardous waste occur within the wellhead protection areas for both Keetac wells and the City of Keewatin wells. Therefore it is important to protect water quality in the project area. The proposed project would produce the total estimated amounts of waste shown in Table 20-1. The Expansion Project would increase solid and hazardous waste approximately in proportion to the increase in taconite productions, or by about 60 percent.

Table 20-1: Description of Solids, Sludges and Hazardous Wastes

Source	Quantity (estimated)	Description, Proposed Disposition
Solid Wastes		
Construction	To Be Determined	Construction debris will be generated during construction and through ongoing plant maintenance. Debris will be trucked to a demolition debris landfill.
Scrap (ferrous and non-ferrous)	1,776 TPY	Recycled
Demolition/Heavy Industrial Waste	708 TPY	Landfilled at a licensed facility
Refuse[1]	255 cubic yards per year (CYY)	Landfilled at a licensed facility
Passenger waste tires	6.83 TPY	Removed and recycled by a licensed contractor
Commercial waste tires	300 TPY	Removed and recycled by a licensed contractor
Source Hazardous and Universal Wastes		
Vehicle batteries	6.92 TPY	Recycled by a licensed contractor
Used oil	108,170 GPY	Removed and recycled/disposed of by a licensed contractor
Used oil filters	34.8 CYY	Removed and recycled/disposed of by a licensed contractor
Electronic appliances	2,534 lbs per year	Removed and recycled/disposed of by a licensed contractor
Antifreeze	1,860 lbs per year	Removed and recycled/disposed of by a licensed contractor
Fluorescent and HID lamps	3,580 lbs per year	Removed and recycled/disposed of by a licensed contractor
Lithium and nickel-cadmium batteries	70 lbs per year	Removed and recycled/disposed of by a licensed contractor
Mercury switches and bulk mercury-containing equipment	21.9 lbs per year	Removed and recycled/disposed of by a licensed contractor
Aerosol cans	1,013 lbs per year	Removed and recycled/disposed of by a licensed contractor
Solvents	50 GPY	Removed and recycled/disposed of by a licensed contractor

[1] "'Refuse' means putrescible and nonputrescible solid wastes, including garbage, rubbish, . . . street cleanings, and market and industrial solid wastes. . . . 'Rubbish' means nonputrescible solid wastes, including ashes, consisting of both combustible and noncombustible wastes, such as paper, cardboard, tin cans, yard clippings, wood, glass, . . . or litter of any kind." Minnesota Rules, part 7035.0300, subparts. 89 & 94.

The Keetac facility is classified as a very small quantity generator of hazardous waste (USEPA Id. No. MND071344733), and is not statutorily required to complete hazardous waste reduction assessments or have a hazardous waste minimization plan. Keetac maintains an spill-prevention

containment and control plan and has a major facility above ground storage tank permit for its larger tanks. As summarized under Item 20c, no new storage tanks or fueling stations are planned as part of the project.

During operation, the plant and offices would generate typical mixed solid waste associated with office and industrial operations. These would be hauled to the St. Louis County Landfill. Paper waste, glass, and aluminum cans would be separated and recycled.

Proposed Treatment of Topic in EIS

The EIS will characterize solid wastes such as emission control dust and discuss the potential impacts of available disposal options.

b. Identify any toxic or hazardous materials to be used or present at the site and identify measures to be used to prevent them from contaminating groundwater. If the use of toxic or hazardous materials will lead to a regulated waste, discharge or emission, discuss any alternatives considered to minimize or eliminate the waste, discharge or emission.

See Table 20-1 for a list of solid and hazardous wastes and their method and location of disposal.

c. Indicate the number, location, size and use of any above or below ground tanks to store petroleum products or other materials, except water. Describe any emergency response containment plans.

Figure 20-1 shows the locations of the aboveground storage tanks (ASTs) and USTs at the Keetac facility. Table 20-2 lists the storage tanks at the Keetac facility. U. S. Steel does not anticipate increasing its fuel oil storage capacity or adding petroleum storage tanks in conjunction with the Expansion Project. Storage tanks are contained as described below. U. S. Steel will amend its existing SPCC plan prior to the start of the Expansion Project operations.

Table 20-2: Storage Tank Information

Material Stored	Storage Capacity (gallons)	Location	Secondary Containment
Aboveground Storage Tanks			
Diesel	20,000	Pit Fueling Station	Yes – concrete floor and dikes
Diesel	20,000	Pit Fueling Station	Yes – concrete floor and dikes
TO410	500	Pit Fueling Station	Yes – inside plant on diked concrete floor
TO430	500	Pit Fueling Station	Yes – inside plant on diked concrete floor
Lube oil	400	Crusher #1	Yes – inside building
Lube oil	400	Crusher #2	Yes – inside building
Fuel oil	500	Pellet Plant	Yes – inside building
Fuel oil	1,757,860	Pellet Plant	Yes - clay liner and dike
Fuel oil	6,000	East of concentrator crane bay	Yes – concrete floor and dike

Material Stored	Storage Capacity (gallons)	Location	Secondary Containment
Diesel	10,000	Tailings Basin	Yes – clay liner and dike
Lignosulfanate	10,000	Tailings Basin	Yes – clay liner and dike
Waste oil	560	Truck Shop	Yes - inside oil room on concrete floor
Lube oil	6,000	North Truck Shop	Yes – concrete floor and dike
Lube oil	6,000	North Truck Shop	Yes – concrete floor and dike
Waste oil	2,000	North Truck Shop	Yes – concrete floor and dike
Hydraulic oil	2,000	North Truck Shop	Yes – concrete floor and dike
Waste oil	1,000	Pelletizer	Yes – inside building
Waste oil	1,000	Concentrator	Yes – double-walled
Lube oil	250	Truck Shop	Yes – inside building
Motor oil	250	Truck Shop	Yes – inside building
Transmission fluid	250	Truck Shop	Yes – inside building
Magnesium chloride	10,000	Pellet Loadout	Yes – concrete floor and dike
T-Oil 30	2,000	North Truck Shop	Yes – concrete floor and dike
T-Oil 50	2,000	North Truck Shop	Yes – concrete floor and dike
Antifreeze	2,000	North Truck Shop	Yes – concrete floor and dike
Hydraulic oil	1,000	Pit Fueling Station	Yes – inside plant on diked concrete floor
Lube oil	1,000	Pit Fueling Station	Yes – inside plant on diked concrete floor
Lube oil	3,000	Crusher #1	Yes – inside plant
Lube oil	3,000	Crusher #1	Yes – inside plant
Lube oil	3,000	Crusher #2	Yes – inside plant
Lube oil	3,000	Crusher #2	Yes – inside plant
Hydraulic oil	110	Crusher #1	Yes – inside building
Hydraulic oil	110	Crusher #2	Yes – inside building
Transmission fluid	250	Truck Shop	Yes – inside building
Motor oil	260	Truck Shop	Yes – inside building
Fuel oil	260	Surface Combustion Basement	Yes – inside building
Antifreeze	500	Pit Fueling Station	Yes – concrete floor and dike
Underground Storage Tanks			

Material Stored	Storage Capacity (gallons)	Location	Secondary Containment
Unleaded gasoline	10,000	South of Truck Shop, west of the Administration Building	Double-walled with Cathodic protection

Proposed Treatment of Topic in EIS
The EIS will describe liquid materials to be stored on site as well as spill prevention and containment measures. The EIS will include an inventory of tanks and major process consumables.

21. **Traffic.** Parking spaces added: None. Existing spaces (if project involves expansion): Not Applicable. Estimated total average daily traffic generated: See discussion below. Estimated maximum peak hour traffic generated (if known) and time of occurrence: See discussion below. Provide an estimate of the impact on traffic congestion on affected roads and describe any traffic improvements necessary. If the project is within the Twin Cities metropolitan area, discuss its impact on the regional transportation system.

The proposed project is not in the Twin Cities metropolitan area.

The Keetac facility is accessed from Trunk Highway 169. There are two roads to the mine site. County Road 16 runs north through the City of Keewatin and turns east toward the plant. A company access road exits directly from Trunk Highway 169 north to the plant on the east side of Welcome Lake. U. S. Steel does not anticipate upgrading or expanding the access roads to the site as a result of this proposed project. Likewise, no new parking spaces are needed to accommodate the increased traffic due to the proposed project since there is currently excess parking available (the facility currently requires significantly fewer employees than were required when the plant was constructed).

U. S. Steel will employ approximately 500 workers during construction of the Expansion Project. U. S. Steel expects to employ 70 additional employees for long-term production, support, and administration. These construction workers and long-term employees will use the same ingress and egress roads as the current employees. Existing daily traffic on Trunk Highway 169 near Keewatin is approximately 6,000 vehicles per day.

County and regional planning is ongoing to investigate the potential need to upgrade Trunk Highway 169 in some areas to accommodate existing and planned industrial expansion (see, e.g., Draft Itasca County Community Readiness Assessment, Appendix E, January 8, 2008, available at http://www.arrowheadplanning.org/documents/Itasca%20Readiness/ItascaReadinessAssessmentDocument.pdf)
The additional construction and operational traffic generated by the proposed Expansion Project is expected to have a relatively minor impact on overall traffic in the area.

Proposed Treatment of Topic in EIS
The EIS will analyze potential traffic pattern and congestion impacts due to employees involved in the construction and on-going operation of the proposed project. Daily and peak hour rates will

be calculated and intersection impacts along Trunk Highway 169 and within the City of Keewatin will be evaluated. Traffic loads from other facilities will be considered.

22. **Vehicle-Related Air Emissions.** Estimate the effect of the project's traffic generation on air quality, including carbon monoxide levels. Discuss the effect of traffic improvements or other mitigation measures on air quality impacts. Note: If the project involves 500 or more parking spaces, consult EAW Guidelines about whether a detailed air quality analysis is needed.

Although a detailed analysis has not been completed, the incremental increase in traffic in a rural setting is expected to have a negligible effect on air quality. Traffic from mine haul trucks is known to be a large source of fugitive particulate emissions at taconite plants but is considered to be part of the stationary source emissions and will be covered by Item 23 below.

Proposed Treatment of Topic in EIS
The EIS will not evaluate vehicle-related air emissions.

23. **Stationary Source Air Emissions.** Describe the type, sources, quantities and compositions of any emissions from stationary sources of air emissions such as boilers, exhaust stacks or fugitive dust sources. Include any Hazardous Air Pollutants (HAPs) (consult EAW Guidelines for a listing) and any greenhouse gases (such as carbon dioxide, methane, nitrous oxide) and ozone-depleting chemicals (chloro-fluorocarbons, hydrofluorocarbons, perfluorocarbons or sulfur hexafluoride). Also describe any proposed pollution prevention techniques and proposed air pollution control devices. Describe the impacts on air quality.

The Expansion Project would produce air emissions from stationary and mobile sources. Stationary processing operations would include mining, ore crushing, ore concentrating, taconite pellet induration furnaces, and materials handling. Mining and mine traffic would be the primary source of fugitive particulate emissions; some fugitive emissions would also come from the tailings basin. Mining shall be managed to control avoidable dust pursuant to Minnesota Rules, parts 6130.3700 and 7011.0150.

The proposed project would increase air emissions above current levels and would be a major modification under the federal Prevention of Significant Deterioration (PSD) regulations for several air pollutants. Appendix B provides emission estimates for chemicals of potential interest (COPI). As a major modification, the air permit application for the proposed project must address the requirements of the PSD program. These include:

- A demonstration of the application of Best Available Control Technology (BACT) for PSD pollutants for which the project exceeds the significant emission rates will be done. Based on the current emission inventory the pollutants for which a BACT analysis will be performed include sulfur dioxide (SO_x), particulate matter less than 10 and 2.5 micrometers in diameter (PM_{10} and $PM_{2.5}$), and carbon monoxide (CO). BACT analysis will not be necessary for nitrogen oxides (NO_x) because U. S. Steel currently expects to limit NO_x emissions below PSD thresholds.
- Class II increment analyses ("fence line" dispersion modeling) will at a minimum be required for PM_{10}. In Minnesota, Class II areas are those that are not National Parks or Wilderness Areas. A Class II increment analysis will also be required for any other pollutants exceeding major modification thresholds and modeled to determine if significant impact levels are reached. This includes $PM_{2.5.}$ PSD permit thresholds were promulgated by the USEPA on May 16, 2008 and MPCA issued guidance on July 18, 2008. Additional modeling for NO_x may also be required for the EIS.

- An additional impacts for criteria pollutants on soils and vegetation will be completed;
- Class I Area impacts analysis evaluating potential long-range transport of visibility impairing pollutants will be completed. Class I areas are national parks and wilderness areas. For this project, the Class I areas of concern include Voyageurs National Park (VNP), Boundary Waters Canoe Area (BWCA), Isle Royale National Park (in Michigan), and Rainbow Lakes Wilderness Area (in Wisconsin); and
- Class II National Ambient Air Quality Standards (NAAQS) analysis for CO, SO_2, PM_{10} will be completed for the air permit and EIS. In addition, a NAAQS and increment analysis $PM_{2.5}$ may be completed pending protocol guidance from MPCA. The Class II NAAQS modeling will include existing sources in the area including MSI and Excelsior Energy, thus eliminating the need for a cumulative Class II analysis.

In addition to the air quality analysis required for the PSD air permit, ambient air concentrations would also be estimated for CO, and lead. VOCs (Volatile Organic Compounds) are a precursor to ozone formation and are not typically modeled except in regional modeling programs. Individual VOC constituents will be modeled as part of the screening level Human Health Risk Assessment (discussed below).

Modeling will be conducted for all air quality analyses according to modeling protocols, which will be submitted to MPCA, NPS, and the USFS for approval.

In addition to PSD requirements, the proposed project would be subject to Maximum Achievable Control Technology (MACT) requirements for those sources that are part of a HAP source category or that are major HAP sources individually. Taconite ore processing has been assigned a MACT category.

Finally, the MPCA's air permit application form HG-01 requires an evaluation of mercury inputs and outputs (a mercury mass balance). Mercury is present at trace levels in the taconite ore and it volatilizes when subjected to the temperatures of taconite pellet induration. A preliminary mercury balance has been prepared for this proposed project. U. S. Steel is proposing to control mercury emissions from the new indurating furnace using control equipment similar to that used to control mercury emissions from power plants. As such, mercury emissions from the Expansion Project would be substantially less than emissions from existing Iron Range taconite plants.

Current Air Quality of Project Site

The proposed project is located in an area that is currently in attainment with the NAAQS for airborne particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone, and lead and is currently meeting all Minnesota state air quality standards (MAAQS).

Particulate Matter Less than 2.5 Micrometers in Diameter

EPA recently issued regulations governing implementation of PSD for $PM_{2.5}$. Because these rules are new, $PM_{2.5}$ is not currently addressed by Keetac's air permit. EPA has also issued a related $PM_{2.5}$ Federal Register notice requesting comments on possible approaches for preconstruction review addressing PSD increments, significant impact levels, and significant monitoring concentrations. The MPCA is currently preparing draft PSD implementation guidance for $PM_{2.5}$.

MPCA ambient air quality monitoring indicates that Minnesota currently meets NAAQS for $PM_{2.5}$. Although federal and state implementation of the new USEPA $PM_{2.5}$ regulations and

guidance are under development, the proposed $PM_{2.5}$ rules will likely apply in some form to the project. Sources including induration and the diesel emissions (hauling) will potentially fall under these rules.

A preliminary $PM_{2.5}$ emission inventory has been developed and an applicability determination based on the inventory will be completed (see Appendix A). Based on preliminary estimates, it is anticipated that the project will trigger PSD and will require application of BACT and modeling to demonstrate compliance with ambient air quality standards.

Description of Stationary Emission Sources

For the purposes of describing the air emission sources, the project can be divided into the following areas:

- Mining and crushing operations;
- Concentrator;
- Pellet plant; and
- Tailings basin.

Figure 23-1 provides a schematic representation of the preliminary process flow for the project. The sections below describe the emission sources from each area in detail.

Keetac's operations do and would center on excavating taconite ore at the mine and processing ore into iron oxide pellets. The main activities associated with the mine and plants include:

- Mining, transporting, and ore crushing;
- Recovering and concentrating magnetite from the ore;
- Additive receiving and handling (pellet plant);
- Concentrate storage and handling;
- Converting the taconite concentrate to iron oxide pellets in the pellet plant furnaces;
- Pellet storage and handling; and
- Supporting activities (e.g., process water treatment; fuel storage and handling, emergency generators).

Mine and Crushers

Mining begins with the blasting, removing, and stockpiling of unconsolidated overburden and waste rock. Blasting, loading, and transferring taconite ore by truck to the primary crusher follows this step. Crushed ore is transferred from the crusher by conveyor to crude ore storage located at the concentrator plant. Particulate sources from mining and crushing activities include:

- Fugitive emissions from overburden stripping;
- Fugitive emissions from drilling and blasting of waste rock and taconite ore;
- Fugitive emissions from vehicle traffic in mine;
- Fugitive emissions from loading and unloading of raw materials;
- Wind erosion (fugitive) emissions from storage piles;
- Emissions from ore dumping to crusher;
- Emissions from ore crushing;
- Emissions from the ore crusher apron feeder;
- Emissions from the crushed ore conveyors and tripper conveyor;
- Emissions from the plant feed conveyor; and
- Emissions from the crushed ore storage.

Except for rock blasting, each of these sources will be included in the air dispersion model analysis. Rock blasting is typically not modeled in these analyses because blasting occurs approximately weekly and emissions are generated only for a few minutes. The models are best

suited to handle continuous emission sources as the model assumes that emissions occur continuously for at least one hour. Annual emissions from blasting will be calculated and included in the overall emission inventory.

Concentrator
Concentrating operations involve a series of wet processes that reduce the crushed ore to a powder and physically (magnetically) separate the iron-containing fines from the nonmagnetic waste (tailings). Tailings are directed to the tailings basin as slurry and the concentrated iron (concentrate) is directed as thickened slurry to concentrate storage tanks. Limestone is added to the concentrate slurry before it is pumped to the pellet plant.

The conveyors that transfer ore from the coarse ore storage to the wet mills are a source of fugitive dust emissions. Other ore processing operations at the concentrating section, including the milling process, are wet processes and therefore are not considered to be sources of air emissions. Particulate sources from the concentrator include:

- Mill Crusher emissions; and
- Emissions from additive day bins loading and unloading.

Concentrate Storage and Handling
Concentrate storage and handling operations consist of the on-ground storage of concentrate, the loading of concentrate onto conveyers, and the transfer of concentrate by conveyors. These operations occur only if the concentrate production rate exceeds the capacity of the pellet plant. Particulate sources from concentrate storage and handling include:

- Fugitive emissions from the concentrate stockpile;
- Fugitive emissions from stockpile truck loading and unloading; and
- Concentrate stockpile reclaim conveyor emissions.

Pelletizing (Induration)
Pelletizing operations include the storage and dewatering of concentrate, the blending of binder into the dewatered (high-moisture) concentrate cake, the forming of the concentrate/binder mixture into green-colored balls, the firing of the green balls into hardened iron oxide pellets, and the transfer of the oxide pellets to storage. Pellet firing is expected to use a grate-kiln furnace. The grate-kiln furnace would use gas stream recycling for heat recovery. Waste gas would exit the process through four exhaust stacks. Because the furnace is the first location in the process where the concentrate is exposed to high heat, mercury is liberated from the ore in this process. U. S. Steel is proposing to install mercury emission controls. The preliminary assessment of control technologies indicates that dry controls for particulates and SO_2 would provide the best available control of emissions. An advantage of the use of dry emissions controls on the Expansion Project furnace is that mercury control technologies used on power plants may be technically feasible to use on the grate-kiln furnace exhausts.

Emission sources associated with these operations include: receiving and handling of binder, the addition of dry additive to the concentrate, grate feed and discharge to the cooler, waste gas emissions, feeders to the pellet transfer conveyors, and pellet screening and the various pellet transfer conveyors leading to the pellet storage area.

Emissions from pelletizing include PM/PM_{10}, $PM_{2.5,}$ NO_x, SO_2, CO, VOCs, fluoride, and mercury. Sources include:

- The binder silo and day bin (PM/PM_{10}/$PM_{2.5}$ only);
- Emissions from the grate feed (PM/PM_{10}/$PM_{2.5}$ only);
- Emissions from the grate-kiln; and

- Emissions from the pellet cooler (PM/$PM_{10/}$ $PM_{2.5}$ only).

Pellet Storage and Handling
Pellet handling and transfer operations consist of pellet screening and size classification, on-ground storage, and transfer of oversize and undersize pellets and pellet fines to the regrind mill. Emission sources associated with these operations include: the discharge of product pellets to storage piles; storage and handling of off-spec pellets and chips; separation of product pellets from off-spec pellets and chips; and the storage and transfer of the fines and chips for reprocessing. Particulate emissions originate from:

- Vibrating feeders and pan feeders;
- Pellet stockpiles to the screen conveyor; and
- Pellet screen/grizzly screening.

Additive Receiving and Handling
Additives used by Keetac likely would include limestone and binders in various forms and quantities. Additive receiving and handling includes railcar or truck unloading, transfer to the additive storage silos, and the transfer of additives from the silos to day bins. Unloading and transfer is pneumatic. Point source emissions for the additive receiving and handling operations would result from venting of additive silos and day bins during pneumatic transfer. Day bins vent back to the storage silos whose vents are controlled with fabric filters.

Tailings Basin
The waste rock (tailings) produced in the concentration process would be pumped as slurry from the tailings thickener through the tailings pipeline to the tailings basin. In the tailings basin, the tailings would separate by gravity from the process water and the water would be reclaimed and returned to the plant. The tailings basin would be sloped and vegetated to meet reclamation standards as exterior slopes are completed and interior beaches are temporarily vegetated or mulched as required to control fugitive emissions. The major sources of fugitive dust emissions from the tailings basin are:

- Wind erosion emissions from the tailings basin; and
- Dam construction and basin maintenance work (heavy equipment operation).

Support Activities
There are a number of support activities, which are activities and sources of relatively small emissions. Support activities will include the sources listed below.

- Building heaters;
- Solvent use;
- Welding/cutting equipment;
- Water Quality/Product Quality Laboratories;
- Fuel storage tanks;
- Plant maintenance activities;
- Process water treatment; and
- Emergency generators.

<u>Project Impacts on Air Quality</u>
The Expansion Project is subject to the most current environmental regulations, which mandate the application of the best available air emissions controls that are commercially available for the different processes making up the overall facility. A preliminary Keetac air emissions inventory is summarized in Appendix A. The initial list of emissions of chemicals of potential interest developed for the human health risk assessment per applicable MPCA requirements is provided in Appendix B.

The current emission inventory indicates that the project would be a major source of particulate, SO_2, and CO emissions. (The PSD threshold for $PM_{2.5}$ is 10 tons per year). As indicated in Appendix A, the expected emissions from the proposed project would trigger federal PSD requirements for PM_{10}, $PM_{2.5}$, SO_2, and CO. Without any additional measures the project would also trigger PSD for NO_x. Keetac has proposed to incorporate an emission cap on the facility that would result in no net emissions increase for NO_x. In other words, emissions from the existing operations would be reduced from baseline emissions to offset the increase in NO_x emissions from the Expansion Project. A summary of the NO_x "netting" analysis for PSD purposes is provided below.

Table 23-2 shows zero NO_x emissions from the Expansion Project point sources, which are subject to PSD regulations. The mobile source emissions shown in Table 23-2 are regulated under USEPA's mobile source regulations and are not part of PSD permits.

U. S. Steel plans to use natural gas and biomass as fuel for the indurating furnace, with coal and fuel oil as back-up fuels if natural gas or biomass are unavailable. As part of the Expansion Project, the Phase I pellet plant would be refurbished using leading-edge-technology for taconite pellet production. The refurbished furnace would increase heat recovery from the process and minimize the plant's fuel usage. In addition, the design of the heat recovery process combined with segregation of the exhaust streams off of the pre-heat sections allows for cost-effective treatment of air pollutants.

NO_x PSD Netting Summary

Based on the air permit issued in 2005, Phase II is currently permitted to use 100 percent natural gas and to have an annual NO_x emission of 6,072 tons per year. Actual Phase II NO_x annual emissions are shown in Table 23-2 and have been lower in recent years, presumably due to improvements in kiln operations and an increased use of coal. Because of this decrease, U.S. Steel believes that it can operate both the Phase II and the Expansion Project at or below historical baseline emission levels of NO_x from Phase II. Although actual emissions would likely increase compared to the past couple of years with the addition of the Expansion Project, permitted emissions from the total facility would decrease. Permitted emissions would also be lower than actual emissions for some years and would be much lower in terms of emissions per ton of pellet produced.

An emissions increase is significant if it exceeds annual tons per year rates known as the PSD significant emission rates. For NO_x, this rate is 40 tons per year. To determine whether the proposed project would result in a significant increase, a baseline emission rate must be established. In this case, it is the actual emissions over a 24-month-consecutive period (2004 to 2005) within the last 10 years. Table 23-2 shows emission information used to establish the baseline. As summarized below, U. S. Steel currently expects to limit net NO_x emissions in the air permit to less than the PSD significant emission rate threshold.

Table 23-2
Keetac Actual NO_x Emissions Per Year

Year	Emissions (TPY) NO_x
1998	3,637
1999	4,405
2000	6,079
2001	4,850
2002	6,049
2003	4,869
2004	5,926
2005	5,789
2006	3,387
2007	3,619
Top 2-year avg.	5,857

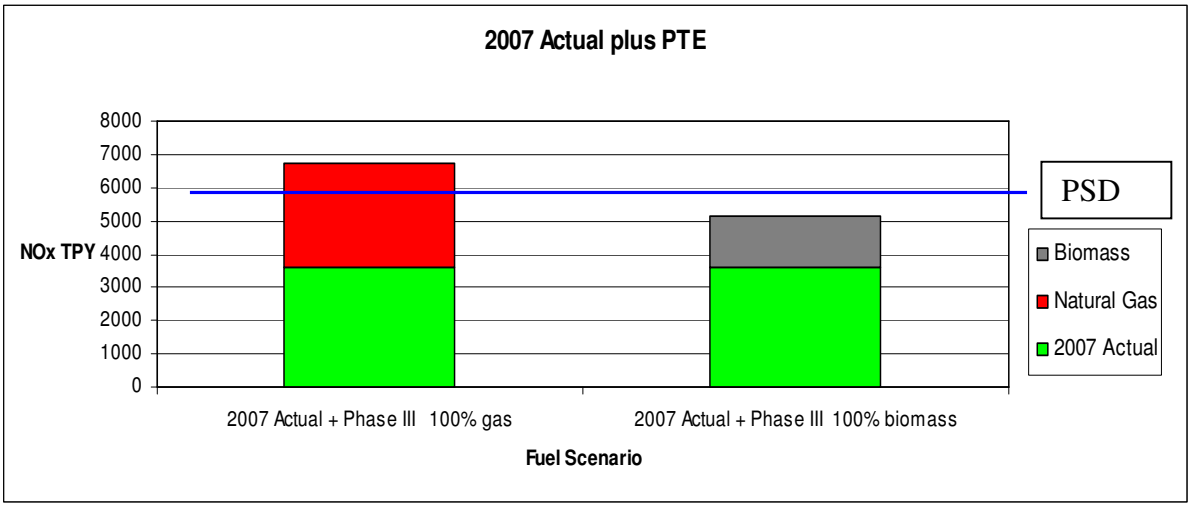
The potential to emit (PTE) for an emissions unit yet to be constructed is generally calculated as the product of its hourly maximum throughput or heat input capacity and an accepted or approved emission factor. Federally enforceable emission limitations on the capacity of the source to emit a pollutant (e.g., fuel use) may be taken to reduce the unit's potential to emit. Table 23-2 shows actual NO_x emissions for the facility. Using these numbers, 2007 is used to represent contemporaneous emissions, which show a negative 2,238-ton offset.

Table 23-3 shows actual emissions from 2007 (Phase II only) along with new project PTE for 100 percent natural gas and 100 percent biomass scenarios. Natural gas has the highest NO_x emissions, coal has the lowest NO_x emissions and biomass is in between the two. Also included is the NO_x baseline.

Table 23-3: Keetac NO_x Emissions

Emission Source	Emissions (TPY) NO_x
2007 Actual	3,619
PTE Project-Only 100% gas	3,107
PTE Project-Only 100% biomass	1,538
Baseline	5,857

The following figure shows 2007 actual emissions added to either the Expansion Project 100 percent natural gas or 100 percent biomass PTE as compared to the baseline.



As shown above, it is feasible to operate both Phase II and the Expansion Project if an overall limit on emissions associated with fuel usage is taken into consideration. This would however mean that the facility would not be permitted to burn 100 percent gas and would have to manage the fuel mix in order to maintain emissions below the emission cap. U. S. Steel plans to use as much biomass as is available to fuel the Expansion Project. NO_x emissions from biomass are significantly lower than natural gas, but slightly higher than coal. Biomass however has the added benefits of emitting less mercury and is greenhouse gas neutral.

To meet the proposed NO_x limit, permit conditions would describe compliance demonstration using continuous emission monitors on both Phase II and the Expansion Project. This would allow for real time fuel choice decisions and the ability to take advantage of operating information to minimize NO_x emissions and maintain compliance with permit limits.

U. S. Steel is required to apply to the MPCA for a PSD permit and demonstrate that the project would not have a significant adverse impact on air quality. Within the PSD permit application, Keetac will be required to provide information demonstrating that new air emissions do not impact air quality beyond an allowable increment for Class I and Class II areas.

Air dispersion modeling is used to predict air emission impacts on Class I (using CALPUFF model) and Class II areas (using AERMOD model). Class I modeling will analyze the impact of SO_2, NO_x and direct $PM_{2.5}$ on visibility (i.e., their contribution to haze) in designated park or wilderness areas. Keetac will also be required to provide a BACT review, which will set emission limits and control efficiencies for specific point sources (stacks).

The proximity of the proposed project to Class I areas (VNP and the BWCA) requires an analysis of the proposed project's air emissions potential impact on those areas. As in the more immediate area of the plant, the proposed project is required to demonstrate that the new air emissions would not result in pollutant concentration increases that exceed established Class I increments. Federal Land Managers (FLMs) for the National Park Service (NPS), U. S. Department of Agriculture (USDA) and USFS require analyses for PSD increment, visibility, and Air Quality Related Values (AQRVs), such as the effect of acid deposition on surface waters within a Class I area. Experience at other Iron Range facilities has shown that the FLM's primary concern will be visibility impairment (haze formation). Emissions of NO_x, SO_x and fine particulates contribute to haze formation. The analysis of potential Class I area impacts will be performed in accordance

with the FLM's Air Quality Related Values Workgroup (FLAG) guidance, both current and proposed. This analysis will likely include an analysis of whether NO_x emissions (including tailpipe emissions from haul trucks) will consume Class I NO_x increment.

Sources and emission before and after the addition of the Expansion Project, including mobile sources, will be modeled to determine the net impact of the project on the Class I increment and modeled visibility impacts.

The EIS will evaluate mitigation of any net increases in modeled visibility impacts resulting from the modification. Mitigation of any existing impacts resulting from the existing facility is the goal of Minnesota's State Implementation Plan (SIP) to address Regional Haze in the Class I areas of northern Minnesota. Mitigation of impacts from the existing facility will not be evaluated in the EIS. However, if there is a net increase in modeled visibility impacts as a result of the proposed project that result in adverse impacts, an identification of potential mitigative measures will be presented as part of the EIS. These measures might include installation of controls that go beyond BACT and/or evaluation of additional emission reduction options for either existing or new sources of emissions that contribute to visibility, including stationary and mobile sources.

Currently, there are no proven technologies to reduce NO_x emissions from taconite furnaces other than good combustion practices and the use of fuels such as biomass and coal. As part of the SIP, Minnesota will continue to evaluate control strategies that have shown the potential to result in reasonable emission reductions, and expects the contributing states to do the same. Due to this ongoing evaluation, Minnesota expects to submit additional control strategies and a revised reasonable progress goal in the Five Year SIP assessment in 2012. These requirements would be applied to existing facilities including Keetac's. The state would also have the authority to apply these requirements for the installation of newly proven controls to the new sources associated with this project.

The PSD increments are much lower than the NAAQS and MAAQS; therefore, if the modeling demonstrates attainment with the PSD increments, it will also demonstrate attainment with NAAQS and MAAQS.

Fugitive and point source emissions to the air, such as the by-products from fuel combustion, contain small amounts of chemicals regarded as HAPs. These substances are regulated under Title III of the Clean Air Act (CAA) and will be part of Keetac's permit review.

Primarily, the Keetac emission inventory includes emissions of small amounts of antimony compounds, arsenic compounds, benzene, beryllium compounds, cadmium compounds, chromium compounds, cobalt compounds, formaldehyde, hexane, lead compounds, manganese compounds, mercury compounds, naphthalene, nickel compounds, selenium compounds, toluene, and 1,4-dichlorobenzene (see also Appendix A). As discussed earlier, control of HAP emissions may be achieved indirectly by controlling criteria pollutants or directly by controlling for a specific chemical.

Risk Assessment

Minnesota's environmental review process includes evaluation of potential multi-pathway risks to human health and the ecology that is caused by new projects. Keetac will prepare a screening level human health risk assessment for the proposed facility for use in the EIS and air quality permit. A cumulative ecological risk assessment will also be prepared and this is discussed in Question 29. The objectives of the human health risk assessment are:

1. To evaluate the potential human health multi-pathway risk associated with potential emissions to ambient air from the Keetac facility under routine operating conditions following Project start-up; and
2. To characterize potential multi-pathway human health risks associated with tailings basin discharge to Swan Lake.

The risk assessment will consist of a human health screening-level risk assessment (HHSRA). The "screening-level" refers to the use of conservative assumptions, input values and risk scenarios (e.g., maximum exposed individual), which generally over-estimate potential risks to human receptors. The HHSRA will evaluate potential human health risk due to direct (inhalation) and indirect (for example, soil contact, homegrown food consumption, and fish consumption) exposure.

The risk assessment will be conducted according to the USEPA's 1998 guidance document, "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities" and updates). MPCA risk assessment guidance will also be followed for the analysis, as applicable. The main parts of the risk assessment are outlined below:

1. Develop a study-specific conceptual model protocol identifying the site boundary, potential chemical emissions to air and water, exposed populations, specific lakes, toxicity values, routes of exposure and potential health outcomes.
2. Develop exposure point concentrations for air using dispersion modeling and for water using tailings basin discharge water chemistry and flow rate, as well as expected Swan Lake water volume.
3. Conduct a direct (inhalation) and indirect (multiple pathways) HHSRA, which will include the traditional components of risk assessments, including hazard identification (what are the chemicals of concern emitted from the facility), exposure assessment (who is exposed to what chemical and concentration), toxicity assessment (how toxic are the chemicals), risk characterization (what is the potential risk to the exposed individual or population), and uncertainty analysis (how likely is the estimated risk to occur and how variable are the assumptions that went into developing those risk estimates).
4. Prepare and submit a risk analysis report to the DNR, MPCA, and MDH to be included in the EIS process.

Greenhouse Gases

Greenhouse gas (GHG) emissions from the Expansion Project are not currently subject to any federal, state, or local laws or regulations. The expected GHG emissions from the Expansion Project have been calculated based on the methods outlined in a 2008 MPCA memorandum. The memorandum proposes to require all new projects to calculate the expected GHG emissions from the project using The Climate Registry (TCR) General Reporting Protocol (GRP). Using TCR GRP, the maximum total GHG emissions from the Expansion Project (from increased mining through pellet production) is 325,000 tons of CO_2-equivalents (CO_2-e) per year. This is a worst-case estimate as it assumes that 100 percent coal will be used. As discussed earlier, Keetac plans to fire the pellet plant with as much biomass as is available on the market. Biomass is considered to be GHG emission neutral. If a 50 percent biomass/50 percent natural gas mix is used to fire the pellet plant, the estimated emissions drop to 233,000 tons of CO_2-e per year or roughly a 30 percent reduction. Indirect emissions from electricity usage are estimated to be 621,000 tons of CO_2-e per year.

Proposed Pollution Control Equipment and Practices

Possible air emissions control technologies to be evaluated for effectiveness within the BACT review include the systems listed below:

- Wet (venturi) scrubbers, electrostatic precipitators (wet or dry), baghouses and clean fuel for particulate control;
- Wet (venturi) scrubbers, dry scrubbers, lime injection, wet electrostatic precipitator and clean fuel for sulfur dioxide control; and
- Catalytic reduction and good combustion practices for carbon monoxide control.

The evaluation will also consider the level of co-beneficial reduction in HAPs, including mercury, offered by technically feasible options that may complement the proven control approaches. Among the list of HAP chemicals is (elemental) mercury, which is expected to be emitted primarily from the pellet plant where pellet induration is the first exposure of ore-based mercury to high-temperature processing. In meeting the stringent particulate emission limits set by the Taconite MACT standard, there is an expectation of some co-benefit reduction in mercury. Elemental mercury (versus oxidized mercury) is typically difficult to remove from the flue gas stream. However, an on-going DNR study suggests that some mercury may deposit or adsorb on taconite mineral during induration. When mercury becomes attached to solid material, the prospect for removal from the gas stream is significantly enhanced. Mercury-laden particulate that is removed from the waste gas stacks by control equipment could be segregated from the typical recycling of taconite dust and subsequently removed from the process. The transfer of segregated dust to the tailings basin represents one potential option for sequestering the associated mercury and this option will be included in the overall evaluation of mercury control alternatives.

In addition, the use of dry control technologies for the control of particulates and SO_2 means that technologies used at power plants to control mercury emissions may also be feasible to use on the Expansion Project furnace. One of the most common technologies used to control mercury emissions from power plants is carbon injection. U. S. Steel is committed to installing and testing carbon-injection mercury emission control equipment on the Expansion Project furnace. The controls are expected to reduce mercury emissions by as much as 50 to 80 percent. The annual project uncontrolled potential emissions estimate range is approximately 70 to 82 pounds of mercury. Even though Keetac is planning to maximize its use of biomass, these calculations are based on the use of coal, so that the maximum mercury emissions are not understated. Keetac is pursuing use of controls that are estimated by the vendor to reduce mercury emissions by approximately 50 to 80 percent. Potential emissions, assuming 50 percent to 80 percent control efficiency and assuming 100 percent coal used to fire the pellet furnace, are estimated to be approximately 15 to 38 pounds per year. Assuming a 1:1 ratio of natural gas and biomass, potential mercury emissions decrease to approximately 13 to 32 pounds per year (mercury from pellets plus natural gas and biomass).

Proposed Treatment of Topic in EIS

Project-Specific Analysis

Air emissions and potential impacts will be a major topic in the EIS. Numerous studies will be undertaken as well as modeling which will describe potential air emissions impacts due to the proposed project.

The Human Health Risk Assessment will be a screening-level multi-pathway human health risk assessment. A detailed list of emissions of chemicals of potential concern will be developed for the assessment using MPCA Air Emissions Risk Analysis (AERA) Guidance and toxicity values

and USEPA Human Health Risk Assessment Protocol. The Risk Assessment will consider air emissions and water discharges, which correspond to inhalation and ingestion of toxics. The MPCA will approve the risk assessment protocol. An ecological risk assessment will be completed for cumulative effects only.

Cumulative Effects Analysis

Class I Areas – Potential Impact to Air Quality (PM_{10} Air Concentrations and Visibility Impairment) in Class I Areas in Minnesota

Federal Class I areas are areas of special national or regional value from a natural, scenic, or historic perspective. PSD regulations provide special protection for such areas. In Minnesota, there are two Class I areas: BWCA, administered by the USFS, and VNP, administered by the NPS. One way in which air quality degradation is limited in all Class I areas is by stringent limits defined by the Class I increments for SO_2, PM_{10}, $PM_{2.5}$ and NO_x. The PSD increments are the maximum increases in ambient pollutant concentrations allowed over baseline concentrations. In addition, the FLMs for each Class I area is charged with the affirmative responsibility to protect that area's unique attributes, expressed generically as AQRVs. An important AQRV for most Class I areas is visibility.

Previous PSD projects in Minnesota have modeled above the significant impact levels for PM_{10} increment and the visibility impact guideline values established by the FLMs. Visibility impacts are most often associated with fine particles that include ammonium sulfate and ammonium nitrate, related to SO_2 and NO_x emissions, respectively. Due to the modeling results from multiple projects, the FLMs and state regulatory agencies have expressed concerns about potential cumulative air quality impacts in the Class I areas in Minnesota. Because a number of projects have been proposed for northeast Minnesota over the last several years and given the relatively close proximity of these projects to both the BWCA and VNP, an assessment of potential cumulative effects to the BWCA and VNP from multiple projects will be conducted for the Keetac EIS process.

Approach to Evaluation

Air quality and visibility impairment in the BWCA and VNP are affected by local, regional, and very distant emission sources, including mobile sources. Regional planning organizations formed to address the requirements of the Regional Haze Rule have been preparing detailed emission inventories for multiple states and have conducted detailed multi-facility and multi-state modeling over the last several years. Therefore, conducting a detailed modeling analysis for this EIS process is not needed, nor is it feasible for one project to attempt. Instead, a semi-quantitative assessment will be conducted for the EIS process that is based on monitoring data, emission inventory data and the potential for actual impacts.

The semi-quantitative analysis will follow the same methodology and format as the analysis conducted for the Minnesota Steel and PolyMet Mining project EISs, respectively, updating the data included in those analyses, and account for currently proposed projects in northern Minnesota, including projects on the west end of the Mesabi Iron Range. The specific list of projects will be finalized after discussions with the state agencies and documented in a scope of work.

In order to determine potential future cumulative effects from the proposed projects, past and existing impacts in the BWCA and VNP will need to be evaluated to provide a baseline. The baseline impacts can be provided from available monitoring data from the BWCA and VNP. The available data will be presented to show trends in PM_{10} air concentrations and in visibility

impairment for the monitoring period of record, including plots of light extinction and other pertinent parameters, depending on data availability.

Because of the importance of long-range transport of emissions of fine particulate, including SO_2, sulfates, NO_x and nitrates, information on this topic will be included in the analysis along with available results from statewide, regional, or national modeling efforts that provide an estimate of out-of-state versus in-state source contributions to specific Class I areas. The assessment of potential impacts will be completed through statewide SO_2, NO_x, and PM_{10} emission trend analyses using existing statewide emission inventory data (listing of sources and TPY emissions). In addition, statewide and national emissions and emission reductions through proposed or reasonably foreseeable voluntary reduction efforts or through regulatory actions (e.g., rulemaking) will also be factored into the analysis. This will provide perspective on the potential emissions from the proposed projects. Current and reasonably foreseeable future regulatory actions include the Regional Haze Rule, Minnesota State Implementation Plan, Northeast Minnesota Plan, implementation of the Taconite MACT standard (particulate emissions), USEPA's acid rain program (SO_2 and NO_x emission reductions) and other pertinent regulations to be identified through discussions with Minnesota state agencies and documented in the scope of work for the analysis.

The assessment will summarize the potential for the projects to contribute to PM_{10} air concentrations and visibility impairment in the BWCA and the VNP. Results will be summarized in a report to be submitted to the MPCA and the EIS contractor. The results will be verified by the MPCA (this may be delegated to the EIS contractor). Results of the cumulative analysis will be incorporated into the EIS by the contractor with guidance from the MPCA.

Data Needs for Cumulative Effects Analysis

- Monitoring data from the IMPROVE Network for VNP and the BWCA;
- Air modeling studies (national, CENSARA, other state efforts);
- PM_{10}, SO_2, and NO_x emission inventory data (total facility) from the MPCA for facilities of interest;
- PM_{10} monitoring data for existing nearby sites;
- Estimated potential emission increases from reasonably foreseeable actions;
- Estimated potential emission decreases from reasonably foreseeable actions including emission reductions due to implementation of the Regional Haze Rules, Best Available Retrofit Technology (BART), and discussion on Minnesota's State Implementation Plan (SIP); and
- Minnesota Steel Industries EIS.

<u>Ecosystem Acidification Resulting From Deposition of Air Pollutants</u>

Minnesota has been a leader in the assessment of acid deposition impacts and regulation of pollutants contributing to ecosystem acidification. Acid deposition is currently regulated under Minnesota Rules through an acid deposition standard of 11 kilograms per hectare per year (wet deposition only) and a statewide SO_2 emissions cap (Minnesota Rules, chapter 7021) and federal rules (Title IV of the 1990 CAA Amendments and 40 C.F.R. Parts 72 and 75). These emissions regulations generally apply only to large electrical generating units.

Acid deposition is an on-going concern for states with low buffering capacity ecosystems. Most (90+ percent) of the acid deposition in Minnesota is from out-of-state sources. Minnesota has low-buffering capacity lakes (typically seepage lakes with no inlets or outlets). Minnesota's terrestrial ecosystems (soils, vegetation, etc.) have been found to be less sensitive to acid deposition than the aquatic ecosystems.

Seepage and headwater lakes are found within 6.2 miles of the Keetac project site. Therefore, an assessment of potential cumulative effects should be provided in the EIS for aquatic ecosystems.

Approach to Evaluation
Ecosystem acidification in Minnesota is affected by local, regional, and very distant emission sources, including mobile sources. Detailed modeling has previously been conducted by the MPCA and the National Acid Precipitation Program to determine emission sources and source region culpabilities. This detailed modeling does not need to be repeated for this EIS process, nor is it reasonable for one project to attempt this detailed modeling for the EIS process. Instead, a semi-quantitative assessment will be conducted for the EIS process.

The semi-quantitative analysis will follow the methodology and format of the analysis conducted for the Minnesota Steel and PolyMet Mining EISs updating the data included in those analyses, and accounting for currently proposed projects in northern Minnesota, including the projects on the west end of the Mesabi Iron Range. The specific list of projects will be finalized after discussions with the state agencies and documented in a scope of work.

Background information on acid deposition in Minnesota will be summarized. It will include the long-range transport of pollution, out-of-state source contributions, and findings from state-funded studies and other studies.

Findings from the deposition trend analysis and emissions trend analysis conducted for the Minnesota Steel and PolyMet Mining EISs will be summarized, updated information on sulfate deposition in Minnesota will be provided, and a qualitative assessment conducted as to whether the additional projects would affect the previous findings and whether the projects would exceed the statewide emission cap and the deposition standard (11 kilograms per hectare per year) which were established to protect Minnesota's aquatic and terrestrial ecosystems.

Additionally, the potential for cumulative effects from the proposed projects will be based on the potential increases or decreases in sulfate and nitrate deposition to Minnesota ecosystems from reasonably foreseeable voluntary and/or regulatory actions. The specific voluntary and regulatory actions to be included in the analysis will be discussed with the Minnesota state agencies and documented in a scope of work.

Results will be summarized in a report to be submitted to the MPCA and the EIS contractor. Description of air emissions control technologies is expected to be a significant section of the report. The results will be verified by the MPCA (this may be delegated to the EIS contractor). Results of the cumulative analysis will be incorporated into the EIS by the contractor with guidance from the MPCA.

Data Needs for Cumulative Effects Analysis
- Existing studies assessing Minnesota's ecosystem buffering capacity;
- Existing air modeling results that identify Minnesota source and/or out-of-state contributions to deposition in Minnesota;
- State air emission inventory data for SO_2 and NO_x emissions; 1975 to present (based on inventory data available from the MPCA);
- National air emissions data for SO_2 and NO_x, 1975 to present;
- Deposition monitoring data from the National Atmospheric Deposition Program for VNP, Fernberg Road (Ely, MN), and Marcell Experimental Forest (just north and east of Grand Rapids); and

- Minnesota Steel Industries EIS.

Potential for Cumulative Effects to Human Health and Ecological Risk in the Keewatin Area

Human Health
The inhalation portion of the screening-level multi-pathway human health risk analysis for the Expansion Project will be supplemented with a cumulative effects analysis for potential receptors at the Keetac facility's property boundary. This analysis will include results from computer models and monitoring data to estimate potential cumulative human health risks. Specifically, the cumulative analysis will include the following risk estimation components:

1. Estimates of background risks based on available monitoring data for the Iron Range for particulate metals, VOCs and carbonyls (e.g., formaldehyde).
2. Estimate of background risk associated with the existing Keetac facility (Phase II only in operation; pellet production at 6 million TPY).
3. Incremental risks from a) the proposed project, and b) the Minnesota Steel Industries proposed project.

Air concentrations from all non-modeled sources are to be represented by background air monitoring data and the background risks will be calculated per MPCA recommendations and guidance. For the existing Keetac facility and the proposed project, modeled air concentrations and estimates of potential risks from stacks, mobile source tailpipe emissions and fugitive dust emissions (e.g., vehicle traffic and stockpiles) from the screening level human health risk assessment will be used. Estimated risks for the nearby and proposed Minnesota Steel Industries project will be obtained from the publicly available EIS for the project.

U. S. Steel will develop a work plan for the cumulative risk analysis in conjunction with the DNR, MPCA, and MDH. A report will be submitted to the agencies and the results summarized in the EIS.

Ecological Risks
An assessment of the cumulative effects on risks to ecological resources will also be conducted. The cumulative ecological risk assessment will focus on potential changes to water quality in Swan Lake resulting from the Expansion project and the Minnesota Steel Industries, LLC project.

For each project, contributions of pollutants to Swan Lake in tailings basin discharges and deposition related to air emissions will be estimated. As part of the environmental review and permitting process for both the Expansion project and the Minnesota Steel Industries project, tailings basin discharge chemistry and volume are estimated. This information will be used to estimate the concentration of pollutants reaching Swan Lake via Hay Creek and O'Brien Creek, respectively. With regard to deposition of air emissions from each project, the respective human health risk analyses provide estimates of deposition to Swan Lake and the incremental concentration in Swan Lake. The incremental concentration of each air pollutant deposited to Swan Lake from each project can then be summed. Overall, the estimated contribution of a pollutant from tailings basin discharge and atmospheric deposition can be summed to provide an estimate of potential cumulative incremental concentration.

The potential incremental change in Swan Lake water chemistry associated with the estimated pollutant contributions from the two projects will then be assessed. The potential

change in water quality will be evaluated by comparing estimated chemical concentrations to respective available water quality standards and ecological benchmark concentrations. U. S. Steel will develop an ecological risk assessment work plan in conjunction with the DNR. Cumulative effects on human and ecological health will be evaluated in the EIS by the DNR consultant. An ecological risk assessment report will be submitted to the DNR and the results summarized in the EIS.

Data Needs for Cumulative Effects Analysis

Human Health

- Background air concentrations and estimated risks;
- Estimated risks for the existing Keetac facility;
- Estimated incremental risks for the Expansion project; and
- Estimated incremental risks for the Minnesota Steel Industries, LLC project (receptor-specific risks or extrapolated risks).

Ecological

- Estimates of air emissions for COPI and deposition to Swan Lake and the associated incremental increase in pollutant concentration in Swan Lake for both the Expansion project and the Minnesota Steel Industries project;
- Estimates of tailings basin discharge chemistry and flow for each project;
- Background concentrations of COPI in Swan Lake (from available data);
- Delineation of the Swan Lake watershed; including physical characteristics and corresponding sub-watersheds;
- Water quality standards and or ecological benchmark concentrations for COPI; and
- Background ambient air monitoring data for COPI.

24. **Odors, Noise and Dust.** Will the project generate odors, noise or dust during construction or during operation? ☑Yes ☐No
    If yes, describe sources, characteristics, duration, quantities or intensity and any proposed measures to mitigate adverse impacts. Also identify locations of nearby sensitive receptors and estimate impacts on them. Discuss potential impacts on human health or quality of life. (Note: fugitive dust generated by operations may be discussed in Item 23 instead of here.)

Odors

The Keetac project is not expected to be a significant source of odor emissions. Diesel exhaust odors are a potential exception. The majority of diesel activity will be in the mining and tailings basin operations and will not significantly change from current operations.

Onsite wastewater treatment will be inorganic in nature to condition water for process use. These processes are not significant generators of odor.

The tailings that will be deposited in the tailings basins are essentially odor-free.

Dust

The facility has two separate dust generating areas—the mine and pellet plant north of Trunk Highway 169 and the tailings basin is south of Trunk Highway 169. Mining shall be managed to control avoidable dust pursuant to Minnesota Rules, part 6130.3700.

Mine and Pellet Plant
Dust will be generated during construction and plant operations. Dust emissions from operations will be evaluated as part of the facility's air permitting (described in response to Item 23). A preliminary list of potential sources and measures that can be taken to mitigate adverse impacts include:

Table 24-1: Potential Dust Sources and Mitigative Measures

Potential Dust Source	Measures to Mitigate Adverse Impacts
Earth/rock moving for preparation of plant site	Compaction, spraying of haul roads, minimizing of open areas, rapid re-vegetation of disturbed areas
Construction traffic	Dust suppressant application (water or chemical)
Removal of overburden prior to and during mining	Compaction, spraying of haul roads, good stockpiling practices to minimize wind erosion
Drilling and blasting of waste rock and ore	Water sprays, good blasting technology, adherence to blasting standards
Truck loading and haul truck traffic associated with transfer of waste rock and ore	Water sprays, compaction and spraying of haul roads, good stockpiling practice to minimize dust production
Plant and mill operation	Discussed previously under Item 23
Mine land reclamation (earthmoving)	Compaction, spraying of haul roads, re-vegetation of disturbed areas
On-site traffic	Paving of roadways, use of dust suppressants

Construction of mine facilities, haul roads and buildings will generate dust typical of large construction projects for a two-year period. Construction-related dust impacts are not expected to be significant or sustained. The nearest residential receptor for mining-related dust impacts is located on Kelly Lake at a distance of approximately 0.25 miles from the nearest stockpile area.

The entire project will be required to meet NAAQS at the project boundary. The probable receptors will be defined by the location of the source and the prevailing wind direction. The wind rose defines the prevailing wind direction and speed at Hibbing, the nearest meteorological station. Dominant winds are from the south-southwest (summer) and from the north-northwest (winter).

Modeling as part of the permitting process will be required to verify these assumptions and will be addressed in the EIS.

Tailings Basin
The tailings basin has had recent dust generation issues. Keetac has conducted studies and implemented actions to minimize dust generation at the tailings basin. In addition, three ambient air monitors and a meteorological station have been installed around the tailings basin perimeter.

Noise
Iron mining and processing are obviously heavy industrial operations and the source of various levels of noise. Mining activities have been part of the primary economic driver for northeastern Minnesota communities for many decades. Local residents and nearby communities are likely to be accustomed to the sound from normal mine activities in the area. New noise impacts from

Keetac mining would be expected to be similar to impacts experienced historically from existing Keetac operations.

The current noise standards for the State of Minnesota are located in Minnesota Rules, part 7030.0040, subpart 2. The rules for permissible noise vary according to which "Noise Area Classification" is involved. In a residential setting, for example, the noise restrictions are more stringent than in an industrial setting. The rules also distinguish between nighttime and daytime noise; less noise is permitted at night. The standards list the sound levels exceeded for 10 and 50 percent of the time in a one-hour survey (L10 and L50) for each noise area classification is summarized in Table 24-2.

Table 24-2: Applicable Minnesota Noise Standards

Noise Area Classification		Noise, Standard, dB(A)			
		Daytime		Nighttime	
		L50	L10	L50	L10
1	Residential	60	65	50	55
2	Commercial	65	70	65	70
3	Industrial	75	80	75	80

The standards are given in terms of the percent of time during a measurement period (typically one hour) during which a particular decibel (dB(A)) level may not be exceeded. A daytime L50 of 60 (dB(A)), for example, means that during the daytime, noise levels may not exceed 60 (dB(A)) more than 50 percent of the time.

The Keetac processing facility will be about one mile from the nearest residence. Components of the facility such as the pellet plant are and would be a source of noise. The additional noise resulting from the proposed project would be relatively low-toned and constant, consistent with industrial fans. As such, it should present less annoyance than higher-pitched or variable tones of changing loudness. The pellet plant processes of milling, indurating, and screening are sources of noise too; however, these operations are generally contained within the plant buildings and are not expected to be a significant source of noise at the property line.

The issue of noise from mine sites was addressed in considerable detail in the Regional Copper-Nickel Study completed by the Minnesota State Planning Agency from 1976 to 1979. That study evaluated several sources of noise from potential mine sites, including:

- Chain saws and skidders used in clearing the mine site;
- Blasting;
- Excavators and drills;
- Large trucks hauling and dumping rock;
- Backup alarms on mine excavators and trucks;
- Mine site warning sirens;
- Over-the-road diesel trucks;
- Trains hauling ore; and
- Train whistles.

In considering potential mine noise impacts, the study took into account many factors. Because ambient noise can mask noise originating from distant sources, ambient sound patterns and levels in both urban and rural areas were evaluated. The study also considered the relative frequency and duration of the noise from the various mine sources. The attenuation of the sound with

distance was considered, and seasonal effects – resulting from changing leaf cover in the surrounding forests, and changes in prevailing wind direction – were also accounted for. These generic observations from the Regional Copper-Nickel Study give a general indication of the probable sources of noise and the overall expectations for noise generation.

- Clearing operations, while noisy, are of relatively short duration, and therefore are less likely to cause significant annoyance or disturbance to those within hearing distance.
- Shovels and drills, being typically electric-powered, are not powerful sources of acoustic energy. (Note: Keetac plans currently call for diesel – hydraulic shovels)
- The percussive noise from blasting is not likely to be particularly objectionable. The activities associated with blasting – spotter aircraft noise and warning sirens – are more likely to be causes of significant acoustic impact than the blasting itself. Blasting is a short duration event that will likely occur only one or two times per week. Using test blasts and meteorological monitoring, mine blasting is timed to minimize acoustic and structural impacts.
- High-frequency sounds are attenuated more rapidly than low-frequency sounds. The backup alarms on trucks, loaders, and excavators, for example, die out relatively rapidly with distance. The extreme limit of audibility for such noise is 3 to 6 miles.
- Computer modeling of the noise propagation from mine site warning sirens (such as those used in preparation for blasting) showed that during a calm summer night, the extreme limit of audibility is 10.6 miles.
- Over-the-road diesel trucks hauling supplies to and from the mine site can be expected to have similar noise emissions as mine trucks. Because the operation of these trucks is relatively infrequent, however, the noise impact from these trucks is relatively insignificant.
- Railroad locomotive noise was evaluated, and the maximum impacted distance was found to be 12 miles. Railroad horns, however, which are designed to be especially detectable by the human ear, produce noise that can be heard at a greater distance. The maximum predicted range of audibility is 19 miles. Like over-the-road diesel hauling, railroad hauling is expected to be relatively infrequent, and the sounding of locomotive signal horns occurs only at crossings. The railroad noise would therefore not be expected to be of great concern.

Truck Noise

The Regional Copper Nickel Study observed that:

> The large ore-hauling trucks will continue to be the limiting factor for noise impact since they are powerful acoustic sources and are an important part of the operation. The trucks will be the dominant noise source for persons not on mining property since they are operating in the open as opposed to in-plant sources, which are subject to substantial noise muffling due to building walls.

With this in mind, the Copper Nickel Study focused on truck noise and evaluated the distances that truck noise would be heard under several conditions (winter, summer, night, day). Detailed evaluations were made of the noise from both 85-ton and 170-ton trucks, under normal operating, and dumping (bed-lift) conditions. In general, the study of truck noise showed that:

- Due to the direction of the prevailing winds, sound will carry more readily to areas to the southeast of a mine site, and less readily to areas to the northeast;
- Mine noise is most likely to be heard during calm summer nights, when there is the least sound masking from wind noise, and temperature inversions boost sound transmission;
- Larger trucks will be heard farther away than smaller trucks; and

- When dumping their loads, the characteristics of the engine/muffler noise is such that it can be heard at greater distances than under normal operating conditions.

The larger (170-ton) trucks considered in the study were expected to give the greatest noise impact of any mining noise sources considered. Modeling indicated that the extreme limit of audibility for these vehicles is 22 miles, with a 10 dB(A) peak considered detectable. At 12.5 miles, the peak noise level expected from these trucks would be 25 dB(A). Although trucks used by Keetac would likely be larger than 170 tons, the noise impacts would be expected to be similar.

As mentioned above, prevailing winds are from the northwest, so that areas to the northeast of the Mine Site are acoustically sheltered. The noise from 250-ton trucks is expected to be inaudible at distances greater than 22 miles. Therefore truck noise from the Keetac mine would not be audible in the BWCA, which is greater than 50 miles from the site.

Blasting

Blasting activity will be routine activity scheduled roughly once per week. Blasting will be conducted per the requirements of Minnesota Rules, part 6130.3900. Keetac would use the same blasting agents as other taconite mines, a mixture of about 94 percent ammonium nitrate and 6 percent fuel oil, commonly referred to as ANFO. A common form of this mixture is ANFO emulsion or a mixture of ANFO and ANFO emulsion. ANFO emulsion contains ammonium nitrate dissolved in water. The water is dispersed in fuel oil. Because oil surrounds the oxidizer, it is resistant to moisture and therefore more useful in damp conditions. This also increases the density and energy production of the explosive compared to dry granules of ANFO.

ANFO will be supplied by one of the explosive supply companies that serve the Mesabi Iron Range. After boreholes are drilled, ANFO is delivered by truck and loaded into the boreholes for detonation. The five impacts of blasting in surface mines are ground vibrations, air blast, flyrock, dust, and fumes. Much of the area has experienced blasting impacts previously during existing operations at Keetac. Minnesota has a vibration limit of 1.0 inches per second with no specified frequencies. The U. S. Bureau of Mines recommendations are 0.50 inches per second for old homes (plaster) and 0.75 inches per second for modern homes (wallboard) in the low frequency range. Keetac will be required to comply with these standards. A pre-operation inspection and videotaping of the nearest homes could help to document the degree of any later damage. U. S. Steel proposes to continue its seismic monitoring program with this expansion.

Air blast is the shockwave propagated through the atmosphere. Flyrock is rock that is blown loose from the free face of the rock and travels beyond the area intended for blasting. Both airblast and flyrock can be minimized by proper blasting planning, including drill hole placement, sequencing velocity, face orientation, and monitoring of explosive weight. Air blast can be affected by wind direction as well.

Rail Noise

Production of additional pellets will result in additional rail shipping. The increase in rail shipping will be accomplished by either adding cars to existing trains, or by increasing the number of trains, or a combination of these options. The noise produced by individual trains will not increase; however, as the number of cars or trains increases the duration or frequency of noise may increase.

Dust and Gases
Dust and gases are usually not a major problem outside the immediate blasting area. As with air blast, wind direction is important. Excessive fumes can be avoided by good explosive design and usage.

Proposed Treatment of Topic in EIS
Odor is not expected to be a significant impact. Noise production is not anticipated to be significant, but it will be discussed. If adverse impacts are identified, mitigation will be discussed. Dust (particulate matter) will be generated during construction of the proposed project and plant operations. Particulate matter will be evaluated as a part of stationary air emissions.

25. Nearby Resources. Are any of the following resources on or in proximity to the site?
a. Archaeological, historical or architectural resources? ☑Yes ☐ No
b. Prime or unique farmlands or land within an agricultural preserve? ☑ Yes ☐ No
c. Designated parks, recreation areas or trails? ☑ Yes ☐ No
d. Scenic views and vistas? ☑Yes ☐ No
e. Other unique resources? ☐ Yes ☑ No
If yes, describe the resource and identify any project-related impacts on the resource. Describe any measures to minimize or avoid adverse impacts.

Archaeological, Historical, or Architectural Resources
Phase Ia archaeological and historical archival and background research was conducted in March and April 2008 for the proposed project. This research revealed no previously recorded archaeological sites in the proposed project boundary (see Figure 5-3) or within a one-mile radius of that area.

The literature review did identify 44 previously recorded historic sites within one mile of the project area. The majority of the historic sites are located within the cities of Keewatin, Nashwauk, and Hibbing. Nine sites are located with the City of Keewatin, one bridge (5232) is located just east of Keewatin, and three additional bridges (6056, 6057, 6060) are recorded in the southern portion of the proposed project area. In addition, the Hull-Rust-Mahoning Open Pit Mine National Landmark is located to the west of the project area, but it is not within any of the areas slated for physical development as part of this Expansion Project (that is, it is not within the proposed project boundary as defined in Figure 5-3).

Proposed Treatment of Topic in EIS
The EIS will include the results of a Phase I archeological survey for the area that will be coordinated with both the State Historic Preservation Office (SHPO) and the USACE. The Phase I archaeological study will address historic mine landscapes in the project vicinity. The EIS will also include the review of any potential impacts on existing historical resources identified in the archival literature review completed for the Scoping EAW.

Prime or Unique Farmlands
As identified in Table 19-1, the project boundary includes over 1,850 acres of farmland-type soil. In the North Project Area, there are approximately 590 acres of Type 619 Keewatin silt loam, which is prime farmland if drained. There are 1,131 acres of Type 622B Nashwauk fine sandy loam, 1 to 10 percent slopes, which is classified as prime farmland. There are 37.2 acres of Type 628 Talmoon silt loam, which is farmland of statewide importance.

In the South Project Area, there are almost 15 acres of Type 619 Keewatin silt loam; approximately 81 acres of Type 622B Nashwauk fine sandy loam, 1 to 10 percent slopes; and no Type 628 Talmoon silt loam.

The soils that would support prime or unique farmlands are not currently used for agricultural purposes.

Proposed Treatment of Topic in EIS
The EIS will include a soil map of the project area and will discuss impacts to prime or unique farmlands.

Designated Parks, Recreation Areas, Scenic Views, or Trails
There is a DNR boat/access and the O'Brien Reservoir Recreation Area (administered by the City of Keewatin) on O'Brien Reservoir. The Recreation Area contains a beach, fishing dock, and picnic tables.

The Mesabi Trail is a walking and bicycling trail that extends along the length of the Mesabi Range from Grand Rapids to Ely. The segment between Nashwauk and Hibbing has been completed. That portion of the Mesabi Trail begins in Nashwauk and extends eastward past O'Brien Lake to the City of Keewatin. From Keewatin, the trail runs along Trunk Highway 169, then heads north to Kelly Lake before turning east to the City of Hibbing. Portions of the Mesabi Trail are located on U. S. Steel's property. However, the project components will not interfere with the Mesabi Trail.

There are several grant-in-aid snowmobile trails that extend around U. S. Steel's property. Some snowmobile trails are on or near the mine site and stockpile areas and will have to be relocated. There are no known designated scenic vistas that would be affected. Potential visual impacts on nearby residents and roadways are summarized in response to Item 26.

Proposed Treatment of Topic in EIS
The EIS will include a map of the snowmobile trails and Mesabi Trail and discuss the impacts of the proposed project on their use and potential relocation of alternatives for impacted trails.

26. **Visual Impacts.** Will the project create adverse visual impacts during construction or operation? Such as glare from intense lights, lights visible in wilderness areas and large visible plumes from cooling towers or exhaust stacks? ☑Yes ☐No If yes, explain.

Plant Site
The Keetac plant site is approximately one mile north of Trunk Highway 169 and slightly less than one mile to the nearest residence and the City of Keewatin. The plant facilities are visible from the highway and from parts of the City. There is an elevated railroad bed between the plant site and Trunk Highway 169, which limits the view of general operations at the plant site. Trees limit the view of the plant site from the direction of Keewatin.

Exhaust plumes from the currently operating facility will not be affected by the project. The proposed project would add another exhaust plume adjacent to the existing plume. The project plume would only be visible during cold weather when a condensation plume can form. In general, because the proposed project plume would be controlled with an electrostatic precipitator, the plume would not be visible. Overall, the project would have no change in visibility impact.

Mine Site

The proposed project would primarily use the current mine for approximately the first 5 years of the project. Mining activity would begin to expand into a new area to the west of the plant in the first 5-year period and then after year 5 the mine would start to expand to the northeast, eventually forming a nearly contiguous mining area between Keetac and HTC. At its closest point, the mine site is approximately 1/3 of a mile from the City of Keewatin. A proposed stockpile area would be about 0.25 mile from Trunk Highway 169 west of Keewatin. The views of these areas are limited due to berms and trees. The new proposed mining area to the north and east of the plant would also be visible from County Highways 79 and 63, as well as potentially from residences located on Kelly Lake. Existing mining areas can already be seen from these areas, so no significant change in visual impact is expected due to the mining area expansion, although the issue will be evaluated in more detail as part of the EIS process.

In addition, former stockpile areas south of the eastern part of the mine pit, which have been inactive for several years, will be reopened for use as a result of the proposed project. Sections of these stockpiles would be built up to over 200 feet high and would become visible from Kelly Lake as well as Trunk Highway 169. Mining will continue 24-hours per day. Site lighting would include both fixed lighting and vehicle lighting. Hauling to the top of the stockpiles may cause vehicle lighting to be visible in the surrounding landscape. Methods to reduce visual impacts on any affected residential areas will be evaluated during the EIS process.

Tailings Basin

The tailings basin is south of Trunk Highway 169 and would be visible from the highway. From the exterior it would appear to be a vegetated slope; tailings disposal operations would be behind the exterior dam. Although final design of the tailings basin is ongoing, U. S. Steel currently expects that the Expansion Project would raise the tailings by approximately one foot per year of additional height compared to current operations. For the 25-year operating period planned, an additional 30 feet would bring the tailings elevation to approximately 1,640 feet by 2036.

The visual impacts discussed here are considered to be different than visibility impacts to local or Class I areas due to air emissions. Visibility impacts due to air emissions (e.g., haze) are discussed in Item 23 and will be evaluated in the air permitting process. The results of the visibility evaluation will be included in the EIS as part of the discussion of air quality impacts.

Proposed Treatment of Topic in EIS

Visual impacts are not anticipated to be significant; however, limited information beyond what is provided in this Scoping EAW will be used to identify potential lighting impacts and mitigation.

27. **Compatibility with Plans and Land Use Regulations.** Is the project subject to an adopted local comprehensive plan, land use plan or regulation, or other applicable land use, water, or resource management plan of a local, regional, state or federal agency?
    ☑Yes ☐No
    If yes, describe the plan, discuss its compatibility with the project and explain how any conflicts will be resolved. If no, explain.

Project zoning is shown in Figure 9-1. The proposed project is located within or near the cities of Hibbing, Keewatin, and Nashwauk, the townships of Lone Pine and Nashwauk, and the counties of Itasca and St. Louis.

State Wellhead Protection Plans

The proposed project falls within the wellhead protection areas for the Keetac facility and the cities of Keewatin and Hibbing. Wellhead protection plans have been completed for each of theses public water suppliers. The proposed expansion does not appear to be incompatible with these wellhead protection plans. However, if the proposed expansion does result in decreased water levels and well yields and new wells are needed to compensate, then this may result in the need to amend the wellhead protection area delineations for those communities ahead of the regular 10-year schedule specified in state rules. This could result in an additional, unanticipated cost to the public water supplier.

Local Comprehensive Plans and Zoning

The City of Hibbing adopted its comprehensive plan in 2003. The Hibbing Comprehensive Plan identifies areas of proposed mining land use, and the Keetac facility and expansion are located within that proposed area. It appears that the project conforms to the Hibbing Comprehensive Plan.

The City of Keewatin has also adopted a comprehensive plan. Keewatin is primarily a residential community, but identified as a goal the introduction of some light industry that will not interfere with its existing infrastructure.

The City of Nashwauk has adopted a comprehensive plan. The City of Nashwauk recently annexed land that includes a portion of the Keetac Expansion Project (See Sections 26 and 27). Itasca County has a comprehensive land use plan that was adopted in May 2000. The land use plan sets general goals for the County and for some specific sub-areas. A general county goal is to "Support the continuation and expansion of the mining industry." It appears that the project is in conformance with this goal and the activities that the plan lists to support that goal.

St. Louis County's comprehensive plan does not address land use issues near the proposed project site.

The majority of the project area is zoned for industrial and general industry.

Future land use of the project area will be important given the close proximity of the project area to the cities of Keewatin and Nashwauk. Any evaluation of potential future land use will need to consider the goals and objectives of the cities of Keewatin, Nashwauk, and Hibbing, the townships of Lone Pine and Nashwauk townships, and Itasca and St. Louis counties.

Road Right-of-Way Setbacks

Trunk Highway 169 is located between the North and South Project Areas. County Road 79 runs along the northeast project boundary. County Road 76 diverges off of Trunk Highway 169 north of the tailings basin heading northwest towards the City of Keewatin, becoming County Road 82. County Road 16 runs north from Trunk Highway 169 through the City of Keewatin.

Trunk Highway 169 setbacks near the project area are governed by the zoning ordinances for the City of Hibbing and Itasca County and the State. Neither the City of Keewatin nor St. Louis County maintains jurisdiction over Trunk Highway 169 in the project vicinity.

County Roads 16, 76, and 82 are under the City of Keewatin's jurisdiction. County Roads 7660, 63, and 79 are under the City of Hibbing's jurisdiction.

State-level regulations also apply. Minnesota Rules, part 6130.1200, subpart H, sets the exclusion areas for mining. Mining activity must be 100 feet from the outside right-of-way line of any public roadway, except where mine access or haul roads cross such right-of-way line.

The proposed project would not infringe on road right-of-way requirements set by local governments or the State. Table 27-1 shows the applicable setbacks for each road and local government jurisdiction.

Table 27-1: Municipal Road Right-of-Way Setbacks

Road	Controlling Jurisdiction	Applicable Setback Requirement
County Road 16	City of Keewatin	Within Commercial District: 8 feet from road centerline Within other districts: 30 feet from road centerline
County Road 60	City of Hibbing	110 feet from centerline, or 35 feet from right-of-way line, whichever is greater
County Road 63	City of Hibbing	110 feet from centerline, or 35 feet from right-of-way line, whichever is greater
County Road 76	City of Keewatin	Within Commercial District: 8 feet from road centerline Within other districts: 30 feet from road centerline
County Road 79	City of Hibbing	110 feet from centerline, or 35 feet from right-of-way line, whichever is greater
County Road 82	City of Keewatin	Within Commercial District: 8 feet from road centerline Within other districts: 30 feet from road centerline
Trunk Highway 169	City of Hibbing	110 feet from centerline, or 35 feet from right-of-way line, whichever is greater
Trunk Highway 169	Itasca County	135 feet from centerline of highway, or 35 feet from right-of-way line, whichever is greater

Proposed Treatment of Topic in EIS
Compatibility with plans will not be analyzed in the EIS.

28. **Impact on Infrastructure and Public Services.** Will new or expanded utilities, roads, other infrastructure or public services be required to serve the project?
☐ Yes ☑ No
If yes, describe the new or additional infrastructure or services needed. (Note: any infrastructure that is a connected action with respect to the project must be assessed in the EAW; see EAW Guidelines for details.)

No additional infrastructure would be needed as a result of the Expansion Project. However, it is possible that increased dewatering required for the project may decrease the amount of

groundwater available to Keetac and for use by the City of Keewatin. U. S. Steel will be negotiating a contingency plan with the City of Keewatin that may include a well monitoring plan for potentially affected wells.

Proposed Treatment of Topic in EIS

The EIS will discuss the ability of the City of Nashwauk to accommodate future demand due to population growth, socioeconomic issues, including demographic and employment trends. The potential impact to nearby water supply systems is discussed in Item 13.

29. **Cumulative impacts.** Minnesota Rule part 4410.1700, subpart 7, item B requires that the RGU consider the "cumulative potential effects of related or anticipated future projects" when determining the need for an environmental impact statement. Identify any past, present or reasonably foreseeable future projects that may interact with the project described in this EAW in such a way as to cause cumulative impacts. Describe the nature of the cumulative impacts and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to cumulative impacts *(or discuss each cumulative impact under appropriate item(s) elsewhere on this form).*

Specific types of cumulative effects are addressed in response to other items. The following text provides background for discussion in other items.

Cumulative Effects

In some cases, in order to adequately assess the potential impacts of a project on nearby natural resources, the impacts must be assessed within the context of other past and future projects proposed in the same area. In this case, the number of recently proposed new mining, manufacturing and energy projects in Northeastern Minnesota creates the potential for "cumulative effects." As described below, the potential for cumulative potential effects of the Expansion Project can largely be evaluated by updating recent studies completed as part of the environmental review for other nearby projects.

RGU Note: The discussion of cumulative effects reflects guidance provided by the Minnesota Supreme Court in the CARD Decision, which distinguishes between cumulative "effects" and cumulative "impacts;" see 713 N.W.2d 817 (Minn. 2006). EQB is developing updated guidance for RGUs in their consideration of cumulative effects in the context of an individual project.

As summarized in the federal Council on Environmental Quality (CEQ) guidelines on cumulative effects, general cumulative effects are analyzed by evaluating whether the affected resource, ecosystem, or human community has the capacity to accommodate additional effects. These include both direct and indirect effects on a given resource, ecosystem and human community and include actions by private and governmental bodies. Cumulative effects may occur when similar impacts accumulate or when diverse impacts have a synergistic effect. Cumulative effects should be analyzed over the entire life of the potential project impact and not just the life of the project. Finally, cumulative effects analysis should focus on truly meaningful effects.

The affected resource of interest for cumulative effects analysis is important in determining the geographic and temporal boundaries of the analysis. This in turn helps identify the past, present and reasonably foreseeable actions that will also be included in the analysis. For example, cumulative effects related to water quality would be limited to the watershed of interest and would not consider the effect of a nearby action in a different watershed.

These specific analyses will evaluate potential cumulative effects using guidance from the CEQ handbook for considering cumulative effects under the National Environmental Policy Act (NEPA) (CEQ, 1997). The affected resources that are related to cumulative effect issues are used to determine the appropriate geographic and temporal scope for each analysis. The geographic and temporal scope in turn is used to identify the specific past, present, and reasonably foreseeable future actions to be considered.

Inventory of Potentially Cumulative Effects

The first step in a cumulative effects analysis is the identification of potential cumulative effects associated with the proposed project. General consideration of other proposed actions in the Arrowhead Region (discussed below) results in the following tabulation of potential aspects of the U. S. Steel project that could have cumulative environmental effects:

- Air quality and visibility impairment related to mining and industrial emissions from multiple sources;
- Ecosystem acidification related to industrial plant emissions from multiple sources (in-state and out-of-state);
- Deposition and bioaccumulation of mercury in fish and wildlife as related to industrial plant emissions from multiple sources (in-state and out);
- Availability of biomass as a source of fuel for other projects on the Mesabi Range, and harvesting impacts to the state, federal, and local forest resources;
- Threatened or endangered plant species loss related to mining activities;
- Wetland loss related to mine activities;
- Fish and wildlife habitat loss or travel corridor barriers related to mining and industrial activities;
- Aquatic habitat and fisheries loss related to mining and industrial activities;
- Water flow changes and associated stream channel changes related to land form alteration, pit dewatering, and plant consumption;
- Water quality changes related to land form alteration, pit dewatering, and plant wastewater discharges;
- Potential for cumulative effects to human health risk in the Keewatin area; and
- Potential for cumulative effects to ecological receptors in the Swan Lake Watershed.

Inventory of Potentially Affected Resources

The second step in cumulative effects analysis is to inventory potentially affected resources. Cumulative effects should be analyzed in terms of the specific resource, ecosystem and human community being affected. In addition, the cumulative effects analysis should focus on those impacts that are significant enough to be meaningful.

The "project impact zone" and the "extent of the resource beyond zone of direct impact" can be different for each resource. For instance, the project's impact on a plant species is most likely limited to the immediate vicinity where direct or indirect impacts are great enough to cause a loss of individual plants. The extent of the plant species beyond that area would include all areas where the species is found in Minnesota. On the other hand, the project impact zone for particulate emissions to the air would likely be much larger than the immediate project area, although the extent of the resource beyond the project impact area might be defined as only northeastern Minnesota. Impacts in specially designated areas (e.g., the BWCA) must meet more stringent standards than elsewhere in the region. The following is a general inventory of resources that potentially could be affected by the Keetac project and the extent of those resources beyond the zone of direct impact:

- Air quality in Class II areas related to projects in the immediate vicinity of the Keetac project and in federally-administered Class I areas (e.g., BWCA and VNP);

- Timber resources in the Superior National Forest (SNF) and Arrowhead Region impacted by harvesting of biomass;
- Populations of state- and federally-listed threatened and endangered, and special-concern-plant species at the mine site and the related populations throughout Minnesota;
- Wetlands in the vicinity of the mine and in the Swan Lake watershed;
- Wildlife habitat at the mine site and greater surrounding area;
- Aquatic biota and fish in Swan Lake and portions of the Upper Mississippi basin;
- Water quality in sensitive ecosystems in federally-administered Class I areas (e.g., BWCA, VNP) due to deposition of sulfates, nitrates, and mercury; and
- Water quality and flow in Swan Lake and Swan River.

It should be noted that noise impacts are not easily treated as cumulative effects. Because of the logarithmic nature of noise measurements, a doubling of sound energy (i.e., noise levels from a second equal source) only produces about a 3 dB(A) increase in cumulative sound levels. Therefore, for a cumulative impact to occur and exceed noise standards, there would have to be two sources, both producing sound at levels just below the standard at the receptor of interest. In practice, noise sources are usually so different, whether in distance or magnitude, that one predominates and the other is insignificant. There are no other significant noise sources in the proposed Keetac site area.

"Other Actions" That May Affect Resources

The third step in cumulative effects analysis is to inventory the other actions that may affect the resources previously listed. To the extent that a resource may be impacted by U. S. Steel, it must be determined whether other actions or projects will affect the resource. Those "other actions" include both governmental actions and private actions (which may also have governmental approvals). The following is a list of past, present, and reasonably foreseeable actions that may have impacts on the resources listed above:

Governmental Actions

- Logging of the SNF lands;
- Logging of state and county lands in the Arrowhead Region;
- Implementation of Taconite MACT standards by facilities in the Arrowhead Region;
- Implementation of the Regional Haze Rules, including the regional haze State Implementation Plan, to reduce emissions of SO_2, NO_x, and fine particles in Minnesota, adjoining states, and states found to significantly contribute to visibility impairment in the Class I areas in Minnesota;
- Implementation of the BART rule adopted in 2005 to reduce emissions of SO_2, NO_x, and fine particles in Minnesota, adjoining states, and states found to contribute significantly to visibility impairment in the Class I areas in Minnesota; and
- Implementation of Minnesota's Regional Mercury TMDL.

Future governmental actions are generally included in agency plans and budgets and can be predicted with some certainty.

Private Actions

- LTV Steel Mining Company (LTVSMC) closure and furnace shutdown in the Arrowhead Region airshed;
- Other taconite plant operations (with proposed modifications, if appropriate) located in other watersheds but in the Arrowhead Region airshed;
- LEA (Virginia and Hibbing) operations in the Arrowhead Region airshed;

- Minnesota Power Boswell Station (Cohassett) operations in the Arrowhead Region airshed;
- Minnesota Power Hibbard power station (Duluth) operations in the Arrowhead Region airshed;
- Minnesota Power Rapids Energy Center (Grand Rapids) operations in the Arrowhead Region airshed;
- Minnesota Power Laskin Energy Center (Hoyt Lakes) operations in the Arrowhead Region airshed; and
- Logging on private lands near the project area.

Private actions are prevalent in the project area. Past private actions include the various projects at the nearby HTC mining operation, the LEA biomass-fired energy project (Virginia and Hibbing), and Keetac's recently completed Fuel Diversification project. With regard to air emissions, major regional sources, including taconite processing plants and power plants, were considered for inclusion in the cumulative effects evaluation. Other past and present private actions were also considered for cumulative effects to other potentially affected resources. Future private actions are less certain; projects may be studied for feasibility and then abandoned. A number of projects have been officially brought to the notice of the State of Minnesota and, in some cases, of the federal government. These potential future actions include:

- Excelsior Energy Inc. of Minnetonka, MN, has been developing plans for the 600-megawatt Mesaba Energy Project in northern Minnesota under a Department of Energy grant. One possible site would be in the Taconite-Marble area. A federal EIS is being completed but the power purchase agreement with Xcel Energy has not been approved by the Minnesota Public Utilities Commissions. The inclusion of this project as a potential cumulative effect should be reviewed as scoping continues;

- Minnesota Steel Industries, LLC has received permits to reactivate the former Butler Taconite mine and tailings basin near Nashwauk, and construct a new crusher, concentrator, pellet plant, direct reduction plant, and steel mill consisting of two electric arc furnaces, two ladle furnaces, two thin slab casters, and hot strip rolling mill to produce sheet steel. This project will be located in the Mississippi River watershed, in nearby Nashwauk;

- Mesabi Nugget Delaware, LLC (Mesabi Nugget) purchased land and minerals rights on property located near Hoyt Lakes, Minnesota, formerly owned by Cleveland Cliffs. Mesabi Nugget plans to re-open the mine and crush and concentrate ore. Mesabi Nugget is currently in the process of obtaining state and federal approvals for its facility. This project will be located in the Lake Superior watershed and in the Arrowhead Region airshed; and

- PolyMet Mining Co. proposes to construct and operate the NorthMet non-ferrous mine and processing facility near Hoyt Lakes. The project is currently undergoing environmental review. This project will be located in the Lake Superior watershed and in the Arrowhead Region airshed.

Summary of Potential Cumulative Effects to be Addressed in the EIS

Given the preceding analysis steps, 12 cumulative impact issues will be addressed in the EIS. Each of these issues was discussed previously in the applicable response, as indicated below in Table 29-1. Each discussion provides background on the issue, a description of the approach to evaluate the issue, and a description of the data needs to perform the analysis.

Table 29-1: Location of Potential Cumulative Effects

Potential Cumulative Effects	Item
Harvesting of Biomass	10
Aquatic Habitat and Fisheries	11a
Potential Local Mercury Deposition and Evaluation of Bioaccumulation in Fish in the Keewatin, Minnesota Area	11a
Wildlife Habitat	11a
Loss of Threatened and Endangered Species	11b
Loss of Wetlands	12
Stream flow and Lake Level Changes	12
Potential for Inter-basin Transfer of Water in the U. S. Steel – Keetac and Hibbing Taconite Mining Area	12
Water Quality Changes	18
Class I Areas – Potential Impact to Air Quality (PM10 Air Concentrations and Visibility Impairment) in Class I Areas in Minnesota	23
Ecosystem Acidification Resulting From Deposition of Air Pollutants	23
Potential for Cumulative Effects to Human Health and Ecological Risk in the Keewatin Area	23

30. **Other Potential Environmental Impacts.** If the project may cause any adverse environmental impacts not addressed by items 1 to 28, identify and discuss them here, along with any proposed mitigation.

DNR previously identified the need to analyze the ore body in the Mesabi Range for the possible presence of amphibole minerals. Currently, there is no evidence that amphibole minerals exist in the ore body at the Keetac site.

Proposed Treatment of Topic in EIS

The EIS will include a summary of existing mineralogical data and studies for the west end of the Mesabi Range from Minnesota state agencies, research institutions, and U. S. Steel files. The EIS will also present an analysis of the existing mineralogy and petrology data for the ore body to be mined and identify the presence/absence of amphibole minerals. In addition, samples will be obtained from U. S. Steel's ore bulk sample and analyzed to confirm the presence/absence of asbestos minerals (Method for bulk sample analysis: USEPA/600/R-93-116; Polarized Light Microscopy). Further evaluation will be required if deposits of asbestos or fine mineral fiber bearing materials are discovered.

31. **Summary of issues.** *Do not complete this section if the EAW is being done for EIS scoping; instead, address relevant issues in the draft Scoping Decision document, which must accompany the EAW.* List any impacts and issues identified above that may require further investigation before the project is begun. Discuss any alternatives or mitigative measures that have been or may be considered for these impacts and issues, including those that have been or may be ordered as permit conditions.

    Not applicable.

RGU CERTIFICATION. The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, part 4410.0200, subparts 9b and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature _____ Date __September 4, 2008___

Title___Principal Planner___

Environmental Assessment Worksheet was prepared by the staff of the Environmental Quality Board at the Administration Department. For additional information, worksheets or for EAW Guidelines, contact: Environmental Quality Board, 658 Cedar St., St. Paul, MN 55155, 651-296-8253, or http://www.eqb.state.mn.us

Appendix A: Preliminary Estimate of Controlled Emission Rates from Project

Note: NO_x emissions represent potential emissions if 100 percent natural gas is used and no emission cap is included in the air permit.

	Project		Project Total	Diesels	Total Facility w/Diesels
PSD Pollutants	Point	Fugitive	ton/yr	ton/yr	ton/yr
PM:	148.20	2598.83	2747.03	46.35	2793.38
PM 10:	229.40	731.12	960.52	31.93	992.45
PM 2.5:	323.53	75.71	399.25	49.75	448.99
SO2:	97.28	0.00	97.28	28.82	126.11
NOx:(1)	3107.37	0.00	3107.37	1259.38	4366.75
CO:	88.99	0.00	88.99	325.53	414.52
VOC:	19.01	0.00	19.01	42.27	61.28
F:	1.55E-04	0.00E+00	1.55E-04	0.00E+00	1.55E-04
SAM:	6.64	0.00	6.64	0.00	6.64
Pb:	1.25E-01	1.95E-03	1.27E-01	0.00E+00	1.27E-01
Asbestos	0.00	0.00	0.00	0.00	0.00
Beryllium	0.01	0.00	0.01	0.00	0.01
Mercury	0.04	0.00	0.04	0.00	0.04
Vinyl Chloride	0.00	0.00	0.00	0.00	0.00
Hydrogen Sulfide	0.00	0.00	0.00	0.00	0.00
TRS	0.00	0.00	0.00	0.00	0.00

(1) - NOx will be removed from PSD evaluation using netting analysis

	Project		Total Facility	Diesels	Total Facility w/Diesels
Hazardous Air Pollutants (HAPs)	Point	Fugitive	ton/yr	ton/yr	ton/yr
Acetaldehyde	4.43E-01	0.00E+00	4.43E-01	3.97E-02	4.82E-01
Acetophenone	3.65E-04	0.00E+00	3.65E-04	0.00E+00	3.65E-04
Acrolein	2.13E+00	0.00E+00	2.13E+00	6.42E-03	2.14E+00
Antimony Compounds	6.58E-03	3.12E-04	6.89E-03	0.00E+00	6.89E-03
Arsenic Compounds	5.74E-01	1.43E-02	5.88E-01	0.00E+00	5.88E-01
Benzene	2.24E+00	0.00E+00	2.24E+00	3.00E-01	2.54E+00
Benzyl chloride	1.70E-02	0.00E+00	1.70E-02	0.00E+00	1.70E-02
Beryllium Compounds	7.67E-03	1.61E-03	9.28E-03	0.00E+00	9.28E-03
Biphenyl	4.13E-05	0.00E+00	4.13E-05	0.00E+00	4.13E-05
Bis(2-ethlyhexyl)pthalate (DEHP)	1.77E-03	0.00E+00	1.77E-03	0.00E+00	1.77E-03
Bromoform	9.48E-04	0.00E+00	9.48E-04	0.00E+00	9.48E-04
1,3 Butadiene	0.00E+00	0.00E+00	0.00E+00	1.59E-03	1.59E-03
Cadmium Compounds	4.98E-03	9.10E-05	5.07E-03	0.00E+00	5.07E-03
Carbon disulfide	3.16E-03	0.00E+00	3.16E-03	0.00E+00	3.16E-03
Chlorine, Chlorides	4.21E-01	0.00E+00	4.21E-01	0.00E+00	4.21E-01
2-Chloroacetophenone	1.70E-04	0.00E+00	1.70E-04	0.00E+00	1.70E-04
Chlorobenzene	1.76E-02	0.00E+00	1.76E-02	0.00E+00	1.76E-02
Chloroform	1.49E-02	0.00E+00	1.49E-02	0.00E+00	1.49E-02
Chromium Compounds	6.12E-02	5.72E-02	1.18E-01	0.00E+00	1.18E-01
Cobalt Compounds	1.36E-02	3.90E-03	1.75E-02	0.00E+00	1.75E-02
Cumene	1.29E-04	0.00E+00	1.29E-04	0.00E+00	1.29E-04
Cyanide	6.08E-02	0.00E+00	6.08E-02	0.00E+00	6.08E-02
Dichlorobenzenes	6.28E-04	0.00E+00	6.28E-04	0.00E+00	6.28E-04
Dimethly Sulfate	1.17E-03	0.00E+00	1.17E-03	0.00E+00	1.17E-03
2,4-Dinitrotoluene	6.81E-06	0.00E+00	6.81E-06	0.00E+00	6.81E-06
Ethyl benzene	1.65E-02	0.00E+00	1.65E-02	0.00E+00	1.65E-02
Ethyl chloride	1.02E-03	0.00E+00	1.02E-03	0.00E+00	1.02E-03
Ethylene dibromide	2.92E-05	0.00E+00	2.92E-05	0.00E+00	2.92E-05
Ethylene dichloride	9.72E-04	0.00E+00	9.72E-04	0.00E+00	9.72E-04
Formaldehyde	2.35E+00	0.00E+00	2.35E+00	7.46E-02	2.42E+00
Hexane	9.41E-01	0.00E+00	9.41E-01	0.00E+00	9.41E-01
Hydrogen Chloride (as Cl)	1.01E+01	0.00E+00	1.01E+01	0.00E+00	1.01E+01
hydrogen cyanide	6.08E-02	0.00E+00	6.08E-02	0.00E+00	6.08E-02
Hydrogen Fluoride (as F)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Isophorone	1.41E-02	0.00E+00	1.41E-02	0.00E+00	1.41E-02
Lead Compounds	1.25E-01	1.95E-03	1.27E-01	0.00E+00	1.27E-01
Manganese Compounds	1.55E+00	1.20E+00	2.74E+00	0.00E+00	2.74E+00
Mercury Compounds	3.59E-02	0.00E+00	3.59E-02	0.00E+00	3.59E-02
Methyl bromide	3.89E-03	0.00E+00	3.89E-03	0.00E+00	3.89E-03
Methyl chloride	1.29E-02	0.00E+00	1.29E-02	0.00E+00	1.29E-02
Methylene chloride	1.55E-01	0.00E+00	1.55E-01	0.00E+00	1.55E-01
Methyl ethyl ketone	9.48E-03	0.00E+00	9.48E-03	0.00E+00	9.48E-03
Methyl hydrazine	4.13E-03	0.00E+00	4.13E-03	0.00E+00	4.13E-03
Methyl methacrylate	4.86E-04	0.00E+00	4.86E-04	0.00E+00	4.86E-04
Methyl tert butyl ether	8.51E-04	0.00E+00	8.51E-04	0.00E+00	8.51E-04
Naphthalene	5.17E-02	0.00E+00	5.17E-02	4.73E-02	9.91E-02
Nickel Compounds	1.85E-02	7.54E-03	2.60E-02	0.00E+00	2.60E-02
Phenol	2.72E-02	0.00E+00	2.72E-02	0.00E+00	2.72E-02
Phosphorous Compounds	1.44E-02	0.00E+00	1.44E-02	0.00E+00	1.44E-02
Propionaldehyde	3.25E-02	0.00E+00	3.25E-02	0.00E+00	3.25E-02
Selenium Compounds	3.16E-02	3.38E-04	3.20E-02	0.00E+00	3.20E-02
Styrene	1.01E+00	0.00E+00	1.01E+00	0.00E+00	1.01E+00
Tetrachloroethylene	1.05E-03	0.00E+00	1.05E-03	0.00E+00	1.05E-03
Toluene	4.91E-01	0.00E+00	4.91E-01	1.11E-01	6.02E-01
Trichloroethane	1.65E-02	0.00E+00	1.65E-02	0.00E+00	1.65E-02
2,3,7,8 TCDD (Equivalents)	2.53E-08	0.00E+00	2.53E-08	0.00E+00	2.53E-08
Vinyl acetate	1.85E-04	0.00E+00	1.85E-04	0.00E+00	1.85E-04
Xylene	8.99E-04	0.00E+00	8.99E-04	7.67E-02	7.76E-02
Total HAP	23.14	1.28	24.42	0.66	25.08

Appendix B: Initial List and Controlled Emission Rates of Chemical of Potential Interest for Human Health Screening Level Risk Assessment

	Project		Total Facility	Diesels	Total Facility w/Diesels
COPI Compounds	Point	Fugitive	ton/yr	ton/yr	ton/yr
Acenaphthene	4.85E-04	0.00E+00	4.85E-04	1.64E-03	2.12E-03
Acenaphthylene	2.67E-03	0.00E+00	2.67E-03	3.32E-03	5.99E-03
Acetaldehyde	4.43E-01	0.00E+00	4.43E-01	3.97E-02	4.82E-01
Acetophenone	3.65E-04	0.00E+00	3.65E-04	0.00E+00	3.65E-04
Acrolein	2.13E+00	0.00E+00	2.13E+00	6.42E-03	2.14E+00
Aluminum Compounds	2.47E-01	1.27E+00	1.52E+00	0.00E+00	1.52E+00
Anthracene	1.60E-03	0.00E+00	1.60E-03	4.91E-04	2.09E-03
Aluminum Oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony Compounds	6.58E-03	3.12E-04	6.89E-03	0.00E+00	6.89E-03
Arsenic Compounds	5.74E-01	1.43E-02	5.88E-01	0.00E+00	5.88E-01
Arsenic (III)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic (V)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium Compounds	9.42E-02	2.60E-02	1.20E-01	0.00E+00	1.20E-01
Benzene	2.24E+00	0.00E+00	2.24E+00	3.00E-01	2.54E+00
Benz(a)anthracene	3.47E-05	0.00E+00	3.47E-05	2.78E-04	3.13E-04
Benzo(a)pyrene	1.39E-03	0.00E+00	1.39E-03	9.44E-05	1.48E-03
Benzo(b)fluoranthene	5.33E-05	0.00E+00	5.33E-05	3.79E-04	4.32E-04
Benzo(g,h,i)perylene	4.96E-05	0.00E+00	4.96E-05	2.08E-04	2.57E-04
Benzo(k)fluoranthene	1.92E-05	0.00E+00	1.92E-05	7.99E-05	9.91E-05
Benzyl chloride	1.70E-02	0.00E+00	1.70E-02	0.00E+00	1.70E-02
Beryllium Compounds	7.67E-03	1.61E-03	9.28E-03	0.00E+00	9.28E-03
Biphenyl	4.13E-05	0.00E+00	4.13E-05	0.00E+00	4.13E-05
Bis(2-ethlyhexyl)pthalate (DEHP)	1.77E-03	0.00E+00	1.77E-03	0.00E+00	1.77E-03
Boron Compounds	3.08E-03	5.46E-02	5.77E-02	0.00E+00	5.77E-02
Bromoform	9.48E-04	0.00E+00	9.48E-04	0.00E+00	9.48E-04
1,3 Butadiene	0.00E+00	0.00E+00	0.00E+00	1.59E-03	1.59E-03
Butane	1.10E+00	0.00E+00	1.10E+00	0.00E+00	1.10E+00
Cadmium Compounds	4.98E-03	9.10E-05	5.07E-03	0.00E+00	5.07E-03
Calcium Carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium Compounds	7.86E-01	9.10E+00	9.88E+00	0.00E+00	9.88E+00
Calcium oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon disulfide	3.16E-03	0.00E+00	3.16E-03	0.00E+00	3.16E-03
Carbon Monoxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloride salts	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorine, Chlorides	4.21E-01	0.00E+00	4.21E-01	0.00E+00	4.21E-01
2-Chloroacetophenone	1.70E-04	0.00E+00	1.70E-04	0.00E+00	1.70E-04
Chlorobenzene	1.76E-02	0.00E+00	1.76E-02	0.00E+00	1.76E-02
Chloroform	1.49E-02	0.00E+00	1.49E-02	0.00E+00	1.49E-02
5-Chloro-2-methyl-4-isothiazolin-3-one	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium Compounds	6.12E-02	5.72E-02	1.18E-01	0.00E+00	1.18E-01
Chromium total	6.12E-02	5.72E-02	1.18E-01	0.00E+00	1.18E-01
Chromium (III)	1.03E-02	5.72E-02	6.75E-02	0.00E+00	6.75E-02
Chromium (VI)	1.91E-03	1.33E-04	2.04E-03	0.00E+00	2.04E-03
Chrysene	2.03E-05	0.00E+00	2.03E-05	5.31E-04	5.51E-04
Cobalt Compounds	1.36E-02	3.90E-03	1.75E-02	0.00E+00	1.75E-02
Copper Compounds	2.85E-02	1.30E-02	4.15E-02	0.00E+00	4.15E-02
Cumene	1.29E-04	0.00E+00	1.29E-04	0.00E+00	1.29E-04
Cyanide	6.08E-02	0.00E+00	6.08E-02	0.00E+00	6.08E-02
Dibenzo(a,h)anthracene	6.36E-06	0.00E+00	6.36E-06	1.40E-04	1.47E-04
Dichlorobenzenes	6.28E-04	0.00E+00	6.28E-04	0.00E+00	6.28E-04
Dimethylbenz(a)anthracene, 7,12-	8.37E-06	0.00E+00	8.37E-06	0.00E+00	8.37E-06
Dimethly Sulfate	1.17E-03	0.00E+00	1.17E-03	0.00E+00	1.17E-03
2,4-Dinitrotoluene	6.81E-06	0.00E+00	6.81E-06	0.00E+00	6.81E-06
Ethane	1.62E+00	0.00E+00	1.62E+00	0.00E+00	1.62E+00
Ethyl benzene	1.65E-02	0.00E+00	1.65E-02	0.00E+00	1.65E-02
Ethyl chloride	1.02E-03	0.00E+00	1.02E-03	0.00E+00	1.02E-03
Ethylene dibromide	2.92E-05	0.00E+00	2.92E-05	0.00E+00	2.92E-05
Ethylene dichloride	9.72E-04	0.00E+00	9.72E-04	0.00E+00	9.72E-04
Fluoranthene	8.54E-04	0.00E+00	8.54E-04	1.67E-03	2.52E-03
Fluorene	1.81E-03	0.00E+00	1.81E-03	5.51E-03	7.32E-03
Dichlorotolyltriazole	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferro niobium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flourine, Flourides	1.55E-04	0.00E+00	1.55E-04	0.00E+00	1.55E-04
Fluoride Salts	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	2.35E+00	0.00E+00	2.35E+00	7.46E-02	2.42E+00
Hexane	9.41E-01	0.00E+00	9.41E-01	0.00E+00	9.41E-01
Hydrogen Chloride (as Cl)	1.01E+01	0.00E+00	1.01E+01	0.00E+00	1.01E+01
hydrogen cyanide	6.08E-02	0.00E+00	6.08E-02	0.00E+00	6.08E-02
Hydrogen Fluoride (as F)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Project		Total Facility	Diesels	Total Facility w/Diesels
COPI Compounds	Point	Fugitive	ton/yr	ton/yr	ton/yr
Indeno(1,2,3-cd)pyrene	4.64E-05	0.00E+00	4.64E-05	1.55E-04	2.01E-04
Iron Compounds	5.28E-01	0.00E+00	5.28E-01	0.00E+00	5.28E-01
Iron II	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron III Oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Isophorone	1.41E-02	0.00E+00	1.41E-02	0.00E+00	1.41E-02
Isoparafinic petroleum distillate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead Compounds	1.25E-01	1.95E-03	1.27E-01	0.00E+00	1.27E-01
Lithium Compounds	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium Compounds	1.27E+00	2.49E+00	3.77E+00	0.00E+00	3.77E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese Compounds	1.55E+00	1.20E+00	2.74E+00	0.00E+00	2.74E+00
Manganese Dioxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury Compounds	3.59E-02	0.00E+00	3.59E-02	0.00E+00	3.59E-02
Methyl bromide	3.89E-03	0.00E+00	3.89E-03	0.00E+00	3.89E-03
Methyl chloride	1.29E-02	0.00E+00	1.29E-02	0.00E+00	1.29E-02
Methylcholanthrene, 3-	9.41E-07	0.00E+00	9.41E-07	0.00E+00	9.41E-07
Methylene chloride	1.55E-01	0.00E+00	1.55E-01	0.00E+00	1.55E-01
5-Methyl chrysene	5.35E-07	0.00E+00	5.35E-07	0.00E+00	5.35E-07
Methyl ethyl ketone	9.48E-03	0.00E+00	9.48E-03	0.00E+00	9.48E-03
Methyl hydrazine	4.13E-03	0.00E+00	4.13E-03	0.00E+00	4.13E-03
Methyl methacrylate	4.86E-04	0.00E+00	4.86E-04	0.00E+00	4.86E-04
Methylnapthalene, 2-	1.26E-05	0.00E+00	1.26E-05	0.00E+00	1.26E-05
Methyl tert butyl ether	8.51E-04	0.00E+00	8.51E-04	0.00E+00	8.51E-04
Molybdenum Compounds	1.33E-03	4.42E-04	1.77E-03	0.00E+00	1.77E-03
Naphthalene	5.17E-02	0.00E+00	5.17E-02	4.73E-02	9.91E-02
Nickel Compounds	1.85E-02	7.54E-03	2.60E-02	0.00E+00	2.60E-02
Nitrogen dioxide (1-hour)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pentane	1.36E+00	0.00E+00	1.36E+00	0.00E+00	1.36E+00
Phenanthrene	3.73E-03	0.00E+00	3.73E-03	1.50E-02	1.87E-02
Phenol	2.72E-02	0.00E+00	2.72E-02	0.00E+00	2.72E-02
Phosphorous Compounds	1.44E-02	0.00E+00	1.44E-02	0.00E+00	1.44E-02
Phosphorous Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium Compounds	2.08E+01	0.00E+00	2.08E+01	0.00E+00	2.08E+01
Propane	8.37E-01	0.00E+00	8.37E-01	0.00E+00	8.37E-01
Propionaldehyde	3.25E-02	0.00E+00	3.25E-02	0.00E+00	3.25E-02
Potassium Oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Propylene	0.00E+00	0.00E+00	0.00E+00	1.05E+00	1.05E+00
Pyrene	1.97E-03	0.00E+00	1.97E-03	1.45E-03	3.42E-03
Selenium Compounds	3.16E-02	3.38E-04	3.20E-02	0.00E+00	3.20E-02
Silicon Compounds	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silicon Dioxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver Compounds	9.07E-01	5.46E-04	9.07E-01	0.00E+00	9.07E-01
Sodium Carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium Compounds	1.92E-01	0.00E+00	1.92E-01	0.00E+00	1.92E-01
Sodium Molybdate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium Oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium Tolytriazole	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Strontium Compounds	8.63E-03	2.13E-02	2.99E-02	0.00E+00	2.99E-02
Styrene	1.01E+00	0.00E+00	1.01E+00	0.00E+00	1.01E+00
Sulfur Compounds	3.14E-04	0.00E+00	3.14E-04	2.88E+01	2.88E+01
Sulfur Dioxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric Acid	6.64E+00	0.00E+00	6.64E+00	0.00E+00	6.64E+00
Tetrachloroethylene	1.05E-03	0.00E+00	1.05E-03	0.00E+00	1.05E-03
Thallium	5.97E-06	1.43E-04	1.49E-04	0.00E+00	1.49E-04
Tin Compounds	1.23E-02	5.72E-04	1.29E-02	0.00E+00	1.29E-02
Titanium Compounds	1.81E-02	9.62E-02	1.14E-01	0.00E+00	1.14E-01
Toluene	4.91E-01	0.00E+00	4.91E-01	1.11E-01	6.02E-01
Titanium Dioxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethane	1.65E-02	0.00E+00	1.65E-02	0.00E+00	1.65E-02
Vanadium Compounds	2.32E-03	1.25E-02	1.48E-02	0.00E+00	1.48E-02
Vinyl acetate	1.85E-04	0.00E+00	1.85E-04	0.00E+00	1.85E-04
Xylene	8.99E-04	0.00E+00	8.99E-04	7.67E-02	7.76E-02
Zinc Compounds	2.25E-01	6.24E-03	2.32E-01	0.00E+00	2.32E-01
Polycyclic Organic Material	6.49E-02	0.00E+00	6.49E-02	7.77E-02	1.43E-01
Total COPI	5.99E+01	1.45E+01	7.44E+01	3.06E+01	1.05E+02
Dioxin/Furan (TCDD Equivalents)	2.53E-08	0.00E+00	2.53E-08	0.00E+00	2.53E-08
PAH	5.05E-04	0.00E+00	5.05E-04	0.00E+00	5.05E-04
Total HAP	2.31E+01	1.28E+00	2.44E+01	6.58E-01	2.51E+01