Minnesota Steel Draft Environmental Impact Statement

Minnesota Department of Natural Resources

U.S. Army Corps of Engineers

St. Paul District

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COVER SHEET

Draft Environmental Impact Statement
Minnesota Steel Industries LLC
Taconite Mine, Concentrator, Pellet Plant,
Direct Reduced Iron Plant and Steel Mill Project

The Minnesota Department of Natural Resources and the U. S. Army Corps of Engineers have jointly prepared the Draft Environmental Impact Statement to evaluate the proposed project in accordance with the National Environmental Policy Act 42 U.S.C. §§ 4321-4347, and the Minnesota Environmental Policy Act, Minnesota Statutes. § 116D.

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Abstract: This Draft Environmental Impact Statement documents the analysis of potential impacts associated with the Minnesota Steel Industries, LLC, Proposed Project. The Proposed Project would include an open pit taconite mine, adjacent stockpile areas, and the construction of new facilities – a crusher, concentrator, pellet plant, plant for producing direct reduced iron, and a steel mill consisting of two electric arc furnaces, two ladle furnaces, two thin slab casters, a hot strip rolling mill, and construction of a new tailings basin on the site of the former Butler facility tailings basin. Minnesota Steel would utilize existing haul roads to transport overburden, waste rock, and lean ore to the stockpile area and taconite ore from the mine to the crusher. The Proposed Project would combine modern, commercially proven technologies to allow production of steel from taconite ore in less than 48 hours on the Minnesota Steel project site.

Approved for Issuance for Public Comment:

2/1/07
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List of Acronyms

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- U.S. Bureau of Mines (USBM)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Fish and Wildlife Service (USFWS)
- University of Minnesota – Duluth (UMD)
- Wetland Conservation Act (WCA)

Definitions

AERMOD air dispersion model: A steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

Aggradation: The process by which a stream's gradient steepens due to increased deposition of sediment.

Air Quality Related Values (AQRVs): Features or properties of Class I areas that could be adversely affected by air pollution.

Ambient Air Quality Boundary: Ambient air means that portion of the atmosphere, external to buildings, to which the general public has access. The ambient air quality boundary is set as part of the ambient air quality modeling analysis completed for the Proposed Project and provides the boundary for which ambient air quality concentrations are predicted and compared to air quality standards established for Class I and II areas. Class I areas include state and national parks and wilderness areas and Class II areas are generally all areas that are not Class I areas.

Ambient Air Quality Standards: An ambient air quality standard sets legal limits on the level of an air pollutant in the outdoor (ambient) air necessary to protect public health. The U.S. Environmental Protection Agency (USEPA) is authorized to set ambient air quality standards.
and trichoptera.

Average Discharge (Q_{Avg}): The annual average discharge in the stream and is representative of both high and low flows.

BACT (Best Available Control Technology): An emission limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification.

Baghouse Dust: an air emission point source of particulate matter.

Bankfull Discharge ($Q_{1.5}$): The most effective discharge at moving sediment cumulatively over long time periods. This flow is largely responsible for forming and maintaining the long term geomorphology of a stream channel, so it is also referred to as the "channel forming flow". The bankfull discharge is typically approximated by the 1.5 year discharge ($Q_{1.5}$), the flow with a 1.5 year recurrence interval.

Bankfull discharge: The discharge at channel capacity or the flow at which water just fills the channel without over-topping the banks.

Bankfull: The elevation of the floodplain adjacent to the active channel.

Baseflow (Q_{Base}): The component of streamflow not directly attributed to storm water runoff. Baseflow defines low flow conditions for maintaining viable habitat for stream organisms. While baseflow does not transport large amounts of sediment it can be important in maintaining a low-flow channel needed by stream organisms when water levels drop in the summer and fall.

Biotic Community: All the interacting organisms living together in a specific habitat of varying sizes, and larger ones may contain smaller ones.

BMPs – Best Management Practices: The schedule of activities, prohibition of practices, maintenance procedures, and other management practices to avoid or minimize pollution or habitat destruction to the environment. BMPs can also include treatment requirements, operating procedures and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

BPIP-PRIME: An air downwash model.

Breach: An opening in the dam/dike embankment to allow drainage.

CALPUFF Model: A non-steady-state puff air dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation, and removal. CALPUFF can be applied for long-range transport and for complex terrain.

cfs (Cubic Feet per Second): the rate of flow representing a volume of 1 cubic foot passing a given point in 1 second.

Channel bottom substrate: The material that rests on the bottom of a stream, also known as sediment.

Chemicals of Potential Interest (COPI): COPI from mining sources are primarily metals and other constituents of the ore. COPI from processing sources include metals from the ore, emissions from fuel combustion, emissions related to processing agents (additives) and process products and by-products.

Class I Area: Federal or State designated national parks and wilderness areas.

Class II Area: All areas that are not Class I areas.
Criteria Pollutant – EPA has set national air quality standards for six common pollutants (also referred to as "criteria" pollutants). These pollutants are particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead.

- "Primary" ambient air quality standards are designed to establish limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

Definitions

- "Secondary" ambient air quality standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

CO: Carbon monoxide

Concentrate: Crushed ore is conveyed to a concentrator where the magnetic iron oxide minerals (concentrate) are separated from the nonmagnetic waste.

Crude ore: Ore which has not been processed or refined in any way.

Decibels (dB(A)): The logarithmic increase in sound energy relative to a reference energy level.

Dewatering: Removing water from one waterbody or area by pumping excess water to another area in preparation for mining, ore processing, and/or flow augmentation.

Direct Reduced Iron (DRI) Plant: A natural gas-fired facility that converts iron oxide (Fe_2O_3) pellets to direct reduced iron (Fe) by stripping oxygen away from iron oxide with reducing gas (a carbon monoxide/hydrogen mix).

Dry cobbing: A dry magnetic separation process during the concentrating process to extract the iron ore.

Ecological Classification System (ECS): Developed by the MNDNR and U.S. Forest Service, ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation.

Electric Arc Furnaces (EAFs): A system that heats charged material by means of an electric arc. Arc furnaces range in size from small units of approximately one ton capacity used in foundries for producing cast iron products, up to about 400 ton units used for secondary steelmaking. Temperatures inside an electric arc furnace can rise to approximately 3,300 degrees Fahrenheit.

Environmental Assessment Worksheet (EAW): An Environmental Assessment Worksheet provides information about a project that may have the potential for significant environmental effects. The EAW is prepared by the Responsible Governmental Unit or its agents to determine whether an Environmental Impact Statement should be prepared.

EPT taxa: The aquatic insect species: ephemeroptera (mayfly family), plecoptera (stonefly family), and tricoptera (caddisfly family).

Evapotranspiration: The sum of evaporation and plant transpiration. Evaporation accounts for the movement of water to the air from sources such as the soil, canopy interception, and waterbodies. Transpiration accounts for the movement of water within a plant and the subsequent loss of water as vapor through stomata in its leaves.

Final Scoping Decision Document (FSDD): A Scoping Decision Document is a companion to the Scoping EAW prepared for the project. The purpose of a Scoping Decision Document is to identify those project alternatives and environmental impact issues that will be addressed in the EIS. A Scoping Decision Document also presents a tentative schedule of the environmental review process.

Flow augmentation: The addition of water to a stream, especially to meet instream flow needs.

Footwall: The mass of rock underlying a mineral deposit in a mine.

Fugitive Sources: Fugitive air emissions are all releases to air that are not released through a confined air stream.

General Development (GD) lakes: GD lakes are large, deep lakes or lakes of varying sizes and depths with high levels and mixes of existing development. These lakes are extensively used for recreation and except for the very large lakes are heavily developed around the shore. Second and third tiers of development are common (source: Itasca County Zoning Ordinance).

Geomorphology: The study of the evolution and configuration of landforms.

gr/dscf: grains per standard cubic feet

HAP emissions: Hazardous air pollutant listed in or pursuant to section 112(b) of the Clean Air Act.

Horizon (soil horizon): A layer of soil that can be distinguished from the surrounding soil by such features as chemical composition, color, and texture.

Hydrology: The science dealing with the origin, distribution and circulation of waters of the earth such as rainfall, streamflow, infiltration, evaporation, and groundwater storage.

Index of Biotic Integrity (IBI): The stream IBI integrates information from individual, population, community, and ecosystem levels into a single ecologically based index of water resource quality (Karr, 1981).

Industrial Risk Assessment Program (IRAP): A computer based program that was developed to assess the impacts from facility emissions and related exposures.

Inert: Having little or no tendency to react chemically with other substances.

Definitions

Integrated Exposure Uptake Biokinetic (IEUBK) model: Developed by EPA, it evaluates potential risks based on predicted blood lead levels associated with exposure to lead. It calculates an incremental increase in blood lead concentration due to exposure to lead.

Iron Oxide (Taconite) Pellets: Produced from taconite iron ore by a separation and concentration process (fine grinding and magnetic or flotation treatment) of iron ore from taconite to produce pellets.

Karst topography: A landscape created by groundwater dissolving sedimentary rock such as limestone. This creates land forms such as shafts, tunnels, caves, and sinkholes, resulting in a fragile landscape susceptible to erosion and pollution.

L_{10}: The level exceeded 10 percent of the time, which is typically the most intrusive noise levels.

L_{50}: The level exceeded 50 percent of the time, which typically represents the median noise level.

Ladle Metallurgy Furnace (LMF or Ladle furnace): An intermediate steel processing unit that further refines the chemistry and temperature of molten steel while it is still in the ladle. The ladle metallurgy step comes after the steel is melted and refined in the electric arc or basic oxygen furnace, but before the steel is sent to the continuous caster.

Lean Ore: Rock with less than 15 percent magnetic iron content may be economically viable in certain conditions.

Littoral zone: The portion of a lake that is less than 15 feet in depth (MNDNR/MPCA); extends from the shoreline of a lake and continues to depth where sufficient light for plant growth reaches the sediments and lake bottom (U of M Extension).

Ln: Percent Noise Levels is the measurement of background noise.

$LoTO_x$™: A NO_x removal system that injects ozone into the flue gas stream to oxidize insoluble NO_x to soluble oxidized compounds by using a low temperature oxidation process.

Macroinvertebrate: An animal without a backbone living in one stage of its life cycle, usually the nymph or larval stage that can be seen with the naked eye.

MACT (Maximum Achievable Control Technology): Technology-based air emission standards established under Title III of the 1990 Clean Air Act Amendments. Hazardous air pollutants identified include carcinogens, mutagens, or reproductive toxins. The USEPA has developed standards for major HAP sources in certain industry categories. Standards are set on a case-by-case basis for a facility to be permitted if standards have not yet been set by USEPA for that facility's source category. Compliance with the MACT standards is designed to reduce HAP emissions.

Mycorrhizal Fungi: A group of soil organisms living in and around plant roots with which most plants establish a symbiotic relationship. Mycorrhizae extract mineral elements and water from soil for their host plant, and live off the plant's sugars. Trees and plants with thriving "mycorrhizal roots" systems are better able to survive and thrive in a variety of environments.

Natural Environment (NE) lakes: NE lakes are small, often shallow lakes with limited capacities for assimilating the impacts of development and recreational use. They often have adjacent lands with substantial constraints for development such as high water tables, exposed bedrock and soils unsuitable for septic systems. These lakes usually do not have much existing development or recreational use (source: Itasca County Zoning Ordinance).

NO_2: Nitrogen dioxide

NO_x: Nitrogen oxides – including all of the oxides of nitrogen.

NPDES Permit: National Pollutant Discharge Elimination System permit means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of Clean Water Act.

NPDES/SDS Permit: An NPDES/SDS Permit is a document that establishes the terms and conditions that must be met when a facility discharges wastewater to surface or groundwaters of the state. The permit is jointly issued under two programs. The National Pollutant Discharge Elimination System (NPDES) is a federal program established under the Clean Water Act, aimed at protecting the nation’s waterways from point and nonpoint sources. In Minnesota, it is administered by the Minnesota Pollution Control Agency (MPCA) under a delegation from the U.S. Environmental Protection Agency. The State Disposal System (SDS) is a state program established under Minn. Stat. § 115. In Minnesota, when both permits are required they are combined into one NPDES/SDS Permit administered by the state. The permits are issued to permittees discharging to a surface water of the state.

Ore: Rock with greater than 15 percent magnetic iron content.

Orifice: an opening in a wall or dam through which flow occurs. Orifices may be used to measure or control rates of flow.

Outfall: The discharge point of a waste stream into a body of water; alternatively it may be the outlet of a river, drain or a sewer where it discharges into a lake or other body of water.

Definitions

Overburden: Unconsolidated material above bedrock, such as soil and other material.

Oxhide Ore: Rock with less than 15 percent magnetic iron content but a high percentage of total iron.

PM: Particulate matter

PM_{10}: Particulate matter less than 10 microns in aerodynamic diameter

$PM_{2.5}$: Particulate matter less than or equal to 2.5 microns in aerodynamic diameter

ppm: parts per million

Proposed Project: An open pit taconite mine, adjacent stockpile areas, and the construction of new facilities – a crusher, concentrator, pellet plant, plant for producing direct reduced iron, and a steel mill consisting of two electric arc furnaces, two ladle furnaces, two thin slab casters, a hot strip rolling mill, and construction of a new tailings basin on the site of the former Butler facility tailings basin in Nashwauk, Minnesota.

Proposed Project Boundary: The Proposed Project Boundary is defined as the area which Minnesota Steel will own, lease or have access to in relation to the Proposed Project.

Proposed Project Impact Area: The Proposed Project Impact Area is the area within the Proposed Project Boundary where physical ground disturbances are proposed to occur. These types of disturbances would include areas associated with the mining pits, stockpile areas, plant layout/construction areas, tailings basin and conveyance systems.

PSD provisions: Prevention of Significant Deterioration of Air Quality regulations/program as cited at 40 C.F.R. 52.21 and incorporated by reference at Minn. Rules, part 7007.3000.

Q/d analysis: An assessment method that estimates the impacts of facilities' emissions increases and decreases by scaling them with the distance from the affected site. Since the method fails to use meteorological data, it provides only a rough estimate of the impact. A negative Q/d would imply that concentrations of a pollutant have decreased since the baseline date.

$Q_{1.5}$: See definition for Bankfull Discharge.
Q_{Avg}: See definition for Average Discharge.

Q_{Base}: See definition for Baseflow.

Recreational Development (RD) lakes: RD lakes are medium-sized lakes of varying depths and shapes with a variety of landform, soil and groundwater situations on the lands around them. Moderate levels of recreational use and existing development often characterize them (source: Itasca County Zoning Ordinance).

Rosgen Level I analysis: The qualitative analysis of geomorphic conditions leading to instability. Classifies streams as A, B, C, D, DA, E, F or G.

Rosgen Type C Channels: In the Rosgen stream geomorphyology classification, streams generally characterized as being highly sensitive to disturbance but have good recovery potential.

Scouring: The clearing and digging action of flowing air or water, especially the downward erosion caused by stream water in removing material (e.g., soil, rocks) from a channel bed or bank or around in-channel structures.

SGCN: Species of Greatest Conservation Need

Sinter feed: Materials remaining from the ore process that can be sold and used by others to extract additional, desirable materials from the waste products.

Slab caster: The semifinished shapes (slabs) that the molten steel from the steelmaking operation or ladle metallurgy step is cast directly into.

Slag: By-product formed during metallurgical and combustion processes from impurities in the metals or ores being treated. The major constituents of slag are calcium oxide, silicon oxide and iron. Slag is considered non-hazardous and is commonly used as construction material.

SO_2: Sulfur dioxide

Straight Grate Indurating Furnace: A furnace system that consists of a traveling grate that carries the taconite pellets through different furnace temperature zones. In the straight grate indurating furnace a layer of fired pellets, called the hearth layer, is placed on the traveling grate prior to the addition of unfired pellets. The straight grate indurating furnace begins at the point where the grate feed conveyor discharges the green balls onto the furnace traveling grate and ends where the hardened pellets drop off of the traveling grate.

Synoptic inventory: an inventory or survey of natural resource features relative to a particular point in space.

Taconite iron ore: A variety of chert containing magnetite and hematite; mined as a low-grade iron ore.

Tailings: Coarse and/or finely ground, nonmagnetic waste rock from the concentrating process, which are pumped by pipeline as a slurry to the tailings basin.

Taxa: a grouping of organisms given a formal taxonomic name such as species, genus, family, etc.

Toe of dike: The lowest part of the dike embankment, where it meets the ground surface.

Tunnel Furnace: The Tunnel Furnace maintains and equalizes the temperature of the slabs arriving from the caster and delivers them to the rolling mill.

ug/m^3: Micrograms per cubic meter of air.

Definitions

VOC: Volatile organic compound

Waste Rock: Rock with less than 15 percent magnetic iron content and all other rock materials outside of the Lower Cherty unit of the Iron Formation.

Watershed: A geographic area from which water is drained by a river and its tributaries to a common outlet. A ridge or drainage divide separates a watershed from adjacent watersheds.

Weir: A weir is a small overflow type dam commonly used to raise the level of a small river or stream. Weirs have traditionally been used to create mill ponds. Water flows over the top of a weir, although some weirs have sluice gates which release water at a level below the top of the weir. The crest of an overflow spillway on a large dam is often called a weir.

Executive Summary

PURPOSE AND NEED FOR EIS

The Minnesota Department of Natural Resources (MNDNR) and U.S. Army Corps of Engineers (USACE) have jointly prepared a Draft Environmental Impact Statement (Draft EIS) to evaluate the proposed project in accordance with Environmental Impact Statement (EIS) preparation requirements of the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-4347 and the Minnesota Environmental Policy Act (MEPA), Minnesota Statute §116D.

The purpose of an EIS is to:

- Evaluate the project's potentially significant environmental effects;
- Consider reasonable alternatives;
- Explore mitigation measures for reducing adverse effects;
- Provide information to the public and project decision-makers; and
- To aid in making permit decisions.

The EIS is intended to provide information to units of government on the environmental impacts of a project before approvals or necessary permits are issued and to identify measures necessary to avoid, reduce, or mitigate adverse environmental effects. The EIS is not a means to approve or disapprove a project.

An EIS is mandatory for the proposed Minnesota Steel, LLC (Minnesota Steel) project pursuant to Minnesota Rules, part 4410.2000, subpart 2; the rule directs that an EIS shall be prepared if the project meets or exceeds the thresholds of any of the EIS categories listed in Minnesota Rules, part 4410.4400. Minnesota Rules, part 4410.4400, subparts 8B and 8C (Metallic Mineral Mining and Processing) indicate mandatory preparation of an EIS for construction of a new facility for mining metallic minerals or for the disposal of tailings from a metallic mineral mine and construction of a new metallic mineral processing facility.

The MNDNR serves as the co-lead agency in preparing this joint state/federal EIS and has coordinated with other state agencies (e.g., Minnesota Pollution Control Agency [MPCA] and Minnesota Department of Health [MDH]) and will participate with the USACE at any public meetings, public hearings, or other public involvement pursuant to NEPA and MEPA. The MNDNR will be responsible for determining EIS adequacy pursuant to MEPA and will prepare the state Record of Decision (ROD).

The USACE is the lead federal agency in preparing this joint state/federal EIS. The USACE received a permit application from Minnesota Steel to discharge fill material in waters of the U.S, for the development of the Proposed Project. The USACE has determined that its action on the permit would be a major federal action that has the potential to significantly affect the quality of the human environment, requiring the preparation of a federal EIS pursuant to NEPA and its implementing regulations (40 C.F.R. parts 1500-1508). The USACE will coordinate with other federal agencies including the U.S. Environmental Protection Agency (USEPA) and the U.S. Fish and Wildlife Service (USFWS), and will consult with Native American Tribes, as appropriate. The USACE will schedule and hold agency and public meetings jointly with the MNDNR pursuant to NEPA and MEPA. The USACE will determine whether the EIS satisfies NEPA and Section 404 of the Clean Water Act (CWA) requirements and will prepare the federal Record of Decision (ROD).

PROJECT OVERVIEW

Minnesota Steel proposes to reactivate the former Butler Taconite mine and tailings basin area. Though the area was initially mined in 1903 and the former Butler Taconite facility was active from 1967 to 1985, viable ore still remains on-site. Minnesota Steel's Proposed Project (or Proposed Action) would combine ore processing, direct reduced iron (DRI) production, and steel-making into an integrated facility to provide steel for the domestic and world markets (Proposed Project).

The Proposed Project would be located near Nashwauk, Minnesota on the Mesabi Iron Range. The Mesabi Iron Range is a major, well-known geologic feature oriented roughly northeast-southwest across more than 120 miles of northeastern Minnesota from near Babbitt to near Grand Rapids. The Mesabi has been the largest source of iron ore produced in Minnesota since the 19th century and Minnesota has been and continues to be the predominant source of iron ore in the United States.

Minnesota Steel expects to employ about 700 people for production, support, and administration. The Proposed Project would integrate the steps necessary to make low-cost, high-quality steel at the former Butler Taconite site. Minnesota Steel plans to make steel from taconite in a cleaner and more efficient manner than traditional steel plants by combining modern technologies to allow it to make steel from taconite ore in less than 48 hours. Efficiencies are gained by having a continuous flow of materials, keeping the material at an elevated temperature throughout the process, and eliminating multiple transportation steps.

In addition to the reactivation of the existing mine and tailings basin, the project would include construction of new facilities. These facilities would include: a crusher/concentrator, pellet plant, a DRI plant, and a steel mill consisting of two electric arc furnaces (EAFs), two ladle furnaces, two thick slab casters, a tunnel furnace, a hot strip rolling mill, a sheet steel coiler, and construction of a new tailings basin on the site of the former Butler facility tailings basin.

Key project features and their nominal capacities are:

- An open pit taconite mine capable of mining approximately 13,100,000 metric tons of ore per year.
- A crusher/concentrator plant with an associated tailings basin, producing approximately 3,800,000 metric tons concentrate per year.
- A pelletizer that can produce approximately 3,800,000 metric tons per year of oxide pellets that would be used as a feedstock for DRI production, or sold.
- A DRI facility producing approximately 2,800,000 metric tons per year of iron pellets for direct feed for steel production.
- An EAF, ladle metallurgy furnace, slag processing and a caster to produce 2,500,000 metric tons per year of steel slabs for direct shipment or for rolling to produce hot rolled coil.

In general, about 3.4 tons of crude ore would be converted to 1.35 tons of iron oxide (taconite) pellets which, in turn, would be converted to 1.12 tons of DRI pellets and 1 ton of finished steel product. The primary raw material inputs to the Minnesota Steel project are iron ore, natural gas, electricity and water.

The Proposed Project would obtain its magnetic taconite ore from a horizon within the Lower Cherty member of the Biwabik Iron Formation. The inferred ore reserves at the proposed Minnesota Steel site are currently estimated at about 1.4 billion tons (or about 100 years of reserves, based on the proposed production capacity). A 20-year mine production period is typically used for mine financing and mine planning. Therefore, a 20-year mine production period (equivalent to 76 million tons of taconite pellets or 55 million tons of steel) was used as the basis for defining the Proposed Project for this EIS. However, the overall analysis timeframe for this EIS is 27 years, which includes an anticipated two years for plant/facilities construction, 20 years of mine production, and five years for closure. Phased actions beyond the 20-year Proposed Project mine production period or a production trigger of 76 million tons of taconite pellets (55 million tons of steel), whichever comes first, would be addressed in accordance with Minnesota Rules, part 4410.2000, subpart 4 and Minnesota Rules, part 4410.3000, subpart 3. Mining operations beyond this time-span would require additional environmental review and permitting.

PURPOSE AND NEED FOR PROJECT

The purpose and need for the project would be to mine taconite ore and produce steel on site in order to provide increased steel product to the domestic and world markets.

ABOUT THE PROPOSER

Minnesota Steel Industries, LLC is a wholly owned subsidiary of J.M. Longyear Heirs, LLC (51 percent ownership) and R.M. Bennett Heirs, LLC (49 percent ownership) with operating offices in Hibbing and St. Paul, Minnesota. Since the early 1890s the Longyear and Bennett families have been partners in the development of Minnesota’s iron ore industry on the Mesabi Range

FINAL SCOPING DECISIONS - LEVEL OF ANALYSIS

In July 2005, the MNDNR in partnership with the USACE prepared a Scoping Environmental Assessment Worksheet (Scoping EAW) and a Draft Scoping Decision Document (Draft SDD) to provide information about the project, identify potentially significant environmental effects, and determine what issues and alternatives will be addressed in the EIS and the level of analysis required. Public notification and opportunities to receive information and public comment on the project began during the project scoping process. A notice of availability for review of the Scoping EAW and Draft SDD was published in the July 18, 2005, EQB *Monitor*. This initiated a 30-day public comment period and the joint state-federal scoping process. The 30-day public comment period concluded on August 17, 2005. A public meeting was held during the comment period on August 10, 2005, at the Nashwauk High School in the City of Nashwauk to provide additional information on the project and allow for comments (verbal and written) and questions. On August 15, 2005 the USACE published a Notice of Intent (NOI) to prepare a Draft EIS in the Federal Register. The comments received during the scoping period were considered in making revisions to the Draft SDD prior to the agencies issuing the Final Scoping Decision Document (Final SDD) on October 13, 2005. The Final SDD satisfies the scoping requirements of MEPA and NEPA and serves as the “blueprint” for preparing the EIS for the Proposed Project.

Minnesota Rules require that an EIS include at least one alternative of each of the following types, or provide an explanation of why no alternative is included in the EIS (Minnesota Rules, part 4410.2300, subpart G): alternative sites, alternative technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through public comments. The alternative of no action is also required to be addressed in the EIS. The project alternatives are evaluated in the Draft EIS.

Environmental issues identified and described in the Scoping EAW were categorized in the Final SDD by significance and level of analysis required in the EIS. These three categories are briefly described below along with a list of topics that are included in each category. The Final SDD describes in greater detail the issues and analyses to be included in the EIS for each topic.

Issues Adequately Analyzed in the Scoping EAW

The following topics were reviewed and considered by the MNDNR and the USACE in the Scoping EAW and it was determined that they were not relevant or were so minor that they would not be addressed in the EIS:

- Water surface use
- Compatibility with plans and land use regulations

Issues for Which Significant Impacts Are Not Expected

The MNDNR and USACE determined that the following topics are not expected to present significant impacts, but would be addressed in the EIS using limited information beyond that provided in the Scoping EAW commensurate with the anticipated impacts. These specific topics are addressed in the Draft EIS and include:

- Land use
- Cover types
- Threatened and endangered species
- Water-related land use management districts
- Erosion and sedimentation
- Geologic hazards and soil conditions
- Traffic
- Vehicle related air emissions
- Archaeology
- Recreational trails
- Visual impacts
- Infrastructure
- Socioeconomics
- Mineland reclamation
- 1855 Ceded Territory Treaty

Potentially Significant Issues Requiring More Extensive Analysis

The MNDNR and USACE also identified the following topics in the Final SDD that may result in potentially significant impacts and would include a substantial amount of additional information in the EIS beyond that included in the Scoping EAW. These specific topics are addressed in the Draft EIS and include:

- Physical impacts on water resources
- Water appropriations
- Surface water runoff
- Wastewater/water quality
- Solid waste
- Stationary source air emissions
- Fish and wildlife resources
- Noise

Lastly, the Final SDD determined that the EIS would also address the potential cumulative impacts associated with combined environmental effects of the Proposed Project and of past, present and reasonably foreseeable future actions relative to air quality (Class I air quality; acid deposition and ecosystem acidification in Class I areas; mercury; and visibility impairment), threatened and endangered plant species, wetlands, wildlife habitat and animal travel corridor obstruction/landscape barriers. The cumulative impacts analysis is presented in the Draft EIS.

PROPOSED ACTION

The Proposed Project would reactivate the existing mine and tailings basin and the construction of new facilities. These facilities would include: a crusher/concentrator, pellet plant, a DRI plant, and a steel mill consisting of two EAFs, two ladle furnaces, two thick slab casters, a tunnel furnace, a hot strip rolling mill, a sheet steel coiler, and construction of a new tailings basin on the site of the former Butler facility tailings basin. The following sections provide a description of processes associated with the Proposed Project including mining and ore and steel production.

Mining Processes

The Proposed Project would obtain its magnetic taconite ore from a horizon within the Lower Cherty member of the Biwabik Iron Formation. The taconite ore of the Biwabik Iron Formation will be mined by open-pit methods. Mining would start at the following two locations: resumed mining in Pit 5 at the southwest portion of the mine site and initiation of mining in proposed Pit 6. Initially, mining in Pit 5 would begin on the upper benches of the southern end of the pit and eventually would be expanded in all directions. A saddle would remain between the two pits; this contains non-iron-bearing rock and low-grade iron ore that cannot be used in Minnesota Steel's concentration process. This saddle is included in the mining area because it is highly likely to be disturbed in the process of mine development.

After overburden is removed, waste rock and taconite ore would be drilled, blasted, and loaded into mine trucks by diesel-hydraulic shovels. The raw ore would be trucked to the primary crusher. Waste rock would either be used to construct dikes and haul roads or placed in waste rock stockpiles. During and following each phase of mining, reclamation of the overburden slopes and stockpiles would be completed according to MNDNR mineland reclamation requirements. The Proposed Project would utilize new haul roads and existing Butler facility haul roads to transport overburden, waste rock and lean ore to the stockpile areas and taconite ore from the mine to the crusher. As the mine pits are expanded and if in-pit stockpiling begins, existing mine pit and inter-pit haul roads would be utilized. Existing haul road alignments and disturbed areas would be utilized where possible.

Ore Processing

The crude ore would be trucked from the pits to the primary crusher for size reduction to approximately 12 inches in diameter. Next, secondary crushing would reduce the ore to approximately three-quarters of an inch in diameter. At this stage dry cobbing (magnetic separation) would be used to eliminate approximately seven percent of the lowest-grade ore. Cobbing rejects would be stockpiled or used for road aggregate. The ore would then be conveyed to the crude ore stockpile area at the concentrator.

The ore concentration and pellet production processes would be similar to those used at existing Iron Range taconite plants. Crushed ore would be conveyed to the concentrator, where the magnetic iron oxide minerals (concentrate) would be separated from the nonmagnetic waste (tailings). In the concentrator, the ore would pass through a series of wet mills that would grind the rock to a flour-like consistency. Magnetic separators would separate the concentrate from the waste rock. Concentrate would be further refined by flotation, which would remove the more silica-rich material, leaving nearly pure iron oxide concentrate. Concentrate would be pumped to the pellet plant. Tailings from the concentrator would be pumped to a tailings thickener where solids would be separated from water by sedimentation. The resulting tailings slurry would be pumped from the tailings thickener to the proposed tailings basin located on the east side of TH 169 for disposal.

In the pellet plant, wet iron oxide concentrate would be dewatered in vacuum filters, mixed with a binder and limestone, and then converted to unfired pellets ("green balls") in balling drums or disks. The greenballs proceed through the indurating furnace and would be fired into hardened iron oxide pellets. After screening, the oxide pellets would be hotcharged directly to the DRI modules or stockpiled. The undersized pellets from the screening process would be ground and recycled to the concentrate slurry (or sold as sinter feed).

The DRI facility would convert iron oxide pellets to nearly pure iron pellets. The oxide pellets would be conveyed to the top of a vertical shaft reactor. In the reactor, the oxide pellets would move slowly downward through the reactor's reduction zone by gravity against a countercurrent flow of reducing gas which converts the iron oxide to metallic iron. The reducing gas is a mixture of hydrogen and carbon monoxide, both of which extract oxygen from the oxide pellets to form water and carbon dioxide. Reducing gas exiting the top of the DRI reactor ("top gas") contains excess hydrogen and carbon monoxide. Top gas is cleaned and cooled by a gas scrubber and is used in part to fire the main burners in the reformer. The remaining top gas stream is recycled through a catalytic reformer to produce reducing gas. As the pellets reach the bottom of the reactor, they would pass through a mixture of natural gas and carbon monoxide, which cools the DRI pellets and increases the carbon content of the product. The hot metallic iron also acts as a catalyst in promoting reforming reactions to convert natural gas to hydrogen gas and carbon monoxide. The DRI product would be hot charged to the steel mill EAFs or, during steel mill down-time, would be stockpiled for later use or for sale. Typically, pellet and DRI production facilities can slightly exceed their design rated capacity, while steelmaking equipment capacity is relatively fixed. Therefore, quantities of excess oxide pellets and DRI product may be shipped for commercial sale.

Steel Production

The steelmaking facility would use purchased electricity to power the EAFs. At full capacity, the steelmaking facility would include two EAFs, two ladle furnaces, two thick slab casters, a tunnel furnace, a vacuum degasser, a hot strip rolling mill, and a sheet steel coiler. The DRI pellets would be fed to the EAFs along with additives such as carbon and lime and melted in batches. The molten steel from the EAFs would be transferred to the two ladle metallurgy furnaces. The steel would be refined in the ladle furnaces through carbon addition, oxygen blowing, temperature control, and the addition of alloying metals. To achieve higher steel quality specifications when needed, some ladles of steel would be further processed by vacuum degassing to remove traces of hydrogen and oxygen. From the ladle furnace, the liquid steel would be transferred to the continuous casters where it would be cast into slabs approximately 8 to 10 inches thick. The slabs may be sold as finished product or proceed through a tunnel furnace and a series of rolling stands where the slab would be rolled successively thinner, to an ultimate thickness as thin as 1 mm. The sheet steel would be coiled for rail or truck shipment.

The Proposed Project is designed to produce about 2.5 million metric tons per year of slab and/or hot rolled sheet steel. This will require 3.8 million metric tons per year of taconite pellets or 13.1 million metric tons of taconite ore. Internally-produced virgin iron and a small amount of scrap (less than 1 percent of clean external scrap) will be charged to the EAFs, thereby avoiding releasing the mercury that might otherwise be found in contaminated scrap.

WATER MANAGEMENT

The Proposed Project would require substantial amounts of water. Minnesota Steel proposes to recycle and reuse most of the water that would service its mining and processing operations, and to capture and use most of the storm water runoff that would occur near those operations. By using this approach, the Proposed Project would be able to ensure that sufficient water is available for processing operations and that it would not need to appropriate water from any naturally-occurring water body, even during dry conditions.

The Proposed Project would use groundwater and surface water that flows into Pits 1 & 2, 5 and 6 as the primary supply of water for the project. Once Pit 5 has been initially dewatered, ongoing maintenance pumping from Pits 5 and 6 would be pumped directly to the facility for use or to two old natural ore pits (Ann and Sullivan Mine Pits) located north of Pits 1 and 5, along with storm water runoff collected from operations and stockpile areas. Alternatively, storm water may also be reused directly in the operations. Water removed from existing mining pits, in addition to storm water that would be diverted and collected, would provide the Proposed Project with adequate water for mining and steel making operations. Runoff from industrial areas and maintenance dewatering would be directed to the Ann and Sullivan natural ore pits located on site, which are isolated from downstream waters and Pits 1 & 2. The water contained in Pits 1 & 2 would be used as a reservoir to supply water for facility processes as needed and to supply water to augment flows in Oxhide Creek. Augmentation water may also be needed from the Hill Annex Pit to supplement augmentation flows to Oxhide Creek and to augment flows in Snowball Creek.

Minnesota Steel proposes to control all discharges and process water from the tailings basin and eliminate any surface discharge of tailings water, including lateral seepage. A seepage collection system would surround the tailings basin and return collected water to the tailings basin.

There would be no direct discharge of process water containing pollutants from this project to downstream waters. Although the majority of the storm water will be captured and used in the process, a portion will leave the site, mainly during construction activities. A complete description of the proposed water management system is provided in the Draft EIS.

STATIONARY SOURCE AIR EMISSIONS

The Proposed Project has primary air emission points at the mine, taconite indurating furnace, DRI modules and the steel mill EAFs. Smaller emission points include numerous individual material handling operations, smaller combustion sources and cooling towers. All emission points have been included in the evaluation of Best Available Control Technology (BACT) required under the Prevention of Significant Deterioration (PSD) air permitting provisions, and some emission points are subject to the Maximum Achievable Control Technology (MACT) standards set by the national emission standards for hazardous air pollutants (NESHAPs). The facility is considered a major source under the New Source Review (NSR) PSD program, and is also a major source under the NESHAP regulations. As required by PSD regulations, BACT emission limits and performance standards are proposed for the Proposed Project.

The control technologies proposed as BACT for the Proposed Project include:

- Clean Fuels (Natural Gas) for SO_2, NO_x, PM and PM_{10}
- Good Combustion Practices for CO, VOC, PM and PM_{10}
- Enclosures with Fabric Filter for PM, PM_{10}
- Enclosures with PM Wet Scrubbers for PM, PM_{10}
- Low NO_x, ultra low NO_x and oxy fuel burners for NO_x

- Wet Scrubbers for PM, PM_{10}
- Absorber/Wet Scrubber for SO_2, fluorides (F) and sulfuric acid mist (SAM)
- Pb, F and SAM Control Performance Monitored via SO_2 and PM emissions limits
- Best Practices for Fugitive Dust Control via a Fugitive Dust Control Plan

In the final air emissions permit, the MPCA and USEPA would include control equipment requirements and BACT limits that are equal to or more stringent than those identified in this Draft EIS. The air emissions permit would also specify BACT limits for periods of start-up and shutdown, and the requirement to re-do the BACT analysis if $LoTO_x$™ control of NO_x is inadequate or determined to be infeasible.

The following studies or analyses were completed in an effort to evaluate Proposed Project-related air quality issues:

- An emission inventory that lists all possible sources of air emissions from the plant (stack and fugitive)
- BACT analyses, which propose control technologies for the project to achieve lowest cost, effective emission levels
- Compliance strategies for standards requiring MACT for control of hazardous air pollutants such as metals and volatile organic compounds
- A Class I Area Impacts Analysis using the California Puff (CALPUFF) model to simulate the long-range transport of project emissions and determine the impact of project-related air emissions on Class I increment, ambient air quality standards, visibility and other air quality-related values for Voyageurs National Park, the Boundary Waters Canoe Area Wilderness, Isle Royale, and Rainbow Lake Wilderness Area
- A Class II Area Impacts Analysis to evaluate air quality effects of the project at the project boundary and demonstrate compliance with ambient air quality standards or the PSD increment.
- A review of potential mercury emissions from the project and an evaluation of mercury emission reduction alternatives
- Human health and ecological risk assessments of potential impacts from the project

The MPCA's permitting process will determine the final compliance requirements for the Proposed Project. The MPCA will review the air emissions permit application and write the air emissions construction and operating permit to ensure the project complies with all applicable air quality regulations which have been promulgated to-date. Additional details related to the Proposed Project's air emissions are described in the Draft EIS.

CLOSURE

The Minnesota Steel Permit to Mine Application, dated December 2006, describes the proposed reclamation plan for mined areas of the project. This reclamation plan must conform to Minnesota Rules 6130 for taconite and iron ore mineland reclamation. In summary, mineland reclamation would include the mine area, stockpile areas, tailings basin and other areas disturbed by mining related activities.

At closure, the Proposed Project would be required to remove all mining equipment and dismantle and remove all plant processing equipment and structures. Pits 1 & 2 and the upstream Harrison and Hawkins/Halobe Pits would again overflow to Pit 5 as they currently do. Pits 5 and 6 would be allowed to refill, Pit 5 would overflow to the Oxhide Stilling Basin and Oxhide Lake, as it currently does. Minnesota Steel would be required to close the tailings basin according to an approved closure plan, and runoff from the closed basin would flow to O'Brien Creek. Additional details related to closure of the Proposed Project are described in the Draft EIS.

SITE PREPARATION AND SCHEDULE

The overall Proposed Project timeline is dependent on numerous factors including acquiring project financing, completion of the EIS process, acquiring all necessary permits (federal, state and local), and the construction of the Proposed Project. The following timelines are presented to provide the reader with a general understanding of the anticipated project schedule and include:

Complete the EIS, obtain permits and acquire project financing	2007
Start construction Year 1 – Year 2 (Pit 5 stripping, Pits 1 & 2 partial dewatering, crusher/concentrator plant, pellet plant, first DRI module, first steel mill line)	2007 – 2008
Complete construction and hot commissioning of Line 1 and begin dewatering of Pit 5	2009
Continue construction (Line 2: second DRI module, second steel mill line, rolling mill)	2009 – 2010
Complete hot commissioning of Line 2	2012

CONNECTED ACTIONS

The Scoping EAW identified a number of infrastructure improvements that would be implemented in conjunction with the Proposed Project. These infrastructure improvements include a natural gas supply line, power transmission lines, roadway improvements, a rail access line, and water and sewer lines connecting to the City of Nashwauk.

Although these infrastructure improvements would be required for the construction and operation of the Proposed Project, these improvements would be implemented by separate entities. Itasca County is planning the infrastructure for roads and railroads. Electrical power providers and/or local public utility providers would be responsible for construction of the infrastructure to supply electricity and natural gas to the facility. Separate permits and environmental review would be required for these infrastructure projects; however, possible environmental impacts (based on available information) are presented in the Draft EIS.

NO ACTION ALTERNATIVE

The No Action Alternative leaves the Proposed Project area, which was the former Butler Taconite mine and tailings basin, in its existing condition. This mining operation has been inactive since 1985. Much of the area in and around the Proposed Project has been excavated or otherwise altered by past mining activities. Unless noted otherwise in the Draft EIS, no social, economic or environmental impacts would result from the No Action Alternative.

PROJECT ALTERNATIVES

Pursuant to Minnesota Rules, part 4410.2300, subpart G, the EIS is required to include one or more alternatives of each of the following categories or provide a concise description of why no alternative in a particular category is included in the EIS.

- Alternative Sites
- Alternative Technologies
- Modified Designs or Layouts
- Modified Scale or Magnitude
- Alternatives that incorporate reasonable mitigation measures identified through the comment periods for EIS scoping or for the Draft EIS.

An alternative may be excluded from analysis in the EIS if it would not meet the underlying need for or purpose of the project; it would likely not have significant environmental benefit compared to the project as proposed; or another alternative of any type that is analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts. (Minnesota Rules, part 4410.2300, subpart G) The implementing regulations of NEPA also require the USACE to explore and evaluate reasonable alternatives and describe the reasons for the elimination of alternatives.

The Scoping EAW and Final SDD describe assessment of alternatives made during the scoping process and carried forward to the EIS. The following sections summarize the scoping decisions and describe alternative assessments and decisions made regarding alternatives to be included in the EIS.

Alternative Site

Based on findings during the Final SDD process, alternative mine pit or processing plant sites for this project were not evaluated. An alternative mine site would not meet the underlying need or purpose of the project. The mineralization of the desired elements within a geologic deposit dictates the location of the mine. An alternative processing plant site would either not have significant environmental benefits over the Proposed Project plant site or would not meet the underlying need and purpose of the project which includes integrated value added process steps to produce steel.

The Final SDD made a commitment to evaluate the benefits, feasibility and impacts of locating a tailings basin to the northwest of the mine site in the EIS. The location of the Alternative Tailings Basin had been identified during scoping. Unlike the Proposed Project tailings basin (at the site of the former Butler Tailings Basin) this location has not been previously disturbed by mining activities. The configuration of the Alternative Tailings Basin analyzed in the EIS was refined from the configuration shown in the Scoping EAW, based on evaluation of various sub-alternatives and refined assessment of the basin design.

The Alternative Tailings Basin would cover an area of approximately 1,119 acres. Starter dams would be constructed around the north end of the basin, using construction methods similar to those proposed for the Proposed Action tailings basin.

The Alternative Tailings Basin sub-alternative would impact fewer total acres of wetlands, compared to the Proposed Project tailings basin location; however, the Alternative Tailings Basin would impact an area previously undisturbed by mining and would impact relatively high quality wetlands (including Type 7 and 8 wetlands), compared to the wetlands impacted by the Proposed Action tailings basin (which primarily impacts wetlands that developed in the former Butler Stage I tailings basin since mine closure in 1985).

Based on the above considerations, the Alternative Tailings Basin was not carried forward for further analysis in the EIS, only the Proposed Action tailings basin was analyzed.

Alternative Technologies

The Scoping EAW and Final SDD stated that alternative mining technologies and alternative steel production technologies do not need further evaluation in the EIS. The Proposed Project uses conventional open pit mining technology that has been used in other mining operations, and the deposit is not suitable for underground mining. Other mining technologies and steel production technologies applicable to the Proposed Project would likely have no substantial environmental benefit over the proposed technologies.

Two proposed technology alternatives: ore processing and air pollution control technology, were evaluated as part of the EIS studies.

Ore Processing

The Final SDD noted that ore processing technology currently has two pellet induration processes that are commercially available – straight grate furnaces and grate kiln furnaces. The Final SDD committed that the EIS would evaluate fuel use and air emissions for both types of indurating furnaces to determine which type will have the least impact on the environment. The findings of the evaluation of the alternative pellet furnaces leads to the conclusion that no further evaluation of the grate kiln furnace is warranted and that only the straight grate furnace should be carried forward in the EIS as part of the Proposed Action. The evaluation determined that the straight grate furnace is more efficient for ore processing, uses less fuel, requires less maintenance and that particulate emissions are lower than the grate kiln furnace.

Based on the above considerations, only the Straight Grate Furnace Alternative (as part of the Proposed Action) was carried forward for analysis in the EIS.

Air Pollution Control Technologies

The Final SDD specified that the EIS would evaluate alternative air pollution control technologies for both ore processing and the steel mill. These evaluations were performed as part of the BACT analysis and MACT submittals required as part of the MPCA air permit application process.

BACT is defined as an emission limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification. The MPCA, on a case-by-case basis, takes into account energy, environmental, and economic impacts and other costs to determine what is achievable for such source or modification through the application of production processes or available methods, systems and techniques.

BACT analysis includes the following steps, which are consistent with the process utilized to identify, evaluate and select alternatives during the environmental review process:

Step 1 – Identify all control technologies
Step 2 – Eliminate technically infeasible options
Step 3 – Rank remaining control technologies by control effectiveness
Step 4 – Evaluate the most effective control technologies and document results
Step 5 – Select BACT

This BACT analysis process and the MACT case-by-case submittals document in detail the process utilized to assess air pollution control technologies, including ore processing and the steel mill, for the Proposed Project. Based on the findings of these analyses, the proposed air pollution control technologies were selected and analyzed for the Proposed Action in the air permit application and in the EIS, and no other control technologies were carried forward for review in the EIS. It is assumed that the air quality analyses included in this EIS represents the maximum emissions and impacts that would result from the Proposed Action. If, as a result of the permit review/revision process, higher emissions are proposed, the EIS and air permit application analyses would need to be revised to reflect impacts from the new, higher emission levels.

Modified Design or Layout

As committed to in the Final SDD, the EIS studies included an evaluation of alternative designs and layouts for the processing plant, waste rock stockpiles, and on-site sanitary wastewater treatment. A technical memorandum was prepared for each of the three layout alternatives, documenting the sub-alternatives developed and evaluated, as well as the rationale for retaining or eliminating those alternatives for analysis in the EIS. The results of the analyses are summarized below.

Plant

The location of the processing plant in the Proposed Action site concept was proposed to minimize transportation and maximize efficiency of the mining/processing operations. As committed to in the Final SDD, the EIS studies included evaluation of the feasibility, benefits, and impacts of slight modifications to the overall layout of the processing plant, developed in an effort to reduce impacts to wetlands in the area. The findings of the studies/evaluation of alternative processing plant layout concepts led to the conclusion that no processing plant layout alternatives would be carried forward for analysis in the EIS. This decision was made based on the following considerations:

- A range of wetland minimization alternatives was developed and evaluated for layout of the processing plant facility;
- None of the alternative layout concepts was found to be feasible/practicable, especially given the size of the facility (approximately 220 acres) and that the processing facilities need to be kept in close proximity to each other and on a level site, to maintain the functionality of the facility, and minimize site preparation costs; and given the above considerations, development of further alternative layout concepts was not likely to result in both substantial wetland impact reductions and a feasible/practicable concept.

Based on the above considerations, no processing plant layout alternative was carried forward for analysis in the EIS – only the Proposed Action plant layout concept was analyzed.

Stockpiling

As committed to in the Final SDD, the EIS studies included development and evaluation of alternative designs and locations for stockpiles in an effort to provide substantial environmental benefits and/or substantial minimization of environmental impacts. The alternatives included in-pit stockpiling, consisting of stockpiling waste rock and overburden in a previously mined pit or portion of a pit. This approach can minimize the footprint of new stockpile areas and allow for backfilled areas of the mine pit to be reclaimed as shallow water habitats for aquatic resources and potential mitigation for other project impacts. The alternatives were evaluated for feasibility, benefits and impacts.

Based on the development and evaluation of the stockpiling sub-alternatives, a conceptual plan that assumes that 50 percent of the post-year-10 mining waste rock would be in-pit stockpiled was carried forward for analysis in the EIS, with the understanding that the potential limits to in-pit stockpiling due to mineral rights, mine pit sequencing, etc., may limit the extent to which in-pit stockpiling may be able to be used. The year-10 starting point for in-pit disposal was assumed because in-pit stockpiling can only be done in areas where the mine has reached the footwall of the ore body and there are no viable mineral values at lower elevations. It was assumed that prior to year-10, these conditions would not be met.

On-Site Sanitary Wastewater Treatment

Based on public comments received on the Draft SDD and the commitment made in the Final SDD, the EIS studies included evaluation of the feasibility and environmental benefits associated with an on-site sanitary wastewater treatment system as a mitigation measure to potentially reduce nutrient loading to Swan Lake. Since the primary objective of analyzing this alternative was reduction of nutrient loading to Swan Lake, alternatives assessed focused on those that would result in zero discharge to water bodies flowing to Swan Lake (i.e., utilization of soil disposal for the effluent). The On-Site Wastewater Treatment System Alternative concept developed for analysis in the EIS consists of a lift station that routes the wastewater to septic tanks for storage and solids removal, followed by distribution of the effluent to filter ponds for secondary treatment (including recirculation/re-treatment) prior to discharge to a sub-surface drainfield. This system would result in no discharge to surface waters and, therefore, no nutrient loading to Swan Lake.

Based on the above considerations, the On-Site Wastewater Treatment System Alternative was carried forward for analysis in the EIS.

SCALE OR MAGNITUDE ALTERNATIVES

The scoping process determined that the EIS does not need to evaluate scale or magnitude alternatives for the project, since the infrastructure requirements to mine and process the ore are such that alternative scale/magnitude would not meet the underlying need for or purpose of the project or would likely not have significant environmental benefit compared to the project as proposed.

MITIGATION MEASURES

Minnesota Rules, part 4410.2300, item G includes the requirement that an EIS must consider alternatives that incorporate reasonable mitigation measures identified through the comment periods for EIS scoping or for the Draft EIS. The On-Site Wastewater Treatment Alternative was included for study in the EIS, based on a mitigation measure identified during scoping comments. In addition, the EIS process identified mitigation measures for each of the potential project impacts identified. Some of these mitigation measures have been incorporated into the Proposed Project. These measures include:

- Integrated System – The Proposed Project would gain efficiencies by having a continuous flow of materials, keeping the material at an elevated temperature throughout the process, and eliminating multiple transportation steps,
- Feedstock selection – The steel making process will use a minimal amount of scrap steel (less than 1 percent) and then only use "clean scrap", minimizing potential air impacts,
- Fuel selection – The facility would use natural gas, minimizing potential air impacts,
- Equipment selection – The Proposed Project has selected equipment for the pellet plant, DRI, and steel mill with consideration towards minimizing potential air and water impacts and,
- Water use – The Proposed Project will recycle and reuse 97 percent of the process water, nearly 100 percent of industrial storm water, and water from the active mines, minimizing potential water impacts.

The net results of these mitigation measures include:

- Less energy consumption (estimated 30 percent less) than a non-integrated facility,
- Lower air emissions than those from typical iron and steel production facilities, and,
- No process water discharges.

A summary of mitigation measures are presented in the table below. The table includes an indication of whether the mitigation measure has already been adopted as part of the Proposed Project or has been identified as a measure that could be implemented. Additional mitigation information relating to the Proposed Project is provided in the Draft EIS.

SUMMARY OF MITIGATION MEASURES		
Corresponding Chapter in Draft EIS	**Mitigation**	**Proposed Project (P) or Identified Additional Measure (I)**
4.1 – Wetlands	▪ Mitigation Plan for on-site (post mining) and off-site ▪ Drainage conveyance measures to maintain flows ▪ Wetland hydrology monitoring program at wetlands that may be indirectly impacted	P I I
4.2 – Water Appropriation	▪ Water Recycling/Reuse, including treatment of process water ▪ Collection and use of storm water	P P
4.3 – Physical Impacts: Non-wetland	▪ Flow augmentation – Oxhide and Snowball ▪ Monitoring – Oxhide and Snowball flows during dewatering and augmentation ▪ Monitoring of Snowball Lake and Oxhide Lake levels ▪ Monitor Oxhide Creek geomorphology (existing and during project) and mitigate, if channel changes occur. ▪ Monitoring Swan Lake level and outflow to Swan River ▪ Swan Lake weir orifice	I I I I I I
4.4 – Surface Water Runoff	▪ Construction storm water pollution prevention plan ▪ Best management practices (including storm water ponds and sediment basins) ▪ Prevent construction and industrial storm water runoff from entering mining pits	P P P
4.5 – Wastewater/ Water Quality	▪ Water Recycling/Reuse, including treatment of process water (no discharge of scrubber blowdown and contact cooling water) ▪ Seepage collection system at tailings basin ▪ Monitor water quality of augmentation flows to Oxhide and Snowball ▪ Continuation of Swan Lake monitoring under MPCA Citizen Lake Monitoring Program	P P I I
4.6 – Solid Waste	▪ Reclamation of tailing dams and stockpiles ▪ Best Management Practices (for storage and handling of process wastes) per applicable rules ▪ Proper disposal of solid and hazardous wastes ▪ Waste characterization study	P P P I

SUMMARY OF MITIGATION MEASURES		
Corresponding Chapter in Draft EIS	**Mitigation**	**Proposed Project (P) or Identified Additional Measure (I)**
4.7 – Air Resources	▪ Integrated process ▪ Use of natural gas ▪ Selection of feedstocks ▪ Offsets for Class I visibility impacts ▪ Air Pollution Controls (BACT/MACT) ▪ Fugitive dust control plan ▪ Monitoring and compliance demonstration measures ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT)	P P P P P P P P
4.8 – Fisheries Resources	▪ Stream invertebrate monitoring ▪ Conversion of mine pits for fishing resources after project completion (if in-pit stockpiling)	I I
4.9 – Wildlife	▪ Reclamation ▪ Enhancement of open water mine pit habitats (if in-pit stockpiling)	P I
4.10 – Noise	▪ Noise reduction packages for equipment ▪ Blaster's log ▪ Seismic monitoring program ▪ Air blast monitoring program ▪ Pre-production test charge ▪ Berm construction at south rim of mine pit at start-up	P P P P P I
5.1 – Class I –Cumulative PM_{10}	▪ Integrated process ▪ Use of natural gas ▪ Air Pollution Controls (BACT/MACT), including $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT) ▪ Future regulatory reductions	P P P I
5.2 – Cumulative Acid Deposition and Ecosystem Acidification in Class I Areas	▪ Integrated process ▪ Use of natural gas ▪ Use of low sulfur diesel fuel in equipment ▪ Offsets for visibility impacts co-benefit ▪ Air Pollution Controls (BACT/MACT) ▪ Future regulatory reductions ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT)	P P P P P I P
5.3 – Cumulative Mercury	▪ Integrated process ▪ Use of natural gas ▪ Selection of feedstocks ▪ Offsets for visibility impacts co-benefit ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT) ▪ Process water re-use eliminating sulfate discharges (reduce methylation in waters) ▪ Future regulatory reductions	P P P P P P I

SUMMARY OF MITIGATION MEASURES		
Corresponding Chapter in Draft EIS	**Mitigation**	**Proposed Project (P) or Identified Additional Measure (I)**
5.4 – Cumulative Visibility Impairment	▪ Integrated process ▪ Use of natural gas ▪ Offsets for visibility impacts ▪ Air Pollution Controls (BACT/MACT) ▪ Future regulatory reductions ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT)	P P P P I P
5.5 – Cumulative Threatened & Endangered Plants	▪ Transplanting plan ▪ Monitoring of transplanted species	P P
5.6 – Cumulative Loss of Wetlands	▪ Mitigation Plan for on-site (post mining) and off-site ▪ Avoidance of impacts to natural Type 6-8 wetlands	P P
5.7 – Cumulative Impacts – Wildlife Habitat Loss and Fragmentation	▪ Reclamation (on-going and upon closure)	P
5.8 – Cumulative Wildlife Travel Corridor Obstruction	▪ Reclamation (upon closure) ▪ Grade and vegetate saddles between Pits 1 and 5 and between Pits 5 and 6 (upon closure), if in-pit stockpiling is feasible	P I
6.1 – Land Use	▪ Local permitting process would define mitigation	I
6.2 – Cover Types	▪ Reclamation (on-going) ▪ Wetland Mitigation	P P
6.3 – Threatened & Endangered Plants	▪ Transplanting plan ▪ Monitoring of transplanted species ▪ Avoid *Botrychium* species (north of tailings basin)	P P P
6.4 – Threatened & Endangered Animals	▪ Canada Lynx Tracking Survey Study ▪ Reclamation (on-going)	P P
6.5 – Water-related Land Use Districts	▪ Local permitting process would define mitigation	I
6.6 – Erosion and Sedimentation	▪ Best Management Practices	P
6.7 – Geologic Hazards and Soil Conditions	▪ Spill prevention control and countermeasure (SPCC) plan ▪ Seepage collection system on tailings basin ▪ Groundwater monitoring and reporting plan	P P I
6.8 – Traffic	▪ Improvements to TH 65/CSAH 86 ▪ Improvements to TH 65/CR 58 ▪ Intersection/Access improvements to TH 169	I I I
6.9 – Vehicle-related Air Emissions	▪ Low sulfur fuels ▪ Particulate control on engines ▪ Fugitive Dust Control Plan	P P P
6.10 – Archaeology/Cultural Resources	▪ To be determined by Section 106 process as outlined in Programmatic Agreement	I
6.11 – Recreational Trails	▪ Relocation of snowmobile trails ▪ Continue to coordinate with Mesabi Trail planning	I I

SUMMARY OF MITIGATION MEASURES		
Corresponding Chapter in Draft EIS	**Mitigation**	**Proposed Project (P) or Identified Additional Measure (I)**
6.12 – Visual Impacts	▪ Minimize impacts to existing vegetative screening ▪ Use of directional lighting ▪ Use of neutral colors for the exterior of all buildings and other structures	I I I
6.13 – Infrastructure	▪ Permitting processes would require mitigation	I
6.14 – Socioeconomics	▪ None required	
6.15 – Mineland Reclamation	▪ Reclamation as per Minnesota Rules 6130	P

IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The EIS provides review and assessment of a number of alternatives and sub-alternatives identified in the Final SDD. At this time, the Proposed Action is the preferred alternative, including an open pit taconite mine, adjacent stockpile areas, and the construction of new facilities - a crusher, concentrator, pellet plant, plant for producing direct reduced iron, and a steel mill consisting of two electric arc furnaces, two ladle furnaces, two thin slab casters, a hot strip rolling mill, and construction of a new tailings basin on the site of the former Butler facility tailings basin. The Proposed Action was selected as the preferred alternative because it is the least environmentally damaging practicable alternative that meets the purpose and need of the project. The preferred alternative includes the technology alternatives of straight grate furnaces and air pollution control technologies; the modified design or layout alternatives of in-pit stockpiling (if determined feasible over time), and mitigation measures already proposed or identified in the table in the previous section (Summary of Mitigation Measures).

The other sub-alternatives considered in the EIS did not provide substantial reductions in environmental impacts, compared to the Proposed Project; therefore they are not proposed for inclusion in the Preferred Alternative concept:

- The Alternative Tailings Basin sub-alternative would impact fewer total acres of wetlands, compared to the Proposed Tailings Basin location; however, the Alternative Tailings Basin would impact an area previously undisturbed by mining and would impact relatively high quality wetlands (including Type 7 and 8 wetlands), compared to the wetlands impacted by the Proposed Action Tailings Basin (which primarily impacts wetlands that developed in the former Butler Stage I tailings basin since mine closure in 1985).

- The In-Pit Stockpiling Alternative concept provides benefits such as reducing the area of wetlands filled by stockpiles and providing an opportunity to create shallow lacustrine wetland areas within the mine pits. However, this sub-alternative cannot be recommended for inclusion in the Preferred Alternative at this time, since it would not be known for certain that in-pit stockpiling is feasible unless/until the footwall has been established at the base of the ore deposit. Use of in-pit stockpiling is recommended as a mitigation measure to be implemented in the future, if feasible.

- The On-Site Sanitary Wastewater Treatment sub-alternative was not recommended for inclusion in the Preferred Alternative, since the water quality analyses performed for the EIS did not indicate a potential improvement in Swan Lake water quality if on-site wastewater treatment was utilized.

The No Build Alternative was not identified as the Preferred Alternative, since it would not satisfy the purpose of and need for the proposed action and since the Proposed Project (including mitigation measures) would minimize the environmental impacts identified in the EIS study process.

1.0 Introduction

1.1 PROJECT OVERVIEW

Minnesota Steel Industries, LLC (Minnesota Steel) proposes to reactivate the former Butler Taconite mine and tailings basin area. Minnesota Steel's Proposed Project would combine ore processing direct-reduced iron (DRI) production and steel making into an integrated facility to provide steel for the domestic and world markets. The Proposed Project would be located near Nashwauk, Minnesota on the Mesabi Iron Range (Figure 1.1). The Mesabi Iron Range is a major, well-known geologic feature oriented roughly northeast to southwest across more than 120 miles of northeastern Minnesota from near Babbitt to near Grand Rapids. The Mesabi Iron Range has been the largest source of iron ore produced in Minnesota since the 19th century and Minnesota has been and continues to be the predominant source of iron ore in the United States. The project area was first mined in 1903. The former Butler Taconite facility was active from 1967 to 1985 and viable ore still remains on-site. The Proposed Project includes the dewatering of existing mine pits in the area and open pit mining operations to remove waste rock and ore.

Minnesota Steel plans to make steel from taconite in a cleaner and more efficient manner than traditional steel plants. Minnesota Steel would combine modern, commercially proven technologies to allow it to make sheet steel from taconite ore in less than 48 hours. Efficiencies are gained by having a continuous flow of materials, keeping the material at an elevated temperature throughout the process and by eliminating multiple transportation steps.

The Proposed Project (Figure 1.2) would include construction of new facilities: a crusher; concentrator; pellet plant; plant for producing DRI; and a steel mill consisting of two electric arc furnaces (EAFs), two ladle furnaces, two thick slab casters, and a hot strip rolling mill. The Proposed Project would refurbish and use the former Butler facility tailings basin. Minnesota Steel would utilize existing haul roads to transport stripping material to the stockpile area and taconite ore from the mine to the crusher.

The inferred ore reserves at the Proposed Project site are currently estimated at about 1.4 billion tons (or about 100 years of reserves, based on the proposed production capacity). A 20-year mine production period is typically used for mine financing and mine planning. Therefore, a 20-year mine production period (equivalent to 76 million tons of taconite pellets or 55 million tons of steel) was used as the basis for defining the Proposed Project for this Environmental Impact Statement (EIS). However, the overall analysis timeframe for this EIS is 27 years, in order to include the anticipated two years for construction, 20 years of mine production and five years for closure. Phased actions beyond the 20-year Proposed Project mine production period or a production trigger of 76 million tons of taconite pellets (55 million tons of steel), whichever comes first, would be addressed in accordance with Minnesota Rules, part 4410.2000, subpart 4 and 4410.3000, subpart 3, connected and phased actions and supplement to an EIS, respectively.

The Proposed Project would require additional environmental review and permitting should the project extend beyond this 20-year mining period. Likewise, permits are only being requested for a 20-year mining period. Expansion of the Proposed Project beyond that described in this EIS would require supplemental environmental review and subsequent modifications to permits.

The Proposed Project would use purchased electricity to power the two EAFs and natural gas as fuel for pelletizing and DRI production. The proposed DRI technology is used or has been used in North America at Mobile, Alabama; Georgetown, South Carolina; Convent, Louisiana; and Contrecoeur, Quebec. Worldwide, there are approximately 50 similar gas-fired direct reduction plants operating. The area of the former Butler Taconite mine contains some of the only iron ore available within the Mesabi Iron Range with the proper grinding characteristics to economically produce DRI and rolled steel.

The Proposed Project would produce about 2.4 million short tons per year of hot rolled sheet steel. This would require 4.1 million long tons per year (mlty) of taconite pellets or 12.8 mlty of taconite ore. Internally-produced virgin iron and a small amount of scrap (less than 1 percent of clean external scrap) will be charged to the EAFs, thereby avoiding releasing the mercury that might otherwise be found in contaminated scrap.

Minnesota Steel expects mine development and plant construction to cost up to $1.6 billion and to take from 24 to 30 months to reach 50 percent capacity and begin production. Installation of the remaining equipment would commence immediately after startup and would require approximately 24 additional months to complete.

A complete description of the project and all the related project elements is provided in Chapter 3.0. Infrastructure (e.g., roads, railroads, and utilities) that would be constructed to serve the Proposed Project are considered "connected actions" and are discussed in greater detail in Section 6.13 (Infrastructure) and Chapter 7.0 (Phased and Connected Actions).

1.2 PURPOSE AND NEED

The purpose and need of the project would be to mine taconite ore and produce steel on site in order to provide increased steel product to the domestic and world markets.

1.3 ABOUT THE PROPOSER

Minnesota Steel Industries, LLC is a wholly owned subsidiary of J.M. Longyear Heirs, LLC (51 percent ownership) and R.M. Bennett Heirs, LLC (49 percent ownership) with operating offices in Hibbing and St. Paul, Minnesota. Since the early 1890s the Longyear and Bennett families have been partners in the development of Minnesota's iron ore industry on the Mesabi Range.

1.4 AGENCY ROLES AND RELATIONSHIPS

The Minnesota Department of Natural Resources (MNDNR) and U.S. Army Corps of Engineers (USACE) have jointly prepared this Draft Environmental Impact Statement (Draft EIS) to evaluate the Proposed Project in accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-4347 and the Minnesota Environmental Policy Act (MEPA), Minnesota Statute §116D.

An EIS is mandatory for this project pursuant to Minnesota Rules, part 4410.2000, subpart 2; the rule directs that an EIS shall be prepared if the project meets or exceeds the thresholds of any of the EIS categories listed in part 4410.4400. Minnesota Rules, part 4410.4400, items 8B and 8C (Metallic Mineral Mining and Processing) indicate mandatory preparation of an EIS for construction of a new facility for mining metallic minerals or for the disposal of tailings from a metallic mineral mine and construction of a new metallic mineral processing facility. The EIS is required to meet the applicable requirements of Minnesota Rules, part 4410.0200 to 4410.7800 (Minnesota Environmental Quality Board [MEQB] Rules) that govern the Minnesota Environmental Review Program. The MNDNR is the responsible governmental unit (RGU) under Minnesota Rules, part 4410.4400, items 8B and 8C.

The MNDNR serves as the co-lead agency in preparing this joint state/federal EIS and has coordinated with other state agencies (e.g., Minnesota Pollution Control Agency [MPCA] and Minnesota Department of Health [MDH]) and will participate with the USACE at any public meetings, public hearings, or other public involvement pursuant to NEPA and MEPA. The MNDNR will be responsible for determining EIS adequacy pursuant to MEPA and will prepare the state Record of Decision (ROD).

The USACE is the lead federal agency in preparing this joint state/federal EIS. The USACE received a permit application from Minnesota Steel to discharge fill material in waters of the U.S, for the development of the Proposed Project. The USACE has determined that its action on the permit would be a major federal action that has the potential to significantly affect the quality of the human environment, requiring the preparation of a Federal EIS pursuant to NEPA and its implementing regulations (40 C.F.R. parts 1500-1508). A Memorandum of Understanding (MOU) has been agreed to by the USACE, MNDNR and Minnesota Steel. A copy of the MOU is included in Appendix A.

The USACE will coordinate with other federal agencies including the U.S. Environmental Protection Agency (USEPA) and the U.S. Fish and Wildlife Service (USFWS), and will consult with Native American Tribes, as appropriate. The USACE will schedule and hold agency and public meetings jointly with the MNDNR pursuant to NEPA and MEPA. The USACE will determine whether the EIS satisfies NEPA and Section 404 of the Clean Water Act (CWA) and will prepare the federal ROD.

1.5 EIS PURPOSE AND OVERVIEW

The purpose of an EIS is to:

- Evaluate the Proposed Project's potentially significant environmental effects;
- Consider reasonable alternatives;
- Explore mitigation measures for reducing adverse effects; and
- Provide information to the public and to the project decision-makers.

The EIS is intended to provide information to units of government on the environmental impacts of a project before approvals or necessary permits are issued and to identify measures necessary to avoid, reduce, or mitigate adverse environmental effects. The EIS is not a means to approve or disapprove the Proposed Project.

1.5.1 Final Scoping Decisions - Level of Analysis

In July 2005, the MNDNR in partnership with the USACE prepared a Scoping Environmental Assessment Worksheet (Scoping EAW) and a Draft Scoping Decision Document (Draft SDD) to provide information about the project, identify potentially significant environmental effects, and determine what issues and alternatives would be addressed in the EIS and the level of analysis required. Public notification and opportunities to receive information and public comment on the project began during the project scoping process. A notice of availability for review of the Scoping EAW and Draft SDD was published in the July 18, 2005, EQB *Monitor*. This initiated a 30-day public comment period and the joint state-federal scoping process. The 30-day public comment period concluded on August 17, 2005. A public meeting was held during the comment period on August 10, 2005, at the Nashwauk High School in the City of Nashwauk to provide additional information on the project and allow for comments (verbal and written) and questions. On August 15, 2005 the USACE published a Notice of Intent (NOI) to prepare a Draft EIS in the Federal Register. The comments received during the scoping period were considered in making revisions to the Draft SDD prior to the agencies issuing the Final SDD on October 13, 2005.

The Final SDD satisfies the scoping requirements of MEPA and NEPA and serves as the “blueprint” for preparing the EIS for the Proposed Project. Both the Scoping EAW and Final SDD are included in this document as Appendix B and Appendix C, respectively. Responses to public comments received during the EIS scoping process are also included in Appendix C.

The MEQB rules require that an EIS include at least one alternative of each of the following types, or provide an explanation of why no alternative is included in the EIS (Minnesota Rules, part 4410.2300, subpart G): alternative sites, alternative technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through public comments. The alternative of no action is also required to be addressed in the EIS. The project alternatives evaluated in this Draft EIS are presented in Chapter 3.0.

Environmental issues identified and described in the Scoping EAW were categorized in the Final SDD by significance and level of analysis required in the EIS. These three categories are briefly described below along with a list of topics that are included in each category. The Final SDD describes in greater detail the issues and analyses to be included in the EIS for each topic.

1.5.2 Issues Adequately Analyzed in the Scoping EAW

The following topics were reviewed and considered by the MNDNR and the USACE in the Scoping EAW and it was determined that they were not relevant or were so minor that they would not be addressed in the EIS:

- Water surface use
- Compatibility with plans and land use regulations

1.5.3 Issues for Which Significant Impacts Are Not Expected

The MNDNR and USACE determined that the following topics are not expected to present significant impacts, but would be addressed in the EIS using limited information beyond that provided in the Scoping EAW commensurate with the anticipated impacts. These specific topics are addressed in Chapter 6.0 of this Draft EIS and include:

- Land use
- Cover types
- Threatened and endangered species
- Water-related land use management districts
- Erosion and sedimentation
- Geologic hazards and soil conditions
- Traffic
- Vehicle related air emissions
- Archaeology
- Recreational trails
- Visual impacts
- Infrastructure

- Socioeconomics
- Mineland reclamation
- 1855 Ceded Territory Treaty

1.5.4 Potentially Significant Issues Requiring More Extensive Analysis

The MNDNR and USACE also identified the following topics in the Final SDD that may result in potentially significant impacts and would include a substantial amount of additional information in the EIS beyond that included in the Scoping EAW. These specific topics are addressed in Chapter 4.0 of this Draft EIS and include:

- Physical impacts on water resources
- Water appropriations
- Surface water runoff
- Wastewater/water quality
- Solid waste
- Stationary source air emissions
- Fish and wildlife resources
- Noise

Lastly, the Final SDD determined that the EIS would also address the potential cumulative impacts associated with combined environmental effects of the Proposed Project and of past, present and reasonably foreseeable future actions relative to air quality (Class I air quality; acid deposition and ecosystem acidification in Class I areas; mercury; and visibility impairment), threatened and endangered plant species, wetlands, wildlife habitat and animal travel corridor obstruction/landscape barriers. The cumulative impacts analysis is presented in Chapter 5.0 of this Draft EIS.

2.0 Government Approvals

All known potential government permits and approvals for the Proposed Project are listed below in Table 2.1. Although the EIS provides information for use in permit issuance or denial, it is not required to gather or present all necessary permit-related information. No permits may be issued until the EIS receives a determination of adequacy.

TABLE 2.1 GOVERNMENT PERMITS AND APPROVALS FOR PROPOSED PROJECT

Unit of Government	Type of Application	Status
Federal Aviation Administration	Notice of Proposed Construction or Alteration (FAA Form 7460-1) for Structures of Heights Greater than 200 feet	To be applied for, as required
U.S. Army Corps of Engineers	Section 404 Permit	Application submitted
	Section 7 Endangered Species Act Consultation with U.S. Fish & Wildlife Service	To be completed by USACE
	Section 106 Determination for Cultural Resources	To be completed by USACE
Minnesota Department of Natural Resources	Permit to Mine	Application submitted
	Water Appropriation Permit	Application submitted
	Dam Safety Permit	To be applied for
	Public Waters Permit	Application submitted
	Wetland Conservation Act	Application submitted
	Burning Permit (land clearing)	To be applied for, if needed
	Takings Permit (for Endangered or Threatened Species)	Application submitted
Minnesota Pollution Control Agency	Air Emissions Facility Permit (combined construction and operating)	Application submitted
	Section 401 Water Quality Certification	To be applied for, as required
	SDS Permit (Tailings Basin Operation)	Application submitted
	NPDES/SDS Storm Water Discharge Permit for Industrial Activity (discharge to mine pits)	Application submitted
	NPDES/SDS General Storm Water Discharge Permit for Construction Activity	Application submitted
	Storage Tank Permits (fuel tanks, etc.)	To be applied for, if needed
	Solid Waste Permits (construction debris, sludge, slag)	To be applied for, if needed
	Hazardous Waste Generator License	To be applied for, as required
Minnesota Department of Health	Radioactive Material Registration (low-level radioactive materials in measuring instruments)	To be applied for, as required

Unit of Government	Type of Application	Status
Itasca County	Building Permit	To be applied for, as required
	Shoreland Alteration Permit	To be applied for, if needed
	Zoning Variance or Conditional Use Permit	To be applied for, if needed
City of Nashwauk	Zoning (Land Use) Permit	To be applied for, as required
	Sewer and Water Permits for domestic use	To be applied for, if needed

Environmental reviews and permits required for connected actions associated with the Proposed Project are listed below in Table 2.2 and described in Section 6.13.

TABLE 2.2 ENVIRONMENTAL REVIEW AND PERMITS FOR CONNECTED ACTIONS

Unit of Government	Type of Application	Status
U.S. Army Corps of Engineers	Section 404 Permit	To be applied for, as required
Surface Transportation Board	EA for Railroad Improvements	To be completed by Itasca County
Minnesota Public Utilities Commission	High Voltage Transmission Line Routing Permit	To be applied for by power supplier
	Natural Gas Pipeline Routing Permit	To be applied for by natural gas supplier
Minnesota Department of Natural Resources	Public Waters Permits for Infrastructure-related improvements	To be applied for, as required
Minnesota Pollution Control Agency	Sewer Extension Permit	To be applied for, if needed, by City of Nashwauk
Minnesota Department of Health	Watermain Plan Review	To be applied for, if needed, by City of Nashwauk
Itasca County	EAW for Roadway Improvements WCA Permits for Infrastructure-related improvements	To be applied for, as required

The following sections provide a brief description of each of the permits or approvals for the Proposed Project listed in Table 2.1 above.

2.1 FEDERAL AVIATION ADMINISTRATION (FAA)

2.1.1 Notice of Proposed Construction and Alteration (FAA Form 7460-1)

Before construction or alteration of structures greater than 200 feet in height can commence, the FAA requires notification to evaluate whether or not the Proposed Action would represent an obstruction or potential hazard to aircraft navigation. As required by 77.13 subpart A, the FAA Form 7460-1 must be completed and submitted to the appropriate regional FAA office for review and final determination status. Filing of this form would be required since several of the proposed structures at the facility would be over 200 feet tall.

2.2 UNITED STATES ARMY CORPS OF ENGINEERS

The USACE regulatory programs include Section 404 of the CWA (33 U.S.C. § 1344). The USACE St. Paul District's regulatory jurisdiction covers the states of Minnesota and Wisconsin.

2.2.1 Section 404 Permit

Under Section 404, the USACE has regulatory authority over "waters of the U.S." which include, but are not limited to lakes, rivers, streams, and jurisdictional wetlands. A Section 404 permit would be required for the discharge of dredged or fill material into waters of the U.S., including jurisdictional wetlands, for the various proposed mining activities including construction of new facilities, haul roads, stockpile areas, and tailings basin.

2.2.2 Section 7 Endangered Species Act Consultation with U.S. Fish and Wildlife Service

Section 7 of the Endangered Species Act (Act) [16 U.S.C. 1531 *et seq.*] requires federal agencies to consult with the USFWS to ensure that actions they authorize, permit or carryout would not jeopardize the continued existence of any listed species or adversely modify designated critical habitats. Section 7(a)(2) defines the consultation process, which is further developed in regulations promulgated at 50 C.F.R. §402. The USACE will work in cooperation with the USFWS to fulfill the requirements of Section 7 as part of the Section 404 permitting process.

2.2.3 Section 106 Determination for Cultural Resources

A Section 106 Determination for Cultural Resources would be made under the USACE's Section 404 permitting process. A draft agreement (Draft Programmatic Agreement) has been prepared among the USACE, the Minnesota SHPO and Minnesota Steel describing how the Section 106 determination would be carried forward if the Proposed Project is undertaken. A copy of the draft agreement is included in Appendix F.

2.3 MINNESOTA DEPARTMENT OF NATURAL RESOURCES

2.3.1 Permit to Mine

A permit to mine is required for any metallic operations, pursuant to Minnesota Rules, part 6130.4200 and is issued by the MNDNR. The permit to mine application includes organizational data, environmental setting maps, environmental setting analysis, mining and reclamation maps, mining and reclamation plan, and an operating plan.

Once a permit has been issued, the applicant is required to provide: operating plans for forthcoming years of operation, not to exceed five years; an annual report for each year of operation; a deactivation plan must be submitted at least two years prior to deactivating any portion of the mining area; and a request for release submitted upon completion of approved deactivation plans.

2.3.2 Water Appropriation Permit

Pursuant to Minnesota Statutes § 103G and Minnesota Rules 6115, a water use (appropriation) permit from MNDNR is required for all users withdrawing more than 10,000 gallons of water per day or one million gallons per year. A water appropriation permit would be required from the MNDNR for dewatering of existing and proposed mine pits to accommodate planned mining activities and the proposed use of pit water for stream augmentation and in the iron ore and steel making process.

2.3.3 Dam Safety Permit

Minnesota Rules, part 6115.0300 through 6115.0520 for Public Water Resources describe the requirements pertaining to dam safety permits for new construction, repair, alteration, removal, and transfer of property containing a dam. A dam safety permit would be needed from the MNDNR for construction and maintenance of starter dams and tailings dams in the proposed tailings basin.

2.3.4 Public Waters Permit

Pursuant to Minnesota Statutes § 103G and Minnesota Rules 6115, a Public Waters Work Permit is required for proposed projects constructed below the ordinary high water (OHW) mark which alter the course, current, or cross section of public waters or public waters wetlands. The permit program applies to those lakes, wetlands, and streams identified on MNDNR Public Water Inventory (PWI) maps. The MNDNR would be responsible for defining special provisions of the permit and implementing the permit approval.

A public waters permit would be required from the MNDNR for crossing Pickerel Creek with proposed tailings pipeline and reclaim water line. The existing mining pits which would be affected by proposed Minnesota Steel mining activities are not considered “public waters” and therefore, proposed intake and discharge structures in the pits would not be subject to a public waters permit.

2.3.5 Wetland Conservation Act

The MNDNR has been designated as the Local Government Unit (LGU) for the implementation of the Minnesota Wetland Conservation Act (WCA) for the Minnesota Steel project. A WCA Wetland Permit Application and Replacement Plan have been prepared by Minnesota Steel and submitted to the MNDNR for WCA approval for unavoidable wetland impacts associated with the Proposed Project. This approval would be administered under the Permit to Mine and would be coordinated with the USACE.

2.3.6 Burning Permit

An open burning permit would be required from the MNDNR if trees, brush, and other vegetative materials are burned on-site as part of any land clearing activities conducted for the Proposed Project. Local coordination with the City of Nashwauk may also be required.

2.3.7 Endangered Species Permit (Takings Permit)

A Takings Permit from the MNDNR is required for unavoidable impacts to threatened and endangered species pursuant to Minnesota Statutes § 84.09895 (Protection of Threatened and Endangered Species). Some species listed under Minnesota law are also listed under the Federal Endangered Species Act (see Section 2.2.2 above). The law and rules prohibit taking, purchasing, importing, possessing, transporting, or selling endangered or threatened plant or animal, including their parts or seeds, without a permit. For plants, taking includes picking, digging, or destroying. The law and rules specify conditions under which the Commissioner of the MNDNR may issue permits to allow taking and possession of endangered or threatened species.

Permitting decisions must be consistent with the intent of the law, which is to retain or restore healthy populations of native plants and animals. Minnesota Steel has submitted a Takings Permit Application to the MNDNR for three threatened and endangered plant species that would be affected by the Proposed Project.

2.4 MINNESOTA POLLUTION CONTROL AGENCY

2.4.1 Air Emissions Facility Permit

The MPCA has delegated authority from USEPA for the implementation of the Prevention of Significant Deterioration (PSD) regulations under Minnesota Rules, part 7007.3000, which requires that "Any person who constructs, modifies, reconstructs, or operates an emissions unit, emission facility, or stationary source must meet the requirements of Code of Federal Regulations, title 40, part 52.21(b)-(f) and (h)-(w), as amended, entitled 'Prevention of Significant Deterioration of Air Quality,' which is adopted and incorporated by reference."

Based on the potential-to-emit (PTE) for all pollutants, the Minnesota Steel project is subject to PSD review and the Part 70 operating permit program. Therefore, Minnesota Steel is required to obtain an air emissions permit to construct and operate the Proposed Project.

2.4.2 Section 401 Water Quality Certification

The MPCA is responsible for Section 401 water quality certification required for Section 404 permits issued by the USACE. Section 401 of the CWA (33 U.S.C. § 1344) requires that activities that may result in discharges to navigable waters and require a federal license or permit to construct, modify, or operate (e.g., Section 404 permits), must be conducted in compliance with Sections 301, 302, 303, 306, and 307 of the CWA. These portions of the CWA are directives for the development of state water quality standards. In order to ensure these activities comply with the CWA and the state water quality standards, a determination is made by the state agency with primary water quality regulatory responsibilities under the CWA. Such a determination is known as a "401 Water Quality Certification."

In Minnesota, the MPCA is the delegated agency responsible under Minnesota Statute 115.03 Powers and Duties for making certification determinations on federal permits that affect waters of the state. Coordination with the MPCA would be initiated by the USACE to obtain the Section 401 certification for the Section 404 permit.

2.4.3 National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Discharge Permits

The NPDES permitting authority, delegated to the MPCA by the USEPA, regulates wastewater and storm water discharges to lakes, streams, wetlands, and other surface waters in Minnesota. State Disposal System (Minnesota Statute § 115) permits regulate the construction and operation of wastewater disposal systems, including land treatment systems. Together, NPDES/SDS permits establish specific limits and requirements to protect Minnesota's surface and groundwater quality for a variety of uses, including drinking water, fishing, and recreation.

For Minnesota industrial facilities, the MPCA issues these permits as consolidated water quality management permits. An individual NPDES/SDS permit for an industrial facility may cover a number of different waste types and activities, including industrial process wastewater, cooling water and storm water.

An SDS permit is required for operation of the tailings basin as a private disposal system because of seepage from the basin to groundwater. An NPDES discharge permit would be needed for the discharge of runoff water, collected from active mining and processing areas, into natural ore pits within the property boundary. Finally, an NPDES construction storm water permit would also be needed to regulate storm water management during initial pit dewatering, pre-stripping, and construction. Minnesota Steel has applied for an SDS permit for the tailings basin, an NPDES permit for discharge of industrial storm water to the natural ore pits within the property boundary, and an NPDES General Storm Water Permit for Construction Activities.

Further description of storm water discharge permits required for industrial and construction activities are provided below.

2.4.3.1 NPDES/SDS Storm Water Discharge Permit for Industrial Activity

The Minnesota Storm Water Program for industrial activity is designed to reduce the amount of pollution that enters surface and groundwater from industrial facilities in the form of storm water runoff. Storm water at industrial sites may come into contact with any number of harmful pollutants, including toxic metals, oil, grease, de-icing salts and other chemicals from rooftops, roads, parking lots, and from activities such as storage and material handling. The primary requirement is the development and implementation of a storm water pollution prevention plan. This plan identifies potential pollutant sources at the Proposed Project, outlines operation procedures for material handling activities, and describes controls and best management practices that would be implemented to minimize pollutants in storm water runoff.

2.4.3.2 NPDES/SDS General Storm Water Discharge Permit for Construction Activity

Construction projects in Minnesota that disturb one acre or more of land must obtain coverage under Minnesota's NPDES general storm water discharge permit for construction activity. The permit application certifies that temporary and permanent erosion and sediment control plans have been prepared and implemented to prevent soil particles from being transported off-site both during and after construction. The permit requires the applicant to prepare a storm water pollution prevention plan that applies best management practices for controlling and managing storm water runoff during and after construction.

2.4.4 Storage Tank Permits

Storage tank permits are required for aboveground storage tanks and underground storage tanks containing petroleum products or hazardous materials. These permits include operational limits and construction requirements that help prevent or minimize the potential for significant environmental effects. Requirements include tank registration with the MPCA, a secondary containment area, routine monitoring for leaks, corrosion protection for the floor of the tank, overfill prevention equipment, and areas where substances are transferred must be equipped with spill containment.

2.4.5 Solid Waste Permits

Solid wastes generated during construction and operation of the Proposed Project that would be disposed of on-site would need to be permitted in accordance with Minnesota Rules 7035. These solid wastes include but are not limited to construction debris, sludges, and slag.

2.4.6 Hazardous Waste Generator License

An entity who generates hazardous waste must obtain a hazardous waste generator license for each individual generation site. The procedures for application and issuance of a hazardous waste generator license are described in Minnesota Rules 7045. A permit application for a new treatment, storage, or disposal facility or activity must be submitted to the MPCA for review and approval before the planned date of the commencement of facility construction of the activity.

2.5 MINNESOTA DEPARTMENT OF HEALTH

2.5.1 Radioactive Material Registration

Types and quantities of radioactive materials that may be possessed and used, as well as any specific restrictions on their use are licensed by MDH. Typically, licenses describe the location of use, the training and qualifications of workers, specific procedures for using the materials, and any special safety precautions required. The license holder must follow the specific license requirements as well as the more general MDH rules.

2.6 ITASCA COUNTY

Itasca County zoning permits are required for new construction, replacement, or additions onto a structure, new installation or alteration of Individual Sewage Treatment System (ISTS), grading/filling or excavation in a Shoreland District, alteration of wetlands and public waters, and other permits including variances, conditional uses, planned unit developments (PUDs) and rezoning. Once issued, these permits are valid for a period of one year to start construction.

2.6.1 Building Permit

A building permit would be required for construction of the Proposed Project. Buildings would have to be constructed to comply with applicable building codes. In an effort to ensure buildings are constructed to minimum standards for safety and durability, Itasca County has adopted the Minnesota State Building Code. Building code enforcement staff reviews building plans and permit applications, issues building permits, and conducts a wide range of field inspections to ensure compliance with state and local building and zoning codes.

2.6.2 Shoreland Alteration Permit

A shoreland alteration permit is required from Itasca County for any grading/filling or excavation within the Shoreland Overlay District established under the County zoning ordinance. The Shoreland Overlay District is defined as the area surrounding a designated waterbody, extending out 1,000 feet from the ordinary high water elevation (OHW) of lakes/wetlands and 300 feet from streams.

2.6.3 Zoning Variance, Conditional Use Permit (CUP)

Variances are necessary when the setback or lot size requirements cannot be complied with. Conditional Use Permits are necessary for certain land uses or development that would not be appropriate generally or without restriction in a particular zoning district, but may be allowed with conditions. Rezone or map amendment would be the changing of the zone district from one to another. These applications require a public hearing process and review by the Itasca County Planning Commission/Board of Adjustment.

2.7 CITY OF NASHWAUK

2.7.1 Zoning (Land Use) Permits

To be applied for as required. Recent annexation may require City Permits.

2.7.2 Sewer and Water Permits

To be applied for as required. Recent annexation may require City Permits.

3.0 Proposed Project and Alternatives

Minnesota Rules, part 4410.2300.G., as well as NEPA (42 U.S.C. §§ 4321-4347 and implementing regulations, 40 C.F.R. parts 1500-1508), require that this EIS evaluate not only the Proposed Action, but also identify and review reasonable alternatives to the Proposed Action, along with a No Action Alternative. The No Action Alternative means the Proposed Project would not be constructed and provides an environmental baseline against which the impacts of the Proposed Action and alternatives can be compared. State requirements for alternatives analysis in an EIS also include assessment of additional alternative categories that are described in Section 3.3.

This chapter presents an updated description of the Proposed Action from that defined in the July 2005 Scoping EAW. In addition, alternatives developed and evaluated during the EIS analyses, consistent with the commitments made in the Final SDD, are also described. If an alternative was considered but then eliminated in the EIS assessment, the rationale for elimination is also discussed.

3.1 PROPOSED ACTION

Minnesota Steel proposes to reactivate the former Butler Taconite mine and tailings basin area. Though the area was initially mined in 1903 and the former Butler Taconite facility was active from 1967 to 1985, viable ore still remains on-site. Minnesota Steel would combine ore processing, DRI production, and steel-making into an integrated facility to provide steel for the domestic and world markets (Figure 1.2).

The Proposed Project would integrate the steps necessary to make low-cost, high-quality steel at the former Butler site. Minnesota Steel plans to make steel from taconite in a cleaner and more efficient manner than traditional steel plants by combining modern technologies to allow it to make steel from taconite ore in less than 48 hours. Efficiencies are gained by having a continuous flow of materials, keeping the material at an elevated temperature throughout the process, and eliminating multiple transportation steps.

In addition to the reactivation of the existing mine and tailings basin, the project would include construction of new facilities. These facilities would include: a crusher/concentrator, pellet plant, a DRI plant, and a steel mill consisting of two EAFs, two ladle furnaces, two thick slab casters, a tunnel furnace, a hot strip rolling mill, a sheet steel coiler, and construction of a new tailings basin on the site of the former Butler facility tailings basin.

Key project features and their nominal capacities are:

- An open pit taconite mine capable of mining approximately 13,100,000 metric tons of ore per year.
- A crusher/concentrator plant with an associated tailings basin, producing approximately 3,800,000 metric tons concentrate per year.
- A pelletizer that can produce approximately 3,800,000 metric tons per year of oxide pellets that would be used as a feedstock for DRI production, or sold.
- A DRI facility producing approximately 2,800,000 metric tons per year of iron pellets for direct feed for steel production.

- An EAF, ladle metallurgy furnace, slag processing and a caster to produce 2,500,000 metric tons per year of steel slabs for direct shipment or for rolling to produce hot rolled coil.

In general, about 3.4 tons of crude ore would be converted to 1.35 tons of iron oxide (taconite) pellets which, in turn, would be converted to 1.12 tons of DRI pellets and 1 ton of finished steel product. The primary raw material inputs to the Minnesota Steel project are iron ore, natural gas, electricity and water.

3.1.1 Mining Processes

The Proposed Project would obtain its magnetic taconite ore from a horizon within the Lower Cherty member of the Biwabik Iron Formation. The inferred ore reserves at the proposed Minnesota Steel site are currently estimated at about 1.4 billion tons (or about 100 years of reserves, based on the proposed production capacity). A 20-year mine production period is typically used for mine financing and mine planning. Therefore, a 20-year mine production period (equivalent to 76 million tons of taconite pellets or 55 million tons of steel) was used as the basis for defining the Proposed Project for this EIS. However, the overall analysis timeframe for this EIS is 27 years, which includes an anticipated two years for plant/facilities construction, 20 years of mine production, and five years for closure. Phased actions beyond the 20-year Proposed Project mine production period or a production trigger of 76 million tons of taconite pellets (55 million tons of steel), whichever comes first, would be addressed in accordance with Minnesota Rules, part 4410.2000, subpart 4 (connected and phased actions) and Minnesota Rules, part 4410.3000, subpart 3 (supplement to an EIS). Mining operations beyond this time-span would require additional environmental review and permitting.

The taconite ore of the Biwabik Iron Formation would be mined by open-pit methods within the general mining area as shown on Figure 1.2. Mining would start at the following two locations: resumed mining in Pit 5 at the northwest portion of the mine site and initiation of mining in the proposed Pit 6 at the southwest. Initially, mining in Pit 5 would begin on the upper benches of the northern end of the pit and eventually would be expanded in all directions. A saddle would remain between the two pits; this contains non-iron-bearing rock and low-grade iron ore that cannot be used in Minnesota Steel's concentration process. This saddle is included in the mining area because it is highly likely to be disturbed in the process of mine development.

The mine would produce about 13,100,000 metric tons of crude taconite ore per year by open-pit methods. All mining would occur north of TH 169 and west of Nashwauk. Previous taconite and red-ore mining operations have created the existing pits on the site. Mining would begin with new pit development (Pit 6) and with the Pit 5 outcrop. Pit 5 would be expanded toward the southwest beginning in Year 5 after dewatering is completed.

After overburden is removed, waste rock and taconite ore would be drilled, blasted, and loaded into mine trucks by diesel-hydraulic shovels. The raw ore would be trucked to the primary crusher. Waste rock would either be used to construct dikes and haul roads or placed in waste rock stockpiles. During and following each phase of mining, reclamation of the overburden slopes and stockpiles would be completed according to MNDNR mineland reclamation requirements. The Proposed Project would utilize new haul roads and existing Butler facility haul roads to transport overburden, waste rock and lean ore to the stockpile areas and taconite ore from the mine to the crusher. As the mine pits are expanded and if in-pit stockpiling begins, existing mine pit and inter-pit haul roads would be utilized. Existing haul road alignments and disturbed areas would be utilized where possible.

3.1.2 Ore Processing

The crude ore would be trucked from the pits to the primary crusher for size reduction to approximately 12 inches in diameter. Next, secondary crushing would reduce the ore to approximately three-quarters of an inch in diameter. At this stage dry cobbing (magnetic separation) would be used to eliminate approximately seven percent of the lowest-grade ore. Cobbing rejects would be stockpiled or used for road aggregate. The ore would then be conveyed to the crude ore stockpile area at the concentrator.

The ore concentration and pellet production processes would be similar to those used at existing Iron Range taconite plants. Crushed ore would be conveyed to the concentrator where the magnetic iron oxide minerals (concentrate) would be separated from the nonmagnetic waste (tailings). In the concentrator, the ore would pass through a series of wet mills that would grind the rock to a flour-like consistency. Magnetic separators would separate the concentrate from the waste rock. Concentrate would be further refined by flotation, which would remove the more silica-rich material, leaving nearly pure iron oxide concentrate. Concentrate would be pumped to the pellet plant. Tailings from the concentrator would be pumped to a tailings thickener where solids would be separated from water by sedimentation. The resulting tailings slurry would be pumped from the tailings thickener to the proposed tailings basin located on the east side of TH 169 for disposal.

In the pellet plant, wet iron oxide concentrate would be dewatered in vacuum filters, mixed with a binder and limestone, and then converted to unfired pellets ("green balls") in balling drums or disks. The greenballs proceed through the indurating furnace and would be fired into hardened iron oxide pellets. After screening, the oxide pellets would be hotcharged directly to the DRI modules or stockpiled. The undersized pellets from the screening process would be ground and recycled to the concentrate slurry (or sold as sinter feed).

The DRI facility would convert iron oxide pellets to nearly pure iron pellets. The oxide pellets would be conveyed to the top of a vertical shaft reactor. In the reactor, the oxide pellets would move slowly downward through the reactor's reduction zone by gravity against a countercurrent flow of reducing gas which converts the iron oxide to metallic iron. The reducing gas is a mixture of hydrogen and carbon monoxide, both of which extract oxygen from the oxide pellets to form water and carbon dioxide. Reducing gas exiting the top of the DRI reactor ("top gas") contains excess hydrogen and carbon monoxide. Top gas is cleaned and cooled by a gas scrubber and is used in part to fire the main burners in the reformer. The remaining top gas stream is recycled through a catalytic reformer to produce reducing gas. As the pellets reach the bottom of the reactor, they would pass through a mixture of natural gas and carbon monoxide, which cools the DRI pellets and increases the carbon content of the product. The hot metallic iron also acts as a catalyst in promoting reforming reactions to convert natural gas to hydrogen gas and carbon monoxide. The DRI product would be hot charged to the steel mill EAFs or, during steel mill down-time, would be stockpiled for later use or for sale. Typically, pellet and DRI production facilities can slightly exceed their design rated capacity, while steelmaking equipment capacity is relatively fixed. Therefore, quantities of excess oxide pellets and DRI product may be shipped for commercial sale.

3.1.3 Steel Production

The steelmaking facility would use purchased electricity to power the EAFs. At full capacity, the steelmaking facility would include two EAFs, two ladle furnaces, two thick slab casters, a tunnel furnace, a vacuum degasser, a hot strip rolling mill, and a sheet steel coiler. The DRI pellets would be fed to the EAFs along with additives such as carbon and lime and melted in batches. The molten steel from the EAFs would be transferred to the two ladle metallurgy furnaces. The steel would be refined in the ladle furnaces through carbon addition, oxygen blowing, temperature control, and the addition of alloying metals. To achieve higher steel quality specifications when needed, some ladles of steel would be further processed by vacuum degassing to remove traces of hydrogen and oxygen. From the ladle furnace, the liquid steel would be transferred to the continuous casters where it would be cast into slabs approximately 8 to 10 inches thick. The slabs may be sold as finished product or proceed through a tunnel furnace and a series of rolling stands where the slab would be rolled successively thinner, to an ultimate thickness as thin as 1 mm. The sheet steel would be coiled for rail or truck shipment.

The Proposed Project is designed to produce about 2.5 million metric tons per year of slab and/or hot rolled sheet steel. This would require 3.8 million metric tons per year of taconite pellets or 13.1 million metric tons of taconite ore. Other than a small amount (less than 1 percent of clean external scrap or internally-produced virgin iron), there would be no scrap (with varying chemistries or other variables) charged to the EAFs.

3.1.4 Water Management

The Proposed Project would require substantial amounts of water. Minnesota Steel proposes to recycle and reuse most of the water (refer to Sections 4.2 and 4.5 for additional information on water resources) that would service its mining and processing operations, and to capture and use most of the storm water runoff that would occur near those operations. By using this approach, the Proposed Project would be able to ensure that sufficient water is available for processing operations and that it would not need to appropriate water from any naturally-occurring water body, even during dry conditions.

The Proposed Project would use groundwater and surface water that flows into Pits 1 & 2, 5 and 6 as the primary supply of water for the project. Once Pit 5 has been initially dewatered, ongoing maintenance pumping from Pits 5 and 6 would be pumped directly to the facility for use or to two old natural ore pits (Ann and Sullivan Mine Pits) located north of Pits 1 and 5, along with storm water runoff collected from operations and stockpile areas. Alternatively, storm water may also be reused directly in the operations. Water removed from existing mining pits, in addition to storm water that would be diverted and collected, would provide the Proposed Project with adequate water for mining and steel making operations.

As described above, runoff from industrial areas and maintenance dewatering would be directed to Ann and Sullivan natural ore pits located on site, which are isolated from downstream waters and Pits 1 & 2. Therefore, there would be no direct discharge of water containing pollutants from this project to downstream waters, including Swan Lake, Swan River, Oxhide Lake or Creek, Snowball Lake or Creek, Pickerel Creek, or O'Brien Lake or Creek. There would be transfers into these downstream waters (except for O’Brien Lake and Creek and Pickerel Creek) during initial pit dewatering, but this water would not have pollutants added by activities associated with the Proposed Project.

The water contained in Pits 1 & 2 would be used as a reservoir to supply water for facility processes as needed and to supply water to augment flows in Oxhide Creek. Augmentation water may also be needed from the Hill Annex Pit to supplement augmentation flows to Oxhide Creek and to augment flows in Snowball Creek.

Minnesota Steel would not discharge scrubber blowdown or contact cooling water to the tailings basin and would not discharge tailings water, including lateral seepage, to surface waters. A complete description of the proposed water management system is provided in Sections 4.2 and 4.5.

3.1.5 Stationary Source Air Emissions

The proposed Minnesota Steel project has primary air emission points at the mine, taconite indurating furnace, DRI modules and the steel mill EAFs. Smaller emission points include numerous individual material handling operations, smaller combustion sources and cooling towers. All emission points have been included in the evaluation of Best Available Control Technology (BACT) required under the Prevention of Significant Deterioration (PSD) air permitting provisions, and some emission points are subject to the Maximum Achievable Control Technology (MACT) standards set by the national emission standards for hazardous air pollutants (NESHAPs). Additional details related to the Proposed Project's air emissions are described in Section 4.7 and the air emissions permit application.

The facility is considered major under the New Source Review (NSR) PSD program, and is also a major source of Hazardous Air Pollutants (HAPs) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. As required by PSD regulations, BACT emission limits and performance standards are proposed for the Proposed Project to be included in the air emissions permit.

The control technologies proposed as BACT for the Proposed Project include:

- Clean Fuels (Natural Gas) for SO_2, NO_x, PM and PM_{10}
- Good Combustion Practices for CO, VOC, PM and PM_{10}
- Enclosures with Fabric Filter for PM, PM_{10}
- Enclosures with PM Wet Scrubbers for PM, PM_{10}
- Low NO_x, ultra low NO_x and oxy fuel burners for NO_x
- Wet Scrubbers for PM, PM_{10}
- Absorber / Wet Scrubber for SO_2, fluorides (F) and sulfuric acid mist (SAM)
- Pb, F and SAM Control Performance Monitored via SO_2 and PM emissions limits
- Best Practices for Fugitive Dust Control via a Fugitive Dust Control Plan

In the final air emissions permit, the MPCA and USEPA would include control equipment requirements and BACT limits that are equal to or more stringent than those identified in this Draft EIS. The air emissions permit would also specify BACT limits for periods of start-up and shutdown, and the requirement to re-do the BACT analysis if $LoTO_x$™ control of NO_x is inadequate or determined to be infeasible.

The following studies or analyses were completed in an effort to evaluate Proposed Project-related air quality issues:

- An emission inventory that lists all possible sources of air emissions from the plant (stack and fugitive)
- BACT analyses, which propose control technologies for the project to achieve lowest cost, effective emission levels
- Compliance strategies for standards requiring MACT for control of hazardous air pollutants such as metals and volatile organic compounds
- A Class I Area Impacts Analysis using the California Puff (CALPUFF) model to analyze the long-range transport of project emissions and determine the impact of project-related air emissions on Class I increment, ambient air quality standards, visibility and other air quality-related values (AQRVs) for Voyageurs National Park, the Boundary Waters Canoe Area Wilderness (BWCAW), Isle Royale, and Rainbow Lake Wilderness Area
- A Class II Area Impacts Analysis to evaluate air quality effects of the project at the project boundary and demonstrate compliance with ambient air quality standards or the PSD increment

- A review of potential mercury emissions from the project and an evaluation of mercury emission reduction alternatives and
- Human health and ecological risk assessments of potential impacts from the project

In accordance with state and federal air quality rules, the Proposed Project is required to obtain an air emissions permit to construct and operate the Proposed Project. In general, the types of proposed emission sources and the quantity of potential emissions from the proposed sources determine which air quality regulations apply to the project, the level of pre-construction review, and the type of operating permit required. Due to the types of emission sources and the quantity of emissions, the following air quality programs have been triggered by the Proposed Project:

- Prevention of Significant Deterioration (PSD),
- New Source Performance Standards (NSPS),
- National Emission Standards for Hazardous Air Pollutants (NESHAPs),
- Part 70 Operating Permit Program, and
- Minnesota Air Quality Rules.

The MPCA's permitting process will determine the final compliance requirements for the Proposed Project. The MPCA will review the air emissions permit application and write the air emissions construction and operating permit to ensure the project will comply with all applicable air quality requirements. The final permit cannot be issued until the Final EIS is deemed adequate. Additional details related to the Proposed Project's air emissions are described in Section 4.7.

3.1.6 Closure

The Minnesota Steel Permit to Mine Application, dated December 2006, describes the proposed reclamation plan for mined areas of the project. This reclamation plan must conform to Minnesota Rules 6130 for taconite and iron ore mineland reclamation. In summary, mineland reclamation would include the mine area, stockpile areas, tailings basin and other areas disturbed by mining related activities.

At closure, the Proposed Project would be required to remove all mining equipment and dismantle and remove all plant processing equipment and structures. Pits 1 & 2 and the upstream Harrison and Hawkins/Halobe Pits would again overflow to Pit 5 as they currently do. Pits 5 and 6 would be allowed to refill, Pit 5 would overflow to the Oxhide Stilling Basin and Oxhide Lake, as it currently does. Minnesota Steel would be required to close the tailings basin according to an approved closure plan, and runoff from the closed basin would flow to O'Brien Creek. Additional details related to closure of the Proposed Project is provided in Section 6.15 (Mineland Reclamation).

3.1.7 Site Preparation and Schedule

The overall Proposed Project timeline is dependent on numerous factors including acquiring project financing, completion of the EIS process, acquiring all necessary permits (federal, state and local), and the construction of the Proposed Project. The following timelines are presented to provide the reader with a general understanding of the anticipated project schedule and include:

Complete the EIS, obtain permits and acquire project financing	2007
Start construction Year 1 – Year 2 (Pit 5 stripping, Pits 1 & 2 partial dewatering, crusher/concentrator plant, pellet plant, first DRI module, first steel mill line)	2007 – 2008
Complete construction and hot commissioning of Line 1 and begin dewatering of Pit 5	2009
Continue construction (Line 2: second DRI module, second steel mill line, rolling mill)	2009 – 2010
Complete hot commissioning of Line 2	2012

3.1.8 Connected Actions

The Scoping EAW identified a number of infrastructure improvements that would be implemented in conjunction with the Proposed Project. These infrastructure improvements include a natural gas supply line, power transmission lines, roadway improvements, a rail access line, and water and sewer lines connecting to the City of Nashwauk. As described in Section 6.13, any new power production facilities would not be a direct result of the Proposed Project and would be built (or not built) independently of the decision on the feasibility of the Proposed Project.

Although these infrastructure improvements are required for the construction and operation of the Proposed Project, these improvements would be implemented by separate entities. Itasca County is planning the infrastructure for roads and railroads. Electrical power providers and/or local public utility providers would be responsible for construction of the infrastructure to supply electricity and natural gas to the facility. Separate permits and environmental review will be required for these infrastructure projects; however, possible environmental impacts are addressed in this EIS. Section 6.13 (Infrastructure) describes each of the connected infrastructure elements and assesses the potential impacts of each element. Chapter 7.0 addresses connected actions for the Proposed Project.

3.2 NO ACTION ALTERNATIVE

The No Action Alternative leaves the Proposed Project area, which was the former Butler Taconite mine and tailings basin, in its existing condition. This mining operation has been inactive since 1985. Much of the area in and around the Proposed Project has been excavated or otherwise altered by past mining activities as depicted by the disturbed areas shown on Figure 3.1. Unless noted otherwise in the Draft EIS, no social, economic or environmental impacts would result from the No Action Alternative.

3.3 PROJECT ALTERNATIVES

Pursuant to Minnesota Rules, part 4410.2300, subpart G, the EIS is required to include one or more alternatives of each of the following categories or provide a concise description of why no alternative in a particular category is included in the EIS.

- Alternative Sites
- Alternative Technologies
- Modified Designs or Layouts
- Modified Scale or Magnitude
- Alternatives that incorporate reasonable mitigation measures identified through the comment periods for EIS scoping or for the Draft EIS.

An alternative may be excluded from analysis in the EIS if it would not meet the underlying need for or purpose of the project; it would likely not have significant environmental benefit compared to the project as proposed; or another alternative of any type that is analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts. (Minnesota Rules, part 4410.2300, subpart G) The implementing regulations of NEPA also require the USACE to explore and evaluate reasonable alternatives and describe the reasons for the elimination of alternatives.

The Scoping EAW and Final SDD describe assessment of alternatives made during the scoping process and carried forward to the EIS. The following sections summarize the scoping decisions and describe alternative assessments and decisions made regarding alternatives to be included in the EIS.

3.3.1 Alternative Site

Based on findings during the Final SDD process, alternative mine pit or processing plant sites for this project were not evaluated. An alternative mine site would not meet the underlying need or purpose of the project. The mineralization of the desired elements within a geologic deposit dictates the location of the mine. An alternative processing plant site would either not have significant environmental benefits over the Proposed Project plant site or would not meet the underlying need and purpose of the project which includes integrated value added process steps to produce steel.

The Final SDD made a commitment to evaluate the benefits, feasibility and impacts of locating a tailings basin to the northwest of the mine site in the EIS. The location of the Alternative Tailings Basin had been identified during scoping. Unlike the Proposed Project tailings basin (at the site of the former Butler Tailings Basin) this location has not been previously disturbed by mining activities. The configuration of the Alternative Tailings Basin analyzed in the EIS was refined from the configuration shown in the Scoping EAW, based on evaluation of various sub-alternatives and refined assessment of the basin design presented in the technical memorandum, *Minnesota Steel EIS – Alternative Tailings Basin Sub-Alternatives Development* (see Appendix I for a listing of technical memorandums). This document describes the development and evaluation of basin sub-alternatives that resulted in the concept studied in the EIS. The location and configuration of the Alternative Tailings Basin concept analyzed in the EIS is shown in Figure 3.2.

The Alternative Tailings Basin would cover an area of approximately 1,119 acres. Starter dams would be constructed around the north end of the basin, using construction methods similar to those proposed for the Proposed Action tailings basin.

3.3.2 Alternative Technologies

The Scoping EAW and Final SDD stated that alternative mining technologies and alternative steel production technologies do not need further evaluation in the EIS. The Proposed Project uses conventional open pit mining technology that has been used in other mining operations, and the deposit is not suitable for underground mining. Other mining technologies and steel production technologies applicable to the Proposed Project would likely have no substantial environmental benefit over the proposed technologies.

Two proposed technology alternatives: ore processing and air pollution control technology, were evaluated as part of the EIS studies.

3.3.2.1 Ore Processing

The Final SDD noted that ore processing technology currently has two pellet induration processes that are commercially available – straight grate furnaces and grate kiln furnaces. The Final SDD committed that the EIS would evaluate fuel use and air emissions for both types of indurating furnaces to determine which type will have the least impact on the environment. The technical memorandum: *Minnesota Steel EIS – Alternative Pellet Furnace Evaluation* (see Appendix I) summarizes the evaluation and comparison of the two induration processes. The findings of the evaluation of the alternative pellet furnaces leads to the conclusion that no further evaluation of the grate kiln furnace is warranted and that only the straight grate furnace should be carried forward in the EIS as part of the Proposed Action. This decision was made based on the following considerations:

- The straight grate furnace is more efficient for ore processing than the grate kiln furnace.
- Less fuel usage in the straight grate furnace would result in lower air emissions of nitrogen oxide (NO_x), CO, and other combustion-related air pollutants.
- Test results suggest that particulate emissions from the straight grate furnace are lower due to less attrition of the pellets during processing. Lower particulate emissions would translate to lower emissions of metals from the ore.
- Additional maintenance on the grate kiln furnace would result in the generation of additional solid waste, used oil and lubricants and refractory lining.
- Sulfur dioxide (SO_2) emissions, water usage and water quality (discharge water) are expected to be similar between the two furnaces types.

Based on the above considerations, only the Straight Grate Furnace Alternative was carried forward (as part of the Proposed Action) for analysis in the EIS.

3.3.2.2 Air Pollution Control Technologies

The Final SDD specified that the EIS would evaluate alternative air pollution control technologies for both ore processing and the steel mill. These evaluations were performed as part of the BACT analysis and MACT submittals required as part of the MPCA air permit application process.

BACT is defined as an emission limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification. The MPCA, on a case-by-case basis, takes into account energy, environmental, and economic impacts and other costs to determine what is achievable for such source or modification through the application of production processes or available methods, systems and techniques.

BACT analysis includes the following steps, which are consistent with the process utilized to identify, evaluate and select alternatives during the environmental review process:

Step 1 – Identify all control technologies
Step 2 – Eliminate technically infeasible options
Step 3 – Rank remaining control technologies by control effectiveness
Step 4 – Evaluate the most effective control technologies and document results
Step 5 – Select BACT

This BACT analysis process and the MACT case-by-case submittals document in detail the process utilized to assess air pollution control technologies, including ore processing and the steel mill, for the Proposed Project. Based on the findings of these analyses, the proposed air pollution control technologies were selected and analyzed for the Proposed Action in the air permit application and in the EIS, and no other control technologies were carried forward for review in the EIS. Section 4.7 provides additional information on the BACT analysis.

Review and approval of the BACT/MACT analyses and decision-making processes will be performed by the MPCA as part of the air permit review process. Some changes in the air pollution control technologies to be utilized by the Proposed Project may result from the MPCA permitting process. It is assumed that the air quality analyses included in this EIS represents the maximum emissions and impacts that would result from the Proposed Action. If, as a result of the permit review/revision process, higher emissions are proposed, the EIS and air permit application analyses would need to be revised to reflect impacts from the new, higher emission levels.

3.3.3 Modified Design or Layout

As committed to in the Final SDD, the EIS studies included an evaluation of alternative designs and layouts for the processing plant, waste rock stockpiles, and on-site sanitary wastewater treatment. A technical memorandum was prepared for each of the three layout alternatives, documenting the sub-alternatives developed and evaluated, as well as the rationale for retaining or eliminating those alternatives for analysis in the EIS. The results of the analyses described in the technical memoranda are summarized below.

3.3.3.1 Plant

The location of the processing plant in the Proposed Action site concept was proposed to minimize transportation and maximize efficiency of the mining/processing operations. As committed to in the Final SDD, the EIS studies included evaluation of the feasibility, benefits, and impacts of slight modifications to the overall layout of the processing plant, developed in an effort to reduce impacts to wetlands in the area. The evaluation process and results are summarized in the technical memorandum: *Minnesota Steel EIS – Processing Plant Alternatives Development* (see Appendix I). The findings of the studies/evaluation of alternative processing plant layout concepts led to the conclusion that no processing plant layout alternatives would be carried forward for analysis in the EIS. This decision was made based on the following considerations:

- A range of wetland minimization alternatives was developed and evaluated for layout of the processing plant facility;
- None of the alternative layout concepts was found to be feasible/practicable, especially given the size of the facility (approximately 220 acres) and that the processing facilities need to be kept in close proximity to each other and on a level site, to maintain the functionality of the facility, and minimize site preparation costs; and given the above considerations, development of further alternative layout concepts was not likely to result in both substantial wetland impact reductions and a feasible/practicable concept.

In addition, agency representatives and representatives from Minnesota Steel agreed that during development and review/approval of final site plans for the project, that the Proposed Action plant layout concept could likely be modified to reduce wetland impacts, since the plant layout that is being analyzed in the EIS is still only a conceptual plan, that is subject to future refinement.

Based on the above considerations, no processing plant layout alternative was carried forward for analysis in the EIS – only the Proposed Action plant layout concept was analyzed.

3.3.3.2 Stockpiling

As committed to in the Final SDD, the EIS studies included development and evaluation of alternative designs and locations for stockpiles in an effort to provide substantial environmental benefits and/or substantial minimization of environmental impacts. The alternatives included in-pit stockpiling, consisting of stockpiling waste rock and overburden in a previously mined pit or portion of a pit. This approach can minimize the footprint of new stockpile areas and allow for backfilled areas of the mine pit to be reclaimed as shallow water habitats for aquatic resources and potential mitigation for other project impacts. The alternatives were evaluated for feasibility, benefits and impacts. These analyses are summarized in a technical memorandum: *Minnesota Steel EIS – Stockpile Alternatives Development* (see Appendix I).

Based on the development and evaluation of the stockpiling sub-alternatives described in the technical memorandum, a conceptual plan (Figure 3.3) that assumes that 50 percent of the post-year-10 mining waste rock would be in-pit stockpiled was carried forward for analysis in the EIS, with the understanding that the potential limits to in-pit stockpiling due to mineral rights, mine pit sequencing, etc., may limit the extent to which in-pit stockpiling may be able to be used. The year-10 starting point for in-pit disposal was assumed because in-pit stockpiling can only be done in areas where the mine has reached the footwall of the ore body and there are no viable mineral values at lower elevations. It was assumed that prior to year-10, these conditions would not be met.

As noted in the Scoping EAW, the feasibility of using in-pit waste rock stockpiling is dependent on a number of potential mineral rights and coordination issues that may limit use of this approach. The complex issues associated with mineral rights include, but are not limited to, mineral access rights if in-pit stockpiling were to begin before the lower limit of marketable ore were reached in the mine pit. Coordination issues related to adequate in-pit space availability, which is dependent on where and when different areas of the mine pits are worked, make it difficult to know with any certainty where, when and if in-pit stockpiling can be accomplished. The concept plans developed for the EIS show possible configurations for the in-pit options, and benefits that may be attained from use of in-pit stockpiling are assessed. However, in-pit disposal is not feasible unless/until the footwall has been established at the base of the ore deposit to prevent stockpiling on top of the remaining ore deposits. Exposure of the footwall would not occur until the later stages of the mine development. More detailed consideration and planning for in-pit disposal would be developed as the pits approach their ultimate limits and adequate footwall areas are exposed. The MNDNR staff and Minnesota Steel will need to continue to evaluate the feasibility and to develop a plan for in-pit disposal for later phases of mine operation, as mining operations proceed over time.

3.3.3.3 On-Site Sanitary Wastewater Treatment

Based on public comments received on the Draft SDD and the commitment made in the Final SDD, the EIS studies included evaluation of the feasibility and environmental benefits associated with an on-site sanitary wastewater treatment system as a mitigation measure to potentially reduce nutrient loading to Swan Lake. Since the primary objective of analyzing this alternative was reduction of nutrient loading to Swan Lake, alternatives assessed focused on those that would result in zero discharge to water bodies flowing to Swan Lake (i.e., utilization of soil disposal for the effluent). The On-Site Wastewater Treatment System Alternative concept developed for analysis in the EIS and as described in the technical memorandum: *Minnesota Steel EIS – On-Site Sanitary Wastewater Treatment Alternatives Development*, (see Appendix I) consists of a lift station that routes the wastewater to septic tanks for storage and solids removal, followed by distribution of the effluent to filter ponds for secondary treatment (including recirculation/re-treatment) prior to discharge to a sub-surface drainfield. This system would result in no discharge to surface waters and, therefore, no nutrient loading to Swan Lake.

3.3.4 Scale or Magnitude Alternatives

The scoping process determined that the EIS does not need to evaluate scale or magnitude alternatives for the project, since the infrastructure requirements to mine and process the ore are such that alternative scale/magnitude would not meet the underlying need for or purpose of the project or would likely not have significant environmental benefit compared to the project as proposed.

3.3.5 Mitigation Measures

Minnesota Rules, part 4410.2300, subpart G includes the requirement that an EIS must consider alternatives that incorporate reasonable mitigation measures identified through the comment periods for EIS scoping or for the Draft EIS. The On-Site Wastewater Treatment Alternative was included for study in the EIS, based on a mitigation measure identified during scoping comments. Other potential project mitigation measures – including the alternatives described above – were considered during scoping and/or the EIS. In addition, the EIS process identified mitigation measures for each of the potential project impacts identified. Some of these mitigation measures have been incorporated into the Proposed Project. These measures include:

- Integrated System – The Proposed Project would gain efficiencies by having a continuous flow of materials, keeping the material at an elevated temperature throughout the process, and eliminating multiple transportation steps,
- Feedstock selection – The steel making process would use a minimal amount of scrap steel (less than 1 percent) and then only use “clean scrap”, minimizing potential air impacts,
- Fuel selection – The facility would use natural gas, minimizing potential air impacts,
- Equipment selection – The Proposed Project has selected equipment for the pellet plant, DRI, and steel mill with consideration towards minimizing potential air and water impacts and,
- Water use – The Proposed Project would recycle and reuse 97 percent of the process water, nearly 100 percent of industrial storm water, and water from the active mines, minimizing potential water impacts.

The net results of these decisions are:

- Less energy use (estimated 30 percent less) than a non-integrated facility,
- Lower air emissions than those from typical iron and steel production facilities, and,
- No process water discharges.

Incorporating these mitigation measures not only reduces energy use but provides reduced impacts to the environment.

A summary of mitigation measures are presented by Section in Table 3.1 below. The table includes an indication of whether the mitigation measure has already been adopted as part of the Proposed Project or has been identified as a measure that could be implemented. The reader is directed to the corresponding Chapters (Chapters 4.0, 5.0 and 6.0) for additional mitigation information relating to the Proposed Project.

TABLE 3.1 SUMMARY OF MITIGATION MEASURES

Corresponding Chapter in Draft EIS	Mitigation	Proposed Project (P) or Identified Additional Measure (I)
4.1 – Wetlands	▪ Mitigation Plan for on-site (post mining) and off-site ▪ Drainage conveyance measures to maintain flows ▪ Wetland hydrology monitoring program at wetlands that may be indirectly impacted	P I I
4.2 – Water Appropriation	▪ Water Recycling/Reuse, including treatment of process water ▪ Collection and use of storm water	P P
4.3 – Physical Impacts: Non-wetland	▪ Flow augmentation – Oxhide and Snowball ▪ Monitoring – Oxhide and Snowball flows during dewatering and augmentation ▪ Monitoring of Snowball Lake and Oxhide Lake levels ▪ Monitor Oxhide Creek geomorphology (existing and during project) and mitigate, if channel changes occur. ▪ Monitoring Swan Lake level and outflow to Swan River ▪ Swan Lake weir orifice	I I I I I I
4.4 – Surface Water Runoff	▪ Construction storm water pollution prevention plan ▪ Best management practices (including storm water ponds and sediment basins) ▪ Prevent construction and industrial storm water runoff from entering mining pits	P P P
4.5 – Wastewater/ Water Quality	▪ Water Recycling/Reuse, including treatment of process water (no discharge of scrubber blowdown and contact cooling water) ▪ Seepage collection system at tailings basin ▪ Monitor water quality of augmentation flows to Oxhide and Snowball ▪ Continuation of Swan Lake monitoring under MPCA Citizen Lake Monitoring Program	P P I I
4.6 – Solid Waste	▪ Reclamation of tailing dams and stockpiles ▪ Best Management Practices (for storage and handling of process wastes) per applicable rules ▪ Proper disposal of solid and hazardous wastes ▪ Waste characterization study	P P P I

TABLE 3.1 SUMMARY OF MITIGATION MEASURES		
Corresponding Chapter in Draft EIS	**Mitigation**	**Proposed Project (P) or Identified Additional Measure (I)**
4.7 – Air Resources	▪ Integrated process ▪ Use of natural gas ▪ Selection of feedstocks ▪ Offsets for Class I visibility impacts ▪ Air Pollution Controls (BACT/MACT) ▪ Fugitive dust control plan ▪ Monitoring and compliance demonstration measures ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT)	P P P P P P P P
4.8 – Fisheries Resources	▪ Stream invertebrate monitoring ▪ Conversion of mine pits for fishing resources after project completion (if in-pit stockpiling)	I I
4.9 – Wildlife	▪ Reclamation ▪ Enhancement of open water mine pit habitats (if in-pit stockpiling)	P I
4.10 – Noise	▪ Noise reduction packages for equipment ▪ Blaster's log ▪ Seismic monitoring program ▪ Air blast monitoring program ▪ Pre-production test charge ▪ Berm construction at south rim of mine pit at start-up	P P P P P I
5.1 – Class I –Cumulative PM_{10}	▪ Integrated process ▪ Use of natural gas ▪ Air Pollution Controls (BACT/MACT), including $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT) ▪ Future regulatory reductions	P P P I
5.2 – Cumulative Acid Deposition and Ecosystem Acidification in Class I Areas	▪ Integrated process ▪ Use of natural gas ▪ Use of low sulfur diesel fuel in equipment ▪ Offsets for visibility impacts co-benefit ▪ Air Pollution Controls (BACT/MACT) ▪ Future regulatory reductions ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT)	P P P P P I P
5.3 – Cumulative Mercury	▪ Integrated process ▪ Use of natural gas ▪ Selection of feedstocks ▪ Offsets for visibility impacts co-benefit ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT) ▪ Process water re-use eliminating sulfate discharges (reduce methylation in waters) ▪ Future regulatory reductions	P P P P P P I

TABLE 3.1 SUMMARY OF MITIGATION MEASURES		
Corresponding Chapter in Draft EIS	**Mitigation**	**Proposed Project (P) or Identified Additional Measure (I)**
5.4 – Cumulative Visibility Impairment	▪ Integrated process ▪ Use of natural gas ▪ Offsets for visibility impacts ▪ Air Pollution Controls (BACT/MACT) ▪ Future regulatory reductions ▪ Evaluate and implement $LoTO_x$ technology, if feasible (if LoTOx not feasible, redo BACT)	P P P P I P
5.5 – Cumulative Threatened & Endangered Plants	▪ Transplanting plan ▪ Monitoring of transplanted species	P P
5.6 – Cumulative Loss of Wetlands	▪ Mitigation Plan for on-site (post mining) and off-site ▪ Avoidance of impacts to natural Type 6-8 wetlands	P P
5.7 – Cumulative Impacts – Wildlife Habitat Loss and Fragmentation	▪ Reclamation (on-going and upon closure)	P
5.8 – Cumulative Wildlife Travel Corridor Obstruction	▪ Reclamation (upon closure) ▪ Grade and vegetate saddles between Pits 1 and 5 and between Pits 5 and 6 (upon closure), if in-pit stockpiling is feasible	P I
6.1 – Land Use	▪ Local permitting process would define mitigation	I
6.2 – Cover Types	▪ Reclamation (on-going) ▪ Wetland Mitigation	P P
6.3 – Threatened & Endangered Plants	▪ Transplanting plan ▪ Monitoring of transplanted species ▪ Avoid *Botrychium* species (north of tailings basin)	P P P
6.4 – Threatened & Endangered Animals	▪ Canada Lynx Tracking Survey Study ▪ Reclamation (on-going)	P P
6.5 – Water-related Land Use Districts	▪ Local permitting process would define mitigation	I
6.6 – Erosion and Sedimentation	▪ Best Management Practices	P
6.7 – Geologic Hazards and Soil Conditions	▪ Spill prevention control and countermeasure (SPCC) plan ▪ Seepage collection system on tailings basin ▪ Groundwater monitoring and reporting plan	P P I
6.8 – Traffic	▪ Improvements to TH 65/CSAH 86 ▪ Improvements to TH 65/CR 58 ▪ Intersection/Access improvements to TH 169	I I I
6.9 – Vehicle-related Air Emissions	▪ Low sulfur fuels ▪ Particulate control on engines ▪ Fugitive Dust Control Plan	P P P
6.10 – Archaeology/Cultural Resources	▪ To be determined by Section 106 process as outlined in Programmatic Agreement	I

TABLE 3.1 SUMMARY OF MITIGATION MEASURES		
Corresponding Chapter in Draft EIS	**Mitigation**	**Proposed Project (P) or Identified Additional Measure (I)**
6.11 – Recreational Trails	▪ Relocation of snowmobile trails ▪ Continue to coordinate with Mesabi Trail planning	I I
6.12 – Visual Impacts	▪ Minimize impacts to existing vegetative screening ▪ Use of directional lighting ▪ Use of neutral colors for the exterior of all buildings and other structures	I I I
6.13 – Infrastructure	▪ Permitting processes would require mitigation	I
6.14 – Socioeconomics	▪ None required	
6.15 – Mineland Reclamation	▪ Reclamation as per Minnesota Rules 6130	P

3.4 SUMMARY OF ALTERNATIVES STUDIED IN THE EIS

Based on the findings of the EIS assessment and evaluation of potential alternatives, the following alternative concepts were carried forward for study in this Draft EIS:

- Proposed Action
- No Action Alternative
- Alternative Tailings Basin Location
- In-Pit Stockpiling
- On-site Sanitary Wastewater Treatment

3.5 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The EIS provides review and assessment of a number alternatives and sub-alternatives identified in the Final SDD. At this time, the Proposed Action is the preferred alternative, including an open pit taconite mine, adjacent stockpile areas, and the construction of new facilities - a crusher, concentrator, pellet plant, plant for producing direct reduced iron, and a steel mill consisting of two electric arc furnaces, two ladle furnaces, two thin slab casters, a hot strip rolling mill, and construction of a new tailings basin on the site of the former Butler facility tailings basin. The Proposed Action was selected as the preferred alternative because it is the least environmentally damaging practicable alternative that meets the purpose and need of the project. The preferred alternative includes the technology alternatives of straight grate furnaces and air pollution control technologies; the modified design or layout alternatives of in-pit stockpiling (if determined feasible over time), and mitigation measures already proposed or identified in Table 3.1 (Summary of Mitigation Measures).

The other sub-alternatives considered in the EIS did not provide substantial reductions in environmental impacts, compared to the Proposed Project; therefore they are not proposed for inclusion in the Preferred Alternative concept:

- The Alternative Tailings Basin sub-alternative would impact fewer total acres of wetlands, compared to the Proposed Tailings Basin location; however, the Alternative Tailings Basin would impact an area previously undisturbed by mining and would impact relatively high quality wetlands (including Type 7 and 8 wetlands), compared to the wetlands impacted by the Proposed

Action Tailings Basin (which primarily impacts wetlands that developed in the former Butler Stage I tailings basin since mine closure in 1985).

- The In-Pit Stockpiling Alternative concept provides benefits such as reducing the area of wetlands filled by stockpiles and providing an opportunity to create shallow lacustrine wetland areas within the mine pits. However, this sub-alternative cannot be recommended for inclusion in the Preferred Alternative at this time, since it would not be known for certain that in-pit stockpiling is feasible unless/until the footwall has been established at the base of the ore deposit (as described in Section 3.3.3.2). Use of in-pit stockpiling is recommended as a mitigation measure to be implemented in the future, if feasible.

- The On-Site Sanitary Wastewater Treatment sub-alternative was not recommended for inclusion in the Preferred Alternative, since the water quality analyses performed for the EIS did not indicate a potential improvement in Swan Lake water quality if on-site wastewater treatment was utilized.

The No Build Alternative was not identified as the Preferred Alternative, since it would not satisfy the purpose of and need for the proposed action and since the Proposed Project (including mitigation measures) would minimize the environmental impacts identified in the EIS study process.

3.6 PAST AND REASONABLY FORESEEABLE ACTIONS IN THE PROJECT VICINITY

Assessment of potential cumulative impacts from the Proposed Action relative to other past, present and reasonably foreseeable future actions in the project vicinity are required as part of the EIS analyses. The Scoping EAW and Final SDD define the cumulative impacts assessments to be included in this EIS. Those analyses are described in Chapter 5.0. The sections for each cumulative impacts assessment defined the past, present and reasonably foreseeable future actions in the project vicinity that were incorporated into each analysis.

4.0 Affected Environment and Environmental Consequences (Potentially Significant Impacts May Result)

4.1 PHYSICAL IMPACTS ON WATER RESOURCES – WETLANDS

4.1.1 Affected Environment (Existing Conditions)

4.1.1.1 Introduction

Existing wetland resources within the project study area were assessed as part of the EIS and wetland permit application data collection process. This assessment included delineation of current wetland boundaries and collection of detailed information on wetlands and deep water areas within the identified direct project impact areas (i.e., tailings basin, mine areas, stockpile areas, water conveyance/supply, and plant site for the Proposed Action and for the Alternative Tailings Basin). Wetland boundaries beyond these direct impact areas were estimated utilizing existing maps, aerial photography, soil surveys and other available information. Figure 4.1.1 shows the wetland resources mapped within the study area.

Appendix I lists the wetland-related studies and permit application documents prepared for the Minnesota Steel project. Detailed information collected for wetlands and deep water areas within the direct project impact areas is contained in the *Wetland Delineation and Wetland Functional Assessment Report: Minnesota Steel Industries, LLC,* dated January 25, 2006 (hereafter called the Wetland Delineation Report). Updated information on wetland impacts and proposed 5- and 20-year mitigation plans were provided in November 8, 2006 and December 18, 2006 submittals to the USACE and MNDNR (see Appendix H). The information from these documents is summarized in the sections that follow, including:

- Wetland Delineation (Section 4.1.1.2)
- Classification Systems (Section 4.1.1.3)
- Functional Assessment Methodology (Section 4.1.1.4)
- Existing Wetland Resources (summary of the above information for each of the direct project impact areas) (Section 4.1.1.5)

Section 4.1.1.6 describes the current state and federal wetland regulatory programs in Minnesota. Section 4.1.2.7 discusses assessment of potential indirect impacts of the Minnesota Steel project on wetlands in the project vicinity.

Some wetlands within the project study area may be impacted by proposed infrastructure improvements that would serve the Minnesota Steel facility. Supporting infrastructure improvements are not considered as part of the Proposed Project under study in this EIS, but are documented in this EIS as connected actions (see Chapter 7.0). Wetlands in these areas would be delineated and the impacts would be determined and permitted by others. Section 6.13 describes these infrastructure improvements, identifies the proposer for each improvement and describes the environmental review and permitting process required for each. These improvements would undergo independent environmental review and permitting (including sequencing and mitigation) by entities other than Minnesota Steel; therefore, detailed information on wetland resources in the areas affected by the infrastructure improvements is not available for inclusion in this EIS. The estimated wetland boundary areas in the Minnesota Steel project area (described in Section 4.1.1.1) were utilized to estimate the location of wetland resources at the infrastructure improvement areas within the project study area. National Wetland Inventory (NWI) mapping was used to estimate infrastructure-related impacts beyond the areas mapped in the Minnesota Steel project vicinity. This provided a preliminary assessment of the order-of-magnitude impacts, including wetland impacts that may occur from the infrastructure improvements, as connected actions to the Proposed Action.

4.1.1.2 Wetland Delineation

Wetlands within the Proposed Project Impact Areas were identified using existing maps, aerial photography, soil surveys and field inspection. Wetlands within the Project Impact Area were delineated between May and October 2005 by Barr Engineering, Inc. The delineations were performed according to the Routine On-Site Determination Method specified in the *U.S. Army Corps of Engineers Wetlands Delineation Manual*, 1987 Edition. Additional information on the wetland delineation methodology is provided in the Wetland Delineation Report.

4.1.1.3 Wetland Classification System Descriptors

As part of the delineation process, wetlands located within direct project impact areas were classified using the Circular 39 system (Shaw and Fredine, 1971), which is the designated classification system used under the Minnesota Wetland Conservation Act (WCA). In addition to the Circular 39 categories, the USACE's St. Paul District uses the Eggers and Reed system to describe and classify wetlands occurring in Minnesota and Wisconsin (Eggers and Reed, 1997). A summary of the descriptors for each classification system are provided in Table 4.1.1.

TABLE 4.1.1 WETLAND CLASSIFICATION SYSTEM DESCRIPTORS

Wetland Plant Community Type (Eggers and Reed, 1997)	U.S. Fish and Wildlife Service Circular 39 (Shaw and Fredine, 1971)
Floodplain Forest	Type 1: Seasonally flooded basin or flat
Seasonally Flooded Basin	Type 1: Seasonally flooded basin or flat
Wet to Wet-Mesic Prairie	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Fresh (Wet) Meadow	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Sedge Meadow	Type 2: Inland fresh meadow
Calcareous Fen	Type 2: Inland fresh meadow
Shallow Marsh	Type 3: Inland shallow fresh marsh
Deep Marsh	Type 4: Inland deep fresh marsh
Shallow, Open Water	Type 5: Inland open fresh water
Shrub-Carr	Type 6: Shrub swamp
Alder Thicket	Type 6: Shrub swamp
Hardwood Swamp	Type 7: Wooded swamp
Coniferous Swamp	Type 7: Wooded swamp
Open Bog	Type 8: Bog
Coniferous Bog	Type 8: Bog

4.1.1.4 Wetland Functional Assessment Methodology

Wetlands can provide a variety of functions such as flood storage, nutrient and sediment removal, fish and wildlife habitat and recreational opportunities. The *Minnesota Routine Assessment Method for Evaluating Wetland Functions,* (MNRAM) is recognized by the WCA as the accepted method for quantifying the functions and values of wetlands in Minnesota. The USACE also recognizes the MNRAM methodology to assess wetland functions and values.

During the field delineation, data was collected related to the functions and values of each wetland within the Proposed Project Impact Areas. The vegetative diversity/integrity within each wetland was rated using the guidelines in the MNRAM, *Version 3.0* (MNRAM 3.0). While the vegetative diversity/integrity of the wetlands serves as one indicator of wetland functional quality, many other factors contribute to the overall functioning of the wetland in the larger landscape. To provide a more comprehensive assessment of wetland functional quality, other applicable wetland functions evaluated in MNRAM 3.0 were also considered in rating the overall wetland quality. The wetland functions that were typically most applicable to the Minnesota Steel project area wetlands include: maintenance of characteristic hydrologic regime, flood attenuation, maintenance of wetland water quality, wildlife habitat, and downstream water quality.

Several landscape characteristics are important for evaluating these wetland functions. Some of the key landscape and wetland characteristics that are considered in the MNRAM ranking of wetland functional quality are provided in Table 4.1.2.

TABLE 4.1.2 KEY LANDSCAPE FACTORS INFLUENCING WETLAND FUNCTIONAL SCORES IN MNRAM

MNRAM Category	Role in Wetland Function and Quality
Wetland or lake Outlet Characteristics	Outlets influence flood attenuation, downstream water quality, and other hydrologic processes
Watershed and Adjacent Land Uses, and Condition	Adjacent land uses influence wetland hydrology, sediment and nutrient loading to wetlands, connectivity for wildlife habitat and other factors
Soil Condition	Soil condition influences plant community type, vegetative diversity, overall wetland quality and productivity (trophic state)
Erosion and Sedimentation	Influences downstream water quality, trophic state of wetlands, vegetative diversity and overall wetland quality
Wetland Vegetative Cover and Vegetation Types	Influences vegetative diversity, wildlife habitat as well as hydrologic characteristics (e.g. evapotranspiration or resistance to flow in floodplain wetlands)
Wetland Community Diversity and Interspersion	Influences the vegetative diversity and overall wetland quality as well as value for wildlife habitat
Human Disturbances (both past and present)	Mining, logging, road–building, stream channelization and other alterations to the landscape

The broader landscape factors in Table 4.1.2 were typically evaluated on a scale larger than one specific wetland, because of similarities within the different regions of the project. For instance, soil and vegetation conditions were similar for most wetlands in the Proposed Project tailings basin. Disturbance factors were also typically similar within a given project area. For example, across the Alternative Tailings Basin, logging was prevalent, while in the mining area, previous excavation was the major disturbance. Other, more local factors were evaluated for each wetland or small groups of wetlands, for instance, the impacts of specific roads, berms or power lines. Tables 4.1.3 to 4.1.8 provide summaries of the vegetative diversity/integrity and overall functional quality rating (rated as low, medium, or high) for each delineated wetland.

4.1.1.5 Summary of Wetland Resources in the Direct Project Impact Areas

Descriptions of wetlands located within the four Proposed Action Impact Areas – mine area, plant site area, stockpile areas, water conveyance/supply and tailings basin – plus the Alternative Tailings Basin site are described in the following sections.

Mine Area

A total of 35 wetland basins, with a total area of 32 acres, along with deep water areas (an additional 204 acres) within water-filled former mine pits 5 and 6 were delineated within the proposed 767-acre mining direct impact area. Tables 4.1.3A and B summarize the size, classification and quality for each basin and Figure 4.1.2 shows the location of these basins. Section 4.1.2.2 provides additional discussion of the type and quality of wetlands within the mine impact area.

TABLE 4.1.3A WETLAND RESOURCES: MINE AREA

Wetland ID	Dominant Circular 39 Type	Impact Area (acres) (1)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
536	1	0.2	Medium	Medium	Low	None
546	1	0.5	High	High	Low	None
718	1	0.7	Low	Medium	High	Pit
2001	1	0.2	Medium	Medium	Medium	Road
532	2	<0.1	High	High	Low	None
615	2	0.1	Medium	Medium	Medium	Road
760	2	5.4	Medium	Medium	Low	None
493	3	0.1	Low	Low	High	Ditch
596	3	<0.1	Medium	Medium	Low	None
599	3	0.1	Medium	Medium	Low	None
600	3	0.1	Medium	Medium	Low	None
649	3	0.1	High	High	Low	None
551	4	0.3	Low	Medium	High	Excavated
556	4	<0.1	High	High	Medium	Road
609	4	0.7	High	Medium	Low	None
770	4	<0.1	High	Medium	Low	None
777	4	1.7	High	Medium	Low	None
553	5	3.8	Medium	Medium	High	Excavated
557	5	3.3	Low	Low	Low	Pit
705	5	4.5	High	Medium	Medium	Pit
524	6	<0.1	Low	Medium	Low	None
530	6	1.5	High	High	Low	None

Wetland ID	Dominant Circular 39 Type	Impact Area (acres) [1]	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
584	6	2.8	High	High	Medium	Logged
586	6	0.2	High	Medium	Low	None
641	6	2.0	High	Medium	Low	None
573	7	0.3	Medium	Medium	High	Impounded
585	7	0.1	High	Medium	Low	None
601	7	0.5	High	Medium	Low	None
602	7	0.7	High	Medium	Low	None
604	7	0.6	High	Medium	Low	None
617	7	0.4	High	Medium	Low	None
625	7	0.1	High	Medium	Low	None
645	7	0.1	High	Medium	High	Road
736	7	0.2	High	Medium	Low	None
739	7	0.3	Medium	Medium	Low	None
330 (Pit 5)	Deep Water	163.5	Low	Low	High	Mine Pit
529	Deep Water	16.9	Low	Low	High	Pit
691	Deep Water	23.9	Low	Low	High	Mine Pit

TABLE 4.1.3B MINE AREA: TABLE SUMMARY

Total # of Wetlands	Wetland Impact Area (acres) [1]	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Wetland Quality
35	**31.6**	High **6**	High **20**	High **6**
		Medium **5**	Medium **10**	Medium **27**
		Low **24**	Low **5**	Low **2**

Total # of Deep Water Areas	Deep Water Impact Area (acres) [1]	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Quality
3	**204.3**	High **3**	High **0**	High **0**
		Medium **0**	Medium **0**	Medium **0**
		Low **0**	Low **3**	Low **3**

[1] The Impact Area includes all of the wetland basin areas located within the boundary line defining the Mine Area (i.e., it assumes that all wetlands within the boundary would be impacted).

Plant Area

There were 30 wetland basins totaling 108 acres delineated in the proposed 477-acre plant facilities impact area. The plant area consists of the crusher/concentrator in the vicinity of the mine pits/stockpiles, the connecting rail and pipeline corridor and the plant facility at the north end. Tables 4.1.4A and B summarize the size, classification and quality for each basin and Figure 4.1.3 shows the locations of the basins. The plant facility site lies north of the area directly disturbed by past mining activities (see Figure 3.1). However, much of the large wetland complex located in the central portions of public land survey Sections 35 and 36 appears to have been enlarged due to the stockpiles impounding water flow from the area. Approximately 12 percent of the wetland acreage within the plant area was established as a result of past mining activities. Section 4.1.2.2 provides additional discussion of the type and quality of wetlands in the plant impact area.

TABLE 4.1.4A WETLAND RESOURCES: PLANT AREA

Wetland ID	Dominant Circular 39 Type	Impact Area (1) (acres)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
2004	1	0.2	High	Medium	Low	None
294	2	3.5	High	Medium	Low	None
307	2	0.1	Low	Medium	Medium	Road
309	2	1.8	Medium	Medium	Low	None
313	2	1.5	Low	Medium	Low	None
317	2	1.1	Medium	Medium	Low	None
318	2	0.7	Medium	Medium	Low	None
320	2	1.1	High	High	Low	None
358	2	2.9	High	Medium	Low	None
368	2	2.1	High	Medium	Low	None
372	2	6.6	High	Medium	Low	None
542	2	0.4	High	High	Low	None
2003	2	1.2	High	Medium	Medium	None
2020	2	1.2	High	High	Low	None
331	4	14.2	Medium	Medium	Medium	Flooded
362	4	3.3	Medium	Medium	Medium	Flooded
369	5	0.7	Medium	Medium	High	Flooded
287	6	2.8	Medium	Medium	Low	Road
316	6	2.4	High	High	Low	None
345	6	6.7	High	Medium	Low	None
350	6	2.1	High	Medium	Medium	Flooded
359	6	1.3	High	Medium	Medium	Flooded
476	6	13.3	Medium	Medium	Medium	Tailings Basin
549	6	1.1	High	High	Low	None
2005	6	0.2	High	Medium	Low	None
2006	6	27.0	High	Medium	Low	None
319	7	3.2	High	High	Low	None
534	7	0.4	High	High	Low	None
568	7	1.3	High	High	Medium	Road
585	7	3.9	High	Medium	Low	None

TABLE 4.1.4B PLANT AREA SUMMARY

Total # of Wetlands	Impact Area (acres) [(1)]	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Wetland Quality
30	**108.2**	High **1**	High **20**	High **8**
		Medium **8**	Medium **8**	Medium **22**
		Low **21**	Low **2**	Low **0**

(1) The Impact Area includes all of the wetland basin areas located within the boundary line defining the Plant Area (i.e., it assumes that all wetlands within the boundary would be impacted).

Stockpile Area

The stockpile area evaluated for wetlands encompasses about 818 acres that lies mostly within former Patrick B Tailings Basin and borrow areas from former mining activities. A total of 41 wetland basins covering 214 acres were identified, delineated, and characterized within the proposed stockpile impact area (see Tables 4.1.5A and B and Figure 4.1.4). Just over 70 percent of the wetland acreage within the stockpile area resulted from past disturbances in the area, including wetlands formed within the former Patrick B Tailings Basin. Many of the wetlands appear to have formed after the former tailings basin, stockpile, and settling basins were decommissioned. Nearly 85 percent of the wetland acreage within the stockpile area is rated medium for overall quality. Section 4.1.2.2 provides additional discussion of the type and quality of wetlands in the stockpile impact area.

TABLE 4.1.5A WETLAND RESOURCES: STOCKPILE AREA

Wetland ID	Dominant Circular 39 Type	Impact Area [(1)] (acres)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
462	1	0.5	Medium	Medium	Medium	Tailings Basin
526	1	0.5	Medium	Medium	Low	None
536	1	<0.1	Medium	Medium	Low	None
718	1	1.4	Low	Medium	High	Pit
2008	1	6.3	Low	Medium	Low	Tailings Basin
532	2	0.3	High	High	Low	None
552	2	1.8	Exceptional	High	Low	Power line adjacent
606	2	7.2	High	High	Low	None
2020	2	1.7	High	High	Low	None
2021	2	0.2	High	High	Low	None
482	3	0.3	Medium	Medium	Medium	Stockpile
2009	3	0.4	Medium	Medium	Medium	Road
485	4	3.3	Medium	Medium	High	Tailings Basin
591	4	7.7	Medium	Medium	High	Tailings Basin
676	4	3.4	High	High	Low	None
704	4	3.4	High	Medium	Medium	Tailings Dam

Wetland ID	Dominant Circular 39 Type	Impact Area [(1)] (acres)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
2010	4	21.1	Medium	Medium	High	Tailings Basin
425	5	71.2	Medium	Medium	High	Tailings Basin
553	5	2.2	Medium	Medium	High	Excavated
455	6	4.3	High	Medium	Medium	Tailings Basin
457	6	0.3	High	Medium	Medium	Tailings Basin
476	6	38.2	Medium	Medium	Medium	Tailings Basin
499	6	0.1	High	Medium	Medium	Tailings Basin
506	6	0.8	Medium	Medium	High	Stockpile
510	6	0.2	Medium	Medium	High	Stockpile
516	6	0.1	Medium	Medium	High	Stockpile
523	6	4.4	Medium	Medium	Low	None
524	6	1.1	Low	Medium	Low	None
530	6	3.4	High	High	Low	None
539	6	0.4	High	High	Low	None
549	6	1.6	High	High	Low	None
572	6	1.0	High	High	Low	None
626	6	5.1	High	High	Low	None
646	6	2.3	High	High	Low	None
658	6	0.1	High	High	Low	None
675	6	2.4	High	High	Low	None
504	7	3.1	Medium	Medium	High	Tailings Basin
568	7	1.1	High	High	Medium	Road
585	7	8.4	High	Medium	Low	None
621	7	2.3	High	High	Low	None
645	7	0.2	High	Medium	High	Road

TABLE 4.1.5B STOCKPILE TABLE SUMMARY

Total # of Wetlands	Impact Area (acres) [(1)(2)]	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Wetland Quality
41	**213.8**	High **11**	Exceptional **1** High **21**	High **16**
		Medium **9**	Medium **16**	Medium **25**
		Low **21**	Low **3**	Low **0**

(1) The Impact Area includes all of the wetland basin areas located within the boundary line defining the Stockpile Area (i.e., it assumes that all wetlands within the boundary would be impacted).

(2) Includes one deep water area: 16.9 acres total size with 0.06 acres of impact.

Water Conveyance/Supply Areas

The water conveyance/supply areas evaluated for wetland/deep water impacts include approximately 16 acres of wetland impacts within the proposed storm water storage and water supply areas and within the tailings pipeline and reclaim line corridors, 12 acres of deep water impacts for the proposed storm water storage and water supply uses (southeast of the plant area), and 182 acres of deep water impacts at Pits 1 & 2 (proposed for partial dewatering to separate them hydraulically from Pit 5 and for use as a water supply source, as described in Section 4.2). Figure 4.1.5 shows the locations of wetland impacts within the water conveyance/supply areas, and Tables 4.1.6A and B summarize the wetland resources located within the defined direct impact areas. Some of these areas have been disturbed previously by mining-related activities, including stockpiling and roads. Most of the wetlands/deep water areas were created or expanded due to water flowing into former mine pits or by flooding due to re-routing or blockage of surface water flows.

TABLE 4.1.6A WETLAND RESOURCES: WATER CONVEYANCE/SUPPLY AREAS

Wetland ID	Dominant Circular 39 Type	Impact Area (acres) (1)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
558	2	0.1	Low	Low	High	Stockpile
362	4	0.6	Medium	Medium	Medium	Flooded
369	5	13.2	Medium	Medium	High	Flooded
408	6	<0.1	Medium	Medium	Medium	Stockpile
562	6	0.3	Medium	Medium	Medium	Roads
566	6	0.4	Medium	Medium	Medium	Roads, Stockpile
2005	6	<0.1	High	Medium	Low	None
387	7	0.3	High	High	Medium	Road
415	7	1.4	High	High	Medium	Pits
441	7	<0.1	High	High	Medium	Road
403	Deep Water	4.5	Low	Low	High	Pit
429	Deep Water	7.4	Low	Low	High	Pit
330 (Pits 1 & 2)(3)	Deep Water	182	Low	Low	High	Mine Pit

TABLE 4.1.6B WATER CONVEYANCE/SUPPLY AREAS: TABLE SUMMARY

Total # of Wetlands	Wetland Impact Area (acres) (1)	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Wetland Quality
10	**16.3**	High **2**	High **4**	High **3**
		Medium **7**	Medium **5**	Medium **6**
		Low **1**	Low **1**	Low **1**

Total # of Deep Water Areas	Total Deep Water Area (acres)(2)	Deep Water Impact Area (acres)(1)	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Wetland Quality
3	**445.5**	**193.9**	High **3**	High **0**	High **0**
			Medium **0**	Medium **0**	Medium **0**
			Low **0**	Low **3**	Low **3**

(1) The Impact Area includes all of the wetland basin areas located within the boundary line defining the water conveyance/supply areas (i.e., it assumes that all wetlands within the boundary would be impacted).
(2) The Total Deep Water Area includes 433.6 acres of deep water in Pits 1 & 2 that would be partially impacted by changing water levels in the pits, plus 11.9 acres of other deep water areas that are assumed to be totally impacted by storm water and water supply uses.
(3) Wetland 330 impact area represents the 'worst case' condition of drawdown predicted during drought year conditions. The area also includes impacts to the Harrison and Hawkins pits, which are hydraulically connected to Pits 1 & 2. The impacts area for 'normal' rainfall conditions is estimated to be 145 acres.

Tailings Basin Area

The Proposed Project tailings basin impact area encompasses approximately 1,580 acres. A total of 57 wetlands covering approximately 395 acres were identified, delineated, and characterized within the area (Figure 4.1.6, Tables 4.1.7a and b). Nearly 70 percent of the wetland area in the tailings basin is artificial wetlands that have developed on the reclaimed tailings basin. The additional wetland areas are largely associated with wetlands in the former Butler water reclaim area and natural wetlands located just outside of the primary dikes of the former tailings basin. Section 4.1.2.2 provides additional discussion of the type and quality of wetlands within the tailings basin impact area.

TABLE 4.1.7A WETLAND RESOURCES: TAILINGS BASIN AREA

Wetland ID	Dominant Circular 39 Type	Impact Area (1) (acres)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
618	2	3.3	Low	Low	High	Tailings Basin
665	2	1.0	Low	Low	High	Tailings Basin
679	2	0.2	Low	Low	High	Tailings Basin
680	2	3.2	Low	Low	High	Tailings Basin
748	2	16.9	Medium	High	Medium	Tailings Dam

Wetland ID	Dominant Circular 39 Type	Impact Area [1] (acres)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
984	2	0.7	Medium	Low	High	Tailings Basin
1033	2	0.7	Low	Low	High	Tailings Basin
1034	2	4.3	Low	Low	High	Tailings Basin
1035	2	3.4	Low	Low	High	Tailings Basin
1037	2	5.6	Low	Low	High	Tailings Basin
1039	2	24.8	High	Medium	High	Tailings Basin
1044	2	0.2	Medium	Medium	High	Tailings Basin
1046	2	1.3	Low	Low	High	Tailings Basin
1047	2	0.4	Low	Low	High	Tailings Basin
1055	2	<0.1	High	High	Low	None
1057	2	0.7	High	High	Low	None
1059	2	<0.1	High	High	Low	None
1060	2	0.1	High	High	Medium	Tailings Dam
438	3	9.8	Low	Low	High	Tailings Basin/ATV
475	3	0.4	High	Medium	Medium	Tailings Dam
519	3	3.0	Medium	Low	High	Tailings Basin
545	3	1.9	Medium	Medium	High	Tailings Basin
651	3	2.4	Medium	Low	High	Tailings Basin
678	3	8.1	Medium	Low	High	Tailings Basin
689	3	3.4	Medium	Low	High	Tailings Basin
744	3	13.1	Low	Low	High	Tailings Basin
771	3	0.2	Low	Low	High	Tailings Basin
782	3	8.6	Medium	Medium	High	Tailings Basin
787	3	2.9	Low	Medium	High	Tailings Basin
794	3	1.3	High	High	Medium	Tailings Basin
797	3	1.3	Medium	Medium	Medium	Tailings Basin
798	3	0.4	High	Medium	Medium	Tailings Basin
805	3	3.1	High	High	Low	None
817	3	0.4	Medium	Medium	High	Tailings Basin
834	3	22.9	High	High	Low	Tailings Dam
838	3	0.2	High	High	Low	None
844	3	2.3	High	High	Low	Tailings Dam
983	3	2.4	Low	Low	High	Tailings Basin
1038	3	0.8	Low	Medium	Low	Tailings Dam
1048	3	0.1	Medium	Medium	Medium	Tailings Dam
1052	3	3.0	Medium	Medium	High	Tailings Basin
1061	3	0.2	High	High	Medium	Tailings Dam
1062	3	0.1	Medium	Medium	Medium	Tailings Dam
445	4	1.2	Medium	Medium	Medium	Excavation/ Tailings Dam
488	4	5.1	Medium	Medium	High	Tailings Basin

Wetland ID	Dominant Circular 39 Type	Impact Area [(1)] (acres)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
831	4	0.1	Medium	Medium	Medium	Tailings Dam
773	5	3.3	High	High	Low	None
779	5	50.8	High	High	Medium	Tailings Dam
784	5	69.2	Medium	Medium	High	Tailings Basin
634	6	6.5	High	High	Medium	Impounded
855	6	1.3	High	High	Low	None
982	6	93.4	Medium	Medium	High	Tailings Basin
985	6	0.7	Medium	Medium	High	Tailings Basin
823	7	0.2	Medium	Medium	Medium	Tailings Dam
849	7	1.8	High	High	Low	Tailings Dam
1056	7	1.3	High	High	Low	None
847	8	1.2	High	High	Low	Tailings Dam

TABLE 4.1.7B TAILINGS BASIN AREA SUMMARY

Total # of Wetlands	Impact Area (acres) [(1)]	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Wetland Quality
57	**395.0**	High **30**	High **20**	High **18**
		Medium **14**	Medium **21**	Medium **20**
		Low **13**	Low **16**	Low **19**

[(1)] The Impact Area includes all of the wetland basin areas located within the boundary line defining the tailings basin area (i.e., it assumes that all wetlands within the boundary would be impacted).

Alternative Tailings Basin Area

The Alternative Tailings Basin impact area encompasses approximately 1,118 acres. A total of 31 wetland areas covering approximately 177 acres were identified, delineated, and characterized within the Alternative Tailings Basin. Tables 4.1.8A and B summarize the wetland resources within the Alternative Tailings Basin and Figure 4.1.7 shows the wetland basins within the impact area. Nearly 90 percent of the wetland area in the Alternative Tailings Basin is represented by wetlands rated high quality overall. The majority of the wetlands in the Alternative Tailings Basin area are located in the Sucker Brook headwaters drainageway and other headwater tributaries to Sucker Brook, and are important for maintaining the integrity of the Sucker Brook ecosystem. The Alternative Tailings Basin is located in an area that has seen relatively little human disturbance, other than occasional logging and, therefore, the wetlands are generally high quality. Section 4.1.2.2 provides additional discussion of the type and quality of wetlands within the Alternative Tailings Basin impact area.

TABLE 4.1.8A WETLAND RESOURCES: ALTERNATIVE TAILINGS BASIN AREA

Wetland ID	Dominant Circular 39 Type	Impact Area [1] (acres)	Vegetative Diversity/ Integrity	Overall Wetland Quality	Existing Disturbance Level	Existing Disturbance Type
1051	N.A.	0.2	No Data	No Data	No Data	
11	2	0.3	High	High	Low	Forest Harvest
18	2	0.7	High	High	Low	Forest Harvest
24	2	0.8	High	High	Low	Forest Harvest
26	2	5.7	High	High	Low	Forest Harvest
31	**2**	**20.5**	**High**	**High**	**Low**	**None**
32	2	1.4	High	High	Low	None
1040	2	0.4	High	Medium	Medium	Impounded
1050	2	0.2	High	High	Low	None
10	5	0.1	Medium	Medium	High	Excavation/Forest Harvest
8	6	2.1	High	High	Low	Forest Harvest
33	**6**	**22.9**	**High**	**Medium**	**Low**	**Forest Harvest**
35	6	1.0	High	High	Low	Forest Harvest
42	**6**	**13.2**	**High**	**High**	**Low**	**Forest Harvest**
43	**6**	**32.9**	**High**	**High**	**Low**	**Forest Harvest**
1010	6	4.6	High	High	Low	None
1029	6	0.5	High	High	Low	Forest Harvest
1030	6	0.7	High	Medium	Medium	Tailings Basin
4	7	0.8	High	High	Low	Forest Harvest
30	7	0.5	High	High	Low	None
37	7	13.8	High	High	Low	Forest Harvest
44	7	7.7	High	High	Low	Forest Harvest
45	7	22.9	High	High	Low	Forest Harvest
46	7	10.1	High	High	Low	Forest Harvest
1021	7	1.2	High	High	Low	Forest Harvest
1041	7	1.0	High	High	Low	Road Adjacent
1043	7	1.5	High	High	Low	Forest Harvest
16	8	5.2	High	High	Low	Forest Harvest
34	8	1.2	High	High	Low	Forest Harvest
1027	8	1.7	High	High	Low	Forest Harvest
1028	8	0.9	High	High	Low	Forest Harvest

Note: Basins highlighted in bold type are wetlands associated with a MNDNR Public Water (Sucker Brook).

TABLE 4.1.8B ALTERNATIVE TAILINGS BASIN AREA

Total # of Wetlands	Impact Area (acres) (1)	Existing Disturbance Level	Vegetative Diversity/ Integrity	Overall Wetland Quality
31	**176.8**	High **1**	High **29**	High **26**
		Medium **2**	Medium **1**	Medium **4**
		Low **27**	Low **0**	Low **0**
		No Rank **1**	No Rank **1**	No Rank **1**

(1) The Impact Area includes all of the wetland basin areas located within the boundary line defining the Alternative Tailings Basin Area (i.e., it assumes that all wetlands within the boundary would be impacted).

4.1.1.6 Regulatory Framework

Wetlands are protected under state and federal laws, including the Minnesota Wetland Conservation Act (WCA) and the Federal Clean Water Act, Section 404. In addition, some wetlands are also designated as Minnesota Public Waters and subject to the Public Waters Work Permit Rules (Minnesota Rules 6115) administered by MNDNR.

Both the state and federal wetland regulations require that a permit be issued by the regulatory agency for wetland impacts (as defined by the respective regulations). The USACE is the permitting authority for federal Section 404 permits and, for the Minnesota Steel project, the MNDNR Division of Lands and Minerals administers the WCA permit process as part of the Permit to Mine (see Minnesota Rules, part 8420.0300). Both permit processes require documentation of existing conditions and proposed impacts (including delineation and functional assessment analyses) and documentation of project 'sequencing' (i.e., wetland impact avoidance and minimization efforts, as well as proposed mitigation for unavoidable impacts).

Although permits are required by the state and federal agencies, the permitting processes differ with respect to the definition of wetlands/waters that are regulated in each process. The USACE has regulatory authority over "waters of the U.S.," which includes jurisdictional wetlands and 'deepwater habitats' (i.e., water bodies greater than 2 meters deep, which are not defined as 'wetlands,' such as the deep water mine pits on the Minnesota Steel site), regardless of how the water bodies were created. However, wetlands and other water bodies that are 'isolated' (i.e., those that do not have a surface water connection to a tributary system to a navigable water of the U.S. or a sufficient connection to interstate commerce other than their use by migratory birds) are not regulated under Section 404 of the Clean Water Act (SWANCC decision of 2001). In contrast, the WCA regulations include 'isolated' wetlands, but do not include regulation of 'incidental' wetlands (i.e., if the wetland 'was created solely by actions, the purpose of which was not to create the wetland') such as the wetlands created at the former tailings basin locations. Thus, most, if not all, of the wetlands and other water bodies on the Minnesota Steel proposed project site would be regulated through either the Clean Water Act or the WCA.

In addition to regulation under WCA, some wetlands and waterbodies are regulated by the MNDNR if they are listed on its Public Waters Inventory (PWI) described in Minnesota Statute 103G.005. The PWI specifies two categories of waters, "Public Waters" and "Public Waters Wetlands." There are two designated Public Waters within the Proposed Project Impact Area; the Sucker Brook channel, located within the Alternative Tailings Basin impact area, and Pickerel Creek, which would be crossed by the tailings pipeline. The wetland basins associated with

Sucker Brook have been identified in bold typeface in the wetland summary Tables 4.1.8A and B. No wetland impacts are expected to occur at the Pickerel Creek crossing, since the pipeline should be able to span over the creek, avoiding impacts. There is also a Public Waters Wetland (MNDNR No. 31-105P) located west of Stockpile Area B. This wetland would not be directly impacted by the Proposed Action. Impacts to waters with the Public Water designation requires additional review and permitting by MNDNR Division of Waters staff. All MNDNR Public Waters within the project area are listed in Section 6.5.

4.1.2 Environmental Consequences

This section describes estimated wetland impacts for the alternatives studied in the EIS. Development of the EIS alternative concepts included efforts to avoid and minimize wetland impacts where feasible and/or practical. Avoidance/minimization considerations during development of the Proposed Action concept were summarized in Section 4.0 (Alternatives Analysis) of the June 2005 Wetland Permit Application for the Minnesota Steel project (see Appendix G). Development of EIS alternatives in addition to the Proposed Action performed as part of the EIS studies, including efforts to avoid/minimize wetland impacts, are described in Chapter 3.0 of this EIS. Additional information on avoidance/minimization efforts for each of the EIS alternative impact areas, as well as a summary of anticipated wetland impacts, is provided in the sections that follow.

Table 4.1.9 compares the total wetland impacts by wetland type (Circular 39 Classification) for the Proposed Action and other sub-alternatives analyzed in the EIS. The estimated area of wetland impacts in this table (and in the tables for each sub-area impacts described in the sections that follow) assume that all wetlands within the yellow boundary defining each impact sub-area (e.g., plant area, stockpile area, etc. shown in Figure 4.1.1) would be directly impacted. This 'worst case' assumption was used in assessing impacts for the EIS, since detailed, final layouts within each impact sub-area have not been developed. However, it may be possible to avoid or minimize wetland impacts as plans are developed in the future. For example, if in-pit stockpiling was found, in the future, to be feasible, wetland impacts at the stockpile area could be reduced (see Section 4.1.2.4).

Based on this 'full impact' assumption for each impact area, the summary table indicates that the Proposed Action results in an estimated 765 acres of direct wetland impacts plus 398 acres of deep water impacts. These impacts have been reduced from the 829 acres of direct wetland impacts estimated in Minnesota Steel's original (January 2005) Wetland Permit Application submittal for this project.

The sections that follow describe the anticipated project impacts for individual impact areas and alternatives, provide additional information on avoidance and minimization, describe potential indirect wetland impacts (Section 4.1.2.8) and describe proposed mitigation for unavoidable wetland impacts (Section 4.1.3).

4.1.2.1 No Build Alternative

The No Build alternative would avoid the 765 acres of direct wetland impacts and 398 acres of deep water area impacts associated with the Proposed Action. However the No Build alternative does not meet the defined project purpose and need.

4.1.2.2 Proposed Action

The Proposed Action includes direct impacts at the mine, plant, stockpile, water conveyance/supply and tailings basin sub-areas, described individually below. The direct impacts estimate assumes that all of the wetland areas within the designated Proposed Project Impact Areas would be impacted by filling or other activities that would result in loss of wetlands and/or wetland functions.

Mine Area Wetland Impacts

Figure 4.1.2 shows the locations of the 35 wetlands (32 acres total area) within the proposed mining impact area and the deep water areas within the direct mine impact area (204 acres, designated as wetland numbers 691, 330 and 529 in the wetland delineation). The deep water mine pits would be dewatered and the few wetlands within the pit impact area would be eliminated as overburden is removed during the mining process. Table 4.1.9 lists the mine area wetland impact areas by wetland type and lists deep water area impacts. When mining operations cease, all of the mine pits (including enlarged Pits 5 and 6) would be allowed to refill with water.

The most common wetland type affected by the proposed expansion of the mine areas is shallow-open water wetlands (Type 5) that make up approximately one-third of the wetland area (Table 4.1.9). This wetland type is dominated by pondweeds (*Potamogeton spp.*), wild celery (*Vallisneria americana*) and lesser duckweed (*Lemna minor*). The three wetlands that account for the entire shallow-open water wetland community within the proposed mine expansion area appear to have been previously excavated.

Alder thickets and shrub carr (Type 6) and wet and sedge meadow (Type 2) and wetlands make up about one-quarter and one-fifth of the projected wetland impacts in the mine area, respectively (Table 4.1.9). The Type 2 wetlands are generally dominated by sedges (*Carex sp.*), Canada bluejoint grass (*Calamagrostis canadensis*), and reed canary grass (*Phalaris arundinacea*). The greatest number of a single wetland type within the mine area is ten, small forested swamps (Type 7), totaling 3.2 acres in area. There are no bogs within the mine area.

A total of 6 of the 35 wetlands comprising 8 acres of the 32 acres of wetlands within the mine impact area are artificial wetlands that have developed as a result of mining, excavation, or impoundment (see Table 4.1.3A). The 204 acres of deep water are also artificially formed in former mine pits. Due to their artificial nature, the majority of the wetland and deep water areas within the mine site are rated low quality overall. These low quality wetland and deep water areas include 208 acres or 88 percent of the projected mine area impacts. Nearly 10 percent of the wetlands are rated medium quality overall which corresponds closely to the natural wetlands. The remaining 6 wetlands, which make up only 5 acres of the wetland area are rated high quality overall.

Mine Area Wetland Avoidance & Minimization

Since the location of taconite ore deposits pre-determines where mining is feasible, relocation options to avoid/minimize wetland impacts in the mine area are minimal compared to other components of the Proposed Action. For this reason, no avoidance alternatives were considered for the mine area. The Alternatives Analysis included in Section 4.0 of the June 2005 Wetland Permit Application for Minnesota Steel (see Appendix G) provides additional details on the location limitations for mine pits.

TABLE 4.1.9 SUMMARY OF WETLAND IMPACTS

Project Area		Circular 39 Type									Wetland Total	Deep Water Total	Total Impact
		0 (2)	1	2	3	4	5	6	7	8			
Mine Area	(acres)		1.6	5.5	0.4	2.8	11.7	6.5	3.2	0.0	31.6	204.3	235.9
	% of impact area (1)		5.0%	17.4%	1.3%	8.8%	36.9%	20.5%	10.0%	0.0%	13.4%	86.6%	
	# wetlands		4	3	5	5	3	5	10	0	35	3	38
Plant Area	(acres)		0.2	24.1	0.0	17.5	0.7	56.8	8.8	0.0	108.2	0.0	108.2
	% of impact area (1)		0.2%	22.3%	0.0%	16.2%	0.7%	52.5%	8.1%	0.0%	100.0%	0.0%	
	# wetlands		1	13	0	2	1	9	4	0	30	0	30
Stockpile Area	(acres)		8.7	11.2	0.7	38.9	73.3	65.9	15.1	0.0	213.8	0.0	213.8
	% of impact area (1)		4.1%	5.2%	0.3%	18.2%	34.3%	30.8%	7.1%	0.0%	100.0%	0.0%	
	# wetlands		5	5	2	5	2	17	5	0	41	0	41
Tailings Basin Pipeline, Storm Water and Water Supply	(acres)		0.0	0.1	0.0	0.6	13.2	0.7	1.7	0.0	16.3	193.9	210.2
	% of impact area (1)		0.0%	0.7%	0.0%	3.6%	80.8%	4.3%	10.6%	0.0%	7.7%	92.3%	
	# wetlands		0	1	0	1	1	4	3	0	10	3	13
Proposed Tailings Basin	(acres)		0.0	66.8	92.3	6.3	123.2	101.8	3.3	1.2	395.0	0.0	395.0
	% of impact area (1)		0.0%	16.9%	23.4%	1.6%	31.2%	25.8%	0.8%	0.3%	100.0%	0.0%	
	# wetlands		0	18	25	3	3	4	3	1	57	0	57
Total with Proposed Tailings Basin	(acres)		10.5	107.7	93.4	66.1	222.1	231.8	32.1	1.2	764.9	398.2	1163.1
	% of impact area (1)		1.4%	14.1%	12.2%	8.6%	29.0%	30.3%	4.2%	0.2%	65.8%	34.2%	
	# wetlands		10	40	32	16	10	39	25	1	173	5	178
Alternative Tailings Basin	(acres)	0.2	0.0	30.1	0.0	0.0	0.1	77.9	59.5	9.0	176.8	0.0	176.8
	% of impact area (1)	0.1%	0.0%	17.0%	0.0%	0.0%	0.1%	44.1%	33.7%	5.1%	100.0%	0.0%	
	# wetlands	1	0	8	0	0	1	8	9	4	31	0	31
Total with Alternative Tailings Basin (3)	(acres)	0.2	10.5	71.0	1.1	59.7	99.0	207.8	88.3	9.0	546.7	398.2	944.9
	% of impact area (1)	0.0%	1.9%	13.0%	0.2%	10.9%	18.1%	38.0%	16.1%	1.6%	57.9%	42.1%	
	# wetlands	1	11	30	7	13	8	43	31	4	148	5	153
In-pit Stockpiling	(acres)		4.0	11.1	0.7	35.6	22.4	51.7	12.1	0.0	137.6	0.04	137.6
	% of impact area (1)		2.9%	8.1%	0.5%	25.9%	16.3%	37.6%	8.8%	0.0%	100.0%	0.0%	
	# wetlands		6	5	2	4	2	15	4	0	38	1	39
Total with In-pit Stockpiling (4)	(acres)	0.0	5.8	107.6	93.4	62.8	171.2	217.6	29.1	1.2	688.7	398.2	1086.9
	% of impact area (1)	0.0%	0.8%	15.6%	13.6%	9.1%	24.9%	31.6%	4.2%	0.2%	63.4%	36.6%	
	# wetlands	0	11	40	32	15	10	37	24	1	170	7	176

(1) Percent of impact area calculation for wetland Types 0 - 8 is based on Total Wetland area; percent of impact area calculation for Total Wetlands and Deep Water Areas are based on Total Impact area (Wetland + Deep Water)
(2) 'Type 0' wetland is a wetland basin identified on an aerial photographs, but that has not been field verified for Circular 39 classification.
(3) Total with Alternative Tailings Basin excludes the Proposed Tailings Basin wetland impact areas.
(4) Total with In-Pit Stockpiling excludes the Stockpile Area wetland impacts areas, and assumes the Proposed Tailings Basin (not the Alternative Tailings Basin)

Plant Area Wetland Impacts

In the plant facilities area, which includes the plant facility, the crusher/concentrator and the rail connection between them, a total of 30 wetlands encompassing an area of 108 acres would be impacted by the Proposed Action (see Figure 4.1.3). The impacts, by wetland type, are listed in Table 4.1.9. Approximately 12 percent of the wetland acreage within the plant area is artificial or established as a result of past mining activities, as described in Section 4.1.1.5.

More than one-half of the wetland acreage located within the plant site is Type 6, alder thicket and shrub carr wetlands. Type 2, wet meadow wetlands make up nearly one-quarter of the wetland area. The Type 2 wetlands are typically dominated by Canada blue-joint grass and the Type 6 wetlands are typically dominated by speckled alder, willow, and Canada blue-joint grass. Type 4, deep marshes comprise about 16 percent of the wetland area within the plant site. The Type 4 wetlands are typically dominated by cattails, bur-reed, bulrushes, and various submergent vegetation. There are also some Type 7, forested wetlands present within the plant site, however, they only make up 8 percent of the wetland area. The dominant vegetation types in these Type 7 wetlands typically includes speckled alder, Canada blue-joint grass, willow, and black ash.

Only 1 of the 31 wetlands, comprising 13.3 acres in the plant site was determined to be an artificial wetland having developed on the Patrick B Tailings Basin (Table 4.1.4A). Approximately 90 percent of the wetland area (97 acres) within the plant site is rated medium for overall quality with the remaining wetland area rated high quality. The large wetland complex that comprises the majority of the wetlands in the plant site is bounded by stockpiles along the south side and recently logged slopes along the north side. These disturbances have contributed to the medium quality of the wetlands along with moderate quality vegetative diversity within the majority of the wetlands.

Plant Area Wetland Avoidance and Minimization Efforts

The discussion of Alternatives Analysis included in Section 4.0 of the June 2005 Wetland Permit Application for Minnesota Steel (see Appendix G) provides additional details on the factors that must be considered in locating and configuring the plant facility site, and the alternatives that were considered in the development of the Proposed Action plant facility site. Section 3.3.3.1 of this EIS describes the development of alternative layout/site locations assessed as part of the EIS studies, including the consideration of avoiding/minimizing wetland impacts in the alternatives development process.

Stockpile Area Wetland Impacts

A total of 41 wetlands covering 214 acres would be impacted within the stockpile impact area (see Table 4.1.5A and Figure 4.1.4). Approximately 70 percent of the wetland acreage within the stockpile area is artificial, primarily wetlands formed within the former Patrick B Tailings Basin. Many of the wetlands appear to have formed after the former tailings basin, stockpile, and settling basins were decommissioned.

The predominant wetland types within the proposed stockpile area are shallow, open water (Type 5) and shrub carr (Type 6) wetlands making up about one-third of the total wetland area each (see Table 4.1.9). These wetlands are dominated by pondweeds, wild celery, lesser duckweed, Canada blue-joint grass, speckled alder, and balsam poplar.

Approximately 18 percent of the wetland area in the proposed stockpile site is classified as Type 4, deep marsh wetland and 5 percent each are classified as Type 1, seasonally flooded wetland, and Type 2, wet meadow wetland.

The vegetative diversity/integrity within the primarily artificial wetlands has developed to moderate quality in most wetlands with a few wetlands rated high. There are considerable areas of surrounding upland with little vegetative cover and significant recreational vehicle activities within the basin. These conditions limit wildlife functions within the area and likely degrade the water quality of the wetlands.

Stockpile Area Wetland Avoidance and Minimization Efforts

The discussion of Alternatives Analysis included in Section 4.0 of the June 2005 Wetland Permit Application for Minnesota Steel (see Appendix G) provides additional details on the factors that must be considered in locating and configuring mine overburden/waste stockpiles, and the alternatives that were considered in the development of the Proposed Action stockpile configurations. Section 3.3.3.2 of this EIS describes the development of alternative layout/site locations for stockpiles assessed as part of the EIS studies, including the consideration of avoiding/minimizing wetland impacts in the alternatives development process. The potential reduction in wetland impacts that may be gained if the In-pit Stockpiling Alternative is used are described in Section 4.1.2.4.

Water Conveyance/Supply Area Impacts

A total of 10 wetlands covering approximately 16 acres would be impacted within the proposed water conveyance/supply areas (see Figure 4.1.5 and Tables 4.1.6A and B). Two deep water former mine pits (including the Anne Mine Pit) totaling approximately 12 acres would be directly impacted by the proposed water supply basins located southeast of the plant area. In addition, approximately 182 acres of the 434 acres of deep water within Pits 1 & 2 would be affected by changing water levels associated with their proposed use as a water storage/supply source (as discussed in Section 4.2). The 182 acre impact area was determined by estimating the water surface area that would be lost when the pit water elevation is at the lowest predicted point (1,255 feet MSL) under drought climatic conditions. Under normal rainfall conditions, the total Pit 1&2 impact area would be 145 acres.

Type 5, shallow open water communities make up over 80 percent of the wetland acreage within the water conveyance/supply areas. Type 7 wooded swamps make up approximately 10 percent and Type 4 (shallow water) and Type 6 (shrub carr and alder thickets) make up less than 5 percent each. As noted previously, some of these areas have been disturbed previously by mining-related activities, including stockpiling and roads. Most of the wetlands/deep water areas were created or expanded due to water flowing into former mine pits or by flooding due to re-routing or blockage of surface water flows. However, even though the majority of the wetlands have been disturbed or altered by changes in water flow, they are still primarily of medium vegetative diversity and quality, with some being ranked as high (see Table 4.1.6B).

Water Conveyance/Supply Area Wetland Avoidance and Minimization Efforts

Wetland avoidance/minimization was taken into account when defining the proposed tailings and reclaim water pipeline routes, resulting in minimal wetland impacts (0.8 acre) along the corridor. Avoiding wetland impacts in the storm water/ water supply areas is more difficult, since the best-suited locations are low-lying areas. However, the ponding areas are primarily proposed within wetland areas that had been previously affected by flooding. Similarly, the impacts to the deep water areas were difficult to avoid, since the water-filled pits are logical locations for water storage.

Proposed Project Tailings Basin Impacts

A total of 57 wetlands covering approximately 395 acres would be impacted within the proposed tailings basin (Figure 4.1.6, Table 4.1.7A). Table 4.1.9 lists the wetland impacts by type in this area. Nearly 70 percent of the wetlands in the proposed tailings basin area are artificial wetlands area that have developed on the reclaimed Butler tailings basin. The additional wetland areas are largely associated with wetlands in the former Butler water reclaim area and natural wetlands located just outside of the primary dikes of the former tailings basin.

Type 5, shallow, open water communities make up about one-third of the wetland acreage within the proposed tailings basin and reclaim pond. The shallow, open water communities are typically dominated by submergent vegetation, or are generally void of emergent vegetation with some cattails around the perimeter. The next most abundant wetland types are Type 6, shrub carrs and alder thickets, which comprise 26 percent of the wetland acreage and Type 3 shallow marsh wetlands comprising nearly 24 percent of the wetland area (see Table 4.1.9). The Type 6 wetlands are typically dominated by speckled alder and willow (*Salix sp.*), with balsam poplar, quaking aspen (*Populus tremuloides*), and some grasses and forbs also present but typically not dominant. The predominant vegetation in the shallow marsh wetlands is cattail (*Typha sp.*) with softstem bulrush (*Scirpus validus*), lake sedge (*Carex lacustris*), and horsetail (*Equisetum sp.*) also present occasionally as dominant species. Type 2 wet meadow wetlands make up about 17 percent of the total tailings basin wetland area. The majority of the wet meadow wetlands are dominated by the invasive species reed canary grass and giant reed grass (*Phragmites australis*). However, there are several Type 2 wetlands that are dominated by sedges and Canada bluejoint grass with a variety of forbs present. Wetland 1039 is worth noting as it is an artificial wetland that has developed into a sedge meadow with high vegetative diversity/integrity.

Over one-half of the wetlands identified in the Proposed Project tailings basin area (30) were determined to be artificial wetlands that have developed since the basin was shut down and reclaimed, starting in about 1985. The wetlands have typically developed on flatter areas of the tailings surface. The larger waterbodies within the basin were artificially impounded by the Butler starter dikes and dams. Approximately 90 percent of the proposed tailings basin area was previously used for tailings deposition, stockpiling, or water clarification/storage. The natural wetlands typically lie outside of the existing dike system and make up about 31 percent of the wetland area (121 acres) within the current proposed basin outline. Many of those have been impacted to some degree by the adjacent dikes. Due to their artificial nature, the majority of the wetlands within the tailings basin are rated low or medium quality overall including 39 wetlands total (see Table 4.1.7A). However, based on wetland area, 54 percent of the wetland area is rated medium quality and 17 percent is rated low quality. The remaining 29 percent of the wetland area is rated high quality.

There are two major factors which contribute to the degraded nature of the wetlands; 1) lack of vegetation, and 2) human recreation. Numerous areas of the tailings basin have sparse vegetative cover which results in erosion and sedimentation. These areas also provide little protective cover for nesting or traveling animals. The tailings basin appears to be a popular local all-terrain vehicle (ATV) recreation area. All of the perimeter and interior dikes are well traveled and there appears to be considerable exploration throughout the wetlands and other areas of the basin by ATVs. This recreational activity has caused damage to vegetation and soils and the frequent activity appears to diminish the use of the area by wildlife.

Proposed Project Tailings Basin Area Wetland Avoidance and Minimization Efforts

The proposed use of the former Butler Stage I Tailings Basin area reduces impacts to natural wetlands by conducting mining activities on previously disturbed land. Wetland impacts have also been reduced from earlier project concepts, since use of the Stage II tailings basin has been eliminated from consideration in conjunction with the Proposed Action.

The discussion of Alternatives Analysis included in Section 4.0 of the June 2005 Wetland Permit Application for Minnesota Steel (see Appendix G) provides additional details on the factors that must be considered in locating and configuring tailing basins, and the alternatives that were considered in the development of the Proposed Action tailings basin concept. Section 3.3 of this EIS describes the development of the Alternative Tailings Basin assessed as part of the EIS studies, including the consideration of avoiding/minimizing wetland impacts in the alternative refinement process, and Section 4.1.2.3 describes wetland impacts associated with the Alternative Tailings Basin concept.

4.1.2.3 Alternative Tailings Basin Impacts

A total of 31 wetland areas covering approximately 177 acres (see Table 4.1.8A and Figure 4.1.7) would be impacted if the Alternative Tailings Basin alternative was incorporated into the Proposed Action, instead of the Proposed Project tailing basin.

Nearly three-fourths of the Alternative Tailings Basin wetland area is comprised of Type 7, coniferous and hardwood swamps and Type 6, alder thickets and shrub carrs (Table 4.1.9). Forested swamps make up approximately one-third of the wetland area and shrub swamps make up about 45 percent of the wetland area. Approximately one-fifth of the wetland area is comprised of Type 2 sedge and wet meadow wetlands with shallow marsh as an occasional component. The forested wetlands are typically dominated by black ash (*Fraxinus nigra*), tamarack (*Larix laricina*), black spruce (*Picea mariana*), balsam fir (*Abies balsamifera*), mountain maple (*Acer spicatum*), ferns and various forbs with marsh marigold (*Caltha palustris*) and impatiens (*Impatiens capensis*) being the most common. Speckled alder, willow, Canada blue-joint grass, manna grass (*Glyceria sp.*), and various forbs were common in the shrub swamps. The dominant vegetation in the wet/sedge meadow wetlands typically includes; sedges, Canada blue-joint grass, meadowsweet, wool grass (*Scirpus cyperinus*), manna grass, with bur-reed (*Sparganium sp.*) in the wetter Type 3 areas. Type 8 bog wetlands were identified, covering 9 acres or approximately 5 percent of the wetland area within the Alternative Tailings Basin (see Table 4.1.9).

Only 1 of the 31 wetlands within the Alternative Tailings Basin was determined to be an artificial wetland. Wetland 10, located in the northeast of the basin, appears to have been excavated in an upland area. There has been little human disturbance or permanent alteration to the landscape within the Alternative Tailings Basin. The primary disturbances include several gravel access roads and recent logging of much of the upland areas. Due to the lack of disturbance, nearly all of the wetland areas are rated high for functional quality including almost 90 percent of the wetland area and 26 of the 31 wetlands delineated. The other wetland areas are rated medium for overall quality. The overall quality of the wetlands has diminished slightly due to the recent logging, but that appears to be a temporary condition that would improve with time.

Alternative Tailings Basin Area Wetland Avoidance and Minimization Efforts

The Alternative Tailings Basin concept is identified in the Final SDD for analysis in the EIS as a concept that may reduce wetland impacts, compared to the Proposed Project tailings basin. During the EIS study process, additional configurations were considered for the Alternative Tailings Basin, as described in Section 3.2.2. The resulting Alternative Tailings Basin configuration analyzed in the Draft EIS reduced wetland impacts from 39 basins affecting 213 acres (in the scoping concept) to 31 basins affecting 177 acres.

Table 4.1.9 shows the difference in overall wetland area impacts between the two tailings basin alternatives (218 acres less wetland area is impacted by the Alternative Tailing Basin compared to the Proposed Project tailings basin). However, wetland impacts within the Alternative Tailings Basin area would affect more natural wetlands with higher quality ratings in MNRAM than the Proposed Project tailings basin alternative (see Section 4.1.2.7). The wetlands in the Alternative Tailings Basin area are associated with the Sucker Brook drainageway and other tributaries to Sucker Brook.

4.1.2.4 In-Pit Stockpiling Alternative

Section 3.3.3.2 discusses the EIS study efforts to develop and evaluate alternative stockpiling concepts to avoid/minimize wetland impacts, with the resulting determination to study an In-Pit Stockpiling concept in the EIS. The details of the concept – and the potential practical limitations to implementing in-pit stockpiling – are described in Section 3.3.3.2. Figure 4.1.8 shows the wetland impact areas resulting from this alternative concept, resulting in approximately 138 acres of wetland impacts at 38 basins, compared to 214 acres at 41 basins for the Proposed Action stockpiling concept (see Figure 4.1.4). Table 4.1.9 summarizes the impacts by wetland type, as well as the total wetland impacts, for the Proposed Action and the In-Pit Stockpiling Alternative.

In addition to reducing overall impacts to wetlands, the In-Pit Stockpiling Alternative could potentially create lacustrine wetland areas within the mine pits, if stockpiled within the pits to an elevation that would create 6.6 feet (2 meters) deep [i.e., Type 5 wetland] or shallower water areas when the pits refill. Preliminary estimates indicate that approximately 190 acres of shallow lacustrine wetland areas could be created with in-pit stockpiling.

4.1.2.5 Plant Siting Alternatives

Section 3.3.3.1 discusses the EIS study efforts to develop and evaluate alternative plant site concepts to avoid/minimize wetland impacts, and why this process did not result in identification of any feasible and/or practicable alternatives to the Proposed Project concept.

4.1.2.6 Technology Alternatives

Section 3.3.2 discusses considerations given to technology alternatives in the development of the Proposed Project concept. However, none of the alternative technologies considered for processing would change the area of wetland impacts from those identified for the Proposed Action.

4.1.2.7 Wetland Quality Considerations

Wetland functional quality is a factor to consider when deciding between impacting natural and artificial or 'incidental' wetlands. As described in the previous sections, the 2006 Minnesota Steel delineation report included assessment of the functional quality of each basin, including evaluation of applicable wetland functions and ratings of vegetative diversity/integrity based on guidelines in MN RAM 3.0. All of the high quality wetlands identified in the Minnesota Steel project area – including those in the Alternative Tailings Basin area -- are of natural origin. All of the low quality wetlands are artificial. Medium quality wetlands are a blend of disturbed, natural wetlands and diverse, artificial/ incidental wetlands, see Illustration 4.1.1. Of the 750 acres of wetlands that would be impacted by the proposed Minnesota Steel project, approximately 300 acres are of natural origin, and 170 acres of those are high quality. There are approximately 450 wetland acres of artificial origin, and 70 acres of those are low quality. In addition to the 70 acres of artificial origin wetlands, all of the deep water areas (former mine pits) delineated within the Minnesota Steel project area were ranked as low quality.

Based on these statistics regarding wetland quality, the potential loss of the diversity and quality of wetlands at the Alternative Tailings Basin site should be considered when weighing possible implementation of that alternative against the Proposed Project tailings basin.

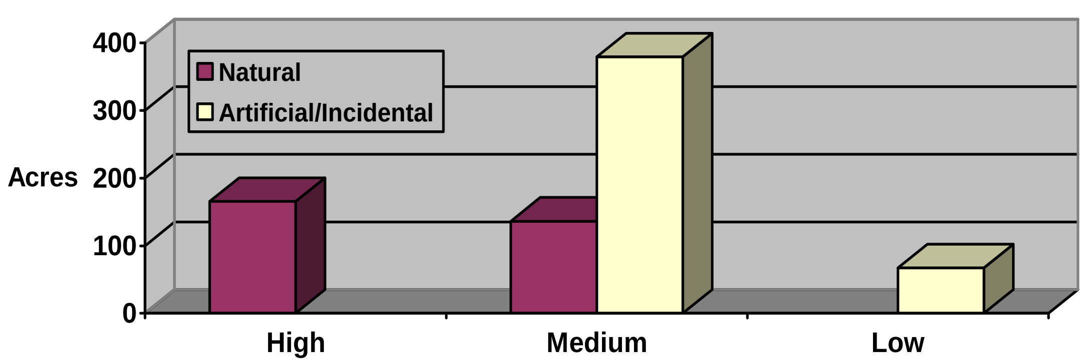

ILLUSTRATION 4.1.1 WETLAND QUALITY BY ORIGIN

4.1.2.8 Indirect Impacts

Indirect wetland impacts could results from changes caused by the Proposed Project that do not occur within the defined Project Impact Areas. They could result from a direct physical alteration that occurs within the Project Impact Area (filling, excavation, etc.) that may indirectly affect wetland characteristics (e.g., vegetation type, wetland functions, etc.) by changing wetland hydrology. Indirect wetland impacts considered in the EIS analyses included the following conditions that could potentially result in indirect impacts to wetland hydrology at wetlands outside of the defined direct Project Impact Areas:

1. Changes in groundwater flow to groundwater-fed wetlands that could result from mine dewatering.
2. Wetland hydrology changes that could result from changes to the surface water flow from the surrounding sub-watershed or water body supplying surface water flow to the wetland.

For each direct Project Impact Area, the potential for indirect hydrologic impacts to wetlands located in the vicinity was assessed. The potential indirect impacts identified are summarized below.

Note that the estimates of potential indirect wetland impacts due to surface water/watershed area changes in this EIS are based solely on potential surface water hydrology changes. Due to limitations in available data on wetland characteristics outside of the Project Impact Area, this impact assessment does not consider whether the hydrology of the wetlands results primarily from groundwater or surface water sources. Since some wetlands may be primarily groundwater fed (experiencing minimal hydrology changes if surface water runoff decreases), this is likely a conservative estimate (i.e., likely an over-estimate) of potential indirect wetland impact areas.

It should also be noted that – depending on how extensive the indirect hydrologic changes are – indirect wetland hydrology impacts may or may not result in a change in wetland type (e.g., conversion from a Type 3 to a Type 2 wetland), a change in wetland vegetation, or other changes in wetland characteristics.

Plant Area

Many of the wetlands in the plant direct impact area are interconnected through surface water flows, so there is a potential for changes to wetland connectivity if surface water flows are disrupted by filling for plant construction. For example, filling could block water flow, resulting in increased water levels in wetlands upstream from the filling and decreasing water supply to wetlands below the fill area. This situation can be avoided through installation of culverts or other means to maintain existing drainage patterns, to avoid impounding water that would affect wetland hydrology and to avoid potential flooding problems. Therefore, indirect impacts to wetlands resulting from flow blockages are expected to be minimal and mitigated through connective conduits.

A decrease in watershed area as a result of plant construction in the headwaters of two streams has the potential to reduce the amount of water supplied to wetlands in the immediate and downstream areas. See Figure 4.1.9 for a map showing estimated direct and indirect wetland impacts for the project. In the Little McCarthy Lake Watershed, the sub-watershed of the wetlands downstream from the plant would receive a 30 percent reduction in area, with 66 percent of its wetlands being directly lost due to plant construction (Table 4.1.10). As a result of this direct impact to wetlands and watershed area, 18 percent of the remaining wetlands could be indirectly impacted. The remaining 16 percent of wetlands in the sub-watershed would not be impacted.

Wetlands in the Little Sucker Watershed would also be directly impacted by the proposed plant and stockpile areas. Two sub-watersheds were analyzed for indirect wetland impacts associated with direct wetland impacts and or watershed reduction. Due to plant and stockpile area impacts, the wetlands in the east sub-watershed would have their contributing area reduced by 51 percent (with an associated direct impact to 67 percent of the wetlands in this area). This decrease could indirectly impact the remaining 33 percent of wetlands in the east sub-watershed. Due to plant and stockpile area impacts, the wetlands in the west sub-watershed would have their contributing area reduced by 13 percent (with an associated direct impact to 1 percent of the wetlands in this area). This decrease could indirectly impact 87 percent of the wetlands in this area, with 11 percent of wetlands remaining un-impacted. The west sub-watershed could be further impacted by the Alternative Tailings Basin with a total watershed area reduction of 22 percent (with an associated direct impact to 2 percent of the wetlands in this area). This could indirectly impact the remaining 98 percent of wetlands in the west sub-watershed.

Mine Area

The proposed mining activities include dewatering Pits 5 and 6, which could indirectly affect wetlands that are hydraulically connected to the pits by artificially lowering the groundwater table. Assessment of the potential effects on adjacent wetlands from dewatering was made based on water levels recorded at shallow monitoring wells installed in 2005 and 2006 at wetlands near the proposed mine pit edges (see locations shown in Figure 4.1.9), and based on discussions with MNDNR staff involved in similar previous mining projects on the Mesabi Iron Range. The data collected in 2005 and 2006 at the monitoring wells does not indicate that there is a groundwater connection between the wetlands and the pits, since the pit water surface elevations are generally below the wetland elevations (i.e., the wetlands appear to be ‘perched’). Additional data would continue to be collected at these wells to provide baseline data for assessing future impacts, but the initial results do not indicate that dewatering impacts to adjacent wetlands are likely. In addition, based on experience at other mines on the Mesabi Iron Range, where wetlands on the rims of mine pits have been observed to maintain their hydrology following pit dewatering, it appears probable that there would not be substantial indirect wetland drainage impacts resulting from mine pit dewatering.

Dewatering of Pits 5 and 6 would necessitate drawdown of Pits 1 & 2, which are hydraulically connected to Pits 5 and 6 (as discussed in Section 4.2). Pits 1 & 2 are deep water areas (under USACE jurisdiction), but are not regulated by Minnesota’s WCA. Additional changes in the surface water elevations of Pits 1& 2 would likely result over time as they are used as ‘reservoirs’ for water supply. The estimated impacts associated with use of Pits 1& 2 for water supply are described in Section 4.1.2.2 (Water Conveyance/Supply Area Impacts) above.

Wetland impacts associated with the mine area would occur in a sub-watershed of the Snowball Lake Watershed. As Pit 6 expands, it would reduce the contributing area of this watershed by 14 percent and directly impact 12 percent of the wetlands in the sub-watershed. This decrease in contributing area could indirectly impact 46 percent of wetlands by reducing available runoff. The remaining 42 percent of wetlands in this sub-watershed would remain un-impacted.

Stockpile Area

Stockpile areas would have surface water runoff collection systems that direct the collected water for use in plant processes, therefore reducing the contributing area to downstream wetlands. A number of the wetlands that could be indirectly affected by changes in surface water supply from stockpile impact areas are included in the shallow monitoring well data collection program initiated in 2005. Collection of data on existing conditions would provide a baseline for assessing if future impacts actually occur to these wetlands from watershed changes.

Wetlands in a sub-watershed of the Swan River Watershed adjacent to the stockpile area would receive direct decreases to both watershed and wetland areas, 29 percent and 15 percent, respectively (Table 4.1.10). Figure 4.1.9 shows the wetlands likely to be indirectly impacted (83 percent of the wetlands in the sub-watershed) as dark blue, while the remaining (2 percent) un-impacted wetlands in the sub-watershed are shown as a lighter shade of blue. While the Swan River Watershed is large (beyond the bounds of the figure), the sub-watersheds shown were chosen to reflect the area that directly contributes runoff to the wetlands. While this small sub-watershed represents a relatively minor contributing area reduction to the Swan River Watershed, it represents a potential for localized indirect impacts to wetlands.

The stockpile area also impacts wetlands in the Sucker Brook Watershed. The sub-watershed immediately impacted by the stockpile area would be reduced by 32 percent with a 10 percent loss of wetlands to direct impacts. This reduction in contributing area could indirectly impact the remaining 90 percent of wetlands by reducing available runoff. The sub-watershed impacted by the stockpile area is part of a larger area analyzed for impacts from the Alternative Tailings Basin (see below). Due to the runoff contributed by the intervening watershed (the stockpile area would reduce this larger sub-watershed by 2 percent), it is assumed that the lower wetlands of this larger sub-watershed would not be impacted by the stockpile area.

Proposed Action Tailings Basin

Proposed Action tailings basin construction would primarily involve placing additional tailings on the former Butler tailing basin area, therefore mostly impacting existing watersheds within the basin. However, expansion of the reclaim pond to the south would directly impact existing wetlands and could have indirect impacts to nearby wetlands. Wetlands that may experience indirect impacts are downgradient from the directly impacted wetlands that would be lost to the reclaim pond as shown in Figure 4.1.9. This area, a sub-watershed of the much larger Swan Lake Watershed, is the direct source of water to the indirectly impacted wetlands and would be reduced by 27 percent with a 62 percent loss of wetlands to direct impacts (Table 4.1.10). This reduction in contributing area could indirectly impact 37 percent of wetlands by reducing available runoff. The remaining 1 percent of wetlands in the sub-watershed would not be impacted by the tailings basin. Also, it should be noted that after mining has ceased and the tailings basin is reclaimed, that the tailings basin area could once again become part of the watershed, and wetlands would eventually re-form in areas of the reclaimed tailings basin.

Alternative Tailings Basin

The Alternative Tailings Basin would remove 1,022 acres of the Sucker Brook watershed and eliminate one of three branches of the stream. This alternative would both directly impact wetlands by fill as well as potentially cause indirect impacts to adjacent wetlands by removing a portion of their contributing watershed area. Figure 4.1.9 shows the Alternative Tailings Basin and the directly and indirectly impacted wetlands in the affected sub-watershed (a part of the larger Sucker Brook Watershed). In addition to the stockpile area impacts mentioned above, the Alternative Tailings Basin would reduce the sub-watershed by 32 percent with a 27 percent loss of wetlands to direct impacts (see Table 4.1.10). This reduction in contributing area could indirectly impact 34 percent of wetlands by reducing available runoff and the remaining 39 percent of wetlands would not be impacted by the Alternative Tailings Basin. Only those wetlands that receive inflow from the tailings basin area were identified as being potentially indirectly impacted. Also, it should be noted that after mining has ceased and the tailings basin is reclaimed, that the tailings basin area could once again become part of the Sucker Brook watershed.

Construction of the Alternative Tailings Basin would also block the northerly drainage of the upper watershed through connected wetlands. This impact could be mitigated by diverting this discharge around the tailings basin to the wetlands just east of the tailings basin boundary.

Cumulatively, the sub-watershed of the Sucker Brook Watershed would be reduced by 1,095 acres from the Alternative Tailings Basin and stockpile area impacts and would directly impact 179 acres of wetland and could indirectly impact 230 acres of wetland due to reductions in the subwatershed supplying water to the wetlands. (It should be noted that some of these wetlands are part of a drainage system fed by watersheds outside of the Alternative Tailings Basin sub-watershed (see Figure 4.1.9), so impacts to these wetlands from the Alternative Tailings Basin may not actually result, since the water from the outside watersheds may be sufficient to maintain the existing hydrology of these wetlands.) The same sub-watershed without the Alternative Tailings Basin impacts would be reduced by 73 acres with a loss of 3 acres of wetlands to direct impacts and potentially 26 acres of wetlands to indirect impacts due to stockpile area impacts.

TABLE 4.1.10 IMPACTS TO WATERSHED AND WETLAND AREAS FROM THE PROPOSED PROJECT

	Watershed Area (acres)[1]		Wetland Area (acres)[1]			
	Total	Reduction	Total	Direct Impact	Indirect Hydrologic Impact[2]	Un-Impacted
Little McCarthy Lake Watershed						
Plant Area Impacts	535	160 (30%)	61	40 (66%)	11 (18%)	10 (16%)
Little Sucker Subwatershed – East						
Plant Area Impacts	444	228 (51%)	93	62 (67%)	31 (33%)	0 (0%)
Little Sucker Subwatershed – West						
Plant Area/Stockpile Area Impacts	470	59 (13%)	62	1 (1%)	54 (87%)	7 (11%)
Plant Area/Stockpile Area Impacts with Alternative Tailings Basin Impacts	470	103 (22%)	62	1 (2%)	61 (98%)	0 (0%)
Sucker Brook Subwatershed						
Stockpile Area Impacts	227	73 (32%)	29	3 (10%)	26 (90%)	0 (0%)
Stockpile Area Impacts with Alternative Tailings Basin	3378	1095 (32%)	670	179 (27%)	230 (34%)	261 (39%)
Swan River Subwatershed-North						
Stockpile Area Impacts	462	132 (29%)	156	24 (15%)	130 (83%)	2 (2%)
Snowball Lake Watershed						
Mine Area Impacts	237	33 (14%)	48	6 (12%)	22 (46%)	20 (42%)
Swan Lake Subwatershed-East						
Proposed Action Tailing Basin Impacts	269	74 (27%)	43	27 (62%)	16 (37%)	<1 (1%)

(1) Values in parenthesis are the percentage of the total area.

(2) Indirect wetland hydrologic impact areas estimates include the total wetland area located immediately downstream from the direct project impact areas (see areas indicated on Figure 4.1.9). It should be noted that – depending on how extensive the hydrologic changes are – the potential indirect wetland hydrology impacts may or may not result in a change in wetland type (e.g., conversion from a Type 3 to a Type 2 wetland), a change in wetland vegetation, or other changes in wetland characteristics.

Shaded rows represent estimated changes related to the Proposed Action.

Unshaded rows include the estimated changes including the Alternative Tailings Basin.

4.1.3 Mitigation

4.1.3.1 Mitigation of Direct Project Impacts

After taking the necessary steps to avoid and minimize adverse wetland impacts, 765 acres of unavoidable direct wetland impacts and 398 acres of impacts to deep water areas have been identified for the Proposed Action. Unavoidable wetland impacts must be mitigated as required by state and federal regulatory requirements. The mitigation ratio (the amount of wetland that must be restored to replace impacted wetlands) is determined in the permitting process to ensure that equivalent amounts of wetland functions and values are replaced. The mitigation ratio is also influenced by a number of other considerations, including: whether mitigation is completed concurrently or prior to wetland impacts, within the same major watershed and of the same wetland type.

Preliminary plans for wetland mitigation have been submitted to the USACE and MNDNR by Minnesota Steel as part of their wetland permit application. The proposed mitigation plan includes off site (pre-impact) and on-site (post-mining) mitigation sites. Appendix H includes copies of the most recent mitigation plan submittals dated November 8, 2006 and December 18, 2006. The plans include: 1) a detailed plan for off-site, pre-impact mitigation for wetland impacts anticipated to occur during the first five years of mining and 2) a description of the conceptual mitigation plan for the total wetland impacts anticipated to occur over the 20-year mining period.

The proposed 5-year wetland mitigation plan includes:

- Restoration of 553 acres of wetland on a wild rice farm near Aitkin (identified as Sites 229 and 248), creating approximately 72 acres of Type 2 wetlands, 92 acres of Type 3 wetlands, 196 acres of Type 4 wetlands, 123 acres of Type 5 wetlands and 69 acres of Type 6 wetlands,
- Wetland restoration focused along the Little Willow River,
- Wetland restoration with sustainable, natural hydrology.

The 20-year concept plan includes the following potential mitigation projects, in addition to the 553 acres of mitigation in the 5-year plan:

- Restoration of 140 acres of drained wetland in Aitkin (Site 1981-NW),
- Restoration and establishment of 150 acres of wetlands on-site during reclamation,
- Establishment of 755 acres of deep water areas in the mine pits following reclamation; and if in-pit stockpiling can be utilized, approximately 190 acres of the mine pits could be restored as Type 3-5 wetlands, and
- Restoration of approximately 130-140 acres of wetlands in the Chippewa National Forest and/or on tribal lands.

4.1.3.2 Mitigation for Indirect Impacts

In areas where surface water drainage patterns may be altered as a result of blockages due to proposed Minnesota Steel project activities, these impacts could be avoided or mitigated through provision of drainage conveyance measures such as ditches or culverts to maintain flows.

As noted in Section 4.1.2.8 above, the estimates of potential indirect wetland impacts due to surface water/watershed area changes in this EIS are based solely on potential surface water hydrology changes. Due to data limitations, the assessment does not consider whether the existing hydrology of the wetlands results primarily from groundwater or surface water sources. This is not a precise estimate, and likely a conservative estimate (i.e., likely an over-estimate), of potential indirect wetland hydrology impact areas. Also, as noted in Section 4.1.2.8, indirect wetland hydrology impacts that occur may or may not result in a change in wetland type (e.g., conversion from a Type 3 to a Type 2 wetland), a change in wetland vegetation, or other changes in wetland characteristics. Therefore, since the extent of potential indirect wetland impacts is not really known, mitigation cannot be defined at this time. In order to get an accurate estimate of indirect wetland impacts, a long-term wetland hydrology monitoring program for wetlands identified as potentially being impacted indirectly could be included as a permitting condition. If monitoring indicates that adverse impacts are, in fact, occurring, these impacts should be permitted and mitigated in accordance with state and federal regulations.

As described in Section 4.1.2.8 above, Minnesota Steel initiated installation of surficial wells in 2005 and 2006 in the vicinity of the proposed mine pits (see Figure 4.1.9) to monitor existing water levels in representative wetlands at locations where indirect wetland impacts from pit dewatering could occur. These data would be used to evaluate the potential for wetland drainage impacts and to provide baseline data for evaluating any future changes, and whether future mitigation measures may need to be implemented. These wells cover the wetlands located south and west of the proposed Stockpile Area B (in Snowball Lake and Sucker Brook watersheds) and the wetlands south of Pit 6 (in the Swan River watershed) (see Figure 4.1.9). Additional wells could be installed to monitor potential indirect impacts to other wetlands in the Little Sucker, Little McCarthy and Swan Lake watersheds.

4.1.3.3 Mitigation for Connected Action Impacts

Possible wetland mitigation for unavoidable wetland impacts resulting from connected actions would be evaluated and proposed by the party responsible for obtaining permits and implementing each planned infrastructure element.

4.2 WATER APPROPRIATION

4.2.1 Water Management and Water Appropriation Overview

The Proposed Project would consume substantial amounts of water. The main consumptive uses include losses to the steel-making process, water that would fill voids in the tailings basin, and seepage through the bottom of the tailings basin to shallow groundwater. In order to conserve water and eliminate discharges of process water, Minnesota Steel has proposed to treat and reuse water from its processing operations (see Section 4.5). Water from tailings basin seeps would also be collected and re-used. Water supply to the project would be derived from surface water runoff from the Project Impact Area; from the watershed for Pits 1 & 2, Pit 5 and Pit 6; and from groundwater that enters these pits through the Biwabik Iron Formation. Illustration 4.2.1 shows the proposed water supply/use relationships. Appendix J includes excerpts from the Minnesota Steel project NPDES Permit Application that describe the proposed water management plan in greater detail.

During the first two years, Pits 1 & 2 would be dewatered by four feet in order to stop their overflow into Pit 5. Pit 5 would be completely dewatered during the ensuing three years. Once Pit 5 has been completely dewatered, ongoing maintenance pumping from Pit 5 (and later Pit 6) would be pumped directly to on-site processing facilities or to the Sullivan (north of Pit 5) and Ann (north of Pits 1 & 2) natural ore pits, along with storm water runoff collected from operations and stockpile areas. During construction and dewatering, storm water from disturbed areas would also be stored in the natural ore pits, so that no pollutants would be added to Pits 1 & 2, Pit 5 or the Draper Annex Pit.

Minnesota Steel, with input from the MNDNR, prepared a year-by-year water balance of the project to assure that the groundwater and surface water supplies are sufficient to meet the project's consumptive use needs. Pits 1 & 2 would serve as a reservoir that could supply water during dry years, and be replenished in normal and wet years. During normal operations, surface water runoff from the project site and groundwater from the active mine pits would be pumped to the Sullivan (until it is enveloped by Pit 5) and Ann natural ore pits for temporary storage before being used for processing. Pits 1 & 2 would receive only groundwater and surface runoff from undisturbed areas. This would allow any excess water from Pits 1 & 2 to be transferred to other surface waters such as Oxhide Creek.

The process and operations water balance is summarized in Table 4.2.1. It is based on estimated groundwater inflows and normal hydrologic conditions. (Initial mine pit dewatering flows are not shown as sources since they cannot be used to meet process and operations demands.) Details of the water balance calculations are provided in the December 2006 *Water Appropriation Permit Application* (see Appendix I). The water balance calculations indicate that there is sufficient water supply to meet the demands of the proposed processing and operations, and that under reasonably foreseeable hydrologic conditions, some excess water would be available to supply part of the water needed for stream augmentation (see Section 4.3). The overall water balance for the 20-year operation shows an average net excess of 535 gpm, or 1.2 cfs.

While no additional water would need to be appropriated for processing and operations, augmentation of Snowball and Oxhide Creeks (total average augmentation flow = 1,700 gpm) would require additional appropriation. Some water from an outside source would need to be appropriated in the future to supply the remainder of the Oxhide Creek augmentation plus augmentation flows for Snowball Creek. On average, approximately 1,200 gpm would be required from an outside source in the years after initial dewatering is complete. Augmentation requirements are discussed in greater detail in Section 4.3.

Detailed descriptions of the proposed Minnesota Steel water management plan and water appropriation request are included in the permit applications for the project submitted to the state regulatory agencies, including:

- *Water Appropriation Permit Application*, submitted to MNDNR in December, 2006.
  This application includes a detailed description of the applicable state regulations; the project water management strategy (including water discharges and transfers, water supply and appropriation, Minnesota Steel's proposed augmentation plans for flow reduction impacts to surface waters, and closure plans); detailed descriptions of proposed appropriation and diversions; and a detailed analysis of yearly water balance, watershed yield, and stream and lake impacts.

- *Application for NPDES/SDS Permits*, submitted to MPCA in December, 2006
  This application includes a detailed description of the applicable state regulations; water management (including sanitary wastewater, water sources, cooling water, storm water, and process wastewater); water discharges and transfers (including process water; tailings basin water; initial mine pit dewatering; storm water management during construction; and storm water, mine water and pit water management during operations); project water balance; water chemistry balance; and the storm water management plan.

The information contained in these permit applications is summarized in the applicable sections of this EIS, including Sections 4.2 (Water Appropriation), 4.3 (Physical Impacts to Water Resources), 4.4 (Surface Water Runoff) and 4.5 (Wastewater).

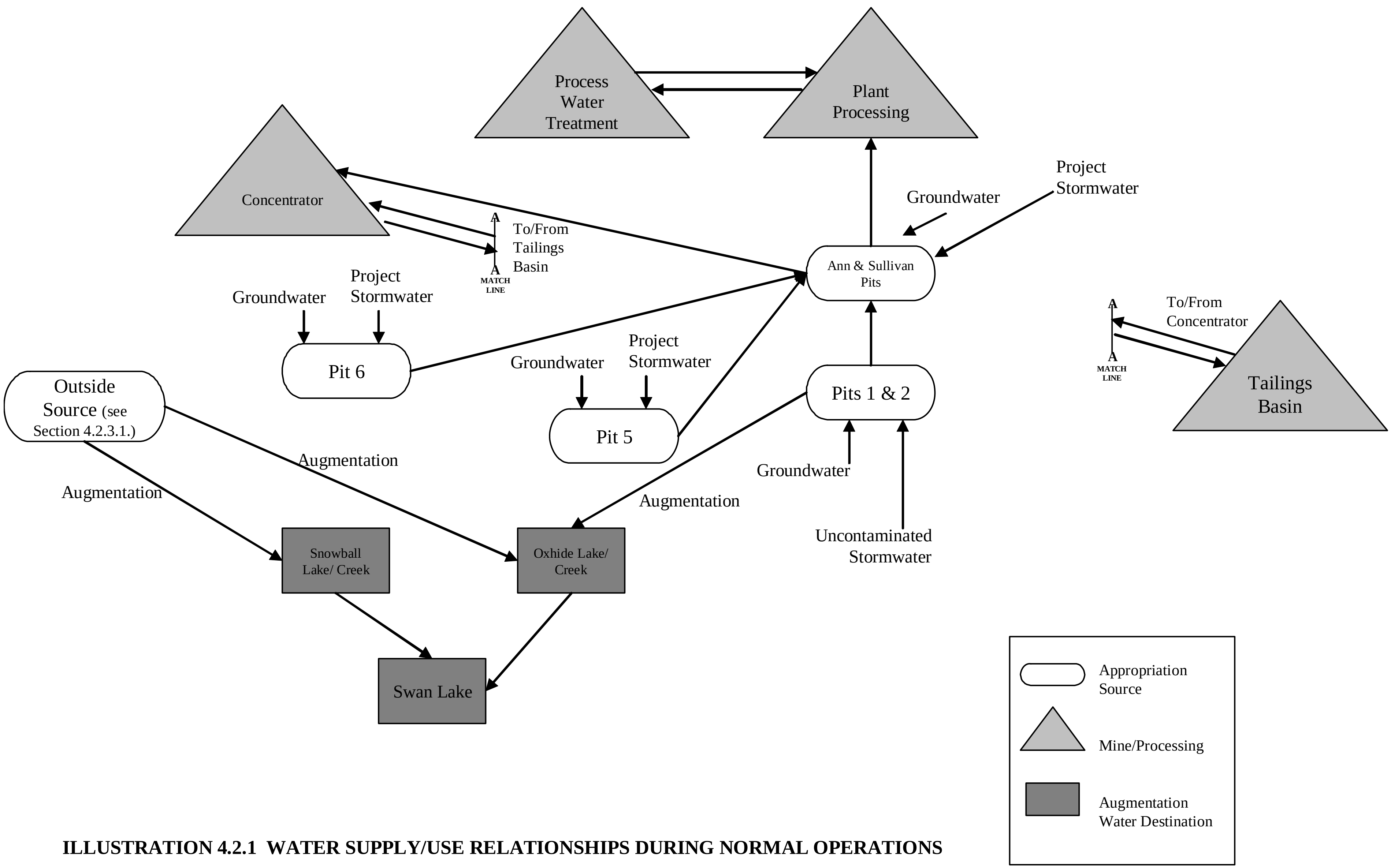

ILLUSTRATION 4.2.1 WATER SUPPLY/USE RELATIONSHIPS DURING NORMAL OPERATIONS

TABLE 4.2.1 SUMMARY OF MINNESOTA STEEL PROCESS AND OPERATIONS WATER BALANCE [1] [2]

Water Demand / Supply Component	Average for Years 1 to 20 (gpm)	Years 1 to 10 (gpm)	Years 11 to 20 (gpm)
Water Demand			
Process water for steel production	3,378	3,030	3,727
Process water for concentrator	259	243	275
Ore moisture recovery	(116)	(109)	(125)
Loss to tailings basin voids	819	735	904
Tailings basin loss to groundwater	570	382	758
Net Water Demand [2]	4,910	4,281	5,539
Water Sources			
Average surface water supply	1,858	1,811	1,905
Average groundwater supply	3,330	3,019	3,642
Tailings basin yield	257	211	302
Net Water Source	5,445	5,041	5,849
Net Water Balance [2]	535	760	310

[1] Normal Conditions: Based on expected steel production rates and expected groundwater increases from mine pit development; water sources do not include initial pit dewatering flows.

[2] Water balance does not include water needed for stream augmentation. Any excess water would be used toward augmentation of Snowball and Oxhide Creeks. With the Snowball and Alternative Augmentation Plans, the average total augmentation demand is 1,700 gpm (see Sections 4.3.2.1 and 4.3.2.3). Additional appropriation would be necessary to provide the total flows.

4.2.1.1 Final SDD Water Appropriation Issues

The Final SDD indicates that the EIS would include a number of issues related to water appropriation for the Minnesota Steel project. These issues are summarized in the table below, followed by a description of where they are addressed in the EIS or related project documents:

Issue	**Where Addressed**
Provide a detailed water balance for the project. Identify additional sources of water to be utilized, if the balance indicates a deficit for the processing plant.	Detailed description and analysis is included in the December 2006 *Combined Application for Water Appropriation Permits and Work in Public Waters Permits* for the Minnesota Steel project. Results are summarized in Section 4.2 of the Draft EIS.
Use the water balance information to model how watershed yield and lake levels would change during and after mining. Identify impacts to water bodies and mitigation/monitoring to be used to minimize impacts.	Detailed description and analysis is included in the December 2006 *Combined Application for Water Appropriation Permits and Work in Public Waters Permits* for the Minnesota Steel project and in various special studies for the DEIS, listed in Appendix I. A summary of impacts to affected water bodies is included in Section 4.2.3.1 (Table 4.2.2). More detailed discussion of physical impacts to surface waters and mitigation/monitoring recommendations are included in Section 4.3.
Evaluate potential quantity and quality impacts to nearby wells due to pit dewatering.	Included in Section 4.2.3.2.
Evaluate the potential for blasting to adversely impact nearby drinking water wells.	Included in Section 4.2.3.3.

4.2.2 Affected Environment

4.2.2.1 Regulatory Framework

The appropriation and diversion of waters of the State of Minnesota are governed by Minnesota Statute 103G and Minnesota Rules 6115. These regulations require a water appropriation permit from the MNDNR for any appropriation or use of 'waters of the state.' Waters of the state, as defined in this statute, include "surface or underground waters, except surface waters that are not confined but are spread and diffused over the land." 'Appropriating' water is defined in Minnesota Statute 103G.005 as "withdrawal, removal, or transfer of water from its source regardless of how the water is used."

4.2.2.2 Existing Surface Water Bodies

Figure 4.3.1 shows the locations of existing surface waters within the Proposed Project Impact Area and in the vicinity of the project. Surface waters (waters of the state) include natural streams and lakes, as well as water bodies that resulted from groundwater infiltration and surface water runoff collection in abandoned mine pits. No water is currently being appropriated from these surface waters. However, the MNDNR is currently transferring (pumping) excess groundwater inflows from the nearby Hill Annex Mine Pit to maintain water levels in the pit. The discharge is to a creek that flows to Upper Panaca Lake.

4.2.2.3 Existing Water Supply Wells

Water supply wells in the vicinity of the Proposed Project include two municipal water supply wells located in the City of Nashwauk (just east of the upper Hawkins/Halobe Pit) as well as numerous private wells on residential properties on and near Little Sucker, Snowball, and Swan Lakes; along area roadways; and in the town of Pengilly.

4.2.3 Environmental Consequences

4.2.3.1 Surface Water Appropriation

As noted in Section 4.2.1, the *Water Appropriation Permit Application* submitted by Minnesota Steel to MNDNR in December 2006 provides a detailed analysis of the water balance on an annual basis throughout the project life. It also describes in detail the proposed sources and uses for appropriated water. Table 4.2.1 summarizes the projected water use and supply for the Minnesota Steel facility operation.

Minnesota Steel proposes to appropriate water for the following purposes:

- Water supply for mining and steel-producing operations
- Mine pit dewatering
- Stream augmentation (to mitigate project-related flow reductions to Oxhide Creek and Snowball Creek which, ultimately, benefit Swan Lake)

Minnesota Steel has submitted a permit application to the MNDNR for appropriation of water for these uses from Pits 1 & 2 (which are hydraulically connected with the upper Harrison, Hawkins, Hadley and Halobe Pits)**,** from Pits 5 and 6, and from the Sullivan and Ann natural ore pits in which storm water runoff and mine pit dewatering water would be collected and stored.
Table 4.2.2 lists the water bodies from which water appropriation is requested (and the proposed use) plus the downstream water bodies that would be affected by changes in water flows as a result of the project appropriation. Other sections in this EIS describe anticipated impacts from the changes in surface water flows that would result from the proposed water appropriation (including the increases in flows during dewatering and reductions in flows during normal plant/mine operation noted in Table 4.2.2). Section 4.3 provides a more detailed description of the physical impacts to surface waters, Section 4.5 describes water quality impacts to Swan Lake, Oxhide Lake and Snowball Lake, and Section 4.8 describes potential impacts to fisheries.

After initial dewatering, streamflow to downstream waters (Snowball Lake/Creek, Oxhide Lake/Creek, O’Brien Lake/Creek and, ultimately, Swan Lake/River) would be reduced due to decreases in contributing watershed area and/or in outlet flows from Pit 5 (to Oxhide Creek) and Pit 6/Draper Annex Pit (to Snowball Creek). The unmitigated reductions in flows to Oxhide Creek and Snowball Creek, which would also reduce Swan Lake levels and discharge to Swan

River, are considered to result in substantial impacts. Therefore mitigation of the flow reductions is planned through addition of augmentation flows to both of these streams.

The augmentation plans analyzed in this Draft EIS for Oxhide (Alternative Augmentation Plan) and Snowball Creeks (Snowball Augmentation Plan) are described in Sections 4.3.2.1 and 4.3.2.3. Combining these two augmentation plan rates, the total average augmentation rate for the two streams is 1,700 gpm. With an average net water supply of 500 gpm (Table 4.2.1), an additional 1,200 gpm would need to be appropriated from another source. Potential additional sources for augmentation water considered include the LaRue Pit (northeast of the Hawkins/Halobe Pit), O'Brien Lake, Swan Lake, and the Hill Annex Mine Pit. All of these sources, excluding the Hill Annex Pit, are in the Swan Lake watershed and would therefore not augment Swan Lake water levels and Swan River flow. According to Minnesota Rules part 6115.0720, subpart 2B, additional water sources are to be selected with higher priority given to "water from inactive mine pits" than to "water from streams appropriated during periods of high flow" than to "water from natural basins greater than 500 acres in size." Following this priority, appropriation from Hill Annex would be preferred over Swan Lake (greater than 2,000 acres) and its tributaries. This priority further supports use of Hill Annex water since appropriating water from Swan Lake indirectly affects Swan River and would reduce its flow at both high and low flow periods. Based on the potential benefit of augmentation flows to Swan Lake and Swan River by using Hill Annex water for augmentation, an assessment was made of potential impacts and other practical considerations related to use of Hill Annex water.

Hill Annex State Park pumps excess water from the Hill Annex Pit at a rate of 6,200 gpm for about half of each year (spring to autumn) in order to maintain water levels in the pit. The average annual water yield is more than 3,000 gpm. Hill Annex State Park is not obligated to discharge at that rate and could terminate pumping at any time without environmental review. The water is discharged under an NPDES permit to the Panaca Lakes, where in the past it was considered to have mitigated the effects of sewage effluent from the cities of Marble and Calumet. However, recent wastewater treatment upgrades for these communities have likely reduced the benefit of the additional water from Hill Annex. Under the augmentation plans described in Section 4.3, more than half of the Hill Annex Pit average annual yield could still be discharged to Upper Panaca Lake; flows from the Panaca Lake watershed to the lake would not be affected.

Another consideration in assessing the feasibility of appropriating water from the Hill Annex Pit is the fact that Excelsior Energy has submitted a MNDNR water appropriation permit application requesting use of all of the Hill Annex water for their proposed coal gasification plant near Taconite, which is also presently undergoing environmental review. However, since the environmental review process for the project is still underway, there is uncertainty about whether the Taconite site or an alternative site also under consideration would be the preferred alternative plant site. Other unknowns include the exact amount of water that Minnesota Steel or Excelsior Energy would need, the timing of the need, and the potential yield of water from other identified sources, which suggests that Minnesota Steel could proceed with planning for use of a portion of the Hill Annex water yield. Further, under Minnesota Rules part 6115.0740, subpart 2A, no permittee can establish a right of use or appropriation by obtaining a permit. Water use conflicts that may arise in the future would be resolved in accordance with Minnesota Rules, part 6115.0470.

Water quality in the Hill Annex Pit meets state and federal surface water quality standards and no pollutants would be added by pumping. Minnesota Steel activities would not introduce pollutants to the water in the Hill Annex Mine Pit prior to or during pumping.

TABLE 4.2.2 WATER APPROPRIATION SUMMARY

Water Body	Proposed Use of Water	Downstream Effect on MNDNR Public Waters
Pits 1 & 2	Dewatering: Partial dewatering of Pits 1 & 2 (and contiguous Harrison/Hawkins/Halobe/ Hadley Pits) initially, to prevent flows to Pit 5 during mining. Normal Operations: Use excess and stored water for process water and stream augmentation	Initial Dewatering: Temporary increased flow to Oxhide Creek, Oxhide Lake and, ultimately, Swan Lake. Normal Operations: Eliminates overflow to Pit 5 and, ultimately, reduces flow to Oxhide Lake, Oxhide Creek, Swan Lake and Swan River.
Pit 5	Initial Dewatering: Lower water level to allow access to pit for mining – convey water to Oxhide Creek. Normal Operations Dewatering: Pump water and store in natural ore pits for process use.	Initial Dewatering: Temporary increased flow to Oxhide Creek and, ultimately, Swan Lake. Normal Operations: Reduced flow to Oxhide Creek and, ultimately, Swan Lake
Pit 6 (existing Draper Annex Pit)	Initial Dewatering: Lower water level to allow access to pit for mining – convey water to Snowball Creek. Normal Operations Dewatering: Pump water and store in natural ore pits for process use	Initial Dewatering: Temporary increased flow to Snowball Creek and, ultimately, Swan River. Normal Operations: Reduced flow to Snowball Creek due to watershed area reduction.
Natural Ore Pit North of Pit 1 (Ann Mine)	Process water	No impacts – water comes from storm water and pit dewatering.
Natural Ore Pit North of Pit 5 (Sullivan Mine)	Process water	No impacts – water comes from storm water and pit dewatering.
Hill Annex Mine Pit	Future need (following initial Pit 5 dewatering) to appropriate water for Snowball Creek and Oxhide Creek augmentation (appropriation is not being requested at this time).	Re-allocation of a portion of the excess water that is currently being pumped from Hill Annex Pit to Upper Panaca Lake. Water quality effect on Panaca Lakes has not been quantified, but is not anticipated to be substantial.

4.2.3.2 Potential for Municipal Water Supply Well Impacts

As part of the proposed Minnesota Steel project, the Hawkins/Halobe/Hadley Pits would be drawn down four feet with Pits 1 & 2 during the Years 1 and 2 of the project, to prevent the Pit 1 overflow into Pit 5 during the initial dewatering of the Pit 5. A bedrock "saddle" exists at 1,340 feet MSL between the Hawkins/Halobe/Hadley pits and North Harrison Pit (which in turn is connected to Pits 1 & 2 above its saddle at 1330 feet MSL). Therefore, the water level in the Hawkins/Halobe/Hadley Pits would match the level in Pits 1 & 2 if they drop to elevations between 1355 and 1340 feet MSL. However, if the water level Pits 1 & 2 drops further, the water level in the Hawkins/Halobe/Hadley Pits would remain at 1340 feet MSL. Thus, the maximum drop in water level in the Hawkins/Halobe/Hadley Pits is 19 feet below the current water surface elevation.

The Nashwauk City Well #1 is used on a daily basis for municipal water supply. It is located on the southeast side of the city at an approximate surface elevation of 1,439 feet MSL. This well is approximately 414 feet deep (1,025 feet MSL). In 2006, its static water level was 75 feet (1,364 feet MSL), and its pumping level was 96 feet (1,343 feet MSL).

The Nashwauk City Well #2 is also used on a daily basis as the main source of municipal water supply for the city. It is located on the north side of the city within a short distance, approximately 200 yards, of the Hawkins/Halobe/Hadley Pits. This well is approximately 540 feet deep (949 feet MSL based on a surface elevation of approximately 1,489 feet MSL). In 2006, its static water level was approximately 128 feet (1,361 feet MSL), and its pumping level was at 168 feet (1,321 feet MSL).

Based on this information, the lowering of water levels in the Hawkins/Halobe/Hadley Pits would not likely affect the quality or production capacity of the municipal wells in Nashwauk. Both city wells are deep enough to continue to provide an adequate supply of water to meet anticipated demand, even if the water level drops to the "saddle" elevation level of 1,340 feet MSL.

4.2.3.3 Potential for Water Supply Well Impacts from Blasting

The closest residential wells to the mine area are the residences on the west side of Snowball Lake, located approximately 0.5 mile from the rim of Pit 6 (see Figure 6.12.1). Based on the distance of the residential wells from the closest blasting locations, and given the structural integrity of the Biwabik Formation and other geologic formations in the area, there is no evidence to suggest that blasting would negatively impact nearby residential wells.

4.2.4 Mitigation

4.2.4.1 Surface Waters

The proposed re-use of process water reduces the total amount of water that needs to be appropriated by Minnesota Steel.

Augmentation of flows to Oxhide Creek/Lake and Snowball Lake/Creek would be required to mitigate flow reductions resulting from the proposed Minnesota Steel appropriation. As described in Section 4.3.2.1, the water balance included in the December 2006 *Water Appropriation Permit Application* identified an average surplus water flow rate of 500 gpm (remaining after mining and processing water uses) that would not be sufficient to supply augmentation for Oxhide and Snowball Creeks in the years after Pit 5 initial dewatering has been completed. This indicates that an additional appropriation would likely need to be requested in the future by Minnesota Steel, to provide adequate water for augmentation flows to Oxhide and Snowball Creeks in the years after Pit 5 initial dewatering is completed.

Other mitigation measures and monitoring related to project impacts associated with water appropriation are described in Sections 4.3.3, 4.5.3 and 4.8.3 of this EIS.

At closure of the mine operations, Pits 5 and 6 would be allowed to refill with water. Pits 1 & 2, Harrison and Hawkins/Halobe/Hadley pits would also refill.

4.2.4.2 Water Supply Wells

The Nashwauk city wells should continue to be monitored routinely (i.e., existing city monitoring) once the dewatering process begins. The wells should also be monitored after dewatering is completed due to slow well recovery in this area (according to information from the city well contractor). If water supply wells experience an adverse drop in groundwater levels due to mining activities, Minnesota Steel may need to provide a remedy, such as lowering or replacing the pumps, or replacing the wells. This contingency could be a condition of the Water Appropriation Permit for the Proposed Project.

4.3 PHYSICAL IMPACTS ON WATER RESOURCES – NON-WETLAND

The Final SDD for the Minnesota Steel project states for physical impacts to non-wetland water resources:

> "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 streamflow and lake water levels throughout mining and after closure."

A detailed project water balance was provided as part of the December 2006 *Water Appropriations Permit Application* for the Minnesota Steel project. Section 4.2 (Water Appropriations) describes the water use, sources and water management strategies proposed by Minnesota Steel. Information on the Proposed Project impacts was provided in *Minnesota Steel Industries: Lake and Stream Hydrologic Impacts Evaluation* (January, 2006). Updated hydrologic and geomorphic impacts information for Oxhide and Snowball Creeks is presented in Minnesota Steel's December 2006 *Water Appropriations Permit Application*. Further analysis of existing mine pit yields was provided by MNDNR in *Oxhide and Snowball Creeks Flow Statistics (Version 4*) dated December 2006. Analyses of Swan Lake levels and outflows to the Swan River were prepared by MNDNR (December, 2006). Finally, the above reports and analyses were used to develop the conclusions summarized in this section in its *Physical Impacts to Water Resources Technical Memorandum* (*Physical Impacts Memo*). Appendix I provides a listing of technical memoranda and other reports utilized in preparation of the Draft EIS.

This section utilizes the above reports in discussing the water resources impacts identified in the Final SDD for study in the EIS, including:

- Surface water flows in O'Brien Creek, Pickerel Creek, Snowball Creek, and Sucker Brook.
- Modifications to Oxhide Creek, if any, to mitigate for project impacts.
- Potential water level impacts to Little Sucker Lake, Snowball Lake, Swan Lake, Little McCarthy Lake, O'Brien Lake, and Oxhide Lake.

The Final SDD also indicated that the physical impacts to water resources discussion would also address tailings basin dam safety issues and the Upper Oxhide Creek diversion. Tailings basin dam safety is discussed in Section 4.6.2.1 and in the Permit to Mine submittal, *Vol. VII: Stage 1 Tailings Basin Report* (December, 2006). Although consideration had been given at one time to potentially diverting Upper Oxhide Creek, this is no longer being considered, so this topic is not discussed in the EIS.

A Level I Rosgen analysis of Oxhide Creek, Snowball Creek, Pickerel Creek, and O'Brien Creek stream geomorphology was completed for the *Lake and Stream Hydrologic Impacts Evaluation* to identify potential stream reaches that may be sensitive to changes in stream flow. This information was compared with estimated stream flow changes that would result from the Minnesota Steel project to identify any stream reaches that require further evaluation for impacts. Three representative stream flows were used to characterize the streams and to assess alterations to the stream hydrology and geomorphology:

> *Bankfull Discharge* is defined as the discharge at which the channel would flow full to its banks. It is generally understood to be the most effective discharge for moving sediment cumulatively over long time periods. This flow is largely responsible for forming and maintaining the long-term geomorphology of a stream channel, so it is also referred to as the "channel-forming flow." In an unaltered channel and watershed, the channel-forming discharge is approximated hydrologically by the 1.5-year discharge ($Q_{1.5}$), the peak flow with a 1.5 year recurrence interval.
>
> *Average Discharge* (Q_{Avg}) is the annual average discharge in the stream.
>
> *Baseflow* (Q_{Base}) is the component of streamflow not directly attributed to storm water runoff. Baseflow defines low flow conditions available to maintain habitat for stream organisms. While baseflow does not transport large amounts of sediment it can be important in maintaining a low-flow channel needed by stream organisms when water levels drop in the summer and fall.

4.3.1 Affected Environment

Oxhide Creek/Oxhide Lake

The existing flow characteristics of Oxhide Creek are altered from the natural pre-mining condition as a result of historic mining disturbances in the upper Oxhide Creek watershed (see Figures 4.3.1 [watersheds] and 3.1 [past mining areas]). These past disturbances are discussed in greater detail in the *Physical Impacts Memo*. Existing Oxhide Creek can be considered as two separate reaches: an upper reach that has been modified by past mining and extends from the headwaters through Pits 1 & 2 and 5, the Oxhide Stilling Basin and into Oxhide Lake; and a lower, less disturbed reach connecting Oxhide Lake to Swan Lake that has been impacted by flow alterations (see Figure 4.3.1). While the upper 800 foot long reach between the Oxhide Stilling Basin and Oxhide Lake would also be impacted by dewatering and flow augmentation from the Proposed Project, the impacts evaluation is focused on the less disturbed, 6,500 foot long lower reach between Oxhide Lake and Swan Lake.

Historic hydrologic changes to Oxhide Creek and its watershed are described in the *Physical Impacts Memo*. In summation, the lower reach currently receives channel-forming flows that are lower than the capacity of the existing channel, while the average annual flow and baseflow are double the flows estimated for pre-mining conditions. These differences are the result of deep pits created during mining that intersect the upper reach of Oxhide Creek. The pits serve as reservoirs that dampen peak storm flows and provide a water source for higher baseflows (through the interception of deep aquifers) during periods of low precipitation.

The *Lake and Stream Hydrologic Impacts Evaluation* included a Level I Rosgen analysis of existing conditions for Oxhide Creek which classified it as a Type C channel. Type C Channels are generally characterized as being highly sensitive to disturbance but have good recovery potential. Further detail on the Rosgen analysis for Oxhide Creek is provided in the *Physical Impacts Memo*.

Oxhide Lake receives most of its inflow from Pit 5 overflow and is therefore affected by changes in the upper watershed. However, water surface elevation data collected from 1911 to 1982 indicate the lake never dropped below the outlet elevation. No water surface elevations were recorded after 1982 for Oxhide Lake but the MNDNR indicates no reports of the lake falling below the outlet elevation. Though it is believed that the lake received mine pit dewatering discharges throughout this time, there are no reports of excessive lake levels as a result of past increased flows from mine pit dewatering.

Snowball Lake/Snowball Creek

The watershed for Snowball Lake lies partially within the Proposed Project area and has been impacted by past mining (Figures 3.1 and 4.3.1). This watershed is comprised of undisturbed areas, the former Patrick "B" Tailings Basin, and the inactive Draper Annex pit that would become part of the proposed Minnesota Steel Pit 6. Snowball Lake receives surface runoff from the upper watershed, but not in a definite channel. A gravel-bottomed channel connects the Draper Annex Pit to the north end of Snowball Lake. Discharge in the channel is intermittent, according to MNDNR staff. Considering the existing landscape of the upper watershed, Snowball Lake could have been impacted in the past by a decreased watershed. Although there have been landscape changes from past mining, the watershed area supplying runoff to Snowball Lake is not appreciably different from its original condition.

Snowball Creek originates from Snowball Lake outflow and continues 15,000 feet before entering the Swan River, just above the Swan Lake outlet weir (Figure 4.3.1). Snowball Creek has not been heavily altered by past mining or other disturbances. Results of hydrologic modeling indicate that the existing conditions are not significantly different from pre-mining conditions and that the physical condition of the creek has not been impacted by past mining (see *Physical Impacts Memo*).

The Level I Rosgen analysis of existing conditions for Snowball Creek led to a Type C channel classification. Further detail on the Rosgen analysis for Snowball Creek is provided in the *Physical Impacts Memo*.

O'Brien Creek /O'Brien Lake

O'Brien Creek and O'Brien Lake (also called Blue Lake) have been extensively altered by past mining. The *Physical Impacts Memo* provides a complete review of the alterations leading to the existing condition including channelization, watershed reduction, and damming. O'Brien Lake is disconnected from its original upper watershed and receives runoff from its immediate watershed and the adjacent Stage I Tailings Basin of Butler Taconite (the Proposed Project tailings basin, Figure 4.3.1). The remaining portion of O'Brien Creek originates as a constructed free outflow channel from O'Brien Lake which extends 7,200 feet to where it connects with the remaining 7,700 feet of its original channel before discharging to Swan Lake.

The Level I Rosgen analysis of existing conditions for O'Brien Creek led to a Type C channel classification. Further detail on the Rosgen analysis for O'Brien Creek is provided in the *Physical Impacts Memo*.

Pickerel Creek

Pickerel Creek originates as a spring-fed stream beginning just south of Nashwauk and receives surface water runoff as it flows south along TH 169 before entering the north end of Swan Lake (see Figure 4.3.1). This stream is a MNDNR-designated Trout Stream. Past mining brought numerous impacts to this stream. Mine related discharges increased stream flows and the stream was diked and ponded at three locations in the 1960s, effectively cutting off upstream migration and increasing stream temperatures. After the closure of Butler Taconite in 1985, these dikes were breached in 1986/1987 to allow the re-establishment of the continuous stream channel. Pickerel Creek remains in this post-mining configuration with much of its channel located between TH 169 and the Butler Taconite Stage I Tailing Basin (the Proposed Project tailings basin).

Because Pickerel Creek and its watershed are not expected to be impacted by the Proposed Project tailings basin, a Rosgen evaluation was not performed.

Little Sucker Lake

Little Sucker Lake receives runoff from a relatively undisturbed watershed partially located within the Proposed Project plant site. Wetlands in this upper area drain to a first order tributary of the stream that enters Little Sucker Lake. Little Sucker Lake outflow travels through lake/wetland complexes before entering Sucker Brook (see Figure 4.3.1).

Sucker Brook

The upper watershed of Sucker Brook has been modestly impacted by human activity. It has been altered by beaver dam activity, converting some stream reaches to pools or ponds. The watershed has been logged recently as well, with unknown hydrologic and geomorphic impacts. Sucker Brook drains a large area northwest of the project area and flows 35,000 feet before entering the Prairie River (Figure 4.3.1).

Swan Lake

With the exception of Sucker Brook, all of the streams described above flow into Swan Lake. While each tributary stream has undergone varying changes to its pre-mining hydrology, the combined effect is relatively small for Swan Lake, since its total watershed size has not changed appreciably. Swan Lake was used as a water source for Butler Mining operations, which ended in 1985. To mitigate this water use, an outlet weir was installed in 1966 to raise the elevation of Swan Lake by about 0.8 feet. The weir included a small orifice to maintain a minimal discharge from Swan Lake when the lake was below the weir crest elevation. Following closure of the mine, the weir was lowered by 0.4 feet.

Little McCarthy Lake

Little McCarthy Lake receives runoff from a watershed relatively un-impacted by past mining and partially located in the Proposed Project plant site (see Figure 4.3.1). Wetlands in this upper area drain to a first order tributary of the stream that enters Little McCarthy Lake, which then drains to Big McCarthy Lake and eventually to the Prairie River.

4.3.2 Environmental Consequences

Section 4.2 (Water Appropriations) describes the water use, sources and water management strategies proposed by Minnesota Steel. Minnesota Steel calculated a water balance (December 2006 *Water Appropriations Permit Application*), summarized in Table 4.2.1 in Section 4.2, to compare the availability of water from the project area with the estimated water use for the Proposed Project operations. As was foreseen in the Final SDD, the December 2006 water balance showed that the plant would consume much (roughly 90 percent) of the water yield available within the Project Area. The water diverted to the Proposed Project processes would substantially reduce flows to Oxhide Creek and, to a lesser extent, flows to Snowball Creek. The Final SDD also indicated that the EIS would identify appropriate discharges to augment the flows lost from Oxhide and Snowball Creeks. The augmented flows are needed to preserve stream ecological health and maintain stream geomorphology. Therefore, streamflow augmentation recommendations were identified as mitigation for the project-related streamflow reductions. The EIS analysis of impacts to Oxhide and Snowball Creeks during mining assumes stream augmentation (including the Alterantive Augmentation Plan described for Oxhide Creek in Section 4.3.2.1 below) would be provided.

The following sections review the physical impacts to streams and lakes from the Proposed Action, and describe the development of augmentation plans for Oxhide and Snowball Creeks.

4.3.2.1 Oxhide Creek

Physical impacts to Oxhide Creek below Oxhide Lake as a result of the Proposed Project would result from changes in surface water flows during each of the following phases:

1. <u>Initial Mine Pit Dewatering</u>: To accommodate storage capacity needs (Pits 1 & 2) and drain Pit 5 of accumulated water, discharge of dewatering flows from these pits to Oxhide Stilling Basin would increase discharges to Oxhide Creek and Oxhide Lake.
2. <u>Streamflow Augmentation</u>: Following initial mine pit dewatering and during mining operations, Oxhide Creek would no longer receive discharge from the Pit 5 overflow. Instead, pumped augmentation discharges would be delivered to the reconstructed Oxhide Stilling Basin, which flows into Oxhide Creek above Oxhide Lake. Augmentation would be required throughout the life of the mine and until the mine pits fill and overflow again to Oxhide Creek.
3. <u>Post-Mining</u>: After mining operations cease and the upper watershed mine pits fill, it is expected that the overflow rate from Pit 5 to Oxhide Creek would increase slightly over existing conditions due to increased groundwater capture by the expanded pit.

Each phase described above was evaluated for hydrologic and geomorphic impacts, as described in the *Physical Impacts Memo*, and as summarized below:

<u>Initial Mine Pit Dewatering</u>
Dewatering rates to the Oxhide Stilling Basin are expected to range from 8 to 12 cfs, with an average of about 10 cfs over the first five years of the Proposed Project.[1] These flow rates are

[1] Planned dewatering rates are presented in the December 2006 *Water Appropriations Permit Application*, over a range of modeled climatic conditions for each year of the Proposed Project. In each case the Year 3 dewatering discharge was significantly higher than other years (maximum was 17 cfs), and dewatering during construction (Years 1 and 2 of the project) was relatively low. The dewatering rates noted here are adjusted to increase the flow during Years 1 and 2 and decrease the flow in Year 3 in order to balance the flow and reduce potential for channel destabilization.

well within the range of flows commonly experienced in Oxhide Creek, and much lower than the existing bank-full discharge. However, MNDNR's hydrologic modeling of Oxhide Creek indicates that present average annual flow exceeds 8 cfs about 25percent of the time, 10 cfs about 5 percent of the time, and 12 cfs probably 2 percent of the time. Therefore, although the channel has remained stable for flows much higher than the proposed dewatering flows, it has not experienced these flows for such extended periods. Since the frequency of larger, channel-forming flows would not increase, substantial stream alteration is not expected to occur. However, the five-year duration of the dewatering discharges is a reason to monitor Oxhide Creek to periodically track channel geomorphology. If substantial impacts begin to occur, a portion of the dewatering flows could be piped directly to Swan Lake. (See Section 4.3.3.)

<u>Streamflow Augmentation</u>
Oxhide Creek would be the stream most impacted by changes in flow from the Proposed Project. Currently the average discharge from Pit 5 to the Oxhide Stilling Basin is approximately 7.2 cfs; from there average flow on Oxhide Creek increases by 1.2 cfs, due to contributions from the lower watershed, before it reaches Swan Lake. Following dewatering of Pit 5, the watershed of Oxhide Creek upstream of the Pit 5 overflow would be severed; average flow in Oxhide Creek would range from zero at the Stilling Basin to approximately 1.2 cfs at Swan Lake. Thus, the Proposed Project would reduce flow in the lower reach of Oxhide Creek by more than 85 percent without augmentation.

The effect of the several pits in the Oxhide Creek watershed is to add a large amount of groundwater from the Biwabik Iron Formation aquifer, and to dampen peak discharge rates from storm and snowmelt events. The average flow from Pit 5 is comprised of approximately 4.6 cfs from groundwater inputs and 2.6 cfs from surface water runoff (7.2 cfs total). The average discharge from this watershed is estimated at 3.3 cfs if the mine pits did not exist.

Evaluation of Original Augmentation Proposals
Initially two augmentation plans were proposed to maintain the stream geomorphology and ecological health of Oxhide Creek:

- The MNDNR proposed an augmentation plan (MNDNR Augmentation Plan) to replace the existing discharge at an annual weighted average rate of 5.8 cfs, or 80 percent of the existing 7.2 cfs average. Under that plan, the augmentation flow rates would vary month to month and also vary between "wet" years (two of ten years), normal years (six of ten) and "dry" years (two of ten). The MNDNR plan would require the average excess flow from Pits 1 & 2 of 1.2 cfs plus an additional 4.6 cfs from an outside source, assumed to be the Hill Annex Mine Pit (see Section 4.2.3.1). It also would require discharge of the $Q_{1.5}$ for three days in April, in two of each three years.
- Minnesota Steel proposed an augmentation plan (Minnesota Steel Augmentation Plan) in which only excess and stored water from Pit 1&2 would be used to augment Oxhide Creek. The flow rate in this plan would vary depending upon the water level in Pits 1 & 2: 1.6 cfs (700 gpm) at elevations above 1,355 feet MSL and 0.2 cfs (100 gpm) at elevations below 1,255 feet MSL. The discharge would vary linearly with elevation between these two points. The Minnesota Steel proposal did not include discharge of the $Q_{1.5}$.

Analysis of these two proposed augmentation plans (described in the *Physical Impacts Memo*) indicated that neither of them would cause any destabilization of the channel. Also, sediment sources would not be sufficient to cause significant channel deposition. Therefore, the analyses indicated that selection of the augmentation flow rate should not be based on stream geomorphology, but instead should be based on providing adequate flow and variability to protect the ecological health of the stream.

The MNDNR Augmentation Plan was based on a concept that if only twenty percent of the existing flow is diverted, then impacts would be minimal and acceptable. The Minnesota Steel Augmentation Plan was determined from the estimated flow that would remain after the Proposed Project water demands were met (see Section 4.2). Thus neither proposal was determined to represent a flow matched to the existing channel dimensions and needs of Oxhide Creek.

Development of Alternative Augmentation Plan

The available stream geomorphic information was reviewed to determine whether an augmentation plan could be identified that was more appropriate for the existing Oxhide Creek channel. The analysis was based on review of estimates of channel-forming flows, the existing channel size, and average annual discharge. The conclusions indicated that:

- Based on stream geomorphology, the existing stream channel appears to be oversized since the existing $Q_{1.5}$ is smaller than the existing bankfull flow capacity.
- The oversized channel would normally lead to channel adjustments of aggradation (deposition) of the stream bed and reduction in size. However, the presence of the mine pits, Oxhide Lake and downstream wetlands on Oxhide Creek means there is little sediment source for the channel. This limits the ability of the channel to fill in to adjust to the smaller $Q_{1.5}$.
- The above points lead to the conclusion that the channel is still sized according to the pre-mining hydrology and has not substantially adjusted to the current hydrology, which has been occurring since 1994 when Pit 5 began to outflow. It should also be noted that the doubling of average annual and base flows caused by development of the mine pits has not caused the channel to increase in size relative to its pre-mining condition.

Since the existing channel is likely sized according to pre-mining conditions, the pre-mining hydrology should serve as the most appropriate baseline condition for the existing channel in terms of providing adequate flow to maintain stream ecological health. Therefore the pre-mining average discharge was used as the basis for the Alternative Augmentation Plan. The estimated average pre-mining discharge for the 6.3 square-mile Pit 5 watershed is 3.3 cfs. Variation according to month, normal (six of ten years), wet (two of ten) and dry (two of ten) conditions as described in the original MNDNR Augmentation Plan was applied to this average, resulting in the following Alternative Augmentation Plan for Oxhide Creek:

Month	Normal 6 of 10 years		Wet 2 of 10 years		Dry 2 of 10 years		Total Weighted	
	cfs	gpm	cfs	gpm	cfs	gpm	cfs	gpm
Oct	2.7	1,200	5.0	2,240	2.6	1,150	3.1	1,400
Nov	2.7	1,200	5.0	2,240	2.6	1,150	3.1	1,400
Dec	2.6	1,150	3.3	1,480	2.6	1,150	2.7	1,210
Jan	2.6	1,150	3.3	1,480	2.6	1,150	2.7	1,210
Feb	2.6	1,150	3.3	1,480	2.6	1,150	2.7	1,210
Mar	2.6	1,150	3.3	1,480	2.6	1,150	2.7	1,210
Apr	4.8	2,170	8.5	3,820	3.1	1,400	5.2	2,350
May	3.7	1,660	6.8	3,060	2.8	1,270	4.2	1,860
Jun	2.8	1,270	4.0	1,780	2.3	1,020	3.0	1,330
Jul	3.1	1,400	5.7	2,550	2.3	1,020	3.5	1,550
Aug	3.1	1,400	5.7	2,550	2.3	1,020	3.5	1,550
Sep	2.7	1,200	5.0	2,240	2.3	1,020	3.1	1,370
Average	**3.0**	**1,340**	**4.9**	**2,200**	**2.5**	**1,140**	**3.3**	**1,470**

This plan is considered appropriate to the existing channel size since it is based on an average discharge rate that it would have experienced under natural, pre-mining conditions. In light of this, the Minnesota Steel Augmentation Plan can be seen as deficient in supplying flows to preserve stream health, especially during dry periods when the flow could drop to just 0.2 cfs for years at a time. The original MNDNR Augmentation Plan can be seen as unnecessarily large since it exceeds flows that would naturally occur in the Oxhide Creek channel.

Excess water from Pits 1 & 2 is expected to be available to supply an average flow of about 500 gpm for augmentation (see Project Water Balance in Table 4.2.1). The remaining augmentation needed for Oxhide Creek could be taken from the Hill Annex Mine Pit discharge, as described in Section 4.2.3.1.

The Alternative Augmentation Plan also includes discharge of the existing $Q_{1.5}$ (21 cfs) on three days in April, in two of three years. The channel appears to be stable with no aggradation under its current flow regime. That means that the existing peak discharges do not appear to be scouring the bed or damaging the banks (except where the banks are poorly managed). Also, any minor aggradation which may be occurring below Oxhide Lake may be scoured by these events. Therefore it is reasonable to require these flows, on the order of 21 cfs. By requiring these artificial events in April, they are more likely to occur coincident with a 1.5-year event on the lower watershed and mimic the existing condition. The ecological benefits of occasional bankfull flows are described in Section 4.8. Natural, minor adjustments to the channel would be expected under both existing and proposed conditions. These are not expected to reach any level of significance, if the $Q_{1.5}$ is released as described above. The 21 cfs could be provided by ponding water in the Oxhide Stilling Basin and releasing it through a gated outlet structure, or by a siphon pipe(s) placed over the dam. The volume of the basin is adequate to provide the $Q_{1.5}$ flow for at least three days.

The Alternative Augmentation Plan was used as the basis for assessing water resource-related impacts during mining (post-dewatering) in other sections of this Draft EIS (e.g., Sections 4.2, 4.3, 4.5 and 4.8). [The EIS technical memoranda (*Physical Impacts Memo*, Swan Lake Nutrient Study, and Oxhide and Snowball Lakes water quality, see listings in Appendix I) also contain analyses of the MNDNR and Minnesota Steel Augmentation Plans.]

Post-Mining

Augmentation of Oxhide Creek is expected to continue from the end of Pit 5 dewatering until Pit 5 refills and overflows. Since most of the augmentation flow is expected to come from the Hill Annex Mine Pit (see Section 4.2.3.1), continuing augmentation until Pit 5 overflows should not substantially affect the time required to fill Pit 5. Nevertheless, adjustments in the augmentation rate may be reconsidered at the time of closure, if the short-term effects of reduced flows on Oxhide Creek are considered to be less important than an earlier restoration of Pit 5 overflows to Oxhide Creek.

In the post-mining condition, the increase in size of Pit 5 is expected to increase interception of deep groundwater resources and cause an increase in discharge of about 0.5 cfs over current conditions. No impact to channel stability would result as compared to existing conditions. The increased area of Pit 5 would act to reduce peak discharges relative to current conditions.

4.3.2.2 Oxhide Lake

Oxhide Lake water levels were evaluated on the basis of proposed changes to average discharge rate and the outlet rating presented in Minnesota Steel's December 2006 *Water Appropriations Permit Application.* With a dewatering rate of up to 12 cfs, the average lake level of Oxhide Lake would rise 1.7 inches. With the Alternative Augmentation Plan, the average lake level of Oxhide Lake would decrease 2.3 inches relative to the existing condition. After Pit 5 refills and overflows, the average lake level of Oxhide Lake would increase 0.3 inches relative to the existing condition.

4.3.2.3 Snowball Creek

Possible physical impacts to Snowball Creek as a result of the Proposed Project would result from changes in surface water runoff during each of the following phases:

1. <u>Initial Mine Pit Dewatering</u>: To drain the proposed mine pits of accumulated water, dewatering of the Draper Annex Mine Pit would increase discharges to Snowball Lake and Snowball Creek by about 0.5 cfs starting in the second year of the project and continue through the sixth year. Thus, no augmentation flows would be required until Year 7.
2. <u>Augmentation</u>: Following initial dewatering, Snowball Creek would no longer receive discharge from part of its upper watershed but would receive pumped augmentation flows (see discussion below). Augmentation would be required throughout the life of the mine and until Pit 6 fills and comes into hydrologic equilibrium.
3. <u>Post-Mining</u>: After operations cease, it is expected that groundwater intercepted by Pit 6 would cause a small increase in flow to Snowball Creek. However, Pit 6 may reach an equilibrium elevation below its rim and not produce surface water overflow to Snowball Creek.

During dewatering of the Draper Annex Mine Pit, Snowball Lake would receive 230 gpm (0.5 cfs) of dewatering flows during project years two through six. After dewatering of the Draper Annex Pit is complete, Snowball Lake/Creek would receive augmentation flows to offset the loss of roughly 800 acres from its upper watershed due to project activities. The augmentation plan for Snowball Lake/Creek was proposed by the MNDNR and was agreed to by Minnesota Steel (see the December 2006 *Water Appropriations Permit Application, Yearly Water Balance Model.)* The flow augmentation plan (Snowball Augmentation Plan) calls for a long-term average flow of 220 gpm (0.5 cfs) compared to approximately 310 gpm (0.7 cfs) average flow diverted from the watershed by the project. The augmentation flow rates would vary by month and also vary between "wet" years (two of ten years), "normal" years (six of ten) and "dry" years (two of ten), as shown in the table that follows.

Month	Normal 6 of 10 years		Wet 2 of 10 years		Dry 2 of 10 years		Total Weighted	
	cfs	gpm	cfs	gpm	cfs	gpm	cfs	gpm
Oct	0.5	220	0.5	220	0.0	0	0.4	180
Nov	0.5	220	0.5	220	0.0	0	0.4	180
Dec	0.0	0	0.0	0	0.0	0	0.0	0
Jan	0.0	0	0.0	0	0.0	0	0.0	0
Feb	0.0	0	0.0	0	0.0	0	0.0	0
Mar	0.5	220	0.5	220	0.0	0	0.4	180
Apr	1.5	670	3.5	1,570	0.0	0	1.6	720
May	0.5	220	1.0	450	0.0	0	0.5	220
Jun	1.0	450	1.0	450	0.0	0	0.8	360
Jul	0.5	220	2.5	1,120	0.0	0	0.8	360
Aug	0.5	220	1.0	450	0.0	0	0.5	220
Sep	0.5	220	0.5	220	0.0	0	0.4	180
Average	**0.5**	**220**	**0.9**	**410**	**0.0**	**0**	**0.5**	**220**

During the “dry” years there would be no augmentation flow provided, and under the normal and wet years there would be no augmentation flow provided during the winter months of December through February. These periods of no flow are reflective of the current intermittent flow conditions on Snowball Creek. The augmentation plan also includes provision of the $Q_{1.5}$ (7.4 cfs) for three days in April, in two of three years to help maintain the channel. The Snowball Creek augmentation water is assumed to be pumped from the Hill Annex Mine Pit.

Each project phase was evaluated for potential hydrologic and geomorphic impacts on Snowball Creek (see *Physical Impacts Memo*). Proposed dewatering rates would not substantially increase flows in Snowball Creek above existing conditions and are within the normal range of discharge from Snowball Lake. Therefore, they are not expected to cause geomorphic impacts to the creek channel. Augmentation and post-mining changes to streamflow are small and within the current range of variability on Snowball Creek. After mining, Pit 6 would fill with water and may slightly increase total yield to Snowball Creek/Snowball Lake from increased groundwater and/or surface water inflow, but impacts are expected to be insignificant.

4.3.2.4 Snowball Lake

Snowball Lake water levels were evaluated as part of the December 2006 *Water Appropriations Permit Application*. The impact of the reduction in watershed area was evaluated in terms of the combined effect of the annual reduction in watershed yield and the addition of augmentation flows. With the proposed augmentation scenario, the average level of Snowball Lake would decrease 0.3 inches.

The Scoping EAW raised a second issue of the potential for Draper Pit/Pit 6 dewatering to capture groundwater that currently flows into Snowball Lake, possibly affecting the lake level. This is similar to the issue of potential impacts to wetlands that reside on the pit edges, discussed in Section 4.1.2.8. An analysis of monitoring well data from those wetlands indicated that they were perched, and not fed by the adjacent mine pits. This finding was supported by MNDNR staff who have found similar cases of un-impacted wetlands residing on the rims of mine pits in the area. This is likely a result of the wetlands’ reliance on a shallow aquifer and/or surface runoff water supply, and even when part of this supply is intercepted by mine pits, the wetlands persist. Similarly, Snowball Lake is below the Draper Pit (which would be greatly expanded to form Pit 6). It is already assumed that Pit 6 expansion would impact surface water flows to Snowball Lake and augmentation flows are proposed as discussed above. Given the findings for similarly situated wetlands, the evidence for a shallow aquifer disconnected from the deeper Biwabik Iron Formation aquifer, and the role of fine particles and organic matter that serve to effectively seal wetland and lake bottoms, it is a remote possibility that Snowball Lake is a site of groundwater recharge or that an open, deep-bottomed pit in close proximity would drain it. As discussed further in Section 4.1.3, there are two groundwater wells proposed to monitor water levels in the wetlands that lie between Snowball Lake and Draper Pit/Pit 6. As such, due to their proximity, these wetlands would register an impact before Snowball Lake in the event that a groundwater depression at Pit 6 affects surface water bodies to the south. If such a situation is found to occur, mitigation to maintain existing Snowball Lake elevations would be required; this would likely be in the form of greater augmentation flows.

4.3.2.5 O'Brien Creek /O'Brien Lake

With the Proposed Project tailings basin, O'Brien Creek's existing watershed area would be reduced by 18 percent resulting in reductions in flows (see *Physical Impacts Memo*). Decreases in $Q_{1.5}$, average and baseflows would result in the reduced ability of the stream to carry its existing sediment load, resulting in the potential for aggradation in the channel. However, since O'Brien Lake retains most sediment sources in the O'Brien Creek watershed, increased deposition would not likely occur in the O'Brien Creek channel. Therefore, the creek channel would not likely be affected due to the flow changes. After mining, when the reclaimed tailings basin would again discharge surface water to O'Brien Lake, the flows in O'Brien Creek would return to their existing levels.

O'Brien Lake (Blue Lake) would likely experience a slightly lower lake level as a result of the 18 percent reduction in its watershed (associated with the tailings basin) that would reduce inflows to the lake. Reductions in the lake levels would likely be very small and not affect the user-developed public access on the north end of the lake. The tailings basin would make a small additional contribution to groundwater input as a result of tailings basin water seeping through the bottom of the basin and into the shallow aquifer; a portion of this input would likely reach O'Brien Lake, partially mitigating for reduced lake levels from O'Brien Creek flow reduction.

There would be no impact to O'Brien Lake or O'Brien Creek from the Alternative Tailings Basin.

4.3.2.6 Pickerel Creek

The Proposed Project tailings basin would reduce the watershed area of Pickerel Creek by 1 percent. This slight decrease would not substantially affect the flows in Pickerel Creek considering the source of the stream is primarily from groundwater, though a slight decrease in peak flows may occur. Further, the tailings basin could increase the amount of groundwater discharged to Pickerel Creek as a result of groundwater mounding caused by tailings basin seepage to the shallow aquifer. This increase in groundwater discharge could slightly increase base and annual average flows, but would cause an inconsequential increase in $Q_{1.5}$ and as such would not impact the geomorphology of the stream.

There would be no impact to Pickerel Creek from the Alternative Tailing Basin.

4.3.2.7 Little Sucker Lake

Little Sucker Lake water levels were evaluated as part of the January 2006 *Lake and Stream Hydrologic Impacts Evaluation.* With the Proposed Action, Little Sucker Lake's existing watershed area would be reduced by 15 percent with an associated reduction in average annual yield. This reduction in inflow is expected to decrease the average annual lake level by 0.03 inches.

4.3.2.8 Sucker Brook

With the Proposed Action, Sucker Brook's existing watershed area would be reduced by 1 percent; and the area would be reduced by 7 percent with the Alternative Tailings Basin. The impact these area reductions would have on representative flows, as measured at the mouth of Sucker Brook, where it joins the Prairie River, would not be significant (see *Physical Impacts Memo*). Neither alternative would result in significant decreases in $Q_{1.5}$, average, or baseflows so no alteration to the Sucker Brook channel would be expected.

4.3.2.9 Swan Lake and Swan River Discharge

To determine the impacts that the Proposed Project would have on lake levels of Swan Lake and discharges to Swan River, the MNDNR conducted an analysis of past data to develop daily average Swan Lake elevations and Swan River discharges. The periods of October 1, 1994 to September 30, 1998 and October 1, 1999 to September 30, 2005 were identified as the best possible baseline period for evaluation, since these records represent the present conditions with Pit 5 overflowing into Oxhide Creek. (The data for 1999 and 2006 were omitted from the record since lake level data was not available for much of these years.) These average daily discharges were then reduced by the estimated reductions in Oxhide Creek and Snowball Creek discharges resulting from the Proposed Project. The monthly-varying rates in the Alternative Augmentation Plan for Oxhide and the Snowball Augmentation Plan were then added to this reduced Swan River average daily discharge, to give the "with project" (including augmentation) daily discharges. Augmentation plans for normal and dry climate conditions were evaluated. For further information on the methodology used, and for complete results of the analysis, see the *Physical Impacts Memo*.

The "pre-project" and "with project" Swan Lake elevation and Swan River discharge records were then compared as shown below. The Alternative Augmentation Plan for Oxhide Creek and the Snowball Augmentation Plan combined are on average 1.0 cfs smaller in "dry" years as compared to "wet" years. The dry year results exaggerate the "worst case" since it provides less augmentation flow, but would only be applied in two of ten years. The normal year is most representative of the typical impacts.

CHANGES TO SWAN LAKE ELEVATION AND DISCHARGE TO SWAN RIVER RELATIVE TO EXISTING CONDITIONS UNDER THE SNOWBALL AND ALTERNATIVE AUGMENTATION PLANS

		Dry Year	**Normal Year**
Swan Lake Elevation	Average Change	-0.04 feet	-0.03 feet
	Range of Change	+0.03 to -0.08 feet	+0.02 to -0.07 feet
Swan River Discharge from Swan Lake	Average Change	-4.7 cfs (-7%)[1]	-3.7 cfs (-6%)[2]
	Range of Change	-0.6 to -18 cfs[3]	+0.7 to -15 cfs[3]
	Days with Zero Flow	0	0

[1] Average pre-mining flow is 62.8 cfs. Average 'dry year' augmented flow is 58.1 cfs.
[2] Average pre-mining flow is 62.8 cfs. Average 'normal year' augmented flow is 59.1 cfs.
[3] The range of pre-mining flows is 1.8 cfs to 298 cfs. The smallest changes under augmented flows (i.e., -0.6 cfs for dry year and +0.7 cfs for normal year) would apply to the lower flow conditions (i.e., existing flow of 1.8 cfs or greater). The highest changes (-18 cfs and -15 cfs) would occur under higher flow conditions (i.e., flows approaching the existing 298 cfs high flow).

As shown in the table above, under both dry and normal year augmentation plans, the change in Swan Lake elevation is small and of little consequence. This analysis revealed no conditions with or without the project that would cause the water level in Swan Lake to fall below its outlet elevation of 1,335.0 feet MSL. While lower discharges to the Swan River would occur under either the dry or normal climate Snowball and Alternative Augmentation Plans as compared to the pre-project condition, neither augmentation plan resulted in zero discharge to Swan River during the period of time analyzed. The average reduction in flow from Swan Lake under the dry year conditions is 4.6 cfs, or about seven percent reduction in the current average flow.

Additionally, Swan River discharge data for October 1, 2005 to September 30, 2006 was used to illustrate the effects of the Proposed Project during a particularly dry period in recent memory. The hydrograph for July through September 2006 is presented in Illustration 4.3.1. The hydrograph shows that the existing, pre-project condition approached zero discharge near the end of July 2006 (minimum discharge was 0.6 cfs). The effect of the dry climate Snowball and Alternative Augmentation Plans is also shown. If this condition were repeated during a period of dry climate augmentation rates, Swan River discharge would be decreased to zero for a total of three days. An orifice installed in the Swan Lake outlet weir during the Butler Mining operation, was designed to maintain a minimum constant outflow of 3 cfs. This orifice was welded shut after Butler closed, but could be modified to prevent Swan Lake outflow from going to zero discharge. For comparison, during the 2006 (dry) water year, the zero discharge was approached for approximately 30 days. An orifice delivering 3 cfs operating during this dry period would result in an approximate decrease in Swan Lake elevation of 0.07 feet.

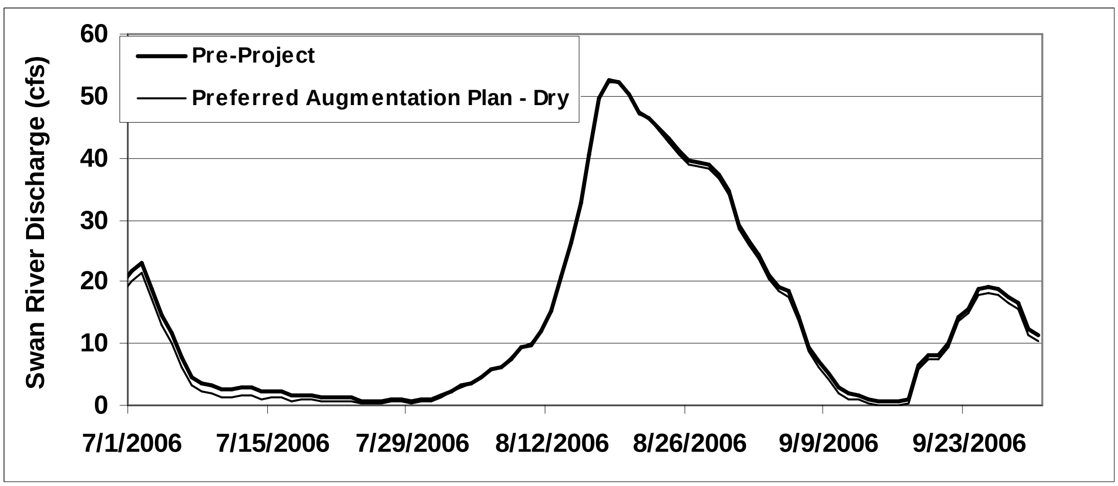

ILLUSTRATION 4.3.1. SWAN RIVER HYDROGRAPH

Illustration 4.3.1 depicts the Swan River Hydrograph for the dry conditions experienced in July to September 2006. The darker line is the record discharge while the lighter line is the augmented and loss-corrected proposed discharge. The augmentation is based on the dry climate Snowball and Alternative Augmentation Plans.

4.3.2.10 Little McCarthy Lake

The Proposed Project plant site, located in the upper watershed that supplies water to Little McCarthy Lake would reduce the existing watershed area by 15 percent. This reduction would mean a decreased discharge to Little McCarthy Lake and an associated decrease in lake level. The proposed reduction in watershed area is similar in size to that proposed for Little Sucker Lake (both receive a 15 percent reduction), and considering the similarity of their lake surface areas (61 acres for Little Sucker Lake, 60 acres for Little McCarthy), a similar lake level decrease of 0.03 inches is likely.

4.3.3 Monitoring and Mitigation Opportunities

From the discussion of Environmental Consequences in Section 4.3.2, no substantial impacts are expected as a result of watershed alteration in O'Brien Creek, Pickerel Creek, Sucker Brook or Snowball Creek from the Proposed Project, assuming that the augmentation flows described in Section 4.3.2 are provided to Snowball Creek. No substantial impacts to lake levels are expected in Oxhide, Snowball, O'Brien, Little Sucker, Swan, or Little McCarthy Lakes. However, periodic monitoring of Snowball Lake and Oxhide Lake water levels is recommended to track effects of augmentation pumping. Also, no substantial physical impacts to Snowball Creek are anticipated to occur during initial pit dewatering. Oxhide Creek is discussed separately below.

Monitoring for both Oxhide Creek and Snowball Creek should include monitoring of dewatering discharge rates and of augmentation flows, to assure that they are provided according to rates agreed to in the MNDNR Water Appropriation Permit.

Oxhide Creek Geomorphic Monitoring

Oxhide Creek would experience more substantial changes in discharge than any other stream affected by the Proposed Project, especially during dewatering. The geomorphic analysis has indicated that these changes are not expected to result in a destabilization of the channel. However, monitoring of the physical condition of Oxhide Creek should be performed by Minnesota Steel and provided to MNDNR – including periodic inventories of the channel and surveying several cross-sections – to identify if significant changes begin to develop in the channel. The monitoring would be most important during the dewatering period when flows are sustained at a relatively high rate for a long time period. Small changes to the physical channel are normal, even under existing conditions, but monitoring conditions before and during the Minnesota Steel project would allow observed changes to be assessed.

Though destabilization of the channel is not expected, field monitoring of the Oxhide Creek channel should be performed to document if a "blowout" is being initiated (see Oxhide Creek Mitigation discussion below). The following schedule of monitoring would provide documentation of changing conditions:

- Existing conditions - Synoptic Survey (see below) prior to start of dewatering;
- During pit dewatering - Routine Monitoring (see below) twice per year
- Following pit dewatering - Routine Monitoring once at the start of augmentation
- During normal operations - Routine Monitoring at 5 year intervals until normal operations cease and Pit 5 is filled

<u>Synoptic Survey:</u> The baseline synoptic inventory of features along the entire stream reach would help to identify if changes to the stream channel are occurring. The synoptic survey would also be used to determine the locations of permanent cross-section locations for the routine monitoring. The following features should be documented by station of occurrence:

- Determine locations for baseline cross-sections
- Gage discharge at creek mouth only
- Survey baseline sections and record baseline photographs
- Note changes to stream channel cover/vegetation type
- Note riffle - pool sequencing
- Locate bridge crossings and culverts (station, inverts, length and size)
- Existing stream channel protection and repair sites such as riprap placements, or bioengineering
- Existing areas of present instability or poor streambank management
- Existing erosion or depositional sites, determined by discontinuity of channel bottom or banks

Routine Monitoring: Monitoring should be performed at representative cross section locations between the outlet of Oxhide Lake to the inlet to Swan Lake, as determined during the synoptic survey. The following data should be compiled at each scheduled monitoring time and at each monitoring section, to document the baseline (existing) and future physical condition of the creek over time:

- Discharge – gaged at creek mouth only
- Channel description, including:
  - Topographical survey of cross section and water surface elevation to a common datum
  - Photographs taken from reference locations for comparison of channel condition
  - Written notes reviewing changes in channel condition relative to the synoptic survey

In addition to the above monitoring, the rates of dewatering and augmentation flows should be continuously monitored and recorded. Biological monitoring of ecological health is further discussed in Section 4.8.3, and may be coordinated with the stream physical monitoring plan.

Oxhide Creek Mitigation

As described in Section 4.3.2, the Proposed Project includes flow augmentation plans for Oxhide Creek and Snowball Creek as mitigation for flow losses resulting from alterations to their watersheds during the Proposed Project operation. The channel monitoring plan described above should be used to provide comparative data for Oxhide Creek, to help identify if alterations to augmentation rates are needed. No other mitigation would be required, unless an unexpected "blow-out" would occur due to the sustained dewatering discharges to Oxhide Creek. In the event that the field monitoring identified that adverse alterations in the Oxhide Creek channel resulted from the Proposed Project, stream channel restoration would need to be provided by Minnesota Steel as mitigation, to return the channel to a stable condition. In this event, dewatering a portion of the flow directly to Swan Lake (or elsewhere, e.g., LaRue Pit, O'Brien Lake) via a pipe could be implemented under a contingency plan to avoid further dewatering flow impacts to Oxhide Creek.

Swan Lake / Swan River

The augmented flows to Oxhide and Snowball Lakes would also augment flows to Swan Lake and the Swan River. Even with these augmentation flows, review of 2006 Swan River discharge data indicates that during periods of unusual low flow, the project would cause a reduction in discharges from Swan Lake to the Swan River and could result in periods of zero discharge from Swan Lake. Therefore, it may be beneficial to install an orifice in the weir at the head of Swan River (as Minnesota Steel has proposed) in order to provide a minimum flow of 1 to 3 cfs to the Swan River, even when Swan Lake levels fall below the top of the weir. A similar orifice was provided by Butler Taconite during its operations, but was welded shut following mine closure. The orifice could be fitted with a gate which would be opened when lake levels are low. Alternatively, it could be fixed open all the times so that it is not mistakenly left closed when low lake levels occur. Installation of the orifice, as well as its design and discharge capacity may be considered during permitting.

Minnesota Steel should be required to continuously monitor Swan Lake levels and outflow from the start of dewatering until Pit 5 refills and begins to overflow into Oxhide Creek. The record of levels and flows would add to the existing period of record which goes back to 1965. It would provide a basis to substantiate the EIS estimates of lake level and discharge impacts, and to determine if changes beyond those estimated in the EIS are occurring and, if so, what additional mitigation measures are needed.

4.4 SURFACE WATER RUNOFF

The Final SDD for the Minnesota Steel project states for surface water runoff: "The EIS will include a watershed balance developed from the project water balance. A model will be developed to predict changes in watershed runoff, watershed yield and changes to affected water bodies." The watershed balance is incorporated into the water balance discussed in Section 4.2 and changes to affected water bodies are discussed in Section 4.3. Additionally, the Final SDD states, "This information will be used to identify potential impacts, mitigation and monitoring to minimize impacts to area water bodies." This topic is discussed further in Physical Impacts on Water Resources (Wetland and Non-Wetland), Sections 4.1 and 4.3, respectively. Also identified in the Final SDD is, "Potential sources of sediment and pollutant discharges from the site will be assessed and mitigation measures discussed." Potential sources of pollutant discharge from the site are discussed further in Section 4.5 (Wastewater). Potential sediment sources are discussed in Section 6.6 (Erosion and Sedimentation). Since the other topics related to surface water runoff defined in the Final SDD are covered in other sections of the EIS, this section focuses on management of surface water runoff within the Project Impact Areas of the Proposed Project.

Requirements for erosion control practices, during and after mining, are provided by the MNDNR Permit to Mine consistent with the *Taconite and Iron Ore Mineland Reclamation Rules* (Minnesota Rules 6130). Further, two MPCA NPDES permits for storm water discharges would be required for the Proposed Project.

- One NPDES permit for the discharge of mine pit water and surface water runoff from Pits 5 and 6 and surface water runoff from the processing plants, stockpiles and surrounding areas to the Sullivan and Ann natural ore pits, which are isolated from downstream waters. Once collected in these pits, this water would be recycled and used by plant processes, resulting in no discharge to surface waters other than the natural ore pits.
- One NPDES storm water construction permit for construction of the facilities, stockpiles, tailings basin, and associated storm water capture and management features.

These two permits reflect two major elements of the Proposed Project that relate to surface water runoff management. One, essentially all runoff from the site is captured for use in processing (see Section 4.2 [Water Appropriations]). And two, there would be no discharge of surface water runoff from developed areas of the site – all storm water collected would be stored in the Ann and Sullivan natural ore pits for reuse.

4.4.1 Affected Environment

The former Butler Taconite Mine resides on the northern edge of the Swan Lake watershed. The area is best described as a reclaimed mining landscape, with former stockpiles, tailings basins, water-filled mine pits and processing sites among areas not previously disturbed by mining activities. Surface waters at the site are comprised of natural and reclaimed wetlands, lakes and flooded mine pits, and natural streams and constructed water channels.

First mined for natural ore at the start of the 20th Century, the area was most recently used by Butler Taconite which operated a taconite mine/plant operation from 1967 to 1985. Following the cessation of mining operations, reclamation practices were employed to meet erosion control requirements established by MNDNR *Taconite and Iron Ore Mineland Reclamation Rules* (Minnesota Rule 6130). Since 1985, the area has remained mostly dormant, with usage limited mainly to logging and recreational vehicles.

During Butler Taconite mining operations, significant alterations to surface water runoff routing occurred. Stockpiling of overburden and waste material meant large, erodable surfaces were placed within or over watershed boundaries, with varying changes to surface water runoff quantity and quality. Tailing basins, created with processed ore slurry, created large flat areas bound by sloped dikes and dams. These tailings basins created new watersheds with little to no discharge, altering the contributing watersheds to many waterbodies around the site. Excavated mine pits intercepted surface water runoff and deep groundwater. Following the end of mining operations, reclamation procedures included the re-vegetation of erodible surfaces on stockpiles and the former plant areas. Tailings basin dikes and dams were also re-vegetated and breached to allow the flow of water from these watersheds back to their original receiving waters. Mine pits filled to capacity and overflowed, returning intercepted surface runoff to affected watersheds.

Additionally, surface water runoff diversions were made to prevent inflow to certain mine features. These were primarily the Oxhide Creek and O'Brien Creek diversions. Runoff in the upper Oxhide Creek, which formerly flowed to Pit 5 was diverted northwest to Little Sucker Lake, effectively reducing inflows to Oxhide Lake. Following shutdown of the Butler Mine, this diversion was breached and water was allowed to flow back into the north Harrison Pit, eventually filling it and overflowing to Pits 1 & 2, then to Pit 5 and then to Oxhide Lake through the Oxhide Stilling Basin.

To facilitate the proposed expansion of the Stage II Tailings Basin (proposed under Butler Taconite, prior to ceasing operation in 1985), O'Brien Creek was diverted around the Stage II Tailings Basin to Hay Creek and a dam was created for the purpose of tailings containment where O'Brien Creek once flowed. By the end of mining operations, with the Stage II Tailings Basin only partially developed, a substantial collection of water occurred, expanding Little O'Brien Lake upstream into O'Brien Lake. The Stage I Tailings Basin dam was breached to allow for flow back into O'Brien Lake, and an outlet was installed in O'Brien Lake to maintain the desired lake level with flow entering Swan Lake via O'Brien Creek.

Past mining in the area has led to extensive and irreversible alterations in the landscape cover and surface water flowpaths. Mitigation and reclamation procedures following past mining operations have resulted in stabilized landscapes of erodable material with alterations in surface water routing, compared to pre-mining conditions.

4.4.2 Environmental Consequences

Minnesota Steel proposes to collect surface water runoff from all areas affected by the project, route it to on-site storm water ponds/reservoirs, and utilize all captured runoff for production. Since this surface water runoff has the potential to convey eroded sediment and production pollutants (as discussed in Sections 6.6 and 4.5, respectively), its collection, conveyance, and ultimate destination are of particular concern. The surface water runoff management plan proposed by Minnesota Steel addresses that concern and, as such, there would be no discharge from the project site of sediment or pollutants associated with surface runoff.

According to the NPDES/SDS permit application provided by Minnesota Steel, "*There will be no discharge of pollutants added by the project to any downstream waters, including Swan Lake, Swan River, Oxhide Lake or Creek, Snowball Lake or Creek, Pickerel Creek, or O'Brien Lake or Creek.*" And that, "*There will be a discharge of industrial storm water and mine dewatering water to the old natural ore pits north of Pits 1 and 5, which are isolated from downstream waters, including Pits 1,2, and 5.*" With this approach, Minnesota Steel proposes the elimination of any off-site discharge of runoff via the construction of a surface water collection system that would divert all discharges to one of two natural ore pits converted to storm water ponds. These ponds serve the dual purpose of retaining surface water discharges from the site and providing a reservoir for plant water consumption needs. The details of this storm water system and how the tailings basin reclaimed water and mine pit water would be managed are discussed in the Minnesota Steel *NPDES Permit Application* dated December 2006, and summarized by operational area below. The sources, management and disposal of process water are discussed in Section 4.5 (Wastewater). Post closure surface water management is discussed in the Mine Closure Plan.

Plant Site

In the area surrounding the processing plant, surface water would be collected and discharged to a wetland southeast of the processing plant. From there, it would be pumped to the natural ore pit (Ann Mine Pit) located north of Pit 1. This pit provides sufficient storage capacity to contain all collected runoff during plant construction and once operation begins, this water would be used as a water supply for the plant. This pit would remain as both a storm water pond and water supply reservoir during operations at the mine.

Crusher Concentrator/Stockpiles

In the area of the crusher concentrator and stockpiles, storm water would initially be routed through the existing Patrick B Tailings Basin to a storm water pond to be constructed south of the Stockpile B area. From there, storm water would be pumped to the Sullivan natural ore pit located north of Pit 5. This pit provides sufficient storage capacity to contain all collected runoff during plant construction and once operation begins, this water would be used as a water supply for the plant. As Pit 5 expands and encompasses this natural ore pit, storm water would flow into Pits 5 and 6 where it would be pumped to the production areas for use as process water.

Pits 5 and 6

As stripping of overburden occurs, surface water would be contained in the Sullivan natural ore pit north of Pit 5, preventing surface water discharge into the proposed mine pits as they are dewatered to accommodate mining. Minnesota Steel proposes to do this by 1) sloping the ground away from the pits to sumps or other areas from which the water can be pumped; 2) creating berms and dikes to prevent surface water from entering the pits; and 3) creating channels and other features to direct storm water runoff away from the pits. Once dewatered and no longer requiring isolation from surface water discharge, Pits 5 and 6 would receive surface runoff that would then be pumped to the production areas for use as process water.

Tailings Basin

From the concentrator, water would be used to convey fine tailings to the tailings basin where it would be clarified and returned for reuse at the concentrator. Minnesota Steel proposes to control all discharges and process water to the tailings basin and to eliminate any discharge of tailings water, including lateral seepage. A seepage collection system would surround the tailings basin and return collected water to the tailings basin, this would also include surface water runoff generated on the outer slope of the basin dikes. While no NPDES permit would be required for this operation, an SDS permit is necessary for seepage to groundwater.

4.4.3 Mitigation Opportunities

Minnesota Steel's proposed water management strategy provides mitigation for potentially contaminated surface water runoff by the collection and re-use of this water under an NPDES permit. The Minnesota Steel construction storm water containment proposal would be permitted under an NPDES construction storm water permit issued by the MPCA. This would require the preparation of a construction storm water pollution prevention plan, including an assessment of the potential sources for sediment and pollutant discharges from the site, identification of responsibility for implementation of Best Management Practices (BMP) and the BMPs to be implemented. These BMPs would include erosion prevention practices to minimize production of sediment. These include seeding and mulching practices and special measures for steep slopes and highly erodible soils (e.g., terracing, silt fence, erosion control fabric and ditch checks). Such locations would include slopes of tailings basin dikes and other water management conveyances (e.g., pipelines to the old natural ore pits and pipelines from Pits 1, 2, 5 and 6 to the production facilities). Temporary sediment basins would be used, as well as permanent storm water detention ponds that would be required in order to collect and pump storm water into the process water system.

The only surface water discharge from the project area is to the Ann and Sullivan natural ore pits within the project area. This would avoid discharges of runoff to major lakes and high quality wetlands. Partial filling of wetlands near the plant would require revegetation of adjacent disturbed soil and use of temporary barriers such as silt fencing to avoid sediment discharge to wetlands and downstream receiving waters (Little Sucker or Little McCarthy lakes). The storm water permit requires a program of inspection and record-keeping procedures to verify that inspections and maintenance are being completed. The plan's construction storm water erosion prevention and temporary sediment control measures should be incorporated into site grading and mine plans, created prior to project construction.

4.5 WASTEWATER/WATER QUALITY

Section 4.2 describes the overall Proposed Project water management strategy, which has been revised since the Final SDD to eliminate all surface water discharges from the project site. Appendix J includes excerpts from the Minnesota Steel project NPDES Permit Applications that describe the proposed water management plan in greater detail. The main components of the water management plan include:

- Collection and return of tailings basin seepage to tailings basin;
- No surface water discharge from the tailings basin;
- No discharge of scrubber blowdown or contact cooling water to the tailings basin;
- A Water Recovery and Reuse System (WRRS) would provide for treatment and re-use of process water with no discharge (concentrate from treatment system would be evaporated);
- Transferring initial mine pit dewatering (pre-mining) to downstream surface waters;
- Storing storm water runoff from plant areas, stockpiles and construction in former natural ore pits (Sullivan and Ann Mine Pits) until the water can be consumed in the processes;
- During mining operations, mine pit dewatering discharges would also be pumped to Sullivan and Ann Mine Pits, to avoid adding pollutants to impaired waters of the state, and stored there until it can be used for processing;
- Pits 1 & 2 would be protected from any surface water discharges from plant, mine and stockpile areas so that excess water in these pits can be transferred to downstream waters.

This approach eliminates discharges, compared to the water use/discharge approach anticipated in the Final SDD. Therefore, the Draft EIS modified the approach to addressing some of the Final SDD issues, as summarized below:

Final SDD Commitment	How Addressed in Draft EIS and/or Permitting
Water chemistry balance for processing water.	Processing water would be treated and reused in the process, therefore not relevant to surface water discharges. Therefore, a water chemistry balance is not included in the Draft EIS (The NPDES permit application includes water chemistry information.) The process Water Recovery and Reuse System is described in Appendix J.

Final SDD Commitment	How Addressed in Draft EIS and/or Permitting
Water chemistry balance tailings basin seepage/discharges.	Surface seepage from tailings basin dams would be collected and returned to the tailings basin; therefore, this water is not addressed in the Draft EIS. The seepage collection system is described in Appendix J. The goal of the seepage collection system is to assure that seepage from the tailing basin does not impact surface waters. If the natural soils in the vicinity of the tailings basin are such that they cannot prevent the migration of seepage to surface waters, mitigation measures include the installation of a constructed clay liner or a geosynthetic liner in the seepage collection system ditches. Seepage through bottom of basin to groundwater is addressed in tailings basin State Disposal System (SDS) permit application and in Draft EIS Section 6.7.
Potential impacts to receiving waters including increased methylation of mercury due to increased sulfate concentrations.	Not addressed in Section 4.5 – Wastewater because Proposed Project no longer includes discharges to surface waters. Methylation of mercury related to cumulative air emissions is addressed in Section 5.3.2.
Pilot plant study data on chemical concentrations in the process water.	Processing water would be treated and reused in process, and therefore, is not relevant to surface water discharges and does not need to be addressed in the Draft EIS.
Evaluation of nutrient loading changes to Swan Lake resulting from changes to inflow, tailings basin discharge/seepage and increased sewage flow through the Nashwauk sewage treatment plant.	The December 2006 *Swan Lake Nutrient Study* (see listing in Appendix I) evaluated nutrient budget changes and predicted changes in water quality. See Section 4.5.2.6.
The EIS will evaluate the water quality of Snowball Lake, Oxhide Lake, and Swan Lake as it relates to lake productivity, trophic status and potential augmentation needs/requirements.	Water quality of Snowball, Oxhide and Swan Lakes were evaluated in technical memoranda (see Appendix I) and impacts are summarized in Section 4.5.2.

4.5.1 Affected Environment (Existing Conditions)

4.5.1.1 Regulatory Framework

Based on the proposed Minnesota Steel water management strategy (summarized in Section 4.2 and in the introduction to Section 4.5), the following water quality regulatory programs are applicable to the project:

- SDS permit for the tailings basin
- NPDES permit for construction storm water;
- NPDES / SDS permit for mine pit water and surface water discharges to natural ore mine pits used as storage basins.

A more detailed discussion of applicable regulations is provided in the combined *SDS/NPDES Permit Application* for the project (see Appendix I).

If future regulatory and legal conditions allow for a discharge from the tailings basin, a supplemental EIS and new NPDES permit application (based on regulatory requirements at the time) would be required prior to release of any potential discharges from the tailings basin, during operations or closure.

4.5.1.2 Snowball, Oxhide and Swan Lakes

Snowball, Oxhide and Swan Lakes are the closest MNDNR-designated Public Water bodies located directly downstream from the Proposed Project area. Their locations are shown relative to the project on Figure 4.3.1.

4.5.1.2.1 Snowball Lake

Snowball Lake is 146 acres in area, and has an average depth of 23 feet. The Snowball Lake watershed includes mostly undisturbed areas, the Patrick "B" Tailings basin and the inactive Draper Annex pit. Snowball Lake water quality is not as high as Oxhide Lake, largely due to the fact that it does not receive groundwater contributions from mine pits. Still, its water quality is good relative to other lakes in the ecoregion.

4.5.1.2.2 Oxhide Lake

Oxhide Lake is a 121 acre lake with an average depth of 20 feet. It currently receives overflow from the west mine pits via the Pit 5 overflow and the Oxhide Stilling Basin. The Pit 5 discharge includes overflow from the Pits 1 & 2 complex. The Pit 5 discharge is about 40 percent from surface water and 60 percent from deep (low-nutrient) groundwater inflow to the pits. Oxide Lake has good water quality.

4.5.1.2.3 Swan Lake

The main (east) basin of Swan Lake has an area 2,090 acres with an average depth of 40 feet (Figure 4.3.1). It receives approximately 10 percent of its inflow from the existing Pit 5 overflow via Oxhide Lake and Oxhide Creek and thus has the potential to be affected by upstream mining activities. The current lake water quality and transparency is high and the lake can therefore be classified as mesotrophic.

After the 1985 shutdown of Butler Taconite, Swan Lake residents were concerned about the reduction in flow from the mines and the effect that would have on water quality. Water transparency was low in 1985 and 1986. Studies undertaken by Butler Taconite and by the MPCA in 1986 indicated that long-term water quality in the lake should be relatively good and that use of fertilizer in mineland revegetation did not appear to be degrading the quality of Swan Lake. The MPCA suggested that upgrading of the Nashwauk and Keewatin municipal wastewater facilities should be a priority. Facility upgrades occurred in the subsequent years and lake water quality has improved to its current condition.

4.5.1.3 Existing Water Quality in Snowball, Oxhide and Swan Lakes

Existing water quality conditions in Snowball and Oxhide Lakes are described in technical memoranda produced for this EIS (see Appendix I). Existing water quality in Swan Lake is described in the December 2006 *Swan Lake Nutrient Study*. The existing or baseline conditions, from which project effects are evaluated, are summarized in Table 4.5.1.

TABLE 4.5.1 SUMMARY OF EXISTING (BASELINE) WATER QUALITY IN LAKES AFFECTED BY PROPOSED PROJECT

Lake	Area [acres]	Total Phosphorus [ug/L]	Secchi Depth [m]	Carlson TP Trophic State Index [--]	Trophic Condition
Snowball	146	20	2.9	47	mesotrophic
Oxhide	121	9.6	5.5	37	oligo- to mesotrophic
Swan	2,090	13	4.2	41	mesotrophic

4.5.1.4 Existing Water Quality in Pits 1 & 2, Pit 5 and Hill Annex Mine Pit

Existing water quality conditions in Pits 1 & 2, Pit 5 and Hill Annex Mine Pit meet state and federal water quality standards. Water from these pits may be transferred to Oxhide and/or Snowball (and eventually) Swan Lakes as part of project dewatering and streamflow augmentation. Water transferred to Snowball and Oxhide Creeks during dewatering would come from Pit 5 and Draper Annex Mine Pits prior to any Minnesota Steel activities that could introduce pollutants to the water. Augmentation water would come from Pits 1 & 2 and potentially from Hill Annex Mine Pit; and none of these waters would have water quality impacts resulting from Minnesota Steel activities. Existing phosphorus concentrations used in the lakes impact analysis included 11 ug/L in Pits 1 & 2 and Pit 5 and 10 ug/L in the Hill Annex Pit.

4.5.2 Environmental Consequences (Environmental Impacts)

The Proposed Action (with the exception of increased domestic wastewater disposal conveyed to the Nashwauk wastewater treatment plant) includes no process water discharges to waters of the state that are currently on the 303(d) list of impaired waters. Therefore, there are no project-related water quality impacts from discharges of pollutants. However, the Proposed Project would alter surface water discharge rates to Snowball, Oxhide and Swan Lakes, which in turn have the potential to cause changes in water quality. Discharge rate changes are described in Section 4.3.

The evaluation of potential water quality impacts to the three lakes were based on assessment of incremental loading changes and their incremental effect on lake water quality as it relates to total phosphorus – the main nutrient controlling lake productivity and algae concentrations – and water clarity expressed as Secchi depth. The Carlson Trophic State Index (TSI) was calculated based on the predicted total phosphorus and compared for each condition occurring during development and operation of the Proposed Project. In each case, predicted changes in phosphorus and water clarity were so small that lake users would not perceive any change in water quality. Therefore, trophic conditions would not be altered by the Proposed Project. The predicted changes in water quality and trophic state for the three lakes are summarized below.

4.5.2.1 Snowball Lake

A simple (Canfield-Bachmann) lake response model was used to assess potential changes in water quality in Snowball Lake for each operational change to Snowball Lake (see the December 2006 *Snowball Lake Water Quality Evaluation* technical memorandum listed in Appendix I). The model predicted slight improvements in phosphorus concentrations for each condition, as summarized in Table 4.5.2 which may be attributed to a reduction phosphorus load from the watershed and replacement with lower phosphorus water from the mine pits. The trophic condition is expected to remain mesotrophic.

TABLE 4.5.2 MODELED CHANGES TO IN-LAKE TOTAL PHOSPHORUS METRICS FOR SNOWBALL LAKE

Modeled Scenario	Modeled In-Lake Total Phosphorus [ug/L]	Modeled Chl-a [ug/L]	Modeled Secchi Depth [m]	Carslon TSI (TP) [--]
Baseline	20	6	2.9	47
Decrease in watershed area and Draper Mine Pit dewatering [(1)]	19	5	3.0	47
Operations with augmentation [(2)] – flow from Hill-Annex Mine Pit	19	5	3.0	47

(1) Draper Mine Pit dewatering rate: 230 gpm over five years.
(2) Augmentation: Assumes average of 220 gpm (see Section 4.3.2.3) inflow from Hill Annex Mine Pit.

4.5.2.2 Oxhide Lake

The Canfield-Bachmann lake response model was also used to assess potential changes in water quality in Oxhide Lake for each operational change to Oxhide Lake (see the December 2006 *Oxhide Lake Water Quality Evaluation* technical memorandum listed in Appendix I). The model predicted minor changes in water quality for each condition, as described in Table 4.5.3. Due to the minor changes, there is no expected change in trophic condition of the lake.

TABLE 4.5.3 MODELED CHANGES TO IN-LAKE TOTAL PHOSPHORUS METRICS FOR OXHIDE LAKE

Modeled Scenario	Modeled In-Lake Total Phosphorus [ug/L]	Modeled Chl-a [ug/L]	Modeled Secchi Depth [m]	Carslon TSI (TP) [--]
Baseline	10	2	5.5	37
Initial dewatering of Pits 1 & 2[(1)]	10	2	5.5	37
Operations with Alternative Augmentation Plan[(2)] – flow from Pits 1 & 2 and from Hill-Annex Mine Pit	10	2	5.6	37

(1) Pits 1 & 2 dewatering rate: 4,000 gpm over two years. Initial Pit 5 dewatering occurs later during mining operations and has a similar effect.
(2) Alternative Augmentation Plan: Average inflow of 1,500 gpm with an average of 500 gpm from Pits 1 & 2 and an average of 1,000 gpm from Hill Annex (see Sections 4.3.2.1 and 4.2.3.1).

4.5.2.3 Swan Lake

Water quality changes in Swan Lake were studied in detail in the December 2006 *Swan Lake Nutrient Study* prepared for the MNDNR by Wenck Associates (see Appendix I for listing of studies). The study included analysis of historic and current water quality, internal nutrient loading, and prediction of water quality changes due to the Proposed Project. The main conclusions of the study include:

- **Historic Analysis.** Historic water quality data indicate that Swan Lake phosphorus reached a maximum in the early to mid-1980s, since then phosphorus concentrations have decreased, leading to increases in water clarity. The likely explanation for these trends is the diversion of effluent (1983) and eventual upgrade (1989) of the Nashwauk wastewater treatment plant

(WWTP) which previously contributed substantial phosphorus loads to Swan Lake. The high external loading of phosphorus probably also led to increases in the sediment phosphorus content and in internal loading of phosphorus from the lake sediments. The water quality recovery was most rapid from about 1986 to 1996 as accumulated sediment phosphorus would have been depleted and buried by new sediments, leading to a reduction in internal phosphorus loading. This explanation is supported in the *Swan Lake Nutrient Study* and contradicts concerns that the closing of the Butler Taconite mine and reclamation activities were responsible for algal blooms in the mid-1980s. The historical analysis supports the findings of the water quality modeling which indicate only imperceptible changes in water quality due to mining activities.

- **Internal Phosphorus Loading.** Internal loading of phosphorus refers to the process of release of phosphorus from lake sediments in areas of low dissolved oxygen. Increased sulfate in lakes has been hypothesized to alter the iron-sulfate-phosphorus cycle causing increased internal loading. Since the original project in the Final SDD included sulfate discharges to Swan Lake, sulfate was investigated as a potential cause of water quality degradation in Swan Lake. Laboratory experiments summarized in the *Swan Lake Nutrient Study* have indicated that existing sulfate concentrations are already sufficient to affect the iron-sulfur-phosphorous cycle, and that increases in sulfate should not be expected to increase the release of sediment phosphorus in Swan Lake. Therefore, as documented in the *Swan Lake Nutrient Study*, internal phosphorus loading is not expected to change as a result of increased sulfate concentrations that may result from the Proposed Project.
- **Proposed Project Effect on Water Quality.** The model developed to analyze historic loading was also used to predict changes in water quality due to the Proposed Project. Changes to the water and phosphorus inputs were evaluated on the basis of the proposed water management plan for initial pit dewatering and operating conditions. On that basis, the water quality changes in Swan Lake due to the combined effects of all loading changes associated with project operation relative to the 1997 to 2005 average conditions were predicted. The results are summarized in Table 4.5.4. Predicted changes in water quality are of no practical significance and are expected to produce only imperceptible changes to average water quality in Swan Lake. After Pit 5 fills and overflows into Oxhide Lake, the Swan Lake water quality is expected to be similar to the existing water quality.

TABLE 4.5.4 MODELED CHANGES TO IN-LAKE TOTAL PHOSPHORUS METRICS FOR SWAN LAKE

Modeled Scenario	Modeled In-Lake Total Phosphorus [ug/L]	Modeled Chl-a [ug/L]	Modeled Secchi Depth [m]	Carslon TSI (TP) [--]
Baseline for average flow conditions	13	3	4.3	41
Initial Pits 1 & 2 dewatering (1)	13	3	4.2	41
Combined Actions (2) – flow from Pits 1 & 2 and from Hill-Annex Mine Pit	13	3	4.3	41

(1) Pits 1 & 2 dewatering rate: 4,000 gpm over two years. Pit 5 dewatering occurs later during mining operations and has a smaller effect.

(2) Alternative Augmentation Plan for Oxhide Creek: Average inflow of 1,500 gpm with an average of 500 gpm from Pits 1 & 2 and an average of 1,000 gpm from Hill Annex Mine Pit (see Section 4.3.2.1 for discussion of augmentation flows). Changes to Snowball Creek do not affect water quality in Swan Lake since Snowball Creek enters the Swan River downstream of Swan Lake.

4.5.2.4 Alternative Tailings Basin

Development of the Alternative Tailings Basin (located in the Prairie River watershed) instead of the Proposed Project Tailings Basin (located in the Swan River watershed) would prevent loss of the tailings basin area from the Swan Lake watershed. This change in watershed area with the Alternative Tailings Basin concept would increase inflow volume to Swan Lake by less than two percent, relative to the Proposed Project. The water quality predicted by the Swan Lake model results in no change relative to the baseline water quality conditions (Table 4.5.4). Therefore, the project including the Alternative Tailings Basin would have a neutral effect on Swan Lake water quality.

4.5.2.5 In-Pit Stockpiling Alternative

Water from Pit 5 and Pit 6 would not be discharged from the pits during mining, with or without in-pit stockpiling. Therefore, there would be no impact to Snowball, Oxhide or Swan Lake from in-pit stockpiling during operations. Following closure Pits 5 and 6 would fill with water and overflow. In-pit stockpiling is not expected increase the concentration of pollutants, including phosphorus, in the pit water and is therefore not expected to affect productivity in Snowball, Oxhide or Swan Lakes.

4.5.2.6 On-Site WWTP Alternative

The *Swan Lake Nutrient Study* estimated that the increase in phosphorus load to Swan Lake due to domestic wastewater from the Proposed Project being conveyed to the Nashwauk WWTP is 10 pounds annually. Phosphorous loading from the Minnesota Steel wastewater would be decreased by treatment at the WWTP, plus the further sedimentation of phosphorus that would occur naturally as the water from the WWTP flows through one of Keewatin Taconite's reservoirs before entering the O'Brien Diversion (Figure 4.3.1). The On-Site WWTP alternative (see Section 3.3.3.3) would cause no increase in phosphorus loading to Swan Lake, since there would be no discharge to surface waters with this alternative. Though this represents a 10-pound annual reduction in loading compared to the Proposed Project, it has no practical effect on Swan Lake water quality. Therefore, the decision on where to treat domestic wastewater from the project should be made based on economics and the capacity of the Nashwauk WWTP.

4.5.3 Mitigation Opportunities

The Proposed Project water management strategy includes recycling and re-use of its process and storm water, so that the project has no wastewater discharges to surface waters that are currently on the 303(d) list of impaired waters. The other hydrologic changes associated with the Proposed Project (including stream/lake augmentation proposed with the project as mitigation) are expected to cause no discernable changes in water quality for Snowball, Oxhide and Swan Lakes.

Since the potential for substantial water quality impacts has not been identified, monitoring of in-lake water quality is not necessary. However, monitoring of the augmentation flow rates (as described in Section 4.3.3) should be carried out to assure that flows are being provided according to the final augmentation plan. The water quality of the augmentation flows should also be monitored to confirm the nutrient content assumed in the EIS analyses. Citizen Secchi depth monitoring (which has been done at four sites, 10 to 14 times per year during 1996 to 2004) should continue during the project to help identify trends in lake productivity.

4.6 SOLID WASTE

The Final SDD indicated that the EIS should cover the following topics related to solid waste:

- Design information and engineering studies that evaluate the tailings basin design for the proposed Expanded (Stage I) Tailings Basin and the Alternative Tailings Basin to ensure structural stability and safety of the tailings dams. This topic is addressed in Section 4.6.2.1 below and Permit to Mine Volume VII (see listing in Appendix I).

- A development plan providing a final outline for the tailings basin, geotechnical data, typical cross-sections and preliminary analyses of seepage and slope stability. The plan would describe initial dike construction, basin phasing and reclaim water management. The EIS would evaluate the feasibility, benefits, and impacts of the proposed tailings basin designs. Section 4.6.2.1 below and Permit to Mine Volumes VII (Stage 1 Tailings Basin) and VIII (Permit to Mine Application) summarize feasibility and benefits.

- A detailed stockpile plan that includes development plans for stockpiles including geometry, volumes, and locations for placement of waste rock, lean ore, and overburden. This topic is addressed in the Permit to Mine Volume VIII.

- Discussion of process wastes and solid wastes (emission control dust and slag) generated from the entire project including characterization, quantity, storage, handling, treatment and disposal, and best management practices. This topic is addressed in Section 4.6.2 and 4.6.3 below.

The sections that follow summarize the available information for these issues, including referrals to Permit to Mine Application documents (listed in Appendix I) that provide additional details on specific topics.

4.6.1 Affected Environment (Existing Conditions)

Much of the Proposed Project area has been affected by previous mining activities, including stockpiling of overburden, waste rock, and tailings wastes from previous mining operations (Figure 3.1). The four potential areas that could be affected by future solid waste disposal – tailings basin, alternative tailings basin, plant site, and stockpile areas – vary in the extent of past impacts from mining disturbance and/or waste storage.

Proposed Action Tailings Basin Area

The Proposed Action tailings basin is located primarily within the area of the previous Butler Stage I tailing basin. The Permit to Mine Application Vol. VII describes the history and construction details of the Butler tailings basin, summarized briefly below.

Construction of the Stage I Tailings Basin was completed in 1969. The Butler Stage I dam initially consisted of Dikes 1 through 7, constructed to retain the tailings along the north, east, and south boundaries of the basin. In August 1982, a temporary retainer dike (Dike 8) was constructed using coarse tailings. In 1983, the Butler Stage I Tailings Basin reached its capacity and tailings were deposited into the Butler Stage II Tailings Basin. At the closure of Butler Taconite’s facilities, the tailings dams were breached to allow gravity drainage to O’Brien Creek. A 20-foot wide channel was dug in 1986, and in 1995 a 30-foot wide channel was dug through the dike. The breaches are along the southern extent of the basin near the proposed reclaim pond.

The majority of the original Butler Stage I Tailings Basin has been reclaimed, and the existing dikes appear to be in fair condition. The dikes appear to have retained their original structure but are now overgrown with vegetation, and large trees cover many areas. Several ponds exist at the downstream and upstream toe of the dikes.

The location of the southern expansion to the Butler Stage I Tailings Basin was previously used for tailings reclaim water. A pond currently covers a portion of the area, and the remaining land is heavily wooded. The dikes appear to be constructed, in part, out of coarse tailings. The eastern extended basin was part of the interior of Butler Taconite Stage II Tailings Basin. Within the extension to the basin areas, there are signs of previous mining activities such as haul roads, dumps, and a reclaim water line.

Alternative Tailings Basin Area

This area has not been disturbed by past mining activities and is relatively undisturbed, aside from recent, periodic logging activities.

Stockpile Areas

The majority of the area proposed for Stockpiles A and C has been affected by previous mining activities, including old tailings basins (the former Patrick B Tailings Basins) and stockpiles. Proposed Stockpile Area B is located in an area that was not previously disturbed by mining activities, with the exception of a small part of the southeast corner where former Draper Annex Mine tailings and stockpiles are located.

Plant Site Area

This area has not been disturbed previously by mining activities, but appears to have been logged in the past.

4.6.2 Environmental Consequences

The proposed mining and processing operations would generate three main types of solid waste. Those include:

- Tailings from the concentrating process
- Overburden and waste rock from mining activities
- Process wastes and solid wastes from the plant operations

The following sections describe the proposed handling and storage procedures for each type of solid waste. In each section, the Proposed Action is described, followed by a description of how the other EIS alternatives differ from the Proposed Action. This section focuses on environmental consequences related to storage and handling of the solid wastes. Other sections of this EIS describe environmental impacts to natural resources (e.g., water quality, wetland impacts, etc.)

4.6.2.1 Tailings

Tailings, which are coarse and/or finely ground waste rock from the concentrating process, would be pumped by pipeline as a slurry to the tailings basin. This EIS analyzes two alternative locations for tailings disposal: the tailings basin (included in the Proposed Action) and the Alternative Tailings Basin. These two alternatives are described in sections A and B below.

4.6.2.1A. TAILINGS BASIN

The *Tailings Basin Preliminary Design Report* (submitted as part of the Permit to Mine application) provides details regarding the proposed tailings basin. Figure 1.2 shows the approximate 20-year extent of the tailings basin and reclaim pond.

1. Tailings Basin Design Considerations

The *Tailings Basin Preliminary Design Report* provides a summary of the potential design advantages and disadvantages, listed below, for the reuse of the former Butler Stage I Tailings Basin.

Advantages

- The location was previously used for a tailings basin. Dams and other features required for tailings disposal are currently in place (i.e., haul and pipeline roads, reclaim pond, water make-up line, etc.);
- Minimal construction is required to begin operations and discharge into the basin;
- Abundant coarse tailings are on site for construction material;
- Clay borrow pits are nearby for future dike construction, if necessary;
- Minimal potential for runoff into the basin due to the elevated position of the existing basin.

Disadvantages

- Overhead utility and underground gas pipelines are currently located within the northern portion of the previous Stage I Tailings Basin and were constructed prior to previous discharge into the basin by Butler;
- Measures would be required to close existing dike breaches;
- Construction would be required to raise dike crest height to an allowable pond freeboard for containing a Probably Maximum Flood (PMF);
- Raising dam construction over fine tailings may add to design and construction costs;
- Basin dike construction would occur over wetlands and previously worked terrain such as dump areas, haul roads, and red ore areas which could lead to significant construction costs in these areas;
- Clearing and grubbing of all the exterior dikes would be required due to the size of the trees. However, this would be required at a previously undeveloped site as well.

2. Construction, Operation and Stability

The tailings basin would be designed and constructed to meet the requirements of Minnesota Rules, part 6130.3000. A preliminary facility design was evaluated as part of the Technical Report: *Volume VII: Stage 1 Tailings Basin* (December 2005) [Tailings Basin Technical Report] submitted by Minnesota Steel as part of their permit to mine application. This report indicated that the mine and plant would not produce ore and tailings immediately upon permit approval. The production would be delayed until the mine and plant facilities are operational. At the tailings basin, starter dams must be completed and pipelines routed around the basin before the facility is operational. This work can be done concurrent with construction of the mine and plant facilities.

The preliminary production estimates used for the Tailings Basin Technical Report are for production levels of 4.95 million metric tons of tailings per year for the first five years. After the initial startup, tailings waste production would increase to approximately

8.26 million metric tons per year. The report also estimates that during the 20-year life of the mine, about 152 million metric tons of tailings storage would be required.

Initially, starter dams would be constructed around the southern perimeter of the basin. As mine operation begins and tailings are discharged into the basin, the dams would be constructed using the upstream construction method with a perimeter pipeline constructed around the basin. Phasing is important to construction of dams over time. Some areas of the tailings basin would need to be raised and some would need flow rerouted with construction of weirs throughout the life of operation. Detailed information on the proposed construction, typical cross sections, stability analysis and phasing is included in the Tailings Basin Technical Report.

3. Closure and Reclamation

Reclamation of the tailing basin areas (including the basin, dikes and dams) would be carried out incrementally/progressively as areas are no longer scheduled to be disturbed. For dikes and dams, as soon as lifts, portions of slopes and benches are final and large enough to be economically reclaimed, the establishment of vegetation would be initiated during the next normal planting season. Slopes would be graded as necessary, hydroseeded and mulched. All vegetating would meet the requirements of Minnesota Rules 6130.3600. Vegetative reference areas (see Section 6.15) for the tailings basin have been identified adjacent to the tailings basin area.

4.6.2.1B. ALTERNATIVE TAILINGS BASIN

A technical memorandum prepared for the EIS summarizing the Alternative Tailings Basin alternative development (see Appendix I - list of EIS Special Studies) provides a description of the Alternative Tailings Basin design concept being studied in this EIS. Figure 3.2 shows the approximate 20-year extent of the basin.

1. Alternative Tailings Basin Design Considerations

The Tailings Basin Alternative Study (July 2005) provides a summary of the potential design advantages and disadvantages, listed below, for the area identified as the Alternative Tailings Basin.

Advantages

- Abundant boulders for riprap varying in size up to several feet in diameter;
- Presence of silty-clayey sand and glacial till filter construction and embankment material;
- Room is available to relocate dams around undesirable features;
- Remote location causes less visual disturbance to landscape from developed areas.

Disadvantages

- Start-up construction of all dikes and auxiliary basin features;
- Direct impact to a tributary of Sucker Brook and to wetlands associated with Sucker Brook;
- Soft foundation material in large marsh areas require excavation or extensive construction on the soft deposits;
- Based on the presence of significant boulder deposits, extensive sorting of borrow pits is expected;

- Overhead utility relocation may be required, as well as relocation of maintained snowmobile trails due to current location being inside the alternate dam perimeter;
- Disturbing large land area that has not previously been affected by mining activities including loss of long-term use by landowner for tree harvesting.

2. Construction, Operation and Stability

The construction and operation of the Alternative Tailings Basin would be similar to that described above for the Proposed Project tailings basin. However, new starter dams would need to be constructed initially for this alternative, since there is no existing dam structure at this location.

A stability analysis was completed for the Alternative Tailings Basin, which is described in the technical memorandum: *Alternative Tailings Basin Sub-Alternatives Development*. The stability analysis concludes that the factors of safety for drained and undrained conditions exceed the recommended minimum standards for safe operation of the dam.

3. Closure and Reclamation

The closure and reclamation of the Alternative Tailings Basin would be similar to the tailings basin, as described above. The tailings dams would be reclaimed as each bench is completed. The perimeter embankments would be designed and constructed to meet the requirements of Minnesota Rules, part 6130.3000 and 6130.3600.

4.6.2.2 Overburden and Waste Rock

Stockpiling would be used to store surface overburden and waste rock material. The EIS analyzes two stockpiling alternatives: the Proposed Action stockpiling plan and a plan that includes in-pit stockpiling of 50 percent of the overburden and waste rock from year 10 to year 20 of mine operation.

4.6.2.2A. PROPOSED ACTION

1. Proposed Action Stockpiling Plan

As described in *Permit to Mine Application* (December 2006), a Proposed Action stockpile plan has been developed for the twenty year mine operation. Figure 1.2 shows the location of the proposed stockpiles for the 20-year plan. The *Permit to Mine Application* provides more detailed figures showing the mine and stockpile plans for interim years of operation (5, 10, 15 and 20 year plans).

The stockpile plan includes substantial use of disturbed areas such as former tailings basins and mine stockpile areas. The stockpiles are located in close proximity to both the mine haul roads exiting Pits 5 and 6, and to the crusher site. Three areas have been identified for stockpile operations, designated as Stockpile Area A, Stockpile Area B, and Stockpile Area C.

- Stockpile Area A is located on the Patrick B Tailings Basin and on stockpile areas located over the Patrick B basin.
- Stockpile Area B is located north of Pit 6, and southwest of the Patrick B Tailings Basin.

- Stockpile Area C is located over portions of both the Patrick B Tailings Basin and the former Perry-Wyman Tailings Basin.

The stockpile plans were developed based on the mine plan, proximity of stockpile areas to the mine and processing operations, mineral rights issues, reclamation requirements, and land/environmental impacts.

Mineral rights have a substantial affect on the siting of stockpiling areas, including the following considerations:

- Land ownership dictates surface rights as well as the disposition of overburden stripped from these areas.
- Mineral rights dictate the ownership of rock materials; including waste rock and ores (see Table 4.6.1 for definitions of the various rock material types).
- Waste rock and ore materials mined from state-owned land must be stockpiled on state-owned land.

TABLE 4.6.1 ROCK MATERIALS DESCRIPTION

Rock Materials	Description
Ore	Rock with greater than 15% magnetic iron content
Lean Ore	Rock with less than 15% magnetic iron content may be economically viable in certain conditions
Oxide Ore	Rock with less than 15% magnetic iron content but a high percentage of total iron
Waste Rock	Rock with less than 15% magnetic iron content and all other rock materials outside of the Lower Cherty unit of the Iron Formation

The stockpile plan was developed to manage mineral and surface ownership issues and to develop a manageable and economical plan for stockpiling materials. After overburden (i.e., unconsolidated material above bedrock) stripping, waste rock and taconite ore would be blasted and loaded into mine trucks. The ore would be trucked out of the pit to the primary crusher located to the north of the area between Pits 5 and 6. Dry cobbing (magnetic separation) would be used to eliminate approximately 7 percent of the lowest-grade ore. Cobbing rejects would be stockpiled and used for construction of haul roads and auxiliary structures or sold to off-site markets. The tables and figures in Volume VIII of the Permit to Mine application show the estimated quantities and the locations for stockpiling these various mine waste materials.

Stockpile Area A provides close proximity to Pit 5, adequate space, and makes use of areas previously used as tailings basin and for stockpiling. Stockpile Area B provides close proximity to Pit 6, adequate space, and minimal impacts to wetlands and threatened or endangered species. Stockpile Area C provides reasonably close proximity to Pit 5, makes use of areas previously used as tailings basin and for stockpiling, and provides extra space and operational flexibility for stockpile operations. During and following each phase of mining, the stockpiles would be graded and benched, and the overburden stockpiles would be re-vegetated in accordance with MNDNR mineland reclamation rules.

2. Closure and Reclamation

Stockpile slopes would be reclaimed as lifts are completed to the planned stockpile limits. Stockpiles would be designed and constructed to meet the requirements of Minnesota Rules, part 6130.2400, 6130.2500, and 6130.3600. Surface overburden stockpiles would be designed and constructed to meet the requirements of Minnesota Rules, part 6130.2700 and 6130.3600. Vegetative reference areas (representing stable, reclaimed slopes) for stockpiles have been identified (see Figure 6-C of Volume VIII of the *Permit to Mine Application*) at a location northwest of Stockpile Area A.

Completed stockpile surfaces would be covered with surface overburden as required by Minnesota Rules, part 6130.2500. Covered surfaces would be seeded by a qualified reclamation contractor. Temporary vegetation may be used in inactive areas to control erosion and dust emissions.

4.6.2.2B. IN-PIT STOCKPILING ALTERNATIVE

1. In-Pit Stockpiling Plan

An in-pit stockpiling disposal concept has been developed as an alternative for managing some of the mine waste rock. Section 3.3.3 describes the In-Pit Stockpiling Alternative, which includes in-pit stockpiling of 50 percent of post year-10 overburden and waste rock. This alternative could be used to reduce the size of overburden and waste rock stockpiles in Areas A, B, and C as shown in Figure 3.3 (Stockpile Alternative) and also could provide some shallow littoral zones within the pits.

The year-10 starting point for in-pit disposal was assumed because in-pit stockpiling can only be done in areas where the mine has reached the footwall of the ore body and there are no viable mineral values at lower elevations left to mine. It was assumed that prior to year-10; these conditions would not be met. The feasibility of in-pit stockpiling would need to be considered and planned for as mine pits approach their ultimate limits and adequate footwall areas are exposed.

2. Closure and Reclamation

Closure and reclamation of Stockpiles A, B, and C for the In-Pit Stockpiling Alternative would be the same as that described for the Proposed Action in Section 4.6.2.2.A.

4.6.2.3 Process Waste and Solid Waste from Crusher and Processing Plant Operations

4.6.2.3A. PROPOSED ACTION

Table 4.6.2 lists the source of wastes associated with the Proposed Project, their estimated quantities and the proposed method for disposal. Where possible, wastes would be recycled or reincorporated back into the process. If a waste cannot be recycled or reincorporated back into the process it would be required to abide by all state and federal requirements regarding its proper storage, handling and disposal.

TABLE 4.6.2 DESCRIPTION OF SOLIDS, SLUDGES AND HAZARDOUS WASTES

Source/Characterization	Estimated Quantity	Storage, Handling and Disposal
Solid Wastes		
Construction	To Be Determined	Construction debris would be generated during construction and through ongoing maintenance. Efforts would be made to recycle materials on site or through available public or private recycling programs. Minnesota Steel may construct a small on-site debris landfill to accept non-recyclable materials. If constructed, the landfill would be designed to comply with state solid waste permit requirements. If such a facility is not constructed, construction debris would be hauled to a licensed demolition debris landfill with an approved industrial waste management plan for acceptance of construction debris.
Mixed solid waste from offices, shops and production facilities (excluding shop and industrial wastes)	Quantities would be typical of an industrial facility with 300 persons per shift.	Typical mixed solid waste (MSW) would be produced from offices and non-production-related locations (lunchrooms, control stations). A comprehensive recycling program would be implemented. A licensed hauler would dispose of MSW in a permitted solid waste landfill.
Crusher baghouse dust	4,800 tpy	Has the composition of ore, and would be sent to the concentrator to be reincorporated into the process.
Concentrator plant tailings	8.2 mltpy	Would be transferred to the tailings basin via slurry pipeline for disposal.
Concentrator baghouse dust	900 tpy	Composed of taconite ore dust that would be reincorporated into the process.
Mill scale	36,000 metric tons per year	Mill scale (primarily iron oxide) is produced by descaling hot metal strips using water jets. The wet scale is collected in the scale pit, dewatered and disposed of by landfilling or by reincorporating it back into the iron-making process. Mill scale is sometimes used as a source of iron by the Portland cement industry and Minnesota Steel has indicated that they may explore this option.
(In-house) Scrap steel	180,000 metric tons per year	Scrap steel is produced from spillage, ladle skulls and tipped steel in the melt shop, as well as from head and tail crops and cobbles in the rolling mill. All scrap would be collected and recycled into the steelmaking process or (if not suitable for reuse) sold as commercial scrap.
Steel Mill, Kiln and DRI Refractory	9,000 tons per year	Furnace lining (brick refractory) wears out and must be replaced regularly. Refractory waste from other facilities has indicated that this material is not hazardous. A normal refractory disposal practice is landfilling but crushing and recycling as construction aggregate is a possibility that may be explored.

TABLE 4.6.2 DESCRIPTION OF SOLIDS, SLUDGES AND HAZARDOUS WASTES

Source/Characterization	Estimated Quantity	Storage, Handling and Disposal
Slag	300,000 metric tons per year	The EAFs and ladle furnaces would produce slag as a by-product of steelmaking at a rate of about 330 lbs per ton of liquid steel. The hardened slag is crushed to allow for magnetic separation of the metallic fraction, which would be added back to the EAF via the scrap bucket. The non-metallic fraction of the slag would be stockpiled on-site as a non-hazardous waste product to be used for construction of haul roads, or sold to off-site markets. The major constituents of slag are calcium oxide, silicon oxide and iron. Slag is considered non-hazardous and is commonly used as construction material. Minnesota Steel would use this material as aggregate at the facility and proposes to hire a contractor to manage the excess slag. This contractor would be responsible for removing the material, and properly disposing of it or moving the material off the project site for reuse. About eight million tons of slag from steelmaking was sold in the U.S. for use as road aggregate, de-icing sand, granular construction fill and other uses in 2000. The MPCA reports that leach testing of slag from another electric arc furnace facility in Minnesota resulted in a non-hazardous leachate. The slag does not require special handling or storage and is mainly used as railroad ballast.
Sludges		
Raw water filtration sludge	2,900 tpy (dry)	Make-up water used in the DRI plant and steel mill would be softened with lime to remove calcium and magnesium. The sludge that is generated by this treatment process would be disposed of at a permitted solid waste landfill.
Pellet plant air scrubber sludge	3,900 tpy of softening sludge (dry); 3,000 tpy of reverse osmosis (RO) brine (dry) from waste gas and other stack blowdown; 1,600 tpy of iron particles	Would be composed of filtered solids such as calcium, magnesium, chloride, fluoride, nitrate, sulfate, iron and carbonate. A multi-cyclone unit would remove the larger particles and the particles would be reincorporated into the process. The softening sludge would be disposed of at a permitted solid waste landfill.
DRI plant air scrubber sludge	515 tpy of RO brine (dry)	Composition would be similar to the make-up water with some ammonia, sodium, and phosphorus enrichment. The dry solids that are generated by this treatment process would be disposed of at a permitted solid waste landfill.

TABLE 4.6.2 DESCRIPTION OF SOLIDS, SLUDGES AND HAZARDOUS WASTES

Source/Characterization	Estimated Quantity	Storage, Handling and Disposal
DRI Cooling Tower Blowdown	400 tpy of RO brine (dry)	Composition would be similar to the make-up water with sodium and phosphorus enrichment (from chemical additives). The dry solids that are generated by this treatment process would be disposed of at a permitted solid waste landfill.
Oil Separation System	To Be Determined	Oily sludge to be managed by licensed disposal contractor.
Steel Mill Cooling Towers – Blowdown	1,500 tpy (dry) of RO brine	Composition would be similar to the make-up water with phosphorus and sodium enrichment (from chemical additives). The dry solids that are generated by this treatment process would be disposed of at a permitted solid waste landfill.
Steel mill - Scale pit sludge includes oil and grease from the rolling mill and fine iron oxide particles mixed with water.	To Be Determined	Scale pit sludge would be sent to a licensed commercial waste-oil disposal or commercial oil-recovery facility.
Hazardous and Special Wastes		
Mine/Crusher Waste Oil and Lubricants	4,000 gallons per year	Shovels and drilling equipment would produce waste lubricants and hydraulic oil. Also, see truck shop, below. Waste oil would be collected and disposed of by a licensed commercial waste oil disposal contractor. Solvents would be drummed and disposed of by a licensed commercial hazardous waste disposal contractor.
Electric Arc Furnace Baghouse Dust	10,100 tpy	RCRA-listed K061waste; Minnesota Steel plans to agglomerate baghouse dust with the intent to recharge the material to the EAFs as a substitute for commercial flux products. Alternately, Minnesota Steel has indicated they would likely pursue delisting of the baghouse dust because virgin iron units supplied to the furnaces would not have the typical heavy metal contaminants introduced by scrap metal. If successfully delisted, EAF dust would be either recycled into iron/steel processes or disposed of in a local permitted landfill. Minnesota Steel would use a commercial hazardous waste contractor to dispose of this waste until the material can be determined to be non-hazardous.
Maintenance – waste solvents	To Be Determined	Waste would be drummed and disposed of by a licensed commercial hazardous waste disposal contractor.
Maintenance – waste lubricants	To Be Determined	Waste would be drummed and disposed of by a licensed commercial hazardous waste disposal contractor.
Paint Shop Waste	4,000 lbs per year	The paint shop would generate small amounts of paint waste, solvents and possibly sandblasting waste. A paint booth would not be operated on-site. Waste would be drummed and disposed of by a licensed commercial hazardous waste disposal contractor.

TABLE 4.6.2 DESCRIPTION OF SOLIDS, SLUDGES AND HAZARDOUS WASTES

Source/Characterization	Estimated Quantity	Storage, Handling and Disposal
Truck Shop Waste	2,400 gallons per year	The truck shop would generate used motor oil and smaller amounts of solvents. Waste oil would be collected and disposed of by a licensed commercial waste oil disposal contractor. Solvents would be drummed and disposed of by a licensed commercial hazardous waste disposal contractor. Mine vehicles would be owned, operated and maintained by a qualified contractor who would be responsible for the proper handling storage and disposal of wastes associated with the mine vehicles.
Laboratory – waste solvents and materials	300 gallons per year	Waste would be drummed and disposed of by a licensed commercial hazardous waste disposal contractor.

4.6.2.3B. OTHER EIS ALTERNATIVES

Processing waste production, handling and disposal for the other EIS alternatives would be similar to the Proposed Action, except for the On-Site Wastewater Treatment Alternative as described below.

On-Site Wastewater Treatment Alternative

Solids from the on-site wastewater treatment system (described in Section 3.3.3.3) would primarily be retained in the septic tanks, which would be monitored for solids levels, with solids removed by a licensed operator, as needed, for transport to an approved disposal facility. Any solids or biomass that accumulates on the textile filters would be periodically removed by spraying off the filters and capturing the residue in the recirculation tank. This tank would also be monitored for solids accumulation and solids pumped by a licensed operator, as necessary, for transport to an approved disposal facility.

4.6.3 Mitigation

4.6.3.1 Tailings

Selection of the tailings basin as the preferred alternative would confine tailings impacts to an area previously impacted, instead of affecting an area previously unaffected by mining (i.e., the Alternative Tailings Basin area).

For either EIS tailings basin location alternative, the impacts from the tailings and tailings basin would be mitigated through the reclamation process. As described previously, all basin, dam and dike areas are required to be vegetated. Tailings dams would be reclaimed as each bench is completed. As soon as a lift or portion of a slope or bench is final and large enough to be economically vegetated it would be scheduled for planting in the next planting season. Slopes would be graded as necessary, hydroseeded and mulched.

4.6.3.2 Overburden and Waste Rock

Using the existing Patrick B Tailings Basin area and old stockpile areas minimizes potential impacts to previously undisturbed land. The impacts associated with the overburden and waste rock in the stockpiles would be mitigated through the reclamation process. Rock stockpile top surfaces and benches would be covered with surface overburden as required and planted by conventional methods. Temporary vegetation may be used in inactive areas to control erosion and dust emissions.

4.6.3.3 Process Wastes

Best management practices would be used in handling, storing and disposing of mining wastes. Solid and hazardous wastes would be stored, handled and disposed of according to Minnesota Rules, parts 7035 and 7045. Hazardous wastes generated by the Proposed Project would be handled and disposed of by a licensed operator, in accordance with applicable state and federal regulations.

Minnesota Steel has indicated that several of the waste streams could be considered for beneficial reuse. Minnesota Rules, part 7035.2860 provides the framework for the beneficial use of a solid waste. Until these wastes are determined to be acceptable for beneficial reuse, they must be handled as a solid waste.

A waste characterization study should be completed to provide additional, detailed information about each of the wastes that would be generated by the Proposed Project. This study should also take into consideration how the waste stream would be handled prior to disposal and if it can be recycled, reused, or considered for beneficial reuse.

4.7 STATIONARY SOURCE AIR EMISSIONS

The Proposed Project has primary air emission points at the mine, taconite indurating furnace, DRI modules and steel mill EAFs. Smaller emission points include numerous individual material handling operations, smaller combustion sources and cooling towers. All emission points have been included in the evaluation of Best Available Control Technology (BACT) required under the PSD provisions, and some emission points are subject to the Maximum Achievable Control Technology (MACT) standards set by the national emission standards for hazardous air pollutants (NESHAPs).

The following studies evaluate the Proposed Project-related air quality items identified in the Final SDD and are addressed in this Draft EIS:

- An emission inventory that lists all possible sources of air emissions from the plant (stack and fugitive) (Section 4.7.2.1.1)
- BACT analyses, which propose control technologies for the project to achieve lowest cost effective emission levels (Section 4.7.2.1.2)
- Compliance strategies for standards requiring MACT for control of hazardous air pollutants such as metals and volatile organic compounds (Section 4.7.2.1.3)
- A Class I Area Impacts Analysis using the CALPUFF model to simulate the long-range transport of project emissions and determine the impact of project-related air emissions on Class I increment, ambient air quality standards, visibility and other air quality-related values (AQRVs). The Class I areas include Voyageurs National Park, the Boundary Waters Canoe Area Wilderness (BWCAW), Isle Royale, and Rainbow Lake Wilderness Area (Section 4.7.2.2.2)

- A Class II Area Impacts Analysis to evaluate air quality effects of the Proposed Project at the project boundary and demonstrate compliance with ambient air quality standards or the PSD increment (Section 4.7.2.2.1)
- A review of potential mercury emissions from the Proposed Project and an evaluation of mercury emission reduction alternatives (Section 4.7.2.3)
- A human health and ecological risk assessment of potential impacts from air emissions from the project (Sections 4.7.2.4 and 4.7.2.5)
- A summary of existing mineralogical data and studies for the west end of the Mesabi Range from Minnesota state agencies, research institutions, and Butler Taconite files. Also, an analysis of the existing mineralogy and petrology data for the ore body to be mined in order to identify the presence/absence of amphibole minerals or fibers (Section 4.7.2.6)

Information presented in this Draft EIS was taken from an air emissions permit application submitted in September 2006 by Minnesota Steel. Additional details related to the Proposed Project's air emissions are described in documents referenced throughout this section and the air emissions permit application.

4.7.1 Affected Environment

4.7.1.1 Air Quality Regulatory Framework Applicable to the Project

In accordance with state and federal air quality rules, Minnesota Steel is required to obtain an air emissions permit to construct and operate the Proposed Project. The types of proposed emission sources and the quantity of potential emissions from the proposed sources determine which air quality regulations apply to the project, the level of pre-construction review, and the type of operating permit required. Due to the types of emission sources and the quantity of emissions, the following air quality regulatory programs have been triggered by the Proposed Project:

- Prevention of Significant Deterioration (PSD),
- New Source Performance Standards (NSPS),
- National Emission Standards for Hazardous Air Pollutants (NESHAPs),
- Part 70 Operating Permit Program, and
- Minnesota Air Quality Rules.

According to PSD regulations, Minnesota Steel is required to complete a BACT analysis, air dispersion modeling analyses for Class I and Class II areas, and an additional impacts analysis. Class I areas include wilderness and national park areas. Class II areas include all other areas. NSPS regulations require applicable processes to comply with pollutant emission limits, monitoring, reporting, and record keeping. NESHAP regulations limit emissions of specific hazardous air pollutants and require certain source categories to comply with MACT standards. Among other things, Minnesota rules include state standards of performance, monitoring and testing conditions, and requirements to report emissions and pay emission fees.

The MPCA's air permitting process would determine the final compliance requirements for the Proposed Project. The MPCA reviews the air emissions permit application and drafts an air emissions construction and operating permit. When the draft air permit has been finalized, it would be placed on public notice. The public has 30 days to review the draft air permit and submit comments to the MPCA. After the MPCA has responded to the public comments and made necessary revisions, the draft permit is sent to USEPA for their 45-day review. If the draft permit is changed significantly, the MPCA may place the permit on public notice for another 30 days before issuing the final permit. Note that the MPCA can request that USEPA begin its 45 day comment period concurrently with the 30 day public comment period for non-controversial permits. The final air emissions permit cannot be issued until the Final EIS is deemed adequate.

The Proposed Project cannot be constructed until the air emissions permit is issued. The USEPA has delegated authority for the PSD program to the MPCA. The MPCA is required to notify those who commented at the beginning of the PSD 30 day appeal period. Construction of the Proposed Project may not start until the MPCA provides notification that the PSD appeal period has passed. Construction is required to start within 18 months of permit issuance. The MPCA would require Minnesota Steel to demonstrate the adequacy of the previous BACT determinations if construction has not commenced within 18 months of permit issuance, construction is discontinued for a period of 18 months or more, or construction is not completed within a reasonable time.

4.7.1.2 Existing Ambient Air Quality

The area that includes the Proposed Project site is in attainment with (i.e., meets), existing air quality standards and is classified as a Class II area. The project is also within the 200 to 300 kilometer (124 to 186 mile) radius of interest cited by Federal Land Managers (FLMs) for the evaluation of air emission impacts on Class I areas. The Class I areas within this radius include Voyageurs National Park, the BWCAW, Isle Royale, National Park and Rainbow Lake Wilderness Area.

Air quality data has been collected that is representative of the existing background concentrations for the region near the project site. The PM_{10} background concentrations represent the 2002 through 2004 average concentrations for the high second-high 24-hour concentration and annual average concentration from Virginia, Minnesota. The SO_2 and NO_2 background concentrations were taken from Table 6 of MPCA's Air Dispersion Modeling Guidance – Northshore Mining, Silver Bay, Minnesota PSD application (December 1999). This information, plus Class II area ambient air quality standards, is summarized in Table 4.7.1.

TABLE 4.7.1 EXISTING BACKGROUND CONCENTRATIONS AND CLASS II AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Period	Existing Ambient Background Concentration (ug/m^3)	Ambient Air Quality Standard (1) (ug/m^3)
PM_{10}	24-hour	38	150
	Annual	16	50
SO_2	1-hour*	90	1,300
	3-hour**	25	915
	24-hour	11	365
	Annual***	3	60
NO_x	Annual	12	100
CO	1-hour	---	40,000
	8-hour	---	10,000
Lead (Pb)	Quarterly	---	1.5

*SO_2 1-hour standard is a Minnesota Ambient Air Quality Standard (MAAQS) only.
** 915 $\mu g/m^3$ is SO_2 3-hour standard for Northern Minnesota. NAAQS is 1300 $\mu g/m^3$.
*** 60 $\mu g/m^3$ is SO_2 annual MAAQS. NAAQS is 80 $\mu g/m^3$.
(1) The NAAQS and MAAQS are the same unless otherwise specified with the more restrictive standard shown in the table.

Similarly, data has been compiled that is representative of the existing and estimated background values for the selected Class I areas. These are summarized in Table 4.7.2.

TABLE 4.7.2 EXISTING AND ESTIMATED BACKGROUND VALUES FOR SELECTED AND POTENTIALLY IMPACTED CLASS I AREAS

Characteristic	BWCAW	Isle Royale	Rainbow Lake	Voyageurs Park
Mean SO_2 Concentration, annual (ug/m^3)[1]	1.2	2.0	1.6	0.7
Max SO_2 Concentration, 3-hour (ug/m^3)[2]	10.8	18	14.4	6.3
Ozone Concentration, 2nd-high hourly (ppb_v)[3]	68	68	90	71
Annual Sulfur Deposition				
Wet deposition (kg S/ha/yr)[4]	2.42	1.72	2.55	1.41
Dry deposition (kg S/ha/yr)[5]	0.43	0.43	0.43	0.43
Total deposition (kg S/ha/yr)	2.85	2.15	2.98	1.84
Annual Nitrogen Deposition				
Wet deposition (kg N/ha/yr)[4]	4.07	3.17	5.20	3.19
Dry deposition (kg N/ha/yr)[5]	0.68	0.68	0.68	0.68
Total deposition (kg N/ha/yr)	4.75	3.85	5.88	3.87

(1) Mean annual SO_2 concentrations (ug/m3):
- Annual average SO_2 concentrations calculated from 1991-1993 data in Table 1 of "Screening Procedures to Evaluate effects of Air Pollution on Eastern Wildernesses Cited as Class I Air Quality Areas", USDA, Forest Service, Northeast Forest Experiment Station, General Technical Report NE-151, dated September 1991.
- BWCAW: data from Ely, Minnesota site applied to BWCAW.
- Isle Royale National Park: data from the Finland, Minnesota site applied to Isle Royale National Park.
- Rainbow Lake Wilderness: data from the Sandstone, Minnesota site applied to Rainbow Lake Wilderness.
- Voyageurs National Park: data from Annual Data Summary, Voyageurs National Park 2002, National Park Service, Gaseous Air Pollutant Monitoring Network, Report No. NPS D-139.

(2) Highest 3-hour SO_2 set equal to annual average SO_2 x 9.0, in accordance with USEPA Guideline for Air Quality Maintenance Planning and Analysis", Vol. 10 (revised), USEPA, Office of Air Quality and Standards, USEPA-450/4-77-001, October 1977.

(3) Ozone concentrations:
- BWCAW: data from USEPA Air Data, Lake County, Minnesota (2003).
- Isle Royale National Park: data from USEPA Air Data, Lake County, Minnesota (2003).
- Rainbow Lake Wilderness: data from USEPA Air Data, Polk County, Wisconsin (1998).
- Voyageurs National Park: data from Annual Data Summary, Voyageurs National Park 2001, National Park Service, Gaseous Air Pollutant Monitoring Network, Report No. NPS D-134.

(4) Annual wet deposition data from NAPD data base (http://nadp.sws.uiuc.edu)
- BWCAW: data for Hovland Site, Cook County, Minnesota (1997-2003).
- Isle Royale National Park: data for Fernberg Site, Lake County, Minnesota (1997-2003).
- Rainbow Lake Wilderness: data for Spooner Site, Washburn County, Wisconsin (1997-2003).
- Voyageurs National Park: data for Voyageurs National Park, Sullivan Bay, St. Louis County, Minnesota (2000-2003).

(5) Annual dry deposition data from CASTnet data base (http://www.epa.gov/castnet) for Voyageurs National Park (1996-2002)

4.7.2 Environmental Consequences

The following sections describe the air quality impacts from the Proposed Project and the associated air quality regulatory requirements. Information presented in this Draft EIS was taken from the Air Emissions Permit Application, submitted in September 2006. The *Review of Fibers Related Data for the West End of the Mesabi Iron Range and the Former Butler Taconite Ore Deposit* report, dated July 2006, was also reviewed for mineralogical data and findings.

4.7.2.1 Emissions Inventory

4.7.2.1.1 Estimated Potential and Actual Emissions

Air emissions from the Proposed Project are described in the Air Emissions Permit Application, submitted by Minnesota Steel in September 2006. Air emissions result from taconite mining, crushing, handling, and pelletizing, as well as DRI and the EAFs. Criteria pollutant and Hazardous Air Pollutant (HAP) emissions were calculated. Uncontrolled and controlled emission estimates were also calculated.

The facility is considered "major" under the New Source Review (NSR) PSD program, and is also a major source of HAPs under the NESHAP regulations. Emission estimates were based on USEPA's AP-42 emission factors, vendor information, stack test data from similar sources, and regulatory emission limits.

Total facility controlled potential emissions are presented in Table 4.7.3 for the proposed Minnesota Steel project (*Application for a Permit to Construct and Operate an Integrated Steel Facility, Volume I, Appendix B, September 2006*).

TABLE 4.7.3 MINNESOTA STEEL CONTROLLED POTENTIAL EMISSIONS

Project Areas	Controlled Potential Emissions (ton/yr)								
	PM	**PM_{10}**	**NO_x**	**SO_2**	**VOCs**	**CO**	**Fluorides**	**H_2SO_4**	**Lead**
Mining and Crushing	1,793	521	---	---	0.4	---	0.0017	---	0.02
Concentrator	493	238	11	0.24	0.36	2.5	0.0005	---	0.001
Pelletizer(1)	214	360	794	172	30	64	1.0	0.864	0.1
Direct Reduced Iron	180	167	275	125	35.2	605	0.01	0.01	0.005
Steel Mill	86	234	521	242	202	3,083	0.3	0.05	1.4
Slag Processing	14	6	---	---	---	---	1.4	---	0
Total	**2,780**	**1,525**	**1,601**	**539**	**268**	**3,755**	**2.7**	**0.92**	**1.5**

(1) Includes $LoTO_x$™ as a control for NO_x.

4.7.2.1.2 Proposed Best Available Control Technology (BACT) Analysis

The Proposed Project is subject to PSD review for emissions of PM/PM_{10}, NO_x, SO_2, CO, VOC, lead, fluorides, sulfuric acid mist, and hydrogen sulfide (H_2S). Regulations require Minnesota Steel to conduct a case-by-case BACT analysis for each emission source associated with the Proposed Project that has the potential to emit air pollutants at levels greater than established thresholds. This section summarizes the information presented in the BACT report, which was submitted to MPCA in September 2006. Table 4.7.4 shows a summary of the emission units or plant operations and the PSD pollutants emitted.

TABLE 4.7.4 CATEGORIZATION OF EMISSION SOURCES SUBJECT TO THE BACT REVIEW

Plant Section	PSD Pollutants Emitted
Mining and Crushing	PM and PM_{10}, Pb, Fluorides
Pellet Plant	PM, PM_{10}, SO_2, NO_x, CO, VOC, Pb, Fluorides and Sulfuric Acid Mist (SAM)
DRI Plant	PM, PM_{10}, SO_2, H_2S, NO_x, CO, VOC, Pb and Fluorides
Steel Mill	PM, PM_{10}, SO_2, NO_x, CO, VOC, Pb and Fluorides
Vacuum Degasser	CO
Vacuum Degasser Boiler	PM, PM_{10}, SO_2, NO_x, CO, VOC
Slag Handling	PM and PM_{10}
Cooling Towers	PM and PM_{10}
Emergency Generators and Pumps	PM, PM_{10}, SO_2, NO_x, CO and VOC
Fugitive Emissions	PM and PM_{10}, Pb and Fluorides

BACT is defined in 40 C.F.R. 52.21(j) as follows:

"an emission limitation (including a visible emission standard) based on the maximum degree of reduction of each air pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant…"

The Proposed Project's BACT analysis used USEPA's top-down approach. Following the top-down approach, the control technology with the highest level of control that is economically feasible is determined the BACT technology. This analysis is based on environmental, energy, and economic impacts. The steps involved, include:

- Identify applicable options;
- Eliminate technically infeasible options;
- Rank remaining alternatives by control effectiveness;
- Evaluate most effective controls; and
- Select BACT

In determining BACT for the emission units included in this project, information from the following sources was evaluated in the BACT review:

- On-line USEPA RACT/BACT/LAER Clearinghouse (RBLC) System;
- USEPA's NSR bulletin board
- USEPA background documents for Electric Arc Furnace (NSPS Subpart AAa)
- USEPA/State Air Quality Permits
- Air and Waste Management Association (A&WMA) Air Pollution Control Technology Manual
- South Coast Air Quality Management District (AQMD) Best Available Control Technology Guidelines
- Bay Area Air Quality Management District (BAAQMD)
- San Joaquin Valley Unified Pollution District BACT Clearinghouse

- Texas Natural Resource Conservation Commissions BACT
- USEPA's Air Compliance Advisor (ACA) Air Pollution Control Technology Evaluation Model version 7.5;
- Air pollution control technology vendors;
- Manufacturer's recommendations; and
- Applicable Standards under 40 C.F.R. Part 60 New Source Performance Standards (NSPS), 40 C.F.R. Part 61 NESHAP, and 40 C.F.R. Part 63 NESHAP/ MACT.

As required by PSD regulations, BACT emission limits and performance standards were proposed by Minnesota Steel for inclusion in the air emissions permit. A detailed summary of the proposed BACT performance standards and emission limits are presented in Tables 4.7.5, 4.7.6 and 4.7.7.

The control technologies proposed as BACT at the Proposed Project include:

- Clean Fuels (Natural Gas) for SO_2, NO_x, PM and PM_{10}
- Good Combustion Practices for CO, VOC, PM and PM_{10}
- Enclosures with Fabric Filter for PM, PM_{10}
- Enclosures with PM Wet Scrubbers for PM, PM_{10}
- Low NO_x, ultra low NO_x and oxy fuel burners for NO_x
- Wet Scrubbers for PM, PM_{10}
- Absorber / Wet Scrubber for SO_2, fluorides (F) and sulfuric acid mist (SAM)
- Pb, F and SAM Control Performance Monitored via SO_2 and PM emissions limits
- Best Practices for Fugitive Dust Control via a Fugitive Dust Control Plan

In the final air emissions permit, the MPCA and USEPA would include control equipment requirements and BACT limits that are equal to or more stringent that those shown in Tables 4.7.5, 4.7.6 and 4.7.7. The air emissions permit would also specify BACT limits for periods of start-up and shutdown.

TABLE 4.7.5 BACT ANALYSIS SUMMARY

Source	PM/PM_{10}	SO_2	SAM	NO_x	CO	VOC	Pb	F	H_2S
Indurating Furnace -Hood Exhaust	Wet Scrubber	No Additional Controls	Wet Scrubber	CF/GCP	No Controls	No Controls	Wet Scrubber	Wet Scrubber	n/a
Indurating Furnace –Waste Gas [1]	Wet Scrubber	Wet Scrubber	Wet Scrubber	CF / GCP (startup) $LoTO_x$™ (future)	CF / GCP	CF / GCP	Wet Scrubber	Wet Scrubber	n/a
DRI Boiler	CF / GCP	CF / GCP	n/a	Ultra Low NO_x burner and Low NO_x with FGR	CF / GCP	CF / GCP	n/a	n/a	n/a
DRI Process Heater	Top Gas Scrubber System	CF	n/a	Ultra Low NO_x burner	CF / GCP	CF / GCP	Top Gas Scrubber System	Top Gas Scrubber System	n/a
Top Gas Purification	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No Control
Pneumatic Transport System Gas Heater	CF / GCP	CF / GCP	n/a	Ultra Low NO_x burner and Low NO_x with FGR	CF / GCP	CF / GCP	n/a	n/a	n/a

Source	PM/PM_{10}	SO_2	SAM	NO_x	CO	VOC	Pb	F	H_2S
DRI Cooling Water Vents	n/a	n/a	n/a	n/a	Good Design and Operating Practices (CO)	n/a	n/a	n/a	n/a
DRI and Melt Shop Cooling Towers	Drift Eliminator	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Melt Shop	DSECS Baghouse	CF	CF	Oxyfuel Burner and DSECS	DSECS Injection	DSECS Injection	DSECS Baghouse	DSECS Baghouse	
Ladle and Tundish Preheaters	CF / GCP	CF / GCP	n/a	Low NO_x Burner	CF / GCP	CF / GCP	n/a	n/a	n/a
Vacuum Degasser	n/a	n/a	n/a	n/a	Flare	n/a	n/a	n/a	n/a
Vacuum Degasser Boiler	CF / GCP	CF / GCP	n/a	Low NO_x Burner with Flue Gas Recirculatio n	CF / GCP	CF / GCP	n/a	n/a	n/a
Tunnel Furnace	CF / GCP	CF / GCP	n/a	Low NO_x Burner	CF / GCP	CF / GCP	n/a	n/a	n/a
Material Handling	Fabric Filter	n/a	n/a	n/a	n/a	n/a	Fabric Filter	Fabric Filter	n/a
Fugitive Dust	BP / DCP	n/a	n/a	n/a	n/a	n/a	BP / DCP	BP / DCP	n/a
Emergency Diesel Generators	GCP	GCP	n/a	GCP	GCP	GCP	n/a	n/a	n/a

Key

[1] = minimizing waste gas flow to the hood exhaust is considered BACT for all pollutants
n/a = not applicable, BACT is not triggered
CF = clean fuel
GCP = good combustion practices
FGR = flue gas recirculation
DSECS – Direct Shell Evacuation Control System
BP / DCP = best practice / dust control plan
RTO = regenerative thermal oxidizer

TABLE 4.7.6 PROPOSED BACT PERFORMANCE STANDARD SUMMARY

Source	PM	PM_{10}	SO_2	SAM	NO_x	CO	VOC	Pb	F
Indurating Furnace -Hood Exhaust	0.006 gr/dscf [1]	0.012 gr/dscf [1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Indurating Furnace -Waste Gas	0.006 gr/dscf [1]	0.012 gr/dscf [1]	5 ppm	n/a	n/a – interim 25 ppm - future	CF / GCP	CF / GCP	n/a	n/a
DRI Boiler	0.0075 lb/MMBtu PM/PM_{10}		CF / GCP	n/a	0.035 lb/MMBtu	0.08 lb/MMBtu	0.006 lb/MMBtu	n/a	n/a
DRI Process Heater	0.015 lb/MMBtu 0.01 gr/dscf PM/PM_{10}		CF	n/a	0.04 lb/MMBtu	0.08 lb/MMBtu	0.006 lb/MMBtu	n/a	n/a
Top Gas Purification	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pneumatic Transport System Gas Heater	0.0075 lb/MMBtu PM/PM_{10}		CF / GCP	n/a	0.035 lb/MMBtu	0.08 lb/MMBtu	0.006 lb/MMBtu	n/a	n/a
DRI Cooling Water Blowdown	n/a	n/a	n/a	n/a	n/a	CO – good design and operating practice	n/a	n/a	n/a
Melt Shop	0.0018 gr/dscf [1]	0.0052 gr/dscf [1]	0.15 lb/ton liquid steel	n/a	0.3 lb/ton liquid steel	2 lb/ton 0.13 lb/ton Liquid steel	0.13 lb/ton Liquid steel	n/a	n/a
Ladle and Tundish Preheaters	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vacuum Degasser	n/a	n/a	n/a	n/a	n/a	40 C.F.R. 60 Subpart A (60.18)	40 C.F.R. 60 Subpart A (60.18)	n/a	n/a
Vacuum Degasser Boiler	0.0075 lb/MMBtu PM/PM_{10}		CF / GCP	n/a	0.035 lb/MMBtu	0.08 lb/MMBtu	0.006 lb/MMBtu	n/a	n/a
Tunnel Furnace	CF / GCP	CF / GCP	CF / GCP	n/a	0.1 lb / MMBtu	0.08 lb/MMBtu	0.006 lb/MMBtu	n/a	n/a
Material and Additive Material Handling	0.005 gr/dscf [2]	n/a	n/a	n/a	n/a	n/a	n/a	0.005 gr/dscf [2]	0.005 gr/dscf [2]
Fugitive Dust	Follow FDCP	Follow FDCP	n/a	n/a	n/a	n/a	n/a	Follow FDCP	Follow FDCP
Emergency Diesel Generators	GCP	GCP	GCP	n/a	GCP	GCP	GCP	n/a	n/a

Key

[1] = PM measured using USEPA Method 5 (Filterable PM only). PM_{10} measured using USEPA Method 201 or 201A (Filterable) and 202 or USEPA approved modified method 202 procedure; there is no performance standard for H_2S.

[2] = New Source Performance Standards for Opacity also apply to the facility as follows:

Metallic Mineral Processing
- Visible Emissions – 7% opacity
- Fugitive Emissions – 10% opacity

Steel Plants
- Visible Emissions from Control Devices – 3% opacity
- Visible Emissions from the Melt Shop – 6% opacity
- Visible Emissions from Dust Handling – 10% opacity

MPCA may specify the above opacity limits – or more stringent ones – as part of the BACT determination for PM/PM_{10}. CF = clean fuel; GCP = good combustion practices; FDCP = Fugitive Dust Control Plan

TABLE 4.7.7 PROPOSED BACT MASS EMISSION LIMIT SUMMARY

Source	PM	PM_{10}	SO_2	SAM	NO_x	CO	VOC	Pb	F
Indurating Furnace - Hood Exhaust	23 lb/hr 24 hr ave	47 lb/hr 24 hr ave	36 lb/hr 3 hr ave	0.016 lb/hr 3 hr ave	165 lb/hr 24 hr ave	4.4 lb/hr 1 hr ave	2.1 lb/hr 24 hr ave	0.013 lb/hr 3 hr ave	0.013 lb/hr 3 hr ave
Indurating Furnace - Waste Gas	17 lb/hr 24 hr ave	33 lb/hr 24 hr ave	10 lb/hr 3 hr ave	0.039 lb/hr 3 hr ave	464 lb/hr 24 hr ave (startup) 46 lb/hr 24 hr ave (future)	12 lb/hr 1 hr ave	5.9 lb/hr 24 hr ave	0.013 lb/hr 3 hr ave	0.25 lb/hr 3 hr ave
DRI Boiler	0.8 lb PM/PM_{10}/hr 24 hr ave		0.1 lb/hr 3 hr ave	n/a	3.8 lb/hr 24 hr ave	8.9 lb/hr 1 hr ave	0.6 lb/hr 24 hr ave	n/a	n/a
DRI Process Heater	8.8 lb PM/PM_{10}/hr 24 hr ave		1 lb/hr 3 hr ave	n/a	24 lb/hr 24 hr ave	50 lb/hr 1 hr ave	3.3 lb/hr 24 hr ave	0.0003 lb/hr 3 hr ave	0.0004 lb/hr 3 hr ave
Top Gas Purification	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pneumatic Transport System Gas Heater	0.09 lb PM/PM_{10}/hr 24 hr ave		0.02 lb/hr 3 hr ave	n/a	0.4 lb/hr 24 hr ave	0.9 lb/hr 1 hr ave	0.1 lb/hr 24 hr ave	n/a	n/a
DRI Cooling Water Blowdown	n/a	n/a	n/a	n/a	n/a	Quench 6.0 lb/hr 3 hr ave Process 3.0 lb/hr 3 hr ave	n/a	n/a	n/a
Melt Shop	9 lb/hr 24 hr ave	29 lb/hr 24 hr ave	33 lb/hr 3 hr ave	0.007 lb/hr 3 hr ave	62 lb/hr 24 hr ave	410 l/hr 1 hr ave	27 lb/hr 24 hr ave	0.2 lb/hr 3 hr ave	0.6 lb/hr 3 hr ave
Ladle and Tundish Preheaters	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vacuum Degasser	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vacuum Degasser Boiler	0.8 lb PM/PM_{10}/hr 24 hr ave		0.1 lb/hr 3 hr ave	n/a	3.8 lb/hr 24 hr ave	8.9 lb/hr 1 hr ave	0.6 lb/hr 24 hr ave	n/a	n/a
Material Handling	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fugitive Dust	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Emergency Diesel Generators	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Note: There are no mass emission limits for H_2S.

4.7.2.1.3 Proposed MACT Compliance Strategy

The Proposed Project has air emission sources that are also subject to federal MACT standards. These standards are also referred to as National Emissions Standards for Hazardous Air Pollutants (NESHAPs). Some of the Hazardous Air Pollutants (HAPs) are regulated by using criteria pollutants as surrogates in limits applicable to the Proposed Project. The applicable MACT standards are:

- Taconite Iron Ore Processing, 40 C.F.R. 63 Subpart RRRRR
- Industrial, Commercial, and Institutional Boilers and Process Heaters, 40 C.F.R. 63 Subpart DDDDD

- Reciprocating Internal Combustion Engines, 40 C.F.R. 63 Subpart ZZZZ
- Industrial Process Cooling Tower MACT, 40 C.F.R. 63 Subpart Q

The Proposed Project air emission sources that emit HAPs but are not subject to one of the MACT standards above, are subject to Case-by-Case MACT Determinations. The requirements for each of these standards are described below.

Taconite Iron Ore Processing MACT

The Taconite Iron Ore Processing MACT requires that Minnesota Steel:

- Prepare and implement a fugitive dust emissions control plan for mining fugitive dust sources.
- Control ore crushing and ore handling air emissions to 0.005 grains per dry standard cubic foot (gr/dscf) for PM. Minnesota Steel would install and operate fabric filters or wet scrubbers to meet this limit.
- Control indurating furnace air emissions to 0.006 gr/dscf PM (new straight grate indurating furnace). Minnesota Steel would install and operate wet scrubbers to meet this limit.
- Control pellet handling air emissions to 0.005 gr/dscf PM. Minnesota Steel would install and operate fabric filters or wet scrubbers to meet this limit.

Industrial, Commercial, and Institutional Boiler MACT

The Proposed Project includes a vacuum degasser boiler that would burn natural gas. The DRI Process Heaters would burn process gas with natural gas as an auxiliary fuel. The Industrial, Commercial, and Institutional Boilers and Process Heaters MACT requires that Minnesota Steel meets an emission limit of 400 ppm CO for the direct DRI process heaters and the vacuum degasser boiler. The DRI process heaters and vacuum degasser boilers would use good combustion practices to meet the CO emission limit.

Reciprocating Internal Combustion Engine MACT

Since all of the Proposed Project back up generating engines would be used for emergency purposes, only initial notification requirements apply to the back up generating engines.

Industrial Process Cooling Tower MACT

The provisions of this subpart apply to all new and existing industrial process cooling towers and prohibits use of chromium-based water treatment chemicals. The Proposed Project will not use chromium-based water treatment chemicals in its cooling towers.

Case-by-Case MACT Determinations

Minnesota Steel has proposed an approach similar to the BACT review process to establish Case-by-Case MACT limits. The MPCA is required to make the final Case-by-Case MACT determinations specified in the facility's air permit. The available control technologies for each type of process and pollutants emitted are listed in the BACT analysis. The available technologies that are not technically feasible were eliminated from the Case-by-Case MACT review process. The control efficiencies of each technically feasible control technology were identified. The technology with highest control effectiveness was selected, after evaluating costs, the non-air health, environmental and energy impacts. To develop numerical limits for the selected control technologies, MACT standards for similar equipment were reviewed. In the Case-by-Case MACT analyses for combustion processes particulates were used as a surrogate for metallic HAP emissions and carbon monoxide was used as a surrogate for organic HAP emissions. USEPA has used surrogate pollutants in other similar MACT standards, such as 40 C.F.R. 63 Subpart RRRRR.

While the MPCA is required to determine the final Case-by-Case MACT limits, Minnesota Steel has proposed the control equipment and emission limits listed in Table 4.7.8.

TABLE 4.7.8 PROPOSED CASE-BY-CASE MACT LIMITS

Emission Source	Proposed MACT Control	HAP(s) Controlled	Proposed MACT Limit
Direct Reduced Iron Material Handling	Wet Scrubbers	Metallic HAPs	0.005 gr/dscf filterable particulate (as a surrogate for metallic HAPs)
Electric Arc Furnace	Fabric filter in combination with a direct-shell evacuation control system	Metallic HAPs, Pb, Hg	0.0018 gr/dscf filterable particulate (as a surrogate for metallic HAPs) and 0.0052 gr/dscf filterable and condensable particulate using USEPA Methods 5 and 202. Use of DRI, and internally generated scrap-fed steelmaking, limit on use of type and amount of external scrap.
		Organic HAPs	2.0 lb CO/ton of steel produced (as a surrogate for organic HAPs)
Vacuum Degasser	Flare	Organic HAPs	40 C.F.R. 63.11(b)
Tunnel Furnace (direct-fired combustion emissions)	Good Burner Design and Operating Practices	Metallic HAPs	Clean fuel (natural-gas fired)
		Organic HAPs	0.08 lb/MMBtu CO (as a surrogate for organic HAPs)
Fugitive Emissions	Fugitive Dust Control Plan (Best Management Practices)	Metallic HAPs	Site specific fugitive dust control plan (as a surrogate for metallic HAPs)
Material Handling	Fabric Filter	Metallic HAPs	0.005 gr/dscf filterable particulate using USEPA Method 5 (as a surrogate for metallic HAPs)
Pre-heater	Good Burner Design and Operating Practices	Metallic HAPs	Clean fuel (natural-gas fired)
		Organic HAPs	Good combustion practices and clean fuel (natural-gas fired)

4.7.2.1.4 Differences in Emissions During Start-up Period Relative to Long-Term Operations

Minnesota Steel is proposing to test and, if feasible, install and operate an innovative NO_x emission control technology on the waste gas stack of the indurating furnace. This innovative technology is called $LoTO_x$™. This technology, which also has the potential to reduce mercury emissions, would be tested. The testing would occur when the indurating furnace is operating, during the startup phase of the project, which could take between 24 to 30 months. LoTO$_x$™ would be permanently installed if it is proven to be technically and economically feasible. If LoTOx™ is not successful, another BACT analysis would be done and that control would be installed.

The analysis results for both controlled and uncontrolled NO_x emissions from the indurating furnace were evaluated in this Draft EIS. Controlled emissions (see Table 4.7.3) are based on the successful implementation of LoTO$_x$™ controls (to control NO_x) on the pellet plant. While LoTO$_x$™ is being tested, NO_x emissions from the pellet plant would be higher. Therefore, additional modeling was conducted to evaluate the impacts under these conditions. Additional Class I area visibility modeling runs were conducted for two scenarios:

- Pellet plant during the period of LoTO$_x$™ trial testing (Pellet plant NO_x emissions uncontrolled and only one DRI and EAF unit operating)
- Proposed facility without NO_x controls on the pellet plant

PM_{10} and SO_2 emissions from the pellet plant would be the same regardless of whether or not LoTO$_x$™ is in place. During the time when LoTO$_x$™ is being tested it is anticipated that the second DRI and EAF units would not yet be operational and therefore no NO_x, PM_{10}, and SO_2 emissions would be emitted from these units during that time period. Class II and I modeling results without the LoTO$_x$™ operating scenario (i.e., the maximum NO_x scenario) are presented in Section 4.7.2.2.1 and 4.7.2.2.2, respectively.

4.7.2.2 Modeled Impacts due to Stationary Source Air Emissions

As required by the Final SDD, an ambient air quality modeling analysis was conducted relative to Class I and Class II PSD area classifications. Class I areas include wilderness and national park areas. Class II areas include all other areas. Figure 4.7.1 shows the Class I areas that were evaluated. The potential impacts under these scenarios were also evaluated in the human health and ecological risk assessments. In this section, Class II area modeling is discussed first to address the area in closest proximity to the Proposed Project; followed by a discussion of Class I area results.

4.7.2.2.1 Class II Area Impacts Analysis

A Class II air quality analysis for the Proposed Project was completed as part of the facility's PSD air permit application. The Class II air quality analysis demonstrated that PM_{10}, NO_x, SO_2, Pb and CO emissions would meet the National Ambient Air Quality Standards, Minnesota Ambient Air Quality Standards (see Table 4.7.9) and PSD Class II Increment Standards (see Table 4.7.10) for the area within 50 kilometers (31 miles) of the facility. The ambient air quality standards were developed by USEPA and the State of Minnesota to protect human health and the environment. The increment standards, which only apply to PM_{10} NO_x and SO_2, are the maximum increase in air quality concentrations of pollutants that are allowed.

The Proposed Project includes both fugitive sources and stacks, as well as nearby large industrial background sources. The modeled fugitive sources include mining activities, dust generation from traffic within the mine and plant site, and a number of smaller stockpiles in the plant areas. The facility stacks include the crushing process stacks through the steel production stacks. Backup generators and stacks used only during plant upset were not included in the modeling. Air pollution control equipment efficiencies and proposed air permit limits are included in the air emission estimates that were used in the modeling.

The AERMOD air dispersion model was used to estimate Class II ambient air concentrations. The USEPA recommends AERMOD as a "Preferred Model" for Class II air quality analyses. Building downwash was predicted for the facility stacks using the BPIP-PRIME downwash model. Both AERMOD and BPIP-PRIME were developed by USEPA.

The predicted concentrations from the Proposed Project are presented below in Table 4.7.9 along with the National and Minnesota Ambient Air Quality Standards. The predicted change in concentrations is presented below in Table 4.7.10 along with the Class II increment standards.

TABLE 4.7.9 MAXIMUM PREDICTED AMBIENT AIR CONCENTRATIONS NEAR THE MINNESOTA STEEL FACILITY

Pollutant	Averaging Period	Modeled Impact(1) ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Predicted Ambient Air Concentration ($\mu g/m^3$)	Minnesota Ambient Air Quality Standard ($\mu g/m^3$)	National Ambient Air Quality Standard ($\mu g/m^3$)
PM_{10}	24-Hour	26	38	64	150	150
	Annual	5	1	21	50	50
SO_2	1-Hour	71	90	161	1,300	-
	3-Hour	37	25	62	915	1300
	24-Hour	10	11	21	365	365
	Annual	1.4	3	4.4	60	80
NO_x	Annual	10	12	22	100	100
CO	1-Hour	153	Not Available	153	40,000	40,000
	8-Hour	52	Not Available	52	10,000	10,000
Lead (Pb)(2)	Quarterly	0.002	Not Available	0.002	1.5	1.5

(1) For averaging periods shorter than annual, one exceedance is allowed per location per year. Therefore, for the short term averaging periods, the highest concentration per year per location is not considered and the high second high is presented. The highest CO concentrations are given since the concentrations are well below the standards.

(2) Ambient air quality modeling for lead was completed as part of the Screening Level Ecological Risk Assessment (SLERA)

TABLE 4.7.10 INCREASE IN CONCENTRATIONS NEAR THE MINNESOTA STEEL FACILITY VS. THE INCREMENT STANDARDS

Pollutant	Averaging Period	Maximum Modeled Concentration Change[(1)] ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
PM_{10}	24-Hour	26	30
	Annual	5.0	17
SO_2	3-Hour	37	512
	24-Hour	9.7	91
	Annual	1.4	20
NO_x	Annual	10	25

[(1)] For averaging periods shorter than annual, one exceedance is allowed per location per year. Therefore, for the short term averaging periods, the highest concentration per year per location is not considered and the high second high is presented.

Federal PSD regulations require that the Proposed Project be reviewed for any "additional" adverse environmental impact on Class II areas (i.e., visibility, vegetation, acidification, etc.). This analysis found that no additional adverse air quality impacts are expected from the Proposed Project in the area near the facility. A summary of the additional adverse air quality impacts analysis is provided below. Additional details regarding the modeling are described in the September 2006 Class II Air Dispersion Modeling Report.

- Class II additional impacts for the Proposed Project show that a plume may be visible at Hill Annex State Park and McCarthy Beach State Park during some meteorological conditions. Hill Annex State Park may have a visible plume during "D" stability class conditions at a wind speed of 4.6 m/s. McCarthy Beach State Park is likely to have a visible plume only during worst case conditions of "F" stability and a wind speed of 1 m/s.

- The predicted SO_2 concentrations surrounding the facility are below the SO_2 concentration where damage to even the most sensitive vegetative species is expected to occur. As stated in the Class II Air Dispersion Modeling Report, prepared by Minnesota Steel, September 2006, damage to sensitive lichens may occur at annual average concentrations of 40 ug/m^3, in comparison to a maximum predicted annual concentration of 4.4 ug/m^3 surrounding the proposed facility.

- Acid deposition to soils and lakes typically occurs over long ranges after SO_2 converts to sulfates, rather than in the immediate plant area. Therefore, acid deposition to soils and lakes is addressed in the Class I impacts analysis.

4.7.2.2.2 Class I Area Impacts Analysis

A Class I air quality analysis was prepared for the Proposed Project as part of the PSD air permit application. The Class I modeling demonstrates that the project would not likely have an adverse effect on flora and fauna or terrestrial or aquatic ecosystems.

Four Class I areas were assessed for potential impacts from the project emissions using the CALPUFF modeling system: 1) BWCAW, 2) Isle Royale National Park, 3) Rainbow Lake Wilderness, and 4) Voyageurs National Park.

Air Quality Related Values (AQRVs) are features or properties of Class I areas that could be adversely affected by air pollution. The Clean Air Act requires that potential AQRV impacts be reviewed for all major sources near Class I areas.

The CALPUFF Modeling System is the required model for determining visual impacts at long distances from sources. The CALPUFF system consists of three main components (CALMET, CALPUFF and CALPOST) and a number of pre-processing programs.

Modeling Results for Air Quality Related Values

Flora and Fauna

Table 4.7.11 below compares the sum of background SO_2 concentrations plus modeled ambient air SO_2 concentrations from the project (without LoTOx™) emissions for the four Class I areas. The most sensitive lichen species are only present when annual average SO_2 concentrations are less than 40 $\mu g/m^3$. As can be seen in Table 4.7.11, all estimated SO_2 ambient air concentrations are lower than 40 $\mu g/m^3$, and they are also below the "Green Line Concentration" of 5 $\mu g/m^3$, indicating that there should be no adverse effects from the Proposed Project emissions on flora or fauna in the Class I areas.

TABLE 4.7.11 CLASS I SCREENING ANALYSIS FOR EFFECTS ON FLORA AND FAUNA FROM SULFUR DIOXIDE INCLUDING PELLET PLANT UNCONTROLLED NO_X

Location	Background Air Concentration[(1)] ($\mu g/m^3$)	Modeled Project Contribution[(2)] ($\mu g/m^3$)	Total Projected Air Concentration ($\mu g/m^3$)	Green Line Concentration[(3)] ($\mu g/m^3$)
BWCAW	1.2	0.010	1.2	5
Isle Royale National Park	2.0	0.001	2.0	5
Rainbow Lake Wilderness	1.6	0.004	1.6	5
Voyageurs National Park	0.7	0.010	0.7	5

(1) Mean annual SO_2 concentrations (ug/m^3)
(2) Modeled ambient air concentration in Class 1 area using the CALPUFF modeling system.
(3) Green line concentration from Adams et al., "Screening Procedures to Evaluate Effects of Air Pollution on Eastern Wildernesses Cited as Class I Air Quality Areas", USDA, Forest Service, Northeast Forest Experiment Station, Generator Technical Report NE-151, September 1991.

Acid Deposition

The acid deposition impact analysis for the BWCAW and Rainbow Lake Wilderness area was conducted according to the "Green-Yellow-Red" screening procedure methodology outlined in guidance from the US Forest Service. The acid deposition impact on terrestrial and aquatic ecosystems is judged to be acceptable if ambient air concentrations and/or deposition is below the respective "green line".

For Voyageurs National Park and Isle Royale National Park, the deposition analysis thresholds (DATs) were calculated for total sulfur and total nitrogen. DATs have been developed by the National Park Service and USFWS to evaluate the contribution of additional nitrogen (N) or sulfur (S) to deposition within Class I areas. They are intended to distinguish where deposition increases may result in potentially adverse ecosystem stresses, as well as where the deposition increases are like to have a negligible impact on AQRVs.

Project-related deposition was estimated using the CALPUFF modeling system and results are presented in Tables 4.7.12 and 4.7.13 below. SO_2 and NO_x emissions from the project (without $LoTO_x$™) are not expected to have an adverse effect on terrestrial or aquatic ecosystems in the Class I areas.

TABLE 4.7.12 CLASS I AREA SCREENING ANALYSIS RESULTS FOR POTENTIAL TERRESTRIAL IMPACTS INCLUDING PELLET PLANT UNCONTROLLED NO_X

Location(2)	Pollutant	Background Data (1)	Model Air Concentration or Calculated Project-Related Deposition(3)	Total Concentration or Deposition	Green Line Value or Deposition Analysis Threshold (4)(5)
BWCAW - Ely	Ann. Ave SO_2 (μg/m^3)	1.2	0.010	1.2	5 μg/m^3
	3-hour max SO_2 (μg/m^3)	10.8	0.504	11.3	100 μg/m^3
	Total Sulfur (kg/ha/yr)	2.84	0.0017	2.9	5-7 kg/ha/yr S
	Total Nitrogen (kg/ha/yr)	4.75	0.008	4.8	5-8 kg/ha/yr N
Isle Royale National Park	Ann. Ave SO_2 (μg/m^3)	2.0	0.001	2.0	5 μg/m^3
	3-hour max SO_2 (μg/m^3)	1.8	0.085	1.8	100 μg/m^3
	Total Sulfur (kg/ha/yr)	2.15	0.001	2.2	5-7 kg/ha/yr S
	Total Nitrogen (kg/ha/yr)	3.85	0.001	3.9	5-8 kg/ha/yr N
Rainbow Lake Wilderness	Ann. Ave SO_2 (μg/m^3)	1.6	0.0014	1.6	5 μg/m^3
	3-hour max SO_2 (μg/m^3)	14.4	0.219	14.6	100 μg/m^3
	Total Sulfur (kg/ha/yr)	2.98	0.002	3.0	5-7 kg/ha/yr S
	Total Nitrogen (kg/ha/yr)	5.88	0.003	5.9	5-8 kg/ha/yr N
Voyageurs National Park	Ann. Ave SO_2 (μg/m^3)	1.2	0.010	1.2	5 μg/m^3
	3-hour max SO_2 (μg/m^3)	10.8	0.488	11.3	100 μg/m^3
	Total Sulfur (kg/ha/yr)	1.84	0.007	1.9	5-7 kg/ha/yr S
	Total Nitrogen (kg/ha/yr)	3.87	0.008	3.9	5-8 kg/ha/yr N

(1) Mean annual SO_2 concentrations (ug/m^3)
(2) Modeled air concentration in each Class I area.
(3) Model estimated ambient air concentrations using the CALPUFF modeling system.
(4) Green line concentration. Deposition Analysis Threshold (DAT) is based on National Park Service Guidance for the Eastern U.S.
(5) S = sulfur, N = nitrogen.

TABLE 4.7.13 SCREENING ANALYSIS RESULTS FOR POTENTIAL AQUATIC EFFECTS INCLUDING PELLET PLANT UNCONTROLLED NO_X

Location [2]	Pollutant [1]	Background Deposition [2](kg/ha/yr)	Estimated Project-Related Deposition (kg/ha/yr)	Total Deposition (Project + Background) (kg/ha/yr)	Green Line Value or Deposition Analysis Threshold [3](kg/ha/yr)
BWCAW - Ely	Total Sulfur Total S + 20% of Total N	2.85 3.80	0.007 0.008	2.86 3.81	7.5-8.0 9-10
Isle Royale National Park	Total Sulfur Total S + 20% of Total N	2.15 3.85	0.001 0.001	2.15 3.85	0.01 0.01
Rainbow Lake Wilderness	Total Sulfur Total S + 20% of Total N	2.98 4.16	0.002 0.003	3.98 4.16	3.5-4.5 4.5-5.5
Voyageurs National Park	Total Sulfur Total S + 20% of Total N	1.84 3.87	0.007 0.008	1.85 3.88	0.01 0.01

(1) S = sulfur, N = nitrogen.
(2) Annual wet deposition data from NAPD database (http://nadp.sws.uiuc.edu)
(3) Green line concentration. Deposition Analysis Thresholds based on National Park Service guidance for the eastern U.S.

Visibility Impairment Modeling

Visibility impairment is defined as "….Any humanly perceptible change in visibility (visual range, contrast, coloration) from that which would have existed under natural conditions." (40 C.F.R. 51.301(x)). The potential visibility impacts associated with the proposed Minnesota Steel project were evaluated using the refined CALPUFF approach recommended by the FLMs. The FLMs are charged with direct responsibility for management of Class I areas and have a responsibility to protect the air quality related values (including visibility) of those areas. Potential changes in the visibility were expressed in terms of an extinction coefficient (b_{ext}). The visibility analysis was completed in four major steps:

1. The atmospheric concentrations of visibility-impairing pollutants in the BWCAW, Voyageurs National Park and the Isle Royale National Park were estimated by the CALPUFF modeling system.
2. Extinction coefficients were calculated from the model-generated atmospheric concentrations of visibility-impairing pollutants.
3. The emission-derived extinction coefficients were compared to natural (pristine) and background extinction coefficients.
4. The potential visibility impacts were expressed as changes in the overall extinction coefficient (Δb_{ext}).

Three Class I areas were included in the visibility analysis for the Proposed Project: the BWCAW (located 80 km from Minnesota Steel's facility), Voyageurs National Park (100 km), and Isle Royale National Park (280 km). The BWCAW falls under the jurisdiction of the U.S. Department of Agriculture (U.S. Forest Service) whereas the national parks fall under the jurisdiction of the U.S. Department of the Interior (National Park Service and U.S. Fish and Wildlife Service). Visibility has not been established as an AQRV for the Rainbow Lakes Wilderness, so visibility impacts were not modeled for that area.

Modeling results for visibility impacts compared to natural conditions are presented in Table 4.7.14 for the Class I areas evaluated. Two different NO_x emission control scenarios [with and without $LoTO_x$™ controls](see discussion in the 'Emission Control Scenarios for Visibility Modeling' section below) are shown. The listed *ranges* in days over 5 percent or 10 percent change in extinction coefficient in the table represent differences in visibility modeling protocols. The project proposer also generated visibility modeling results comparing project emissions to existing background conditions in the respective Class I areas. The modeled impacts using existing conditions were lower than those shown below for natural conditions. The comparisons to existing conditions provide supplemental information for evaluating this project and are presented in the September 2006 Air Emission Permit Application.

TABLE 4.7.14 CLASS I VISIBILITY MODELING RESULTS FOR THE PROJECT COMPARED TO NATURAL BACKGROUND

Location	Parameter	Controlled with $LoTO_x$™*	No $LoTO_x$™
BWCAW	Maximum Δb_{ext} (%)	3.65 – 17.55	6.38 – 31.23
	Days with $\Delta b_{ext} \geq$ 5%	0 – 46	22 – 106
	Days with $\Delta b_{ext} \geq$ 10%	0 – 8	0 – 32
Isle Royale	Maximum Δb_{ext} (%)	0.83 – 4.82	1.29 – 8.56
	Days with $\Delta b_{ext} \geq$ 5%	0	0 – 10
	Days with $\Delta b_{ext} \geq$ 10%	0	0
Voyageurs	Maximum Δb_{ext} (%)	3.28 – 19.81	5.82 – 36.06
	Days with $\Delta b_{ext} \geq$ 5%	0 – 47	31 – 106
	Days with $\Delta b_{ext} \geq$ 10%	0 – 9	0 – 38

* Maximum changes in the daily extinction coefficients compared to natural background and the total number of days over three modeled years (i.e., 2002, 2003 and 2004) in which the increase in the daily extinction coefficient exceeds 5 and 10 percent due to Minnesota Steel emissions.

Emission Control Scenarios for Visibility Modeling

The results presented above labeled "Controlled with $LoTO_x$™" are based on the estimated NO_X emissions from the entire stationary source and successful implementation of NO_x controls on the pellet plant indurating furnace. The results labeled "Uncontrolled" are based on the estimated NO_X emissions from the entire stationary source without the implementation of $LoTO_x$™. Minnesota Steel has proposed to test $LoTO_x$™ as an innovative control technology and would install and operate it if it is found to be technically and economically feasible. The results presented in the table above labeled "No $LoTO_x$™" account for the possibility that the tests may prove that $LoTO_x$™ is not a feasible alternative.

A third scenario, the testing of the $LoTO_x$™ technology at the pelletizing furnace, was also modeled. During $LoTO_x$™ testing, there will only be one DRI and one EAF line operating. The impacts from this interim scenario were bracketed by (fall in between) the two ranges listed in Table 4.7.14 so they are not shown.

Mitigation of Potential Visibility Impacts

The air quality permit will require any necessary mitigation. Mitigation measures that have been identified, including: an evaluation of LoTOx™, and securing emission reductions from any combination of the following:

- Enforceable reductions in emissions from Minnesota Steel or nearby sources;
- Securing and retiring tradable emission allowances from National Emissions Trading Boards (i.e., Acid Rain Credits);
- Offests associated wih the use of green energy.

Class I Area Increment Analysis

Federal air emission permitting rules for major sources require that an air quality analysis be conducted to demonstrate that national ambient air quality standards will not be exceeded and that the project will not significantly deteriorate air quality from baseline levels beyond what has been set aside for growth. The allowance for growth, in terms of air quality, is defined as the increment of the national ambient air quality standards that are set aside for increases in ambient air concentrations of certain criteria pollutants. Class I areas have the smallest amount of growth (lowest increment) that is allowed.

An increment analysis is required of any major PSD source for which the modeled Class I area impacts of that facility's emissions alone are above the Significant Impact Levels (SILs). Modeling of Minnesota Steel's facility (with LoTOx™ for NO_x control) showed that its impacts are above the SILs for PM_{10} and SO_2 ; therefore, the Proposed Project must analyze the cumulative impact from all sources of these pollutants (past and present, increases and decreases) on the Class I areas. A semi-quantitative increment analysis was completed for these pollutants. The semi-qualitative analysis indicated that the increment is not only protected, it is expanded (i.e., the cumulative impact analysis showed less of an incremental impact than the project-only analysis showed). This is primarily due to the closure of the Butler Taconite facility in 1985, emissions from the former Butler Taconite facility were uncontrolled. Modeled air concentrations compared to the Class I PSD increment for the Proposed Project are presented in Tables 4.7.16 A, B, and C.

TABLE 4.7.16A MAXIMUM MODELED 2002 POLLUTANT CONCENTRATIONS (WITH BUTLER INCREMENT CREDIT)

Pollutant	Averaging Period	PSD Class I Increment (μg/m³)	USEPA Significant Impact Level (μg/m³)	Boundary Waters Canoe Area (μg/m³)	Voyageurs National Park (μg/m³)	Isle Royale National Park (μg/m³)	Rainbow Lake Area Wilderness (μg/m³)
SO_2	3-Hour	25	1.0	0.118	0.148	0.016	0.036
	24-Hour	5	0.2	0.061	0.040	0.003	0.009
	Annual	2	0.1	0.001	0.001	--	--
NO_x	Annual	2.5	0.1	--	--	--	--
PM_{10} Total	24-Hour	8	0.3	0.035	0.019	0.001	0.004
	Annual	4	0.2	--	--	--	--

TABLE 4.7.16B MAXIMUM MODELED 2003 POLLUTANT CONCENTRATIONS (WITH BUTLER INCREMENT CREDIT)

Pollutant	Averaging Period	PSD Class I Increment ($\mu g/m^3$)	USEPA Significant Impact Level ($\mu g/m^3$)	Boundary Waters Canoe Area ($\mu g/m^3$)	Voyageurs National Park ($\mu g/m^3$)	Isle Royale National Park ($\mu g/m^3$)	Rainbow Lake Area Wilderness ($\mu g/m^3$)
SO_2	3-Hour	25	1.0	0.228	0.187	0.010	0.036
	24-Hour	5	0.2	0.046	0.047	0.003	0.010
	Annual	2	0.1	0.001	0.002	--	--
NO_x	Annual	2.5	0.1	--	--	--	--
PM_{10} Total	24-Hour	8	0.3	0.045	0.024	0.011	0.001
	Annual	4	0.2	--	--	--	--

TABLE 4.7.16C MAXIMUM MODELED 2004 POLLUTANT CONCENTRATIONS (WITH BUTLER INCREMENT CREDIT)

Pollutant	Averaging Period	PSD Class I Increment ($\mu g/m^3$)	USEPA Significant Impact Level ($\mu g/m^3$)	Boundary Waters Canoe Area ($\mu g/m^3$)	Voyageurs National Park ($\mu g/m^3$)	Isle Royale National Park ($\mu g/m^3$)	Rainbow Lake Area Wilderness ($\mu g/m^3$)
SO_2	3-Hour	25	1.0	0.280	0.180	0.024	0.045
	24-Hour	5	0.2	0.060	0.004	0.011	0.049
	Annual	2	0.1	0.001	0.001	--	--
NO_x	Annual	2.5	0.1	--	--	--	--
PM_{10} Total	24-Hour	8	0.3	0.039	0.001	0.004	0.017
	Annual	4	0.2	--	--	--	--

The emission inventory and cumulative increment analysis show a net decrease in actual emissions of both PM_{10} and SO_2 within a 300 km (180 mile) radius of receptors of interest in Class I areas. Minnesota Steel is in the process of completing a detailed increment analysis to provide additional information (data) to further support conclusions derived from the semi-quantitative increment analysis. Information from the detailed increment analysis will be included in the Final EIS.

4.7.2.3 Mercury Emissions

The EIS and the environmental permitting processes required for the Proposed Project have produced a number of mercury-related technical analyses that are incorporated into various submittals to state regulatory agencies. A list of pertinent documents is provided below, including a summary of the contents relating to mercury emissions.

4.7.2.3.1 Reports and Documents Addressing Mercury

Mercury information for the Proposed Project is contained in the following documents (also listed in Appendix I).

Mercury content in ore, Barr Engineering Co. memorandum (May 2006) - describes the sample collection and analysis of the ore samples, which provides the basis for estimating releases to air and water.

Technical Feasibility of Mercury Air Pollution Control Technology for the Minnesota Steel Pellet Plant Exhaust Streams (July 2006) - An initial assessment of the technical feasibility of mercury control for the indurating furnace.

Water Permit, Revised National Pollutant Discharge and Elimination System / State Discharge System (NPDES/SDS) (December 2006) - provides a water and chemical balance for the Proposed Project and estimates the potential amount of mercury in tailings basin seep and discharge water. The NPDES permit proposes to re-use process and tailings basin water (including collection of seep water), resulting in no discharges of water from the facility to surface waters.

Minnesota Steel Air Permit, Revised Application (September 2006). In this document, a mercury mass balance is presented (HG-2003). The mass balance identifies where the mercury comes from and the fate of mercury through the process. A detailed discussion of air pollution control technologies is also presented.

Mercury Overview (October 2006): A summary of Mercury Releases and Potential Impacts to the Environment

Mercury Air Pollution Control Assessment at Minnesota Steel (October 2006) An in-depth analysis of four leading mercury control technologies, including detailed technical feasibility assessment and estimated costs.

Human Health and Ecological Impact Assessments:

- *Human Health Screening-level Risk Analysis* (HHSRA; May 2006 and subsequent updates) and the *Screening Level Ecological Risk Assessment* (SLERA; August 2006) - A multipathway risk analysis and a screening-level ecological risk analysis evaluation. Both assessments included estimating potential mercury deposition within 10 kilometers of the proposed facility, potential uptake by fish, and the potential change in fish mercury concentrations. The HHSRA also includes estimated potential exposure of a subsistence fish consumer and recreational fish consumer to the incremental increase in fish mercury concentrations. Further discussion of the conduct and findings of risk analyses for the Proposed Project are found in Sections 4.7.2.4 and 4.7.2.5.

Cumulative Impacts Reports:

- *Mercury Deposition and Bioaccumulation in Fish* (October 2006) - This analysis examines the potential cumulative impacts from nine proposed projects (including the Minnesota Steel project) plus potential reductions due to voluntary actions and regulatory programs. The scope of work and findings are discussed in Section 5.3.
- *Ecosystem Acidification* (August 2006) - This analysis examines the potential cumulative impacts from emissions of sulfur dioxide and nitrogen oxides from nine proposed projects (including the Minnesota Steel project). It is relevant in a discussion related to mercury because sulfate deposition plays a role in mercury methylation, which affects the uptake of mercury by fish.

4.7.2.3.2 Mercury Emissions from the Proposed Project's Operations

The Proposed Project's operations include mining, ore crushing, ore concentrating, taconite pellet induration, DRI production, a steel mill (i.e., electric arc finances, ladle furnaces, casting and rolling) and material handling associated with each of these operations. Mercury emissions result from this facility because mercury is found in iron ore. Mercury is liberated during ore processing, especially from high heat treatment (e.g., in the taconite indurating furnace stack). Secondary sources of mercury include other raw material additives, fuel combustion and process water. The average mercury content of the ore is estimated at 12.2 parts per billion (ppb). All other materials input to the process contain less than 1 ppb of mercury and, in combination with a much lower throughput by mass, contribute much less to the overall mercury balance than the ore.

The concentrator operations at this facility mill ore and use a magnetic separator to divide the ore into a magnetite concentrate and discarded tailings. Most of the mercury contained in the ore is sent to the tailings basin. The tailings are recognized as a mercury sink and the accumulation of tailings isolates the mercury from further transport within the environment. The mercury not sent to the tailings basin is contained in the concentrate, and is released during the taconite induration and steel making process.

Table 4.7.17 provides a summary of the potential environmental releases of mercury from the proposed facility. Potential air emissions of mercury are estimated at a maximum of 81 pounds per year. These potential air emissions are estimated to be 99.8 percent elemental mercury and 0.2 percent particle-bound mercury. Oxidized mercury is not expected to be emitted in any great quantity (see discussion of mercury speciation in Section 4.7.2.3.3). The pellet plant emissions account for approximately 81 percent of the mercury air releases.

TABLE 4.7.17 SUMMARY OF POTENTIAL MERCURY RELEASES TO THE ENVIRONMENT FROM THE MINNESOTA STEEL PROJECT

Input (lbs/yr)	**Process Component**	**Potential Release to Environment** (1)	**Media**	**Expected Speciation**	**% of Input**	**% of Total Releases**
	Mining	0.06	Air	Particle-bound	NA	0.07
529	Concentrator	0.02	Air	Particle-bound	0.004	0.02
	Pellet Plant	65.81	Air	Elemental	12.4	80.96
	DRI Plant	14.22	Air	Elemental	2.7	17.49
	Steel Mill	0.3	Air	Elemental	0.06	0.37
	Product	0.37	NA		0.07	0.46
	Tailings Basin		Water			
	Tailings Basin	0.51	Air	Elemental	0.10	0.63
	Total	81.29			15.37	

(1) Potential release to the environment and mercury speciation is based on the total facility mercury Mass Balance, Hg-2003 form in the September 2006 Minnesota Steel air permit application. The values in this table are based on the upper 95 percent confidence level of the concentration of mercury in the ore.

Mercury is one of 188 hazardous air pollutants (HAPs) required to be inventoried, and is of heightened concern in Minnesota due to widespread mercury contamination of fish in Minnesota lakes. Therefore, the estimated extent of mercury release from the Proposed Project was analyzed in this Draft EIS and in the air permit application for the project (September 2006, see Appendix I).

The MPCA assesses the impacts of a facility on the basis of its potential to emit (PTE), that is, the maximum emissions level allowed under the facility's air quality emissions permit. The MPCA seeks emission estimates that do not underestimate reasonably expected emissions, especially when process inputs like iron ore have a known variability. To account for this variability, the annual mercury emissions rate for this facility was estimated by calculating an upper 95 percent confidence level (UCL) of the concentration of the mercury in ore[2]. The resulting PTE of mercury released to the air is 81 pounds per year. The 95 percent UCL represents a conservative estimate of the annual average mercury emissions from the entire Minnesota Steel facility. The remainder of the estimated 529 pounds of mercury input into the process would be deposited and sequestered in the tailings basin, with less than 0.1 percent of the mercury becoming part of the production end-products.

Throughout the analyses conducted to prepare this Draft EIS and the facility's associated air emissions permit, two conditions are assessed: the PTE case (that is, emissions at 81 pounds per year), and an "annual arithmetic average" case, an assessment of impacts based on an arithmetic average of mercury in ore (estimated at 61 pounds per year). The annual arithmetic average estimate seeks to describe impacts from mercury over a very long-term basis. The MPCA has taken note of these estimates, and believes they are instructive as they describe the central tendency of the annual mercury emissions estimate; however, for this EIS, only the upper 95 percent confidence level data (emissions of 81 pounds per year) is presented, since it represents the upper-bound impacts of mercury air emissions from this facility.

4.7.2.3.3 Mercury Speciation, Transport, and Environmental Fate

As discussed in Section 4.7.2.3.2, most of the mercury contained in the iron ore is deposited in the tailings basin, which is a mercury sink that isolates the mercury from further transport in the environment. Therefore, the major potential release of mercury from the proposed facility is in the form of air emissions (see Table 4.7.17).

Assumptions about the speciation of mercury from the facility stacks must be made in order to assess the environmental fate of mercury air emissions. Speciation plays a major role in determining where mercury goes after it is emitted from a facility. Possible speciation of mercury emissions include:

- **Elemental mercury**: a long-range transport pollutant, having an average residence time in the atmosphere of several months to a year or more.
- **Oxidized mercury**: water soluble form that has a relatively high potential to be captured by air pollution control systems. If oxidized mercury is emitted from a facility, the propensity for the oxidized mercury to adsorb to water and

[2] Similar to other taconite processing facilities, there is expected to be some variability in mercury emissions from Minnesota Steel's taconite processing because of variability in the mercury content of the ore. Based on the analysis of 12 samples from one ore drill core (Air Permit Application, Appendix N data), the concentration of mercury in the ore to be used by Minnesota Steel ranges from 4.5 to 22.0 ng Hg/g.

particles tends to result in the oxidized mercury being deposited relatively close to an emission source, typically within 10 to 100 kilometers (6.2 to 62 miles) of the emission source.

- **Particle-bound mercury**: this form also has a relatively high potential to be captured by air pollution control systems. If particle-bound mercury is emitted from a facility, there also is a tendency for coarse particles (greater than 2.5 microns) to be deposited locally within 10 to 100 kilometers of a facility and for fine particles (greater than 2.5 microns) to be transported further.

In the Draft EIS analysis, the potential mercury air emissions are estimated to be 93 percent elemental, 5 percent oxidized, and 2 percent particle-bound mercury species. This speciation profile, based on measured speciation at Hibbing Taconite facility near Hibbing, Minnesota, was used to estimate local human and ecological impacts from Minnesota Steel's mercury emissions. The results of these analyses are summarized in Sections 4.7.2.4 and 4.7.2.5. These mercury speciation assumptions were also used in the cumulative impacts analysis (see Section 5.3).

Minnesota Steel's potential elemental mercury air emissions are expected to become part of the large atmospheric pool of elemental mercury. The addition of 81 pounds per year of mercury to the atmospheric pool from the proposed Minnesota Steel project might be considered against the following current conditions:

- Worldwide emissions of mercury are approximately 2,400 metric tons/year (5,300,000 pounds).
- Total mercury emissions in the U.S. were estimated to be approximately 128 short tons/year in 1999 (256,000 pounds); about 5 percent of global emissions.
- Electric utilities in the U.S. emitted approximately 45 to 48 short tons/year (90,000 to 96,000 pounds) of mercury in 1999; approximately 1.7 percent of global mercury emissions.
- Minnesota's statewide mercury emissions are primarily elemental and in 2005 were estimated to be 1.67 short tons (3,341 pounds); approximately 0.06 percent of global emissions.
- 216 pounds per year would increase Minnesota's 2005 emissions by about 6 percent at the same time that Minnesota's draft TMDL suggests an ultimate statewide mercury emission goal of 789 pounds per year.

It is also notable that it is estimated that about 90 percent of Minnesota's mercury emissions are transported out of Minnesota prior to deposition, and that about 90 percent of the mercury deposited in Minnesota is emitted from outside the state.

4.7.2.3.4 Conclusions

A mass balance evaluation of the proposed facility indicates that most (84.6 percent) of the mercury input to the process is sent to the tailings basin and sequestered from the general environment. Approximately 15.4 percent of the mercury input to Minnesota Steel's process is estimated to be potentially emitted to air. Total facility mercury air emissions are estimated to range from 61 – 81 pounds per year. Approximately 93 percent of these emissions are expected to be elemental mercury, which typically does not deposit locally near an emission source.

Given the predominance of elemental mercury emissions from the proposed project and the transport and mixing of the elemental mercury in the atmosphere, the specific contribution of mercury from the Proposed Project to deposition at any given location, while likely, is not expected to be detectable, due to the presence of mercury emissions from other current and future mercury emission sources.

4.7.2.3.5 Mitigation for Potential Mercury Impacts

Mercury associated with tailings is sequestered in the tailings basin due to adsorption of the mercury onto the tailings material and would not be released to the environment. The primary route of mercury to the environment would be to the air from the taconite indurating furnace stack, which is associated with the first high-heat treatment of the ore.

No currently operating indurating furnace has a control technology installed for specifically controlling mercury, although some mercury control has been demonstrated as a co-benefit with the use of wet particulate matter devices. Of the mercury control technologies considered to be potentially feasible, most are emerging technologies. Minnesota Steel proposes to adopt a "pollution prevention" measure by designing and permitting the plant for the use of natural gas rather than coal in the taconite pellet indurating furnace, thus avoiding mercury released when burning coal. The use of natural gas as a fuel rather than coal avoids potential mercury emissions of about 33 pounds per year.

- natural gas emissions : 0.54 pounds per year
- equivalent coal-based emissions: 33 pounds per year

Additionally, Minnesota Steel has proposed operating restrictions for its permit to limit the use of scrap iron to charge its furnaces. Internally-produced virgin iron and a small amount of scrap (less than 1 percent of clean external scrap) will be charged to the EAFs, thereby avoiding releasing the mercury that might otherwise be found in contaminated scrap.

Further, Minnesota Steel reviewed several mercury control technologies and conducted further evaluation of the four most promising technologies:

- injection of oxidizing agents (including the current proposal to use $LoTO_x$™ to control nitrogen oxide emissions),
- fixed beds of carbon,
- injection of calcium or clay-based sorbents, and
- injection of activated carbon.

The indurating furnace has two separate stacks that exhaust furnace gases. Minnesota Steel has evaluated implementing these control technologies on both the waste gas stack and hood exhaust. Mercury emissions from other sources at Minnesota Steel are too low for add-on controls to be economically feasible.

Based on the air pollution control assessment, the oxidation technology trademarked "$LoTO_x$™" is the most promising control technology, considering it has the potential for co-control benefits of both NO_x and mercury and lacks the limitations of the other technologies. In other applications not related to a taconite pellet plant, the $LoTO_x$™ technology has demonstrated a mercury removal efficiency of up to 75 percent. Minnesota Steel would test and evaluate the nitrogen oxide control capabilities of $LoTO_x$™ (see

Section 4.7.2.1.4). If the test results show $LoTO_x$™ to be technically and economically feasible for controlling NO_x, $LoTO_x$™ would be installed on the waste gas stack. Concurrent with the testing of the effectiveness for NO_x control, Minnesota Steel would also test and evaluate the ability of $LoTO_x$™ to control mercury emissions. Any future reductions in mercury emissions would further reduce the facility's impact on the environment.

4.7.2.4 Human Health Risk Assessment

A Human Health Screening-Level Risk Assessment (HHSRA) was conducted for the Proposed Project. It was conducted according to a Scope of Work agreed upon by the MPCA and Minnesota Steel. The purpose of the HHSRA is to examine potential human health consequences from the potential release of chemicals to the air from the proposed Minnesota Steel project. In this assessment, direct (inhalation) and indirect (consumption via multiple pathways) exposures to multiple chemicals are assessed.

The HHSRA follows USEPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) (USEPA 1998 and updates). The basic process in that protocol consists of:

- Identifying pollutants emitted by the facility called Chemicals of Potential Interest or COPIs.
  - Identify COPIs
  - Estimate Emissions
- Exposure Assessment
  - Identify types of exposure
- Toxicity Assessment
  - Identify toxicity data to be used
  - Identify which pollutants will be assessed quantitatively (i.e., those with toxicity data) and which will be assessed qualitatively
- Risk Characterization
  - Quantitative Analysis
  - Qualitative Analysis
- Uncertainty Analysis

Minnesota Steel conducted the HHSRA and submitted it in May 2006. That document was supplemented based on comments by the MPCA and its reviewers in November and December 2006. The results presented in this section are based on those submittals.

Minnesota Steel is at this time conducting an updated version of the HHSRA. That is being done to insure that prior to final action on the project a current version of the HHSRA is available that reflects all changes made since the May 2006 HHSRA was conducted. To the extent possible, the impact of changes since the May 2006 HHSRA are addressed in the November and December supplements and those results are discussed in this section. The results of this update will be incorporated into the final EIS.

Note that the potential effects of Mineral Fibers are addressed in Section 4.7.2.6.

4.7.2.4.1 Chemicals of Potential Interest (COPI) and Emission Rates

The Proposed Project consists of a number of potential sources of air emissions. These can generally be divided into mining sources (mining and crushing) and processing sources (concentrator, pelletizer, direct reduced iron processes, steel mill, slag processing). For purposes of the HHSRA, chemicals potentially emitted by these sources that could be of concern to human health need to be identified.

Data from all available sources was analyzed to determine the Chemicals of Potential Interest (COPI). This included test data where available, mass balance calculations, emission factors available from USEPA, process engineering calculations, BACT emission rates, vendor data, etc. In general, COPI emitted by mining sources consist of the constituents of the mined material. COPI from mining sources are primarily metals and other constituents of the ore. COPI from processing sources include metals from the ore, emissions from fuel combustion, emissions related to processing agents (additives) and process products and by-products.

A list of 81 COPIs was compiled for the Minnesota Steel project. Table 4.7.18 is the final list of COPIs and identifies whether they were quantitatively or qualitatively assessed. It includes only chemicals for which emissions estimates could be estimated. This list differs somewhat from the list that will be found in the HHSRA submitted by Minnesota Steel. Those differences relate to how chemicals were grouped for the listing. Table 4.7.18 notes where various chemicals were included in a chemical group to assess toxicity. For instance, titanium dioxide was included as part of titanium compounds. For those assessed quantitatively, that table also identifies what general types of toxicity impacts were considered.

Initially dioxins/furans and additional emissions of some poly aromatic hydrocarbons (PAHs) were not included due to a lack of data or indications that they would not be emitted. Based on new information and upon review by the MPCA, emissions of dioxins/furans from the electric Arc Furnace (EAF) and additional emissions of PAHs were added to reflect the use of approximately 1 percent of scrap in the steel-making process.

PAHs were evaluated individually for toxicity in the assessment. They were not treated as if they were equivalent to benzo(a)pyrene, which is sometimes used as a surrogate for all PAH compounds.

Because natural gas is the main fuel, and no data on natural gas fueled process sources that indicated the presence or formation of dioxin/furan emissions was found, dioxins/furans were assumed to be emitted only from the EAF due to use of scrap.

Criteria pollutants are PM, PM_{10}, SO_2, NO_x, CO, lead and VOCs as a surrogate limit for ozone. Criteria pollutants are generally not treated as COPIs. PM, PM_{10}, SO_2, CO and VOCs (ozone) are not included in the COPI list for this project. As criteria pollutants they are subject to Minnesota and National Ambient Air Quality Standards (M/NAAQS). Assessments comparing emissions to those Class II and Class I ambient air quality standards are addressed in Sections 4.7.2.2.1 and 4.7.2.2.2, respectively. NO_x, on a 1-hour basis, is included as a COPI since there is no 1-hour M/NAAQS. VOCs are assessed as individual compounds. Lead is a criteria pollutant, but is also treated as a COPI.

The following chemicals were also considered but emission rates could not be determined for them. Therefore they were not further assessed. Those are: acetic acid, bismuth, ferro chromium, ferro manganese, ferro vandium; gallium, isododecyloxypropal-1,3-diaminopropane, methyl amyl alcohol, methyl isobutyl alcohol, methyl isobutyl carbinol, propanediamine, 1,3-and sodium acrylate and acrylamide copolymer.

Data to assess the potential impact of emissions on human health is not always available. Data on the potential impact due to inhalation is required for the inhalation assessment. For the multi-pathway ingestion assessment, data is needed on potential impacts due to ingestion as well as how chemicals move through the environment. A quantitative analysis was done on all chemicals for which sufficient data was available. When sufficient data is not available, a qualitative analysis approach is used.

The air quality permit will contain conditions to ensure emission rates are at or below those used in the risk assessment.

Small Sources Not Included

Emissions from emergency diesel-fired generators and natural gas space heaters are not included as they are likely to have an insignificant impact on the assessment. The emergency generators emit primarily NO_x and diesel particulate. They would be run only on a short term basis for emergencies and as needed for testing. Because process sources have significantly higher levels of NO_x emissions, and because the generators would likely be located internally to the site and emissions impacts would not travel as far as tall stack sources, it is assumed that generator emissions would be unlikely to add significantly to the NO_x impacts assessed for process sources The same is true for natural gas space heaters.

Mercury Emissions

Two levels of mercury emissions were assessed:

1. Average Emission Rate of 61 pounds per year. – This value was used in the Industrial Risk Assessment Program (IRAP) November 2006 update.
2. Maximum Emission rate of 78 pounds per year. – This value was used in the Minnesota Mercury assessment methodology. This value is slightly lower than the final maximum mercury emission rate of 81 pounds per year for the project. The difference is 3.7 percent. Therefore, the potential impacts of that difference are low. This is discussed in more detail with results. Results reflecting these levels are included in the Risk Characterization.

4.7.2.4.2 Exposure Assessment

4.7.2.4.2.1 Methodology

The exposure assessment used the following analyses:

- Air dispersion modeling;
- Exposure modeling via the IRAP;
- Exposure modeling for exposure via mercury in fish using both IRAP and Minnesota’s approach; and
- USEPA’s Integrated Exposure Uptake Biokinetic (IEUBK) model for lead.

TABLE 4.7.18 TREATMENT OF CHEMICALS ASSESSED IN THE HHSRA

		Quantitative Analysis					Qualitative Analysis		
		Acute	Chronic						
			Non-Cancer		Cancer				
Count	**Chemical Name** ***Shaded chemicals have been treated qualitatively**		**Inhalation**	**Oral**	**Inhalation**	**Oral**		**PAHs**	**Notes**
1	Acenaphthene			X				X	
2	Acenaphthylene						X	X	
3	Acetaldehyde		X	X	X				
4	Acrolein	X	X	X					
5	Aluminum Compounds		X	X					Includes Aluminum Oxide
6	Anthracene			X					
7	Antimony Compounds			X					
8	Arsenic Compounds	X	X	X	X	X			Includes Arsenic III and V Compounds
9	Barium Compounds		X	X					
10	Benzene	X	X	X	X	X			
11	Benz(a)anthracene				X	X		X	
12	Benzo(a)pyrene				X	X		X	
13	Benzo(b)fluoranthene				X	X			
14	Benzo(g,h,i)perylene						X	X	
15	Benzo(k)fluoranthene				X	X			
16	Beryllium Compounds		X	X	X				
17	Boron Compounds		X	X					
18	1,3 Butadiene		X		X				
19	Butane						X		
20	Cadmium Compounds		X	X	X	X			
21	Calcium Compounds						X		Includes Calcium Carbonate and Calcium Oxide. Addresses Limestone/Dolomite
22	Chloride salts						X		
23	Chlorine, Chlorides	X	X	X					
24	5-Chloro-2-methyl-4-isothiazolin-3-one						X		
25	Chromium Compounds			X					Includes Chromium other than Chromium VI
26	Chromium (VI)		X	X	X				
27	Chrysene				X	X		X	
28	Cobalt Compounds		X	X					
29	Copper Compounds	X		X					

		Quantitative Analysis					Quali-tative Analysis		
		Acute	Chronic						
			Non-Cancer		Cancer				
Count	**Chemical Name** ***Shaded chemicals have been treated qualitatively**		**Inhalation**	**Oral**	**Inhalation**	**Oral**		**PAHs**	**Notes**
30	Dibenzo(a,h)anthracene				X	X		X	
31	Dichlorobenzenes		X	X					
32	Dichlorotolyltriazole						X		
33	Dimethylbenz(a)anthracene, 7,12-				X	X			
34	Dioxin/Furan				X	X			
35	Ethane						X		
36	Fluoranthene			X					
37	Fluorene			X					
38	Ferro niobium						X		
39	Fluorine, Fluorides		X	X					Includes Fluoride Salts
40	Formaldehyde	X	X	X	X				
41	Hexane		X	X					
42	Hydrogen Chloride (as Cl)	X	X	X					
43	Hydrogen Fluoride (as F)	X	X						
44	Hydrogen Sulfide	X	X						
45	Indeno(1,2,3-cd)pyrene				X	X		X	
46	Iron Compounds			X					Includes Iron II Oxide and Iron III Oxide
47	Isoparafinic petroleum distillate						X		
48	Lead Compounds				X	X			See also IEUBK Model
49	Lithium Compounds			X					
50	Magnesium Compounds						X		Includes Magnesium nitrate and Magnesium oxide
51	Manganese Compounds		X	X					Includes Manganese dioxide
52	Mercury Compounds/Methyl Mercury	X	X	X					
53	Methylcholanthrene, 3-				X	X			
54	Molybdenum Compounds			X					
55	Naphthalene	X	X	X	X	X			
56	Naphthalene, 2-methyl			X					
57	Nickel Compounds	X	X	X	X				
58	Nitrogen dioxide (1-hour)	X							
59	Pentane						X		

		Quantitative Analysis					Quali-tative Analysis		
		Acute	Chronic						
			Non-Cancer		Cancer				
Count	**Chemical Name** ***Shaded chemicals have been treated qualitatively**		**Inhalation**	**Oral**	**Inhalation**	**Oral**		**PAHs**	**Notes**
60	Phenanthrene						X	X	
61	Phosphorous Compounds						X		Includes total phosphorus
62	Polycyclic Organic Matter (POM) (non-PAH)						X		
63	Potassium Compounds						X		Includes Potassium Oxide
64	Propane						X		
65	Propylene		X						
66	Pyrene			X					
67	Selenium Compounds		X	X					
68	Silicon Compounds						X		
69	Silicon Dioxide						X		
70	Silver Compounds			X					
71	Sodium Compounds						X		Includes Sodium carbonate, molybdate, nitrate, oxide and tolytriazole
72	Strontium Compounds			X					
73	Sulfur Compounds						X		Does not include sulfur dioxide
74	Sulfuric Acid						X		
75	Thallium						X		
76	Tin Compounds			X					
77	Titanium Compounds			X					Includes titanium dioxide
78	Toluene	X	X	X					
79	Vanadium Compounds	X		X					
80	Xylene	X	X	X					
81	Zinc Compounds			X					

Air dispersion modeling outputs were used directly to determine acute (short term) impacts from inhalation (i.e., IRAP was not used for acute analysis). Air dispersion modeling outputs were also used as one of many inputs to IRAP. Air dispersion modeling is discussed in Sections 4.7.2.2.1 and 4.7.2.2.2. In general, an emission rate along with stack data, location data, and meteorological data are used to estimate the concentration of a chemical in the air at a particular location due to that emission.

IRAP is a computer based program that was developed to assess the potential health impacts from facility emissions and resultant exposures. It takes the HHRAP approach and implements it via a series of computer analyses. Inputs to IRAP include:

- Emissions data
- Air dispersion modeling results
- Chemical data (such as physical data and environmental fate and transport data)
- Exposure data

The IRAP model estimates potential health impacts at selected 'risk receptors'. Those receptors are chosen on a project-specific basis to reflect both project-specific emissions and local land use. The choice of 'risk receptors' is discussed in more detail in Section 4.7.2.4.2.3 - Location and Type of Risk Receptors Section.

Use of Maximally Exposed Individual (MEI)

In this case the Maximally Exposed Individual (MEI) was assessed. The MEI assumes an individual is exposed 24 hours per day over a 70 year lifetime to the modeled maximum outdoor air concentration. By maximizing the air concentration and exposure frequency and duration, the MEI assumptions should provide an upper bound estimate of expected exposures for the COPIs evaluated. Exposures to concentrations at or near such an upper bound are described as "conservative" in that they are more protective of public health compared to average exposure levels.

For comparison, other levels of exposure often considered in risk assessments are the reasonable maximum exposure (RME) scenario which assesses approximately the upper 95th percentile of the MEI and the modified central tendency exposure (MCTE) approach which assesses approximately the 85th percentile of the MEI (reference USEPA 1989). No RME scenario was assessed by Minnesota Steel in this case. The MCTE was assessed as a less conservative point of reference (Appendix I provides a list of special studies) however MCTE results are not presented here, as they are not typically used for decision making by the MPCA. Those results are available for review in Minnesota Steel's HHSRA documents. The MCTE results were generally lower than the MEI results.

4.7.2.4.2.2 Exposure Assumptions

In risk assessments in general the following exposure pathways are recommended for consideration:

- Acute
- Chronic
    - Resident
    - Farmer
    - Fish Consumer
        1. Recreational Level
        2. Subsistence Level

All of these types of exposure currently occur nearby the facility. Further, there is potential for expansion of any of these land uses in the area. Therefore, they were all assessed.

The ***acute*** pathway addresses inhalation only, on a short term basis (1-hr).

The various chronic exposure pathways are discussed in the following.

The ***residential*** pathway includes the following exposures:

- Inhalation of vapors and particles,
- Incidental ingestion of soil, and
- Ingestion of homegrown produce.

The ***farmer*** pathway assesses the items listed for residential pathway assessment plus:

- Higher levels of ingestion of homegrown produce,
- Ingestion of homegrown beef,
- Ingestion of homegrown cows,
- Ingestion of homegrown pork, and
- Ingestion of homegrown chickens, and eggs from homegrown chickens.

This is called a ‘subsistence farmer’ receptor in this analysis because the receptor gets all of their diet from home grown/raised food (produce/livestock) and locally caught fish.

The ***fish consumer*** pathway assesses impacts listed for the residential pathway plus:

- Ingestion of fish.

The fish consumer pathway can be assessed at either a ‘recreational’ or a ‘subsistence’ level of consumption of locally caught fish. All assessments in this HHSRA include at least a recreational level of fish consumption. All fish consumed is assumed to be locally caught. Subsistence fish consumption receptors are also included at some specific receptors. The subsistence level of fish consumption used in the IRAP analysis is 0.44 pounds/day for adults, or approximately six, ½-pound servings per week. This value is greater than the value used by the Minnesota Mercury analysis method which is 0.31 pounds/day for adults, or between four and five, ½-pound servings per week. Fish consumption for a 34 pound child was 0.046 lbs/day, for both the subsistence and residential exposure scenario.

As an example, the following outlines the impacts assessed for a subsistence farmer pathway analysis:

1. Emissions to Air
    a. breathing that air
2. Deposition of chemicals onto plants
    a. ingestion of the plant
    b. ingestion of the plant by animals
        i. ingestion of animals and animal products (milk, eggs) by humans
3. Deposition of chemicals onto soils
    a. incidental ingestion of soils by humans
    b. movement of chemical into the soil
    c. uptake of the chemical into plants
    d. ingestion of plants by humans
    e. ingestion of plants by animals
        i. ingestion of animals and animal products (milk, eggs) by humans

Impacts for a fish consumer pathway include:

1. Deposition of chemicals onto soils
    a. Movement of chemicals via rain/snowfall into lakes
    b. Uptake of chemicals by fish in lakes from water or sediments
    c. Ingestion of fish by humans

2. Deposition of chemicals onto surface waters
    a. uptake of chemicals by fish in lakes from water or sediments
    b. ingestion of fish by humans

Some other routes of exposure are ***not*** considered as they have been shown, in other analyses to have little effect on results – relative to other routes of exposure. These are:

- incidental ingestion of surface water or sediments (during swimming for instance),
- dermal (i.e., skin) exposure to air concentrations of chemicals, to chemicals in soil, to chemicals in surface water and chemicals in sediments, and
- groundwater impacts – i.e., the potential for groundwater contamination from air emissions (via deposition movement of chemicals through soil).

For exposure pathways that occur over the long term, and include cumulative impacts, exposures were assumed to begin as if the facility had already operated for 20 years. Thus there is not a period of low exposure at the beginning of the analysis that increases over time as the facility operates. Instead a higher level of impact starting after a 20-year facility life is assumed. This is a conservative assumption.

An assessment can be conducted for an adult and/or a child. In all exposure scenarios for this assessment adult and child inhalation and ingestion rates are included in the analysis.

Lakes and Watersheds

The following lakes and their related watersheds where included in the May 2006 HHSRA:

- Swan Lake
- Snowball Lake
- Big Sucker Lake

Originally, it was assumed that:

- Oxhide Lake, and
- Little Sucker Lake,

would be included in the property boundary and therefore they were excluded from the analysis. The property boundary was changed after completion of the May 2006 HHSRA to exclude Oxhide and Little Sucker Lakes (i.e., they are no longer within the property boundary). Therefore, they need to be considered in the analysis. The November 2006 HHSRA Supplement discussed the proposed change in property boundary and the potential impact of that change.

Further, changes to the water impacts analysis and related watershed data between the time of completion of the original analysis and this Draft EIS have an impact on the IRAP assessment of the watersheds. The updates to the analysis currently underway will include the final data for the watersheds and lakes (area, flow rates, etc.). The potential impact of those changes was also discussed in the November 2006 HHSRA Supplement and is addressed in Section 4.7.2.4.4.

4.7.2.4.2.3 Location and Type of Risk Receptors

When there are multiple sources of emissions of multiple chemicals, as is true for the Proposed Project, and because estimating risk at every location is not feasible given the large amount of data, the choice of location of 'risk receptors' in IRAP is important. Emissions, modeling, and land use considerations are used to locate those places where risks will be estimated – called 'risk receptors'. Land use in the surrounding area was analyzed along with potential exposure pathways and locations of maximum concentrations from the criteria pollutant analysis. Risk receptors were placed based on this analysis.

In this case, emissions are of two basic types – particulate and gaseous. Mining sources emit particulates. Process sources may emit particulates and gaseous emissions. Data from Class II dispersion modeling shows that impacts are at a maximum at the property boundary. Further, that modeling also shows that impacts from mining sources are highest along the southern property boundary and that impacts from process sources are highest along the northwestern property boundary. Impacts decrease with distance from the property line. Impact locations for deposition of particles are generally the same as for air concentrations of particles.

The area around the proposed facility was reviewed with respect to current and potential future land uses and risk receptors placed accordingly. Specifically, current residences in areas where impacts are expected to be highest were included. Also the area was surveyed for evidence of farming such as current farms or past land clearing. Subsistence farmer receptors were placed based on that survey. Additional receptors were placed to insure adequate coverage around the facility.

Impacts are not assessed within the property boundary. This is consistent with risk assessment methodology as Minnesota Steel is assumed to have control over the activities within the facility boundary. This is assumed to prevent, for instance, a resident or subsistence farmer locating within the property boundary.

To the extent that watersheds include areas within the property boundary, chemical deposition into the full watershed which contributes to a lake assessed in this analysis was considered. In other words, run-off from a portion of a watershed inside the property boundary was considered to add to the load on a lake outside the property boundary.

Risk receptors were placed as follows:

- At areas of high impact from particulate-type emissions.
- At areas of high impact from gaseous/process type sources.
- At locations of known farming or evidence of past farms.
- At additional locations along the property boundary to assess areas not addressed in the prior items.

Table 4.7.19 identifies the risk receptors assessed in this analysis and the exposure pathways that were assumed to occur with a note relative to why the receptor was included. Figure 4.7.2 shows the locations of those receptors along with the property boundary and other relevant information. Note that Figure 4.7.2. shows the project boundary as of the May 2006 HHSRA. This will be updated in the HHSRA update currently underway. The potential affects of changes in the property boundary are discussed in this section.

Adult and child exposure levels were considered at each receptor.

All receptors assume at least a recreational level of fishing. Directly adding exposures for subsistence fish consumers and subsistence farming would result in consumption of greater than a maximum overall consumption level of calories. Rather, the subsistence level fish consumer is assumed to have residential levels of local produce consumption, and the subsistence farmer is assumed to have recreational levels of fishing.

TABLE 4.7.19 RISK RECEPTOR SUMMARY

#	Residential + Recreational Fish Consumer	Residential+ Subsistence Fish Consumer	Subsistence Farmer + Recreational Fish Consumer	Actual or Potential Land Use	Areas of High Particulate or Gaseous Pollutant Ambient Air Concentrations
1	X			Actual Resident	
2		X		Potential	
3	X			Potential	Gaseous
4	X			Potential	Gaseous
5		X		Potential	
6	X			Actual Resident	
7		X		Actual Resident	Particulate
8	X			Actual Resident	
9	X			Potential	
10	X			Potential	
11	X			Potential	
12		X		Actual Resident	
13		X		Actual Resident	Particulate & Gaseous
14	X			Actual Resident	Particulate & Gaseous
15	X			Potential	
16	X			Actual Resident	
17	X			Actual School	
18			X	Evidence of Farming/Clearing	
19			X	Evidence of Farming/Clearing	
20			X	Evidence of Farming/Clearing	
21			X	Evidence of Farming/Clearing	
22			X	Evidence of Farming/Clearing	
23			X	Evidence of Farming/Clearing	
24	X			Actual School	
25	X			Potential	Gaseous

4.7.2.4.3 Toxicity Assessment

Toxicity varies with both the time of exposure and potential impact. With respect to duration of exposure, the following time frames are assessed:

- Acute impacts – Occur on a 1-hour or similar short-term exposure basis from inhalation only.
- Chronic – Multiple exposures occurring over an extended period of time.

With respect to the type of potential impacts, carcinogenic and non-carcinogenic impacts are assessed. For non-carcinogenic health endpoints, the most sensitive endpoint was used for the analysis. These include such things as the potential for developmental effects, systemic effects, neurotoxicity, etc.

To be used in a HHSRA, toxicity data must meet certain criteria for validity. Inhalation toxicity values from the following sources in the following hierarchy (best to least) were used:

- MDH promulgated Health Risk Values (HRVs) and MDH guidance.
- Data published in USEPA's Integrated Risk Information System (IRIS).
- Data developed by the State of California EPA Office of Environmental Health Hazard Assessment (OEHHA).
- Data from USEPA's Health Effects Summary Tables (HEAST).
- Minimal Risk Levels developed by the ATSDR.

For oral toxicity (i.e., from ingestion of chemicals), no standard MPCA or MDH database exists. The MPCA provided Minnesota Steel with oral values for use in this assessment.

Except for lead in the IEUBK analysis, all chemicals are assumed to be 100 percent bio-available in this analysis. For example, if a metal is ingested, it is assumed that 100 percent of it could be used in the body in the mechanism that would result in the toxic endpoint.

The dioxin/furan family of chemicals consists of many individual chemicals that share some common characteristics. The toxicity of those individual chemicals varies. Emissions can be estimated using estimates for each individual chemical, or estimates can be made for the total group based on the relative toxicity. When the relative toxicity basis is used, this is referred to a 'toxic equivalents.' Dioxin/furan emissions were treated as toxic equivalents in this HHSRA.

The treatment of each chemical that was assessed quantitatively is included in Table 4.7.18. Refer to the Minnesota Steel HHSRA report and supplements for detailed toxicity data used in the analysis.

4.7.2.4.4 Minnesota Method Mercury Analysis

The MPCA has developed a tool for assessing potential impacts from mercury deposition to lakes in the state. The tool is a spreadsheet entitled "Calculation of Local Mercury Hazard Quotient from Mercury Emissions from a Project." The tool allows for input of data specific to a particular lake. Input data include the existing ambient fish mercury concentration, lake and watershed data, and mercury emissions data. The spreadsheet then calculates an incremental increase in the Hazard Quotient (HQ) due to mercury ingestion from fish for a specific lake from a specific project. (See the next section for a definition of hazard quotient). The spreadsheet includes MPCA specified consumption values for both a subsistence and recreational fish consumer scenario.

As part of the May 2006 HHSRA, the MPCA spreadsheet analysis was completed for Big Sucker Lake, Snowball Lake and Swan Lake. As noted previously, the Minnesota method used a mercury emission rate of 78 pounds per year. Local fish mercury data was available from the MNDNR and was used.

4.7.2.4.5 Risk Characterization

The calculation methodology for each type of assessment is described below.

Non Cancer Impacts – Inhalation

For each pollutant assessed quantitatively, the air concentration estimated from air dispersion modeling is divided by the inhalation toxicity value for that pollutant. The result is defined as the hazard quotient (HQ). For this screening assessment, the toxicity of COPIs for all routes of exposure are assumed to be additive and HQs are then summed to yield the hazard index (HI). An HI of less than 1 indicates that exposures are not expected to pose an unacceptable health risk to the exposed populations.

Non Cancer Impacts – Ingestion

The same general procedure is used as for inhalation, however, prior to comparison to a toxicity value, the air concentration is converted into a concentration available in food or through soil ingestion based on chemical specific values for fate and transport in the environment. The uptake values discussed in the exposure analysis are applied to the available concentration and an ingestion dose is estimated. The resulting ingestion dose is compared to an ingestion based toxicity value. As with the procedure discussed for inhalation, the individual chemical fraction is defined as the HQ and, assuming additive toxicity across COPIs and exposure routes, all HQs are summed to give a hazard index (HI). An HI of less than 1 indicates that exposures are not expected to pose an unacceptable health risk to exposed populations.

Cancer Risks - Inhalation

For carcinogens, a similar approach is used but rather than a hazard quotient or index, an incremental risk is calculated. The Minnesota Department of Health currently applies an acceptable incremental cancer risk of 1 in 100,000 (or 1 E-5).

For each pollutant assessed quantitatively that is a potential carcinogen, the air concentration estimated from dispersion modeling for that particular pollutant is multiplied by the unit risk factor for that pollutant. The result is an incremental risk due to exposure to that pollutant. Assuming all cancer risks are additive across COPIs and exposure pathways, the incremental risk values are summed. If this sum does not exceed the MDH guideline level of 1 in 100,000 (1 E-5) the inhalation exposures are not expected to pose an unacceptable cancer risk to the general public.

Cancer Risks - Ingestion

The same general procedure is used as for inhalation, however, prior to comparison to a toxicity value, the air concentration is converted into an concentration available in food based on chemical specific values for fate and transport in the environment. Then uptake values discussed in the exposure analysis are applied to estimate an ingestion dose. The result is an incremental risk due to ingested exposure to that chemical. Assuming all cancer risks are additive across COPIs and exposure pathways, the incremental risk values are summed. If this sum does not exceed the MDH guideline level of 1 in 100,000 (1 E-5), the ingested exposures are not expected to pose an unacceptable cancer risk to the general public.