4.7.2.4.5.1 Quantitative Results

IRAP Results

The results of the IRAP quantitative analysis for the project are summarized in Table 4.7.20. That table lists the maximum risk level for that receptor for the pathways assessed. Results are summarized using the latest data available for each receptor.

All values in Table 4.7.20 are below guideline levels of 1 E-5 for cancer and 1 for non-cancer impacts. Results are summarized below. Note that all results for carcinogenic risk are presented on an E-5 basis to allow easier comparison to the MDH guideline level.

- For the Residential/Recreational Fish Consumer Receptors - The maximum cancer risk is 0.6 E-5. The maximum non-cancer impact is 0.9. Cancer risks range from 0.03 to 0.6 E-5 and non-cancer impacts range from 0.03 to 0.9 for the receptors assessed.
- For the Residential/Subsistence Fish Consumer Receptors - The maximum cancer risk is 0.8 E-5. The maximum non-cancer impact is 0.9. Cancer risks range from 0.3 E-5 to 0.8 E-5 and non-cancer impacts range from 0.3 to 0.9 for the receptors assessed.
- For the Subsistence Farmer Receptors - The maximum cancer risk is 0.5 E-5. The maximum non-cancer impact is 0.7. Cancer risks range from 0.1 E-5 to 0.5 E-5 and non-cancer impacts range from 0.2 to 0.7 for the receptors assessed.

These data represent the IRAP assessment for fish consumption at the average mercury emission rate of 61 pounds per year. The impact of mercury on fish consumption impacts is discussed in more detail in the next portion of this section.

Due to the method of treatment of mercury in IRAP to address fish consumption, inhalation impacts were not estimated. An independent estimate of inhalation impacts from mercury was made to address this issue. The result is a hazard quotient from mercury inhalation of less than 0.001 for either the 61 pounds per year level or the higher 81 pounds per year value. Therefore adding inhalation impact from mercury does not affect the results.

TABLE 4.7.20 SUMMARY OF IRAP RESULTS – MEI – 61 LB/YR MERCURY

Recep-tor #	Cancer Risk	Risk Driver Chemicals at Pathway Maximum	Non-Cancer HI	Impact Driver Chemicals at Pathway Maximum	Pathways Assessed**	Data Source ***
1	0.3 E-5		0.4		Res + Rec Fish Consumer	2
2	0.4 E-5		0.3		Res + Subsistence Fish Consumer	1
3	0.5 E-5		0.4		Res + Rec Fish Consumer	2
4	0.5 E-5		0.5		Res + Rec Fish Consumer	2
5	0.3 E-5		0.3		Res + Subsistence Fish Consumer	2
6	0.3 E-5		0.4		Res + Rec Fish Consumer	1
7	**0.8 E-5**	Arsenic, DB(a,h)A, BAP	**0.9**	Iron, Manganese, Arsenic, Chlorine, Methyl mercury	**Res + Subsistence Fish Consumer**	2
8	0.3 E-5		0.4		Res + Rec Fish Consumer	1
9	0.2 E-5		0.2		Res + Rec Fish Consumer	2
10	0.1 E-5		0.2		Res + Rec Fish Consumer	2
11	0.3 E-5		0.4		Res + Rec Fish Consumer	2
12	0.5 E-5		0.5		Res + Subsistence Fish Consumer	1
13	0.7 E-5		0.6		Res + Subsistence Fish Consumer	2
14	0.4 E-5		0.4		Res + Rec Fish Consumer	2
15	0.3 E-5		0.3		Res + Rec Fish Consumer	1
16	0.1 E-5		0.1		Res + Rec Fish Consumer	1
17	0.3 E-5		0.2		Res + Rec Fish Consumer	1
18	0.3 E-5		0.3		Subsistence Farmer + Rec. Fish Consumer	1
19	**0.5 E-5**	Arsenic, DMB(a)A, DB(a,h)A, Cadmium	0.4		**Subsistence Farmer + Rec. Fish Consumer**	2
20	0.2 E-5		0.2		Subsistence Farmer + Rec. Fish Consumer	1
21	0.1 E-5		0.2		Subsistence Farmer + Rec. Fish Consumer	1
22	0.3 E-5		0.4		Subsistence Farmer + Rec. Fish Consumer	1
23	0.4 E-5		**0.7**	Iron, Manganese, Arsenic, Chlorine, Methyl mercury	**Subsistence Farmer + Rec. Fish Consumer**	2
24	0.03 E–5		0.03		Res + Rec Fish Consumer	1
25	**0.6 E-5**	Arsenic, DB(a,h)A, BAP	**0.9**	Iron, Manganese, Arsenic, Chlorine, Methyl mercury	**Res + Rec Fish Consumer**	2
*AL**	*1 E-5*	*NA*	*1*	*NA*	*NA*	*NA*

Notes for Table 4.7.20:

* AL – Acceptable Level
E-5 = 1 in 100,000 – for carcinogens
HI of 1.0 for non-carcinogens
**'Res.' – Residential
**'Rec.' – Recreational

****Data Sources:*
1 – Values from Appendix B: Exhibit 1 – May 2006 HHSRA
2 – Values from Table 6 – Supplemental Information to the May 2006 HHSRA, November 2006

Chemical Abbreviations:
DB(a,h)A = Dibenzo(a,h)anthracene
BAP = Benzo(a)pyrene
DMB(a)A = Dimethylbenzo(a)anthracene, 7,12-

Minnesota Mercury Method Results

Table 4.7.21 presents the results of the Minnesota Mercury Method analysis for the three lakes assessed. The HQ calculated is for mercury from fish ingestion only according to the Minnesota Mercury methodology. The calculations use the higher mercury emission rate of 78 pounds per year.

TABLE 4.7.21 MPCA METHOD – MERCURY FISH CONSUMPTION – 78 POUNDS PER YEAR

Lake	Incremental Mercury Hazard Quotient – Recreational Fish Consumer	Incremental Mercury Hazard Quotient – Subsistence Level Fish Consumer
Big Sucker	0.04	0.2
Snowball	0.04	0.2
Swan	0.03	0.1

These results show incremental increases in the HQ for fish consumption from these lakes due to the project of:

0.03 to 0.04 for recreational level fish consumption, and
0.1 to 0.2 for subsistence level fish consumption.

There is some disagreement regarding the best way to assess the potential for mercury impacts via fish consumption. Specifically, it is not clear which forms of mercury impact *local* waters. Mercury may be elemental, oxidized, and particle bound (93 percent, 5 percent and 2 percent, respectively in this case). The Minnesota method assumes some contribution to local impacts from all forms with the largest impact being from oxidized mercury. HHRAP and IRAP assume only a contribution due to oxidized mercury.

Table 4.7.21 results reflect mercury emissions of 78 pounds per year. Updating the data to 81 pounds per year would have minimal effect. The difference in emission rate is 3.7 percent. Further, the majority of the emission, as noted previously, would be elemental mercury (93 percent). Elemental mercury has a lower impact on results in the Minnesota analysis method. Therefore, it is not expected that any noticeable change in the results using 81 pounds per year mercury versus 78 pounds per year mercury.

The incremental results in Table 4.7.21 are not 100 percent additive to results summarized in Table 4.7.20. Table 4.7.22 summarizes the results of the previous IRAP analysis with the Minnesota Mercury Method substituted for that portion of the IRAP assessment due to mercury fish consumption. Results were calculated for the maximum receptor of each type from Table 4.7.20 (i.e., Residential/ Recreational Fish Consumer; Residential/Subsistence Fish Consumer; Subsistence Farmer/Recreational Fish Consumer). Table 4.7.22 presents the re-calculated total hazard index for the three maximum receptors listed (maximum for each receptor type).

TABLE 4.7.22 SUMMARY OF RESULTS – MEI –RECALCULATED TOTAL HI MINNESOTA MERCURY ANALYSIS SUBSTITUTED FOR IRAP MERCURY ANALYSIS

Receptor #	Lake	Non-Cancer HI*	Pathways Assessed
7	Snowball	1	Res + Subsistence Fish Consumer
23	Snowball	0.7	Subsistence Farmer + Rec. Fish Consumer
25	Snowball	0.9	Res + Rec Fish Consumer

Table 4.7.22 shows that by using the Minnesota Mercury approach and the higher mercury emission rate of 78 pounds per year, impacts increased by approximately 0.1 at receptor 7 and less than 0.1 at receptors 23 and 25.

Discussion of Results

Carcinogenic Impacts:

The mercury fish consumption assessment methodology does not affect carcinogenic analysis results. As noted previously (Table 4.7.20), for the sum of potential carcinogenic impacts, all results are below acceptable levels of 1 in 100,000. Results are generally highest for adult exposure.

Non-Carcinogenic Impacts:

Results using HHRAP methodologies via IRAP are below a hazard index (HI) of 1.0 for the sum of impacts from non-carcinogens. Results applying Minnesota Mercury Assessment methodology for fish consumption are up to 1 for the sum of impacts from non-carcinogens. Results are generally highest for child exposure for non-cancer impacts.

Results over 1 for a non-cancer HI do not indicate that a health risk would occur. As noted previously, exposures are not expected to pose an unacceptable health risk to exposed populations when the HI is less than 1. The value of 1 should not be viewed as a 'bright line'. The IRAP/Minnesota Method value of 1 indicates that there is higher potential for a health risk to occur at this receptor for a subsistence fish consumer than there is for other pathways (residential, recreational fishing). HI's for recreational fish consumers remain 0.90 or below. In determining if any action is needed to address this level of risk, factors such as the level of conservatism of the assessment, the qualitative assessment for chemicals without toxicity values, and uncertainties in the data and methodology are considered.

Two sources of data are used for Table 4.7.20 – the May 2006 HHSRA and the November 2006 supplement. The November Supplement included a re-run of IRAP to reflect the addition of dioxins/furans and PAHs due to use of scrap steel, as well as some corrections to toxicity data for cobalt. Cancer risks increased approximately 0.01 E-5 for residential receptors and up to 0.08 E-5 for subsistence farmer receptors. Non-cancer risks were unaffected.

Additional Subsistence Farmer Receptor

In the updated analysis currently underway, a subsistence farmer will be assessed at receptor 14. In the May 2006 analysis and its updates, subsistence farming was only assessed at locations where there was evidence of current or past farming. Upon review, it has been agreed that areas potentially amenable to farming should also be considered.

Receptor 14 is a boundary receptor that has been chosen to represent that potential future land use. Other boundary areas have been rejected due to their high slopes, location within shoreland management areas, or other aspects which make them highly unlikely to be used for farming in the future. Receptor 14 is near areas of high gaseous and particulate pollutant impacts from processing sources and will thus represent impacts on farming from those sources.

Receptor 19 has the highest subsistence farming impacts currently. Receptor 19 is located northwast of the facility. As receptor 14 is located along the property boundary, impacts may be higher than those reported at receptor 19.

Effect of Watershed/Lake Changes

Two sets of changes will be made in the updated analysis currently underway related to lakes and their watersheds. Those will be 1) to include an assessment of Oxhide and Little Sucker Lakes, and 2) to update watershed parameters (primarily extent and flows). The November 2006 HHSRA Supplement includes a semi-quantitative review of the impact of these potential changes on the results. That analysis is discussed in the following.

For Oxhide and Little Sucker lakes, the November 2006 supplement review indicated that the impacts to these lakes, when addressed in the updated analysis, would not be greater than impacts already calculated for risk receptors included in the May 2006 analysis.

With respect to watershed and lake parameters, the results will depend on the proximity of additional areas considered to the property boundary. Specifically, the watershed for Little Sucker Lake is closer to the boundary than is the watershed for Big Sucker Lake. Comparing data for Little Sucker Lake to the analysis that was conducted for Snowball Lake shows potentially similar impacts with Little Sucker Lake experiencing higher process-related emissions. Little Sucker Lake is shallow and has a frequent turnover compared to Snowball Lake. This serves to limit the potential for accumulation of COPIs. Therefore, it is not expected that impacts due to Little Sucker Lake would be significantly greater than those identified for Snowball Lake at receptor 7, which is the MEI for the resident/subsistence fish consumer receptor, in the May 2006 HHSRA.

In the updated analysis, the contribution of Little Sucker Lake to Big Sucker Lake will also be analyzed. It is possible that this analysis could show results greater than previously analyzed for subsistence fishing in and around receptor 13. The potential for contaminant flow from Little Sucker to Big Sucker Lake could increase impacts at that receptor. It is likely that they will be similar to subsistence level fish consumer results for Snowball Lake at receptor 7.

Impacts from inclusion of Oxhide Lake are likely to be similar to or less than those for Snowball Lake. Oxhide Lake is located on the south side of the facility and modeling indicates that its watershed should receive similar or lesser inputs than Snowball Lake.

Therefore, it is likely that individual receptor results may increase due to changes in watershed parameters but results are not expected to be significantly greater than the maximum already calculated for receptor 7.

4.7.2.4.5.2 Acute Results

The HI for acute impacts from inhalation is between 0.5 and 0.9, compared to an acceptable level of 1, depending on the level of NO_x controls. The risk driver for this impact is nitrogen dioxide (NO_2).

That impact from NO_x may vary from 0.4 – 0.8 depending on the level of NO_x control implemented at the facility and the level of conversion of NO_x to NO_2. The lower level represents the potential NO_x impact at the interim and proposed facility pellet plant controlled NO_x level. The higher value represents the potential NO_x impact at the interim and proposed facility pellet plant uncontrolled for NO_x – i.e., without $LoTO_x$™. (Refer to prior discussions in this Section 4.7.2.1.4 for more information on NO_x emissions and controls). The higher impacts assume a 75 percent conversion of NO to NO_2.

Acute results are not located at a particular risk receptor. Rather, they assume co-location of the maximum impacts for all chemicals – even though those are likely to occur at different locations. This is a conservative assumption.

4.7.2.4.5.3 Lead

Due to special concerns regarding lead exposure and its exposure pathways, an additional assessment is typically conducted for lead exposure. That assessment uses the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) model. Version 1.0 was used. It evaluates potential risks based on predicted blood lead levels associated with human exposure to lead. It calculates an incremental increase in blood lead concentration due to exposure to lead. The IEUBK model default value for bio-availability of lead is 30 percent. That value was used.

The IEUBK model was conducted for the Minnesota Steel project. The results show a maximum incremental increase in blood lead concentrations of 1.3-1.7 micrograms/deciliter (ug/dl) for children ages 0.5 – 7 years due to the project. That impact is at the location of maximum lead concentration. This impact level is below the Center for Disease Control (CDC) guideline of 10 ug/dl.

4.7.2.4.5.4 Qualitative Analysis

Based on the May 2006 Minnesota Steel analysis, 58 of 81 chemicals were assessed quantitatively in some way as described in the previous sections. A semi-quantitative analysis using occupational health data was conducted for 13 chemicals. The remaining COPIs consist primarily of ethane, sulfur, and chloride salts. Information on those three materials were reviewed as part of the May 2006 HHSRA and did not reveal any data of concern that would indicate additional analysis was appropriate.

For the semi-quantitative analysis, occupational health data was used as a starting point. The majority of the emissions assessed using occupational data are silicon compounds including silicon dioxide. The majority of the impact for the 13 chemicals is due to magnesium and silicon compounds. These materials are part of the ore matrix and the bio-availability of the metal is therefore unknown.

Occupational health data is typically based on 8-hr exposures, 5 days/week over a working lifetime (25 yrs). As an initial approach that data was scaled, using an adjustment factor, to represent a full time exposure for a lifetime. The resulting semi-quantitative analysis used a HQ/HI approach and showed an HI for emissions of the 13 chemicals of between 0.22 and 0.77 depending on the adjustment factors used.

Although HIs were obtained for chemicals assessed in this qualitative analysis, no calculation of an overall HI was developed by combining these data and the previously calculated quantitative HIs for several reasons. The qualitative assessment considered only direct inhalation exposures which were compared to chronic occupational standards or guidelines. The HQs calculated were dominated by magnesium compounds and silicates. These magnesium silicate particulates in ambient air would be produced by ore crushing and smelting. The potential toxicity of these particulate exposures would be restricted to effects on the lung. For example, long term exposure to silica, the crystalline form of silicates, can produce pulmonary fibrosis. Magnesium compounds other than silicates are well known lung irritants.

For the quantitative chronic assessment, only iron, methyl mercury, manganese, arsenic, and chlorine contributed significantly to any of the calculated HIs. Of these COPIs, only chlorine is a lung toxin and its maximum contribution to the HI is only 2 percent.

Therefore, the quantitative and qualitative results were not combined since there was very little overlap in target organ for any of COPIs involved in the two analyses. The acute quantitative assessment did include the lung irritant NO_2, however, that acute HI cannot be combined with the qualitative occupational HI since the occupational based HI was calculated for chronic effects (not acute effects).

4.7.2.4.5.5 Criteria Pollutants

A summary of criteria pollutant data is included in Table 4.7.23. That table presents the data as a percent of the applicable ambient air quality standard on an incremental basis (i.e. without background).

Table 4.7.23 shows that results for criteria pollutants (other than $PM_{2.5}$), are from 0.4 percent to 17 percent of the applicable standard. The highest results are for particulates. Many of those particulates are metals that are assessed either quantitatively or semi-quantitatively as individual materials. Therefore, those fractions should not be considered to be additive.

TABLE 4.7.23 CRITERIA POLLUTANT SUMMARY

Pollutant	Maximum Project Modeled Ambient Air Concentrations*, ** (ug/m^3)	Ambient Air Quality Standard (AAQS) (ug/m^3)	Percent (%) of Standard
PM_{10} – 24-hr	26	150	17
PM_{10} – annual	5	50	10
NO_x – annual	3-10	100	3-10
CO – 1-hr	153	40,000	0.4
CO – 8-hr	52	10,000	0.5
SO_2 – 1-hr	71	1,300	5.5
SO_2 – 3-hr	37	915	4.0
SO_2 – 24-hr	10	365	2.7
SO_2 – annual	1.4	60	2.3

*Does not include background.
** High impact as determined according to AAQS requirements.

Particulate Matter less than or equal to 2.5 microns($PM_{2.5}$)
Ambient Air Quality Standards (AAQS) for $PM_{2.5}$ are 35 ug/m^3 on a 24-hr basis and 15 ug/m^3 on an annual basis. Emissions and ambient air concentrations for $PM_{2.5}$ have not been specifically estimated for the project. One approach is to assume that all PM_{10} is $PM_{2.5}$. That would result in impacts of 74 percent and 33 percent of the $PM_{2.5}$ 24-hr and annual standards, respectively.

Analysis in the December 2006 HHSRA Supplement indicated that it is unlikely that 100 percent of PM_{10} is $PM_{2.5}$. Specifically, physical processes such as hauling, handling, crushing and grinding are not likely to have significant levels of $PM_{2.5}$. Process sources are more likely to be contributors of $PM_{2.5}$ from combustion. Therefore $PM_{2.5}$ concentrations are expected to be lower than those listed in Table 4.7.21 for $PM_{10.}$

4.7.2.4.6 Uncertainties Analysis

This section summarizes uncertainties in the HHRSA process. An analysis of the uncertainties is important because it provides perspective on the presence or absence of conservatism in the assessment. Uncertainties in each area of the assessment are discussed in this section. Where possible, worst case or conservative assumptions that tend to over-estimate rather than under-estimate risk are used to address uncertainties in risk assessment. This is evidenced in this case by the use of the MEI instead of the RME for instance.

Screening risk assessments are generally designed to make broad conservative assumptions about exposure, toxicity, and risk to avoid underestimating potential health risk to exposed human populations. For example, in the present screening assessment, hazard quotients are summed across all COPIs and pathways without regard for whether the chemicals express toxicity at the same target organ as is common in more detailed assessments of risk. This provides a conservative assessment as the HI is an upper bound on the HI that would result from a more detailed assessment. However there are a number of data gaps in the methodological approaches that add to the uncertainty of the HHSRA. These are as follows:

Emission Related Uncertainties

Use of emission factors: The use of emission factors can under or over-estimate impacts. The use of emission factors may also limit or expand the list of COPIs. Treatment of chemicals as part of chemical groups may under or over-estimate risk. To the extent that it allows quantitative assessment of a chemical that would otherwise not be assessed, this is a conservative approach.

Use of emission limits: To the extent that emission limits are set above expected levels of emissions (to provide a 'safety factor' for compliance), the use of emissions limits will over-estimate impacts on a long term basis. If emission limits were to be violated, risk may be understated.

Lack of emissions data: To the extent that emissions data is not available for a pollutant it is not included in the analysis and therefore could underestimate risks. Specifically, there is a lack of data for dioxin/furan emissions from natural gas fueled pellet furnace due to process emissions unrelated to scrap.

Secondary formation of pollutants: Atmospheric conversion of emissions to other species is not addressed. This may under or overestimate risks depending on the conversion that occurs in the atmosphere. Secondary conversion to fine particulate is not considered.

Sources not assessed: As noted previously, emissions from small sources (emergency diesel engines and natural gas space heaters) are not included.

Criteria Pollutants: Criteria pollutants were not included in the COPI list and were assessed separately from the quantitative and qualitative analyses except for NO_x acute effects and lead. This lessens the conservatism of the analysis.

Toxicity Value Related Uncertainties

Chemicals with toxicity data: There is uncertainty in most health-related data that are used to derive toxicity values. The goal for development of toxicity values is to assure that it is very unlikely that exposure limits resulting from the use of such values are under-protective. This is accomplished by applying uncertainty factors or calculation procedures for non-carcinogens or carcinogens, respectively, to obtain exposure limits intended to protect public health. In general toxicity related uncertainties are likely to over estimate impacts.

Chemicals without toxicity data: Chemicals without toxicity data are not assessed or are assessed semi-quantitatively. This may under-estimate risk.

Exposure Assessment Related Uncertainties:

Air Dispersion Modeling: Modeling used to estimate ambient impacts has uncertainties. The uncertainties include the choice of meteorological data, ability to represent complex building and stack arrangements, and assumptions regarding dispersion in the model itself. The overall impact of these uncertainties may result in an over- or under-prediction of air concentrations. Multiple years of meteorological data are used in an attempt to address one of these uncertainties.

Bio-availability: The level of bio-availability of chemicals is uncertain. The use of the default value for lead in the IEUBK analysis may over- or under-estimate risks in this case. The use of 100 percent bio-availability for other chemicals may over-estimate risk.

Chronic (cancer and non-cancer) Exposure Assumptions: The ambient air concentrations used in the chronic analyses are derived from air dispersion modeling. That modeling uses five years of meteorological data. The highest annual average of the five years of data is used. The chronic impacts analyses then assume this concentration during the full exposure period. This is conservative in two ways, first using the maximum of five years of averages and second in assuming continuous exposure to that maximum annual average.

Chronic (cancer) Exposure Assumptions: Cancer inhalation impacts assume continuous exposure for 70 years at a single, outdoor, location.

Exposure analyses: Data used for calculations in the exposure analyses can result in over- or under-estimating risk. These data include such things as inhalation and ingestion rates, deposition rates, soil transport data, plant uptake data, foraging data for animals, etc. If insufficient data is available for a particular COPI (i.e. lack of fate and transport data), those exposures were not assessed. This underestimates risk. Similar uncertainties exist for fish consumption related data.

Pathways not addressed: As outlined in Section 4.7.2.4.2, some pathways were not assessed based on experience from other assessments. The impact of those pathways on this specific analysis is unknown.

Risk Calculations

Additivity: The calculations assume toxic impacts are additive. Additivity for non-carcinogens is likely to be over-protective. Current standard risk assessment practice assumes additivity is not necessarily over-protective for carcinogens.

Synergism: The calculations do not address synergism. This uncertainty potentially yields under-protective results.

4.7.2.4.7 Summary

Results of the quantitative analysis are summarized in Tables 4.7.20 and 4.7.22. Results are summarized below:

MDH Acceptable Incremental Cancer Risk	1 in 100,000
Maximum predicted project impacts – Incremental Cancer Risk	0.8 in 100,000

MPCA/MDH Acceptable Project Hazard Index	1
Maximum predicted project impact Hazard Index (chronic) (subsistence fish consumer)	
- IRAP	0.9*
- IRAP/Minnesota Mercury Method	1**

Maximum predicted project impact Hazard Index (chronic) (recreational fish consumer)
- IRAP– 0.9*
- IRAP/Minnesota Mercury Method 0.9**

*Uses average mercury emission rate of 61 pounds per year and USEPA consumption rates.
**Uses mercury emission rate of 78 pounds per year and MPCA consumption rates).

Maximum predicted project impact Hazard Index (acute) – 0.9

A semi-quantitative analysis was conducted using occupational health data for the remaining pollutants potentially emitted in the largest amounts. Although there is uncertainty regarding the application of occupational health data to use as toxicity data for exposure to the general population, that analysis indicated impacts at or below MDH criteria of an HI of 1.

Project changes that occurred between the May 2006 HHSRA and publication of the Draft EIS will be assessed in an updated HHSRA. Preliminary assessment of the impact of those potential changes shows that they may increase impacts at some locations; however, the overall maximum is not expected to increase significantly.

4.7.2.5 Ecological Risk Assessment

A Screening-Level Ecological Risk Assessment (SLERA) was conducted for the Proposed Project in August 2006. Supplemental Information to the initial analysis was provided in November 2006 based on changes in an updated September 2006 Air Permit application. It should be noted that the SLERA was completed prior to the process water re-use concept (see Section 4.5) was incorporated into the Proposed Project. The SLERA assumed a tailings basin discharge of 1,000 gpm and seepage loss of 230 gpm. These discharges would be eliminated with the 100 percent re-use concept. Therefore, the results described in this section overestimate the Swan Lake impacts due to tailings basin pollutants.

The primary purpose of the SLERA is to provide an understanding of the potential ecological risks related to air emissions and tailing basin discharge and seepage from the Proposed Project. An additional assessment was conducted for Swan Lake to evaluate the potential impact from chemicals emitted to air that deposit onto soil and surface water plus the chemicals in the tailings basin discharge and seepage.

4.7.2.5.1 Overview of Methodology

The ecological risk assessment process is based on two major elements: characterization of potential exposure, and characterization of effects. These two elements provide the focus for conducting the three phases of risk assessment: problem formulation, analysis, and risk characterization.

Chemicals potentially emitted from the Proposed Project may be deposited on soil and surface water, where they may transfer to sediments. Once deposited or discharged, they may come into contact with ecological receptors. The receptors evaluated in the SLERA to assess ecological impacts were the potential exposure to soil, surface water and sediments. A Scope of Work that provided for conducting a phased ecological risk analysis process was used. Step 1 is conducting the SLERA. The results from the SLERA determine the need for Step 2, a more detailed screening-level ecological risk assessment (DESLERA).

The SLERA considered the impacts of emissions and discharges from the Proposed Project on 25 sites/receptors from three exposure pathways. The Chemicals of Interest (COIs) were those whose emissions could be quantitatively estimated, considered persistent or capable of bioaccumulating, and who had ecological benchmarks. The estimates of emissions dispersion, transport, and deposition were done by AERMOD, and the resulting exposure concentrations in the water, sediment, and soil were estimated by a modification of the IRAP. The estimated exposure concentrations for a given COI in a given medium were divided by the most conservative applicable ecological benchmark or toxicity reference value that was available to derive an Ecological Screening Quotient (ESQ). The ESQs for chemicals affecting the same species or having the same toxic effect in a given medium were then summed to give a Hazard Index (HI). Risk was then characterized as being potentially significant (ESQ or HI greater than 1.0; adverse effects may occur) or not significant (ESQ or HI less than 1.0; adverse effects not expected). A final review of the process, inputs and findings of the SLERA and Supplemental Information was performed by Dr. Deborah Swackhammer, Ph.D, at the University of Minnesota.

4.7.2.5.2 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, DRI, steel mill, slag processing). The SLERA identifies chemicals potentially emitted by these processes that could cause adverse ecological effects. This resulted in 113 Chemicals of Potential Interest (COPI) being identified. The list was refined to include only those chemicals that had data with which to estimate their emission rates, and those that had Toxicity Reference Values (TRVs) for the pathways under consideration. This resulted in 50 COI. Thirty-two of those COI were already parameterized in IRAP. The remaining 18 COI and their necessary parameters were entered into the IRAP database. A complete listing of all of the chemicals in the COPI list and COI list is included in the SLERA, dated August 2006 (see Appendix I).

4.7.2.5.3 Exposure Assessment

The SLERA characterized the exposure setting in order to more thoroughly identify the ecological receptors that might be impacted by exposure to emissions from the Proposed Project. This included analyzing the environmental setting and reviewing the ecological classifications and natural resources in that setting, including soils, vegetation, wetlands, wildlife, and state protected species.

The exposure pathway analysis primarily focuses on chemicals potentially emitted to air from the Proposed Project, with subsequent deposition of those chemicals to soil, surface water and sediments. The potential concentrations in soil, surface water, and sediments in the specific locations of interest were estimated based on the procedures of USEPA's HHRAP, which are described in Section 4.7.2.4 – Human Health Risk Assessment, including AERMOD and IRAP.

In summary, the estimated deposition of particulate metals and semi-volatile organic compounds adhered to particles onto surface soil, plants and surface water was used to derive potential environmental concentrations within a 10-km (6.2 mile) radius of the Proposed Project. These estimated environmental concentrations were then compared to benchmark values to provide an estimate of potential ecological impact within this 10-km (6.2 mile) radius of the Proposed Project.

Potential ecological risks were evaluated for 25 specific receptors within IRAP including:

- Waterbody and watershed parameters were determined for three lakes and input to IRAP: Swan Lake, Snowball Lake, and Big Sucker Lake.
- The area surrounding Snowball Lake (terrestrial receptors), and Snowball Lake itself (aquatic receptor), were selected for inclusion in the SLERA based on AERMOD modeling results, predicting maximum deposition to occur in this area.
- Swan Lake was also selected as a receptor to assess the potential additive impact from 1) atmospheric deposition related to the Proposed Project emissions and 2) the chemicals potentially added to the lake via tailings basin discharge (direct discharge and seepage). [Note: Based on revised Proposed Project plans, since the analysis was completed for the SLERA, tailings basin discharge is no longer a factor in the Proposed Project.]

Additional analysis was used to estimate mercury speciation using the MPCA's local mercury model in order to further evaluate the results for potential mercury impacts, which were also analyzed in other modeling for the SLERA.

Bioavailabilty was analyzed in the SLERA. This analysis assumes 100 percent bioavailability of the particulate bound metals, which likely overestimates the actual exposure of the ecological receptors. This is discussed further in the toxicity assessment.

4.7.2.5.4 Toxicity Assessment

The SLERA identified exposure medium (soil, surface water, sediment) specific toxicity benchmarks for each chemical, referred to as Toxicity Reference Values (TRVs). TRVs are media specific, expressed on a concentration basis (i.e. milligrams of chemical per kilogram of soil) and used to screen ecological effects to receptors inhabiting soil, surface water, and sediment. TRVs are used by the USEPA to select chemicals for evaluation in an ecological risk assessment.

The SLERA uses conservative ecological benchmarks that are intended to be applied at the screening stage of the assessment. The ecological benchmarks, referred to as TRVs, are intentionally conservative in order to provide confidence that contaminants that could present an unacceptable risk are not screened out early in the SLERA process. The TRV represents a receptor-class specific estimate of a no-observed adverse effect level (NOAEL) (dose) for the respective contaminant.

In this SLERA, the TRVs were used as the basis for interpreting quantitative exposure estimates for receptors in soil, surface water and sediment. Chemicals for which TRVs were available were included in the quantitative risk characterization.

Bioavailability/bioaccessibility was also evaluated in the SLERA. In risk assessments, exposures are stated in terms of the external dose or intake. Most of the toxicity values used in this SLERA are expressed as intakes, relating to bioavailability and bioaccessibility.

4.7.2.5.5 Risk Characterization

For ecological risk estimation, an Ecological Screening Quotient (ESQ) is calculated. In this calculation, TRVs are set as the denominator for calculating chemical specific ESQs to characterize risk. For this SLERA, the screening level risk evaluation consisted of comparing the maximum concentration of a COI in soil, surface water and/or sediment to the lowest applicable TRV for the specific media.

The ESQ is not a statistical measure of the probability that an adverse effect will occur; it only indicates that the exposure level is below or above the specific chemical toxicity threshold. An ESQ less than 1.0 indicates that the specific chemical is not likely to cause adverse ecological effects. However, an ESQ greater than 1.0 does not necessarily imply unacceptable ecological effects or that adverse impacts are expected.

Surface Water Exposure Pathway

When considering the conservatism in this analysis (e.g., metals emitted in ionic form and in the most toxic valence state, and 100 percent bioavailable), the individual ESQs and the summed HI are well within the acceptable range and no adverse ecological impacts are expected to occur from the chemicals evaluated in this SLERA.

Soil Exposure Pathway

Metals potentially emitted from the Proposed Project are expected to be in the form of compounds and not released as individual ions. Metals, as part of compounds, typically have a low bioavailability. Potential individual metal emissions from the proposed Minnesota Steel facility, having a range of ESQs from less than 0.1 up to 3.7 for iron and a HI of 4.28 based on the conservative assumption of 100 percent bioavailability, are not expected to adversely affect resident biota. When the iron ESQ of 3.7 is excluded from the analysis because the potential incremental iron concentrations are within existing background soil concentrations, a revised HI of 0.58 indicates that adverse ecological impacts are not expected when compared to the guideline threshold of 1.0.

Sediment Exposure Pathway

All chemical specific ESQs were below 1, indicating that adverse ecological impacts from the chemicals evaluated are not expected. To address potential additive effects, the individual ESQs were summed to derive a HI. Assuming additive effects of all chemicals evaluated resulted in a summed risk (HI) of 0.01 indicating that adverse ecological impacts from a combination of the chemicals evaluated are not expected.

Summary of Potential Local Mercury Impacts

A summary of mercury deposition impacts on concentrations in local lake fish was provided in Section 4.7.2.4.

Summary of Potential Sulfur Dioxide and Nitrogen Oxide

The potential sulfur dioxide and nitrogen oxide emissions from the proposed facility are not expected to result in a change in the sulfate and/or nitrate deposition in the lakes within 10 km (6.2 miles) of the proposed facility due to the relatively small contribution of a local emission source to acid deposition at a specific aquatic receptor. In addition, Eilers and Bernert (1997) concluded that Minnesota's water bodies are well protected against acid deposition impacts. Since the wet sulfate deposition standard was set at a level to be protective of the most sensitive lakes, and current wet sulfate deposition is well below the standard in the Grand Rapids/Nashwauk area, potential ecological impacts from sulfate deposition (wet and dry) associated with the Proposed Project's emissions are not expected.

4.7.2.5.6 Uncertainties Analysis

Uncertainty is inherent in the ecological risk assessment process even if the most accurate data with the most sophisticated models are used. The methodology outlined in the SLERA relies on a combination of point values—some conservative and some typical—yielding a point estimate of exposure and risk that falls at an unknown percentile of the full distributions of exposure and risk. For this reason, the degree of conservatism in risk estimates cannot be known; instead, it is known that the values combine many conservative factors and are likely to overstate actual risk.

4.7.2.5.7 Conclusions

Direct discharges of pollutants to land and water will be addressed through several environmental permitting programs (see Chapter 2.0). The MNDNR Permit to Mine regulates waste rock piles and tailings basin construction/operation. The MPCA SDS permitting program would regulate the land application of industrial process water at the tailings basin. The MPCA NPDES permitting program would regulate the NPDES General Construction Storm Water Permit and the NPDES/SDS Industrial Storm Water Permit for discharge of storm water to the Ann and Sullivan natural ore pits. Indirect discharges of pollutants to land and water (i.e., deposition of chemicals emitted to the air) will be addressed by the Part 70 air emission permit.

When considering all substantial potential pathways – soil exposure, surface water exposure, and sediment exposure – for assessing the potential for ecological effects, emission sources from the Proposed Project do not pose a risk to ecological receptors above the USEPA guidelines for screening level risk assessments. The review of the SLERA analysis, conducted by the University of Minnesota, found that the SLERA followed accepted and reasonable methodologies, and that the conclusions drawn in the assessment are supported by the information presented.

4.7.2.6 Mineralogical Data and Studies

A *Review of Fibers Related Data for the West End of the Mesabi Iron Range and the Former Butler Taconite Ore Deposit* (Barr) report, dated July 2006, was examined to verify the presence or absence of amphibole minerals in the ore body to be mined by the Project Proposer. This report discusses the mineralogical features of the Mesabi Iron Range and analyzes ore and tailings samples from the former Butler Taconite facility and Minnesota Steel's bulk ore samples for the presence of fibers.

Mineralogical Data for the Mesabi Range

The Proposed Project is based on mining ore from the Biwabik Iron Formation on the western portion of the Mesabi Iron Range, which extends approximately 120 miles from Birch Lake (just east of Babbitt) in the east to Grand Rapids in the west. The Biwabik Iron Formation extends the complete northeast-southwest length of the Proposed Project area.

The Biwabik Iron Formation is composed of massive, cherty, iron oxide-rich layers intercalated with slaty, iron silicate-rich layers. This formation has a gross mineralogy of quartz, magnetite, hematite, siderite, ankerite, greenalite, stilpnomelane, and minnesotaite. Across the Mesabi Range, the Biwabik Iron Formation varies in thickness from 180 ft. to 800 ft. (Morey, 1972).

On the far east end of the Mesabi Range, the Biwabik Iron Formation has been metamorphosed by intrusions of the Duluth Gabbro Complex (Duluth Complex). These intrusions have resulted in mineralogical changes in the Biwabik Iron Formation, which can be divided into four zones that have characteristic textural and mineralogical features:

- Zone 1 – unaltered taconite,
- Zone 2 – transitional taconite,
- Zone 3 – moderately metamorphosed taconite,
- Zone 4 – highly metamorphosed taconite.

The former Butler Taconite ore body to be mined by the Proposed Project is associated with the west end of Zone 1 as described by French (1968), which has not had contact with the Duluth Complex. The mineralogy of the Biwabik Iron Formation in the project area is described below.

Archean Rocks

The northernmost unit in the project area is the Late Archean Giants Range batholith. This granitic body is primarily medium to coarse-grained, weakly foliated, and composed of hornblende adamellite and monzonite, with some tonalite and diorite (Sims et al., 1970; Green, 1970).

Lower Proterozoic Rocks

Just north of the Proposed Project area, the Archean rocks are intruded by Kabetogama dikes. These are magnetic gabbro to diabase. These granites and mafic dikes also contain inclusions of Archean supracrustal rocks. Three conformable Lower Proterozoic formations, known as the Animikie sequence include *Pokegama Quartzite* (an orthoquartzite of limited natural exposure), *Biwabik Iron Formation* (the uppermost bedrock unit at the mine site which becomes progressively deeper to the south-southeast), and *Virginia Formation* (the uppermost bedrock unit south of the mine site, almost no natural exposure).

Potential for Generation of Asbestiform Fibers

Fibers-related data are available from several sources for taconite mining operations on the west end of the Mesabi Iron Range. Mineralogical and specialized microscopic analyses conducted by Zanko et al (2003) and the MDH (Ring 1981) show that coarse taconite tailings sample composites from five western Mesabi Range taconite mines did not indicate the presence of the six regulated asbestos minerals, nor did they contain amphibole minerals.

The potential for the generation of asbestiform fibers, along with potential concerns for associated health risks depends on the mineral composition of the ore body. The first observation of grunerite and other amphibole minerals in the Biwabik Iron Formation occurs approximately 3 miles east of Biwabik, which is approximately 60 miles east of the ore deposit proposed to be mined by Minnesota Steel. The presence of the amphibole minerals near Biwabik is associated with the intrusion of the Duluth Complex into the Biwabik Iron Formation. In comparison, there have been no similar intrusions of the Biwabik Iron Formation by the Duluth Complex in the western part of the Mesabi Iron Range. The mineralogy of the Biwabik Iron Formation indicates that it is unlikely that amphibole or asbestiform fibers will be found in the western portion of the Mesabi Iron Range.

The identity of the minerals from tailings samples from the western part of the Mesabi Iron Range is different from the minerals from tailings from taconite operations on the east end of the Iron Range near Babbitt. The tailings samples from the west part of the Iron Range are composed mostly of magnetite or hematite, stilpnomelane, minnesotaite, and greenalite. Of these minerals, stilpnomelane can appear fibrous; however, its folia are inelastic and brittle and therefore are not, by definition, asbestiform.
Minnesotaite occurs in the ore body planned to be mined by Minnesota Steel and is a sheet silicate similar to talc; however, fibers that have been observed in tailings samples from the western part of the Iron Range are non-amphibole and have had low aspect ratios (close to 3:1) and did not appear likely to break into long thin fibers (Zanko et al. 2003). In comparison, asbestiform fibers typically have aspect ratios of 20:1 or greater.

Figure 4.7.4 identifies the boundary from which MNDOT will not accept tailings for use in transportation projects. Tailings from the Mesabi Iron Range that are produced east of Range 15W are not accepted due to the potential for the presence of amphibole and asbestiform fibers.

Evaluation of Minnesota Steel Samples for the Presence of Mineral Fibers

The July 2006 Fibers Report included analysis of samples taken from Minnesota Steel's bulk ore sample. Other data used was from a 1980-1981 study in which samples of taconite tailings were collected from operating taconite companies on the west end of the Mesabi Iron Range (including the Butler Taconite facility). The samples were examined for mineral fibers. Neither the ore nor the tailings samples showed evidence of asbestos minerals, and no amphibole minerals were found in the various samples.

The July 2006 Fibers Report indicates that based on the geology and mineralogical composition of the ore deposit (French 1968) and available fibers related analytical results (Ring 1981; Zanko et al. 2003), that it is unlikely that amphibole minerals are present in the former Butler Taconite ore deposit which is proposed to be mined by Minnesota Steel. Asbestos minerals, amphibole minerals, and asbestiform fibers have not been detected in the former Butler Taconite ore deposit. Based on the available data, release of amphibole minerals in an asbestiform habit to air or water is not expected to occur from, or be associated with, the Proposed Project.

4.7.3 Mitigation Opportunities for Air Emissions

The Proposed Project would be required to install BACT and/or MACT levels of control. 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

The MPCA and USEPA would include control equipment requirements and BACT limits in the final air emissions permit that would be equal to or greater than the controls described in this EIS. If the proposed $LoTO_x$™, control for NOx , system is inadequate or determined to be infeasible, another BACT analysis would be completed and a control system would be selected and installed. Therefore, emissions levels may decrease as part of the final air emissions permit, but would not increase from those assessed in this EIS.

In addition to the BACT requirements, the Proposed Project is incorporating several items that assist in mitigating air quality impacts including:

- The integrated steel production process reduces energy usage by 30 percent – reduced energy usage contributes to lower air emissions.
- Natural gas has been selected as a fuel source to reduce emissions of particulates, sulfur dioxide, and mercury, compared to coal or fuel oil.
- The DRI process that was selected reduces NO_x emissions. By primarily using the DRI (instead of scrap iron) as feedstock for the EAFs, emissions of mercury and other air toxics should be reduced.

The air quality permit would also require mitigation of visibility impacts. Mitigation measures that have been identified for visibility impacts include an evaluation of $LoTO_x$™ 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 Emission Trading Boards (i.e., Acid Rain Credits),
- Offsets associated with the use of green energy.

As proposed by Minnesota Steel in their air permit application and as required in the final air emissions permit, operating, monitoring, testing, record keeping, and reporting would be required to ensure ongoing compliance with emission limits and operating limits. The air quality permit would contain conditions to ensure emission rates are at or below those used in the risk assessments. The MPCA and USEPA would enforce the permit requirements to ensure protection of human health and the environment.

4.8 FISHERIES AND AQUATIC RESOURCES

The impact area for the Proposed Project has the potential to affect several lakes and streams. The Final SDD indicated that the EIS would include a qualitative description of fisheries resources and angling activity in the former Butler tailings basin (Big and Little O’Brien Lakes), Swan Lake, Snowball Lake, Oxhide Lake, Little Sucker Lake, Big Sucker Lake, Snowball Lake, O’Brien Creek, Sucker Brook, and Pickerel Creek. This section investigates the potential biological impacts to those lakes and streams within or in the vicinity of the Project Area including impacts to existing fish and invertebrate populations and their habitat as well as potential changes to angling activity. Although Hay Creek was included in a biological monitoring study, as committed to in the Final SDD, no assessment of impacts to Hay Creek was performed since it would not be impacted by the Proposed Project.

The Final SDD also indicated that the EIS would evaluate the feasibility of restoring the O'Brien Creek watershed as a potential benefit to fisheries resources, since the proposed tailings basin was anticipated to affect the O'Brien Creek watershed. However, the extent of impacts to the O'Brien watershed decreased as the tailings basin design was refined. As discussed in Sections 4.3.2 and 4.8.2, the Proposed Action would not result in substantial impacts to the O'Brien Creek watershed or fish populations in the creek. Therefore, the EIS does not include evaluation of restoring the watershed.

4.8.1 Affected Environment

Lakes

There are six lakes listed in the Final SDD as having the potential to be impacted by the Proposed Action including Oxhide Lake, Snowball Lake, Swan Lake, Big Sucker Lake, Little Sucker Lake and O'Brien Reservoir (also known as O'Brien Lake or Blue Lake). The locations of these lakes in relation to the Proposed Project Impact Areas are presented in Figure 4.8.1. The main source of information describing the existing condition of these lakes was the MNDNR Lake Management Plan for each lake. Each lake management plan provides a summary of the fish population assessments conducted on the lake, fisheries management information such as stocking reports, historical background, and future management plans.

Oxhide Lake

Oxhide Lake is a small deep lake, which is 121 acres in size and has a maximum depth of 40 feet. There are two inlet sources to Oxhide Lake; one which originates from groundwater and the other from an old mine stilling basin. The outlet to Oxhide Lake is Oxhide Creek, which flows to the south into Swan Lake. There is one MNDNR-owned public access on the lake off of TH 169. Angling activity was estimated at 10.2 hours per acre during the summer of 2001. Winter activity was estimated at 8.4 hours per acre during the following winter. This level of angling effort was the highest among lakes in Ecological Lake Class 28 in the Grand Rapids Area.

The MNDNR lake management plan indicates that northern pike is the primary management species in Oxhide Lake with black crappie, bluegill and largemouth bass as secondary species. MNDNR population surveys revealed that northern pike and bluegills are abundant in the lake but small individuals dominate the populations. Black crappie abundance is below average for this lake type. Supplemental electrofishing for largemouth bass revealed that they are quite abundant in Oxhide Lake. The prey base in Oxhide Lake is tulibee and white suckers. Tulibee are an important species in a lake and generally indicate very good water quality. Both northern pike and walleye have been stocked historically by the MNDNR but the stockings have not improved the northern pike population or established a walleye population in the lake.

Snowball Lake

Snowball Lake is a relatively small, deep lake 146 acres in size. The littoral area is 43.2 acres, which accounts for 30 percent of the basin, and the maximum depth is 38 feet. There is one intermittent inflow source to Snowball Lake in the form of a channel that flows from Draper Annex. Water quality measurements taken during the MNDNR 1989 fish survey for Snowball Lake revealed the lake has moderately hard, clear and fertile water with sulfate concentrations higher than other area lakes. There is one concrete public boat access owned by the township and also a carry-in access point near the MNDOT rest area along TH 169. Regional angler usage of Snowball Lake has not been estimated.

The primary management species for Snowball Lake are walleye and black crappie while bluegill and northern pike are secondary management species. MNDNR lake surveys indicate that walleyes are not abundant in Snowball Lake but average individuals are large. Black crappie and bluegill abundance is average for this type of lake, but small individuals dominate both populations. Northern pike abundance in Snowball Lake has been increasing based on MNDNR surveys, but small individuals dominate the population. The current management plan for Snowball Lake includes stocking walleyes every other year. The stocked walleyes have experienced above average growth rates, but the lack of suitable gravel spawning habitat has limited the walleye natural reproduction and the population appears dependent on stocking.

Swan Lake

Swan Lake is the largest recreational resource in proximity to the Proposed Project. The 2,472-acre basin has an average depth of 40 feet, a maximum depth of 65 feet and a littoral area of 507 acres or 20 percent of the basin. Swan Lake receives inflow from the following six sources: Oxhide Creek, Pickerel Creek, O'Brien Creek, Hay Creek, Hart Creek and Lebron Creek. The lake outlet is located in the southeast corner of the lake, where it drains into the Swan River. Swan Lake has hard, clear water and is classified as mesotrophic. Based on angler usage estimates from MNDNR survey efforts, Swan Lake is an important regional fishery resource. Swan Lake receives a high amount of angling activity during both the open water and ice fishing seasons. In 2001 angling activity was estimated at 12.4 hours per acre in the summer and 3.9 hours per acre in the winter, among the highest of Ecological Lake Class 22 lakes in the area. Currently, recreational users can access Swan Lake by means of three public boat accesses, one maintained by the MNDNR and the other two maintained by the township.

The primary management species for the lake are walleye and northern pike, with black crappie as the secondary species. Northern pike have exhibited above average growth rates in Swan Lake while walleye and black crappie have exhibited average growth. The Swan Lake fishery has been managed through habitat protection, regulations and stocking. Recently, a 17 to 26 inch protected slot limit for walleyes was implemented on Swan Lake with the goal of increasing spawner abundance and enhancing natural reproduction. Walleye have been stocked at varying intensities since the 1940s. Since 2000, the stocking plan has been to stock fry two consecutive years followed by two years of no stocking. Fish population assessments conducted on Swan Lake has indicated that natural reproduction of walleyes is occurring within the lake as evidenced by non-stocked year classes present. However, the stocked fry are not marked, so it has not been possible to determine their contribution in relation to naturally produced fry. Historical information for Swan Lake indicates that walleye spawning runs used to occur in O'Brien and Hay Creeks. These two watersheds have been altered by mining activities in the area including the creation of the O'Brien Reservoir and the O'Brien Diversion. The alteration of flows within Hay and O'Brien Creeks has likely affected the spawning success of walleyes in Swan Lake, but it is not known to what extent. In 1999 a spawning assessment was completed on these streams and documented walleye natural reproduction continues to occur. The MNDNR lake management plan indicates that recent stocking efforts have not always led to strong walleye year classes and that environmental and fish population factors are likely more important. Tulibee are also present in Swan Lake and may serve as an indicator of water quality.

Big Sucker Lake

Big Sucker Lake is 230 acres in size, has a littoral area of 138 acres (60 percent of the basin) and a maximum depth of 36 feet. Water clarity in Big Sucker Lake has declined during recent MNDNR assessments from 7.0 feet in 1972 to 5.0 feet in 2003. There is one MNDNR public access located on the southwest end of Big Sucker Lake. Based on an aerial creel survey conducted by the MNDNR during the 2001/2002 fishing season, Big Sucker Lake receives a moderate amount of regional fishing pressure that peaks during the ice fishing season with high amounts of angler activity (10.7 hours per acre in summer, 18.8 hours per acre in winter).

The primary management species for Big Sucker Lake are black crappie and northern pike, while largemouth bass is a secondary management species. The northern pike fishery of Big Sucker Lake contains quality size fish, but the overall abundance of northern pike is moderate. Due to the low numbers of large northern pike and the intense amount of winter angling pressure, the MNDNR estimates that Big Sucker Lake has the potential for over harvest. Converse to the northern pike populations, the black crappie population is quite abundant but the average size fish is small. Based on angler reports Big Sucker Lake is thought to have a quality largemouth bass fishery in terms of numbers and size, even though largemouth bass are not collected frequently in MNDNR surveys. Walleyes are thought to be native to Big Sucker Lake but their current population is low, likely due to the lack of suitable habitat.

Little Sucker Lake

Little Sucker Lake is a small, shallow 61-acre basin with a maximum depth of 13 feet. Due to the shallowness of the lake, it appears to winterkill frequently. Based on the small size of the lake and lack of public access, the lake has a low priority for management and surveys, and as a result, little is known about the lake's fish community. One historical report indicates that the lake contains northern pike, perch, suckers, and bullheads. Little Sucker Lake likely provides shallow spawning habitat for the northern pike population of Big Sucker Lake that access the basin by swimming upstream through an unnamed creek that connects the two lakes. The amount of angler use for Little Sucker Lake was estimated at 3.2 hours per acre in the summer, and 8.7 hours per acre in the winter.

O'Brien Reservoir

Also known as Blue Lake, the existing 900-acre O'Brien Reservoir encompasses the natural O'Brien Lake and Little O'Brien Lake basins. The Reservoir was created when Butler Taconite converted O'Brien Lake into the Stage II Tailings Basin. An earthen dam was created on O'Brien Creek at the outlet of Little O'Brien Lake that caused water levels to rise approximately 30 feet. The lake contains hard, clear water with a maximum depth of 63 feet. Due to the rise in water levels, large stands of timber that were adjacent to the original lake basins have become inundated, making access and navigation difficult. There is a gravel, user-developed, boat access on the west side of the basin. Estimates of angler usage have not been made for O'Brien Reservoir, but MNDNR reports from local fisherman indicate regional fishing pressure is moderate including an annual tournament for largemouth bass.

The primary management species for O'Brien Reservoir are black crappie and northern pike with bluegill and largemouth bass listed as secondary management species. Due to the large stands of flooded timber and areas of inaccessible shoreline, it is difficult to accurately survey the fish populations of O'Brien Reservoir. Based on MNDNR lake survey results, bluegill and black crappie are abundant in O'Brien Reservoir but small individuals dominate the populations. Northern pike abundance is average in O'Brien Reservoir but the individuals are above average in size. Largemouth bass have not been collected in large numbers in O'Brien Reservoir, but angler reports indicate that a quality largemouth bass fishery is present in the lake. There are no reports of past stocking events in O'Brien Reservoir.

Streams

There are five streams listed in the Final SDD as potentially being impacted by the Proposed Project: Pickerel Creek, Oxhide Creek, Snowball Creek, O'Brien Creek and Sucker Brook. The locations of these streams in relation to the Proposed Project Impact Areas are presented in Figure 4.8.1. The main source of information describing the existing ecological community of each stream was an invertebrate monitoring study conducted in the fall of 2005 (see listing in Appendix I). The only stream in the impact area with fish community data available is Pickerel Creek. The fish community data for Pickerel Creek was gathered from the MNDNR stream management plan. Potential impacts to the streams would be based on changes to the existing conditions described below.

Oxhide Creek

Oxhide Creek begins at a stilling basin south of Pit 5 and flows south approximately 700 feet until it enters Oxhide Lake. The creek then exits the lake at the southwest corner of the basin and continues southeast for an additional 7,000 feet where it discharges into Swan Lake. The channel of Oxhide Creek is slightly entrenched. The substrates vary from sand embedded cobble in the upper reaches to mostly sand in the lower reaches. The riparian zone along Oxhide Creek consists of a mix of forested areas in the upper reaches to grasses or wetland vegetation further down stream. The channel of Oxhide Creek is moderately sinuous. The mean annual average flow of Oxhide Creek at the point it enters Swan Lake is 8.4 cubic feet per second (cfs). Water quality samples collected in 2005 in Oxhide Creek revealed that the waters are moderately fertile, cool, and well oxygenated.

The results from the October 2005 invertebrate community sampling of Oxhide Creek revealed that there were 40 total taxa present (Table 4.8.1). Caddisflies (Family Tricoptera) were the most abundant group of invertebrates, accounting for 47 percent of the total sample. One commonly used metric in assessing stream health is the amount of Ephemeroptera (mayflies), Pliecoptera (stoneflies) and Tricoptera (caddisflies) or EPT Taxa present. These organisms are generally sensitive to pollution or habitat alteration and are generally less abundant in altered or impacted systems. Oxhide Creek had 12 EPT taxa present in the sample, which accounted for 57 percent of the total individuals. Another measure that is used to examine the health of stream invertebrate community is the 'tolerance scale.' The tolerance scale rates each species or taxon from one (highly intolerant) to ten (highly tolerant) depending on its individual tolerance to disturbance or pollution (adopted from Hilsenhoff 1987). For an individual taxon to be included in the 'intolerant' metric it must receive a score of less than three on the tolerance scale and for an individual taxon to be included in the 'very tolerant' metric, it must receive a score greater than seven (Genet and Chirhart 2004; Hilsenhoff 1987). In Oxhide Creek there were zero intolerant taxa and seven very tolerant taxa collected during the fall of 2005 (Table 4.8.1). The individuals from the very tolerant taxa accounted for 14 percent of the total individuals collected. Oxhide Creek has experienced impacts due to past mining activities, however for some metrics the macroinvertebrate community of Oxhide Creek compares favorably to similar regional streams. Oxhide Creek has a similar amount of EPT taxa and very tolerant taxa (Tables 4.8.1) but has less total taxa and intolerant taxa compared to similar regional riffle-run streams with watersheds less than 10 square miles. Oxhide Creek also has almost double the percentage of very tolerant individuals compared to similar regional streams (Table 4.8.1).

There is no fish community data available for Oxhide Creek. There is no angling data available for the creek, but due to the relatively small stream channel it is unlikely that a fishery of interest to local anglers exists in Oxhide Creek.

Pickerel Creek

Pickerel Creek begins at TH 169 and flows south for one and a half miles until it outflows into Swan Lake. Pickerel Creek is a groundwater fed system. The stream channel can be characterized as high gradient with sand substrate. The riparian zone is heavily forested with alder trees and brush that creates a canopy over the channel. The measured stream flows from 2005 average 2.5 cfs (*Surface Water Quality Monitoring for Pits, Lakes, and Streams within and Downstream of the Minnesota Steel Industries Project Area,* January 2006 [see listing in Appendix I]). Pickerel Creek contains cool, well-oxygenated waters that are moderately fertile for this type of cold-water stream.

The fall 2005 invertebrate sampling for Pickerel Creek collected 25 total taxa, which was the lowest number of total observed taxa from the six stream sites sampled in 2005 (Table 4.8.1). Pickerel Creek also had the lowest number of total observed individuals of the six sites. Caddisflies were the most abundant group of organisms collected, accounting for 56 percent of the total sample. There were seven EPT taxa collected that accounted for 67 percent of the total sample. Additionally, one intolerant and four very tolerant taxa were collected. Individuals from the very tolerant taxa comprised 11 percent of the total sample. Compared to similar regional streams the existing macroinvertebrate community of Pickerel Creek is in a less healthy state. Pickerel Creek has approximately half of the total taxa and EPT taxa compared to similar regional riffle-run streams with watersheds less than 10 square miles (Table 4.8.1). Pickerel Creek also has a larger percentage of very tolerant individuals compared to similar regional streams.

Pickerel Creek is the only designated Minnesota Trout Stream located in the vicinity of the Proposed Project Boundary and the target management fish species is brook trout. Brook trout are currently stocked every other year by the MNDNR, but population surveys also indicate that low amounts of brook trout natural reproduction is occurring. The MNDNR has not conducted a survey of angling activity along Pickerel Creek. Based on the stream management plan angler access is good in the lower and upper reaches of the creek but the middle reach access is limited due to private land ownership. Angler activity and success are likely highest in the upper reach due to the higher brook trout densities in this reach.

Snowball Creek

Snowball Creek begins at the southeast corner of Snowball Lake and flows south for approximately 17,500 feet until it outflows into the Swan River. The Snowball Creek channel is narrow, typically one meter or less in width. The riparian vegetation consists of alder trees and brush, which creates a canopy over the channel in the upper reaches and grasses and wetland vegetation in the lower reaches. The Snowball Creek watershed is 4,044 acres in size. The creek has an existing base flow of 1 cfs, an average annual flow of 2.9 cfs and the sediments are sand mixed with reddish clay. The waters of Snowball Creek are clear, moderately oxygenated, relatively cool and moderately fertile.

The results from the October 2005 invertebrate community sampling of Snowball Creek revealed that there were 30 total taxa present. Of the six stream sites sampled in October 2005, Snowball Creek had the largest number of total individuals (Table 4.8.1). The most abundant group of organisms in Snowball Creek was Dipterans (true flies) accounting for approximately 68 percent of the total individuals in the sample. There were 9 EPT taxa present, which accounted for 10 percent of the individuals in the sample. Two intolerant taxa and four very tolerant taxa were present in the sample. Individuals from the very tolerant taxa accounted for 5 percent of the total individuals in the sample. The existing macroinvertebrate community of Snowball Creek compares favorably to similar regional glide-pool streams with watershed areas less than 10 square miles, in terms of EPT taxa, very tolerant taxa and percent of very tolerant individuals but there are less total taxa present overall (Table 4.8.1).

There is no fish community data or angling data available for Snowball Creek. Due to the narrow, shallow nature of the creek channel and the low average flows it is unlikely that Snowball Creek supports a substantial game fish population or receives substantial angling activity. The lower reaches of Snowball Creek provide important spawning habitat for northern pike, largemouth bass and panfish from Swan Lake.

TABLE 4.8.1 INVERTEBRATE METRICS FOR SIX STREAMS SAMPLED IN OCTOBER 2005

Stream Metric	Project Area Stream Data						Regional Stream Data[7]		
	Oxhide Creek RR[1]	**Pickerel Creek RR**[1]	**Snowball Creek GP**[2]	**O'Brien Creek GP**[2]	**Sucker Brook GP**[2]	**Hay Creek GP**[2]	**Riffle/Run < 10 mi**[2] **(–5 Streams)**	**Glide/Pool < 10 mi**[2] **(4 Streams)**	**Glide/Pool > 20 mi**[2] **(4 Streams)**
Watershed Area	0.8 mi^2	2.6 mi^2	3.2 mi^2	1 mi^2	27 mi^2	26 mi^2	Avg: 7.4 mi^2	Avg: 5.5 mi^2	Avg: 28.4 mi^2
Intolerant Taxa [3]	0	1	2	2	1	4	5	3	5
Other Taxa[4]	33	20	24	33	28	34	39	25	28
Very Tolerant Taxa [5]	7	4	4	7	11	7	8	12	9
Total Taxa	40	25	30	42	40	45	52	40	42
EPT Taxa [6]	12	7	8	11	13	13	12	6	11
Total Individuals	1,221	319	2,684	1,696	1,214	1,652	N/A[8]	N/A[8]	N/A[8]
Percent Very Tolerant Individuals	13.7 %	10.7%	5.2 %	10.3 %	34.0 %	38.2%	7.9 %	20.1 %	18.9 %

(1) RR = Riffle/Run streams; classified as high gradient
(2) GP = Glide/Pool streams; classified as low gradient
(3) Intolerant taxa are those with a rating of less than 3 on the invertebrate tolerance scale that ranges from 1 to 10 (adopted from Hilsenhoff, 1987).
(4) Other taxa are those with a rating from 3 to 7 on the invertebrate tolerance scale that ranges from 1 to 10 (adopted from Hilsenhoff, 1987).
(5) Very tolerant taxa are those with a rating greater than 7 on the invertebrate tolerance scale that ranges from 1 to 10 (adopted from Hilsenhoff, 1987).
(6) EPT taxa is the cumulative number of taxa from the Ephemeroptera, Tricoptera, and Pliecoptera families found at each site regardless of the invertebrate tolerance score for that taxa.
(7) Regional Stream Data – Average data obtained from PCA regional sampling of similar stream types.
(8) The total individual's metric was not provided in the data set received from the MPCA.

O'Brien Creek

The watershed of O'Brien Creek has been highly altered through past mining activities and the creation of both the O'Brien Reservoir dam and the O'Brien Diversion canal. Currently, O'Brien Creek begins at the O'Brien Reservoir dam and flows southwest for approximately 7,700 feet where it flows into Swan Lake. Immediately below the O'Brien Reservoir dam, the channel of O'Brien Creek has been engineered and is relatively straight with a high gradient and boulders present. Downstream of this constructed reach, the channel of O'Brien Creek is fairly wide and shallow, with sand being the dominant substrate. The stream channel is low gradient and with base flow of 2.3 cfs and an average annual flows of 6.3 cfs. The riparian vegetation mainly consists of grasses along much of the channel. The waters of O'Brien Creek are clear, moderately oxygenated and moderately fertile but are also relatively warm.

The invertebrate sampling station on O'Brien Creek was located downstream of the O'Brien Reservoir Dam, near Town Hall Road. This section of the stream channel has been influenced by the construction of the dam. Due to the presence of boulders as habitat along with the relatively high gradient of the channel, the invertebrate community of this reach may not be representative of the overall community in O'Brien Creek. The October 2005 invertebrate sampling in O'Brien Creek found 42 total taxa present

(Table 4.8.1). Caddis flies were the most abundant group of organisms, which accounted for 44 percent of the individuals collected. There were 11 EPT taxa collected, with EPT individuals comprising 55 percent of the total individuals in the sample. Two intolerant taxa and six very tolerant taxa were collected, with individuals from the very tolerant taxa accounting for approximately 10 percent of the total individuals in the sample. Comparison of the existing macroinvertebrate metrics for O'Brien Creek (Table 4.8.1) to similar regional riffle-run streams with watershed areas less than 10 square miles reveals that the macroinvertebrate community of O'Brien Creek is less diverse than similar streams in the region. O'Brien Creek has less EPT taxa and intolerant taxa and has a larger percentage of very tolerant individuals compared to similar regional streams which indicates a decline in the health of the invertebrate community of the creek.

The O'Brien Creek channel was monitored for walleye spawning activity in May 1999. There is a short reach near the lake that still supports a walleye spawning migration and some spawning activity takes place. There is no other fish community data available for O'Brien Creek. Estimates of angling efforts are also not available. Due to the narrow, shallow nature of the creek channel and the low average flows it is unlikely that O'Brien Creek supports a significant game fish population or receives a significant amount of regional angling activity.

Sucker Brook

The main stem of Sucker Brook originates from a wetland as a first order stream approximately two miles north of the city of Calumet and flows west for approximately 9.7 miles to where it enters the Prairie River. Three tributaries enter Sucker Brook from the north and two more enter from the south. Sucker Brook is a low gradient, meandering stream with sand and clay being the prevalent substrates. Riparian vegetation mainly consists of grasses and wetland vegetation, with very little forest cover. The watershed of Sucker Brook is 19,702 acres and the brook has a base flow of 7.4 cfs and an average annual flow of 18.6 cfs. The waters of Sucker Brook are clear, moderately warm and fertile, with moderate dissolved oxygen concentrations.

During the October 2005 invertebrate sampling, a total of 40 taxa were collected in Sucker Brook. The most abundant group of individuals in the sample was Mayflies, which accounted for 37 percent of the total individuals collected. There were 13 EPT taxa collected, with EPT individuals comprising 45 percent of the total individuals in the sample. One intolerant taxon and 11 very tolerant taxa were collected in Sucker Brook, with very tolerant individuals accounting for 34 percent of the total individuals in the sample (Table 4.8.1). Compared to similar regional glide-pool streams with watershed areas greater than 20 square miles, Sucker Brook has more very tolerant taxa and a higher percentage of very tolerant individuals (Table 4.8.1). Sucker Brook also has similar number of total taxa and EPT taxa compared to similar regional streams.

There is no fish community data available for Sucker Brook. Further, estimates of angling efforts are also not available. Due to the shallow nature of the creek channel and the variable, sometimes intermittent flows it is unlikely that Sucker Brook supports a significant game fish population. With the likely lack of a game fish in Sucker Brook and its close proximity to important regional fisheries including Sucker and Swan Lakes, it is also reasonable to conclude that there is little or no angling activity on Sucker Brook.

Summary

The key habitat requirements and existing conditions for the primary management fish species in each water body managed for fisheries, described above, are summarized in Table 4.8.2.

4.8.2 Environmental Consequences

Physical changes to the watersheds, lake levels and stream flows of the water resources located in the vicinity of Proposed Project are described in Section 4.3. The physical impacts to these water bodies were used to determine the potential for impacts to the fisheries resource of each water body. The key habitat requirements for the primary management fish species in each water body managed for fisheries are presented in Table 4.8.2. As discussed in Section 4.5, no wastewater or storm water discharges from the Proposed Project are proposed. Therefore, no project related contaminants would be discharged to area water bodies. Water quality impacts, if any, would only be related to changes in surface water flows (see Section 4.5).

Lakes

The Minnesota Department of Natural Resources target management species for each fisheries resource are provided along with their required critical habitat elements. A description of existing and future conditions, along with suggested mitigation options are also provided (see Table 4.8.2).

Changes to water levels, water flows or water quality of a water body that would cause the loss of a critical habitat element or a significant change in a required water quality parameter were considered to be an impact to the fisheries resources of that water body. Potential impacts to fisheries resources for each water body are described below.

Oxhide Lake

The Oxhide Lake watershed would decrease in size, causing the flows to Oxhide Lake to decrease by approximately 87 percent as a result of project activities without augmentation. The decrease in watershed size and lake inflows is projected to result in an estimated decrease in lake levels of 2.3 inches without augmentation. During dewatering of Pits 1, 2 and 5, Oxhide Lake would receive dewatering flows for the years of 2007 through 2011. Oxhide Lake would thereafter receive augmentation flows to offset the loss of the upper watershed due to project activities. The augmentation sources for Oxhide Lake are assumed to be are Pits 1 & 2 and the Hill Annex pit. The water quality of Pits 1 & 2 and the Hill Annex pit is similar to the water quality of Oxhide Lake.

The target management fish species of Oxhide Lake are northern pike, black crappie, bluegill and largemouth bass. The required critical habitat elements for each for the target management fish species of Oxhide Lake are listed in Table 4.8.2. The decreases in the watershed size and lake levels of Oxhide Lake should not result in a significant loss of critical habitat elements required by the target management fish species. Any small project related changes or impacts to available habitat of Oxhide Lake are expected to be offset by the inclusion of augmentation flows. The flows provided during the dewatering of the Pits 1 & 2 and 5, as well as the augmentation flows, should not result in changes of water quality parameters outside the optimal ranges required by the target management fish species. As a result, no population level impacts to the target management fish species of Oxhide Lake due to project activities are anticipated. The small changes in lake water levels are not expected to impact angler access or angler success on Oxhide Lake. However, some of the project mining activities would take place in close proximity to Oxhide Lake and these mining activities could create conditions (such as increased noise levels) that could decrease angler usage satisfaction of Oxhide Lake.

Snowball Lake

The Snowball Lake watershed would be decreased by approximately 51 percent of the existing 1,693-acre watershed, as a result of project activities. This decrease in watershed size would result in a decrease in lake levels of approximately 1.2 inches if stream augmentation were not provided.

During dewatering of the Draper Annex pit, Snowball Lake would receive dewatering flows from 2008 through 2012. After dewatering of the Draper Annex is complete Snowball Lake would receive augmentation flows to offset the loss of the upper watershed due to project activities. The Snowball Augmentation Plan (see Section 4.3.2.3) flow rates would vary month to month and also vary between wet years (20 percent of the time), normal years (60 percent of the time) and dry years (20 percent of the time) (See Section 4.3 for augmentation rates). 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. The flows provided under all years would provide similar flows to the existing variable conditions. The assumed source of the augmentation water is the Hill Annex mine pit, which has similar water quality to Snowball Lake.

The target management fish species of Snowball Lake are walleye, black crappie, bluegill and northern pike. The required critical habitat elements for each for the target management fish species of Snowball Lake are listed in Table 4.8.2. The decreases in the watershed size and lake levels of Snowball Lake without augmentation should not result in a significant loss of critical habitat elements required by the target management fish species. Any small project related changes or impacts to the available habitat of Snowball Lake are expected to be offset by the inclusion of augmentation flows. The flows provided during the dewatering of the Draper Annex pit as well as the augmentation flows should not result in changes of water quality parameters outside the optimal ranges required by the target management fish species. As a result, no population level impacts to the target management fish species of Snowball Lake are anticipated as a result of the project. The small changes in lake water levels are not expected to impact angler access or angler success on Snowball Lake. However, some of the project mining activities would take place in close proximity to Snowball Lake and these mining activities could create conditions (such as increased noise levels) that could decrease angler usage satisfaction of Snowball Lake.

Swan Lake

The Swan Lake watershed would decrease due to the creation of the Tailings Basin, as well as decreases in the contributing watersheds of Snowball Creek, Oxhide Creek and O'Brien Creek. The decreases in watershed size would result in a loss of inflow to Swan Lake, with the majority of that loss coming from the elimination of Pit 5 overflows into Oxhide Lake. The loss of inflows into Swan Lake would result in a small annual average decrease in lake levels of less than 2 inches. As a result of augmentation flows that would to be provided to Oxhide Creek, Swan Lake would receive some augmentation flows. These augmentation flows would less any small project related losses of Swan Lake inflows.

TABLE 4.8.2 KEY HABITAT REQUIREMENTS FOR PRIMARY MANAGEMENT OF FISH SPECIES IN EACH WATER BODY

Waterbody	Fish Species	MNDNR Management Status	Key Habitat Elements [a]	Existing Waterbody Conditions
Swan Lake	Walleye	Primary	Feed on small forage fish, invertebrates, crustaceans and leeches. The optimal temperatures are from 20-24C and optimal DO from 3-5 mg/L. The key habitat feature is well oxygenated shallow gravel substrates near current or wave action for spawning.	Walleyes are stocked by MNDNR annually but some natural reproduction of walleyes occurs. Past alteration of Hay Creek and O'Brien Creek flows have affected walleye spawning success. Northern Pike were stocked historically but current population is based on natural reproduction. Black crappie have not been managed through stocking. Swan Lake receives high amounts of regional angling activity during both open water and ice fishing seasons. Some increases in nutrient loads have occurred that have contributed to increases in aquatic vegetation growth.
	Northern Pike	Primary	Ambush predator that feeds primarily on fish. The optimal temperatures are from 10-24C; optimal DO from 3-7 mg/L. The key habitat factor is access to shallow spawning habitat with submerged vegetation.	
	Black Crappie	Secondary	Feed on small forage fish. The key population limiting factor is the availability of forage fish. Intolerant of high turbidity. The optimal temperatures from 23-32C and optimal DO above 5.0 mg/L. Spawning habitat is shallow areas with submerged vegetation.	
Oxhide Lake	Northern Pike	Primary	Ambush predator that feeds primarily on fish. The optimal temperatures are from 10-24C; optimal DO from 3-7 mg/L. The key habitat factor is access to shallow spawning habitat with submerged vegetation.	Northern Pike have been stocked historically but current population is based on natural reproduction. Bluegill, black crappie and largemouth bass populations are naturally occurring. Oxhide Lake receives moderate regional angling activity through out the year but usage can be high at times during the ice fishing season, especially in the lower basin. Lower basin of Oxhide Lake provides shallow vegetated spawning areas for target management species. Current watershed is smaller than historic due to past mining activities. Oxhide Lake currently receives 7.2 cfs of inputs as a result of overflow from existing Pits 1 & 2.
	Black Crappie	Secondary	Feed on small forage fish. The key population limiting factor is the availability of forage fish. Intolerant of high turbidity. The optimal temperatures from 23-32C and optimal DO above 5.0 mg/L. Spawning habitat is shallow areas with submerged vegetation.	
	Bluegill	Secondary	Feed on a variety of zooplankton and aquatic invertebrates. The optimal temperatures from 10-30C and optimal DO above 5 mg/L. Moderately intolerant of turbidity. They require adequate submergent vegetative for feeding, spawning and escaping predation.	
	Largemouth Bass	Secondary	Feed primarily on fish but also crustaceans and invertebrates. The optimal temperature from 24-30C and optimal DO above 8.0 mg/L. They are intolerant of high turbidity. They create spawning beds in aquatic vegetation over gravel or sand.	
Snowball Lake	Walleye	Primary	Feed on small forage fish, invertebrates, crustaceans and leeches. The optimal temperatures are from 20-24C and optimal DO from 3-5 mg/L. The key habitat feature is well oxygenated shallow gravel substrates near current or wave action for spawning.	Walleyes are stocked every other year by the MNDNR. Little natural reproduction of walleye occurs due to the lack of suitable spawning habitat. Stocked walleyes have exhibited above average growth. Black crappie and bluegill abundance is average for this type of lake but individuals are small. Northern pike abundance is above average but population is dominated by small individuals. Snowball Lake has hard, clear infertile water but elevated sulfate levels are the result of past mining impacts. Surveys of regional angling activity have not been conducted for Snowball Lake.
	Black Crappie	Primary	Feed on small forage fish. The key population limiting factor is the availability of forage fish. Intolerant of high turbidity. The optimal temperatures from 23-32C and optimal DO above 5.0 mg/L. Spawning habitat is shallow areas with submerged vegetation.	
	Bluegill	Secondary	Feed on a variety of zooplankton and aquatic invertebrates. The optimal temperatures from 10-30C and optimal DO above 5 mg/L. Moderately intolerant of turbidity. They require adequate submergent vegetative for feeding, spawning and escaping predation.	
	Northern Pike	Secondary	Ambush predator that feeds primarily on fish; temperatures from 0-24C; optimal DO from 3-7 mg/L; key limiting factor is access to shallow spawning habitat with submerged vegetation;	

TABLE 4.8.2 KEY HABITAT REQUIREMENTS FOR PRIMARY MANAGEMENT OF FISH SPECIES IN EACH WATER BODY

Waterbody	Fish Species	MNDNR Management Status	Key Habitat Elements[a]	Existing Waterbody Conditions
Big Sucker Lake	Black Crappie	Primary	Feed on small forage fish. The key population limiting factor is the availability of forage fish. Intolerant of high turbidity. The optimal temperatures from 23-32C and optimal DO above 5.0 mg/L. Spawning habitat is shallow areas with submerged vegetation.	Fish are not currently being stocked into Sucker Lake. Black Crappie are abundant but not very large. Conversely northern pike are of a quality size but not abundant. Sucker Lake also supports a quality largemouth bass population. The relatively small size of lake makes it susceptible to over harvest from anglers. Big Sucker Lake receives moderate annual angler usage but angler usage can be quite high during the ice fishing season.
	Northern Pike	Primary	Ambush predator that feeds primarily on fish. The optimal temperatures are from 10-24C; optimal DO from 3-7 mg/L. The key habitat factor is access to shallow spawning habitat with submerged vegetation.	
	Largemouth Bass	Secondary	Feed primarily on fish but also crustaceans and invertebrates. The optimal temperature from 24-30C and optimal DO above 8.0 mg/L. They are intolerant of high turbidity. They create spawning beds in aquatic vegetation over gravel or sand.	
O'Brien Reservoir	Black Crappie	Primary	Feed on small forage fish. The key population limiting factor is the availability of forage fish. Intolerant of high turbidity. The optimal temperatures from 23-32C and optimal DO above 5.0 mg/L. Spawning habitat is shallow areas with submerged vegetation.	Creation of dam caused water levels to rise 30 feet to their current level. The reservoir now encompasses the O'Brien and Little O'Brien Lake Basins. The southern half of the basin has thick stands of flooded timber which make angler access and navigation difficult but provide habitat for management species such as largemouth bass and black crappie. The reservoir currently receives some runoff from wetlands located to the west where the stage 1 tailings basin will be located. O'Brien reservoir does not currently receive supplemental fish stockings. There has not been a survey to estimate angler usage but anecdotal reports from local anglers indicate usage is moderate and that fishing tournaments for largemouth bass are held annually.
	Northern Pike	Primary	Ambush predator that feeds primarily on fish. The optimal temperatures are from 10-24C; optimal DO from 3-7 mg/L. The key habitat factor is access to shallow spawning habitat with submerged vegetation.	
	Bluegill	Secondary	Feed on a variety of zooplankton and aquatic invertebrates. The optimal temperatures from 10-30C and optimal DO above 5 mg/L. Moderately intolerant of turbidity. They require adequate submergent vegetative for feeding, spawning and escaping predation.	
	Largemouth Bass	Secondary	Feed primarily on fish but also crustaceans and invertebrates. The optimal temperature from 24-30C and optimal DO above 8.0 mg/L. They are intolerant of high turbidity. They create spawning beds in aquatic vegetation over gravel or sand.	
Pickerel Creek	Brook Trout	Primary	Feed on bottom dwelling and drifting aquatic and terrestrial invertebrates. Prefer streams with ground water inputs. Require water temperatures below 24C, optimally from 11 to 16C. Require DO above 5 mg/L optimally above 7 mg/L and base flows 55% of average daily flow. Prefer gravel substrates with in-stream cover to avoid predation and over-hanging vegetation to provide shading and allochthonous inputs.	Riparian zone is forested providing shade over the channel. Waters are relatively fertile for a cold water stream. Brook trout are stocked every other year by MNDNR. Some natural reproduction of brook trout is also occurring. Angler usage is low to moderate in lower reach in the Town of Pengilly. Angle usage is higher in upper reach were fish populations are greater.

a: Key habitat elements for each species were taken from the Habitat Suitability Index Reports published by the USFWS. The individual reports are listed in the references in Chapter 10.0.

The target management fish species of Swan Lake are walleye, northern pike and black crappie. The required critical habitat elements for each for the target management fish species of Swan Lake are listed in Table 4.8.2. The decreases in the watershed size of Swan Lake and resulting small changes in lake levels are not anticipated to result in a substantial loss of critical habitat elements required by the target management fish species. The source water for the augmentation flows provided to Oxhide Creek that would enter Swan Lake are assumed to be from two sources, existing Pits 1 & 2 and the Hill Annex pit. The water quality of both of these augmentation sources are similar to that of Swan Lake, and as a result the use of these augmentation sources should not cause a significant change in the water quality of Swan Lake. Due to the overall small potential project impacts on Swan Lake water quality (see Section 4.5) it is unlikely that water quality parameters would change outside of the optimal ranges required by the target management fish species of Swan Lake. The small decreases in water levels should not impact angler access to Swan Lake. Overall, the project impacts on Swan Lake due to the changes in lake water levels, available habitat and water quality are expected to be relatively minor and should not negatively affect angler success.

Big Sucker Lake

The Big Sucker Lake watershed would decrease in size due to the small decrease in the Little Sucker Lake watershed as a result of the Proposed Project. This small change in the upper watershed of Big Sucker Lake should not have a measurable impact on lake water levels or water quality. There would not be direct water withdrawals from the basin as a result of the Proposed Project. As a result, project activities are not expected to cause population level impacts to the target management fish populations of Big Sucker Lake. Changes in angler access to the lake or angler success resulting from project activities are not expected.

Little Sucker Lake

The Little Sucker Lake watershed would experience a small decrease in size as a result of the Proposed Project. This should result in a very small decrease (less than one inch) in the water levels of Little Sucker Lake. These small changes to Little Sucker Lake are unlikely to result in significant changes to the aquatic habitat or water quality of the lake. As a result, community or population level impacts to the fish community of Little Sucker Lake are not anticipated.

O'Brien Reservoir

As described in Section 4.3.2, the O'Brien Lake watershed would decrease in size 18 percent of the existing watershed. Lake level changes as a result of project activities were not estimated for O'Brien Reservoir, but the decrease in watershed area is not expected to result in a substantial change in the water levels of O'Brien Reservoir. The target management species for O'Brien Reservoir are black crappie, northern pike, bluegill and largemouth bass. The critical habitat requirements for each management species are listed in Table 4.8.2. The possible changes in O'Brien Reservoir water levels are expected to be minimal and should not result in the loss of critical spawning or cover habitat required by the target management fish species. Additionally, the Proposed Project should not cause changes in the water quality parameters outside of the optimal ranges required by the target management fish species. No population level impacts to the target management fish species are expected. Additionally, no changes in angler access to or angler success on O'Brien Reservoir are expected as a result of the Proposed Project.

Streams

Physical changes to the watersheds, lake levels and stream flows of the water bodies located in the vicinity of the Proposed Project are described in Section 4.3. The physical impacts to these water bodies were used to determine the potential for impacts to the biotic communities of each stream. Changes to water flows that would cause a loss in the availability, diversity, or quality of in-stream habitat were considered to be a potential impact on the biotic community of the stream. Potential impacts to the biotic communities for each stream in the vicinity of the Proposed Project are described below.

Oxhide Creek

Oxhide Creek would be cut off from the majority of its up watershed due to Proposed Project mining activities and the overflow from Pit 5 would stop. The loss of Pit 5 overflow would result in a decrease of the existing stream flow by approximately 80 percent without augmentation. During dewatering of Pits 1 & 2, Oxhide Creek would receive dewatering flows for the years of 2007 through 2011, depending on climate conditions. Thereafter, Oxhide Creek would receive augmentation flows to offset the loss of overflow from Pit 5 due to project activities. Under the Alternative Augmentation Plan, Oxhide Creek would receive flows that vary month to month and also vary between wet years (20 percent of the time), normal years (60 percent of the time) and dry years (20 percent of the time). The water sources for the Oxhide Creek augmentation plan are assumed to be Pits 1 & 2 and the Hill Annex pit. The water quality of Pits 1 & 2 and the Hill Annex pit is similar to the water quality of Oxhide Creek and should not cause significant changes in water quality parameters of Oxhide Creek.

Streams exhibit natural variability in terms of channel flow, shape and habitat and the biotic communities are adapted to this variation. Intra-annual variation in hydrological conditions is essential to successful life-cycle completion for many aquatic organisms and this variation often plays a major role in the population dynamics of these species through influences on reproductive success, natural disturbance and biotic competition (Poff and Ward 1989). The Alternative Augmentation Plan attempts to incorporate much of the existing flow variability of Oxhide Creek by including normal, wet, and dry monthly and yearly flows. Additionally, the augmentation plan includes flows representative of bankfull discharge two out of every three years. Bankfull flows are the channel forming flows that scour and shape the stream channel, dictating the types and amounts of in-stream habitat available to biota. For example, pool habitat, which is particularly critical for stream fishes, is formed by scouring processes during bankfull flow (Schlosser 1990; Keller 1977).

The Alternative Augmentation Plan (as described in Section 4.3.2.1) is based on the flow that would have existed in the historic channel, prior to mine pit overflow into Oxhide Creek. This augmentation flow would be less than the existing Oxhide Creek flows. The proposed augmentation flow would result in a loss of approximately 10 to 20 percent of the existing wetted perimeter of Oxhide Creek, based on cross sectional analysis provided in the *Combined Application for Water Appropriations Permits and Work in Public Waters Permits* (December 2006). This reduction in wetted perimeter would reduce the available in-stream habitat and could have an impact on the macroinvertebrate community of Oxhide Creek. It is not know if the Proposed Project would lead to substantial impacts to the existing macroinvertebrate community of Oxhide Creek but potential impacts could include a shift in community structure, loss of community diversity or decrease in total macroinvertebrate abundance (biomass).

Pickerel Creek

The Pickerel Creek watershed would experience a slight decrease (1 percent) in size as a result of the Proposed Project. As a result the Proposed Action is not expected to impact the flows, water quality or water levels within Pickerel Creek.

The primary management species for Pickerel Creek is brook trout. The critical habitat and water quality factors required by brook trout (listed in Table 4.8.2) should not be changed outside of the optimal ranges and are therefore unlikely to result in population level impacts to the stocked or naturally reproducing brook trout. Minimal changes in the Pickerel Creek watershed area may occur but these changes are not expected to affect stream flows in such a manner that would impact brook trout populations, limit angler access to the creek or affect angler success. The minor changes in water flows and the lack of changes to channel size and water quality caused by Proposed Project activities are unlikely to cause a shift in the abundance or diversity invertebrate community of Pickerel Creek.

Snowball Creek

The Snowball Creek watershed would experience a moderate decrease of 811 acres, which is 20 percent of the existing 4044-acre watershed, as a result of the Proposed Project. This decrease in watershed size would lead to a moderate decrease in base flow (11.2 percent) and in average annual flow (6.3 percent). Snowball Creek would receive dewatering flows when the Draper Annex pit is dewatered to allow for the expansion of Pit 6. After the dewatering of the Draper Annex pit is completed Snowball Creek would receive augmentation flows to offset the loss of flows caused by the decrease in watershed size. The Snowball Augmentation Plan flow rates would vary month to month and also vary between wet years (20 percent of the time), normal years (60 percent of the time) and dry years (20 percent of the time). 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. The flows provided under all years would provide similar flows to the existing variable conditions. The proposal includes providing bankfull flows for three days, two out of every three years.

The Snowball Augmentation Plan would mimic some of the existing flow variation in Snowball Creek in terms of normal, wet and dry monthly and yearly flows. Intra-annual variation in hydrological conditions is essential to successful life-cycle completion for many aquatic organisms and this variation often plays a major role in the population dynamics of these species through influences on reproductive success, natural disturbance and biotic competition (Poff and Ward 1989). The proposed plan provides a simulation of the existing conditions in Snowball Creek by providing a large percentage of the existing flow, provides variability in the monthly flows and includes wet year, normal and dry year augmentation rates. Additionally, the inclusion of flows representative of bankfull discharge in the Snowball Augmentation Plan is a key component in maintaining the integrity of the biotic community of Snowball Creek. Bankfull flows are the channel forming flows that scour and shape the stream channel, dictating the types and amounts of in-stream habitat available to biota. For example, pool habitat, which is particularly critical for stream fishes, is formed by scouring processes during bankfull flow (Schlosser 1990; Keller 1977). Through the implementation of the Snowball Augmentation Plan, impacts to the ecological community of Snowball Creek are not anticipated.

O'Brien Creek

The watershed of O'Brien Creek would experience an approximate 18 percent decrease of the existing 7,395-acre watershed, as a result of the Proposed Project. This decrease in watershed size would lead to a moderate decrease in base flow (22 percent) and in average annual flow (20 percent). The decrease in base and average annual flow are not expected to lead to substantial decreases in stream wetted perimeter or available in-stream habitat. The resulting small changes in base and annual average stream flows are unlikely to result in substantial changes in the channel size, water quality or available in-stream habitat of O'Brien Creek. As a result, significant shifts in the abundance or diversity of the macroinvertebrate community of O'Brien Creek as a result of the Proposed Project are unlikely.

O'Brien Creek currently provides some suitable spawning habitat for Swan Lake walleyes, as shown by a survey for walleyes eggs conducted in O'Brien Creek by the MNDNR in April 1999. However, while the survey did collect a small number of walleye eggs in O'Brien Creek, it also revealed that Hay Creek is likely a more important habitat element for spawning walleyes from Swan Lake, based on the larger number of walleye eggs present. The small reductions in flows from O'Brien Creek into Swan Lake due to Proposed Action are not expected to significantly impact the naturally reproducing walleyes of Swan Lake.

Sucker Brook

The Sucker Brook watershed would decrease by approximately 1.4 percent of the existing 19,702-acre watershed as a result of the Proposed Project. This decrease in watershed size would lead to a small decrease in both base flow (1.3 percent) and average annual flow (1.6 percent). As a result the Proposed Action is not expected to substantially impact the flows or water levels within Sucker Brook. The resulting small changes in base and annual average stream flows are unlikely to result in substantial changes in the channel size, water quality or available in-stream habitat of Sucker Brook. As a result, significant shifts in the abundance or diversity of the macroinvertebrate community of Sucker Brook as a result of the Proposed Project are unlikely.

4.8.3 Mitigation Opportunities

Stream Invertebrate Monitoring

There is a limited amount of available information on the existing biological communities of the streams in the project area. Minnesota Steel conducted invertebrate monitoring in the fall of 2005 (see the monitoring report [dated 2006] listed in Appendix I) in five streams within the Proposed Project Boundary [community metrics from this sampling in Table 4.8.1]. This single sampling event represents the only biotic community information available for each of the streams for use in the EIS analyses, with the exception of Pickerel Creek. Thus, it provides a limited indication of the existing health of the biotic communities in these streams.

Three of the streams within the project area (Snowball, Oxhide, and O'Brien Creeks) would lose a portion of their watershed and stream flows as a result of project activities. Investigations of the relationship between flow regimes and macroinvertebrate communities have indicated that certain factors, such as species richness, community assemblage and life history, are closely related to flow regimes (Robinson and Marshall, 1998). When flow regimes are altered, changes in biotic community assemblage or species richness are possible. Of the three systems that would experience watershed changes, two are not anticipated to be impacted significantly as a result of the Proposed Project due to the providing of sufficient augmentation flows (Snowball Creek) or the relatively minor changes in watershed area and average flow (O'Brien Creek).

Project-related impacts to Oxhide Creek would be reduced by providing augmentation flows. A study of the effects of compensation flows revealed that constant compensation flow in excess of existing conditions resulted in enhanced biomass of the invertebrate community studied (Gustard et al., 1987). However, the study also revealed that compensation flows below existing low flows could result in reductions in wetted area and, ultimately, overall productivity. The proposed augmentation flow for Oxhide Creek is based on the flow of the historic channel, which is less than the existing flow. While substantial changes to the macroinvertebrate community are not anticipated under the proposed Oxhide Creek augmentation plan, it is possible that some changes in community structure or health could occur.

Therefore, it is recommended that the biological health of Oxhide Creek be monitored during project operations, to attempt to determine if the proposed augmentation plan is protecting the health and structure of the existing biological community. One potential tool that could be used to determine the changes in the health of the macroinvertebrate community of Oxhide Creek is the 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). Conducting an IBI on Oxhide Creek prior to project start-up should give a better indication of current stream health. The MPCA has developed a macroinvertebrate-based IBI for streams in the Upper Mississippi River Basin that could be used to assess a baseline of the current health Oxhide Creek (Genet and Chirhart 2004). After the baseline sampling was conducted, future IBI samplings could be conducted on Oxhide Creek to determine if biotic community health is being influenced by project activities. A possible stream IBI monitoring program for Oxhide Creek could include the following sampling schedule:

- Prior to project start-up
- During pit dewatering
- Following completion of pit dewatering
- Subsequently at five year intervals during normal operations

Conversion of Mine Pits to Public Fishing Resources after Project Completion

One possible mitigation measure for the Minnesota Steel project would be to convert the mine pits to public fishing resources after the mining is completed. In the past, the MNDNR has stocked mine pit lakes with species such as rainbow trout, brook trout or lake trout. A study was conducted by the MNDNR to explore the water quality, macroinvertebrates and zooplankton communities of reclaimed mine pits in northeast Minnesota in an attempt to determine the suitability for growth and survival of stocked trout in these waters (Pierce and Tomcko, 1989). The study found that the majority of mine pit lakes had suitable water quality characteristics to support trout for parameters such as dissolved oxygen; temperature; pH; conductivity; nitrogen; nickel; chromium; and boron. However, heavy metal concentrations (copper, iron, manganese and zinc) were high enough in some lakes to suggest that the concentrations should be investigated when undertaking a stocking program in a mine pit lake. The study also revealed that both benthic invertebrate and zooplankton densities were low in mine pit lakes compared to oligotrophic natural lakes. A main concern in undertaking a mine pit reclamation project through the stocking of trout species is the lack of available forage food to sustain adequate growth and survival of stocked trout.

Water quality in existing Pits 1 & 2 and 5 was monitored in the spring of 2005. The observed values for temperature, dissolved oxygen, conductivity, pH, total phosphorus, total Kjeldahl nitrogen, and hardness were within the rage of values observed by the MNDNR in northeast Minnesota mine pit lakes for each parameter (Pierce and Tomcko, 1989). Macroinvertebrate and zooplankton community data is not currently available for existing Mine Pits 1 & 2,and 5. However, due to their similarities in water quality and physical characteristics (i.e., steep slide slopes, hard substrates, small littoral areas) as compared to the mine pit lakes in the MNDNR study, the invertebrate and zooplankton communities are likely similar.

Overall productivity (total phosphorus) is currently low in existing Pits 1 & 2 and 5, but based on the MNDNR examination of other mine pit lakes, it is possible that productivity may increase with age (Pierce and Tomcko, 1989). An increase in overall fertility and productivity of the mine pits as they age could lead to an increase in zooplankton and macro invertebrates which would provide forage for stocked trout.

The implementation of in-pit stockpiling could help to improve the productivity of mine pit lakes by creating shallow areas near the shores. These shallow areas could provide a simulated littoral habitat in the deep mine pits. These littoral areas could provide a starting place for primary production (i.e., plant and algal growth) that would add to the productivity of the mine pits. Based on the existing information available for Mine Pits 1 & 2 and 5 and the findings of the MNDNR study in 1989, it is recommended that stocking programs for Minnesota Steel mine pit lakes include monitoring of water quality, lake productivity, and trout growth/survival.

4.9 WILDLIFE RESOURCES

The wildlife resources impact assessment for the Proposed Project was based upon known habitat alliances between wildlife species and plant community types. These associations were estimated using MNDNR Gap Analysis Program (GAP) analysis correlating wildlife species occurrence to Ecological Classification System (ECS) types of the Nashwauk Uplands ecological subsection and comparing those habitat types to the general habitats identified in the project area. This habitat-based approach to wildlife impact assessment is described in greater detail below. (Note: threatened and endangered wildlife species are discussed in Section 6.4.)

4.9.1 Affected Environment

The MNDNR and the U.S. Forest Service (USFS) developed the ECS as a hierarchical system to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The Minnesota Steel project area lies within the Nashwauk Uplands ECS subsection of the Northern Superior Uplands Section of the Laurentian Mixed Forest Province (MNDNR, 2003). This subsection and the Northern Superior Uplands Section coincide with the Canadian Shield in Minnesota and are characterized by partially exposed Precambrian bedrock, intermittent lakes, and significant topographic relief (MNDNR, 2003). Community types that occur within the Nashwauk Uplands sub-section may include: upland mixed forest, upland conifers, lowland conifers, lowland hardwoods, woodland, brushland, grasslands, emergent wetlands, bogs, rivers, open water habitats, temporary openings, open ground, and various human habitations or development.

The following information sources were used to compile, screen, and assess habitats and associated wildlife species likely to occur in the project area:

1. Geographic Information Systems (GIS) mapping for the Nashwauk Uplands ecological subsection
2. MNDNR-GAP analysis of animal species within the Nashwauk Uplands ECS subsection
3. MNDNR list of Species of Greatest Conservation Need (SGCN) associated with the Nashwauk Uplands
4. 2005 Botanical Survey: Minnesota Steel Industries (report prepared by Barr Engineering, see Appendix I listing)

The MNDNR – GAP land cover classification system maps existing natural vegetation to the level of dominant or co-dominant plant species and overlays the predicted distribution of native vertebrate species using GIS. A panel of experts involved in the GAP analysis for the Nashwauk Uplands ECS subsection identified a total of 203 amphibian, bird, mammal or reptile species that could occur in the native plant communities or habitats common to the Nashwauk Uplands subsection. However, only a fraction of these species is likely to actually exist within the Proposed Project Impact Area due to the relatively small footprint of the Proposed Project when compared to the entire Nashwauk Uplands area. Also, the GAP analysis list of 203 species does not distinguish between species that are in danger of significant population declines (i.e., SGCN) and those species that are not in danger.

For the EIS analysis, the assessment was limited to those Nashwauk Uplands species identified by MNDNR as SGCN (i.e., animal species whose populations are rare, declining, or vulnerable in Minnesota or species whose Minnesota populations are stable, but are declining in a substantial part of their range outside of Minnesota) such as common loon or black tern. Table 4.9.1 lists the SGCN species extracted from the 203 species identified in the GAP analysis, grouped by critical habitat type. All other species listed in the GAP analysis for the Nashwauk Uplands are not identified as SGCN, that is, they appear to have large stable populations, have increasing populations, are habitat generalists, are not subject to over-exploitation, can persist in fragmented habitat, have small home ranges, have high dispersal rates or high reproductive capacity, and/or are broadly disseminated throughout the breeding and migration seasons so that the species would not be subject to a catastrophic loss to its population if its habitat within the project area were impacted by the Proposed Project. Therefore, non-SGCN species were excluded from this wildlife impact assessment.

As noted previously, not all habitats/species within the Nashwauk Upland are likely to be present in the Minnesota Steel project area. Therefore, the list of species in Table 4.9.1 was sorted by critical habitat association. Plant community mapping compiled during scoping and during the 2005 *Botanical Survey* conducted at the proposed Alternative Tailings Basin site were used as the basis for estimating which of the six critical habitat groups may occur in the project area.

The SGCN species were grouped into six categories based on MNDNR GAP analysis critical habitat association similarities. With the exception of a native plant community evaluation performed at the Alternative Tailings Basin area as part of the 2005 *Botanical Survey*, the only available data on habitat within the project area were general land cover categories from the MNDNR GAP analyses landcover dataset and a general plant communities map produced during scoping (Scoping EAW Figure 9-2, see Appendix B). The GAP landcover categories are very broad. They include: deep water, wetlands, forest, brushland/grassland, mineland, and developed land. These general categories are not sufficiently detailed to accurately identify landcover sub-types that would correspond to specific SGCN critical habitat categories. Therefore, the plant communities mapping compiled for scoping was used as an additional reference to identify more specific habitat types within the project area. Table 4.9.2 shows the resulting assumed landcover categories interpreted as corresponding to each of the six SGCN critical habitat categories within the Minnesota Steel project area. The SGCN corresponding to the estimated six critical habitats interpreted as potentially occurring within the project area are shaded in Table 4.9.1. As noted previously, only a fraction of these species is likely to actually exist in the Proposed Project Impact Area, due to the relatively small footprint of the Proposed Project.

TABLE 4.9.1 SPECIES OF GREATEST CONSERVATION NEED WITHIN THE NASHWAUK UPLANDS SUBSECTION(1)

Taxa	Scientific Name	Common Name	Critical Habitat Association
Mammal	*Canis Lupus*(2)	Gray Wolf	Multiple Habitat Associations
Mammal	*Lynx canadensis*(2)	Canada Lynx	Multiple Habitat Associations for Travel (Upland Conifer, Lowland Conifer/Shrubland)
Bird	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	Group 1. and Group 4. Northern Hardwood, Quaking Aspen, Cut-over Forests, Upland Shrub Thicket
Bird	*Catharus fuscescens*	Veery	Group 1. Mature Upland or Unbroken Forest – Northern Hardwoods, Upland Conifer, Cut-over Forest
Bird	*Caprimulgus vociferus*	Whip-poor-will	Group 1. Mature Upland or Unbroken Forest – Northern Hardwoods, Upland Conifer, Cut-over Forest
Bird	*Contopus virens*	Eastern Wood-pewee	Group 1. Mature Upland or Unbroken Forest – Northern Hardwoods, Upland Conifer, Cut-over Forest
Bird	*Sphyrapicus varius*	Yellow-bellied Sapsucker	Group 1. Mature Upland or Unbroken Forest – Northern Hardwood, Upland Conifer, Conifer Swamp, Second Growth Quaking Aspen, Cut-over Forests
Bird	*Seiurus aurocapillus*	Ovenbird	Group 1. Mature Upland or Unbroken Forest – Northern Hardwoods, Upland Conifer , Cut-over Forest
Bird	*Wilsonia canadensis*	Canada Warbler	Group 1. Mature Upland or Unbroken Forest – Upland Conifer, Conifer Swamp, Conifer/Hardwood Swamp, Wet Alder Thicket, Second Growth Quaking Aspen, Upland Shrub Thicket, Cut-over Forests
Bird	*Accipiter gentilis*	Northern Goshawk	Group 1. Mature , Upland or Unbroken Forest – Northern Hardwood, Upland Conifer, Conifer Swamp, Conifer/Hardwood Swamp, Quaking Aspen, Cut-over Forests
Bird	*Dendroica tigrina*	Cape May Warbler	Group 1. Mature Upland or Unbroken Forest – Lowland Conifer, Conifer Uplands
Bird	*Falcipennis canadensis*	Spruce Grouse	Group 1. Mature Upland or Unbroken Forest – Lowland Conifer, Conifer Uplands
Bird	*Contopus cooperi*	Olive-sided Flycatcher	Group 1. Mature , Upland or Unbroken Forest – Northern Hardwood, Upland Conifer, Conifer Swamp, Conifer/Hardwood Swamp

Taxa	Scientific Name	Common Name	Critical Habitat Association
Bird	*Troglodytes troglodytes*	Winter Wren	Group 1. Mature Upland or Unbroken Forest – Northern Hardwood, Upland Conifer, Conifer Swamp, Conifer/Hardwood Swamp
Bird	*Poecile hudsonica*	Boreal Chickadee	Group 1. Mature Upland or Unbroken Forest – Upland Conifer, Conifer Swamp, Conifer/Hardwood Swamp
Bird	*Hylocichla mustelina*	Wood Thrush	Group 1. Mature Upland or Unbroken Forest – Northern Hardwoods, Cut-over Forest
Bird	*Picoides arcticus*	Black-backed Woodpecker	Group 1. Mature Upland or Unbroken Forest – Northern Hardwood, Upland Conifer, Conifer Swamp, Conifer/Hardwood Swamp, Cut-over Forests
Bird	*Haliaeetus leucocephalus*[(2)]	Bald Eagle	Group 1. Upland Forest/Conifer Forest/Lakes– (Mature)
Butterfly	*Oeneis macounii*	Macoun's Arctic	Group 1. and Group 4. Upland Conifer, Northern Hardwood, Cut-over Forests
Bird	*Empidonax minimus*	Least Flycatcher	Group 1. and Group 4. Upland Conifer, Lowland Conifer, Northern Hardwood, Conifer/Hardwood Swamp, Quaking Aspen, Cut-over Forests, Upland Shrub Thicket
Bird	*Oporornis agilis*	Connecticut Warbler	Group 1. and Group 4. Upland Conifer, Lowland Conifer, Northern Hardwood, Conifer/Hardwood Swamp, Quaking Aspen, Cut-over Forests, Upland Shrub Thicket
Bird	*Pluvialis dominica*	American Golden-plover	Group 2. Mud Flats
Bird	*Limnodromus griseus*	Short-billed Dowitcher	Group 2. Mud Flats
Bird	*Calidris alpine*	Dunlin	Group 2. Mud Flats
Bird	*Calidris pusilla*	Semipalmated Sandpiper	Group 2. Mud Flats
Bird	*Tringa melanoleuca*	Greater Yellowlegs	Group 2. Mud Flats
Bird	*Tryngites subruficollis*	Buff-breasted Sandpiper	Group 2. Mud Flats
Butterfly	*Pyrgus centaureae freija*	Grizzled Skipper	Group 3. and Group 4. Grassland
Butterfly	*Lycaeides idas nabokovi*	Nabokov's Blue	Group 3 and Group 6. Wetland and Lowland Forest Species – Conifer Swamp, Lichen Heaths, Open Ground/Bogs w/Dwarf Billberry
Bird	*Falco peregrinus*	Peregrine Falcon	Cliff/Talus Slopes
Mammal	*Taxidea taxus*	American Badger	Group 4. Grassland
Bird	*Dolichonyx oryzivorus*	Bobolink	Group 4. Grassland

Taxa	Scientific Name	Common Name	Critical Habitat Association
Bird	*Sturnella magna*	Eastern Meadowlark	Group 4. Grassland
Mammal	*Spermophilus franklinii*	Franklin's Ground Squirrel	Group 4. Brushland/Upland Forest/Conifer Forest – Mixed Communities, Alder Thicket, Upland Shrub Thicket, Cut-over Forest, Grasslands
Bird	*Toxostoma rufum*	Brown Thrasher	Group 4. Brushland – Upland Scrub, Cut-over Forests
Bird	*Zonotrichia albicollis*	White-throated Sparrow	Group 4. Brushland/Upland Forest/Conifer Forest – Mixed Communities, Alder Thicket, Upland Shrub Thicket, Cut-over Forest
Bird	*Tympanuchus phasianellus*	Sharp-tailed Grouse	Group 4. Brushland/Wetland – Second Growth Quaking Aspen, Upland Shrub Thicket, Cut-over Forests
Bird	*Vermivora chrysoptera*	Golden-winged Warbler	Group 4. Brushland - Second Growth Quaking Aspen, Alder Thicket, Upland Shrub Thicket, Cut-over Forests
Bird	*Empidonax minimus*	Least Flycatcher	Group 4 and Group 1. Brushland/Upland Forest - Second Growth Quaking Aspen, Upland Shrub Thicket, Cut-over Forests
Bird	*Scolopax minor*	American Woodcock	Group 4. Upland Forest/ Brushland/ Shrub Wetland - Second Growth Quaking Aspen, Upland Shrub Thicket, Cut-over Forests, Mixed Communities
Bird	*Circus cyaneus*	Northern Harrier	Group 4. Brush/Grassland & Wetland and Lowland Forest – Sedge/Wet Meadow
Bird	*Cistothorus platensis*	Sedge Wren	Group 4. Brush/Grassland & Wetland and Lowland Forest – Sedge/Wet Meadow
Bird	*Ammodramus leconteii*	LeConte's Sparrow	Group 4. Brush/Grassland & Wetland and Lowland Forest – Sedge/Wet Meadow
Bird	*Chodeiles minor*	Common Nighthawk	Group 4. Brush/Open ground – Second Growth Quaking Aspen, Scrub Forest, Upland Shrub Thicket, Cut-over Forests, Open Ground
Bird	*Cocccyzus erythropthalmus*	Black-billed Cuckoo	Group 4. Northern Hardwood, Quaking Aspen, Cut-over Forests, Upland Shrub Thicket, Alder Thicket

Taxa	Scientific Name	Common Name	Critical Habitat Association
Bird	*Melanerpes erythrocephalus*	Red-headed Woodpecker	Group 4. Northern Hardwood, Quaking Aspen, Cut-over Forests , Upland Shrub Thicket, Northern Hardwoods
Butterfly	*Phyciodes batesii*	Tawny Crescent	Group 4. Grassland
Bird	*Gavia immer*	Common Loon	Group 5. Open Water Species – Ponds/Lakes
Bird	*Podiceps grisegena*	Red-necked Grebe	Group 5. Open Water Species – Ponds/Lakes
Reptile	*Chelydra serpentina*	Common Snapping Turtle	Group 5. Open Water Species – Ponds/Lakes, Wetlands, Cattail/Reed Marshes
Bird	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	Group 5. Open Water Species – Ponds/Lakes, Riverine Banks/Lakshore Banks
Bird	*Anas rubripes*	Black Duck	Group 6. Wetlands – Ponds/Lakes, Cattail /Reed Marshes
Bird	*Botaurus lentiginosus*	American Bittern	Group 6. Wetlands – Ponds/Lakes, Cattail /Reed Marshes
Bird	*Melospiza georgiana*	Swamp Sparrow	Group 6. Wetlands – Ponds/Lakes, Cattail /Reed Marshes
Amphibian	*Plethodon cinereus*	Eastern Red-backed Salamander	Group 6. Wetland and Lowland Forest Species – Conifer Swamp, Conifer/Hardwood Swamp
Butterfly	*Epidemia epixanthe michiganensis*	Bog Copper	Group 6. Wetland and Lowland Forest Species – Bogs
Butterfly	*Erebia disa mancinus*	Disa Alpine	Group 6. Wetland and Lowland Forest Species – Conifer Swamp, Bogs

(1) Shaded rows identify species that may occur within the habitat groups identified as potentially occurring within Minnesota Steel project area, based primarily on landcover mapping from Figure 9-12 in the Scoping EAW (see Appendix B).

(2)Potential impacts to bald eagle, gray wolf and Canada lynx are assessed in Section 6.4 of this EIS.

TABLE 4.9.2 LANDCOVER TYPES WITHIN THE PROPOSED ACTION PLAN AREAS

Critical Habitat Designation	Corresponding Landcover Categories*	Extent/Location in Minnesota Steel Project Impact Area
Group 1 – Mature, Upland or Unbroken Forest Inhabitants	Forest of Various categories (e.g., Northern Hardwoods, Conifer Swamp, Upland Conifer, Conifer/ Hardwood Swamp)	Most forest areas within the project area are second growth. Group 1 (mature) forests make up less than 5 percent of the Proposed Action area – primarily located on approximately 100 acres in the Plant Site Impact Area. Fragmented Group 1 forests make up approximately one-quarter (approximately 300 acres) of the Alternative Tailing Basin area.
Group 2 – Mud Flat Inhabitants	Wetlands - shallow	Group 2 species are not likely within the project area.
Group 3 – Species Inhabiting Open Ground and Bare Soils	Mineland, Lichen Heaths, Grasslands	Isolated locations of exposed soils in disturbed areas that have not re-vegetated. Group 3 species are not likely within the project area.
Group 4 - Brush/Grassland and Early Successional Forest Species	Second Growth Quaking Aspen, Wet Alder Thicket, Scrub Forests, Upland Shrub Thicket, Cut-over Forests	This group is the most common habitat type in the Proposed Action area, making up approximately two-thirds of the project area. This habitat type results primarily from past disturbances due to mining (approximately 60 percent of the project area), logging, or other human activities. Approximately 55 percent of the Alternative Tailings Basin area is Group 4 habitat.
Group 5 - Open Water Species	Ponds/Lakes	This habitat type makes up less than 10 percent of the Proposed Action area; the majority of the open water areas are comprised of water-filled mine pits with limited wildlife value, as they have little/no shallow, littoral areas.
Group 6 - Wetland and Lowland Forest Species	Wetlands, Cattail/Reed Marshes, Sedge/Wet Meadow	Wetland areas are relatively common in the project area, making up approximately one-third of the Proposed Action area and 20 percent of the Alternative Tailings Basin area. However, many of the wetlands in the Proposed Action area are 'incidental' or artificial wetlands that were formed as a result of past mining disturbances (see Section 4.1).

*Habitat community acreages were estimated based upon Figure 9-2 (Plant Communities) from the Scoping EAW (see Appendix B).

Descriptions of the characteristics of each of the six SGCN critical habitat groups are provided below:

Group 1 – Mature, Upland or Unbroken Forest Inhabitants

These species' population viabilities are dependent upon mature canopy cover, climax forest structure, or the density of decadent trees and snags, in which they nest and feed. These types of resources are typical of mature forest and unbroken forest habitat types. These forests have progressed to climax conditions, including relatively stable tree biomass, a variety of species and individuals of varying sizes and canopy levels, a temporally stable density of over-mature (or "decadent") trees, and an abundance of downed logs. This is distinct from a second-growth (Group 4) forest with a first generation of regenerated trees that have achieved mature, harvestable age and size. Such a forest is not very old, has not achieved mature forest conditions, and does not provide suitable habitat for Group 1 species.

Due to a trend toward fragmentation, development, road building, and timber harvest in this area of the State of Minnesota over many decades, mature forest habitat characteristics (especially the quantity of snags and "decadent" or "over-mature" trees, as opposed to mature individual trees) may be limiting to Group 1 species. The Proposed Project area is already highly fragmented due to past mining activities and only two locations were mapped with Northern Hardwood that may exhibit mature forest structure. Aerial photographs of the areas mapped as northern hardwoods within the Proposed Project Boundaries exhibit scars from former mining or forestry activities and are likely second growth forest comprised of northern hardwood species. One area located within the Alternative Tailings Basin contains approximately 300 acres of fragmented mature Northern Hardwood forest that would be impacted by the project should this area be utilized. There are approximately 100 acres of Upland Conifer habitat within the proposed plant area that would be affected.

Many of the Group 1 species could occur in the Upland Conifer area or in the Northern Hardwoods but it is unlikely that all would be present in the project area due to the fragmented character and relatively small forest tract sizes of mature forests in the project area. Species such as Connecticut Warbler, Least Flycatcher, Canada Warbler, Ovenbird, Yellow-bellied Sapsucker, Eastern Wood Pewee, Whip-poor-will, Veery, Northern Goshawk and McCoun’s Arctic would be the species within Group 1 that might occur within these tracts of mature forest. However, given the relatively small size of these two areas of mature forest it is unlikely that large populations of any of these species would be substantially affected by the loss of these mature forest areas. The remaining Group 1 species would not be expected within these remnants of mature forest due to the habitat types or character of the remaining habitat.

Group 2 – Mud Flat Inhabitants

These species are migrants that utilize grassy open fields, exposed mudflats, or wetlands comprised of shallow open water or with short stature vegetation. They are known to utilize stopover sites that are ephemeral in nature or that exhibit different water levels from year to year or are otherwise dynamic in character. This type of habitat is not likely to occur within the Minnesota Steel Proposed Project area.

Group 3 – Species Inhabiting Open Ground and Bare Soils

These species may find suitable habitat conditions in abandoned mines, exposed soils, on cleared road shoulder areas or on sub-grade road materials that consist of gravel material and some exposed soil. However, it is unlikely that these species occur within the Minnesota Steel project area, since these species are closely tracked by the MNDNR and known populations of these species do not occur within the Proposed Project area.

Group 4 – Brush/Grassland and Early Successional Forest Species

This group consists of species adapted to native grasslands, disturbed grassland, brushland, early to mid-succession second-growth forest, forests with dense shrub layers, and at forest edges. These species require various habitats that may occur within the Proposed Project area where abandoned ground re-colonized by grasses, in shrubby areas next to historic roads, in areas re-colonized by forest, and re-generating forest edges. Potential habitat for these species may occur in isolated patches where grasses have re-established themselves on cleared ground, in areas where forests were cut for mining or to create roads or clearings or along the edges of existing road corridors, or in areas that have re-vegetated since cessation of prior mining activities. This group is the most common habitat type in the Proposed Action area, making up approximately two-thirds of the project area. This habitat type results primarily from past disturbances due to mining (approximately 60 percent of the project area), logging, or other human activities.

Group 5 – Open Water Species

This group consists of species adapted to lakes and open water wetlands with emergent fringes. These species require various habitats throughout their life-cycle but require open water or lakes that support fisheries to survive. Potential habitat for this group may occur within the Proposed Project area where abandoned mines have filled with water or where deeper wetlands and lakes occur. Nesting habitat is utilized in areas where emergent wetland occurs. However, the majority of the open water areas within the project area are water-filled mine pits with little or no shallow water or emergent wetland areas; therefore there is relatively little of this habitat type in the project area. It should also be noted that open water lakes, ponds and wetlands with emergent edge vegetation are relatively common in the Nashwauk Uplands area, so the few areas of this habitat type within the Minnesota Steel Proposed Project would not be critical to the overall survival of Group 5 species in the region.

Group 6 – Wetland and Lowland Forest Species

This group consists largely of birds that require emergent wetlands, lowland forests or sedge meadows. Lowland forest generally includes areas that are classified as wetlands, but also includes forest types typical of moist soils, including shrub thickets such as the wet alder thickets.

Wetland areas are relatively common in the project area, making up approximately one-third of the Proposed Action area and 20 percent of the Alternative Tailings Basin area. However, many of the wetlands in the Proposed Action area are 'incidental' or artificial wetlands that were formed as a result of past mining disturbances (see Section 4.1 for a more detailed discussion of wetland types in the project area).

4.9.2 Environmental Consequences

The potential impacts to each of the habitat groups identified as likely being present within the project area in Section 4.9.1 above (i.e., Groups 1, 4, 5 and 6) are described below.

Group 1 – Mature, Upland or Unbroken Forest Inhabitants

These wildlife species depend on the characteristics of mature forest habitat, particularly large areas of mature forest, climax forest structure, snags and decadent trees. Much of the forest in and surrounding the project area is already fragmented or characterized as second-growth and is not suitable for most of the Group 1 species. Therefore, loss of the relatively small, fragmented tracts of mature forests in the project area would not result in substantial impacts to these species.

Group 4 – Brush/Grassland Species and Early Successional Forest

Mining activities would eventually create disturbed conditions that promote establishment of brushland, grassland and early successional forest species, although the rate at which these habitats would be re-established is dependent on whether sequential reclamation/revegetation is part of the mine plan, and what re-vegetation process are used (e.g., some practices can be used to expedite re-vegetation). As part of the reclamation process, exposed soils and bare areas would be planted to prevent erosion and to restore forest or brushland, effectively re-establishing habitats utilized by these species. Therefore, proposed impacts are not expected to contribute to a long-term adverse effect upon species in this group or their habitat. Most of the existing grassland, brushland, and early succession growth forest within the Proposed Action area have been established since the cessation of previous mining activities and development of a similar successional habitat would be expected to occur as Minnesota Steel mine areas are reclaimed, resulting in no net loss of this habitat type.

Also, since other human disturbances are common in the Nashwauk Uplands (e.g., logging, mining, etc.), creation of Group 4 habitat areas is relatively common; therefore loss of this habitat type in the Proposed Project area would not result in a substantial impact to Group 4 species populations overall.

Group 5 – Open Water Species

Habitat for all four Group 5 species appears to be relatively abundant in open water areas within the proposed mine pit area. However, the common loon, red-necked grebe and snapping turtle all rely on open-water areas with areas of emergent vegetation communities for nesting or foraging and open water habitat with associated emergent fringes are limited or non-existent in the mine pit lakes. Emergent wetland communities only occur at two locations in the project area. Both are limited in size and lie outside actual Proposed Project Impact Areas. As noted previously, the majority of open-water habitats within the Proposed Project Impact Area consists of the deep water mine pits that have limited or no emergent vegetation and, therefore, would not provide Group 5 habitat areas. Therefore, mining activities are not likely to affect the reproductive activities of these species in the project area. Also, as noted previously, open water lakes, ponds and wetlands with emergent edge vegetation are relatively common in the Nashwauk Uplands area, so the few areas of this habitat type within the Minnesota Steel project would not be critical to the survival of Group 5 species.

Lakes and wetlands within mining areas or where tailing basins occur would alter naturally occurring wetlands. Although wetlands and open water would become re-established during reclamation, a loss of habitat for these species would result during active mining. If in-pit stockpiling were implemented, open water mine pit habitats could be enhanced to create shallow littoral areas, providing Group 5 species habitats. These species could colonize areas as new habitat is established in the project area but would be displaced for the period of time between commencement and cessation of mining activities. Therefore, the Proposed Project impacts are not expected to contribute to a long term adverse effect upon species in this group or their habitat.

Group 6 – Wetland and Lowland Forest Species

These species depend on habitats consisting of emergent wetlands, lowland forest habitat, bogs, or sedge meadows. As noted previously, many of the wetlands in the Proposed Action area were created as a result of past mining disturbance (see Section 4.1). These wetlands include emergent wetlands, but generally do not include the more unique, natural wetlands such as lowland forest, bogs, or sedge meadows. The Alternative Tailing Basin area has not been previously affected by mining and, as a result, has more natural wetland areas that may harbor Group 6 wildlife species.

The Proposed Project activities may impact individuals of the Group 6 species, but are not likely to cause a loss of population viability since there are few, if any, areas of this habitat type in the project area and since this type of habitat occurs in other locations in the Nashwauk Uplands. Wetland mitigation would include establishment of wetland areas as part of reclamation; however, bogs, and lowland forest are very difficult to re-establish. Therefore, if the Alternative Tailings Basin site were utilized in lieu of the Proposed Project Tailings Basin, losses of those wetland habitat types would be difficult to mitigate.

4.9.3 Mitigation

Potential strategies to mitigate impacts to each of the habitat groups identified above are described in this section.

Group 1 – Mature, Upland or Unbroken Forest Inhabitants

No mitigation for impacts to Group 1 species/habitat was identified for the Proposed Action since, as described previously, there are limited areas of mature forests within the project area, and those that are present are fragmented. Also, mitigation would be difficult since it would take a very long time for mature-forest habitat conditions to develop in the surrounding second-growth forests or on the cleared portions of the project area after mining, even with implementation of reclamation practices.

Impacts to Group 1 wildlife species could be minimized by avoiding impacts to the Alternative Tailings Basin area, which contains more areas of undisturbed forest than the Proposed Project tailings basin site.

Group 4 – Brush/Grassland and Early Successional Forest Species

As described previously, mining activities would eventually create disturbed conditions that promotes establishment of brushland, grassland and early successional forest species, although the rate at which these habitats would be re-established is dependent on whether sequential reclamation/revegetation is part of the mine plan, and what re-vegetation process are used (e.g., some practices can be used to expedite re-vegetation). As part of the reclamation process, exposed soils and bare areas could be seeded and planted to pioneering shrub and tree species that occur within the project area, to speed the recovery of edge or brushland habitats. Most of the existing grassland, brushland, and early successional growth forest within the Proposed Action area have been established since the cessation of previous mining activities and development of a similar successional habitat would be expected to occur as Minnesota Steel mine areas are reclaimed, resulting in no net loss of this habitat type.

Group 5 – Open Water Species

Open water habitats may be able to be established in mine pits and tailings basins during reclamation. If in-pit stockpiling were implemented, open water mine pit habitats could be enhanced to create shallow littoral areas, providing Group 5 species habitats. Emergent fringes would need to be established and food sources for fisheries established to create conditions suitable for use by these species. Similarly, deeper water areas in the tailings basins could be graded and re-vegetated to promote open water areas with shallow water/emergent vegetation edges.

Group 6 – Wetland and Lowland Forest Species

As noted previously, many of the wetlands in the Proposed Action area were created as a result of past mining disturbance; therefore, it can be assumed that similar wetlands would re-form once the Minnesota Steel mining is complete (see Section 4.1.3). The resulting wetlands would likely include emergent wetlands, but not include the more unique, natural wetlands such as lowland forest, bogs, or sedge meadows. Avoidance of impacts at the Alternative Tailings Basin site by using the Proposed Project Tailings Basin would minimize impacts to more unique natural wetland habitat types that would be difficult to mitigate if they were lost. Section 4.1.3 provides a summary of proposed wetland mitigation proposed for the Minnesota Steel Proposed Project, including on-site and off-site wetland creation and restoration.

4.10 NOISE

The Final SDD (Section 3.3.9 Odor and Noise) determined that the EIS should address the following noise issues: 1) blasting and air overpressure; 2) limited noise modeling/study for the Proposed Project, conducted in accordance with state noise standards; and 3) identification of mitigation measures to reduce potential noise and blasting impacts. The following information is provided to identify potential impacts and mitigation strategies.

Noise is defined as unwanted sound. Sound travels in wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels. Decibels (dB(A)) represent the logarithmic increase in sound energy relative to a reference energy level. A sound increase of 3 dB(A) is barely perceptible to the human ear, a 5 dB(A) increase is clearly noticeable and a 10 dB(A) increase is heard twice as loud. For example, if the sound energy is doubled, (e.g., the amount of traffic doubles), there is a 3 dB(A) increase in noise, which is just barely noticeable to most people. On the other hand, if traffic increases to where there is 10 times the sound energy level over a reference level, then there is a 10 dB(A) increase and it is heard twice as loud.

Table 4.10.1 provides a rough comparison of the noise levels of some common noise sources:

TABLE 4.10.1 COMMON NOISE SOURCES

Sound Pressure Level dB(A)	Noise Source
140	Jet Engine (at 25 meters)
130	Jet Aircraft (at 100 meters)
120	Rock and Roll Concert
110	Pneumatic Chipper
100	Joiner/Planer
90	Chainsaw
80	Heavy Truck Traffic
70	Business Office
60	Conversational Speech
50	Library
40	Bedroom
30	Secluded Woods
20	Whisper

4.10.1 Affected Environment

4.10.1.1 Regulatory Framework

Current noise standards for the State of Minnesota are located in Minnesota Rules, part 7030.0040, Subpart 2. The rules for permissible noise vary according to which “Noise Area Classification” is involved. In a residential setting, for example, the noise restrictions are more stringent than in an industrial setting. The rules also distinguish between nighttime and daytime noise; less noise is permitted at night. The standards list the sound levels not to be exceeded for 10 and 50 percent of the time in a one-hour survey (L_{10} and L_{50}) for each noise area classification, as follows:

TABLE 4.10.2 APPLICABLE MINNESOTA NOISE STANDARDS

Noise Area Classification		Noise, Standard, dB(A)			
		Daytime (7 am to 10 pm)		Nighttime (10 pm to 7 am)	
		L_{50}	L_{10}	L_{50}	L_{10}
1	Residential	60	65	50	55
2	Commercial	65	70	65	70
3	Industrial	75	80	75	80

The standards are given in terms of the percent of time during a measurement period (typically one hour) during which a particular decibel dB(A) level may not be exceeded. A daytime L_{50} of 60 dB(A), for example, means that during the daytime, noise levels may not exceed 60 dB(A) more than 50 percent of the time (i.e., 30 minutes of an hour).

4.10.1.2 Existing Conditions

No mine haul truck or blasting noise has been generated at the property since Butler ceased operations in 1985.

4.10.2 Environmental Consequences

4.10.2.1 Mine Haul Truck Noise

This section discusses the results of a limited noise assessment that was completed by David Braslau Associates, Inc. (DBA) to estimate potential noise impacts associated with mine haul trucks (see listings in Appendix I). The primary concern expressed relative to haul truck noise was transport of materials from mine areas to processing areas or stockpiles. Since information on mining staging and layouts and alignments of haul roads is not available, this assessment examines the potential impact of unshielded truck noise along the perimeter or the mining area, which should represent worse case conditions. Some shielding by intervening topography outside of the mining pits is assumed, however, in the analysis.

Minnesota Steel has indicated that during mine construction and operation, diesel-hydraulic power shovels would initially remove overburden that would be loaded into 205-ton trucks and stockpiled north of the mine. Nine of these trucks would be used, with the number of trips depending upon distance between the pit and stockpiles.

Mine operations would run 24 hours per day, with three shifts for five days per week, with operations seven days per week depending upon demand. Stripping and drilling would run two shifts per day, five days per week.

At typical mines, three diesel-hydraulic shovels, one front-end loader, one bulldozer, 9 to 15 haul trucks, and one drill would be used on any given shift. This usage would occur when the mine reaches maximum output and less equipment would likely be used in the first few years of mine operation. Daily usage would vary depending on material requirements.

Most equipment operation would occur within the mine pit where the pit walls would help shield the equipment and mitigate noise levels, especially as the pit becomes deeper. However, the EIS

noise assessment assumed that the mine haul trucks would operate at or near the surface of the mine at the pit perimeter.
Noise sensitive receptor sites (homes) closest to the mining areas (Pits 5 and 6) have been identified. This information was supplemented with information collected through reviewing USGS topographic maps of the area. Sound levels were estimated for each of the source locations in relationship to each of the receptor locations. Source and receptor locations are illustrated in Figure 4.10.1. Predicted sound levels were then compared against the Minnesota Noise Standards (Minnesota Rules, part 7030.0040) reflected in Table 4.10.2.

Haul truck spectral sound levels were previously monitored by DBA at the Minorca site in 1992 and are compared with levels compiled by Barr Engineering for another mining project (Table 4.10.3). The latter data were based upon the published sound power level of 121 dB(A) for the Caterpillar Model 793C 240-ton mine haul truck. The haul trucks used at Minorca were smaller than the 793C model, but the observed sound levels were higher. This suggests that the size of the haul truck is no longer a reliable parameter for determining noise level, since engine and truck technology has improved greatly in the past 10 to 15 years. A heavy equipment manufacturer (Caterpillar) is currently providing sound reduction packages for the 793C model that would reduce the sound level by as much as 9 to 10 dB(A). For this EIS noise assessment, the more conservative (louder) noise levels based on DBA monitoring were used.

TABLE 4.10.3 MINE HAUL TRUCK SPECTRAL SOUND LEVELS (AT 50 FEET)

Freq (Hz)	David Braslau Associates	Barr and Caterpillar
31	82	63
63	86	66
125	86	64
250	82	70
500	80	69
1000	76	70
2000	74	69
4000	72	69
8000	70	67
dB(A)	82.6	76.1

Statistical sound levels (L_{10} and L_{50}) contained in the state noise standards cannot be estimated without detailed information on the location of haul roads, mining areas and stockpiles, elevations of each, and shielding provided by the terrain, mine faces, and stockpiles. Therefore, for purposes of this haul truck limited noise impact assessment, sound levels were based upon haul truck operation at the perimeter of the mine pits using existing ground elevations.

A noise model developed by DBA (the DBA outdoor propagation model) is based upon ISO 9613-1 and ISO 9613-2 (International Standards Organization atmospheric sound attenuation and outdoor sound propagation methodology) and was used to project mine haul truck sound levels. Inputs and assumptions in this model included:

- Source sound level [82.6 dB(A)]
- Source height of 15 feet above mine perimeter ground level
- Standard atmospheric conditions

- Effect sound wave interaction with the ground
- No attenuation due to trees or vegetation
- Topographic shielding due to terrain
- Receptor height of 6 feet

Projected haul truck sound levels are shown in Table 4.10.4.

TABLE 4.10.4 PROJECTED MAXIMUM HAUL TRUCK SOUND LEVELS cB(A)

Source #	Receptor # R1	Receptor # R2	Receptor # R3	Receptor # R4	Receptor # R5	Receptor # R6	Receptor # R7	Receptor # R8	Receptor # R9
S1	40.0	35.1	35.9	35.4	34.5	34.1	32.5	30.4	24.9
S2	38.6	33.8	36.2	35.3	34.2	33.7	32.3	30.4	25.3
S3	36.9	32.6	36.2	35.0	33.8	33.2	27.2	30.6	20.6
S4	33.7	30.3	34.4	33.2	32.1	31.4	30.9	29.8	26.0
S5	35.7	32.2	37.8	36.1	34.8	33.9	33.6	32.6	28.3
S6	38.5	34.9	42.6	40.2	38.6	37.3	37.2	30.9	30.4
S7	43.6	37.8	45.1	42.7	40.6	39.5	38.2	35.9	29.2
S8	46.4	38.8	42.0	41.0	39.4	38.7	36.8	34.2	27.5
S9	42.3	36.4	38.4	37.6	36.4	35.9	34.3	32.0	26.1
S10	32.1	29.3	33.9	32.5	31.6	30.8	25.7	25.1	27.2
S11	25.2	28.0	27.1	26.1	25.2	24.4	24.5	24.0	28.0
S12	28.7	21.9	26.0	25.1	24.4	23.7	23.6	23.8	28.9
S13	27.3	21.0	24.7	23.9	23.1	22.4	22.6	29.1	29.7
S14	22.8	22.1	26.3	25.2	24.5	23.8	24.2	30.9	31.4
S15	25.5	24.6	29.6	28.5	27.3	26.3	26.7	27.1	32.1
S16	35.0	32.7	34.4	37.6	36.5	30.4	31.0	30.5	32.0

Table 4.10.4 indicates that the maximum predicted sound level due to haul truck usage is 46.4 dB(A). This sound level would be from the Source 8 site and experienced by Receptor 1. Source 8 and Receptor 1 are separated by a distance of approximately 2,300 feet. The second highest predicted level is 45.1 dB(A) from Source 7 and the Receptor 3 pair. This pair is separated by a distance of approximately 2,650 feet. Therefore, even if trucks operated at the perimeter location for over 30 minutes of any given hour, the nighttime L_{50} standard of 50 dB(A) is not expected to be exceeded.

Typical ambient sound levels in the area of the homes south of the mine pits are anticipated to be between 35 and 45 dB(A) during daytime hours and 30 to 35 dB(A) during nighttime hours, although noise from adjacent TH 169 and the railroad may add to these sound levels. Thus, while the predicted sound levels are well below the nighttime L_{50} standard, haul truck sound levels may be clearly audible, until the pit walls provide shielding of truck noise.

Some noise during removal of overburden is unavoidable, although provision of an earth berm along the south side the pits during initial stripping could help reduce noise impacts. Initiation of mining from the north will provide additional distance from the nearest receptors and the opportunity to depress potential noise sources, thus providing shielding by mine faces. Some noise will be unavoidable as trucks move from the pit to the stockpile. Stockpiles could also be strategically located to minimize noise to the south.

4.10.2.2 Blasting Vibration and Air Overpressure Impacts

Blasting, when viewed in slow motion, is essentially a process of sloughing off layers of rock from the mine face with each sequential detonation. As the shock wave from a drill hole reflects off the free face, the tensile strength of the rock is exceeded and it breaks away from the free face. This provides another free face for the second shock (typically 25 milliseconds[ms] later) to break the rock followed by subsequent shocks from a carefully designed series of detonations. Blast design is a complex procedure that typically takes into account the average size of material desired, fragmentation of rock type, powder factor (kilograms of explosive per cubic meter of rock), charge weight, strength of explosive, sequence and timing of detonations, hole spacing, burden (distance to free face), depth of holes, depth of stemming, and other factors including limitations on ground vibration and air blast.

Blasting techniques/procedures are designed to break and fragment rock into a desired size so that it can be readily transported, crushed and processed efficiently. Blasting activity at the Minnesota Steel mine would occur roughly once per week and would use the same blasting agents as other taconite mines: a mixture of about 94 percent ammonium nitrate (AN) and 6 percent fuel oil (FO), commonly referred to as ANFO. A small explosive cap is used as the triggering mechanism for the ANFO detonation. The drill hole is stemmed or filled after placement of the ANFO, to contain the explosion process and also limit blast wave occurrence in the atmosphere.

Ground vibration and air blast (overpressure) from rock blasting is primarily related to the weight of explosive detonated during any one instant (at least 8 ms from another to be treated as a separate detonation) and distance to a structure or sensitive receptor. As described above, a pattern of drill holes is used to most efficiently break and fragment rock so that it can be hauled to a processing location. The detonation in each of these holes is delayed by 25 ms within a column and 42 ms between each column to provide time for the previous detonation to break rock and provide a relatively free surface for the next detonation. The amount of explosive used per delay is commonly called the "delay weight" or weight per delay.

This section discusses the potential impacts due to blasting and air overpressure. For the purpose of this discussion estimates of impacts from blasting have been based upon generated data and historical blast data from previous studies at the Minorca Mine in Eveleth and the Laurentian Mine in Gilbert, along with information provided by Minnesota Steel, to evaluate potential impacts from blasting. Two predicted estimates are also available from the old Butler Mine. The blasting procedure at the Laurentian Mine was similar to that proposed by Minnesota Steel except that the patterns at the Laurentian Mine were slightly skewed rather than rectangular. Detailed data on specific blast effects at the proposed Minnesota Steel mine are not available; therefore, the estimates contained in the analysis are for comparison purposes only and are used to provide a preliminary estimate of possible impacts due to blasting.

Impacts due to blasting in surface mines include; ground vibrations, air blast, flyrock, dust, and fumes. Dust and gases are usually not a major problem outside the immediate blasting area. As with air blast, wind direction is important. When necessary, dust and gas production can be reduced by wetting the area to be blasted. Excessive fumes can be avoided by utilizing good explosive design techniques. Therefore, the remainder of the blasting impacts assessment focused on ground vibration and air blast (overpressure).

In order to provide an overview of potential blasting impacts in this assessment, a series of blasting locations were selected from around the periphery of Pit 5 and Pit 6 north of Snowball Lake. These blasting source locations and receptors are shown in Figure 4.10.1.

4.10.2.2.1 Ground Vibration

Ground vibration is normally characterized by the Peak Particle Velocity (PPV) as measured by an instrument on the ground surface. Ground vibration limits have been established by the MNDNR and the U.S. Bureau of Mines (USBM). The State of Minnesota (Minnesota Rules, part 6130.3900, subpart 2) has established a ground vibration limit of 1.0 inches/second (with no specified frequencies). The USBM recommendations are 0.50 inch/second for old homes (plaster) and 0.75 inch per second for modern homes (wallboard) in the low frequency range. Information on the construction of the receptor sites is not available; however, Minnesota Steel would be required to comply with these standards.

Vibration levels were evaluated using unpublished data from the Minorca and Laurentian Mines, two estimates from the old Butler Mine and published data by the USBM. Based on a comparison of this data, DBA determined that using the Laurentian Mine blast data would generate the most conservative prediction of vibration at the Minnesota Steel Mine. However, to demonstrate the importance of using test blasting prior to production blasting, ground motion was also estimated based upon the old Butler/Minorca data represented by the lowest data values (least conservative). Using these two sets of data, the predicted ground motion at the nearest receptor to blasting (2,300 feet) ranges from 0.16 inches per second for the Butler/Minorca data to 0.94 inches per second for the Laurentian data. The difference in these two results, and given that actual results can vary based on a number of factors, points to the need for test blasts to get an accurate estimate of impacts.

Even with the worst case (Laurentian) vibration predictions, only the two closest blast/receiver distances (S8 to R1 at 2300 feet and S7 to R3 at 2650) exceed the 0.75 inches per second limit for damage to wall board established by the USBM. Except for the receptor sites close to blast locations S6, S7, S8 and S9, the predicted ground vibration velocities are generally below 0.3 inches per second.

4.10.2.2.2 Air Overpressure

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

Air overpressure or air blast limits have been established by the MNDNR and the USBM. Minnesota Rules, part 6130.3900, subpart 1, “Air Overpressure Standards” specifies a limit of 130 decibels as measured on a linear peak scale. The USBM has a similar limit although it references certain frequencies.

Air blast data from different mines or quarries and even the same mine and quarry can vary greatly depending on blasting and atmospheric conditions. For the EIS assessment, air overpressure predictions were made for the sources and receptors shown in Figure 4.10.1 using blasting data from the Laurentian and Minorca mines. The analyses indicated that a delay weight of 487 pounds would result in an air overpressure of 130 dB(A) or under at the closest source-receptor pair (Source 8 and Receptor 1). Using Minorca mine data, a delay weight of 1,700 pounds would result in air overpressures below the 130 dB(A) limits. The large differences between these predicted air blast levels and those using the Laurentian Mine data demonstrate the importance of obtaining pre-blast data prior to a major construction blast.

4.10.3 Mitigation

Below are identified some mitigation strategies or practices. Implementing these practices should assist in mitigation impacts due to haul truck noise and blasting.

4.10.3.1 Haul Truck Noise

Some haul truck noise during mine operation would be unavoidable. Based on the limited noise assessment it appears that state standards would not be exceeded; however, the following mitigation measures have been identified which could assist in reducing impacts from haul truck noise.

During the initial startup of mine pit related activities (removal of overburden) a berm could be constructed along the southern perimeter to assist in reducing noise impacts. Initiation of mining from the north would increase the distance away from the nearest receptor. This would provide an opportunity to depress potential noise sources by providing mine shielding through creating a topographic release feature (i.e., work within a bowl or depression). Some noise would be unavoidable as trucks move form the pit to the stockpile. Stockpiles are proposed to be located along the northern property boundary and their location should assist in reducing noise. As previously mentioned, some heavy equipment manufacturers provide a noise reduction package for their equipment. These noise reduction packages should be considered when purchasing the haul trucks used by Minnesota Steel.

4.10.3.2 Blasting Vibration and Overpressure Impacts

Minnesota Rules, part 6130.3900, subpart 1(C) requires collection of detailed information for each production blast. All open pit mining operators are required to keep a blaster's log of production blasts for a period of at least six years containing the following:

(1) date and time of blast;
(2) type of explosive used;
(3) ignition layout with locations of blast holes and time intervals of delay;
(4) pounds of explosives per each delay of eight milliseconds or more;
(5) total pounds of explosives;
(6) type of material blasted;
(7) monitoring locations and results of monitoring when conducted;
(8) meteorological conditions, including temperature inversions, wind speed, and directions as can be determined from the U. S. Weather Bureau, and ground-based observations;

(9) directional orientation of free faces of bench to be blasted; and
(10) other information which the commissioner finds necessary to determine if the standards of Minnesota Rules, part 6130.3800 are achieved.

Regulations exist which have established limits for blasting vibrations and overpressure. These limits would have to be adhered to during the operation of the proposed Minnesota Steel project. Initially, blasting should occur as far away from receptors as possible or feasible. Once Minnesota Steel develops blast data and blasting experience at the mine site, specific estimates of ground motion and air overpressure can be determined. For blast source areas closest to receptors, it may be necessary to adjust drill hole density along with delay weights to keep vibrations below the MNDNR and USBM prescribed limits. Air overpressure levels can be maintained through a reduction of delay weights, appropriate stemming depth, use of shock tubes, and depth of burden (distance of blast from free bench face). Atmospheric conditions are critical for sound propagation. Unfavorable conditions, such as low level inversions or winds toward nearby buildings, should be avoided during blasting.

A seismic monitoring program was implemented during the Butler Taconite operations and Minnesota Steel has indicated that they would implement a similar program for this project. The Butler Taconite operation also conducted an air blast monitoring program. This program included the practice of exploding a small test shot to check atmospheric conditions prior to the main air blast. Minnesota Steel has indicated that they would implement a similar air blast monitoring program.

Minnesota Steel has indicated that they would fire a pre-production test charge intended to ensure that the MNDNR's 130 dB(A) limit is not exceeded at the mine property boundary. If the test blast yields an overpressure equal to or greater than a predetermined level at the nearby monitoring location, adjusted to the nearest off-site receptor, the test blast should be delayed. Even if the test blast does not exceed this limit, blasting should be delayed if the area had a strong and easily detectable atmospheric inversion or wind greater than 15 mph from the north or northwest. This should minimize air shock and dust dispersal over the nearby receptor locations.

5.0 Cumulative Effects

Assessment of cumulative effects/impacts is required as part of state and federal environmental review of proposed actions. Although the state and federal regulations differ somewhat in their definitions and applications of cumulative effects/impacts, the intent of the analysis in this document is essentially the same: to assess the magnitude of impacts of a proposed action in combination with other actions.

The distinction between the state and federal cumulative review is an important distinction with respect to EIS adequacy. The National Environmental Policy Act (NEPA) defines 'cumulative impact' in 40 C.F.R. 1508.7 as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" The State of Minnesota defines 'cumulative impact' in Minnesota Rules, part 4410.0200, subpart 11 using a definition similar to the federal definition and, in Minnesota Rules, part 4410.1700, subpart 7, defines a 'cumulative potential effects' criterion as a factor in determining the potential for significant environmental effects.

As this is a project-specific EIS the cumulative potential effects analysis is the appropriate standard of cumulative analysis under Minnesota Environmental Policy Act (MEPA). However, this project invokes both a state and federal environmental review. For the purpose of this Draft EIS document, the terms 'cumulative impact,' 'cumulative effect' or "cumulative potential effect" are used interchangeably, with the intent of representing both the state and federal definitions of 'cumulative impact' and 'cumulative potential effects.' The rationale for this decision is based on the greater rigor of the federal standard in light of the state-level cumulative analysis. Fulfilling the federal cumulative impacts analysis will fulfill the state-level cumulative potential effects analysis. See generally Minnesota Rules, part 4410.3900 regarding cooperating state and federal governmental entities.

The Final SDD identified the following areas to be evaluated with respect to the potential cumulative impacts in the Minnesota Steel EIS:

- Class I Area Air Quality Impacts due to Particulate Matter less than 10 microns (PM_{10})
- Class I Area Air Quality Impacts due to Acid Deposition and Ecosystem Acidification
- Mercury Emissions, Deposition and Bioaccumulation
- Visibility
- Loss of Threatened and Endangered Plant Species
- Loss of Wetlands
- Wildlife Habitat Loss/Fragmentation
- Wildlife Corridor Obstruction

The reasonably foreseeable future actions, geographic extent, timeframe, and scope of analysis for each of the eight subject areas listed above were defined in the Scoping EAW and Final SDD. The specific parameters applicable to each of the cumulative impact studies are defined in the sections that follow for each of the eight subject areas.

5.1 CLASS I AIR QUALITY – PARTICULATES

5.1.1 Affected Environment

5.1.1.1 Summary of Issues/Overview

The cumulative impacts analysis evaluating the particulate matter less than 10 micrometers (µm) in diameter (PM_{10}) concentrations from the Minnesota Steel mining project on Class I areas was performed as a special study for the proposed Minnesota Steel Draft EIS. The results of the analysis were described in a technical memorandum, *Cumulative Impacts – Minnesota Iron Range Industrial Development Projects, Evaluating Particulate Matter (PM_{10}) Air Concentrations in Federal Class I Areas in Minnesota and Implications for Prevention of Significant Deterioration (PSD) Air Quality Increment*, completed in November 2006 (hereafter called the '2006 PM_{10} CI Study'). This section summarizes that analysis.

Particulate Matter (PM_{10}) includes primary particulates emitted directly to air, and secondary particulates, which are formed from atmospheric transformations of gaseous nitrogen oxides (NO_x), sulfur dioxide (SO_2) and volatile organic compound (VOC) emissions.

- **Primary PM** consists of carbon (soot) — emitted from cars, trucks, heavy equipment, forest fires, industrial combustion processes, and burning waste — and crustal material from unpaved roads, stone crushing, construction sites, and metallurgical operations (EPA 2004b).
- **Secondary PM** forms in the atmosphere from gases. Some of these reactions require sunlight and/or water vapor. Secondary PM includes: *Sulfates* formed from sulfur dioxide emissions from power plants and industrial facilities; *Nitrates* formed from nitrogen oxide emissions from cars, trucks, and power plants; *Carbon* formed from reactive organic gas emissions from cars, trucks, industrial facilities, forest fires, and biogenic sources such as trees (EPA 2004b). The formation of secondary particulate matter occurs when gaseous pollutants react in the atmosphere, usually resulting in sulfates such as ammonium sulfate and nitrates such as ammonium nitrate (EPA 2003b; EPA 2004b).

Particulate Matter (PM_{10}) can be further divided into coarse and fine particulate fractions. The coarse fraction (particles with a diameter between 2.5 and 10 µm) is usually made up of primary PM (EPA 2003a; EPA 2004b). Particulate Matter ($PM_{2.5}$) or fine particulate, is particulate matter less than or equal to 2.5 µm. $PM_{2.5}$, the fine fraction of PM_{10} consists of primary and secondary PM. Sulfates, nitrates, and carbon compounds are the major constituents of fine particle pollution (EPA 2004b). Each of these components can be naturally occurring or the result of human activity. The natural levels of these species varies with season, daily meteorology, and geography (EPA 2003b).

In the atmosphere, coarse and fine particles behave in different ways. Larger coarse particles tend to settle out from the air more rapidly than fine particles and usually are found relatively close to their emission sources (EPA 2004b; MPCA 2005d). Fine particles, however, can be transported long distances by wind and weather and can be found in the air thousands of miles from where they were formed (EPA 2004b).

5.1.1.2 Summary of the 2006 PM_{10} PSD Increment CI Study Scope - Background

The Scoping EAW defined the scope to be used as the basis for assessing the potential cumulative impacts from the proposed projects on PM_{10} air concentrations and the implications for the PSD increment in the Class I areas in Minnesota using semi-quantitative analysis methodology. Critical elements of the analysis include:

1. Assessing and evaluating potential air quality impacts from primary particulate as well as particulate matter speciated into the following fractions, following Federal Land Manager (FLM) guidance for Class I areas impacts analyses:
    - Coarse (from 2.5 to 10 micrometers; $PM_{2.5}$ up to PM_{10})
    - Fine ($PM_{2.5}$ or smaller)
    - Elemental Carbon (EC)
    - Organic Carbon (OC)
    - Sulfate aerosol
    - Nitrate aerosol

    This cumulative impact analysis evaluates the particulate fractions (coarse, fine) and species (primarily sulfate and nitrate aerosols) identified above. This means that the evaluations include emissions of SO_2 and NO_x since these are the precursor emissions to sulfate and nitrate aerosols.

2. A summary of the long range transport of fine particulate ($PM_{2.5}$), including sulfate and nitrate aerosols.

3. A summary of available data from the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring network data for particulates, including ammonium nitrate, ammonium sulfate, coarse particulate, elemental carbon and organic carbon for the period of record for the Voyageurs National Park (Voyageurs) site and the Boundary Waters Canoe Area Wilderness (BWCAW) site.

4. A summary of the PM_{10} air concentrations available from any nearby state monitoring sites.

5. A summary of available air modeling studies conducted to date that identify emission source contributions (in-state versus out-of-state) of fine particles to the Class I areas located in Minnesota.

6. The potential cumulative impacts of recently proposed projects on the PM_{10} air concentrations in Class I areas in Minnesota. The proposed projects are as follows:
    - Cliffs Erie Railroad Pellet Transfer Facility;
    - Excelsior Energy – Mesaba Energy Coal Gasification Power Plant;
    - Laurentian Wood Fired Energy Project;
    - Mesabi Nugget Company – DRI Plant;
    - Minnesota Steel – Mining/Taconite/DRI/Steel Plant;
    - Northshore Mining Company – Furnace 5 Reactivation Project;
    - PolyMet Mining – NorthMet Project;
    - United Taconite – Emissions and Energy Reduction Project;
    - UPM/Blandin Paper Mill Expansion – Project Thunderhawk, and
    - U.S. Steel-Keewatin Taconite – Fuel Diversification and Pollution Control Equipment Upgrade.

7. Potential emissions increases and decreases due to reasonably foreseeable actions, which include the proposed projects listed above, facility shutdowns, and potential regulatory actions:
    - Regulatory actions:
        - Implementation of the Taconite MACT standard;
        - Implementation of other MACT standards, including Boiler & Process; Heater MACT, stationary compression and spark ignition engine MACT;
        - Implementation of the Clean Air Interstate Rule (CAIR);
        - Implementation of the Regional Haze Rule and Best Available Retrofit Technology (BART);
        - The NO_x SIP call (40 C.F.R. parts 51, 72, 75, 96);
        - EPA proposed rule for NO_x in Class I areas (Fed. Register, Vol. 70, No. 35);
        - State acid rain rule and statewide SO_2 emissions cap, and
        - Title IV of the 1990 Clean Air Act Amendments
    - Emission reductions:
        - Butler Taconite, facility closure (1985);
        - LTV Steel Mining Company (LTVSMC), shutdown of the taconite furnaces (2001);
        - Minnesota Power Arrowhead Regional Emission Abatement (AREA) Project (voluntary; in progress), and
        - Xcel Energy Metropolitan Emission Reduction Project (MERP) (voluntary; in progress).

The semi-quantitative assessment of potential cumulative impacts from the proposed projects was completed in four parts:

Part 1 – Assess the IMPROVE data for Voyageurs and/or the BWCAW to provide the current status of PM_{10} air concentrations (depending on data availability), including a trends analysis (improvement, no change, or continued degradation even with past, current and/or expected future emission reductions);

Part 2 – Assess available modeling results that identify emission sources and/or emission source regions as significant contributors to ambient air concentrations in the Class I areas located in Minnesota;

Part 3 – Evaluate statewide SO_2, NO_x, and PM_{10} emissions and trends using existing statewide emission inventory data (listing of sources and tons/year emissions). The trend analyses provide a breakout of emissions by geographic area of the state;

Part 4 – A discussion of reasonably foreseeable regulatory actions and the projections for state and national emissions with regard to expected decreases in the future. The potential cumulative impacts from the proposed projects are based on the potential increases in SO_2 and NO_x, and PM_{10} emissions in Minnesota from current and reasonably foreseeable actions.

5.1.1.3 Analysis Boundaries

The Scoping EAW and the Final SDD concluded that the following boundaries should define the extent of the analysis for the PM_{10} Cumulative Impacts Study:

1. The timeframe for the trends analysis, both past and future
    - The timeframe for this analysis is 1980 to 2015.

2. The list of specific past and future projects to be assessed in addition to the Proposed Project, including type, geographic limits, and project status.
   - Figure 5.1.1 shows the general locations of the "reasonably foreseeable" projects to be assessed for cumulative impacts, as well as the locations of existing taconite facilities and federally protected Class I areas. The projects selected as "reasonably foreseeable" are defined as those that are already underway, or for which a completed data portion of an environmental assessment worksheet has been submitted to the MNDNR or the MPCA. "Reasonably foreseeable actions" in regard to potential emission reductions include those regulatory actions that have been placed on public notice by a government agency (e.g., draft rules or regulations) or a submittal to a regulatory agency that provides details on a planned voluntary action being considered (e.g., Xcel Energy's Metropolitan Emission Reduction Project).

3. The specific geographic area of concern ("zone of impact"), including resources, ecosystems, and populations of concern
   - For PM_{10} air concentrations in Class I areas in Minnesota, the selected zone of impact is defined as Voyageurs and the BWCAW. Voyageurs is primarily located in St. Louis County, while the BWCAW encompasses parts of St. Louis, Lake, and Cook Counties (see Figure 5.1.1).

4. The extent and geographic limits of other sources that may affect resources in the zone of impact, for the specific issue under study
   - This report summarizes emission trends for SO_2, NO_x and PM_{10} from sources within the four-county project area (Itasca, St. Louis, Lake, and Cook Counties), as well as statewide and national (from the eastern two-thirds of the U.S.) emissions.

5.1.2 Environmental Consequences

Summary findings from the assessment of potential cumulative impacts from the Proposed Action with regard to PM_{10} air concentrations in the Class I areas in Minnesota include the following:

1. Median day PM_{10} and $PM_{2.5}$ air concentrations in Voyageurs and the BWCAW have declined from 1992 to 2003, the years for which IMPROVE monitoring data are available. Voyageurs data are presented as an annual average instead of median day rolling averages because rolling average data are not available.
   - BWCAW
     - The median day decrease in PM_{10} air concentrations is approximately 15 percent.
     - The median day decrease in $PM_{2.5}$ air concentrations is approximately 9 percent.
   - Voyageurs
     - The annual average decrease in PM_{10} is approximately 37 percent.
     - The annual average decrease in $PM_{2.5}$ is approximately 22 percent.
   - The declines in air pollutant concentrations in Voyageurs and the BWCAW are similar to national declines in ambient concentrations and national point source emissions of SO_2, NO_x, and PM_{10} (EPA 2004b).

2. The available data indicate that Iron Range emissions of PM_{10} and SO_2 contribute only a small amount to $PM_{10}/_{2.5}$ air concentrations in Voyageurs and the BWCAW.
   - Based on available MPCA emission inventory data, primary PM_{10} emissions from existing taconite facilities (stack + fugitive) and electric utilities in the four county project area (Itasca, St. Louis, Lake, and Cook Counties) have decreased overall since 1990. However, between 1996 and 2003, direct PM_{10} emissions in the area increased. Over the same time period, the rolling 5-year PM_{10} air

concentration in the BWCAW (median day) (starting with 1996, the first point at which a 5-year rolling average can be determined for the data set) decreased by approximately 7 percent.

- MPCA emission inventory data indicates that SO_2 emissions in northeast Minnesota increased from 1990-2004. Sulfate is a secondary formation pollutant derived from SO_2 emissions and is most closely associated with declines in $PM_{2.5}$ air concentrations (EPA 2004b). However, $PM_{2.5}$ air concentrations in the BWCAW decreased by approximately 9 percent (median day) over the same time period.
- Decreasing air concentrations of $PM_{10}/_{2.5}$ in Voyageurs and the BWCAW from approximately 1991-2003 and increasing emissions from nearby Iron Range sources during the same time period indicates that Iron Range emissions of SO_2 and primary PM_{10} likely contribute only a small amount to measured $PM_{10}/_{2.5}$ air concentrations in Voyageurs and the BWCAW. This assessment is consistent with previous modeling assessments and fine particle monitoring data discussed below.

3. Modeling indicates that Minnesota sources contribute a relatively small amount of the $PM_{10}/_{2.5}$ to Voyageurs and the BWCAW.
   - Long-range transport modeling results indicate that acid deposition (wet sulfate and wet nitrate associated with sulfate and nitrate aerosol) is primarily due to out-of-state emission sources and that only 10 to 15 percent of the acid deposition in Minnesota is from Minnesota emission sources.
   - The MPCA estimates that in urban areas such as the Twin Cities, regional (out-of-state) contributions of $PM_{2.5}$ in the Upper Midwest average about 77 percent, and nearby sources contribute 20 to 25 percent of the measured $PM_{2.5}$. In more remote rural areas such as Voyageurs National Park and the BWCAW, the local contribution of $PM_{2.5}$ would be less than in urban areas because of less traffic and fewer nearby industrial sources.
   - Speciation of fine particulate identifies that iron processing accounts for only 1 percent of the $PM_{2.5}$ in Voyageurs (CENRAP 2005).
   - The Lake Michigan Air Directors Consortium (LADCO 2003) estimates that statewide Minnesota emission sources contribute about 35 percent of the fine particles to Voyageurs and the BWCAW.

4. As shown in the table below, the potential PM_{10}, SO_2 and NO_x cumulative emissions increase from the proposed projects are small in comparison to statewide emissions.

Emission Category	PM_{10} (tons/yr)	SO_2 (tons/yr)	NO_x (tons/yr)
Statewide Emissions (all sources, 2004)	783,466	162,000	483,600
Proposed Projects (includes Minnesota Steel, Pellet Plant Controlled for NO_x)	4,855	2,413	6,182
Potential Percent Increase from Proposed Projects – Controlled for NO_x	0.6 percent	1.5 percent	1.3 percent
Proposed Projects (includes Minnesota Steel, Pellet Plant Uncontrolled for NO_x)	4,855	2,413	7,725
Potential Percent Increase from Proposed Projects – Uncontrolled NO_x	0.6 percent	1.5 percent	1.6 percent

5. Overall, the potential emission increases from the proposed projects would be offset by reductions from other Minnesota sources due to voluntary actions and current and reasonably foreseeable federal regulations such as EPA's acid rain program, CAIR, and Regional Haze/BART.
   - Voluntary actions
     - Minnesota Power's Arrowhead Regional Emission Abatement (AREA) proposal reduces SO_2 and NO_x emissions by 3,552 tons/year and 3,745 tons/year, respectively.

- Xcel Energy's Metropolitan Emission Reduction Project (MERP) would reduce its emissions of SO_2, NO_x and PM_{10} emissions by approximately 32,460 tons/year, 22,870 tons/year, and 670 tons/year, respectively.

6. Detailed regional modeling is currently being conducted by the Central States Regional Air Partnership (CENRAP) to further define in-state and out-of-state source contributions to fine particle concentrations in Class I areas in Minnesota. The results of this modeling are then used along with other information to determine any additional emission reductions that are needed to meet the requirements of the Clean Air Visibility Rule (formerly known as the Regional Haze Rule).

Conclusions

Particulate Matter (PM_{10}) concentrations (20 percent worst day and median day, 5-year rolling average) in the BWCAW have declined by approximately 15 percent from 1992 to 2003, mostly due to declines in fine particulate concentrations. PM_{10} air concentrations have similarly declined in Voyageurs. Over the next decade, reasonably foreseeable regulatory actions are expected to significantly reduce emissions of SO_2, NO_x, and PM_{10}, both nationally and in Minnesota. Subsequently, these emission reductions should enhance the air quality in Minnesota's Class I areas and would likely continue the decline in monitored $PM_{10}/_{2.5}$ concentrations in Voyageurs and the BWCAW. When taken in total, the reasonably foreseeable actions (proposed projects + regulatory actions) are expected to result in a net improvement in air quality in Voyageurs and the BWCAW and it is likely that $PM_{10}/_{2.5}$ air concentrations in Voyageurs and the BWCAW would continue to decline.

5.1.3 Mitigation Opportunities

Particulate controls incorporated into the Minnesota Steel proposal include the integrated facility design, installation of Best Available Control Technologies and use of natural gas rather than oil or coal. Measures to reduce SO_2 and NO_x emissions also contribute to minimizing PM_{10} concentrations since these can form sulfate and nitrate fine particulates. The $LoTO_x$™ system can therefore be considered to be a mitigation strategy. Other 'reasonably foreseeable' future projects would also identify mitigation strategies as part of their associated environmental review processes. Due to anticipated statewide future emission reductions, $PM_{10}/_{2.5}$ concentrations in Voyageurs and BWCAW are likely to continue to improve. Therefore, no additional mitigation strategies are proposed by Minnesota Steel for Class I air quality impacts due to particulates.

5.2 ACID DEPOSITION AND ECOSYSTEM ACIDIFICATION IN CLASS I AREAS

5.2.1 Affected Environment

5.2.1.1 Summary of Issues/Overview

The *Cumulative Impacts – Minnesota Iron Range Industrial Development Projects Ecosystem Acidification* report completed in 2006 (here after called 2006 Acidification CI Study) evaluated whether the cumulative acid precursor emissions from the Minnesota Steel project near Nashwauk could cause or significantly contribute to ecosystem acidification in northeast Minnesota. The 2006 Acidification CI Study evaluated whether the potential cumulative air emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) from the proposed Minnesota Steel project could cause or significantly contribute to ecosystem acidification in northeast Minnesota. The 2006 Acidification CI

Study focused on emissions of SO_2 and NO_x because they are the two primary pollutants of concern with regard to ecosystem acidification (acid precursors). This section summarizes that analysis.

The Minnesota Steel Scoping EAW and Final SDD defined a semi-quantitative approach to assess potential cumulative impacts of ecosystem acidification. Critical elements of the acidification analysis include:

- A summary of acid deposition trends in Minnesota, including analyses by the MPCA (1985) in setting an acid deposition standard and emissions control plan, and analyses by the National Acid Precipitation Assessment Program (NAPAP 1990).
- The potential maximum emissions from the Minnesota Steel project, plus the potential emissions increases and decreases due to the following reasonably foreseeable actions and potential regulatory actions:
  - Additional Proposed Projects:
    - PolyMet Mining Inc. – NorthMet Project;
    - Excelsior Energy – Mesaba Energy Coal Gasification Plant;
    - Laurentian Wood Fired Energy Project;
    - Mesabi Nugget Company – Direct Reduced Iron (DRI) plant;
    - Northshore Mining Company – Furnace 5 Reactivation Project;
    - United Taconite Line 1 Emissions and Energy Reduction Project (EERP);
    - UPM/Blandin Paper Mill – Thunderhawk Project; and
    - U.S. Steel – Keewatin Taconite – Fuel Diversification and Pollution Control Equipment Upgrade;
  - Voluntary and Regulatory Actions
    - Minnesota Power – Arrowhead Regional Emission Abatement (AREA) Project*
    - Shutdown of the LTV Steel Mining Company (LTVSMC) taconite furnaces;
    - Implementation of the Clean Air Interstate Rule (CAIR);
    - Implementation of the Regional Haze Rule and Best Available Retrofit Technology (BART);

*Minnesota Power's AREA Project and subsequently announced emission reductions at its Clay Boswell Unit 3 were not identified in the Scoping EAW list of reasonably foreseeable actions to be included in the cumulative impacts analysis. However, due to the significance of this voluntary action in reducing emissions in northeast Minnesota, it is included to provide additional perspective on the potential emissions from the proposed projects. The MPCA estimated that the AREA Project would reduce SO_2 emissions by 3,550 tons/yr, and NO_x by 3,750 tons/yr (MPCA 2006b).

This semi-quantitative assessment used emission trend analysis to assess the potential cumulative acidification impacts of these reasonably foreseeable actions. The analysis first summarized the relationship between acid precursor emissions and acid deposition. It then compared potential acid precursor emissions from the proposed projects to the emissions from existing taconite facilities and coal-fired power plants in the four-county project area. Finally, it summarized historic nationwide emission trends and predicted future trends to evaluate likely acidification rates in the region.

5.2.1.2 Background Information on the Ecosystem Acidification Process

Relationship between Emissions and Deposition

Both SO_2 and NO_x are long-range transport pollutants. This means that they can travel long distances in the atmosphere while subject to complex atmospheric chemical and physical processes before being washed out or deposited back down onto land, lakes, and rivers. The MPCA has determined that about 90 percent of the acid deposition in northeastern Minnesota is caused by emissions from sources located outside the state, primarily from states to the south and east of Minnesota (MPCA 1985). As a result, Minnesota emission sources tend to have minimal impact on the amount of acid deposition falling in Minnesota. The MPCA's analysis, along with similar findings from other states and NAPAP (1990) provided the basis for the USEPA to develop a national strategy for reducing emissions of SO_2 and NO_x rather than relying solely on individual state regulatory actions.

Acid Precursors/Atmospheric Processes

Acidic deposition occurs when gaseous precursors are converted by atmospheric processes to compounds that are either acidic themselves or can be easily converted to acidic compounds by interactions with terrestrial or aquatic compounds. Sulfur oxides (SO_x) and NO_x are probably the best-recognized acid precursors, and in some cases, ammonia, emitted primarily by livestock operations, can also be an acid precursor. Sulfur dioxides (SO_2)is the predominant oxide of sulfur species emitted. Most of our discussions from the 2006 Acidification CI Study focused on SO_2, but other forms of sulfur species are emitted and can contribute to sulfate deposition.

Acidic compounds are formed in the atmosphere by a complex group of gas- and aqueous-phase chemical reactions between acid precursors and other atmospheric compounds such as VOCs, ozone, and hydrogen peroxide, often catalyzed by sunlight. At the same time, air masses can transport these compounds for long distances, in some cases thousands of kilometers, from their origin (hence the term long-range transport) (National Research Council 1983). One of the results from this complexity of atmospheric reactions is the strong likelihood of nonlinear responses to emission reductions (West et al., 1999).

Emission Sources

There are a variety of sources of SO_2 and NO_x emissions. Using national data for the period from 1970 to 2002, electric utilities are the major source of SO_x (primarily as SO_2), contributing about two-thirds of all emissions. Other major source categories include industrial fuel use (about 13 percent) and metals processing (7 percent). The emissions of SO_2 are primarily related to the sulfur content of the fuels being burned.

In contrast, although utilities are a major source of national NO_x emissions (about 25 percent), highway (41 percent) and off-highway (14 percent) transportation are also major source categories. In the case of NO_x emissions the oxides arise from fixation of atmospheric nitrogen at high temperatures, and hence are more dependent on the combustion process than on the properties of the fuel (Husar 1986). For both pollutants, the proportional contribution of emissions from various source categories does not vary greatly year-to-year because most source categories are simply not amenable to rapid changes. The proportional distribution of SO_x and NO_x emissions from the respective source categories in Minnesota is very similar to the national distribution.

Wet Deposition

Wet deposition occurs when aerosols directly combine with droplets of water as they condense during formation of precipitation, or the aerosols can be “washed out” of the atmosphere during a rain or snow event. Deposition of acidic aerosols in this manner is referred to as “acid rain”. In general, sulfate (SO_4) is a good proxy for deposition of acidic materials associated with SO_2 emissions, and nitrate (NO_3) is a proxy for the deposition of acidic materials associated with NO_x emissions. Sulfate-associated acidity constitutes about 60 percent of acidic deposition, and nitrate-associated acidity about 40 percent (MPCA 1993).

Dry Deposition

Some of the acidic aerosols do not fall with precipitation, but instead come directly into contact with and remain on surfaces such as tree leaves. This process is continuous; deposition is not dependent on a precipitation event. Such deposition is referred to as dry deposition or dryfall. Depending on the nature of the atmosphere, the collecting surface, and climatic conditions, dryfall can account for as much or more of the acidic materials delivered to an ecosystem as wet deposition. For example, total wet and total dry depositions are thought to be of approximately equal magnitude over eastern North America (Stenslund et al. 1986). Forest canopies, especially those of conifers, are very efficient at filtering these aerosols from the atmosphere and hence dry deposition is greater in forests than in more open vegetation types (Hultberg 1985). Some fraction of the nitric acid also remains in a gaseous form, and direct uptake of that gas by plants is an important mode of dry deposition for nitrogen (Lindberg et al. 1986).

Source-Receptor Relationships/Models

The qualitative or quantitative relationship between the emission of acid precursors at their source(s) and the air concentration and deposition of acidic materials at a receptor (source-receptor relationship – SRR) has considerable uncertainty (Venkatram 1991).

Throughout the 1980s, the scientific community dedicated significant resources to developing acid deposition modeling capabilities. The NAPAP 1990 Integrated Assessment relied primarily on a then state-of-the-art model called the Regional Acid Deposition Model (RADM). The model was designed to provide a scientific basis for predicting changes in deposition resulting from changes in sulfur and nitrogen emissions, to predict the influence of emission sources in one region on acid deposition in other regions, and to predict the levels of acid deposition in certain sensitive receptor regions. Updated versions of RADM are still considered by most modelers to be the highest quality acid deposition model currently available for the eastern United States (NAPAP 2005).

The results of most modeling efforts indicate that sulfur deposition at remote receptors is dominated by wet deposition, with the sulfur originating from sources at distances as large as 500 km from these receptors (Venkatram 1991). On a national basis, for source regions aggregated by state, no one source region contributed more than about 15 percent to the sulfur deposition at remote receptors. Thus, sulfur deposition at remote receptors, including northeastern Minnesota, is *not* dominated by one or two source regions. Source regions as far away as 1,000 km contributed to the deposition, even though their relative contributions are as small as 1 to 2 percent. For example, one analysis indicates that only 13 percent of the wet sulfate deposition in the Upper Midwest region (Iowa, Michigan, Minnesota, and Wisconsin) is derived from sources within the region, with sources in Illinois, Missouri, Indiana, and Texas each contributing about 10 percent of the deposition (Shannon 1999).

Effects on Ecosystems

Terrestrial Systems: The most important long-term impact of air pollution on terrestrial ecosystems is the potential of altering soil properties. Soils are the basic resource or substrate from which the terrestrial ecosystem derives its existence. Soils are resistant to change. Various natural processes tend to both buffer soil properties against change and to restore those properties toward their initial state following disturbance. Accumulation of organic matter and weathering of minerals can rebuild an eroded soil. The amount of acids added annually by atmospheric deposition, even in the worst cases, is a small portion of the total chemical buffering capacity of surface soils (McFee 1982).

Aquatic Systems: Acidic deposition can affect water quality by lowering pH levels (i.e., increasing acidity); decreasing acid-neutralizing capacity (ANC); and increasing aluminum concentrations. Direct acidic deposition onto lakes can directly reduce pH, as can runoff from soils that have been acidified. The ANC of an aquatic system measures that balance between cations such as calcium and magnesium and strong acid anions (i.e., sulfate and nitrate). The same factors that can lower pH of aquatic systems therefore can also lower ANC. Finally, just as in soils, as pH drops in aquatic systems inorganic aluminum can become more available to biota.

Low pH and soluble aluminum can have deleterious effects of aquatic biota, reducing both abundance and species diversity. In some cases, although the average water quality in aquatic systems is within the range of tolerance of biota, seasonal acidification can occur. This is the periodic increase in acidity and the corresponding decrease in pH and ANC in streams and lakes caused by a sudden pulse of acids and/or a dilution of base cations (e.g., calcium, magnesium, sodium, potassium) due to spring snowmelt and large rain events (Wigington et al. 1996). These short-term increases in acid inputs can reach levels that are lethal to fish and other aquatic organisms (Baker et al. 1996; Van Sickle et al. 1996). In the United States, effects of acidic deposition on aquatic systems have been most prominent in acid-sensitive areas of New York and other areas of the Northeast.

5.2.1.3 Analysis Boundaries

The Scoping EAW and Final SDD concluded that the following boundaries should define the extent of the analysis for the ecosystem acidification Cumulative Impacts Study:

1. The timeframe for the trends analysis, both past and future
   - The timeframe for this analysis is 1980-2020.

2. The list of specific past and future projects to be assessed in addition to the Proposed Project, including type, geographic limits, and project status.
   - Figure 5.1.1 shows the general locations of the “reasonably foreseeable” projects to be assessed for cumulative impacts, as well as the locations of existing taconite facilities and federally protected Class I areas. The projects selected as “reasonably foreseeable” are defined as those that are already underway, or for which a completed data portion of an environmental assessment worksheet has been submitted to the MNDNR or the MPCA. The following projects are included because they are underway or “reasonably foreseeable”:
     - Excelsior Energy – Mesaba Energy Coal Gasification Plant;
     - Laurentian Energy Project in Hibbing and Virginia;
     - Mesabi Nugget Company – DRI Plant;
     - Minnesota Steel DRI/Steel Plant;
     - Northshore Furnace 5 Reactivation Project;

- PolyMet Mining NorthMet Project;
- United Taconite Line 1 Emissions and Energy Reduction Project (EERP);
- UPM/Blandin Paper Mill Expansion –Thunderhawk Project, and
- U.S. Steel-Keewatin Taconite Fuel Diversification and Pollution Control Upgrade.

The closure of the LTV Steel Mining Company is also included because the NorthMet project and the Mesabi Nugget Project are located at the former LTV site in Hoyt Lakes. The closure of Butler Taconite is also discussed because that facility was located near the proposed site for Minnesota Steel, but emission reductions are not included in the analysis because reliable past actual emission data for SO_2 and NO_x are not readily available from company files, the MPCA or the USEPA.

3. The specific geographic area of concern ("zone of impact"), including resources, ecosystems, and populations of concern.
   - The zone of impact for this analysis is considered to be the area encompassed by Itasca, St. Louis, Lake, and Cook Counties.

4. The extent and geographic limits of other sources that may affect resources in the zone of impact, for the specific issue under study.
   - The resources of concern—such as the lakes in the BWCAW or Voyageurs—are affected by air emissions not only from local and regional sources, but also by sources located throughout the Midwest and throughout the country.

5. Other direct and indirect factors that need to be evaluated, such as ecosystem assimilation capacity (in this case acid buffering capacity), and any potential additive, synergistic, and counterbalancing cumulative impacts.
   - The critical assimilation capacity for acidification is the watershed buffering capacity of the area, which was discussed previously in Section 5.2.1.2 of this document.

See Figure 5.1.1 for locations of Federal Class I Areas within 250 kilometers and existing taconite mining operations, and proposed 'reasonably foreseeable' projects in northeast Minnesota.

5.2.1.4 Acid Deposition Overview

Acid Deposition in Minnesota: Regulation, Current Status, Trends

Depending on watershed buffering capacity and other factors, aquatic ecosystems can be harmed when precipitation pH is less than 4.7. In general, sulfate (SO_4) is a good proxy for deposition of acidic materials associated with SO_2 emissions, and nitrate (NO_3) is a proxy for the deposition of acidic materials associated with NO_x emissions. The Acid Deposition Control Act of 1982 required the MPCA to identify sensitive resources in the state and adopt an acid deposition standard and emissions control plan. In 1986, the MPCA established a wet sulfate deposition standard of 11 kilograms per hectare (kg/ha) and a statewide SO_2 emissions cap of 194,000 tons per year (tons/yr) (emissions cap effective on January 1, 1994). Currently, wet sulfate deposition in Minnesota is below the 11 kg/ha standard (~ 6 to 7 kg/ha in 2004). Total statewide SO_2 emissions are approximately 160,000 tons/yr (132,000 tons/yr from point [i.e., stack] sources).

Due to the long-range transport of SO_2 and NO_x emissions, acid deposition rates in northeastern Minnesota are mostly driven by national emissions, not local emissions. National reductions in SO_2 emissions have reduced acid deposition across the U.S., particularly in the eastern one-half of the country. Wet sulfate deposition in northern Minnesota and other parts of the Midwest has declined by about one-third since the early 1980s. More recently, however, sulfate deposition in northern Minnesota has not changed significantly since about 1997, despite continued nationwide emission reductions. Nevertheless, wet sulfate deposition rates in Minnesota are below the state annual wet sulfate deposition standard of 11 kg/ha, a level that is designed to protect the acid-sensitive ecosystems. Further, these sulfate deposition rates are expected to continue to slowly decline as reasonably foreseeable regulatory actions are implemented.

Nitrogen deposition (both nitrate and total inorganic nitrogen), which contributes about 40 percent of the acid inputs to ecosystems, has not declined in northern Minnesota, but has remained at approximately the same levels since the mid-1980s. Nitrogen deposition in Minnesota is expected to remain the same, or decline slightly, over the next decade because of anticipated power plant and mobile-source emission reductions.

Cumulative Project Emissions and Statewide Trends

Cumulative potential SO_2 emissions from the reasonably foreseeable projects are approximately 2,413 tons/yr. In 1980, statewide actual SO_2 emissions were about 250,000 tons/yr (MPCA 1990). Currently, total actual SO_2 emissions in Minnesota (all sources) have been reduced to approximately 160,000 tons/yr (MPCA 2006a), of which about 82 percent are from point sources (about 132,000 tons/yr). Minnesota annual point source SO_2 emissions fluctuate from year to year, but have remained about 130,000 tons/year since 1990. (MPCA 1997; MPCA 2004). Based on total statewide emissions, the cumulative potential emissions from the proposed projects represent about a 1.5 percent potential increase in statewide SO_2 emissions.

The potential increase in SO_2 emissions from the proposed projects is offset by past and future actions.

- The AERA Project would reduce SO_2 emissions by about 3,550 tons/yr (MPCA 2006b), which alone is more than the total projected potential emissions from all the proposed Iron Range Projects (2,413 tons/yr).
- The 2001 shutdown of the LTVSMC taconite furnaces, which had permitted SO_2 emissions of approximately 4,500 tons/yr (potential to emit basis), or 1,150 tons/yr (past actual average emissions).
- Of the current inventory of approximately 160,000 tons/yr, approximately 100,000 tons/yr is from electric generating units. The Clean Air Interstate Rule (CAIR) would cap electric utility SO_2 emissions at 50,000 tons/yr in 2010 and 38,000 tons/yr by 2015. This requires a decrease of approximately 50,000 tons/yr by 2010 and an additional 12,000 tons by 2015. The caps may be met through voluntary reductions (such as the AREA projects), installation of controls, or allowance trading.
- Additional emission reductions due to BART requirements on taconite facilities and electric generation units may be possible.

Cumulative potential NO_x emissions from the reasonably foreseeable projects are approximately 7,725 assuming uncontrolled NO_x emissions and 6,455 tons/yr assuming controlled NO_x emissions. (These data reflect Minnesota Steel's most recent estimate of NO_x emissions documented in a revised emission inventory submittal to the MPCA in September 2006). Although point-source NO_x

emissions have declined recently, total statewide NO_x emissions have been increasing gradually since the mid-1980s, and are currently about 483,600 tons/yr (MPCA 2006a). Of this, about 31 percent is from point sources (150,000 tons/yr). As discussed in section 5.1.2, the potential increase in NO_x emissions due to the projects is about 1.3 to 1.6 percent of total statewide emissions.

The potential increase in NO_x emissions from the proposed projects is offset by past and future actions.

- The AERA Project would reduce NO_x emissions by about 3,745 tons/yr (MPCA 2006b), which alone is more than the total projected potential emissions from all the proposed Iron Range Projects (2,413 tons/yr).
- The 2001 shutdown of the LTVSMC taconite furnaces, which had permitted NO_x emissions of approximately 4,900 tons/yr (potential to emit basis), or 760 tons/yr (past actual average emissions).
- Of the current inventory of approximately 483,600 tons/yr, approximately 90,000 tons/yr is from electric generating units. The Clean Air Interstate Rule (CAIR) would cap electric utility NO_x emissions at 50,000 tons/yr in 2009 and 26,000 tons/yr by 2015. This requires a decrease of approximately 40,000 tons/yr by 2009 and an additional 24,000 tons by 2015. The caps may be met through voluntary reductions (such as the AREA projects), installation of controls, or allowance trading.
- Additional emission reductions due to BART requirements on taconite facilities and electric generation units may be possible.

Northeastern Minnesota Four County Trends

Emissions of SO_2 in the four county area identified for analysis (Itasca, St. Louis, Lake, and Cook) show an increasing trend from 1996 through 2004 having increased approximately 45 percent over that period (data from Table 6, 2006 Acidification CI Study). The 2004 data shows a total of approximately 38,000 tons/yr for SO_2 emissions in those counties. The proposed Minnesota Steel project represents an increase of 1.4 percent of the four county inventory (using 2004 as a baseline). The total of the reasonably foreseeable projects emissions increase represents a 6.3 percent increase when compared to the four county inventory, (using 2004 as a baseline).

Data for NO_x emissions shows less change. Over the same period emissions have increased only slightly – approximately 2.5 percent. The 2004 data shows a total of approximately 53,400 tons/yr for NO_x. The proposed Minnesota Steel project represents an increase of approximately 3 to 6 percent, depending on the level of NO_x control, of the four county inventory (using 2004 as a baseline). The total of the reasonably foreseeable projects emissions increase represents approximately a 12 to 15 percent increase when compared to the four county inventory; depending on the level of NO_x control (using 2004 as a baseline).

Effects of proposed voluntary and regulatory decreases previously discussed would affect emissions inventories in the four counties. The AREA projects by Minnesota Power, and the shutdown of LTVSMC taconite furnaces are expected to decrease emissions in the four county area. Also as discussed previously, acidification impacts do not occur in the local area of the emissions. Therefore, no direct correlation between emissions in the four county area and acidification impacts in that area should be inferred.

National Emission Trends

Nationally, SO_2 emissions are currently about 16 million tons/yr, which is about 32 percent below that emitted in 1990. Total electric generating unit emissions are about 10.5 million tons/yr. By 2010, existing acid rain regulations would cap national SO_2 emission allowances from electric generation units at 8.7 million tons annually, or about 2 million tons/yr below existing levels. In addition, USEPA's recent CAIR rule requires additional reductions of SO_2 and NO_x in twenty-three eastern and southern states. USEPA (2005b) expects the CAIR rule to cut nationwide utility SO_2 emissions to 6.1 million tons/yr by 2010, to 5.0 million tons/yr by 2015, to 4.3 million tons/yr by 2020, and finally, to 3.5 million tons/yr at full implementation.

Nationally, NO_x emissions have also declined over the last fifteen years. In 2003, total annual NO_x current emissions were about 18 percent below 1990 levels, with most of these reductions occurring in the late 1990s. Nitrogen oxide (NO_x) emissions from electric generators have been reduced from 5.5 million tons/yr in 1990 to about 4.4 million tons/yr currently. NO_x emissions from electric generation units in the affected CAIR states would be further reduced by 50 percent by 2010, and by 60 percent by 2015. In addition, USEPA required mobile source regulations are expected to further reduce NO_x emissions in Minnesota and nationwide between 2007 and 2010 (MPCA 2005). The current estimate is that mobile source programs are expected to reduce mobile source NO_x emissions by over 70,000 tons/year in Minnesota.

5.2.2 Environmental Consequences

The following items outline the results and environmental consequences of the 2006 Acidification CI Study:

1. The potential cumulative emissions from the projects (~ 2,413 tons/yr of SO_2; ~ 6,455 to 7725 tons/yr of NO_x depending on the level of NO_x control) represents 1.5 percent of statewide SO_2 emissions and 1.3 to 1.6 percent of statewide NO_x emissions.
2. The potential cumulative emissions from the projects represents approximately 6.3 percent of the four county SO_2 emissions and 12 to 15 percent of the four county NO_x emissions.
3. Existing SO_2 emissions in Minnesota have a small contribution to acid deposition in the state; approximately 10 percent of the acid deposition falling in Minnesota is due to in-state sources. Approximately 90 percent comes from outside the state (MPCA 1985; Shannon 1999). The estimated potential increase in SO_2 and NO_x emissions from the proposed projects is therefore expected to have a minor impact on acid deposition in Minnesota (10 percent of 1.5 percent and up to 1.6 percent for SO_2 and NO_x, respectively.)
4. The potential cumulative emissions are small compared to national emissions inventories, which are expected to decrease due to implementation of various voluntary and regulatory programs.
5. Current levels of acid deposition in northern Minnesota are below thresholds of concern. Wet sulfate deposition is less than 11 kg/ha (~ 6 – 7 kg/ha in 2004), and the pH of precipitation is greater than 4.7.
6. Lake survey work from the early 1990s indicates that Minnesota's aquatic and terrestrial ecosystems have sufficient buffering capacity to withstand current levels, and projected future levels, of acid deposition (Eilers and Bernert 1997). Similarly, Minnesota's terrestrial ecosystems are well-buffered against negative impacts of acid deposition. Due to this inherent buffering capacity, no adverse impacts to aquatic and terrestrial ecosystems are expected due to the potential emissions from the proposed projects.
7. Minnesota's SO_2 and NO_x emissions are expected to continue to decline due to reasonably foreseeable voluntary and federally required actions, which should help to offset any potential emissions increases from the proposed projects.

8. Since 90 percent of Minnesota's acid deposition comes from outside the state, the reasonably foreseeable federal regulatory actions and associated national emission reductions should continue to decrease acid deposition in Minnesota due to out-of-state sources.

Based on the assessment of acid deposition and emissions trends on a state and national level, the cumulative potential emissions from the proposed projects do not have the potential to cause or significantly contribute to ecosystem acidification.

5.2.3 Mitigation Opportunities

Minnesota Steel has incorporated into its project several measures which minimize emissions of SO_2 and NO_x. These include integrated facility designs which would use less energy than conventional steel making, installation of Best Available Control Technologies including low sulfur fuels and NO_x burners. Low sulfur diesel would be used in mining equipment and haul trucks. $LoTO_x$™ can also be considered to be a mitigation strategy. Other 'reasonably foreseeable' future projects would also identify mitigation strategies as part of their environmental review and permitting processes. Due to anticipated future emission reductions, ecosystem acidification is likely to continue to improve. Therefore, no additional mitigation strategies are identified for Minnesota Steel to address ecosystem acidification.

5.3 MERCURY EMISSIONS, DEPOSITION AND BIOACCUMULATION

A cumulative impacts analysis evaluating potential impacts from mercury deposition and bioaccumulation as a result of reasonably foreseeable future actions was performed as a special study for the Minnesota Steel EIS. The results of the analysis were described in a technical memorandum, *Cumulative Impacts – Minnesota Iron Range Industrial Development Projects, Mercury Deposition and Evaluation of Bioaccumulation in Fish in Northeast Minnesota*, completed in October 2006 (hereafter called the '2006 Mercury CI Study'). This section summarizes the analyses from the study.

5.3.1 Affected Environment

5.3.1.1 Summary of the 2006 Mercury CI Study Scope

The Scoping EAW defined the scope to be used as the basis for assessing the potential cumulative impacts from reasonably foreseeable future actions with respect to mercury deposition and bioaccumulation, using semi-quantitative analysis methodology. Critical elements of the analysis included:

- A summary of mercury deposition in Minnesota, including:
  - The issue of long-range pollutant transport
  - Findings from studies that assessed mercury deposition and bioaccumulation in fish tissue in Minnesota's aquatic ecosystems
  - Emission source contributions based on national and state modeling efforts
- Summary of state actions and the state's proposed statewide Total Maximum Daily Load (TMDL) for mercury which calls for a 93 percent reduction in Minnesota's mercury emissions.
- Assessment of potential emissions increases and decreases due to reasonably foreseeable actions, which include proposed projects and potential regulatory actions through 2020.

The following projects and actions were included in the 2006 Mercury CI Study analysis:

- Projects:
  - Excelsior Energy – Mesaba Energy Coal Gasification Plant (Phase I and Phase II);
  - Laurentian Wood Fired Energy Project;
  - Mesabi Nugget Company –DRI plant;
  - Minnesota Steel Mining/Taconite/DRI/Steel plant;
  - Northshore Mining Company – Furnace 5 Reactivation Project;
  - PolyMet Mining Company – NorthMet Project;
  - United Taconite Emissions and Energy Reduction Project;
  - UPM/Blandin Paper Mill Expansion – Thunderhawk Project, and
  - U.S. Steel – Keewatin Taconite – Fuel Diversification and Pollution Control Equipment Upgrade.
- Actions (emission reductions):
  - Butler Taconite – shutdown of taconite furnaces in 1985;
  - LTV Steel Mining Company (LTVSMC) – shutdown of taconite furnaces in 2001;
  - Minnesota Power – Arrowhead Regional Emission Abatement (AREA) Project, and
  - Xcel Energy's Metropolitan Emission Reduction Project (MERP); (Existing Power Plants with Proposed Modifications).

Data for other sources, statewide and national emissions, and potential future trends were evaluated in the context of the following regulatory and voluntary emission reduction efforts:

- The Minnesota Mercury Reduction Act of 2006*
- Implementation of the Clean Air Mercury Rule (CAMR), and the related CAIR
- Implementation of the Electric Utility MACT Standards
- Implementation of the Taconite MACT Standards
- Implementation of the Regional Haze Rule and Best Available Retrofit Technology (BART)**
- The MPCA TMDL proposal
- The MPCA Voluntary Agreements and other ongoing state mercury reduction programs

* The Minnesota Mercury Reduction Act was signed into law May 11, 2006 and is expected to result in mercury reductions of more than 1,100 pounds per year. Therefore, this "action" was included in the cumulative impacts analysis.

** Regional Haze Rule and BART were not originally identified for inclusion in this analysis. However, the control of SO_2, NO_x, and/or fine particulate ($PM_{2.5}$) may result in mercury air emissions being reduced from those sources as well. Therefore, the Regional Haze Rule and BART were included in the analysis.

5.3.1.2 Analysis Boundaries

The following boundaries were used to define the extent of the analysis for the Mercury CI Study:

1. The timeframe for the trends analysis, both past and future
   - The timeframe for the analysis was 1980 to 2020.

2. The list of specific past and future projects to be assessed in addition to the proposed Minnesota Steel project, including type, geographic limits, and project status.
   - Figure 5.1.1 shows the general locations of the "reasonably foreseeable" projects to be assessed for cumulative impacts. The projects and regulatory actions selected as reasonably foreseeable for this analysis are listed in Section 5.3.1.1.

3. The specific geographic area of concern ("zone of interest"), including resources, ecosystems, and populations of concern.
    - The "zone of interest" is defined as the area of concern to be evaluated for potential impacts due to the multiple proposed projects. For mercury deposition and bioaccumulation in fish the selected zone of interest was defined as northeast Minnesota, essentially the area consisting of the following four counties: Itasca, St. Louis, Lake, and Cook. This area of the state is in the vicinity of the proposed Minnesota Steel project and is highly prized for its many fishing lakes and streams and noted
4. The extent and geographic limits of other sources that may affect resources in the zone of impact, for the specific issue under study
    - This boundary defines the area or sources that may affect resources in the zone of interest. In this case, the resources of concern—such as the lakes in northeast Minnesota—are affected by air emissions not only from local and regional sources, but also by sources located throughout the Midwest, throughout the country, and in the case of mercury, throughout the world. The 2006 Mercury CI Study report summarizes mercury emission trends from sources within the zone of interest, as well as from the state of Minnesota and the United States. It also briefly considers global emissions.

5.3.1.3 Mercury Transport and Bioavailability Background Information

5.3.1.3.1 Mercury Speciation and Transport

As described in Section 4.7.2.3, the speciation of mercury from source stack emissions determines the fate and range of transport of mercury emissions. Air emission species of mercury and their relative ability to be transported 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 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 (less than 2.5 microns) to be transported further.

5.3.1.3.2 Mercury Methylation and Bioaccumulation

The relationship among mercury air emissions, deposition to aquatic systems and mercury accumulation in fish is complex. Mercury deposited in lake sediment and wetlands can be transformed into methylmercury by sulfate-reducing bacteria. Methylmercury readily bioaccumulates in the food chain and accounts for nearly all the mercury present in fish. Due to the importance of sulfate-reducing bacteria in mercury methylation, it may be possible to obtain reductions in methylmercury formation by decreases in sulfate deposition. Sulfate deposition trends in Minnesota and expected future emissions of sulfur dioxide (SO_2), on a local (four-county area), regional (Upper Midwest) and national basis are expected to decrease. Section 5.2 (Acid Deposition and Ecosystem Acidification) discusses cumulative impact analyses related to sulfate deposition.

Mercury methylation depends on the presence of multiple interacting reactants, including mercury, sulfate, organic matter and bacteria, and one or more of these interacting reactants can be limiting. Therefore, it is difficult to predict the extent of future mercury methylation anticipated to occur. Nevertheless, the current scientific understanding is that, in general, for any given water body the amount of mercury accumulating in fish is roughly proportional to the amount of mercury deposited on the watershed. Therefore, the 2006 Mercury CI Study made the semi-quantitative assessment of the potential impact of the proposed projects on mercury bioaccumulation in fish in northeastern Minnesota lakes by assessing the extent to which the projects are likely to affect mercury deposition in that area.

5.3.2 Environmental Consequences

Table 5.3.1 summarizes the estimated future mercury emissions and for the reasonably foreseeable future projects assessed in the cumulative impacts study. Estimated reasonably foreseeable future emissions reduction projects are also listed and summarized in the table.

TABLE 5.3.1 LIST OF PROPOSED PROJECTS AND EMISSION REDUCTIONS EVALUATED IN THE 2006 MERCURY CUMULATIVE IMPACTS REPORT

Project	**Location**	**Potential Emissions (pounds/year)**
Excelsior Energy	Subject to State Site Process	42
Mesabi Nugget DRI Plant	Hoyt Lakes	75
Minnesota Steel	Nashwauk	81
Northshore Mining Company: Furnace 5 Reactivation Project	Silver Bay	1
PolyMet Mining, NorthMet Project	Hoyt Lakes	3
United Taconite: Emissions and Energy Reduction Project	Forbes	0
US-Steel Keewatin Taconite Fuel Diversification and Pollution Control Equipment Upgrade	Keewatin	0
UPM/Blandin Paper Mill Expansion	Grand Rapids	2
Laurentian Wood-Fired Energy Project	Virginia/Hibbing	12
Total		216
LTV Steel Mining Company (LTVSMC): Facility Closure (2001)	Hoyt Lakes	-83
Minnesota Power AREA proposal (implemented by 2009)	Taconite Harbor	-64
"Net" Emissions: Net Emissions = Proposed Projects – LTVSMC – AREA		69
Other Emissions: Butler Taconite	Nashwauk	-55

Source: *Cumulative Impacts – Minnesota Iron Range Industrial Development Projects, Mercury Deposition and Evaluation of Bioaccumulation in Fish in Northeast Minnesota*, October 2006; Table 1.

When compared to existing regional mercury deposition rates, increased deposition rates of 1.6 percent across the Arrowhead region (for all future reasonably foreseeable projects) were estimated, based on the following assumptions:

- Speciation for the reasonably foreseeable future projects included in the cumulative impacts analysis was approximately 93 percent elemental, 5 percent oxidized, and 2 percent particle-bound mercury;
- Annual mercury emissions from Minnesota Steel are estimated at 81 pounds per year (see Section 4.7.2.3), and the total of all reasonably foreseeable new facilities (including Minnesota Steel) are estimated to emit 216 pounds;
- An estimated 90 percent of mercury emissions are transported out of Minnesota;
- Current deposition of mercury across Minnesota is uniform, and is 12.5 $ug/m^2/yr$.

Minnesota Steel's potential elemental mercury air emissions are expected to become part of the large atmospheric pool of elemental mercury. The addition of 216 pounds per year of mercury to the atmospheric pool from the reasonably foreseeable future projects (including Minnesota Steel) 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% 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.
- By adding 216 pounds per year Minnesota's 2005 emissions would increase 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.

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 Minnesota Steel project or any other reasonably foreseeable future project to deposition at any given location, while likely, is not expected to be detected.

The 2006 Mercury CI Study also provided a description and a summary of estimated future mercury reductions that could result from voluntary actions and the 2006 Mercury Reduction Act. These estimated mercury reductions are summarized, along with the estimated future reasonably foreseeable project increases, in Table 5.3.2.

TABLE 5.3.2. MERCURY EMISSIONS SUMMARY: PROPOSED REASONABLY FORESEEABLE PROJECTS AND EXPECTED FUTURE REDUCTIONS DUE TO MINNESOTA VOLUNTARY ACTIONS AND THE 2006 MERCURY REDUCTION ACT

Description	Mercury Emissions (lbs/year)
Total Statewide Emissions in 2000*	3,638
Emission Reductions from Point Sources 2000-2003**	(188)
Potential Emission Increases from Proposed Projects***	216
Reasonably Foreseeable Future Emission Reductions (2003-2015)****	(1,334)
Total	2,332
Net Change in Mercury Emissions Due to Reasonably Foreseeable Actions*****	(1,306)

* Statewide emissions of 3,638 pounds per year from the MPCA's "2005 Mercury Reduction Progress Report to the Legislature".
**Emission reductions include: 70 pounds per year due to Minnesota Power's switch to Western coal; 83 pounds per year due to LTV Steel Mining Company plant closure in 2001; 35 pounds per year Xcel Energy switch from coal to natural gas at the Black Dog facility.
***Proposed Projects: In addition to the Minnesota Steel project and PolyMet Mining's NorthMet project, seven other proposed projects are included in this analysis, including the Mesabi Nugget DRI project. Table 5.3.1 lists the proposed projects included in this analysis and their estimated potential mercury emissions.
****Future emission reductions include: 64 pounds per year, Minnesota Power AREA project; 170 pounds per year, Xcel Energy MERP; 1,100 pounds per year 2006 Mercury Reduction Act. The relationship between the emission reductions anticipated under the 2006 Mercury Reduction Act and the Clean Air Mercury Rule is uncertain at this time. To avoid double counting reductions, the estimated reductions due to the Clean Air Mercury Rule are not included in this table.
*****Additional reductions due to the implementation of the Statewide Mercury Total Maximum Daily Load (TMDL) are not included here. The TMDL goal is to reduce Minnesota mercury emissions to approximately 789 pounds per year. Based on the estimated "Total" emissions of 2,332 pounds per year, an additional reduction of 1,543 pounds per year (a 66 percent reduction) would be needed to meet the TMDL goal.
Source: *Cumulative Impacts – Minnesota Iron Range Industrial Development Projects, Mercury Deposition and Evaluation of Bioaccumulation in Fish in Northeast Minnesota*, October 2006; Table OV-1.

Conclusions

Based on the findings summarized above, potential cumulative impacts from the future reasonably foreseeable projects analyzed, taking into account the emission increases from the proposed projects, voluntary actions that reduce emissions, and regulatory actions that reduce emissions, do not appear to have the potential to significantly cause or contribute to mercury deposition and/or bioaccumulation in fish in northeast Minnesota lakes or streams.

5.3.3 Mitigation Opportunities

5.3.3.1 Project-Related Mitigation

Section 4.7.2.3 describes efforts made to reduce mercury emissions from the proposed Minnesota Steel project, including use of natural gas fuel and selection of feedstock. Additional reductions in Minnesota Steel's mercury emissions may be possible in the future through the application of the $LoTO_x$™ technology. Any future reductions in mercury emissions would further reduce the facility's impact on the environment. Other future reasonably foreseeable projects would be required to demonstrate their efforts to reduce mercury emissions through emission controls, processing decisions, etc.

With respect to mercury methylation as it related to bioaccumulation, it should be noted that (as described in Section 4.5), Minnesota Steel proposes to re-use its processing and tailings basin water (including seep water), eliminating project water discharges. This would eliminate sulfate discharges that are commonly associated with taconite mining operation water discharges; thereby, decreasing the potential for local increases in mercury methylation and resulting potential impacts to bioaccumulation of mercury in fish.

5.3.3.2 Regulatory Mitigation

In addition, the estimated reductions from the 2006 Minnesota Mercury Reduction Act shown in Table 5.3.2 demonstrate the importance of regulatory programs in potentially reducing mercury emissions. This Act focuses on reducing emissions from coal-fired power plants, which produce substantial amounts of mercury emissions. Similar state and federal emissions regulatory requirements would help to further reduce mercury emissions in Minnesota, since long-range transport from other parts of Minnesota and from other states contributes to northeast Minnesota's mercury deposition problems.

5.4 VISIBILITY IMPAIRMENT

5.4.1 Affected Environment

5.4.1.1 Summary of Issues/Overview

In July 1999, the USEPA published regulations intended to improve visibility in our nation's largest national parks and wilderness ("Class I") areas. On June 15, 2005, USEPA issued final amendments to its July 1999 rule. This rule and amendments are referred to as the Regional Haze Rule, or the Clean Air Visibility Rule. Minnesota has two Class I areas – the Boundary Water Canoe Area Wilderness (BWCAW) and Voyageurs National Park (Voyageurs). The 2005 USEPA amendments require emission controls known as Best Available Retrofit Technology, or BART, for certain industrial facilities emitting air pollutants that reduce visibility. Also, by December 2007, the Minnesota Pollution Control Agency (MPCA) must submit to USEPA a State Implementation Plan (SIP) that identifies sources that contribute to visibility impairment in these areas and demonstrate reasonable progress toward reaching a specific 2018 visibility goal.

A cumulative impacts analysis assessing the potential visibility impacts on Federal Class I areas was performed as a special study for the Minnesota Steel EIS. The results of the analysis were described in a technical memorandum, *Cumulative Impacts – Assessment of Potential Visibility Impacts in Federal Impacts Class I Areas in Minnesota*, completed in November 2006 (hereafter called the '2006 Visibility CI Study').

5.4.1.2 Summary of the 2006 Visibility CI Study Scope - Background

What is Regional Haze?

Persistent, widespread visibility problems in areas like national parks are primarily caused by fine particles less 2.5 microns in diameter ($PM_{2.5}$). Coarse particles (predominantly soil dust) and gaseous nitrogen dioxide (NO_2) can also contribute in some areas. Fine aerosol particles consist almost entirely of just five pollutants: sulfates, nitrates, organics, elemental carbon, and soil dust. Most of the visibility impairment in the BWCAW and Voyageurs is due to sulfates, nitrates and organic compounds. These compounds are not typically emitted directly but are formed in the atmosphere through chemical reactions. Sulfur dioxide forms sulfate, and nitrogen oxides and ammonia form nitrates. Volatile organic compounds (VOCs) react to form secondary organic compounds which condense into fine particulate matter. Consequently, the air emissions from man made sources most often responsible for regional haze are sulfur dioxide, nitrogen oxides, primary volatile organic particles, gaseous volatile organic compounds, elemental carbon, soil material, and ammonia.

In the absence of precipitation, fine aerosol particles (and their gaseous precursors) can exist in the atmosphere for many days and can be carried great distances by winds. Therefore, regional haze is often primarily caused by conversion and transport of gaseous precursor emissions from distant sources. In addition, organic particles are produced as primary emissions from natural sources such as wildfire smoke, plant waxes, and pollen and as a result of conversion of volatile organic compound emissions such as terpenes and other hydrocarbons from trees and other natural sources. Note that regional haze does not depend on stagnant meteorological conditions.

Measuring Visibility

Because visibility is difficult to measure directly, it usually is estimated from monitored ambient particulate concentrations. Measured concentrations of each of the major particulate components are multiplied by a specific factor to arrive at a total “light extinction coefficient” (b_{ext}). Higher light extinction coefficients indicate decreased visibility. A visibility metric, called “deciviews.” Is used by the USEPA. Deciviews are a logarithmic conversion of light extinction coefficients that reflect more accurately how humans perceive visibility impairment. Visibility impairment often varies substantially from week to week and season to season.

5.4.1.3 Visibility Impairment “Cumulative Impact” Approach

The scope of the cumulative impact analysis for the Minnesota Steel EIS was completed in essentially four general steps:

1. Assess the IMPROVE data for Voyageurs and/or the BWCAW to provide the current status of PM_{10} air concentrations (depending on data availability), including a trends analysis (improvement, no change, or continued degradation given past, current and/or expected future emission reductions);

2. Assess available modeling results that identify emission sources and/or emission source regions as significant contributors to ambient air concentrations in the Class I areas located in Minnesota;

3. Evaluate statewide SO_2, NO_x, and PM_{10} emissions and trends using existing statewide emission inventory data (listing of sources and ton/year emissions). A detailed trend analysis providing a breakout of emissions by geographic area of the state is contained in the 2006 Visibility CI Study and is not repeated here.

4. Evaluate the cumulative impacts from the proposed projects based on the potential increases in SO_2 and NO_x, and PM_{10} emissions in Minnesota from current and reasonably foreseeable projects and the projections for state and national emissions in regard to expected decreases in the future.

5.4.1.4 Analysis Boundaries

The Scoping EAW and Final SDD concluded that the following boundaries should define the extent of the analysis for the visibility cumulative impacts study:

1. The timeframe for the trends analysis, both past and future.
   - The timeframe for this analysis was 1980 to 2020.

2. The list of specific past and future projects to be assessed in addition to the proposed project, including type, geographic limits, and project status
   - The following projects and actions are considered to be underway or "reasonably foreseeable":
   - Proposed Projects:
     - Cliffs Erie Railroad Pellet Transfer Facility;
     - Excelsior Energy, Mesaba Energy Project, Coal Gasification Power Plant;
     - Laurentian Wood Fired Energy Project;
     - Mesabi Nugget Company, DRI Plant;
     - Minnesota Steel Industries, Mining/Taconite/DRI/Steel Plant;
     - Northshore Mining Company, Furnace 5 Reactivation Project;
     - PolyMet Mining, NorthMet Project;
     - United Taconite, Emissions and Energy Reduction Project;
     - UPM/Blandin Paper Mill Expansion, Project Thunderhawk, and
     - U.S. Steel-Keewatin Taconite, Fuel Diversification and Pollution Control Equipment Upgrade.
   - Actions that reduce emissions:
     - Butler Taconite, facility closure (1985);
     - LTVSMC Taconite Furnaces shutdown;
     - Minnesota Power AREA Project (voluntary; proposed), and
     - Xcel Energy MERP (voluntary; initiated).
   - Regulatory actions:
     - Implementation of the Taconite MACT;
     - Implementation of the Regional Haze Rule and BART Rule;
     - Implementation of the CAIR Rule;
     - The NOx SIP call (40 C.F.R. parts 51, 72, 75, 96);
     - USEPA proposed rule for NO_x in Class I areas (Fed. Register, Vol. 70, No. 35);
     - State acid rain rule and statewide SO_2 emissions cap, and
     - Title IV of the 1990 Clean Air Act Amendments.

3. The specific geographic area of concern ("zone of impact"), including resources, ecosystems, and populations of concern.
   - The selected zone of impact was defined as Voyageurs and the BWCAW. Voyageurs is primarily located in St. Louis County, while the BWCAW encompasses parts of St. Louis, Lake, and Cook Counties.

4. The extent and geographic limits of other sources that may affect resources in the zone of impact, for the specific issue under study.
   - The resource of concern is visibility in the BWCAW and Voyageurs.

5.4.2 Environmental Consequences

5.4.2.1 Proposed Projects and Summary of Potential Emissions

Table 5.4.1 shows the estimated potential emissions of SO_2, NO_x, and particulate matter less than 10 microns (PM_{10}) from each of the proposed projects included in this analysis. Emission reductions due to the 2001 closure of the LTV Steel Mining Company (LTVSMC) taconite plant in Hoyt Lakes and other "reasonably foreseeable actions" included in the cumulative impacts analysis are provided for comparison to the emissions estimated for the proposed Minnesota Steel project.

TABLE 5.4.1 MAXIMUM POTENTIAL SULFUR DIOXIDE, NITROGEN OXIDE, AND PARTICULATE EMISSIONS FROM PROPOSED PROJECTS IN THE FOUR-COUNTY PROJECT AREA IN COMPARISON TO SELECTED LIKELY STATEWIDE EMISSION REDUCTIONS. (FOUR-COUNTY PROJECT AREA = ITASCA, ST. LOUIS, LAKE, AND COOK COUNTIES)

Project	Locations in Minnesota	SO_2 (tpy)	NO_x (tpy)	PM_{10}[15] (tpy)	BACT/ MACT[16]
POTENTIAL INCREASES					
Cliff Erie Railroad Pellet Transfer Facility [1]	Hoyt Lakes	0	0	140	No
Excelsior Energy, Mesaba Energy Project [2]	Subject to PUC Site Process	1,300	2,822	478	Yes
Laurentian Wood Fired Energy Project [3]	Hibbing and Virginia	50	302	50	Yes
Mesabi Nugget DRI Plant [4]	Hoyt Lakes	417	954	514	Yes
Minnesota Steel Industries (with and without $LoTO_x$™) [5]	Nashwauk	539	1,599 3,142	1,525	Yes
Northshore Mining Company: Furnace 5 Reactivation [6]	Silver Bay	56	200	149	Yes
PolyMet Mining, NorthMet Project [7]	Hoyt Lakes	15	247	2,269	Yes
United Taconite – Emissions and Energy Reduction Project [8]	Forbes	0	0	14	Yes
UPM/Blandin Paper Mill Expansion: Project Thunderhawk [9]	Grand Rapids	1	23	2	Yes
US-Steel Keewatin Taconite, Fuel Diversification and Pollution Control Upgrade [10]	Keewatin	35	35	-287	Yes
Total Potential Increases ("net") (With and Without $LoTO_x$™)		2,413	6,182 7,725	4,855	
REDUCTIONS					
LTV Steel Mining Company: (Closure in 2001) [11]	Hoyt Lakes	1,150 [~4,500]	760 [~4,900]	3,720 [~11,079]	N/A
Minnesota Power – AREA Proposal [12] (voluntary action by 2009)	Aurora; Schroeder	3,552	3, 745	--	Yes
Butler Taconite [14]	Nashwauk	n/a	n/a	1,372	N/A
Total Estimated Actual Emission Reductions ("net")		4,702	4,505	5,092	
Net Emissions = Total Potential Increases – Total Estimated Reductions (With and without $LoTO_x$™)		(2,289)	1,677 3,220	(-237)	

Prepared September 2005; updated July 2006:

(1) Estimated limited emission increase from modification; PTE increase for permitting purposes is -3.8 tons per year due to contemporaneous decrease in PTE from shutdown of currently idled "LTV" equipment, from Technical Support Document for Air Emissions Permit No. 13700009-005, Table 1.

(2) Preliminary emission estimates (Phase 1 & 2) based on emission factors and heat inputs provide on Excelsior Energy Web site, www.excelsiorenergy.com, initially accessed on October 28, 2005.

(3) Potential to emit from Technical support documents for Virginia Public Utilities (MPCA permit #13700028-005) and Hibbing Public Utilities (MPCA permit #13700027-003)

(4) Mesabi Nugget's Proposed Direct Reduced Iron (DRI) Facility: No crushing/grinding at the site; receive concentrate from off-site. Air Permit Application, May 2005.

(5) SO_2 estimates assume controlled emissions for the pellet plant and DRI plant.

(6) Northshore Mining's Furnace 5 Project: reactivating 2 crushing lines, 9 concentrating lines, one pellet furnace (Furnace 5); new sources emissions only; EAW Table 6 (May 20, 2005).

(7) PolyMet Mining's Proposed Facility: crushing/grinding of ore, reagent and materials handling, flotation, hydrometallurgical processing. Emissions from Scoping EAW Tables 23-2, 23-3, NO_x emissions: very conservative estimates of emissions because natural gas fired boilers operating at maximum capacity to generate heat and steam for all processes. Process changes have occurred since public notice of the EAW that affect particle emissions. Additional changes are likely to occur prior to finalizing the air permit. The current conservative estimate of PM_{10} emissions for the proposed NorthMet project is 2,269 tons/year (1,170 tons/year stack emissions, 52 percent; 1,099 tons/year fugitive emissions, 48 percent). Final emission calculations would be submitted in support of the air permit application.

(8) United Taconite – A minor permit amendment has been submitted to the MPCA. The projected increase in actual PM_{10} emissions, for PSD permitting purposes, is 14 tons/yr. The maximum permitted PM_{10} emissions are not yet available from the MPCA. The project is also expected to reduce NOx emissions by ~ 2,000 tons/yr. However, since the permit amendment is only for PM_{10} emissions increase, the NO_x reduction was not included in this table. United Taconite LLC - Fairlane Plant, Forbes, Minnesota, MPCA, Permit Change/Modification Application Forms, Line 1 Emissions and Energy Reduction Project (EERP), September 2004.

(9) Difference in permitted allowable emissions from Blandin Project Thunderhawk Draft EIS, January, 2006.

(10) U.S. Steel Keewatin; Technical Support Document Permit Action #13700063-003, Dated 2/28/05

(11) LTVSMC: Actual past emissions as annual average emissions since 1996, from http://www.pca.state.mn.us/data/edaAir/index.cfm; downloaded on December 14, 2005. Permitted emissions (potential to emit) information from Technical Support Document for Air Emissions Permit No. 13700009-001, Table 1. Potential emissions are in parenthesis.

(12) MPCA, January 17, 2006, Review of Minnesota Power's Arrowhead Regional Emission Abatement (AREA) Project. Table 12. (MPCA 2006a). Just prior to the MNDNR's Final SDD being made available to the public on October 25, 2005, Minnesota Power announced a major initiative to reduce pollutant emissions, including mercury, at several of its power plants in northern Minnesota. Due to the significance of the AREA project in regard to air emission reductions, this future project has been included in this analysis.

(14) Butler Taconite facility closed in 1985. Estimates of SO_2 and NO_x emissions are not available, but historical PM_{10} data are available. Emission reduction of 1,370 tons/year PM_{10} is included (85 percent of 1,615 tons per year TSP assumed as PM_{10}). From *Iron Range Air Quality Analysis*, MRI Draft Final Report to MPCA, MRI project No. 4523-L(2) June 5, 1979 (1976 inventory). Assumption of 85 percent TSP as PM_{10} based on Hannah Mining Co. (1980) submittal to MRI and MPCA dated August 8, 1980.

(15) PM_{10} emission estimates include point and fugitive emissions for all sources at a facility.

(16) MACT = Maximum Achievable Control Technology; BACT = Best Available Control Technology.

Abbreviations:

Tpy = tons per year;
BACT = Best Available Control Technology
MACT = Maximum Achievable Control Technology
SO_2 = sulfur dioxide
PM_{10} = particulate matter less than 10 micrometers in size
NO_x = nitrogen oxides
PUC = Public Utilities Commission
AREA = Arrowhead Region Emission Abatement
MERP = Metropolitan Emission Reduction Project
N/A = not applicable
DRI = Direct Reduced Iron

The PM_{10} emissions in Table 5.4.1 include both stack and fugitive emissions for all projects [see note (15)]. For regional haze and visibility impairment, emissions from high temperature stacks are considered to be of most importance due to their height of emission, potential buoyancy and ability to travel long distances. Fine particle emissions are typically associated with stack emissions. Fugitive emissions are typically coarse particulate and are most often ground-level emissions, having the potential for local air quality impacts near the facility, but likely not associated with impacts at distance from a facility. Past and projected direct emissions of PM_{10} are used as a surrogate for direct emissions of $PM_{2.5}$ because readily available MPCA emissions inventory data only report PM_{10} emissions and $PM_{2.5}$ data are only available for 2004.

The MPCA emissions inventory data that was readily available to the public as of January 2006 and used in the cumulative impacts analysis is for total facility emissions and includes both fugitive emissions and stack emissions. For certain types of facilities, such as mining facilities, fugitive emissions can account for 50 percent or more of the particulate emissions. The inclusion of PM_{10} fugitive emissions in the analysis likely overestimates the potential cumulative impacts from the proposed projects in regard to the visibility impairment that is related to direct emissions of particulate (i.e., PM_{10}) since these emissions typically fall out near where they are generated and would not reach the Class I areas.

5.4.2.2 Summary of Visibility Cumulative Impacts Analysis

The following items outline the results and environmental consequences of the 2006 Visibility CI Study:

1. Class I Area Visibility Gradually Improving. Between 1992 and 2004, visibility in the BWCAW on the 20 percent worst visibility days improved from 21.4 deciviews to 19.8 deciviews, based on a rolling 5-year average. This 1.6 deciview reduction is equivalent to about a 16 percent improvement in visibility. Visibility also appears to have improved by more than 2.0 deciviews in Voyageurs, although continuous data at a single site are not available at Voyageurs as they are in the BWCAW.

2. Sulfate Particles are Largest Contributor. Sulfate particulates are the largest contributor to visibility impairment in the BWCAW year round. Organic carbon particulates are the second largest contributor in warm weather months (April through September). Nitrates are the second largest contributor in cold weather months (October through March). Elemental carbon, soil, coarse particulate matter and gaseous species are minor contributors.

3. Improvement Due to Reduced Sulfate and Nitrate Particulates. The 1.6 deciview improvement in the BWCAW on the 20 percent worst visibility days is mostly due to a reduction in sulfate particulate concentrations, although nitrate particulate concentrations also declined. Between 1992 and 2004, the calculated light extinction coefficient due to sulfate particulates declined by 24 percent, and the extinction coefficient due to nitrate particulates declined by 22 percent. Changes in organic carbon concentrations did not significantly impact visibility in the BWCAW, although organic carbon concentrations did decline in Voyageurs.

4. Nature of Visibility Impairment. Local industrial sources have a limited impact on visibility in BWCAW and Voyageurs, based on $PM_{2.5}$ data and preliminary regional modeling and back-trajectory analyses. Modeling and other studies indicate that 65 percent to 90 percent of the secondary sulfate and nitrate particulates in Minnesota Class I areas are formed from SO_2 and NO_x emitted by many sources located outside the state—primarily in the eastern United States and Canada. The source of the increase in organic carbon fine particulates in the summer is not clear, but may be due in part to wildfires.

5. Local Emissions – Changes and Effects. MPCA emission inventory data indicate that point source air emissions of both SO_2 and direct PM_{10} in northeast Minnesota have increased somewhat since 2001. Over the same time period, however, sulfate particulate concentrations and visibility have not changed significantly in the BWCAW and Voyageurs. In part, this may be because 30 percent to 70 percent of the direct PM_{10} emitted by taconite facilities are relatively larger fugitive emissions that deposit within a mile of the facility. It is also possible that local SO_2 and NO_x emissions do not completely transform into secondary particulates fast enough to affect the nearby BWCAW or Voyageurs.

6. Small Magnitude of Cumulative Project Impact. Worst-case total potential emissions from the proposed Iron Range projects represent a comparatively small increase in statewide emissions: less than 1percent of PM_{10}, 1.5 percent of SO_2, and 1.3 to 1.6 percent of NO_x emissions, depending on the current level of NO_x controls, statewide.

7. Impact of National Emission Reductions. Over the next decade, voluntary and mandatory reductions in SO_2, NO_x and direct particulate emissions from exiting sources in Minnesota and nationwide are likely to more than offset emissions from the proposed projects. However, despite currently planned overall emission reductions in Minnesota and nationwide, it is possible that reasonable progress targets for visibility improvement in Minnesota Class I areas would not be met without further emission reductions.

Conclusions

The extent of potential visibility impairment for the Proposed Project alone is discussed in detail in Section 4.7.2.2.2. That analysis shows a potential for visibility impacts, depending on the success of $LoTO_x$™. Minnesota Steel would be required to mitigate any visibility impacts over visibility thresholds for Class I areas.

This section addresses the cumulative impacts of the Proposed Project and reasonably foreseeable projects. The cumulative analysis conducted shows a gradual improvement in visibility and in particular noted that sulfates have the largest impact. The net emissions change calculated in Table 5.4.1 shows a decrease in SO_2 emissions and therefore potentially a decrease in sulfate impacts from the cumulative projects.

Table 5.4.1 shows an overall net reduction in SO_2 and PM_{10} emissions and a net increase in NO_x emissions. The net increase for NO_x is approximately equal to the magnitude of the project emissions. Therefore, to the extent that the Proposed Project emissions are mitigated as discussed in section 4.7.2.2.2, the net result should be no change or a decrease in net impacts (i.e. any project related emissions are mitigated and other projects, which would be required to offset impacts to visibility, show a potential decrease in emissions) for the cumulative project analysis.

5.4.3 Mitigation Opportunities

As noted in the conclusion above, Minnesota Steel would be required to mitigate any visibility impacts over visibility thresholds for Class I areas. That conclusion also indicates that no mitigation beyond that required for the project would be required to address cumulative impacts.

As noted in previous sections Minnesota Steel has already incorporated into its project several measures which minimize emissions of regional haze causing pollutants including the integrated facility design that uses less energy than traditional steel making, installation of best available control technologies, and use of clean burning natural gas. Nitrogen Oxide (NO_x) emissions in the case of Minnesota Steel are the largest contributor of regional haze causing emissions. The DRI technology selected by Minnesota Steel would reduce NO_x emissions compared to other technologies. Minnesota Steel has committed to testing an innovative technology, $LoTO_x$™, that has been shown to reduce emissions NO_x. If demonstrated to be technically and economically feasible, Minnesota Steel has committed to installing this additional control technology.

The State of Minnesota is currently preparing a document to describe the regional haze problem in Minnesota. It would be completed by the end of 2007. In addition, the MPCA is currently completing source-apportionment modeling in support of the regional haze plan for a number of facilities. This modeling would provide more information on this subject and indicate whether additional mitigation at Minnesota facilities would be required to meet regional haze goals.

Each proposed project would potentially be subject to emission reductions for its emissions alone based on results of environmental review analyses and future MPCA regional haze analysis.

5.5 LOSS OF THREATENED AND ENDANGERED PLANT SPECIES

5.5.1 Affected Environment

5.5.1.1 Summary of Issues/Overview

Minnesota's Endangered Species Law (MS 84.0895) and associated Rules (Chapter 6212.1800 to 6212.2300 and 6134) and the Federal Endangered Species Act of 1973, as amended (16 U.S.C. 1531 – 1544) impose a variety of restrictions, permits, and exemptions pertaining to plant and animal species that have been designated as threatened and endangered. Significant impacts are not expected, but based on the information in Section 6.3 of this EIS, it is assumed that the project would result in the taking of several state-listed threatened or endangered plant species. Therefore, the Scoping EAW and Final SDD committed that an analysis would be performed to assess the cumulative loss of those threatened/endangered plant species populations that are anticipated to be affected by the Proposed Action. The scoping documents describe the approach to be used in performing the cumulative impacts analysis, using a semi-quantitative analysis of past, present and reasonably foreseeable future conditions.

The cumulative impacts analysis was performed as a special study for the Minnesota Steel EIS. The results of the analysis were described in a technical memorandum, *Cumulative Impacts – Threatened and Endangered Plant Species*, completed in November 1, 2006 (hereafter called the '2006 T/E Plant CI Study'). This section summarizes the results of that analysis.

5.5.1.2 Summary of the 2006 T/E Plant CI Study Scope

Species to be Assessed – The Scoping EAW identified potential project impacts to four threatened and endangered species and three species of special concern, and stated that those seven plant species would be addressed in the EIS cumulative impacts analysis. Minnesota Steel used information in the Scoping EAW and the results of botanical surveys conducted in 1999 and 2005 to develop a revised Proposed Action plan that reduces the impact on threatened and endangered plant species from seven species down to three species (*Botrychium oneidense*, *Botrychium pallidum*, and *Botrychium rugulosum)* at one location, a former tailings basin in the proposed crusher area north of Pit 6. (Section 6.3 of this EIS describes project-specific impacts.) Therefore, the cumulative impacts analysis was performed only for the three threatened and endangered plant species that are currently expected to be impacted by the Proposed Project.

<u>Study Area</u> – Because the MNDNR is charged with administering the program to protect state-listed threatened and endangered species, the entire state was the geographic boundary for analysis.

<u>Time Period</u> – The analysis of cumulative impacts assessed three time periods: past, present, and the reasonably foreseeable future. A description of present conditions was used to create a baseline for analyzing past and future impacts. Past impacts include species losses since the time of European settlement. Impacts in the reasonably foreseeable future are forecasted for 27 years, consistent with the Minnesota Steel projection of two years of construction, 20 years of operations, and five years of closure.

5.5.1.3 Summary of Species Life History

The 2006 T&E Plant CI Study provides detailed descriptions of the life history of each of the three species of concern. Differences between the species arise mainly in their preferred habitats and required disturbance regimes. *Botrychium* habitat needs vary widely, primarily based on microhabitat conditions of soil moisture, nutrient availability, disturbance regime, and access to sun and shade. Important characteristics related to each species' life history are summarized in Table 5.5.1.

TABLE 5.5.1 SUMMARY OF SPECIES LIFE HISTORY

Factor	***B. oneidense***	***B. pallidum***	***B. rugulosum***
State status	Endangered	Endangered	Threatened
Range	Eastern species	Northern species	St Lawrence Seaway
Preferred habitat	Hardwood forest edges	Aspen forest edges	Pine forest edges
Disturbance regime preference	Low disturbance around wet depressions within mature forests	Continual disturbance along roadways, pastures, and tailings basins	Continual disturbance along roadways, pastures, and tailings basins
Limiting factors	Mycorrhizal health Soil moisture Partial shade Spore source	Mycorrhizal health Soil moisture Partial shade Spore source	Mycorrhizal health Soil moisture Partial shade Spore source
Threats	Exotic earthworms Global warming Logging Altered forest habitat Altered hydrology Lakeshore homes	Exotic earthworms Global warming Logging Altered forest habitat Altered hydrology Lakeshore homes Forest succession	Exotic earthworms Global warming Logging Altered forest habitat Altered hydrology Lakeshore homes Forest succession

5.5.1.4 Existing (Baseline) Conditions and Past Losses

The 2006 T/E Plant CI Study describes the data sources and methodology used to define the existing extent of each *Botrychium* species, based primarily on a ‘preferred habitat’ approach. The analysis utilized information from the MNDNR’s Natural Heritage Information System (NHIS) Element Occurrence entries in the database, including descriptions of observed habitat type and mapping of the statewide distribution for each species. Analysis of past losses was based on available historic habitat mapping and information about changing habitat conditions over time. Past losses for which the MNDNR has issued takings permits were also considered in the analysis.

A preferred habitat for each *Botrychium* species was assigned by tabulating the entries from the NHIS database that provided habitat descriptions. Based on these descriptions, the entries were assigned to one of the 13 general habitat types, and the observed habitat type that occurred most frequently for each species was identified as the ‘preferred habitat’ (see Table 5.5.1). [It should be noted that the number and level of detail of NHIS entries is limited, and that the categorization of species based on preferred habitats doesn’t take into account the importance of microhabitats, perhaps the most important determinant in species distribution. Simplifying preferences to general habitats, therefore introduces some error. Unfortunately, data is only available to the level of detail of general habitats, not microhabitats. Thus, the determination of preferred habitat in this analysis is a rough estimate, based on available data, with the understanding that the data has limitations, as described in more detail in the 2006 T/E Plant CI Study.]

In very general terms, it is possible to quantify habitat loss in the state of Minnesota over the past 100 years. The MNDNR tracks the amount of habitat in Minnesota’s 25 Ecological Classification System (ECS) subsections. An estimate of the habitat loss that has occurred with European settlement for the state as a whole and the Proposed Project area’s local subsection (Nashwauk Uplands) was made by comparing mapping from 1890 (Marschner maps) and 1990 (MNDNR GAP mapping). The changes in the preferred habitat cover for each of the three *Botrychium* species are shown in Tables 5.5.2 through 5.5.4. The areas shown in these tables were measured from the Marschner and MNDNR GAP mapping, but the percentage loss/gain is reported as a range rather than as a specific percentage, to reflect the limited accuracy of the mapping data.

Generally speaking, potential habitat has been reduced across the state by 25-50 percent for *B. oneidense* and *B. rugulosum* and by 10-25 percent for *B. pallidum.* However, it is important to remember that there are many complex factors influencing plant distribution. Key factors certainly include habitat quality, availability of spore source, the disturbance regime, microclimate conditions, and the presence of water.

TABLE 5.5.2 UPLAND DECIDUOUS FOREST (HARDWOODS) AREA CHANGES

Upland Deciduous Forest (Hardwoods)	1890 Total 1,000 Acres	1990 Total 1,000 Acres	Loss (Gain) 1,000 Acres	Loss Percent
Nashwauk Uplands	60	10	50	75-100
Statewide	4,500	2,320	2,180	25-50

Source: *Tomorrow’s Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*

TABLE 5.5.3 UPLAND DECIDUOUS FOREST (ASPEN/BIRCH) AREA CHANGES

Upland Deciduous Forest (Aspen/Birch)	1890 Total 1,000 Acres	1990 Total 1,000 Acres	Loss (Gain) 1,000 Acres	Loss Percent
Nashwauk Uplands	260	245	15	5-10
Statewide	8,370	7,060	1,310	10-25

Source: *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*

TABLE 5.5.4 UPLAND CONIFEROUS FOREST AREA CHANGES

Upland Coniferous Forest	1890 Total 1,000 Acres	1990 Total 1,000 Acres	Loss (Gain) 1,000 Acres	Loss Percent
Nashwauk Uplands	145	80	65	25-50
Statewide	3,210	1,700	1,510	25-50

Source: *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*

5.5.1.5 Alteration of the Forest Disturbance Regime and Soil Hydrology

In addition to direct habitat loss due to conversion of forests to other land uses, the 2006 T/E Plant CI Study described changes in forest 'disturbance regime' and soil hydrology that have occurred since the start of European settlement in Minnesota. These changes are summarized below. Not all changes result in negative impacts to the three Botrychium species of concern – changes to the disturbance regime that create increased forest edge may be beneficial.

The original disturbance regime was primarily fire, with occasional wind storms and episodes of disease. The resulting forest was a dynamic mosaic of diversity, with a mixture of young and old-growth patches, rather than a forest of uniform age. New openings were continually being created within the forest resulting in the early successional edges typically favored by the species of interest. These openings eventually closed up again as the forest matured.

Changes in disturbance regime and/or hydrology that resulted from European settlement include:

- Fire suppression, resulting in more uniform-aged forest stands.
- Settlement, agriculture, mining, and road building create permanent openings (edges) in the forest.
- Logging every 50 to 70 years artificially maintains early successional plant communities and prevents forest maturation from occurring, thereby altering the composition of forest species. Heavy machinery used in the logging process compacts soil and may impact spore banks and mycorrhizal fungi in the soil.
- Only about 4 percent of Minnesota's remaining forest is old-growth (vs. approximately 51 percent of pre-settlement forests). Mature hardwood forests are preferred by *B. oneidense*.
- Global warming (generally believed to result from human activities) is predicted to increase the frequency of heavy precipitation events (NRC, 2001). Changes in the frequency, intensity, and location of other climate-modulated factors such as wind storms are more difficult to project. As climate changes, alterations in the future patterns and frequency of these forest disturbances are possible.
- The invasion of human-introduced exotic earthworms has been shown to be detrimental to mycorrhizal health in the duff layer (Nixon, 1995).

All three Botrychium species tend to occur in upland areas around wetlands, under the shady protection of trees between the wetland edge and the forest edge. The plants and their associated mycorrhizia depend on the availability of moisture in the soil. Logging and agriculture remove vegetative cover and the cooling shade it provides but can cause a rise in the water table due to reduced evapotranspiration in areas with perched water tables and limited opportunities for drainage[3].

Mine stockpiles and tailings basins create permanent edges in the surrounding forest that can provide good habitat for *B. pallidum* and *B. rugulosum*, but mine pits may also interrupt surface water flow and the availability of moisture in the soil. Most wetlands and water bodies in the project area are perched on impermeable layers and are not hydrologically connected to groundwater supplies. Therefore, alterations to surface water flow can result in impacts to soil moisture.

5.5.2 Environmental Consequences

5.5.2.1 Future Reasonably Foreseeable Conditions

Potential land use trends and patterns in the reasonably foreseeable future (over the next 27 years) were assessed, as a means of estimating the potential extent of *Botrychium* species loss, based on estimated levels of habitat removal and habitat disturbance. The 'reasonably foreseeable' future impacts considered in the cumulative impacts analysis include: PolyMet, East Reserve (formerly Ispat Inland), Minnesota Steel, and planned economic development zones. The Scoping EAW indicated that the Mesabi Nugget Project and the Cliffs Erie pellet railroad loading project would also be included in the 'reasonably foreseeable actions' in the EIS threatened and endangered species cumulative impacts analysis. However, those projects were not included in the analysis because these two potential future projects have not been developed to the point where detailed data is available re: plant species and potential project impacts.

5.5.2.2 Other Potential Future Impacts

Other potential future impacts to the species of interest within Minnesota include anything that may alter forest composition, reduce forest cover, or change the availability of moisture in the soil. The demand for paper and wood products would likely continue to increase and cause logging to further impact *B. oneidense*, *B. pallidum*, and *B. rugulosum* by removing forest cover and converting hardwoods and pine forests into aspen forests. Removing forest vegetation also eliminates shade and its cooling effect. Hotter, drier soils result in less favorable growing conditions for the species of interest. The potential scale of future logging activities in the Arrowhead Region was projected as part of the 2006 *Cumulative Effects Analysis on Wildlife Habitat Loss/Fragmentation and Wildlife Travel Corridor Obstruction/Landscape Barriers in the Mesabi Iron Range and Arrowhead Regions of Minnesota* study completed for MNDNR. This study documented projected future habitat losses within ecological subsections in the Arrowhead Region. Based on reasonably foreseeable future actions (logging, mining and economic development) over the next 27 years, logging affected a substantially greater number of total acres of land, compared to mining and development – primarily within the North Shore Highlands and Border Lakes ecological subsections.

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[3] see FL example at: http://soil.scijournals.org/cgi/content/full/66/4/1344; see Canada example at: http://www.suoseura.fi/suo/pdf/Suo56_Jutras.pdf.

The invasion of exotic earthworms and other forest pests is made easier by disturbance. Roads, development, logging, agriculture, and mining activities fragment forest habitat into ever smaller patches and create vectors for exotic species to invade native habitats. The presence of exotic earthworms is detrimental to mycorrhizal health in the duff layer. (Nixon, 1995)

Although there is potential for more (and more severe) extreme weather episodes in a warmer atmosphere, modeling and data are inconclusive. (NRC, 2001). Increasing temperatures may have a drying effect on soil moisture. If climate and habitat zones move north as temperatures increase there could be dramatic impacts on forest composition in the state of Minnesota. *B. oneidense, B. pallidum*, and *B. rugulosum* are already at the southern and western limits of their natural ranges.

5.5.2.3 Summary of Past and Future Cumulative Impacts

Logging and development have probably had the greatest impact on forest habitats – and therefore, by extension the species of interest – across the state of Minnesota over the last 100 years. Both would continue to impact forests in the future. Development impacts would likely occur in the proximity of existing development, while logging would likely continue to impact the more remote portions of the state.

Mining activities have altered large tracts of Minnesota's forest habitat in the past. Future mining activities would likely have less of an impact, since areas proposed for mine expansion have in most cases already been disturbed by previous mining activities for stockpiles and tailings basins (see discussion in the Wetland Cumulative Impacts Technical Memorandum also prepared as a study for the Minnesota Steel EIS). Mining activities may even create favorable conditions for *B. pallidum* and *B. rugulosum* within tailings basins as long as suitable forest habitat remains around the basin (see Table 5.5.1 disturbance regimes).

Invasive exotic species have impacted native plant and animal species elsewhere in the state of Minnesota. It is not unreasonable to expect that their arrival in the forests of northern Minnesota would have similar impacts on the species of interest. The potential extent of these impacts, plus the impacts of global warming and acid rain, are difficult to estimate.

5.5.3 Mitigation and Monitoring

5.5.3.1 Mitigation

Expanded mining activities are not expected to be a substantial contributor to future statewide cumulative impacts to the three species of concern, compared to past and probable future impacts from logging and development or the potential impacts of global warming and invasive pests, as described in the previous section. Most of the mining impacts would occur in areas that have been impacted in the past by mining, and some of the mining impacts may be temporal, not permanent, impacts. For example, the *Botrychium* population identified for taking by the Minnesota Steel action is located under a mixed poplar/aspen stand adjacent to a sparsely vegetated open area of mine tailings. It is reasonable to assume that at the end of mining activities, growing conditions around the tailings basins may once again be favorable for the same *Botrychium* species to become re-established. However, since the favorable growing conditions would not likely occur until reclamation, this temporal impact would likely extend through the anticipated 27-year mining and reclamation period, and possibly further into the future, since it would take time for favorable growth conditions to develop in the disturbed areas.

An appropriate mitigation strategy in the case of *Botrychium*, a species whose ecology and life history are not well understood, would be to provide research data to develop a better understanding of the ecology and distribution of the species. Research that correlates the occurrences of *Botrychium* species to the disturbance regime (age, length, type of disturbance, etc.) and physical conditions (soils, hydrology, associated vegetation, etc.) at those locations would aid in establishing favorable growing conditions and the restoration of *Botrychium* populations in and around the tailings basins at the end of mining operations.

A portion of this research might include transplanting the affected *Botrychium* populations to a suitable location in the vicinity of the mining area, as a way to minimize impact and evaluate the effectiveness of transplanting as a mitigation strategy. For example, initial results of the Enbridge Pipeline monitoring study for transplanted *Botrychium* populations indicated a 69 percent survival rate of *Botrychium* transplants after 3 years. As described in Section 6.3.3, Minnesota Steel has proposed a transplanting plan as mitigation for project impacts to *Botrychium* species. The plan has been submitted to MNDNR for review as part of their review of the takings permit. If the takings permit and the proposed transplanting plan are approved, a 5-year monitoring period of any transplanted plants would be required. This monitoring could provide additional information to assist in evaluating transplanting as a mitigation strategy.

5.5.3.2 Monitoring

The overall status of existing *Botrychium* populations in the state can be monitored on an on-going basis by the MNDNR through their 'takings permit' program – which requires projects that would potentially impact threatened or endangered species to assess, avoid (if possible) and mitigate potential species impacts.

5.6 LOSS OF WETLANDS

5.6.1 Affected Environment

5.6.1.1 Summary of Issues/Overview

Minnesota's Wetland Conservation Act (Minnesota Rules 8420) regulates wetland resources with a goal of no net loss. Section 404 of the Clean Water Act regulates waters of the U.S., which includes jurisdictional wetlands. Both state and federal permits for unavoidable wetland impacts require the replacement of lost wetland resources at a minimum 1:1 ratio, although the state and federal regulations differ in their definitions of regulated 'wetlands' (e.g., state regulations exempt impacts to 'incidental' wetlands [i.e., wetlands that were created as a result of an action, such as mining, taken for a purpose other than creating the wetland(s)]).

A cumulative impacts analysis of wetlands loss was performed as a special study for the Minnesota Steel EIS. The results of the analysis are presented in a technical memorandum (see listing in Appendix I) *Cumulative Impacts – Wetlands*, completed in November 2006 (hereafter called the '2006 Wetlands CI Study'). This section summarizes the results of that analysis.

5.6.1.2 Summary of the 2006 Wetland CI Study Scope

Study Area – Because wetland function is directly related to watershed processes, the cumulative impacts analysis was performed on a watershed basis. The geographic area of analysis is the Upper Swan River watershed including Swan Lake and its tributaries, about 70,391 acres or 110 square miles. A portion of the Minnesota Steel project is located within the Sucker Brook subwatershed of the Prairie River watershed, but was not included in the cumulative impacts analysis, since that watershed has been, and is anticipated to remain in the reasonably foreseeable future, less impacted by mining and development projects, compared to the Upper Swan River watershed. [In contrast to the approximately 30 percent of the 70,390 acre Upper Swan River watershed impacted by past and reasonably foreseeable future mining, only approximately 3 percent of the 20,885 acre Sucker Brook watershed would be impacted by past and future mining and development (including the proposed Minnesota Steel plant site and the Excelsior Energy project).]

Time Period – The cumulative impacts analysis assessed three time periods: past, present, and the reasonably foreseeable future. Available information on historic conditions was used to create a baseline for analyzing present and future impacts. Present impacts include wetlands lost since the time of European settlement. Impacts in the reasonably foreseeable future are forecasted for 27 years, consistent with the Minnesota Steel projection of two years of construction, 20 years of operations, and five years of closure.

Wetland Diversity – A variety of wetland types exist within the Upper Swan River watershed, including all eight of the USFWS Circular 39 wetland classification categories. The cumulative impact on wetland resources from past actions, the proposed Minnesota Steel project and its alternatives, and other reasonably foreseeable actions in the future were compared based on their estimated impact to wetland acreage and the diversity of wetland types.

Wetland functions are also a consideration in assessing existing conditions and potential future impacts; however, information on existing wetland functions was only available for the Minnesota Steel project. Therefore, existing wetland functions and potential future impacts to functions were not assessed in the analysis of cumulative wetland impacts within the Upper Swan River watershed.

5.6.1.3 Summary of Historic Baseline Conditions

The 2006 Wetlands CI Study describes the data sources and methodology used to determine the historic baseline conditions. The study analysis used ‘Trygg maps’ to provide information on land cover conditions in the study area just prior to European settlement. These maps were compiled in 1966 by J. William Trygg based on land surveys from the 1870s. The Trygg maps show the estimated location of natural features encountered by the original land surveyors, such as pine forests, lakes, rivers, swamps, bottomlands, and marsh. The 1870s survey grid was 1-mile by ¼-mile, limiting map detail and overall accuracy; but the Trygg maps still provide the best information available on the pre-settlement landscape in areas that have been disturbed by post-European settlement human activities. According to these maps, there were relatively few wetlands in the steep Missabe Wachu or Big Man Hills that contained iron ore deposits. Wetlands were more common along the lakes and streams draining the land on either side of the ridge.

The study analysis also used National Wetlands Inventory (NWI) maps (interpreted by the USFWS from aerial photos that were taken in 1979-1988), which provide more detailed data on wetland resources in the watershed than the Trygg maps. Since much of the northern half of the watershed had already been disturbed by mining and urban development activities by 1988, a combination of Trygg maps and NWI maps were used to estimate the total pre-settlement wetlands in the watershed. The methodology is described in detail in the 2006 Wetlands CI Study.

Since the Trygg mapping only designated three 'types' of wetlands, the NWI Circular 39 wetland classifications were grouped as follows: Types 1 and 2 (equivalent to Trygg's "bottoms" type); Types 3, 4, and 5 (Trygg "marsh and lake"); and Types 6, 7, and 8 (Trygg "swamp"). Table 5.6.1 summarizes the historic wetland resources estimated in the 2006 Wetlands CI Study. All numbers showing the approximate area of wetlands have been rounded to reflect the level of detail of the Trygg mapping.

TABLE 5.6.1 UPPER SWAN RIVER WATERSHEDWETLAND AREA CHANGES OVER TIME (in Acres)

	Historic	Existing	Future Foreseeable – No On-site Mitigation (1) (2)	Future Foreseeable – With On-Site Mitigation
Type 1 – 2	510 (2 percent)	860 (4 percent)	740 (4 percent)	770 (4 percent)
Type 3 – 5	5,490 (23 percent)	9,320 (44 percent)	8,950 (43 percent)	9,260 (44 percent)(4)
Type 6 – 8	18,010 (75 percent)	11,090 (52 percent)	10,880 (53 percent)	10,880 (52 percent)
Wetlands Subtotal	24,010	21,270	20,570	20,910
Outside Watershed			(110)	(110)
Deep Water	0	640	260(3)	2,390 (5)
Total Wetland and Water	24,010 (34 percent)	21,910 (31 percent)	20,830 (30 percent)	23,300 (33 percent)
Non-Wetland	46,380 (66 percent)	48,480 (69 percent)	49,560 (70 percent)	47,090 (67 percent)
Total Watershed	70,390	70,390	70,390	70,390

(1) Estimated wetland losses in this column do not reflect mitigation that would be provided as required by wetland permitting, since Minnesota Steel mitigation plans are not finalized and the extent of mitigation that may or may not be provided within the Upper Swan River watershed, including wetlands that may form in tailings basins or other mined areas in the future following mine closure, can only be estimated at this time.

(2) Estimated future wetland areas reflect anticipated wetland losses from the proposed Keewatin Taconite and Minnesota Steel (Proposed Action – not the Alternative Tailings Basin) projects.

(3) Includes dewatering at Minnesota Steel Pits 5 and 6 plus approximately 180 acres of drawdown at Pits 1 & 2, Hawkins and Harrison pits (see Section 4.1)

(4)Includes approximately 190 acres of shallow lacustrine areas anticipated to be created if in-pit stockpiling is utilized.

(5)Includes increase in deep water areas resulting from enlarged mine pits re-filling with water at the Minnesota Steel (approximately 890 acres of deep water) and Keewatin Taconite (approximately 1,500 acres) mines. [Does not include Minnesota Steel in-pit stockpiling areas, see Note (3) above.]

5.6.1.4 Existing Conditions

The 2006 Wetlands CI Study describes the methodology used to estimate the existing wetland resources. Generally, the methodology uses NWI mapping plus available wetland delineations and other wetland permit data to estimate the size and type of existing wetlands. The resulting estimated existing wetlands are summarized in Table 5.6.1. The estimated areas also include a category for deep water areas with little or no aquatic vegetation that have developed in most of the former mine pits. These "deep water areas" are assumed to have no wetland function and are listed separately in Table 5.6.1.

The 2006 Wetlands CI Study also included an estimate of existing areas of disturbance in the Upper Swan River watershed based on current landcover conditions and the extent of past mining activities. MNDNR Gap Analysis Program (GAP) landcover data[4] was used to determine the extent of current disturbances. This estimate indicated that over 95 percent of all disturbances in the Upper Swan River watershed are related to past and present mining activities.

5.6.1.5 Summary of Past Losses

As summarized in the 2006 Wetlands CI Study, historic activities within the watershed that have affected wetland resources were primarily mining activities, logging, and other development over the last 100 years. Comparison of historical and existing wetland areas in Table 5.6.1 shows a loss of approximately 3,000 acres of wetlands (a 12 percent loss from the original 24,000 acres) and a change in types – with a small increase (from 2 percent to 4 percent) in Type 1-2 wetlands, an increase in Type 3-5 (23 percent pre-settlement to 44 percent now, not including the 650 acres of deep water areas in former mine pits) and a decrease in Type 6-8 (75 percent pre-settlement to 52 percent of total wetland acreage now). The decrease in Type 6-8 wetlands from 18,000 acres historically to 11,090 acres now represents a 38 percent overall reduction in Type 6-8 wetlands.

Logging has contributed to the conversion of some forested wetlands (Type 7) to other wetland types. Direct impacts to wetland resources from mining include the loss of wetlands during the excavation of mine pits and formation of stockpiles and tailings basins, as well as the creation of new wetlands and mining related deep water areas within tailings basins and abandoned mine pits. Part of the change in diversity of wetland types results from natural forested bogs and swamps being converted to Type 3-5 wetlands when artificial, 'incidental' wetlands were created as former tailings basins (often built on top of natural wetlands) took on wetland characteristics following cessation of mining activities. Tailings basin berms and rock stockpiles have also altered the hydrology of surface water by rearranging surface water flow and altering watershed boundaries, impounding water and flooding existing wetlands, thereby altering wetland types and their associated plant communities.

5.6.2 Environmental Consequences

5.6.2.1 Future Reasonably Foreseeable Conditions

Potential land use trends and patterns in the reasonably foreseeable future over the next 27 years were projected to estimate future wetland losses. The 'reasonably foreseeable' future impacts considered in the 2006 Wetlands CI Study analysis included the expansion of economic activities

[4] MNDNR GAP landcover data source is http://deli.dnr.state.mn.us

at Minnesota Steel, Keewatin Taconite, and at planned economic development sites within the Upper Swan River watershed. Table 5.6.1 includes two columns summarizing the "Future Foreseeable" wetland areas estimated in the 2006 Wetlands CI Study. The first 'Future' column estimates the resulting wetland areas assuming project wetland losses from future reasonably foreseeable activities in the watershed, without taking potential future on-site mitigation areas into account. Since on-site wetland mitigation is likely to be provided for the future reasonably foreseeable projects, the second column provides an estimate of future wetland resources in the watershed based on currently available mitigation plans for proposed future projects.

5.6.2.2 Summary of Cumulative Impacts

Table 5.6.1 summarizes the anticipated changes in wetland type and acreage within the Upper Swan River watershed for historic, existing and future conditions described in the previous sections. The data show that cumulative impacts to wetland resources in the Upper Swan River watershed from pre-settlement to future reasonably foreseeable conditions include a 15 percent decrease in overall wetland acreage and a redistribution in the diversity and quality of wetland types. Natural forested wetlands and bogs (Type 6 - 8) decline from 75 percent of all wetlands to just 53 percent, a decrease of approximately 7,100 acres. The decrease in Type 6-8 wetlands from 18,000 acres historically to 10,880 acres in the future represents a 40 percent overall reduction in Type 6-8 wetland areas. Artificial or 'incidental' wetlands that formed in tailings basins and settling ponds increase Types 3 -5 by almost 3,400 acres – from 23 percent to 43 percent of the watershed's total wetland area. Type 1-2 wetlands would increase by approximately 200 acres from pre-settlement to future conditions (i.e., from 2 percent to 4 percent of the total wetland area in the watershed).

The extent of change in wetland type and acreage that occurred in the time period between pre-settlement and the present is considerably greater than the projected change between existing and future conditions. Comparison of historical and existing wetland areas show a loss of approximately 3,000 acres of wetlands (a 12 percent loss from the original 24,000 acres of wetlands) and a change in types – with an increase in Type 3-5 (23 percent pre-settlement to 44 percent now, not including approximately 650 acres of deep water area in the former mine pits) and a decrease in Type 6-8 (75 percent pre-settlement to 52 percent now). Historic activities within the watershed that have affected wetland resources were primarily mining activities, logging, and other development over the last 100 years.

Reasonably foreseeable future impacts to wetland resources in the Upper Swan River watershed include 640 acres of wetland loss at Minnesota Steel, and 60 acres of wetland loss at Keewatin Taconite. Therefore, mining activities would likely be the largest direct impact to wetland resources in the watershed over the next 27 years. However, the majority of future mining-related impacts in the watershed would occur at wetlands within areas previously impacted by mining; therefore, the changes in percentage of wetland types within the watershed are not anticipated to change substantially (see Table 5.6.1).

In their May 2006 and subsequent Preliminary Wetland Mitigation Plan submittals, Minnesota Steel has identified on-site mitigation plans to create approximately 150 acres of replacement wetlands within the Upper Swan River watershed, as mitigation for some of the wetlands impacted by the project. In addition, approximately 190 acres of shallow lacustrine (Type 3-5) wetlands may be created at the mine pits following mine closure, if in-pit stockpiling can be utilized at Minnesota Steel. Therefore, some of the Minnesota Steel impacts would be temporal, not permanent, impacts to the watershed. However, since the on-site mitigation would occur as part of the reclamation process – and the mitigation areas would probably not be completed until mining has been completed – this temporal impact would likely extend through the anticipated 27-year mining and reclamation period, and possibly further into the future, since it would take time for wetland characteristics to form in the tailings basins. [It should be noted that in addition to the 150 acres of on-site wetland mitigation proposed to be established during reclamation, that Minnesota Steel is also proposing additional wetland creation/restoration outside of the Upper Swan River watershed (in Aitkin County) as mitigation for wetland impacts. This mitigation would be provided prior to or concurrent with timing of the Minnesota Steel project wetland impacts, as discussed in Section 4.1.3.]

Mitigation for Keewatin Taconite wetland impacts is being provided within the Upper Swan River prior to the future impacts. Functioning wetlands primarily located within the Upper Swan River watershed have developed in the reclaimed portions of the tailings basin over the last 5 to 10 years. These areas would not be disturbed by future mining activities and their hydrology is likely to be maintained after the conclusion of mining activities, thereby enabling their continued and perpetual development into functional wetland systems. These areas are not included as 'Mitigation' in Table 5.6.1 since these areas have already formed wetlands and the delineated wetlands in this area were included as "existing" wetlands. It is likely that additional wetland areas would form in the future within reclaimed areas of the Keewatin Taconite tailings basin, including additional areas within the Upper Swan River watershed. If these wetlands form, they would provide additional mitigation for mining impacts within the watershed. However, it is difficult to estimate the area of additional wetland that would form in the future at the tailings basin, so no additional mitigation acreage was included for Keewatin Taconite in the 'Future with Mitigation' column in Table 5.6.1. Diversity among wetland types that would form in the near future within the Keewatin Taconite tailings basin mitigation areas would likely be limited to wet meadows, shallow marshes, and shrub swamps similar to those that have formed previously in tailings basins.

5.6.3 Mitigation

The main conclusions from the 2006 Wetlands CI Study analysis of estimated past, present and anticipated future wetland acreages and types include:

1. Past human actions have resulted in a decrease in the total acreage of wetlands within the Upper Swan River watershed and in a shift in the relative proportions of wetland types, with a decrease in the proportion of Type 6-8 and an increase in the Type 1-2 and Type 3-5 wetlands.

2. Reasonably foreseeable future actions would result in additional wetland losses which should be mitigated within the watershed, as much as possible, to maintain wetland functions and values within the watershed. Therefore, as potential future project/impacts are reviewed by permitting agencies, 'sequencing' could be used to: a) avoid/minimize impacts, especially to natural wetlands and/or wetlands that have had proportionately higher impacts (e.g., Type 6-8), and b) mitigate for unavoidable impacts within the watershed, to the greatest extent possible.

5.6.3.1 Avoidance/Minimization

Wetland regulations emphasize 'sequencing' in project planning within the watershed, to minimize wetland impacts. Consideration of possible strategies for avoiding/minimizing impacts to wetland types that have been lost in greater percentages in the past (e.g., Type 6-8 forested wetlands, bogs, and 'natural' wetlands) could be included in project planning, in order to minimize cumulative impacts. Additionally, resource agencies could, as opportunities arise, attempt to identify any degraded (e.g., by logging) or drained former, relatively undisturbed Type 6-8 areas within the watershed that could be enhanced or restored as possible mitigation areas for mining impacts.

In addition, given the past impacts to Type 6-8 wetlands in the Minnesota Steel project vicinity, potential impacts to the 'natural' wetlands at the Alternative Tailings Basin area could be weighed against potential impacts to the primarily 'artificial' wetlands at the Proposed Project Tailings Basin in evaluating alternatives for the Minnesota Steel project with respect to wetland impact 'avoidance.' Table 7 in the 2006 *Wetland Delineation and Functional Assessment Report for Minnesota Steel Industries* summarizes the wetland types delineated in the Proposed Project Tailings Basin (mostly located in an area disturbed by the previous Butler tailings basin) and in the Alternative Tailing Basin (undisturbed area). The wetlands in the Proposed Project tailings basin are dominantly Type 3, 5 and 6 (with only 3 acres of Type 7 and less than 1 acre of Type 8); while the wetlands in the Alternative Tailings Basin area include 76 acres of Type 6, 78 acres of Type 7, and 11 acres of Type 8.

5.6.3.2 Mitigation/Replacement

The mitigation plans submitted to permitting agencies for Minnesota Steel and Keewatin Taconite describe proposed mitigation for unavoidable mining impacts from these two projects. Keewatin Taconite proposes on-site mitigation within tailings basins at the mine. Minnesota Steel's plan for providing mitigation prior to or concurrent with project impacts primarily proposes restoration of wetlands outside of the Upper Swan River watershed, due to lack of availability of large previously-drained wetlands that could be used as restoration sites within the watershed. However, in their May 2006 and subsequent Preliminary Wetland Mitigation Plan submittals (see Appendix I), Minnesota Steel has identified on-site mitigation plans to create approximately 150 acres of replacement wetlands within the Upper Swan River watershed, as mitigation for some of the wetlands impacted by the project (see Section 4.1.3). In addition, approximately 190 acres of shallow lacustrine (Type 3-5) wetlands may be created at the mine pits following mine closure, if in-pit stockpiling can be utilized at Minnesota Steel. (It should be noted that in addition to the 150 acres of on-site wetland mitigation proposed to be established during reclamation, Minnesota Steel is also proposing additional wetland creation/restoration outside of the Upper Swan River watershed [in Aitkin County] as mitigation for project-related wetland impacts. This mitigation would be provided prior to or concurrent with timing of the Minnesota Steel project wetland impacts, as discussed in Section 4.1.3.)

Wetland restoration is commonly preferred as compensatory wetland mitigation over the creation of new wetlands, due to the higher probability of success. Minnesota Steel's mitigation plan describes opportunities for on-site mitigation that could be developed as areas impacted by mining are reclaimed, including: 1) developing lacustrine, fringe wetland habitats within mine pits after they fill with water if in-pit stockpiling is determined to be feasible, 2) developing wetlands within the tailings basin, and 3) reclaiming settling ponds in a way that maximizes the development of wetlands. Although the on-site mitigation would likely occur in the relatively distant future, compared to the timing of impacts, on-site mitigation should be encouraged to mitigate for project impacts in the Upper Swan River watershed. Based on available information on wetlands that have formed in areas previously disturbed by mining, it is expected that wetlands formed in disturbed areas in the years immediately following future Minnesota Steel mining would be dominantly Type 2, 3, 5 and 6 wetlands; although Type 7 forests could eventually develop in some areas over a longer time period, through natural succession.

5.7 CUMULATIVE IMPACTS – WILDLIFE HABITAT LOSS/FRAGMENTATION

5.7.1 Affected Environment

5.7.1.1 Summary of Issues

Assessment of cumulative impacts to wildlife habitat was performed based on the commitment in the Final SDD to evaluate habitat loss in the Arrowhead region by assessing changes to habitat type and what effect it may have on wildlife species utilizing that habitat type, rather than focusing on specific threatened species. The cumulative impacts described in this section are based on the findings of a study prepared in 2006 by Emmons & Olivier Resources, Inc. for the MNDNR titled: *Cumulative Effects Analysis on Wildlife Habitat Loss/Fragmentation and Wildlife Travel Corridor Obstruction/Landscape Barriers in the Mesabi Iron Range and Arrowhead Regions of Minnesota* (2006 Study). The results of the study's findings related to cumulative impacts analysis of habitat loss/fragmentation are described in this section. Section 5.8 discusses the study's findings regarding cumulative impacts to wildlife travel corridors.

Assessment of cumulative impacts to wildlife habitat in the 2006 Study included GIS-based identification of existing habitat types and estimates of reasonably foreseeable future human disturbance from development, mining and logging. The 2006 Study describes the limitations in applying the results of the analysis to specific projects, such as Minnesota Steel, due to the large geographic scale of the study area and limits to data interpretation. However, the results are useful in assessing large-scale trends, types of wildlife habitat loss, source of losses (mining, development or logging), and based on these findings, in assessing appropriate mitigation strategies to minimize future losses.

5.7.1.2 Define Study Area, Habitat Types and Study Timeframe

The geographic scope for assessing cumulative habitat loss in the 2006 Study included seven ecological subsections within the Arrowhead Region: the Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, St. Louis Moraines, Tamarack Lowlands, and the Toimi Uplands (see Figure 5.7.1). Ecological subsections are part of an ecological classification system (ECS) developed by the MNDNR and U.S. Forest Service that follow the National

Hierarchical Framework of Ecological Units (ECOMAP 1993). The Minnesota Steel project area lies within the Nashwauk Uplands ecological subsection.

Habitat types in the 2006 Study analysis follow the MNDNR GIS-based GAP analysis habitat type categories: open wetland, lowland forests, upland forests, upland shrub/woodland, water, urban/developed areas, mining, cropland, and grasslands.

Cumulative impacts from future actions were assessed in the 2006 Study based on comparing existing conditions to reasonably foreseeable human disturbances that could occur within a 20-year period, since future urban development and mining activities can only realistically be defined based on 20-year economic development plans and known plans for other industrial projects. Reasonably foreseeable mining/development projects considered in the 2006 Study of cumulative impacts include: PolyMet, Mesabi Nugget Plant, Cliffs Erie Railroad Pellet Transfer Facility, Minnesota Steel, Mittal East Reserve Mine, and the Mesabi Energy Plant.

Forestry data regarding future logging were available on a limited temporal scale (specific state plans for harvesting are available through year 2007). Therefore, beyond the year 2007, the cumulative effects assessment with respect to logging activities is incomplete.

5.7.1.3 Baseline (Existing) Conditions

GIS-based mapping of existing habitat types was compiled in the 2006 Study from the following data sources:

- Ecological Subsections of the Arrowhead Region
- MNDNR GAP land cover classification associated with each of the Arrowhead region ecological subsections

Although the Final SDD committed to assessing cumulative impacts within the entire Arrowhead region, the 2006 Study assessed each of the seven ecological subsections individually. To better understand the potential changes within the Nashwauk Uplands ecological subsection containing the Minnesota Steel project and the other five projects listed in Section 5.7.1.2 above, the habitat types mapped in the Nashwauk Uplands subsection are summarized in Table 5.7.1, along with the calculated area of each habitat type. This data shows that mining and urban areas combined account for approximately 12 percent of the total existing area of the Nashwauk Upland, with the remaining 88 percent in ‘natural’ habitats.

TABLE 5.7.1 NASHWAUK UPLANDS HABITAT AREAS -- EXISTING AND FUTURE

	Existing Area		Future Development Losses		Future Mining Losses		Total Future Losses	
Nashwauk Uplands Habitat Type	**(Acres)**	**%of total existing area**	**Acres**	**% of existing type**	**Acres**	**% of existing type**	**Acres**	**% of existing type**
Open Wetland	6,014	1	(2)	0.03	(4)	0.07	(6)	0.10
Lowland Deciduous	13,000	2	(6)	0.05	(3)	0.02	(9)	0.07
Lowland Conifer/Shrubland	160,541	20	(7)	0.00	(10)	0.01	(17)	0.01
Upland Conifer	75,025	9	(6)	0.01	(3)	0.00	(9)	0.01
Upland Deciduous (Aspen/Birch)	234,518	29	(46)	0.02	(102)	0.04	(148)	0.06
Upland Deciduous (Hardwoods)	15,995	2	(4)	0.03	(18)	0.11	(22)	0.14
Upland Shrub/ woodland	133,684	17	(21)	0.02	(42)	0.03	(63)	0.05
Water	31,989	4	(1)	0.00	(4)	0.01	(5)	0.02
Urban/Developed	8,779	1	(20)	0.23	(14)	0.16	(34)	0.39
Cropland	9,000	1	(1)	0.01	(1)	0.01	(2)	0.02
Grassland	30,456	4	(23)	0.08	(17)	0.06	(40)	0.13
Mining	91,013	11	(21)	0.02	(500)	0.55	(521)	0.57
Total Area	**810,014**	**100**	**(158)**	**0.02**	**(718)**	**0.09**	**(876)**	**0.11**
Total: 'Natural' Habitat (N.I. Urban and Mining land use areas)	**710,222**	**88**	**(117)**	**0.02**	**(204)**	**0.03**	**(321)**	**0.05**

5.7.2 Environmental Consequences

The 2006 Study screened existing habitat types in the seven Arrowhead region ecological subsections against the reasonably foreseeable future human development described in Section 5.7.1.2 above.

5.7.2.1 Future Cumulative Impacts to Wildlife Habitat in the Arrowhead Region

The 2006 Study estimated losses of all wildlife habitat types in the Arrowhead region ecological subsections as a result of future human actions (see Table 5.7.2). This analysis indicates approximately 10 percent of the total habitat lost would result from mining activities, 6 percent from development and 84 percent from forest harvest activities. Although logging is indicated in the 2006 Study as contributing substantially to habitat 'loss,' logging impacts are generally a 'conversion' from one habitat type to another that continues to change over time through succession, not a 'loss' that often can take more effort and time to restore, such as impacts from urban development or mining impacts. However, the number of acres of land that are projected to be affected by forestry in the Arrowhead are considerably greater than the area affected by development and mining. Therefore, in assessing potential impacts to critical habitats needed by Species of Greatest Conservation Need (SGCN), forestry impacts are an important consideration.

The assessment of cumulative impacts to wildlife habitat is especially important to maintaining SGCN populations of in the Arrowhead region. The SGCN listing compiled by MNDNR identifies species that are experiencing significant population declines due to known and unknown factors. Impact to habitat required by SGCN could potentially lead to substantial future cumulative losses and population declines. The potential reasons for a species being listed as a SGCN are many, but habitat degradation/loss is by far the most common reason. Thus, proposed actions which cumulatively lead to substantial future habitat losses could affect SGCN that are dependent on the affected habitats.

However, as noted in the introduction to this section, the 2006 Study has limits to its application to specific locations, given the large geographic extent of the study. Similarly, the cumulative impacts study results cannot be extrapolated to the habitat-specific needs of SGCNs. (Section 6.4 describes the analysis of potential impacts to SGCN species performed for the proposed Minnesota Steel project.) Acknowledging these limitations, the assessment of cumulative impacts to wildlife habitat is still useful in assessing large-scale trends; and the results of the 2006 Study indicate that the magnitude of habitat conversion from forestry actions affects a substantially larger area than conversion due to mining and development.

5.7.2.2 Future Impacts in the Nashwauk Uplands Subsection

In contrast to the predominance of forestry-related habitat conversions projected for the entire Arrowhead region in Section 5.7.2.1, habitat loss within the Nashwauk Uplands (where the six reasonably foreseeable future mining/industrial development projects are proposed) is projected to be minimally affected by forestry and predominantly affected by future mining and development. Therefore, for SCGN associated with Nashwauk Uplands habitats, the projected extent of future mining and development impacts relative to the total habitat area in this ecological subsection was assessed.

Table 5.7.1 summarizes the estimated area of future impacts for each habitat type in the subsection, based on the analysis in the 2006 Study. The future areas of impact within each habitat type as a percentage of the total existing habitat area are also tabulated. The results indicate that future impacts would affect 0.11 percent of the total subsection area (i.e., 876 acres of the total area of 810,014 acres), and only 0.05 percent of the existing ‘natural habitat’ area (i.e., areas not currently categorized as urban/developed or mining). Future mining was estimated to impact less than 0.1 percent of the total area within the Nashwauk Uplands ecological subsection, and that the majority of future mining activity is anticipated to occur within areas that had previously been disturbed by mining.

TABLE 5.7.2 CUMULATIVE WILDLIFE HABITAT LOSSES WITHIN THE ARROWHEAD REGION ECOLOGICAL SUBSECTIONS

	Mining Losses	**Development Losses**	**Forestry Harvest Losses**	**Total Losses**
All Habitat Types (all Arrowhead Region ecological subsections)	913 ac	498 ac	7,315 ac	8,727 ac

5.7.3 Mitigation

Potential mitigation strategies to avoid and/or minimize impacts from future losses due to mining, development and logging are summarized in the sections below.

5.7.3.1 Mitigation Strategies for Mining-Related Habitat Impacts

As noted in Section 5.7.2.2, the majority of future mining in the Nashwauk Uplands is projected to occur in areas that have been disturbed previously by mining. This use of previously-disturbed land for mining is an appropriate mitigation strategy for minimizing impacts to late-successional habitat types. Mining impacts can be further minimized by reclaiming and re-vegetating areas disturbed by:

- Revegetating as soon as possible after completion of mining activities in the area.
- Identification of habitat types prior to mining, to identify critical habitat locations, and potential impacts to SGCNs (especially those dependent on late succession or other low-disturbance habitats).
- Use of appropriate post-mining, land reclamation, and re-vegetation practices to accelerate the rate of habitat restoration.
- Avoidance of areas identified as critical to the survival of species that are threatened, endangered or SGCN, if feasible and practicable.
- Maintenance of habitats identified as critical to the survival of species that are threatened, endangered or SGCN.

Section 6.4 describes wildlife habitat mitigation strategies identified specific to the Minnesota Steel project.

5.7.3.2 Mitigation Strategies for Development-Related Habitat Impacts

In contrast to mining and logging impacts, development-related impacts are usually permanent (i.e., once a habitat is lost to development, it rarely is restored to a natural habitat). Within the Arrowhead region approximately 6 percent of the total projected reasonably foreseeable future habitat area loss was estimated to be due to development.

Mitigation strategies to avoid/minimize development impacts could include:

- Land use planning that takes critical SGCN habitat locations into account and encourages development in areas outside of critical areas.
- Planning that minimizes sprawl thus reducing overall habitat impacts.
- Avoidance of areas identified as critical to the survival of species that are threatened, endangered or SGCN.

5.7.3.3 Mitigation Strategies for Logging-Related Habitat Impacts

As noted in Section 5.7.2.1 above, logging is anticipated to impact the greatest area of habitat in the Arrowhead region. Although logging impacts are generally considered temporary (since logged areas would re-vegetate following logging), impacts to mature late-succession forests could be considered ‘permanent’ with respect to the species dependent upon them, since the time period required to re-establish these habitats is very long.

Possible logging mitigation strategies to avoid/minimize impacts include:

- Identification of habitat types prior to logging, to identify critical habitat locations, and potential impacts to SGCNs (especially those dependent on late succession or other low-disturbance habitats).
- Use of selective cutting in lieu of clear-cutting, if appropriate to maintain a habitat type.
- Use of appropriate post-logging, land reclamation, and re-vegetation practices, to accelerate the rate of habitat restoration.
- Avoidance of areas identified as critical to the survival of species that are threatened, endangered or SGCN.
- Maintenance of habitats identified as critical to the survival of species that are threatened, endangered or SGCN.

5.8 CUMULATIVE IMPACTS – WILDLIFE TRAVEL CORRIDOR OBSTRUCTION

5.8.1 Affected Environment

5.8.1.1 Summary of Issues/Overview

In addition to general habitat loss described in Section 5.7, mining activity on the Mesabi Iron Range Mineral Deposit (Iron Range) has created a unique impact on the landscape in the area that, along with other human disturbances, may affect wildlife travel corridors. The location and orientation of mineralized deposits, and thus the mining activities, are in a relatively narrow, linear band from Ely to Grand Rapids. The length and extent of 125 years of mining activity and associated infrastructure (shear-walled mine pits, stockpiles, haul and railroads, tailings basins, and associated structural development), along with other human disturbances like highways and development, could potentially cause “landscape barriers” that impede wildlife travel. These landscape barriers may have impacts on dispersal, migration, and/or seasonal movements of large mammals. Large predatory mammals are most sensitive to landscape barriers due to the relatively large home ranges and the magnitude of large mammal movement, which can be affected by linear physical barriers in the landscape.

The potential cumulative impacts of past and reasonably foreseeable future human activities (including the proposed Minnesota Steel project) on wildlife habitat and travel corridors along the Iron Range were assessed in a study prepared in 2006 for the MNDNR by Emmons & Olivier Resources, Inc.: *Cumulative Effects Analysis on Wildlife Habitat Loss/Fragmentation and Wildlife Travel Corridor Obstruction/ Landscape Barriers in the Mesabi Iron Range and Arrowhead Regions of Minnesota* (2006 Study). The results of the habitat loss/fragmentation portion of the 2006 Study are described in the previous chapter. The following sections would evaluate these findings with regard to cumulative impacts to the wildlife travel corridors across the Iron Range in the vicinity of the proposed Minnesota Steel project.

It is important to note that the 2006 Study discussed data limitations to applying its findings to specific projects, such as Minnesota Steel, due to the methodology of the study necessitated by the scale of the area to be analyzed. Although the results of the 2006 Study are limited in their level of detail, the results are still useful in assessing locations of major travel corridors, potential locations of travel corridor impacts or losses, and based on these findings, in assessing appropriate mitigation strategies to minimize future impacts and losses.

5.8.1.2 Travel Corridor Area

The geographic scope for the travel corridor analysis focused on a 1 to 2.5-mile wide corridor along the approximately 115-mile Iron Range mineral formation, as well as the locations of nearby development and highways that can act as wildlife travel barriers. Outside of the iron formation corridor, nearby habitat blocks that are likely sources/destinations for traveling wildlife were also taken into consideration in defining likely travel corridors.

5.8.1.3 Baseline (Existing) Conditions – Identify Existing Corridors

Currently, travel by large predatory mammals is restricted due to landscape changes that have occurred as a result of historic mining activities, road construction, and regional development along the Iron Range. Likely existing wildlife travel corridors were identified and evaluated in the 2006 Study using GIS information techniques that locate "roadless blocks" (i.e., core habitat areas that are likely sources/destinations for traveling large mammal populations) and areas where forest, brush, or otherwise undeveloped lands currently create a "corridor" between two large roadless block areas that could serve as core habitat for large mammals.

Thirteen existing wildlife travel corridors varying in width from 0.1 to 3.2 miles were identified in the 2006 Study along the 115 mile Iron Range Minerals Formation in St. Louis and Itasca Counties. Two of these travel corridors, identified in the figures in the 2006 Study as Corridors #3 and #4 (see Figures 5.8.1 and 5.8.2), are located in the vicinity of the proposed Minnesota Steel project.

5.8.1.4 Past Losses

Prior to the human actions which led to the existing mine features, development, and highways, wildlife travel was unrestricted across the Iron Range. In addition to mining effects, other past human disturbances include logging, development, road corridors, and energy corridors that have created barriers and/or have reduced the size of habitat blocks utilized by large mammals. These activities limit the number and location of habitat blocks between which large wildlife would travel, effectively reducing the number of available corridors. The combined effect of past activities was to reduce travel locations across the 115 mile long Iron Range mineral deposit from a contiguous block of unbroken habitat to 13 wildlife travel corridors identified above as the Baseline condition. The 13 travel corridors vary in width from 0.1 to 3.2 miles with a total width of 20.2 miles. Additional travel barriers were created by the various highways (e.g., TH 169, Highway 53 and Highway 135) that parallel or transect the Iron Range.

5.8.2 Environmental Consequences

5.8.2.1 Reasonably Foreseeable Future Conditions

In the 2006 Study, travel corridor and habitat data intersecting the Iron Range were screened against the reasonably foreseeable future 'human footprint' 30 years from now (the anticipated timeframe for construction, operation and closure of known proposed mining, including Minnesota Steel and other reasonably foreseeable projects), based on the best available information on locations of anticipated mining, forestry, and regional development activities. Reasonably foreseeable mining/development projects considered in the cumulative impacts analysis include: PolyMet, Mesabi Nugget Plant, Cliffs Erie Railroad Pellet Transfer Facility, Minnesota Steel, Mittal East Reserve Mine, and the Mesabi Energy Plant.

5.8.2.2 Future Reasonably Foreseeable Impacts

Cumulative impacts were examined within the context of potential future impacts to the existing 13 wildlife travel corridors along the Iron Range with respect to habitat blocks located northwest and southeast of mining features. Future impacts were classified based upon the type and extent of proposed human footprint that would affect each corridor directly or indirectly as they relate to the proximity to habitat blocks. The type of impact in each corridor was classified into one of six categories: direct loss, fragmentation, isolation, minimal isolation, minimal impact, and no impact.

Travel Corridor #3 in the 2006 Study is approximately 1.7 miles wide and includes the area of the Minnesota Steel project at the southwest end of Pit 5 and all of Pit 6, as well as additional vegetated areas south and southwest of the Minnesota Steel impact areas. The Stockpile B/Crusher areas area located just north of the corridor defined in the 2006 Study. The area currently exhibits natural habitat between two mining features northeast and southwest of the wildlife travel corridor. This corridor is the only travel route for wildlife for several miles in either direction along the mineral formation; therefore it is characterized in the 2006 Study as having a "high" existing value. This corridor connects a large habitat block to the northwest with a habitat block to the southeast.

The Minnesota Steel project impact areas would affect much of the eastern half of Corridor #3, which is currently a wider, more continuous corridor than the western half (which is heavily fragmented, comprised of narrow, more circuitous vegetation corridors). The study indicates future development impacts at all of the existing vegetated areas within Corridor #3 outside of the known Minnesota Steel and other known planned future development impact areas. Therefore, the 2006 Study characterizes future impacts as a "direct loss" of the entire travel corridor.

The "direct loss" of Corridor #3 is characterized in the 2006 Study as a significant loss due to the high density of core habitat blocks within several miles of this corridor. Although, as vegetation at individual re-vegetated areas matures following reclamation, some of these areas could be utilized as new wildlife travel corridors to offset those areas lost to new mining activities. The extent of the disturbance is dependent on how well mine planning can sequence impacts and reclamation.

In addition to the mining-related impacts described above, TH 169 parallels the Iron Range formation to the south in the Corridor #3 area, further restricting wildlife travel to and from northwest to southeast.

Travel Corridor #4 is approximately 2 miles wide with its western boundary at north-south Highway 65. The City of Nashwauk is located southwest of the corridor. The corridor is ranked as having “high value” for wildlife travel. However, wildlife traveling north-south still face crossing the TH 169 corridor through this area. Areas southwest of this corridor section are the developed portions of Nashwauk and likely would not be utilized by wildlife for travel.

The 2006 Study characterizes the existing Corridor #4 as connecting a large core habitat block to the north with a slightly smaller block to the southeast, with existing mine features, including a linear water body created by a mine pit, dissecting the corridor. The proposed Minnesota Steel Tailings Basin is south of the corridor, at the western edge of a large ‘habitat block’ identified in the 2006 Study. TH 169 also acts as a linear barrier to animal travel in this area.

Future impacts to Corridor #4 identified in the 2006 Study include a decline in the value of habitat to the south due to direct loss (at the Tailings Basin) and the potential for increased wildlife/vehicle conflicts on TH 169 as traffic increases. Habitat at the Tailings Basin would eventually be re-established following the completion of mining. For example, the existing habitat at the Tailings Basin was established following closure of the former Butler tailings basin at this location. However, the long duration of mining activities results in a temporal loss, unless the mine plan/reclamation provides for sequential re-vegetation throughout the active mining period. Also, the eastern half of the habitat block (east of the tailings basin) would not be affected by the Proposed Project, so this area should remain available to wildlife use.

5.8.3 Mitigation

5.8.3.1 Mineland Reclamation

The Minnesota Mineland Reclamation Rules (Minnesota Rules 6130) requires sequential, ongoing reclamation during mining operations. Reclamation requirements that would help to mitigate the impacts of mining on wildlife travel corridors include the following:

- Tailings basin dikes shall be designed by a qualified engineer, and surface overburden stockpiles and surface overburden portions of pit walls will be graded to a slope no steeper than 2.5 horizontal to 1 vertical (minimizing physical obstruction to wildlife travel).
- Limiting surface overburden lift heights to 40 feet, with a minimum 30-foot wide bench between lifts. Rock stockpile lifts are limited to 30 feet with a surface-capped and vegetated bench between lifts.
- Vegetation is required to be established on stockpiles, tailings basins, pit walls and other mine disturbances during the first planting period following when that area or mine feature is no longer scheduled to be disturbed or used in a manner that would interfere with the establishment of vegetation (providing cover and food for traveling wildlife).

If feasible, in-pit stockpiling materials may be able to be placed and graded to facilitate creation of wildlife travel corridors along the saddles between pits as part of mine reclamation.

5.8.3.2 Project Specific Mitigation

Minnesota Steel plans to work with MNDNR staff as part of a dynamic planning process as the mine plan and reclamation plans are developed, to refine strategies for maintaining wildlife movement through and/or in the vicinity of the project. Based on the potential impacts to Travel Corridors #3 and #4 that could result from the Minnesota Steel project, as described in Section 5.8.2, the following mitigation strategies could be implemented to minimize/mitigate impacts:

Corridor #3: In addition to the general mining mitigation strategies described above, travel at a portion of Corridor #3 may be able to be re-established following completion of mining if in-pit stockpiling is determined to be feasible (see Section 3.3.3.2 – Stockpiling). If feasible, in-pit stockpiling materials may be able to be placed and graded to facilitate creation of wildlife travel corridors along the saddles between Pits 5 and 1 and/or between Pits 5 and 6 as part of mine reclamation. A vegetated saddle width of at least 0.25 mile has been recommended by MNDNR Wildlife staff.

Corridor #4: Re-vegetate at the Tailings Basin as soon as possible following mine closure.

6.0 Significant Impacts are not Anticipated - Additional Information is Presented in the EIS

6.1 LAND USE

The Final SDD stated that the Draft EIS analysis with respect to land use should include potential land use conflicts with nearby residences, water bodies and the cemetery with respect to various issues. As noted in Section 6.1.2 below, these impacts are described in detail in other sections of this Draft EIS.

The Final SDD also identified compatibility of project plans with the Itasca County Land Use Plan and required rezoning and variances, as needing additional analysis in the Draft EIS. Analysis in this section of the Draft EIS focuses primarily on those issues related to the land use plan.

6.1.1 Affected Environment

6.1.1.1 Existing Conditions

The current and historic economic uses of land within and adjacent to the Proposed Project area are primarily mining (refer to Figure 3.1, Past Mining Activities) and logging interspersed with some recreational and residential land uses. Some of the former mining areas and tailings basins have been reclaimed and are now re-vegetated. The Cities of Nashwauk and Calumet/Marble are located in the project vicinity to the northeast and southwest, respectively (see Figure 6.1.1). Item 9 in the Scoping EAW (see Appendix B) provides detailed information about current land use in areas within and adjacent to the Proposed Project.

6.1.1.2 Regulatory Framework

There are four local units of government that have zoning authority within the Proposed Project Boundary: Itasca County and the Cities of Calumet, Marble, and Nashwauk. Itasca County has zoning authority over the majority of land within the Proposed Project Boundary. The Cities of Calumet and Marble are located at the southwest corner of the Proposed Project Boundary; none of the proposed Minnesota Steel Project Impact Areas are located within the city limits of Calumet or Marble.

The City of Nashwauk recently annexed land on the west side of the city that includes parts of the proposed Minnesota Steel Project Boundary and includes most of the Plant Site Impact Area (the current Nashwauk city boundary is shown in Figure 6.1.1). The City annexed this land as part of its intent to provide wastewater treatment, water services, and gas services to the Minnesota Steel facility and potentially other industrial expansion areas. As noted previously, the City of Nashwauk maintains zoning authority within its boundaries. The City of Nashwauk is also the designated public utility provider and is currently in the process of updating its comprehensive plan to reflect the annexed area. The current zoning designation of this annexation area is for mining. The Proposed Project would be compatible with this zoning district.

Itasca County planning and zoning regulations apply to the project Impact Areas located outside the City of Nashwauk. Itasca County requires all land use ordinances to be consistent with the 1999 Itasca County Comprehensive Land Use Plan. A review of the County Land Use Plan showed objectives related to both natural resource management and a strong commercial and industrial economy. The Itasca County Land Use Plan goal is to encourage a diverse economy and support the continuation and expansion of the mining industry. The proposed Minnesota Steel project would be consistent with this goal.

Under the County ordinance, the Proposed Project area is primarily zoned as industrial land use with a few small areas zoned as farm residential and rural residential. A shoreland overlay zoning district is also in place, which regulates the state minimum shoreland standards around designated lakes and streams. The standards set forth in the shoreland overlay district, which regulates the areas within 1,000 feet around designated lakes and 300 feet along designated streams, prevail over underlying zoning. Shoreland zoning as it relates to the Minnesota Steel project is discussed in greater detail in Section 6.5.

The County's Comprehensive Plan recently established a mining industrial zone, which would eventually be used to define an exclusive zone for mining activities. The County has started the process of updating the zoning maps to conform to its 2005 zoning ordinance, and the updates would include designating locations of mining districts. Completion of this task is anticipated sometime in 2007.

6.1.2 Environmental Consequences

The Scoping EAW describes current land use in areas within and adjacent to the Proposed Project. This information was used to assess potential impacts to land use resulting from the Proposed Project and serve as the basis for the Final SDD identification of potential land use conflicts between the proposed Minnesota Steel project and other nearby land uses. Table 6.1.1 summarizes the potential land use conflicts identified in the Final SDD and identifies the EIS section that describes each of the issues related to potential conflicts with nearby residences, water bodies, and the Nashwauk Cemetery.

TABLE 6.1.1 LAND USE-RELATED ISSUES DESCRIBED FOR THE PROPOSED PROJECT

Issue	Residences	Water Bodies	Cemetery
Water Resources – Wetlands	N.A.	EIS Section 4.1	N.A.
Water Resources – Non-Wetland	N.A.	EIS Section 4.3	N.A.
Blasting Noise	EIS Section 4.10	N.A.	N.A.
Mine Truck Noise	EIS Section 4.10	N.A.	N.A.
Visual Impacts	EIS Section 6.12	EIS Section 6.12	N.A.
Air Quality- Mobile Source	EIS Section 6.9	N.A.	N.A.
Air Quality – Stationary Source	EIS Section 4.7	EIS Section 4.7	EIS Section 4.7
Traffic	EIS Section 6.8	N.A.	N.A.
Infrastructure	EIS Section 6.13	N.A.	N.A.

N.A. = Not Applicable, no impact is anticipated.

Chapter 3.0 describes the Proposed Action and Alternatives in detail. The Permit to Mine Application for the Proposed Project provides a detailed description of the Proposed Action, including the proposed pit geometry, pit phasing, and mine facilities. Sections 6.1.2.1 and 6.1.2.2 below describe the compatibility of the Proposed Action and Alternatives with zoning/variance conditions of the applicable Itasca County or City of Nashwauk local land use regulations.

6.1.2.1 Proposed Action Plan Compatibility

6.1.2.1A Stockpile, Crusher and Concentrator and Tailings Basin

The current Itasca County zoning is industrial for the stockpile, crusher and concentrator, and tailings basin locations. These proposed project activities are compatible with the regulations outlined in the current County zoning ordinance. The County is in the process of updating its zoning map. This process is anticipated to designate mining overlay districts, which would likely include areas within the identified project area.

6.1.2.1B Plant Site

The City of Nashwauk annexed land where the proposed Minnesota Steel facility would be located, along with land extending east of the plant to the previous Nashwauk city limits. This annexation occurred in anticipation of extending sewer and water along the County Road 58 corridor to the steel plant. This area is currently zoned as industrial, and the Proposed Project would be an allowed use under this zoning designation. A comprehensive plan update, which would include the recently annexed area, is anticipated to be completed in 2007.

6.1.2.2 EIS Alternatives Planning Compatibility

Except as noted below, the EIS alternatives would not change the zoning/plan conformance from that described above for the Proposed Action. The exception would be the location for the Alternative Tailings Basin. The current County zoning districts where the Alternative Tailings Basin is proposed include farm residential and industrial zones. Portions of three 40-acre parcels, zoned as farm residential, are located in the northeast corner of the Alternative Tailings Basin. These three parcels are all owned by Blandin Paper Company and identified in county tax records as timber, non-homesteaded property. The remaining area of the Alternative Tailings Basin is zoned as industrial, which is compatible with Proposed Project activities. Mining and industrial land uses are not allowable under the farm residential zoning designation, and if the Alternative Tailings Basin location was selected as the preferred tailings basin site, it would likely require a variance or rezoning of the parcels.

6.1.3 Mitigation Opportunities

Approximately five private properties that have associated buildings/homes are located within the Proposed Project Boundary. All were identified as residential properties or improved recreational land. As noted previously, Minnesota Steel plans to acquire residences and other improved private property within the Proposed Project Boundary. This would minimize potential conflicts between residential properties and the Proposed Project. The implications of acquiring these properties are discussed in Section 6.14 - Socioeconomics.

Additionally, when Itasca County and City of Nashwauk begin to review the project permit applications, an appropriate permitting process (e.g., plan approval or granting a Conditional Use Permit [CUP] or variance) would be determined. During this process, the County may elect to specify mitigation or restrictions as conditions of permit approval.

6.2 COVER TYPES

The Scoping EAW included estimates of before and after land use cover types, based on project plans available during the scoping process. The Final SDD indicated that the land use cover type estimates would be updated to reflect updated mining and plant site development details made available for the EIS, and that the EIS would describe the conversion of existing land cover types that would result from project implementation and reclamation. This section provides the updated cover type information. Information on reclamation, including re-vegetation, is also provided in Section 6.15 - Mineland Reclamation.

6.2.1 Affected Environment

Existing cover types were estimated using geographic information system (GIS) data files maintained by the MNDNR. Acreages are approximate and are based on the MNDNR Gap Analysis Program (GAP) landcover data set. The existing cover types mapped at the proposed plant site, mine, tailings basin and stockpile area are shown in Figure 6.2.1. Tables 6.2.1 and 6.2.2 summarize the estimated existing cover types within the project area, based on the GIS mapping. Due to differences in soils, habitat value and vegetation, the cover types that have been previously disturbed by mining activity (based on MNDNR Mesabi Elevation Project mapping) are tabulated separately from those with no apparent previous disturbance, where applicable.

6.2.2 Environmental Consequences

Tables 6.2.1 through 6.2.3 summarize the estimated existing and post-development (pre-reclamation) cover types, based on the GIS mapping within the Proposed Project Impact Areas, assuming that the Proposed Action affects the entire area within the project impact boundary at the plant site, mine, tailings basin and stockpile areas shown in Figure 1.2. Table 6.2.1 provides the Proposed Action Impact Areas cover type estimates after mining has been completed, but before reclamation as a ‘worst case’ assessment of cover type changes. (The exception to this is the mine pits, which are assumed to re-fill with water to create deep water areas.) This table also includes estimated cover type changes for connected action infrastructure (see Section 6.13)

Table 6.2.2 provides the cover type estimates for the area affected by the Alternative Tailings Basin. These impacts would occur in lieu of the Tailings Basin impacts estimated in Table 6.2.1 if the Alternative Tailings Basin site was utilized instead of the Proposed Action tailings basin.

Table 6.2.3 provides the cover type estimates for the In-Pit Stockpiling Alternative. These impacts would occur at the Stockpile Area in lieu of the Stockpile Area impacts identified for the Proposed Action in Table 6.2.1. In addition, the Mine Area impacts would change. The estimated 640 acres of deep water that would result in the Mine Area from the Proposed Action would change to include an estimated 190 acres of Type 3-5 (shallow lacustrine) wetlands plus 450 acres of deep water, if the In-Pit Stockpiling Alternative were implemented instead of the Proposed Action.

6.2.3 Mitigation Opportunities

Minnesota Rules 6130 requires reclamation of mined lands following completion of mining activities (see discussion in Section 6.15 – Mineland Reclamation). Reclamation requirements include re-establishment of vegetation in areas disturbed by mining activities. The 'after' cover types indicated in Tables 6.2.1 through 6.2.3 above do not indicate the post-reclamation cover types in the mine, plant, tailings basin or tailings pipeline corridor/water supply areas, although they would ultimately be re-vegetated as part of the reclamation process. An accurate estimate of future cover types cannot be made now, since reclamation and re-vegetation strategies (e.g., planting grassland vs. shrub/grass vs. reforestation) would be defined at a time closer to actual implementation of reclamation. At that time, the appropriate type of re-vegetation would be agreed upon with MNDNR staff based on wildlife habitat needs, erosion control objectives, forest production considerations, hydrology, landforms, etc. Sections 4.1, 4.9, 5.7, 5.8 and 6.4, and 6.15 describe vegetation and wetland mitigation replacement strategies proposed for incorporation into the final Minnesota Steel reclamation plans.

Another reason that an accurate estimate of future post-mining cover types cannot be made now is that succession (and, potentially, future human activities in the area) would ultimately keep changing plant communities in the area over time. Reclamation re-vegetation would likely utilize early succession plant species to improve the chances of successful re-vegetation. Whether grass, shrub and/or tree species are planted as part of the reclamation process, the cover types that are planted as part of site reclamation would not necessarily be the 'ultimate' cover types, since succession would ultimately result in changes to cover types in the future, as it has in the past. For example, grassland vegetation was the primary cover type established during reclamation following closure of the Butler mine in 1985; however, many of the former Butler mine areas have now evolved from grassland into shrub/grassland or early successional forest areas. A similar process would take place over time following closure and reclamation of the Minnesota Steel project. Post-mining land management (and possible wildlife management) practices would determine the 'ultimate' cover types to be established on the site after mining.

TABLE 6.2.1 COVER TYPES BEFORE AND AFTER: THE PROPOSED PROJECT PLANT SITE

	Number of Acres	
Cover Types	**Before**	**After**
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	103	0
Wooded/Forest	234	0
Brush/Grassland	56	50
Crop Land	0	0
Lawn/Landscaping	0	5
Residential	0	0
Developed/Utility/Transportation	0	338
(Subtotal)	393	393
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	6	0
Wooded/Forest	14	0
Brush/Grassland	55	5
Residential	0	0
Developed/Utility/Transportation	0	70
(Subtotal)	75	75
TOTAL	**468**	**468**

MINE AREA

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	25	0
Deep Water Areas	0	269
Wooded/Forest	239	0
Brush/Grassland	127	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	0	122
(Subtotal)	391	391
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	4	0
Deep Water Areas	204	375
Wooded/Forest	100	0
Brush/Grassland	63	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	4	0
(Subtotal)	375	375
TOTAL	**766**	**766**

STOCKPILE AREA

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	59	0
Wooded/Forest	295	0
Brush/Grassland	24	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	0	378
(Subtotal)	378	378
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	156	0
Wooded/Forest	27	0
Brush/Grassland	213	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	54	450
(Subtotal)	450	450
TOTAL	**828**	**828**

TAILINGS BASIN*

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	112	0*
Wooded/Forest	256	0
Brush/Grassland	3	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	0	371
(Subtotal)	371	371
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	269	0*
Wooded/Forest	77	0
Brush/Grassland	735	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	128	1,209
(Subtotal)	1,209	1,209
TOTAL	**1,580**	**1,580**

* Note: Wetlands will likely form in the tailings basin and reclaim pond areas following reclamation. The wetland mitigation plan estimates 90 acres and 60 acres of wetlands would form in the tailings basin and reclaim pond, respectively. However, since there is no certainty about the area that would form (it could be greater or less than the estimates in the mitigation plan), a value of '0' was used in this cover type estimate.

TAILINGS PIPELINE CORRIDOR AND OTHER WATER CONVEYANCE/SUPPLY AREAS

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	19	0
Deep Water Areas	0	0
Wooded/Forest	8	0
Brush/Grassland	10	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	1	38
(Subtotal)	38	38
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	6	0
Deep Water Areas	446	446
Wooded/Forest	34	0
Brush/Grassland	16	0
Residential	0	0
Developed/Utility/Transportation	1	57
(Subtotal)	503	503
TOTAL	**541**	**541**

CONNECTED ACTIONS INFRASTRUCTURE

ACCESS ROADS*

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	6	0
Wooded/Forest	58	0
Brush/Grassland	11	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	1	76
(Subtotal)	76	76
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	0	0
Wooded/Forest	5	0
Brush/Grassland	8	0
Residential	0	0
Developed/Utility/Transportation	0	17
Mineland	4	0
(Subtotal)	17	17
TOTAL	**93**	**93**

*Assumes Option 2 roadway improvements are constructed, as a 'worst case'. (See Section 6.13.)

SEWER/WATER SERVICE LINES

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	1	1
Wooded/Forest	8	0
Brush/Grassland	4	13
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	1	0
(Subtotal)	14	14
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	0	0
Wooded/Forest	0	0
Brush/Grassland	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
(Subtotal)	0	0
TOTAL	**14**	**14**

RAILROADS

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	2	0
Wooded/Forest	21	0
Brush/Grassland	8	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	0	31
(Subtotal)	31	31
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	3	0
Wooded/Forest	8	0
Brush/Grassland	6	0
Residential	0	0
Developed/Utility/Transportation	0	17
(Subtotal)	17	17
TOTAL	**48**	**48**

NATURAL GAS PIPELINE*

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	25	25
Wooded/Forest	44	0
Brush/Grassland	31	75
Crop Land	2	2
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
(Subtotal)	102	102
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	0	0
Wooded/Forest	0	0
Brush/Grassland	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
(Subtotal)	0	0
TOTAL	**102**	**102**

* Acres affected assumes a typical corridor as shown in Figure 6.13.1 for the natural gas pipeline route as a representation of the number of acres and type of land cover affected, but does not imply that this corridor is the selected route at this time.

TRANSMISSION LINES*

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	51	51
Wooded/Forest	72	0
Brush/Grassland	110	214
Crop Land	4	4
Lawn/Landscaping	0	0
Residential	2	2
Developed/Utility/Transportation	32	0
(Subtotal)	271	271
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	1	1
Wooded/Forest	3	0
Brush/Grassland	4	7
Residential	0	0
Developed/Utility/Transportation	0	0
(Subtotal)	8	8
TOTAL	**279**	**279**

* Acres affected assumes a typical transmission line corridor as shown in Figure 6.13.1 as a representation of the number of acres and type of land cover affected, but does not imply that this corridor is the selected route at this time.

TOTAL AREA AFFECTED BY PROPOSED ACTION*

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	402	77
Wooded/Forest	1,234	269
Brush/Grassland	385	352
Crop Land	6	6
Lawn/Landscaping	0	5
Residential	2	2
Developed/Utility/Transportation	35	482
Mineland	0	871
(Subtotal)	2,064	2,064
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	447	1
Deep Water Areas	650	821
Wooded/Forest	268	0
Brush/Grassland	1,099	12
Residential	0	0
Developed/Utility/Transportation	191	160
Mineland	0	1,661
(Subtotal)	2,655	2,655
TOTAL	**4,719**	**4,719**

* Proposed Action cover type totals include an estimated 536 acres impacted by infrastructure connected actions. (See Section 6.13.)

TABLE 6.2.2 COVER TYPES FOR THE ALTERNATIVE TAILINGS BASIN ALTERNATIVE TAILINGS BASIN*

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	239	0**
Wooded/Forest	717	0
Brush/Grassland	163	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	0	1,119
(Subtotal)	1,119	1,119
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	0	0**
Wooded/Forest	0	0
Brush/Grassland	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	0	0
(Subtotal)	0	0
TOTAL	**1,119**	**1,119**

* These impacts would occur instead of impacts at the tailings basin for the Proposed Action.
** Note: Wetlands will likely form in the tailings basin area following reclamation. The wetland mitigation plan estimates 90 acres and 60 acres of wetlands would form in the Proposed Action tailings basin and reclaim pond, respectively, and a similar estimate is likely for the Alternative Tailings Basin. However, since there is not certainty about the area that would form (it could be greater or less than the estimates in the mitigation plan), a value of '0' was used in this cover type estimate.

TABLE 6.2.3 COVER TYPES IN THE STOCKPILE AREA WITH THE IN-PIT STOCKPILING SUB-ALTERNATIVE*

Cover Types	Number of Acres Before	After
Areas Not Disturbed by Previous Mining Activity		
Types 1 to 8 Wetlands	58	0
Wooded/Forest	293	0
Brush/Grassland	23	0
Crop Land	0	0
Lawn/Landscaping	0	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	0	374
(Subtotal)	374	374
Areas Previously Disturbed by Mining Activity		
Types 1 to 8 Wetlands	80	0
Wooded/Forest	10	0
Brush/Grassland	195	0
Residential	0	0
Developed/Utility/Transportation	0	0
Mineland	42	327
(Subtotal)	327	327
TOTAL	**701**	**701**

* These impacts would occur instead of impacts at the stockpile area estimated for the Proposed Action.

6.3 THREATENED AND ENDANGERED SPECIES - PLANTS

6.3.1 Affected Environment

6.3.1.1 Regulatory Framework

The Federal Endangered Species Act of 1973, as amended (16 U.S.C. §§ 1531 – 1544) defines the regulations pertaining to plant and animal species that have been federally-designated as threatened or endangered. Field surveys performed in the project area identified no federally-listed threatened or endangered plant species. A search of the MNDNR Natural Heritage Information System database also indicated no federally-listed threatened or endangered plant species in the project area. In addition, the U.S. Fish and Wildlife Service did not identify any federally-listed vascular plant species as being potentially present in the Proposed Project area.

Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895) requires the MNDNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern. The resulting list of Endangered, Threatened, and Special Concern Species is codified as Minnesota Rules 6134. The Endangered Species Statute also authorizes the MNDNR to adopt rules that regulate treatment of species designated as endangered and threatened. These regulations are codified as Minnesota Rules, part 6212.1800 to 6212.2300.

Minnesota's Endangered Species Statute and the associated Rules impose a variety of restrictions, a permit program, and several exemptions pertaining to species designated as endangered or threatened. Species of special concern are not protected by Minnesota's Endangered Species Statute or the associated Rules.

Based on these regulatory considerations, the discussion in this section focuses on state-listed threatened and endangered plant species in the project Impact Area. Species listed by the state as 'special concern' as well as those being 'tracked' by the MNDNR for possible listing are discussed, but in less detail, since those species are not protected or regulated by state rules.

6.3.1.2 Existing Conditions

The Scoping EAW described initial database searches and field surveys that provided information available during scoping, including a 1999 botanical field survey by Gary Walton. A search of the MNDNR Natural Heritage Information System database for the EIS identified 12 populations of state-listed threatened and endangered plant species recorded previously within the Mining Area boundary: one population of *Botrychium oneidense* (Blunt-lobed grape fern), two of *B. pallidum* (Pale moonwort), five of *B. rugulosum* (Ternate grapefern), and four of *Platanthera flava* (Pale green orchid). In addition, 23 other populations of species listed as special concern or tracked were included in the database: ten populations of *B. simplex* (Least moonwort), two of *B. minganense* (Mingan moonwort), five of *B. matricariifolium* (Daisy-leaved moonwort), two of *B campestre* (Prairie moonwort), one of *Platanthera clavellata* (Club spur orchid), one of *Sparganium glomeratum* (Clustered bur-reed), one of *Spiranthes casei* (Case's lady's-tresses), and one of *Liparis liliifolia* (Brown widelip orchid).

The Proposed Project Boundary is larger than the areas proposed to be impacted by the project, so not all of the species identified by the database would necessarily be impacted by the Proposed Project. The database listings were used, along with other information sources, in the preparation of a list of target species to be searched for during botanical field survey work performed in Proposed Project Impact Areas in 2005. The survey methodology and results were described in an August 2005 report, *2005 Botanical Survey: Minnesota Steel Industries, LLC*. The 2005 survey included areas that would be impacted by the Proposed Action and by the Alternative Tailings

Basin. This included some, but not all, of the areas surveyed by Walton in 1999 and described in the Scoping EAW (since some of the 1999 areas are no longer potentially impacted by the project). The findings of the 1999 and 2005 surveys are summarized in Table 6.3.1.

The 2005 survey identified two state-listed endangered plant species (*Botrychium oneidense* and *Platanthera flava)* at two separate locations and one threatened plant species (*Botrychium rugulosum*) found at four locations within the areas surveyed. The 1999 botanical survey found additional populations of these three state-endangered and threatened plant species plus a population of *B. pallidum* (see Table 6.3.1). The 2005 botanical survey rediscovered one of the *Platanthera flava* locations. However, the remaining 1999 populations were not found – or a different state-listed species was found at the coordinates of the 1999 survey – by the 2005 survey.

The 2005 Botanical Survey report lists likely reasons for the differences between the surveys, including the tendency for *Botrychium* species to be present in close proximity to one another, which could explain the difference in species findings at site 71607 (see Table 6.3.1). In addition, life history information for these species indicates that individual plants of the species could be in a subterranean dormant state when field observations were made.

TABLE 6.3.1 COMPARISON OF BOTANICAL SURVEYS

Location	Status	2005 Survey	# in 2005	1999 Survey	# in 1999
71501	T	*Botrychium rugulosum*	6		
71504	E	*Platanthera flava*	40	*Platanthera flava*	78
71602	T	*B. rugulosum*	12		
71603	T T	*B. rugulosum*	5	 *B. campestre*	 20
71605	T	(No T or E plants found)		*B. campestre*	3
71606	T	*B. rugulosum*	50		
71607	**E** **T** **E**	***B. oneidense***	**40**	 ***B. rugulosum,*** ***B. pallidum***	 **1** **4**
PLAFLA2	E	No T or E plants found		*Platanthera flava*	70
	T	(Outside current project area)		*B. rugulosum*	60
	T E	(Outside current project area)		*B. rugulosum,* *B. oneidense*	25 10

Location 71607 listed in bold type would be impacted by Proposed Action (crushing operation)
Data source: *2005 Botanical Survey*

In addition to re-surveying the areas studied in 1999, the 2005 survey also surveyed the proposed Alternative Tailings Basin area. No state listed plant species were identified in field surveys performed at the Alternative Tailings Basin area (described in detail in *2005 Botanical Survey*), but this area does contain remnants of preferred habitat for *Botrychium* species including: upland deciduous hardwood forest, upland deciduous aspen forest, and upland coniferous pine forest.

6.3.2 Environmental Consequences

6.3.2.1 Proposed Action

The findings of the 1999 and 2005 botanical surveys were used to make project design modifications, where feasible, in order to avoid populations of state-listed threatened and endangered plant species. The Proposed Action tailings basin has been reduced in size to avoid encroaching on sites #71501 and #71504. The pipeline has been routed to avoid sites #71602 and PLAFLA2. Two sites -- identified as #71603 and #71606 – located east of Pit 5 would also be avoided by the Proposed Action.

There is only one location where a loss of state-listed threatened/endangered species cannot be avoided: Site #71607, at the site of the proposed primary and secondary crusher and dry cobbing operation (see listing in bold type in Table 6.3.1). Minnesota Steel has studied the possibility of relocating this facility and concluded that relocation is not feasible for a number of reasons, including the need to locate the crusher in close proximity to the edge of the mine pit but outside of the iron formation boundary.

Construction of this facility would result in removal of a population of approximately 40 *B. oneidense* (Blunt-lobed grapefern) plants identified in 2005. This population is currently located under a mixed poplar/aspen stand adjacent to a sparsely vegetated open area of fine older mine tailings and grit. The 1999 botanical survey also located four individuals of *B. pallidum* (Pale moonwort) and one of *B. rugulosum* (St. Lawrence grapefern) at the same location as site #71607, but they were not observed in 2005. It is unknown whether these species are still present at this location in a subterranean dormant state. Many species of *Botrychium* can persist underground for several years. For the purpose of assessing potential impacts for this EIS, it is assumed that the individuals identified in 1999 are still present at this location. Based on this assumed impact, the Proposed Action would take approximately 45 threatened and endangered *Botrychium* plants within the project Impact Area.

In addition, the Proposed Action would take approximately 93 individuals of special concern or tracked species, including two individuals of *B minganense* (special concern species), 35 of *B. matricariifoia* (tracked species), and 7, 45, and 4 individuals of *B. simplex* (special concern species). A population of 45 *B. simplex* and a population of 35 *B. matricariifolium* were found in 1999 along with *B. pallidum* and *B. rugulosum* at site #71607 (proposed crusher area) where only *B. oneidense* was found in 2005. A population of seven *B. simplex* was found at site #SIM1 (proposed stockpile area) in 1999 where no listed plants were found in 2005. A population of four *B. simplex* was found at site #SIM3 (proposed Tailings Basin) in 1999 where no listed plants were found in 2005; and a population of two *B. minganense* was found at site #71608 (proposed mine area) in 2005 where *B. simplex* was found in 1999.

6.3.2.2 Alternative Actions

Alternative Tailings Basin

If the Alternative Tailings Basin were selected as the preferred alternative, the impact to a population of four *B. simplex* (special concern species) identified in 1999 would be avoided. Otherwise, all of the Proposed Action impacts described above would not change.

Although no state-listed species were identified in field surveys performed at the Alternative Tailings Basin site, this area does contain remnants of preferred habitat for *Botrychium* species including upland deciduous hardwood forest, upland deciduous aspen forest, and upland coniferous pine forest. The proposed site of the Alternative Tailings Basin has a history of logging with both natural and artificial regeneration of the forest community. The 2005 Botanical Survey concludes that the mature forest existing prior to cutting does not provide suitable habitat for most species of *Botrychium*.

Because logging operations do not generally result in complete removal of vegetation from the ground surface, the successional processes that follow logging are initiated at a more advanced level of vegetative community structure. Within logged areas, shrub coverage can be dense with little or no sunlight penetrating to the ground surface. The 2005 Botanical Survey attributes the lack of listed species within the Alternative Tailings Basin site to the relative scarcity of suitable habitat and to the ongoing logging activities.

The results of the 2005 Botanical Survey suggest that, if left undisturbed, the Alternative Tailings Basin site would develop into mixed hardwood-conifer forest containing moderately diverse habitats and openings, with microhabitats suitable for certain state-listed plant species. However, given the land use options currently under consideration for the area (e.g., forest harvest or as a tailing basin), the Alternative Tailings Basin site is not likely to attain these ecological functions. As a result, the probability that the area harbors rare plant species would remain low.

In-Pit Stockpiling

The In-Pit Stockpiling Alternative would decrease the size of some of the stockpiles as compared to the Proposed Action. However, this alternative would not likely avoid impacts to a *B. simplex* (special concern species) population identified in 1999 in the stockpile area, since this site is located between the stockpiles and the mine area, where truck traffic would need to travel back and forth.

6.3.3 Mitigation Opportunities

Section 6.3.2.1 described how the findings of the 1999 and 2005 botanical surveys were used to make project design modifications, where feasible, in order to avoid populations of state-listed threatened and endangered plant species. The Proposed Action tailings basin has been reduced in size to avoid encroaching on sites #71501 and #71504. The pipeline has been routed to avoid sites #71602 and PLAFLA2. Two sites -- identified as #71603 and #71606 – located east of Pit 5 would also be avoided by the Proposed Action.

Where there is no feasible alternative to taking a state-listed species, Minnesota Steel and MNDNR staff discussed options for compensatory mitigation to reduce the impact of the loss of the *Botrychium* species populations that would result from the Proposed Action. Based on these discussions, Minnesota Steel has submitted a transplanting plan to MNDNR staff for review (see Appendix E).

The transplanting plan is based on field assessments of habitat characteristics at the existing site of the affected *Botrychium* populations, including canopy cover, associated plant species and soils descriptions. Based on this information, a site with corresponding habitat characteristics was identified. Soil sections approximately 10” thick containing the *Botrychium* populations at the existing site would be removed and transported to the transplant site, using techniques that would conserve subterranean plant structures and fungal associates important to the species’ survival. Individuals with known locations at the existing site would be re-located to the transplant site, as well as additional soil sections from the existing site with no visible *Botrychium*. This would help ensure that subterranean *Botrychium* individuals potentially present at the existing site would also be re-located. As part of their review of the takings permit for Minnesota Steel, the MNDNR is reviewing the proposed transplanting plan; and if the takings permit and the proposed transplanting plan are approved, a five-year monitoring period of any transplanted plants would be required.

6.4 THREATENED AND ENDANGERED SPECIES – ANIMALS

The Scoping EAW provided an initial evaluation of federal and state-listed threatened and endangered animal species that could potentially be affected by the proposed Minnesota Steel project. This evaluation identified the project site as being within the overall range of the Canada lynx (listed as a federal 'threatened' species in March 2000) and the gray wolf (listed as a federal 'threatened' species in the mid-1970s and as a state 'species of concern'). This section of the EIS evaluates the potential for the Proposed Project to affect the Canada lynx and the gray wolf.

The bald eagle is also listed as a federal threatened species and a state 'species of concern.' However, study of the bald eagle in the EIS was determined to be unnecessary, based on the following analysis/finding in the Scoping EAW:

> *'The Minnesota Natural Heritage database was searched in March, 1997 and February, 1999 to determine if any rare plant or animal species or other significant natural features are known to occur within the project area. The search found two bald eagle nests, a nesting colony of double-crested cormorants, and great blue herons in the Butler Taconite Stage II Tailings Basin that is located adjacent to the proposed tailings basin (Stage I) for Minnesota Steel. The bald eagle is listed by the federal government as a threatened species. It is listed by the state of Minnesota as a special concern species. The bald eagle is also federally protected by the Bald and Golden Eagle Protection Act. Since the Stage II basin is not being utilized, no direct impact to the nesting habitat is anticipated.'*

The bald eagle nests identified in the scoping analysis are located over 0.25 mile from the Proposed Action tailings basin, so they should not be negatively impacted by activity in the tailings basin. The Project Impact Areas were also reviewed with respect to whether they may provide wintering habitat for bald eagles. Generally, eagles winter where there is available food, either near open water or where there is carrion available. There are no water bodies within the project area that are likely to remain open in the winter; and carrion from road kill on TH 169 and/or natural deer mortality is not likely to be abundant enough to sustain both eagles and other predators such as wolves. Therefore, the project area is not likely to be a wintering area for eagles. This assessment confirmed the scoping decision that there is no likely impact to bald eagle populations and that study of potential impacts to bald eagles is not needed in the EIS.

The USFWS and USACE are currently in informal consultation, to determine if formal Section 7 Consultation would be required for the Canada lynx and/or the gray wolf on this project. If formal consultation is required, the USACE (as the Federal Requesting Agency) will prepare and submit a letter to the USFWS requesting initiation of formal Section 7 Consultation. The request letter will be submitted to USFWS concurrent with publication of the Draft EIS.

6.4.1 Affected Environment

6.4.1.1 Gray Wolf

The gray wolf was present throughout most of the contiguous United States and North America prior to European settlement (Hazard, 1982). Wolf populations experienced declines as forestry, land conversion, and agricultural practices altered prey populations and habitat availability. Bounty records and other anecdotal information sources were used to estimate wolf populations during the post-settlement era so precise numbers are lacking. However, the gray wolf range contracted to sparsely-populated parts of Minnesota, Canada, and Alaska during this time period. Upon its protection during the mid-1970s, northeastern Minnesota contained the only reproducing population of wolves in the lower 48 states. Populations are now recovering and have been re-established in several western and southwestern states. Gray wolf populations within the western Great Lakes Region (i.e., Minnesota, Wisconsin, and Michigan) are expanding and have exceeded recovery goals for the region for several years (Erb and Benson, 2004). Proposals have been made in 2000, 2003 and 2004 to de-list the gray wolf in the contiguous U.S. or in the eastern region of the U.S. (including Minnesota).

In northern Minnesota, the principal food of the gray wolf is the white-tailed deer and, to a lesser extent, moose. In summer, wolves supplement their diet with beaver and other prey. Most wolves live in family packs consisting of two to eight members. Each pack inhabits an area of 20 to 214 square miles or more and tends to be territorial. The *Recovery Plan for the Eastern Timber Wolf* (USFWS 1992) identifies five main factors that are critical to the long-term survival of this species. These critical factors are; 1) large tracts of wild land with low human densities and minimal accessibility by humans, 2) ecologically sound management, 3) availability of adequate wild prey, 4) adequate understanding of wolf ecology and management, and 5) maintenance of populations that are either free of, or resistant to, parasites and diseases new to wolves, or are large enough to successfully contend with their adverse effects.
Large blocks of undeveloped land exist to the northwest and southeast of the project area. Wolves are known to occur on a regular and historical basis at both locations.

Wooded/forested and brush/grassland are habitats that are utilized by wolves for a variety of activities. These habitat types are common in the Minnesota Steel Proposed Project Impact Area, especially since much of the project area has been disturbed in the past by mining operations. However, there are no documented records of wolf den sites or rendezvous areas in the project area. Specific surveys have not been conducted; therefore it is possible that such sites occur in the project area, though it is highly unlikely, given the higher level of human activity at the Minnesota Steel Proposed Project area compared to the large, undeveloped areas to the northwest and southeast.

The existing TH 169 corridor and previous land disturbance from mining reduce habitat quality for wolves in the immediate vicinity of the project area by affording easier human and vehicle access to the forested and/or grassland/brush habitat areas that could be utilized by wolves. Wolves are sensitive to human presence and activity. Currently wolves are known to utilize habitats on both sides of this corridor, but no detailed information is available on wolf use/travel between these habitat areas – across TH 169 and the Proposed Project site. (Section 5.8 discusses wildlife travel corridors in greater detail.)

6.4.1.2 Canada Lynx

The historical and present range of the lynx north of the contiguous United States includes Alaska and the portion of Canada extending from the Yukon and Northwest Territories south to the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, lynx historically occurred in the Cascades Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982, Quinn and Parker 1987). The project area is within the Great Lakes Geographic Area and is within the species range. However, no Critical Habitat for lynx has been designated by USFWS within or near the proposed Minnesota Steel project area.

Relatively little is known concerning the distribution and habitat associations of Canada lynx in northeastern Minnesota, which is near the southern limit of its range. The lynx is an uncommon, solitary animal that lives in boreal and mixed coniferous-deciduous forests with home ranges estimated to vary from 20 to 47 square miles in Minnesota (Mech 1980). McKelvey et al. divide Canada lynx populations in the 48 contiguous states into western Great Lakes, eastern, and western populations. Historically, Minnesota had the highest numbers of lynx in the western Great Lakes population. Harvest data document the persistence of a lynx population in

Minnesota through most of the 20th Century (Henderson 1978, Loch and Lindquist, unpubl. manuscript). They are rare in areas densely populated by humans (Hazard 1982). There is no reliable population estimate for Minnesota, but available information indicates that it is extremely low (USFWS 1998). MNDNR has data from trapping records in the last 20 years showing a significant drop in lynx numbers.

The 2006 *Canada Lynx Assessment Final Interim Report* produced for Minnesota Steel states "Observations of lynx based on trapping records and visual observations show that lynx are more likely to be found in northeastern Minnesota than other portions of the state. Based on sightings of lynx since 2000, the mine is on the western edge of the core area used by lynx in Minnesota. A total of 15 (1 confirmed, 14 probable or unconfirmed) sightings of lynx have been recorded in Itasca County since 2000. One confirmed sighting of a lynx was made in the northern portion of the county, approximately 20.3 miles from the project site. Several probable and unverified sightings have been within or near the Action Area [i.e., within six miles of the Proposed Project area]. Few, if any, observations are the result of a systematic effort to find lynx in Minnesota. The vast majority are incidental encounters, and as such, tend to be clustered along roads and other places frequented by observant and interested people. Thus, while these reports tell us something about where lynx are, they provide no information about where lynx do not occur. Similarly, we cannot know the relationship between the number of reports and the number of lynx in Minnesota at the time of the reports (MNDNR 2006)."

Mature forests with downed logs and windfalls provide cover for lynx natal dens, escape, and protection from severe weather. Early successional forest stages provide habitat for the lynx's primary prey, the snowshoe hare. Hare populations are highest in lowland conifer forests, forests with dense shrub layers (Jaakko Poyry 1992), and in 20 year old stands with overhead cover. The lynx population fluctuates with the hare's in Canada or other areas where lynx metapopulations occur; however, where lynx occur in areas peripheral to core snowshoe hare habitat, lynx may persist due to a number of factors including, dispersal from Canada and/or snowfall depths that allow lynx a competitive advantage to other carnivores in limited areas or the Arrowhead Region of Minnesota (Buehler and Keith 1982, McKelvewy at al. 2000a).

At the southern periphery of its range, including Minnesota, lynx immigration rates from Canada may be low because habitat conditions are marginal (Koehler 1990). Some timber management, fire suppression, and grazing practices may temporarily reduce prey population, leading to low kitten survival. Conversion of native vegetation communities to forest types that are less suitable or unsuitable as lynx habitat may also decrease prey populations. Road and trail access and recreational uses that result in snow compaction may allow ingress of coyotes, fox and bobcats into lynx habitat, thereby increasing competition for limited winter prey resources (Buskirk, et al. 2000). In addition, roads create a risk of lynx mortality due to vehicular collisions.

The Canada Lynx Conservation Assessment and Strategy (Ruediger, et al. 2000) guides management activities that could affect both denning and foraging habitat for lynx. Both foraging and denning habitat characteristics occur in the forest within and surrounding the project area; but the presence of existing roads, including site access roads from previous mining activity on site and state and county roadways, provides human access to the project area, which makes it less desirable for lynx. Since there is potential lynx habitat in the area, but no field data to confirm the presence or absence of lynx in the area, a winter tracking survey will be performed within the proposed Minnesota Steel project area during the winter of 2006-2007 (see Appendix D).

6.4.2 Environmental Consequences

6.4.2.1 Gray Wolf

The Proposed Project would affect the existing forest and grassland/brushland habitats within the mining areas and would increase human activity in the area. Both of these impacts would likely result in decreased wolf use of the area during mining, but wolf use of the area would likely resume again following mine closure and reclamation.

The large blocks of undeveloped land to the northwest and southeast of the project area where wolves are known to occur on a regular and historical basis would not be affected by the Proposed Project. The presence of wolves within the large habitat tracts northwest and southeast of the project area suggest these animals have adapted to the presence of both the TH 169 corridor and existing disturbed land conditions. Since wolves appear to be utilizing habitat in the area, despite human activity, it is likely that even if the Proposed Project affected habitat currently utilized by individual animals within the project area, it would not likely affect overall wolf population levels of the gray wolf in the project vicinity or in Minnesota.

6.4.2.2 Canada Lynx

As described in Section 6.4.1, the existing level of human disturbance at the Proposed Project area and along the TH 169 corridor already potentially reduces habitat quality for Canada lynx in the project area. The Proposed Project would affect the existing forest habitat within the mining areas and would increase human activity in the area. Although the presence of lynx in the project area has not been confirmed by field studies, if lynx are using the area now, the project impacts would likely result in decreased lynx use of the area during mining. Lynx use of forested portions of the area may resume again following mine closure and reclamation.

The 2006 Canada Lynx Assessment report indicates that the project area is on the edge of the core area used by lynx in Minnesota (see Section 6.4.1.2); however, minimal snow cover during the winter of 2005-2006 limited the ability of researchers to confirm lynx use of the project area. Additional research would be performed during the winter of 2006-2007 to confirm if/how lynx utilize the areas in the project vicinity, to better define what the project impacts would be, and what additional study or mitigation is needed, if any (see the Minnesota Steel letter in Appendix D regarding performance of the study.)

6.4.3 Mitigation Opportunities

6.4.3.1 Gray Wolf

The existing forest and grassland/brushland habitats in the project area – much of which has been affected by past mining activities – is evidence that wolf habitat can be re-established following mining disturbances. Wolves can utilize the forest-edge habitat that would develop after cessation of mining activities to hunt deer in the edge habitats and small mammals in the open areas. Providing good planting conditions (e.g., soil cover over coarse materials and rock) and planting disturbed areas as soon as possible with early-successional tree and shrub seedlings and grass seed to accelerate the re-vegetation process would speed the wolf habitat creation process.

6.4.3.2 Canada Lynx

Since the 2005-2006 field survey was limited by snow cover, additional study would be performed during the winter of 2006-2007 to obtain additional information on extent of use of the project area by Canada lynx (see the Minnesota Steel letter in Appendix D committing to the study). Minnesota Steel would work with USFWS to define the scope of additional studies and, once findings are available, what the potential effects to the local lynx population would be (if any) and, if effects are identified, what mitigation could be required (e.g., habitat restoration/enhancement outside of the project area).

If reclamation plans included re-establishment of conifer forests through seedling planting, lynx may find the young conifers to be a suitable winter hunting ground for snowshoe hare, their preferred prey. Those areas where this habitat type is established could benefit the lynx by providing a prey base that was temporarily eliminated while the mine was in operation.

6.5 WATER-RELATED LAND USE MANAGEMENT DISTRICTS

Water-related land use management districts are shoreland areas designated by a federal, state or local units of government, which have specific restrictions on uses and locations of structures as defined by the local zoning ordinance. The Final SDD indicated that the Proposed Action is not expected to have significant impacts on water-related land use management districts. Itasca County's Shoreland Zoning Ordinance, including Pickerel Creek which was specifically identified in the Final SDD, was reviewed and compared to the Project Impact Areas.

The water-related land use management district item of the Final SDD indicated that mining in proximity to Snowball Lake, which has the potential to affect lake water levels, would be analyzed in the EIS. These issues are discussed in Section 4.3.2.

6.5.1 Affected Environment

6.5.1.1 Regulatory Framework

The current Itasca County Zoning Ordinance went into effect on July 1, 2005. Prior to that, the County operated under an ordinance developed in 1998, which went through a major revision in 2003, and more revisions in 2004 and 2005. Itasca County designates Shoreland Overlay Districts in its zoning ordinance for County Public Waters to implement the current shoreland standards described in Minnesota Rules 6120. These shoreland zones are designated within 1,000 feet and 300 feet of the ordinary high water level (OHW) for lakes and streams, respectively. Figure 6.5.1 shows the shoreland management districts designated by the County in the project vicinity, based on mapping provided by the County. Usually, the County Public Waters consist of waters designated as State Public Waters, which are regulated by the MNDNR. However, in some cases, the County has designated additional waters as County Public Waters. The Itasca County Zoning Ordinance Article 5 – Shoreland Overlay Districts define specific lake classifications and zoning provisions enacted by the County (see Table 6.5.1).

TABLE 6.5.1 WATER-RELATED LAND USE MANAGEMENT DISTRICTS IMPACTED

Name	Itasca County Public Waters Classification	MNDNR Public Waters Inventory (PWI) Status [(2)]	Project Activities Impacting the Shoreland Overlay District [(1)]
Oxhide Lake	General Development	31- 106P	• No anticipated shoreland zoning impacts
Oxhide Creek (between Oxhide Lake and Swan Lake)	Tributary	Protected stream (31-0999)	• No anticipated shoreland zoning impacts
Snowball extension	Swamp	31-107P	• No anticipated shoreland zoning impacts
Snowball Lake	Recreational Development I	31-108P	• A portion of the ultimate Pit 6 boundary lies within the shoreland overlay district
O'Brien Lake (Big and Little)	Natural Environment I	Not on PWI (31-0032)	• East edge of the Tailings Basin is within the shoreland boundary on the west side of O'Brien Lake**
O'Brien Creek	Tributary	Protected stream (31-0999)	• No anticipated shoreland zoning impacts
Sucker Brook (Sucker Creek)	Natural Environment I	Protected stream (31-0975)	• A portion of one of the upper tributaries to this stream may be eliminated by the development of the Alternative Tailings Basin if that alternative is utilized. (No impact from the Proposed Action)
Swan Lake	Recreational Development II	31-67P	• No anticipated shoreland zoning impacts
Pickerel Creek	Natural Environment I	Designated Trout stream – protected (31-0965)	• Proposed tailings pipeline alignment crosses stream corridor within the shoreland district**
Headwaters – Pickerel Creek (Pickerel Lake)	General Development	Not on PWI (31-0033)	• No anticipated shoreland zoning impacts
Unnamed Wetland (T56R23 Sec. 9)	Natural Environment III	31-105P	• Stockpile Area B boundary is within the shoreland district and; • *Proposed Road Alignment – Option 1*
Unnamed Lake – E of Plant near Co. Rd. 58 (T57R22 Sec. 30)	General Development	Not on PWI (31-0068)	• *Proposed sewer and water alignment in the existing County Road 58 corridor*
Little Sucker Lake	Natural Environment II	31-126P	• *Proposed road and gas pipeline corridor within the shoreland district at the NW corner of the lake* • *Proposed railroad alignment on the SE side of the lake*
(Big) Sucker Lake	Recreation Development II	31-124P	• *Improvement of local access roadway on the SE side of the lake*
Little McCarthy Lake	Recreational Development II	31-123P	• *Improvement of existing roadway at west edge of shoreland district*

** If the Alternative Tailings Basin is chosen, instead of the Proposed Action Tailings Basin, mining activities would not impact the shoreland overlay district.

(1) Activities in italics are connected actions, not part of the Proposed Action or related alternatives.

(2) Numbers appearing in parentheses were received from Itasca County.

The overlay-zoning districts incorporate underlying zoning districts and impose additional or varying requirements from the requirements of the underlying zones. When there is conflict between the provisions of the shoreland overlay district and the underlying zoning, the provisions of the shoreland overlay district prevail (as per the County Ordinance, Section 5.2).

The Scoping EAW indicates that “within shoreland zones, the County zoning ordinance requires a 500-foot setback from the OHW for mining-related activities and that mining closer than 500 feet would be permitted through a variance only. The proposed mine and associated stockpiles and structures exceed the 500-foot setback requirement for shoreland zoning areas, with the possible exception of Pickerel Creek.” Further research performed for the Draft EIS, indicated that the information presented in the Scoping EAW was from the 1998 Itasca County Zoning Ordinance. The current County mining ordinance, Section 3.13 – Extractive Uses (July 2005) requires a 200-foot setback from the OHW for mining-related activities.

Based on information obtained from the Itasca County Environmental Services Department, the Shoreland Overlay District requirements would prevail over any other zoning in the project area. This indicates that a conditional use permit (CUP) or variance would be required if mining activities not listed as allowed land uses in the shoreland ordinance are proposed within a shoreland overlay district.

The County’s Comprehensive Plan establishes a mining industrial zone, which would eventually define an exclusive zone for mining activities in order to support a strong mining industry. The County has started the process of updating the zoning maps to conform to the new 2005 zoning ordinance, and the updates would include designating locations of mining districts. Completion of this task is anticipated sometime in 2007. As implementation of the mining districts occurs, the County will determine how these districts would be regulated relative to the shoreland overlay districts. The timeframe for completion of the County zoning maps and review/permitting for the Minnesota Steel project may overlap.

6.5.2 Environmental Consequences

Figure 6.5.1 shows where the proposed and connected actions (infrastructure) of the project encroach upon the Itasca County Shoreland Zoning Districts. This data and mapping was used to determine where potential shoreland zoning impacts from the project may occur.

Table 6.5.1 lists the waters located within the Proposed Project Boundary and their classification by Itasca County and the MNDNR. It also summarizes the project-related activities that may occur within the 2005 Itasca County Shoreland Overlay Districts as a result of the implementation of the Minnesota Steel project. These impacts are described in greater detail below.

Proposed Actions

Tailings Basin

The outline of the Proposed Project tailings basin would intersect a small portion of the west edge of the 1,000-foot shoreland overlay district of O’Brien Lake. It may be possible to change the outline of the tailings basin to bring the tailings basin boundary outside of the 1,000-foot shoreland overlay district to avoid the need for a CUP or variance from the County. If the Minnesota Steel project uses the Alternative Tailings Basin, the Proposed Project tailings basin would no longer be used and therefore would not impact the shoreland overlay district. However, if the Alternative Tailings Basin is utilized, the shoreland area at the upper headwaters of Sucker Brook would be impacted, and the County would likely require a CUP or variance for that impact.

The Proposed Action would also involve crossing Pickerel Creek with a tailings pipeline. If the Alternative Tailings Basin is used, the Pickerel Creek shoreland area would not be impacted by the project.

Mining Area

The southeast side of the identified boundary of Pit 6 falls within the shoreland area within 1,000 feet of Snowball Lake. This impact would require a CUP or variance from the County.

Stockpiles

The proposed Stockpile B area falls within the Unnamed Wetland 31-105P shoreland overlay district. This would require a CUP or variance from the County or a reconfiguration of the stockpile.

Plant Area

The rail corridor between the crusher/concentrator and the plant area intersects the southeast edge of the shoreland district of Little Sucker Lake (31-126P). This impact would likely require a County CUP or variance.

Connected Actions

The proposed southwest to northeast roadway, the natural gas corridor from TH 169 to the County Road 58 corridor, and the local road connection (see Figure 6.5.1 and Section 6.13) would intersect shoreland overlay districts at Unnamed Wetland 31-105P and Big Sucker and Little Sucker Lakes, requiring a CUP or variance. Also, the shoreland district for an unnamed lake (31-0068) located north of County Road 58 (northwest of Nashwauk) would be affected by a proposed water and sewer line extension along existing County Road 58. This too may require a County CUP or variance for temporary construction impacts.

6.5.3 Mitigation Opportunities

Mining activities proposed to occur within a shoreland overlay district would require a conditional use permit (CUP) or variance depending on the type of activity. The County requires a variance when a proposed construction, alteration or replacement does not conform to current setback requirements. Variances are granted on the basis of hardship and/or practical difficulty. The County defines a conditional use as: a land use or development that would not be appropriate generally or would not be appropriate without restriction throughout a Zoning District.

The County Zoning Office stated that they are not currently reviewing Minnesota Steel plans with respect to the zoning ordinance, but anticipate reviewing Proposed Project plans at a later date. At the time of that review, the appropriate permitting process (e.g., CUP or variance) would be determined and, if appropriate, mitigation measures may be required as conditions of permit approval.

6.6 EROSION AND SEDIMENTATION

The Final SDD for the Minnesota Steel project states for Erosion and Sedimentation, “The EIS will address runoff from erosion-prone areas of the site, including downstream sensitive areas of Oxhide Creek as part of the larger issue of surface water runoff and overall water quality impacts of the project.” Surface water runoff is discussed in Section 4.4 and overall water quality impacts of the project are discussed in Section 4.5. Impacts to Oxhide Creek are discussed in Section 4.3. Water related erosion at the project site is discussed in this section.

Note: Wind erosion at exposed soil surfaces in disturbed areas of the project is addressed in Section 6.15 (Mineland Reclamation) and Section 4.7 (Stationary Source Air Emissions).

6.6.1 Affected Environment

6.6.1.1 Existing Conditions

Existing site conditions include numerous water bodies susceptible to impacts associated with erosion and sediment transport. These areas include stream channels, wetlands, lakes and flooded mine pits. The Proposed Project also contains areas that could potentially be susceptible to erosion by runoff water, adding to sediment transport loading. These areas include reclaimed stockpiles, mine pit side slopes, tailings basin dike slopes, and areas previously disturbed by former mining facility activities (haul roads, former plant sites, etc.).

The Proposed Project area was first mined for natural ore at the start of the 20th Century. The proposed mining and processing area was most recently used by Butler Taconite which operated a taconite mine/plant from 1967 to 1985. Following the cessation of mining operations, reclamation practices were employed to meet erosion control requirements established by MNDNR in *Taconite and Iron Ore Mineland Reclamation Rules*, (Minnesota Rules 6130). Since then, usage of the area has been limited mainly to logging and recreational vehicles. The Proposed Action would use the former Butler Taconite tailings basin currently comprised of reclaimed dike slopes and wetlands for tailings disposal.

The Alternative Tailings Basin would be located approximately one mile northwest of the proposed mine site in an area currently comprised of forest, wetlands, and a first order headwaters stream feeding Sucker Brook. No mining has occurred at this site and logging has been the only land-disturbing activity.

6.6.1.2 Regulatory Framework

Permitting for the project would include a Storm Water Pollution Prevention Plan (SWPPP) as part of the NPDES permit required by MPCA for the proposed on-site surface runoff management. Erosion control related to reclamation would be addressed by the MNDNR, in the Permit to Mine, based on the requirements of the *Taconite and Iron Ore Mineland Reclamation Rules* (Minnesota Rules 6130).

6.6.2 Environmental Consequences

Minnesota Steel proposes to collect all surface runoff from the project site in on-site storm water ponds. The collected runoff would be piped to production areas of the site for consumptive use. Therefore, the Proposed Project would not discharge surface runoff impacted by mine-feature derived sediments or pollutants off-site, and no sedimentation impacts to downstream water bodies would result from the Proposed Project.

However, erosion-prone areas would be created on disturbed areas of the site as discussed below. Erosion and sedimentation at these areas would be mitigated through the implementation of BMPs, as discussed in Section 6.6.3.

Crusher Concentrator/Stockpiles

The proposed stockpile areas are primarily located in areas previously used for stockpiling. These areas have been reclaimed and would experience complete or partial clearing of vegetation in preparation for their intended use as areas for stockpiling overburden, waste rock, and other process materials. The clearing of existing vegetation and the stockpiling of new materials would create new barren surfaces susceptible to storm water erosion and sediment transport.

Pits 5 and 6

Both Pits 5 and 6 were formerly used or disturbed during previous mining activities. As pit expansion proceeds, previously reclaimed areas would be cleared to expose the underlying overburden or bedrock. Pit expansion would also expose new barren slopes susceptible to erosion and sediment transport.

Plant Site

The majority of the proposed plant site sits on an area previously undisturbed by mining activities. Prior to plant construction, this area would be cleared, graded, and temporarily exposed to storm water erosion, until disturbed areas are paved, revegetated or otherwise stabilized.

Tailings Basin

The Proposed Project tailings basin was previously used by Butler Taconite as their tailings basin. This area would experience complete or partial clearing of vegetation in preparation for use again as a tailings basin. The Alternative Tailings Basin has not been previously disturbed by mining activities. It would be cleared of existing vegetative cover and graded, greatly increasing the potential of erosion and sediment transport by runoff water. Once constructed, tailings basins are designed for sediment containment and expand inward and upward, so any disturbance within the basin should be contained. Construction of the outer dike slopes could initially result in erosion and sediment transport, but revegetation following final grading would protect the outer dike slopes.

Dewatering

As part of the mining plan, drawdown of water in Pits 1 & 2 and 5 is planned prior to ore extraction. Oxhide Creek is the proposed conveyance for this excess water and would receive increased channel flows which could result in downstream erosion. This is covered in detail in Section 4.3.2.

6.6.3 Mitigation Opportunities

In an effort to control off-site discharges and to salvage water for plant consumption, Minnesota Steel has proposed that surface water runoff be collected and stored on-site. Best management practices (BMPs) to be identified in the NPDES permit for the project would serve two purposes: erosion control and storm water retention. The Proposed Project would utilize a capture and conveyance approach for collecting, storing, routing and utilizing storm water (described in greater detail in Sections 4.2 and 4.5).

The NPDES permit would also require the identification of BMPs and a SWPPP to assist in controlling erosion that occurs during construction and operation of the facility and mining areas. The state mineland reclamation rules require that slopes are designed (and ultimately constructed) to reduce erosion and facilitate stabilization and revegetation. Once final grades on a disturbed surface have been reached, the surface is required to be vegetated during the following growing season.

6.7 GEOLOGIC HAZARDS AND SOIL CONDITIONS

The Final SDD identified that significant impacts are not expected in this subject area. The primary concern is the potential for groundwater contamination from process chemicals and hazardous materials used or stored at the project site and seepage from tailings basins. Measures to prevent and contain spills from processing materials and maintenance/repair of mining equipment to prevent groundwater contamination are identified in this section. Additional information pertaining to solid waste and waste material handling can be found in Section 4.6 (Solid Waste).

6.7.1 Affected Environment

The proposed Minnesota Steel site does not have sinkholes, shallow limestone formations or karst conditions that would present unusual geologic hazards and increase the risk of groundwater contamination. However, groundwater has partially filled the abandoned on-site pits, and would flow into active mining areas. Depth to the water table varies across the Proposed Project. Bedrock depth is zero only in disturbed areas; minimum overburden thickness is probably between 20 to 25 feet in undisturbed areas, and ranges to over 200 feet at the south margins of the mining areas.

Soil types derived from the Itasca County Soil Survey information were listed in the Scoping EAW and are shown in Figure 19-1 of the Scoping EAW (see Appendix B). Soil textures primarily include loamy sand, sandy loam, silt loam, and organic soils in the undisturbed areas. The previously disturbed areas are highly variable including some areas with bedrock at the surface to other areas containing deep deposits of glacial overburden.

Soils in the mine area (which would be the soils to be stockpiled) include Nashwauk fine sandy loam and Keewatin silt loam, as well as udorthents. Udorthents are areas where soils have been stripped and highly disturbed such as cut-and-fill operations or gravel pits. In this context, nearly level udorthents are areas that have been stripped for mining and very steep udorthents are piles of excavated material.

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

6.7.2 Environmental Consequences

Equipment refueling and maintenance presents the most likely potential pathway for spills to enter the soil and groundwater. Existing soils in unmined areas are not especially coarse-textured and, therefore, would not rapidly transmit spilled materials. Areas of active mining could potentially expose spills to fractured bedrock. In these areas, spills could enter the groundwater relatively quickly.

Previous mining activities have left stockpiles upon the land surface and these stockpiles do not appear to represent a potential source of groundwater contamination. The proposed stockpiles would store three classes of materials: surface overburden, waste rock and lean ore. The properties of waste rock and lean ore are well known and would not require special procedures. All waste rock, lean ore, and coarse tailing stockpile slopes that are within one-quarter mile of residential or public use areas would be reclaimed to provide aesthetic and compatible areas as per Minnesota Rules, part 6130.3600 subpart 2.D.

Seepage of water from the tailings basin is anticipated to occur. Minnesota Steel proposes to eliminate any surface water discharge of tailings basin seepage by constructing a collection system and returning the water to the tailings basin. Some seepage is anticipated to discharge to groundwater through the bottom of the tailings basin, resulting in groundwater mounding under the basin. This water would flow radially from the tailings basin perimeter, ultimately flowing in the general direction of the surficial groundwater (i.e., some to O'Brien Creek and some toward Swan Lake directly).

Minnesota Steel has provided estimates of expected concentrations of modeled water quality constituents in the Tailings Basin (see Table 6.7.1). Although state drinking water standards for public water supplies are not directly applicable to discharges to groundwater, the standards provide a basis for comparing relative concentrations of constituents in seep water. The modeled tailings basin water concentrations are below primary drinking water standards and below three of the four secondary standards, indicating low potential for groundwater quality impacts from the seep water.

TABLE 6.7.1 CONCENTRATION OF MODELED CONSTITUENTS IN THE TAILINGS BASIN VS. DRINKING WATER STANDARDS.

Constituent	Tailings Basin Concentration (mg/L) [a]			Drinking Water Standards (mg/L) [b]		Health Risk Limits (mg/L [d]
	Average	Maximum	Minimum	1°	2°	
Calcium	19	20	12			
Chloride	14	16	11		250	
Fluoride	0.11	0.13	0.09	4.0	2.0	
Hardness	522	611	313			
Magnesium	115	136	69			
Nitrate+Nitrite	1.5	1.8	0.8	11 [c]		10
Phosphorus	0.017	0.025	0.014			
Sodium	4.8	6.2	4.1			
Sulfate	101	116	67		250	
Total Dissolved Solids	825	967	506		500	

(a) Estimated by modeling water chemistry balance in the Tailings Basin (Barr Engineering, Dec. 2006)
(b) Drinking water standards taken from: http://www.epa.gov/safewater/mcl.html#mcls. Applicable to public water supply.
(c) Nitrate standard is 10 mg/L, nitrite standard is 1 mg/L for a total of 11 mg/l
(d) The only MN Dept. of Health Health Risk Limit (HRL) is for nitrate nitrogen 10 mg/L. HRLs are taken from http://www.health.state.mn.us/divs/eh/groundwater/hrlrule.html

A two-foot drainage layer would be placed on top of the excavated fill underlying the tailings basin. Permeability within the drainage layer (sand) would be greater than the underlying till, so most of the seepage would move towards the collection system at the toe of the tailings basin. Using this drainage layer would reduce the amount of tailings basin water seeping into the groundwater.

Blasting activity is scheduled to occur roughly once per week. Minnesota Steel has indicated that they would use the same blasting agents as other taconite mines, a mixture of about 94 percent ammonium nitrate (AN) and 6 percent fuel oil (FO), commonly referred to as ANFO. A common form of this mixture is ANFO emulsion or a mixture of ANFO and ANFO emulsion. ANFO emulsion contains ammonium nitrate dissolved in water. The water is dispersed in fuel oil. Because oil surrounds the oxidizer, it is resistant to moisture and therefore more useful in damp conditions. This also increases the density and energy production of the explosive compared to dry granules of ANFO.

Blasting presents a minor potential for groundwater contamination. Nearly all the chemicals are consumed in the detonation process; however, some undetonated blasting material may remain in the blast holes. The small portion of the ammonium nitrate and fuel oil that may remain could be transported by storm water within the pits. Minnesota Steel is proposing to collect the pit and stockpile area storm water and use it for process water, minimizing the possibility of blasting-related contaminants becoming a source of groundwater contamination.

6.7.3 Mitigation Opportunities

Refueling activities should include procedures and training for the proper handling of spills and leaks. Refueling vehicles should carry spill containment equipment. On-site aboveground and underground storage tanks are subject to permitting and leak detection under state permits. Bulk liquids should not be stored in the pit or along haul routes. Based on the volume of fuel that is anticipated to be used by the Proposed Project, the Proposed Project would need to develop and implement a spill prevention control and countermeasure (SPCC) plan, as well as comply with underground and aboveground storage tank requirements.

Waste materials generated at the facility are subject to storage and permitting requirements. The storage and handling of each type of material is discussed in greater detail in Section 4.6 (Solid Waste).

In addition to the proposed seepwater collection system and two-foot drainage layer for the tailings basin, groundwater monitoring could be conducted around the tailings basins to detect changes in groundwater chemistry, which would indicate its seepage is moving away from the tailings basin. A groundwater monitoring and reporting plan would be required for the tailings basin under the SDS permitting rules.

The potential for contamination from blasting chemicals would be mitigated by the planned collection of pit and stockpile area storm water for process consumption.

6.8 TRAFFIC IMPACTS

The Final SDD identified traffic-related issues as not likely to result in substantial impacts and, therefore, traffic was not identified as requiring detailed analysis in the EIS. This section focuses on the traffic operations at key intersections on roadways affected by project traffic. It also discusses traffic-related noise, dust and safety issues, as committed to in the Final SDD. Information presented in the Itasca County Public Infrastructure Improvement Study (December, 2005) and the Traffic Operations Memorandum by SEH, Inc. (January 28, 2005) was reviewed and is summarized in this section. Section 6.13 (Infrastructure) describes, and Figure 6.13.1 shows, the location of existing and proposed roadways serving the proposed Minnesota Steel facility.

6.8.1 Affected Environment

Roadways impacted by traffic generated from the Proposed Project include TH 169, TH 65, and CR 58. TH 169 is a four-lane divided roadway and TH 65 and CR 58 are currently two lane undivided roadways in the project vicinity. Intersections impacted by traffic from the Proposed Project are TH 65 at CSAH 86 (downtown Nashwauk), TH 65 at CR 58 (north of downtown Nashwauk), and TH 169 at the proposed new roadway location (west of Marble).

Under existing conditions, the TH 65/CSAH 86 intersection operates with stop control on the southbound, westbound, and eastbound approaches. The northbound approach is free flowing.

The TH 65/CR 58 intersection is a T-configuration, with the eastbound approach stop controlled and the northbound and southbound approaches free flowing.

There presently is no intersection on TH 169 at the proposed intersection location.

6.8.2 Environmental Consequences

6.8.2.1 Intersection Operations Analysis

Intersection operations were analyzed for existing, 2028 no-build, and 2028 build conditions. All initial analyses assumed the existing intersection control and geometrics described above. The proposed new roadway/TH 169 intersection west of Marble is assumed to have right and left turn lanes on TH 169 and stop control for the southbound traffic at TH 169 on the new roadway. The intersection operations analysis results below are presented in terms of level of service (LOS), which ranges from A to F. LOS A represents the best intersection operation, with very little delay for each vehicle using the intersection. LOS F represents the worst intersection operation with excessive delay. LOS C or better is generally considered to be an acceptable level of intersection operations.

TH 65/CSAH 86 Intersection

Under existing conditions, all movements at the TH 65/CSAH 86 intersection operate at LOS A during the weekday AM peak hour. Under 2028 no-build conditions, all movements would continue to operate at LOS A. Under 2028 build conditions, the southbound approach would operate at LOS B while all other movements would operate at LOS A.

Under existing conditions, all movements at the TH 65/CSAH 86 intersection operate at LOS A during the weekday PM peak hour. Under 2028 no-build conditions, all movements would continue to operate at LOS A. Under 2028 build conditions, the southbound and westbound approaches experience increased delay due to traffic from the Proposed Project, but still operate at LOS C or better.

TH 65/CR 58 Intersection

Under existing conditions, all movements at the TH 65/CR 58 intersection operate at LOS A during the AM peak hour. Under 2028 no-build conditions, all movements continue to operate at LOS A. Under 2028 build conditions, the eastbound and northbound approaches experience increased delay due to traffic from the Proposed Project, but still operate at LOS C or better.

Under existing conditions, all movements at the TH 65/CR 58 intersection operate at LOS A during the weekday PM peak hour. Under 2028 no-build conditions, all movements continue to operate at LOS A. Under 2028 build conditions, the eastbound and northbound left turn movements experience increased delay due to traffic from the Proposed Project, but still operate at LOS C or better.

TH 169/New Roadway Intersection

Traffic volumes on the proposed new north-south connection roadway are anticipated to be relatively low, providing adequate traffic operations with side street (new roadway) stop control at TH 169. Estimated post-build 2029 average daily traffic (ADT) volumes on the new roadway are 1,800 vehicles per day, or (assuming 10 percent of the traffic in the peak hour) approximately 180 vehicles in the peak hour.

6.8.2.2 Other Traffic-Related Considerations

Traffic Noise

As discussed in Section 4.10, human perception of noise is measured on a logarithmic scale in decibels (dBA). Increases in noise of 3 dBA or less are generally not perceptible to human receptors. Traffic noise generation is a function of a number of factors, including speed and traffic volumes. Generally, a doubling of traffic volumes (with speed held constant) would be required before a 3 dBA (perceptible) increase in traffic noise would result. The traffic studies performed for the Proposed Project provided existing (2002) and forecast 2029 Build ADTs on existing state and county roads that would be affected by Minnesota Steel traffic: TH 65, CSAH 86, CSAH 8 and TH 169. None of these roadways was projected to experience a doubling of traffic volumes from 2002 to 2029 Build (which included both the Proposed Project traffic plus normal background traffic growth). Therefore, traffic noise at receptors located on these existing roads would not increase perceptibly as a result of the Proposed Project.

Construction of the proposed new TH 169/plant site access road would create a new, relatively high volume (estimated future ADT of 1,500 to 1,700) roadway in the vicinity of existing residential receptors in the vicinity of Little Sucker Lake and the intersection of the new roadway with the existing CR 58 corridor. If Option 2 for this new road was constructed, traffic volumes on the north-south connection between CR 58 and CSAH 8 would increase substantially, compared to volumes on the existing low-volume gravel township road. Since details regarding roadway alignment, design, elevation, etc., are not yet available, a noise analysis was not performed for this EIS. Potential for roadway noise impacts to existing residential receptors in the vicinity of the new access roadway would be assessed during the Itasca County environmental review process for the proposed roadway.

Traffic Dust

The affected roadways in the project area (TH 169, CR 58, CSAH 86, TH 65) are paved, so dust generation from traffic would not be an issue. If Option 2 for the proposed new TH 169/plant site access road were built, it would include paving the existing north-south gravel township road between CR 58 and CSAH 8 as part of the roadway improvements, eliminating potential dust-generation at this road as well.

Safety

The new right and left turn lanes proposed on TH 169 at the new intersection would safely accommodate slower-moving truck traffic turning to/from the Proposed Project. Turn lanes are also proposed at the TH 65/CR 58 intersection to improve operations and safety at that intersection. No other potential safety concerns were identified.

Travel Circuity

As described in Section 6.13, the proposed roadway infrastructure changes include terminating CR 58 west of TH 65 at the proposed Minnesota Steel plant entrance. The proposed new access road from TH 169 north to the west side of the plant entrance would also connect to the existing CR 58 corridor west of the plant. The termination of the existing east-west segment of CR 58 would affect travel patterns of some traffic traveling between TH 65/Nashwauk and the properties on CR 58 west of the proposed plant site.

Alternative routes for this traffic would include the new access road north of TH 169 to CR 58 or CR 58 and the local road due north, approximately 2 miles to CSAH 8 and then east to TH 65. Little Sucker Lake area travelers could also take the new access road south to TH 169, then east on TH 169 to TH 65 north to Nashwauk. No origin/destination data is available to provide information on existing CR 58 travel patterns/destinations; however, existing volumes on CR 58 are low (e.g., a 2001 ADT of 95), so relatively few travelers are affected. Assuming a 'worst case' of a traveler from Little Sucker Lake area who currently travels to/from downtown Nashwauk, the potential increase in travel distance (one way) due to increased circuity from termination of CR 58 would be 4 miles (2 miles north to CR 8, then 2 miles south on TH 65 from CSAH 8 to CR 58).

6.8.3 Mitigation Opportunities

The traffic operations memorandum (SEH, January 2005) identified the following mitigation measures that could improve traffic operations and/or safety at intersections affected by traffic from the Proposed Project:

- TH 65/CSAH 86 – change the control of the intersection to one of the following options:
  1. Create a two-way stop controlled intersection by removing the existing stop sign on the southbound approach
  2. Create a four-way stop controlled intersection by adding a stop sign on the northbound approach
- TH 65/CR 58 – widen the eastbound CR 58 approach to provide one lane for left turns and one lane for right turns, construct a northbound bypass lane on TH 65, and construct a southbound right turn lane on TH 65.
- TH 169/new access road intersection – construct left and right turn lanes on TH 169 to provide safe access for traffic to/from the new roadway.

6.9 VEHICLE-RELATED AIR EMISSIONS

The Final SDD stated that the EIS would provide a qualitative discussion of the effects of mine haul truck emissions on air quality at receptor sites near the mining operation, including carbon monoxide, nitrogen oxides and particulate emissions as well as a discussion of mitigation measures for any potential air quality impacts. The discussion of truck emissions in this section of the EIS is limited to engine-related pollutants. Fugitive dust emissions due to truck travel on unpaved roads are included in the air quality analyses described in Section 4.7 (Stationary Source Air Emissions).

6.9.1 Affected Environment

Since the Butler mine facility closed in 1985, no haul truck emissions have been generated from the project area. The closest receptors to the proposed Minnesota Steel mine pit, where truck hauling activities would occur, are the residences on Snowball Lake, located south of the Pit 6. The closest residence to the mine pit is located approximately 2,300 feet from the southern-most mine pit edge.

No ambient air quality monitoring data are available for the Nashwauk area. Ambient air monitoring data is available in Virginia, Minnesota and was used as background data in the air quality analysis discussed in Chapter 4.0. Except for mining and processing sources including fugitive dust from mining operations, no other sources of pollutants have been identified in the immediate vicinity of the proposed Minnesota Steel mine except for TH 169 and the adjacent railroad. Both the highway and the railroad have relatively low traffic volumes and, therefore, would not generate substantial air emissions.

6.9.2 Environmental Consequences

This semi-qualitative assessment of mine haul truck emissions from the Proposed Action is based upon assumptions used in development of the air permit application, truck operating assumptions, and the US EPA Off-Road vehicle emissions database. Minnesota Steel anticipates utilizing 240 ton haul trucks at the mine pits. The Caterpillar Model 793C haul truck was assumed in this analysis as representative of the trucks to be used**.** Table 6.9.1 summarizes the truck assumptions used to estimate emissions.

TABLE 6.9.1 MINE HAUL TRUCK ASSUMPTIONS

Vehicle	Caterpillar Model 793C
Average Net – Horsepower/truck	686.9
Average vehicle wt	200 tons
Average Speed (mph)	15
Annual miles traveled	758,875

Pollutant emission rates in grams/hour (g/hr) were obtained from the Project Proposer (i.e., from the Mobile Diesel Source Emission table in the Minnesota Steel Air Permit Application) and the resulting calculated pollutant emissions are shown in Table 6.9.2.

TABLE 6.9.2 MINE HAUL TRUCK POLLUTANT EMISSIONS

Pollutant	Grams/hr	Grams/sec
CO	6,192	1.72
NO_x	8,353	2.32
PM_{10}	93.6	0.26

Annual pollutant emissions were estimated, based upon the speed and miles traveled in Table 6.9.1 (50,592 hours per year) and the pollutant emission rates in Table 6.9.2. The estimated annual emissions – assuming controlled emission rates of 70 percent for NO_x and 90 percent for PM_{10} – are shown in Table 6.9.3.

TABLE 6.9.3 ANNUAL POLLUTANT EMISSIONS

Pollutant	Tons/year (Uncontrolled)	Tons/year (Controlled)
CO	345	345
NO_x	465	140
PM_{10}	5.2	0.5

Concentrations of criteria pollutants associated with engine emissions have also been estimated for the closest receptor, located on Snowball Lake approximately 2,300 feet south of the southern pit edge. A simplified Gaussian dispersion model was used to estimate concentrations of pollutants at a distance of 2,300 feet, assuming a ‘worst case condition’ of a mine haul truck operating at this point continuously throughout the year. Other assumptions in the dispersion model are shown in Table 6.9.4.

TABLE 6.9.4 DISPERSION MODEL ASSUMPTIONS

Parameter	Value
Wind speed	1 m/sec
Wind direction	From S8 to R1
Stability class	D (neutral)
Source height	5 meters
Averaging Time Factor	C_{10}*(10/minutes)^.5

The time factor is calculated from the projected concentration over 10 minutes (C_{10}). Table 6.9.5 presents estimated concentrations at the closest receptor (due to a continuously operating truck) for the time periods shown for each pollutant and compares them with the national and Minnesota ambient air quality standards.

TABLE 6.9.5 CRITERIA POLLUTANT STANDARDS AND PREDICTED CONCENTRATIONS AT THE CLOSEST RECEPTOR (MICROGRAMS PER CUBIC METER)

Pollutant/Period	Concentration (Uncontrolled)	Concentration (Controlled)	NAAQS	MAAQS
CO 1-hour	181.8	181.8	40,000	35,000
CO 8-hour	64	64	10,000	10,000
NO_2 Annual	2.64	0.79	100	100
PM_{10} Annual	0.03	0.003	50	50
PM_{10} 24-hour	0.55	0.055	150	150

NAAQS = National Ambient Air Quality Standards
MAAQS = Minnesota Ambient Air Quality Standards

From Table 6.9.5 it can be seen that the projected pollutant concentration from trucks operating at the edge of Pit 6 closest to the nearest receptor not owned or controlled by Minnesota Steel would be well below the national and state ambient air quality standards for criteria pollutants. It can be seen from this assessment that mine truck emissions alone are well below ambient air quality standards and are not expected to have a significant adverse impact on air quality at receptors near the mine. This analysis utilized assumptions based on the Proposed Action, and would not change with any of the other EIS alternatives.

6.9.3 Mitigation Opportunities

Minnesota Steel would be required to implement a fugitive dust control plan as a requirement of the air emissions permit.

Minnesota Steel has proposed to install particulate controls and use low sulfur diesel in all major pieces of mining equipment such as shovels and haul trucks that would mitigate impacts to air quality from these sources. Since the Proposed Action is not anticipated to have a significant adverse impact on air quality from mine haul truck activity at the nearest residential receptors, no additional mitigation is proposed related to haul truck emissions.

6.10 CULTURAL RESOURCES AND THE 1855 CEDED TERRITORY TREATY

Consistent with the commitments of the Final SDD, this section includes a summary of archaeological, historical and cultural resource investigations as well as cultural resource regulatory/permit process requirements for the Proposed Project. This section also discusses tribal cultural resource considerations and issues, including those related to the 1855 Ceded Territory Treaty (listed as a separate EIS topic area in the Final SDD).

6.10.1 Affected Environment

6.10.1.1 State and Federal Regulatory Framework

There are a number of federal and state laws regarding historic, cultural and archaeological resources that do, or may pertain to, the Minnesota Steel project. A summary of these laws is provided below to provide context for future decision-making regarding cultural resources issues.

National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (Advisory Council) a reasonable opportunity to comment on such undertakings. The State Historic Preservation Officer (SHPO) acts on behalf of the Advisory Council in each state. The Section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency officials and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of project planning. The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate adverse effects on historic properties. A federal undertaking includes issuing permits which, for the Minnesota Steel project, includes the USACE Section 404 permit.

Minnesota Field Archaeology Act, 1963 (M.S. 138.31 – 138.42)

This act established the Office of the State Archaeologist (OSA) and directs OSA and the Minnesota Historical Society (MHS) to make recommendations for the preservation of archaeological sites endangered by construction or development on all public land. The OSA issues licenses, with the concurrence of the Minnesota Indian Affairs Council (MIAC), for all archaeological investigations associated with public funding or on public land. Only professional archaeologists meeting the Secretary of Interior’s Standards for Archaeology (36 C.F.R. Part 61) may be licensed to conduct such investigations in the state of Minnesota. If a site is related to Native American history or religion, OSA must coordinate with the MIAC for review and comment.

Minnesota Private Cemeteries Act, 1975 (M.S. 307.08)

This act provides protection for marked and unmarked human burials and remains older than 50 years, located outside of platted, recorded or identified cemeteries, and protection from unauthorized disturbance. This statute applies to burials on either public or private land or waters.

6.10.1.2 Archaeological Resources

The Minnesota Steel project area is located near to and encompasses a chain of natural lakes and near previously identified Native American trails and habitation sites. Because the project area is in proximity to and encompasses portions of a chain of natural lakes northwest of the project area and was used by Native Americans when Europeans first settled in this area, there is some potential that the project area may contain archaeological sites dating to the precontact (Native American), contact, or post-contact (Euro-American) periods. To date, no archaeological surveys have been conducted within the project area and no archaeological sites have been recorded within the proposed Minnesota Steel project area. Archaeological surveys would be completed prior to construction as described below in Section 6.10.2

6.10.1.3 Architectural History Resources

The Proposed Project is located on the Western Mesabi Iron Range, where mining and intensive shipment of iron ore began circa 1906. The lower grade or "wash" ores of the western area required mechanical processes such as beneficiation and concentration. Along the length of the Mesabi, features associated with the century-old industry include mine pits, stockpiles, tailings basins, road and rail alignments, mining plants and equipment, and miners' housing. Following the general decline of mining activity after World War II, various companies began to mine and process magnetic taconite ore. Taconite processing is large scale and highly mechanized, and produces huge amounts of waste materials, or tailings. Taconite tailing basins are flat and terraced, and may reshape the stockpiles, pits, and other features associated with earlier ore production. To date, no historical resource surveys have been conducted within the proposed Minnesota Steel project area; but such surveys would be completed prior to construction as described in Section 6.10.2.

6.10.1.4 Traditional Cultural Properties

As part of the Section 106 process of the National Historic Preservation Act, the USACE provided an opportunity for the seven northern Minnesota federally-recognized Native American tribes to consult with the USACE regarding the proposed Minnesota Steel project. Three tribes, the Fond du lac Band of Lake Superior Chippewa, the Grand Portage Chippewa, and the Red Lake Band of Chippewa Indians have requested to consult. This consultation would assist the federal agencies in addressing Native American tribal and religious practices, and explore whether there are traditional cultural properties (TCPs) within the project area. At the time of publication of this document there are no TCPs known to be present within the project area.

6.10.1.5 1855 Ceded Territory Treaty

The Minnesota Steel project area is located in the historical region encompassed by the 1855 Ceded Territory Treaty. The Ojibwe of the Mississippi ceded the lands within the 1855 treaty boundary to the United States government. This cession resulted in the creation of reservations at Mille Lacs, Rabbit Lake, Gull Lake, Pokagomon Lake, Sandy Lake, Leech Lake, Winnibigoshish Lake, Cass Lake, and on Islands in Rice Lake (United States 1900[5]). The project does not appear to affect any rights established under the 1855 treaty.

6.10.2 Environmental Consequences

6.10.2.1 Section 106: Cultural and Archaeological Resources

At the present time the project impacts to cultural, historic and archaeological resources are unknown. As part of the federal agencies' obligations under the provisions of Section 106 of the National Historic Preservation Act, a draft programmatic agreement (PA) among the USACE (St. Paul District), the Minnesota SHPO, and Minnesota Steel has been prepared. The PA is currently in draft form (see Appendix F). The PA outlines the responsibilities of the signatory parties and the process to be used to study, make determinations regarding and minimize impacts to cultural resources within the project impact area. The process outlined in the PA includes these major steps:

[5] United States 1900 Indian Land Cessions in the United States, 1784-1894, *United States Congressional Serial Set No. 4015*. Government Publication Office, Washington D.C.

1. Identify the geographic area or areas (area of potential effect) within which the Proposed Project may cause changes in the character or use of historic properties, if any such properties exist.

2. Identify historic properties that may be affected by the project and gather sufficient information to evaluate the eligibility of these properties for the National Register of Historic Places (NRHP).

3. Use the information gathered for identified properties to determine whether they are eligible for inclusion in the NRHP.

4. If eligible properties are found, assess the effect of the project on these properties.

5. If adverse effects from the project are found, work with interested persons and agencies to mitigate the effects on historic properties.

The PA includes commitments to perform Phase I archaeological and architectural history surveys to identify whether archaeological or historic cultural resource sites are present in the Proposed Project's Impact Area. The level of effort for the surveys would be determined in consultation with the USACE, as the lead federal agency, in partnership with the Minnesota SHPO and in conformance with the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.*

If cultural resource sites are identified during the Phase I surveys, a Phase II evaluation would be performed on those sites to determine their potential eligibility for listing on the NRHP, in accordance with the requirements of 36 C.F.R. §800.4(c) et seq. The evaluation would be done in consultation with the USACE and SHPO, following the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.*

In May 2006, the USACE initiated formal consultation with several northern Minnesota-based Ojibwe tribes. In response to interest by some Ojibwe tribes to participate in the consultation process, the USACE provided a copy of the draft PA to the following tribes: Red Lake Band of Chippewa Indians, Grand Portage Chippewa, and Fond du Lac Band of Lake Superior Chippewa. Coordination with tribal representatives is on-going. Future tribal representative involvement related to cultural resource issues may include identification of traditional cultural properties (TCPs) and review of archaeological studies and treatment plans.

In accordance with the requirements of 36 C.F.R. §800.4(c) et seq., a Phase II evaluation of any identified TCPs during the consultation process as potentially eligible for listing on the NRHP would be conducted. The evaluation would be done in consultation with the appropriate tribal representatives, following the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.*

6.10.2.2 Tribal Issues

Three tribes (Fond du Lac Band of Lake Superior Chippewa, Grand Portage Chippewa, and Red Lake Band of Chippewa Indians), have expressed concerns about potential direct, indirect, and cumulative effects to natural and cultural resources in the region. In addition, although the Minnesota Steel project area is not situated within the 1854 Treaty area, the 1854 Treaty Authority (an inter-tribal natural and cultural resources management organization) has expressed concerns about potential direct, indirect, and cumulative effects to natural and cultural resources in the region, potentially affecting the 1854 Treaty area. The area of potential effect for cultural resources has not yet been determined, but would be addressed as part of the stipulations in the

Draft PA. Sections 5.1 through 5.4 describe analyses of potential cumulative air quality impacts within the project region and Section 4.7.2.4 and 4.7.2.5 includes discussion of the Human Health Risk Assessment and an Ecological Risk Assessment performed for the project vicinity, which would include most, if not all, of the tribal lands that may be affected by the Proposed Project.

6.10.3 Mitigation Opportunities

According to the stipulations in the draft PA, if historic properties are identified and deemed eligible for inclusion on the NHP, the USACE would follow the procedures described in the PA and in 36 C.F.R. Part 800.5 through 800.7 to assess the project's effects on them and to identify measures to be implemented during project planning, permitting and/or construction to avoid or reduce adverse effects.

6.11 RECREATIONAL TRAILS

The "Archaeology" Section of the Final SDD indicated that the EIS would include a map of the snowmobile trails and the Mesabi Trail and discuss the impacts of the Proposed Project on their use. The Scoping EAW indicated that significant impacts to trails are not expected. This section provides information on the recreational trails committed to in the Final SDD.

6.11.1 Affected Environment

There are several recreational trails and trail alignments running through the Proposed Project area as shown on Figure 6.11.1. These include the Mesabi Trail (a walking and biking trail) as well as two snowmobile trails.

6.11.1.1 Snowmobile Trails

The snowmobile trail system in Minnesota is partially funded by the MNDNR Minnesota Trails Assistance Program, also known as the Grants-in-Aid Program (GIA). The goal of this program is the creation and maintenance of locally initiated trails that are financially assisted by the state. Part of the financial assistance from the state includes preparing maps of the trails. There are two Grants-in-Aid snowmobile trails that cross the Proposed Project area: the Lawron Trail Riders Trail and the Greenway Club Trail (see Figure 6.11.1). Both trails are sponsored by Itasca County. Ownership of the trails remains private, but the snowmobile clubs and Itasca County have worked with landowners to obtain easements in order to route trails and operate snowmobiles across private property.

6.11.1.2 Mesabi Trail

The Mesabi Trail is owned, operated and maintained by the St. Louis & Lake Counties Regional Railroad Authority. This walking and bicycling trail is planned to be extended along the length of the Mesabi Iron Range from Grand Rapids to Ely. Major trail funding is from federal, state and local grantors.

The trail is completed along the south edge of the Proposed Project Boundary between the Cities of Marble and Pengilly, and construction of the trail segment between the Cities of Pengilly and Nashwauk is scheduled to begin in 2006, with anticipated completion sometime in 2007. The Pengilly to Nashwauk trail alignment would connect with the existing trail in Pengilly and end at the south edge of Nashwauk. Once this trail segment is complete, recreational users would be able to use city streets to connect onto the existing Mesabi Trail segment on the northeast side of Nashwauk. Figure 6.11.1 shows the locations of existing and future trail alignments of the Mesabi Trail.

6.11.2 Environmental Consequences

6.11.2.1 Snowmobile Trails

Lawron Trail Riders Trail

The Proposed Project would impact the present route of the Lawron Trail Riders snowmobile trail. The current route of this trail runs along the south edge of the proposed Alternative Tailings Basin location, through the proposed stockpile areas, and along the edge of the proposed plant facility site, connecting with County Road 58 as it continues east. This trail segment may need to be moved outside of the Proposed Project Boundary for safety reasons.

No analysis of the potential environmental impacts associated with the re-route is included as part of this EIS since the exact route has not been finalized. Environmental review, if required, as part of re-routing the trail would address impacts associated with the trail.

Greenway Club Trail

The Greenway Club snowmobile trail is not anticipated to experience any direct impacts from the project. This trail runs outside of any direct mining activities. A portion of the trail is within the Proposed Project Boundary, south of the Proposed Action tailings basin. This portion of the trail uses an old railroad grade, which is also used by ATVs. There is a possibility that this section of the trail may need to be re-routed outside of the Proposed Project Boundary. A decision regarding whether or not this section of the trail would be re-routed has not been made.

6.11.2.2 Mesabi Trail

The existing Mesabi Trail is outside of the Project Impact Area (although it is within the Proposed Project Boundary), therefore the project would not affect these trail segments. Construction on the trail alignment within the Proposed Project Boundary between the Cities of Pengilly and Nashwauk has not been completed. The St. Louis & Lake Counties Regional Railroad Authority and Minnesota Steel have been working together to design a trail alignment (shown in Figure 6.11.1) that avoids conflicts with proposed mining operations.

6.11.3 Mitigation Opportunities

6.11.3.1 Snowmobile Trails

Although the trail is not required to be re-routed, due to safety reasons, Minnesota Steel is proposing to relocate the snowmobile trails currently located within the Proposed Project Boundary. Members of the Lawron Trail Riders and Greenway Snowmobile Clubs have been meeting with Minnesota Steel representatives to identify re-route alignments for existing snowmobile trails within the Proposed Project Boundary.

In addition, Itasca County hired part-time staff to evaluate new trail alignments. This staff person created new trail alignments and talked with landowners. However, the proposed re-alignment has not yet been finalized (as of January 2007).

The re-located Lawron Trail alignment would be finalized and constructed as landowner permission is gained. In addition to the major landowners: U.S. Steel, Minnesota Steel (north boundary), Blandin (outside of Proposed Project Boundary), there are approximately six individual, private landowners that would need to grant permission to run a trail across their property under the currently proposed alignment for the Lawron Riders Trail. These six landowners make up a small portion of the proposed trail re-route corridor.

Based on the current timelines for construction and operation of the Minnesota Steel project, the snowmobile trails may need to be re-routed in 2007. If the Minnesota Steel project moves forward as planned, Itasca County would remain the local sponsor for the new snowmobile trails, working with the Lawron Trail Riders and Greenway Clubs, MNDNR, Minnesota Steel, and landowners to get it constructed. This would require following the MNDNR guidelines and acquiring any necessary permits for new snowmobile trail construction. If the re-route alignment is 20 miles or greater in length, preparation of an EAW would be required.

6.11.3.2 Mesabi Trail

Planning for the Mesabi Trail has occurred in cooperation with Minnesota Steel over the past few years. This has resulted in a proposed trail alignment that should not conflict with mining activities and therefore, no mitigation is proposed at this time.

6.12 VISUAL IMPACTS

The Scoping EAW evaluated potential visual impacts associated with the proposed Minnesota Steel project. It was stated in the Final SDD that visual impacts from the project are not anticipated to be significant. Additional information regarding potential visual effects due to lighting and facility structures are discussed below as well as mitigation options proposed to reduce such impacts.

6.12.1 Affected Environment

The Minnesota Steel project site is located along TH 169 on the west edge of the Mesabi Iron Range near the towns of Nashwauk, Pengilly, Calumet, and Marble. The proposed mine pits, stockpile areas, and plant site are located on a ridge approximately one to two miles north of TH 169 and the proposed Tailings Basin is located about a half mile south of TH 169. Much of the general area is dominated by past mining activities with reclaimed mining pits, stockpiles, tailings basins, and other mining-related features visible along this section of TH 169. Active mines are located further to the east at Keewatin and beyond.

The property was first mined in 1902 and the former Butler Taconite facility operated within the Proposed Project Boundary from 1967 to 1985. The locations of stockpiles and tailings basins from previous mining activities are shown on Figure 3.1. All buildings, structures, and auxiliary facilities were subsequently removed from the site and the mine pits were allowed to fill with water. Midland Research, an independent firm, is located off TH 169 on a portion of the old Butler site. In addition to people living within the nearby towns, there are a few isolated residents scattered throughout the area.

6.12.2 Environmental Consequences

The proposed Minnesota Steel facility would be comprised of several areas supporting the mining operations as shown on Figure 1.2. These include the mining area, crusher and concentrator, stockpile areas, plant area (pellet plant, DRI facility, steel mill), and tailings basin. Buildings and structures would be constructed within the crusher/concentrator and steel plant areas, and lighting at the facility would be provided for night operations and safety and security purposes. There would be parking lots for employees and rail yards for material receiving and shipping. Locations of these facilities are shown on the site layout (Figure 1.2). At night, both of these areas would be lit to normal safety standards but no specific plans have been prepared so far. Minnesota Steel would decide on the location and type of lights during the final design phase of the project.

Mining operations would be conducted 24-hours a day and would require both fixed lighting and vehicle lighting during the nighttime. Lights and vehicle operations in the mining pit and in the mining pit expansion areas should not be a visibility issue as they would be below the ground surface. Lights from heavy haul trucks may be visible to the surrounding landscape as they haul overburden and waste rock to the top of the stockpiles that would eventually reach heights between 100 and 200 feet above the existing ground level, at the end of the 20-year mine operation period. At least one portable light tower would normally be stationed at the truck dumping station on the stockpile and would be visible from a distance as the stock piles increase in height, mainly from TH 169 looking across Snowball and Oxhide Lakes. Building, structure, and stack/vent information including heights from the planned base elevations are listed in the air permit application for each major plant area.

With the exception of the DRI towers, buildings and structures at the Minnesota Steel facility would vary in height from 36 feet to 164 feet. The tallest structures at the facility would be the two DRI towers that would be constructed at the DRI facility surrounding and supporting the DRI furnaces and external cooler vessels. These towers would have a maximum height of 288 feet and would not be enclosed. Floors at various points in the tower would require lighting that could be visible from a considerable distance depending on the vantage point. Numerous stacks and vents extending beyond the tops of buildings and structures are located throughout the main building areas. These stacks would vary in height with taller ones reaching heights between 180 and 328 feet above the ground. The highest points would be the process gas heater stacks, oxide charging area stacks, and gas purification stacks at the DRI facility all with an approximate height of 328 feet. These stacks as well as the 305-foot tall depressurizing stacks would be concentrated in and around the DRI towers.

The FAA requires notification of all structures with a height of greater than 200 feet above existing ground elevation or those with the potential to obstruct air navigation. FAA Form 7460-1, Notice of Proposed Construction or Alteration, requires identification of the exact coordinates and height of structures. Through review of this application, the FAA determines whether any interference with flight patterns would result in impacts and may require obstruction marking and lighting for aviation safety. Based on the current facility design, the DRI towers and several stacks would be taller than 200 feet and therefore subject to FAA noticing and regulation. The exact requirements for the lighting system would be determined in conjunction with the FAA review. The lighting system would likely consist of medium intensity flashing white lights during the daytime and twilight and red lights during the nighttime, similar to those seen on tall radio towers and water towers in the region.

There are currently some residential dwellings located within the Minnesota Steel Ambient Air Quality Boundary. These homes/residences would be acquired by Minnesota Steel and the residents relocated prior to operation of the facility as no residences are allowed within the Ambient Air Quality Boundary. Adjacent residential dwellings located outside the Ambient Air Quality Boundary are shown on Figure 6.12.1. Residences closest to the plant area are located on or near Little McCarthy Lake and Little Sucker Lake more than one mile away.

The tops of taller buildings and structures would likely be visible from TH 169 in some places and from homes located near the facility, however, trees along the highway and other existing physical barriers such as stockpiles should screen and block out views in most cases.

Mining activities would be visible from the Hawkins overlook in Nashwauk; however, the general public should not be able to see the mining facilities from Nashwauk with the exception of the DRI towers. Similarly, the DRI towers would be visible in the distance from many of the homes and cabins on Swan Lake located over 4 miles away to the south, however, since the lake is set at a much lower elevation than the plant site, other buildings and structures should not be visible. Based on projected sight angles, the facility should not be visible from Pengilly, Calumet, Marble or other surrounding communities as views would be blocked by existing stockpiles and other physical barriers.

Nearly all operations at the plant site would be visible from County Highway 58, except where hidden by fencing and trees. However, it is proposed that County Highway 58 would no longer be a through road for the traveling public and would instead terminate at the Minnesota Steel plant, serving as the major access route off Highway 65 for employees working at the facility. Views of the facility would be visible to visitors at the nearby Nashwauk Cemetery and from Big Sucker, Little Sucker, Swan Lake, and Little McCarthy Lakes where the ground elevation drops away and no previous mining activities have taken place. Many of these areas are fairly remote with relatively few residents. Many of these areas are also heavily wooded and trees should block out views of the plant in most cases, except the far sides of the lakes from the plant, where the plant would be visible on the horizon when looking across the water.

For the Proposed Action, the tailings pipeline would cross TH 169 with an overpass structure discharging tailings from the concentrating process to the proposed tailings basin located on the east side of the highway at the site of the former Butler Stage I tailings basin. The tailings basin would be visible in places along TH 169 (depending on vegetation and topography along the corridor) for roughly two miles. From the exterior, it would appear as a vegetated slope with tailings disposal operations occurring behind the exterior dam, much like it did during the Butler operations. The basin would increase in elevation and change shape over time. The slopes of the tailings basin dams would be stabilized and vegetated in accordance with the reclamation plan for the facility.

The alternative tailings basin located west of the proposed stockpile areas would not be visible from TH 169, however, it would be visible to residents living nearby. With the exception of the no-build alternative, potential visual impacts from lighting and facility structures would be the same for all alternatives under consideration in the EIS. Visibility impacts due to air emissions (e.g., haze) are discussed in Section 4.7.2 (air quality impacts).

6.12.3 Mitigation Opportunities

The facility would be located within a former mining area and most of the buildings and structures would be set far enough away from main roadways and residential areas or screened from view by existing trees, stockpiles and other physical barriers such that significant visual impacts to the surrounding area are not anticipated. However, stacks and towers at the facility would be visible for some distance both during the day and at night. Overall, the visual impacts are anticipated to be minor. Minnesota Steel’s proposed mining operations are consistent with existing land uses and would not change the overall visual character of the area.

Since the Proposed Project plant site is located further away from TH 169, it would have less of a visual impact from the highway than the former Butler plant site which was immediately adjacent to TH 169. Wooded areas along the TH 169 corridor should serve as a vegetative buffer and also help to screen views of the mining operations. Those wooded buffers should be maintained whenever possible. Minnesota Steel has committed to using neutral colors for the exterior of all structures (buildings, towers, stacks, vents, etc.) at the plant and mine.

Minnesota Steel would light the grounds in a manner similar to other mining operations in the region using directional lighting to direct light downward thus minimizing light impacts onto adjacent properties. Shielded reflectors, covers, and lowering of lighting masts would also be considered to reduce stray nighttime lighting from the facility. It is not anticipated that the facility lighting would light up the night sky or create a nuisance for nearby residents.

6.13 INFRASTRUCTURE

The Scoping EAW identified infrastructure elements that would be required to serve the proposed Minnesota Steel facility, making them ‘connected actions’ (see Chapter 7.0) requiring assessment of environmental impacts in this EIS. The infrastructure requirements include an access road, a railroad spur, a gas pipeline, water and sanitary sewer lines, and electrical transmission lines. The Final SDD noted that infrastructure impacts from the project are not anticipated to be significant. Additional information regarding the location and potential impacts associated with construction of the related infrastructure, as well as required permits and environmental review for each supporting infrastructure project, is presented below. Unless noted otherwise below, the required infrastructure improvements would be the same for all of the EIS alternatives.

6.13.1 Affected Environment

The existing roadway and railway systems in the vicinity of the Minnesota Steel Project site are shown on Figure 1.2 and Figure 6.13.1. Trunk Highway 169 is the main highway running northeast-southwest along the Mesabi Iron Range and it is located between the proposed Minnesota Steel facility (mine pits, stockpile areas, and plant) and tailings basin, approximately 2 miles southeast of the proposed plant site. County Road 58 is located along the north side of the site and currently provides access to lake properties west of Nashwauk. There are two railroad lines serving the Iron Range running parallel to TH 169 in the vicinity of the Proposed Project site: the Canadian National Railroad (CN) and BNSF Railroad (BNSF). A railroad ownership change occurs between Marble and Taconite near County Road 7. The CN owns about 4 miles of track from this point west into Bovey. The BNSF owns the track going to the east that connects directly to the main shipping terminal in Superior, Wisconsin.

The Iron Range is served by two major natural gas pipeline transmission companies (Great Lakes Gas Transmission and Northern Natural Gas). The closest field source delivery point to the Minnesota Steel plant site is the Great Lakes Gas Transmission Company facility located in Blackberry Township near Highway 2, approximately 16 miles southwest of the project site.

The Minnesota Steel plant site is proposed to be located about 2 miles west of the City of Nashwauk. Municipal services including water and sanitary sewer are provided to residents and local industries by the City. The Minnesota Steel plant site was recently annexed by the City of Nashwauk; no municipal services currently exist within this recently annexed area. Outside the City's public utility service area and in rural areas, private wells and individual septic systems provide potable water and wastewater treatment and disposal.

Electrical transmission lines are located throughout the area providing electrical power. High voltage transmission lines located near the Minnesota Steel site include a 115 kilovolt (kV) transmission line that crosses the proposed mining and stockpile areas and a double circuit 115 kV line running along the east side of TH 169 that connects the Nashwauk Substation to the east and the Blackberry Substation further to the south. A 230 kV line is also located approximately 7 miles north of the site connecting up to the Shannon Substation north of Chisholm. All of these high voltage transmission lines are owned by Minnesota Power, the regional electrical utility supplier.

6.13.2 Environmental Consequences

As noted in Chapter 7.0, the impacts from the 'connected action' infrastructure improvements described in this section are based on the best information currently available regarding the location and extent of the proposed infrastructure facilities. However, as plans for each infrastructure component are refined, the anticipated impacts may change, including possibly making adjustments, to the greatest practical extent, to further avoid and/or minimize impacts. Most of the proposed infrastructure elements would be subject to separate environmental review, as described in the sections below. If the re-assessment of impacts based on refined infrastructure plans results in increases in the extent of impacts from those documented in this EIS, a supplemental EIS would also be prepared, consistent with EQB requirements.

6.13.2.1 Infrastructure Study

Itasca County completed a *Public Infrastructure Improvement Study* (Infrastructure Study or Study) and published a report in December 2005 summarizing public infrastructure improvements that would be needed to support the proposed Minnesota Steel project. The public infrastructure improvements considered in the Study included roadways, railroads, natural gas pipeline, and fresh water supply and wastewater treatment (the Study did not include electrical transmission lines which would also be needed).

The Study, which was funded by a State of Minnesota Grant to Itasca County, evaluated potential alignment options and estimated costs for the preferred improvements. As part of the Study, a separate report was prepared in January 2005 documenting avoidance efforts: *MSI Infrastructure Improvements, Wetland and Natural Heritage Data Assessment and Avoidance Potential for Linear Alignments* (hereafter referred to as the 2005 Avoidance Study). The relevant factors used for development and assessment of infrastructure alignment options included the following:

- Compatibility with the mine plan.
- Attainment of desired design criteria.
- Avoidance of existing environmental features including plant/animal species of concern, lakes, wetlands, mine pits, and overburden piles. Design alignment and grades to fit with existing topography to minimize excavation and fill requirements.
- Avoidance of developed properties and minimization of impacts on private lands.
- Compatibility with other proposed public infrastructure and connections with existing systems.
- Utilization of existing utility and public rights-of-way wherever possible.

Public involvement during the study process included regular meetings of a technical advisory group, presentations and status updates to the Itasca Development Corporation/Jobs 2020 group, and a public open house. The public open house was held on July 19, 2005 at the Nashwauk City Hall and provided an opportunity for interested individuals to review preliminary findings and provide input on the proposed public infrastructure improvement concepts.

The various public infrastructure elements identified in the Study are discussed in greater detail below and are summarized in Table 6.13.1.

6.13.2.2 Roadways

Proposed Improvements

The proposed roadway intended to serve as the main truck access route to the Minnesota Steel facility from the west would be designed to meet State Aid Standards and would be approximately 10 miles in length on a new alignment. The preferred access roadway alignment is shown on Figure 6.13.1. It is proposed to be a 2-lane paved roadway with 12-foot wide lanes, 8-foot wide shoulders, 1:4 side slopes, with a design speed of 55 mph. Several road alignments were considered with various connection options to TH 169 west of Marble and these alternative alignments are documented in the Infrastructure Study and in the 2005 Avoidance Study. The connection point on TH 169 is a desirable location with respect to sight lines along TH 169 and where the elevation of TH 169 is compatible with the access roadway grade separation with the BNSF railroad (roadway under railroad). The new roadway intersection would have left and right turn lanes on TH 169 with stop control on the southbound Minnesota Steel access road.

County Road 58, which runs along the north side of the plant, would serve as the major access route off Highway 65 north of Nashwauk for employees working at the facility. County Road 58 would terminate at the plant resulting in a loss of local access to properties located west of the plant site. Two options are currently being considered at the northern termini for the new roadway to the Minnesota Steel plant.

Option 1

This option, shown in orange on Figure 6.13.1, includes a new roadway alignment that curves to the east connecting up with the existing east-west segment of County Road 58. The new roadway would terminate at the Minnesota Steel plant and the local roadway system in the area of Sucker Lake would not connect with the proposed roadway under this option. Local residents going to Nashwauk and south along TH 169 would utilize existing roads driving north to County Road 8 and then east to Highway 65.

Option 2

This option, shown in red on Figure 6.13.1, has the proposed roadway linking up with the existing north-south segment of County Road 58, and Southview Road would be improved from the County Road 58 connection point north to County Road 8. This option provides connectivity with the existing roadway system and has much better potential to be designated as a county highway facility.

Consensus on the preferred alignment option on the northern termini of the roadway alignment has not yet been reached. As stated in the Infrastructure Study report, further review and consideration would be given to these options during the roadway design development process and selection of a preferred route.

As discussed in Section 6.8, improvements were recommended in a Traffic Operations Memorandum (SEH, January 2005) to accommodate future traffic volumes generated by the proposed Minnesota Steel project at the intersections of Highway 65/Central Avenue and Highway 65/County Road 58. These improvements consist of reconfiguring the locations of stop signs at the Highway 65/Central Avenue intersection and adding turn lanes and a bypass lane at the Highway 65/County Road 58 intersection. Right and left turn lanes would also be added on TH 169 at the location of the proposed new access road.

Environmental Impacts and Environmental Review

Environmental impacts from the proposed new access roadway were estimated for the Option 1 and Option 2 roadway alignments identified by Itasca County, assuming a construction corridor width of 70 feet. Table 6.13.1 summarizes the impacts identified, which include vegetative cover, wetlands, residential property acquisition, noise, shoreland zoning areas, surface water runoff, and wildlife travel cumulative impacts. As noted in Section 6.13.2.1, development of alignment alternatives included efforts to minimize wetlands and other sensitive areas. The roadway alignments may be able to be adjusted during final design, to the greatest practical extent, to further avoid and minimize impacts. The potential impacts from the Highway 65 intersection improvements at Central Avenue and at County Road 58 described above were not quantified since they are relatively minor, and would likely be able to be constructed mostly or entirely within existing road rights-of-way, with limited environmental impacts.

Itasca County would be the party responsible for designing, building, owning, and maintaining the proposed new access roadway. Preparation of an EAW would be required to review potential environmental effects associated with construction of the proposed roadway (including its connection to existing roads), as required under Minnesota Rules, part 4410.4300, Subpart 22 (A) for construction of a road on a new location over one mile in length that would function as a collector roadway. As part of this separate environmental review, which would be prepared by Itasca County, the project would be evaluated for a wide variety of possible impacts and possible mitigation measures. At this time, no definitive timetable has been established for environmental review and construction of the proposed roadway project.

6.13.2.3 Railroads

Proposed Improvements

Providing access to the existing railroad system is an important consideration in the operation of the Minnesota Steel facility. It is expected that up to 90 percent of the finished steel product would be shipped to various markets via rail thus minimizing truck traffic and associated transportation costs. Four different railroad access alignments were considered and documented in the Infrastructure Study with various connections to the existing railroad system. The preferred railroad access alignment and connection to the existing railroad system is shown as a yellow line on Figure 6.13.1.

The track alignment would consist of 8 miles of a main lead track into the plant site, 6 to 10 miles of car storage tracks, and a series of plant loading tracks. The tracks would be constructed to meet BNSF industry standards for heavy use and a 12-foot wide service road would be constructed adjacent to the lead track. The main lead track would connect to both the BNSF and the CN between Marble and Taconite near County Road 7 where the railroad ownership change occurs. Having access to two railroads helps to keep rail freight rates competitive. There would be an interchange yard near the mainline connections for the purpose of interchanging Minnesota Steel rail cars with either the BNSF or CN.

It is anticipated that the rail access system to the plant would serve 70 to 80 rail cars per day. Inbound shipments would consist of bentonite, limestone, and other miscellaneous supplies. Outbound shipments would consist of processed sheet steel and DRI pellets and oxide pellets. Onsite railroad facilities include rail and locomotive storage yard, office/crew building, car repair facility and fueling facility. Design of tracks within the plant site and ancillary facilities would be included as part of the overall plant design.

Environmental Impacts and Environmental Review

Environmental impacts for the railroad corridor identified by Itasca County were estimated, assuming a construction corridor width of 60 feet. Table 6.13.1 summarizes the impacts identified, which include vegetative cover, wetlands, right-of-way acquisition, noise, shoreland zoning areas, surface water runoff, and wildlife corridor cumulative impacts. As noted in Section 6.13.2.1, development of alignment alternatives included efforts to minimize wetlands and other sensitive areas. The track alignments may be able to be adjusted during final design, to the greatest practical extent, to further avoid and minimize impacts.

The railroad interchange and lead track to the Minnesota Steel plant would be designed and constructed by Itasca County, owned by the Itasca County Regional Rail Authority (ICRRA), and operated and maintained under contract by a short line railroad operator. Contract procurement for the shortline operator would be secured by ICRRA prior to construction of the railroad improvements.

TABLE 6.13.1 INFRASTRUCTURE IMPACTS

Infrastructure Element (Related DEIS Chapter)	Responsible/ Implementing Agency	Environmental Review Process	IMPACTS								
			Cover Types[1]	Wetlands	Residential/ Commercial Property Acquisition	Noise	Shoreland Zoning Issues	Surface Water Quality/ Quantity	Wildlife Travel Cumulative Impacts	Cultural Resources	Other Considerations
Roadways [2] (Chapter 6.13.2.2)	Itasca County	State EAW	Option 1: 5 ac wetlands 45 ac wooded 14 ac brush/ grassland 0.2 ac developed/ transportation/ utility corridor 4 ac mineland Option 2: 6 ac wetlands 63 ac wooded 19 ac brush/ grassland 0.6 ac developed/ transportation/ utility corridor 4 ac mineland	Option 1: 5 acres Option 2: 6 acres	Property acquisition may be needed in the vicinity of S. Sucker Lake Road, depending on the final roadway alignment.	Potential for roadway noise impacts to existing residential receptors in the vicinity of Little Sucker Lake and the intersection of the new roadway with existing CR 58 will be assessed during the Itasca County environmental review process for the proposed roadway.	Yes Conditional Use permit would be required	Increase in impervious surface on new and improved roadways would increase runoff and decrease runoff water quality. Regulations require mitigation, including but not limited to NPDES Construction Stormwater Permit requirements.	Low volume, 2-lane road would not be a substantial impediment to wildlife travel.	Will be addressed as provided for in the Programmatic Agreement (see Chapter 6.10)	Approx. 25% of corridor area is within areas previously-disturbed by mining Option 2: Southview Road upgrade would cross a creek.
Railroad (Chapter 6.13.2.3)	Itasca County (or possibly private railroad – decision is not final)	Federal environmental review process (Surface Transportation Board)	5 ac wetlands 29 ac wooded 14 ac brush/ grassland	5 acres	No residential or commercial property acquisitions anticipated.	Closest residential receptors are over 0.5 mile from the proposed rail line to the Minnesota Steel plant site. Potential for noise impacts will be assessed in the STB environmental review process for the rail line extension.	Yes Conditional Use permit would be required	Increase in runoff and decrease in runoff water quality. Regulations require mitigation, including but not limited to NPDES Construction Stormwater Permit requirements.	Low volume spur rail line would not be a substantial impediment to wildlife travel.	Will be addressed as provided for in the Programmatic Agreement (see Chapter 6.10)	Approx. 35% of corridor is within areas previously-disturbed by mining
Gas pipeline (Chapter 6.13.2.4)	City of Nashwauk	Minnesota Public Utilities Commission environmental assessment	25 ac wetlands 44 ac wooded 31 ac brush/ grassland 2 ac cropland	25 acres (Temporary impacts)	No residential or commercial property acquisitions anticipated. The pipeline alignment would be located at least 400 feet away from all existing dwellings.	None	Yes Conditional Use permit would be required	Temporary impact during construction; mitigated by BMPs.	None	Will be addressed as provided for in the Programmatic Agreement (see Chapter 6.10)	With the exception of trees that would be cleared from the gas pipeline corridor, ground surfaces including wetlands would be temporarily impacted and ultimately would be restored to pre-construction conditions.
Water/ sanitary sewer lines (Chapter 6.13.2.5)	City of Nashwauk	None required (plan review by MDH and MPCA)	1 ac wetlands 8 ac wooded 4 ac brush/ grassland 1 ac developed/ transportation/ utility corridor	1 acre (Temporary impacts)	None. Construction along existing road right-of-way	None	Yes Conditional Use permit would be required	Temporary impact during construction; mitigated by BMPs.	None	Will be addressed as provided for in the Programmatic Agreement (see Chapter 6.10)	Ground surfaces in the utility corridors, including wetlands, would be temporarily impacted and ultimately would be restored to pre-construction conditions.
Electrical transmission line (Chapter 6.13.2.6)	City of Nashwauk or Minnesota Power	Minnesota Public Utilities Commission environmental review	52 ac wetlands 75 ac wooded 114 ac brush/ grassland 4 ac cropland 2 ac residential 32 ac developed/ transportation/ utility corridor	Minimal impacts – support structures only potential impact areas	2 acres of residential property acquisition anticipated	None	Yes Conditional Use permit would be required	Temporary impact during construction; mitigated by BMPs.	None	Will be addressed as provided for in the Programmatic Agreement (see Chapter 6.10)	Ground surfaces in the utility corridors, including wetlands, would be temporarily impacted and ultimately would be restored to pre-construction conditions.
TOTAL	NA	NA	89 ac wetlands 219 ac wooded 182 ac brush/ grassland 6 ac cropland 2 ac residential 34 ac developed/ transportation/ utility corridor 4 ac mineland	89 acres (26 ac of the total would be temporary impacts)	2 acres	NA	NA	NA	NA	Will be addressed as provided for in the Programmatic Agreement (see Chapter 6.10)	NA

(1) No unique cover types were identified. Land cover is typical of the region; second growth forests, shrub/grassland, mine land, wetlands and low density rural residential.
(2) Does not include impacts associated with construction of turn lanes, assumed to minimal impacts.

Construction of the new railroad would need approval from the Surface Transportation Board (STB), a federal agency responsible for railroad regulation including the construction of new railroads. Under the National Environmental Policy Act (NEPA), the STB is required to review the environmental impacts of actions subject to the STB's jurisdiction, including construction of new rail lines. The STB must consider these impacts before making its final decision.

Itasca County is taking the lead in preparation of an environmental assessment (EA) to review potential environmental effects associated with construction of the proposed railroad improvements. Project impacts would be fully quantified and proposed mitigation measures identified. The EA would be submitted to the STB for review and approval. The environmental review process as defined in Title 49, Code of Federal Regulations, Section 1105 is anticipated to take up to a year to complete. Based on this schedule, track construction could begin in the spring of 2008 assuming other applicable permits and approvals are secured.

6.13.2.4 Gas Pipeline

Proposed Improvements

The Minnesota Steel facility would be operated with natural gas as its primary fuel source. It is projected that the facility would initially use 80 million cubic feet of natural gas per day with future added capacity of 40 million cubic feet per day. Therefore, the project would require a natural gas delivery capacity of 120 million cubic feet per day at a minimal operating pressure of 450 pounds per square inch gauge (psig). Three different gas pipeline alignments entering from the west were considered and documented in the Infrastructure Study to deliver natural gas to the Minnesota Steel site. Each of these alignments had a different field zone pipeline source location. The preferred gas pipeline alignment is shown as a blue line on Figure 6.13.1 and represents the shortest length of the three alignments considered. The preferred pipeline alignment is 21 miles in length and originates from the existing Great Lakes Pipeline at the Blackberry source point located in Blackberry Township near Highway 2. The pipeline would pass through Trout Lake, Iron Range, Greenway, and Blackberry Townships and cross under four main roadways (TH 169, the proposed access road, County Road 10, and County Road 71) and the BNSF mainline railroad adjacent to TH 169.

The proposed pipeline would have an outside diameter of 16 inches and be buried at least 4.5 feet underground. The pipe would be 1/3 inch thick steel delivered in 70-foot sections. The pipe sections are welded together above ground, pressure tested, and then placed in the trench, backfilled, and ground surface restored. The pipeline would require a 75-foot construction easement and a 50-foot permanent right-of-way and would be constructed using standard construction practices. It is anticipated that the gas pipeline would be installed and in service to Minnesota Steel by the end of 2008.

Environmental Impacts and Environmental Review

Environmental impacts for the gas pipeline corridor identified by Itasca County were estimated, assuming a construction corridor width of 50 feet. Table 6.13.1 summarizes the impacts identified, which include vegetative cover, wetlands, right-of-way acquisition and shoreland zoning areas. As noted in Section 6.13.2.1, development of alignment alternatives included efforts to minimize wetlands and other sensitive areas. The pipeline alignment would be located at least 400 feet away from all existing dwellings. With the exception of trees that would be cleared from wooded areas located along the gas pipeline construction corridor, ground surfaces including wetlands would be temporarily impacted and would be restored to pre-construction conditions upon completion of the underground utility installation work. The pipeline alignment may be able to be adjusted during final routing, to the greatest practical extent, to further avoid and minimize impacts.

At this time, the City of Nashwauk intends to design, build, own, and operate the gas pipeline as the designated public utility provider (Nashwauk Public Utilities). Minnesota Steel would pay for the use of the pipeline. A pipeline route permit application for the new pipeline is currently being prepared by the City and would be submitted to the Minnesota Public Utilities Commission (MPUC) in accordance with the requirements of Minnesota Rules 4415. The MPUC is the lead agency responsible for regulatory review and approval of the pipeline. That regulatory review requires a separate environmental assessment to evaluate potential human and environmental impacts associated with construction and operation of the proposed pipeline. The City of Nashwauk plans to seek a partial exemption from the pipeline route selection procedures allowed for qualifying projects under a shorter process, which does not require the applicant to evaluate an alternative route and does not require a contested case hearing. The MPUC review process includes public noticing requirements, public information meetings, and other means for the public to find out about the project and/or provide comments on the project. To grant a partial exemption, the MPUC must determine that there are no substantial environmental impacts. When a partial exemption is granted, the MPUC issues a pipeline routing permit with conditions that address construction and restoration practices. It generally takes three to four months to complete this process. The route permitting application should be submitted to the MPUC soon. Public meetings for the process would be held in the area sometime in the first quarter of 2007.

6.13.2.5 Water and Sanitary Sewer Services

Proposed Improvements

The City of Nashwauk prepared a Preliminary Engineering Report (August 2005, RLK) to provide municipal water and sanitary sewer services to the proposed Minnesota Steel facility. The findings and recommendations from the report were summarized in the Infrastructure Study and the full report is included as an appendix to the Infrastructure Study report.

Potable, fresh water for fire protection and domestic uses at the facility such as drinking water, eye wash stations, showers, toilets, sinks, and other incidental water needs would be supplied by the City through a lateral service connection to the municipal water supply system. The service line would be constructed along Highway 65 and County Road 58 to the main plant area shown as a dashed pink line on Figure 6.13.1. The estimated water requirement for the facility is 30,000 gallons per day. The City obtains its potable water from two supply wells located in town and has a water tower for storage. The existing water supply system has adequate capacity to meet the water requirements of the Minnesota Steel facility and no upgrades are required.

Domestic wastewater generated from the facility would be discharged directly to the City's sanitary sewer system through a lateral service line connection constructed along the same alignment as the water line and would consist of both gravity flow and forcemain. The design flow from the Minnesota Steel facility is estimated to be 30,000 gallons per day. This discharge would not include any process or industrial wastewater streams. The wastewater from the plant would be treated at the City's wastewater treatment facility located approximately two miles east of town. The current facility was constructed by the City in 1988 and consists of a stabilization pond treatment system. The facility has adequate capacity to treat the increased flows that would be generated from the Minnesota Steel plant.

Alternatives Analysis

As discussed in Section 3.3.3.3 of this Draft EIS, an on-site sanitary wastewater treatment system was analyzed to handle domestic wastewater generated at the Minnesota Steel facility. If this alternative is implemented to treat wastewater on-site, then the sanitary sewer line described above would no longer be necessary nor would disposal/treatment at the City's wastewater treatment facility.

Environmental Impacts and Environmental Review

The proposed water and sanitary sewer lines to serve the Minnesota Steel facility would be constructed along existing roads and within public right-of-way and therefore, environmental impacts are expected to be minimal. Table 6.13.1 summarizes the impacts identified (vegetative cover, wetlands and shoreland zoning), assuming a 40-foot wide disturbed area parallel to County Road 58. Temporary erosion and sediment control measures would be maintained during construction and would remain in place until all disturbed areas have been stabilized and vegetation has been reestablished.

The proposed water and sewer improvements do not trigger any mandatory environmental reviews, only plan reviews and permits for line extensions/connections would be required from the MDH and MPCA. However, existing MNDNR and MPCA permits may need to be amended to increase water appropriation and expand the wastewater treatment system should the neighboring industrial park areas in Nashwauk develop in the future.

6.13.2.6 Electrical Transmission Lines

Proposed Improvements

Minnesota Steel would require about 450 megawatts of electrical power from an independent power provider. One or more transmission lines would be required from a major distribution line to supply electrical power to the Minnesota Steel plant. The Proposed Project's estimated electric power demand represents approximately 1 percent of the current capacity of the Mid-Continent Area Power Pool (MAPP). This power pool includes electric generating facilities in Minnesota, North Dakota, South Dakota, Iowa, and Wisconsin. Total generating capacity of MAPP, as of 2004, was 41,956 megawatts (MWs). The maximum summer peak for MAPP was approximately 33,187 MWs, while the winter peak usage was approximately 30,660 MWs (based on 2004 data). This information indicates that MAPP has the capacity to accommodate the estimated future power requirements of the Proposed Project. Therefore, 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.

Minnesota Power is the regional electric utility company serving the Iron Range and Northeastern Minnesota. Minnesota Power's industrial customers include mining companies, paper mills, and municipalities. Minnesota Power's transmission network is interconnected with the transmission grid and is part of a regional transmission organization that is larger than MAPP, called the Midwest Independent System Operation (MISO). Minnesota Power has prepared conceptual plans showing possible options for connecting the project to the power grid. The most current proposal from Minnesota Power to route electrical power to the Minnesota Steel facility is shown on Figure 6.13.1. The concept plan includes the following improvements:

- Construct 15.2 miles of single 230 kV line from the Minnesota Steel Plant along the north side of the site and then south along Minnesota Power's existing 115 kV transmission line right-of-way interconnecting to the Blackberry Substation.
- Construct 7.5 miles of double circuit 230 kV lines along new right-of-way going north from the plant tying into an existing 230 kV line that connects up to the Shannon Substation.
- Reroute existing 115 kV line which currently passes through the proposed mine expansion area of the Minnesota Steel site. This line would be rerouted starting from the west side of the facility following existing and proposed road rights-of-way and along the right-of-way for the proposed single 230 kV line connecting up again to the existing 115 kV line east of TH 169 that connects up to the Nashwauk Substation.

The proposed transmission lines would be suspended overhead and mounted on above-ground support structures. The high voltage transmission lines typically require a 150-foot wide construction easement and a 100-foot wide permanent right-of-way. It should be noted that the transmission line routes are still conceptual in nature and preliminary at this time and subject to change. An interconnection agreement with the MISO would eventually be required with the proposer/owner of the transmission lines to approve the new lines and connection to the power grid.

The power required for the project can be provided from existing sources, from market sources, from market purchases of power, and from power production facilities that are planned or proposed at this time. Any new power production facilities would not be a direct result of the Minnesota Steel project and would be built (or not built) independently of the decision on the feasibility of the Minnesota Steel project.

Environmental Impacts and Environmental Review

Environmental impacts for the preliminary transmission corridor identified by Minnesota Power were estimated, assuming a construction corridor width of 150 feet. Development of alignment alternatives included efforts to minimize wetlands and other sensitive areas, including use of existing rights-of-way in some segments of the transmission line corridor. Table 6.13.1 summarizes the impacts identified, which include vegetative cover, right-of-way acquisition and shoreland zoning areas. Trees would need to be cleared from wooded areas along the transmission line corridor which would result in a loss of forest wildlife habitat. Although wetland areas are located along the transmission line routes, impacts are expected to be minimal because the transmission lines would be suspended above ground on support structures. Ground level impacts would only occur where footings for the support structures are constructed and from temporary impacts associated with construction vehicles and equipment. No significant filling of wetland areas is anticipated. The transmission line alignment may be able to be adjusted during final routing, to the greatest practical extent, to further avoid and minimize impacts.

It is unclear at this time who would be the responsible party to design, build, own, operate, and maintain the proposed transmission lines and associated electrical facilities needed to serve the Minnesota Steel facility. Possibilities include the City of Nashwauk as the designed public utility provider, Minnesota Power, or an independent party.

In accordance with the requirements of Minnesota Rules 4400, a route permit application for new transmission lines would be prepared and submitted to the MPUC, the lead agency responsible for regulatory review and approval of new high voltage transmission lines (100 kV or more). That regulatory review would require a separate environmental review to evaluate potential human and environmental impacts associated with construction and operation of the proposed transmission lines. The review process includes public notifications, public hearings and other opportunities for the public and local governments to learn about and comment on the Proposed Project. Minnesota Rules 4400 requires the applicant to identify at least two potential routes for its proposed high voltage transmission lines, identify which of the routes it prefers, and provide justification for its preference. As part of the permitting process, the MPUC prepares an EIS on the project and holds a contested case hearing. The MPUC has up to one year from the time the permit application is accepted to complete the process and make a decision on the permit.

There are provisions in the Rules that allow certain smaller-size transmission line projects to be reviewed and approved in a shorter, alternative process than that required under the full permitting process. Under the alternative permitting process, a shorter environmental assessment is prepared by the MPUC instead of an EIS, the applicant does not have to propose any alternative routes to the preferred route, and a more informal hearing is required instead of a contested case hearing. The shorter alternative process must be completed within six months. It is unknown at this time if the proposed transmission lines would qualify for the alternative permitting process or require the full permitting process.

6.13.3 Mitigation Opportunities

6.13.3.1 Avoidance, Minimization and Mitigation

The preferred infrastructure alignments established by Itasca County in the Infrastructure Study and those shown for the transmission lines are based on conceptual level design, especially the transmission line routes. In the development of these alignments, reasonable effort was made to avoid existing environmental features including plant/animal species of concern, lakes, wetlands, mine pits, overburden piles, and developed properties. The infrastructure alignments were also laid out to follow existing public rights-of-way whenever possible to reduce costs and minimize local impacts. Final infrastructure alignments would be adjusted during final design to further avoid and minimize impacts to wetlands and other existing sensitive environmental features wherever possible.

As described above separate environmental reviews would be required for most of the infrastructure improvements. Impacts would be fully quantified as part of this process and specific mitigation measures identified including wetland mitigation and replacement.

6.13.3.2 Impact Minimization: Possible Shared Infrastructure with Excelsior Energy

A series of special bimonthly infrastructure coordination meetings were held by Itasca County in March, April, and May of 2006 to address the various aspects of infrastructure issues associated with both the proposed Minnesota Steel project and the proposed Excelsior Energy project located nearby. Excelsior Energy has identified a primary or preferred site for their proposed coal gasification power plant near Taconite, known as the West Range Site. Portions of the planned railroad, access road, and gas pipeline, as well as possible electrical transmission lines could share common infrastructure if the Taconite site is selected for the Excelsior Energy project thus reducing both environmental impacts and implementation costs. Excelsior Energy’s alternative East Range Site is located near Hoyt Lakes in St. Louis County.

A joint permit application for Excelsior Energy’s proposed power plant site and associated high voltage transmission lines and natural gas pipeline was submitted to the MPUC on June 19, 2006. Previously on October 5, 2005, the Department of Energy (DOE), who is providing financial assistance for the Excelsior Energy project, published a Notice of Intent to prepare an EIS for the project. It is DOE’s intent to prepare, in cooperation with the MPUC, an EIS that would fulfill the requirements of both the federal and state environmental review processes. The Draft EIS for the Excelsior Energy project has not been released as of January 2007.

6.14 SOCIOECONOMICS

This section discusses social and economic impacts of the project, including the direct and indirect effects on local economic development, tax base and demand for public services. In reviewing potential social and economic impacts, the area focused on was defined based on data from the 2000 US Census that indicates over 20 percent of workers living in Itasca County travel more than 30 minutes to work (Cohen, 2006). Since commute time, in rural areas, is likely related to distance traveled rather than time spent in traffic congestion, (Cohen, 2006) the area that is most likely to experience the greatest impact from the Proposed Project is in and around the Cities of Grand Rapids (Itasca County) and Hibbing (St. Louis County) (approximately 15 to 30 miles away), including communities in between along the TH 169 corridor.

The following sections describe in further detail the existing social and economic setting and potential economic, employment, housing, and tax revenue impacts and mitigation opportunities if the Proposed Project is completed.

6.14.1 Affected Environment

6.14.1.1 Population Trends

Based on US Census data, the population trends for cities in the vicinity of the Proposed Project show a general decline between 1980 and 2000, although Itasca County as a whole experienced moderate growth (2.1 percent) during this time period (see Table 6.14.1). St. Louis County (the county border is just east of Keewatin) experienced a 9.8 percent decline from 1980-2000. Some of the decline in population may be due to the closing or downsizing of some major employers in the area during that time period. For example, the Butler Taconite Facility closed in 1985.

The State Demographer's population projections, published in 2004, for the cities near the Proposed Project show a continued decline for three of the four cities, though at a slower rate. Itasca County was projected to continue to grow at a rate just slightly less than the state average. St. Louis County was projected to rebound from its previous decline and grow 8.6 percent between 2000 and 2030. There is no indication that the State Demographer's 2004 projections take into account the influence that Minnesota Steel and other proposed industrial projects may have on this area, however, it appears unlikely that the projections include these impacts.

TABLE 6.14.1 POPULATION TRENDS

Population	1980	1990	2000	% Change 1980-2000	2010 Projection	2030 Projection	% Change 2000-2030
Grand Rapids	7,934	7,976	7,764	-2.1	7,828	7,631	-1.7
Hibbing	21,193	18,046	17,071	-19.5	16,748	16,161	-5.3
Keewatin	1,443	1,118	1,164	-19.3	1,209	1,272	9.3
Nashwauk	1,419	1,026	935	-34.1	931	838	-10.4
Itasca County	43,069	40,863	43,992	2.1	47,590	53,530	21.7
St. Louis County	222,229	198,213	200,528	-9.8	205,890	217,790	8.6
Minnesota	4,075,970	4,375,099	4,919,479	20.7	5,452,500	6,268,200	27.4

Source: Minnesota State Demographer's Office (2004)

6.14.1.2 Employment Trends

The average weekly wage in Itasca and St. Louis Counties has continued to increase between 1980 and 2000, although the amount of increase varied considerably among the industry classifications (see Table 6.14.2).

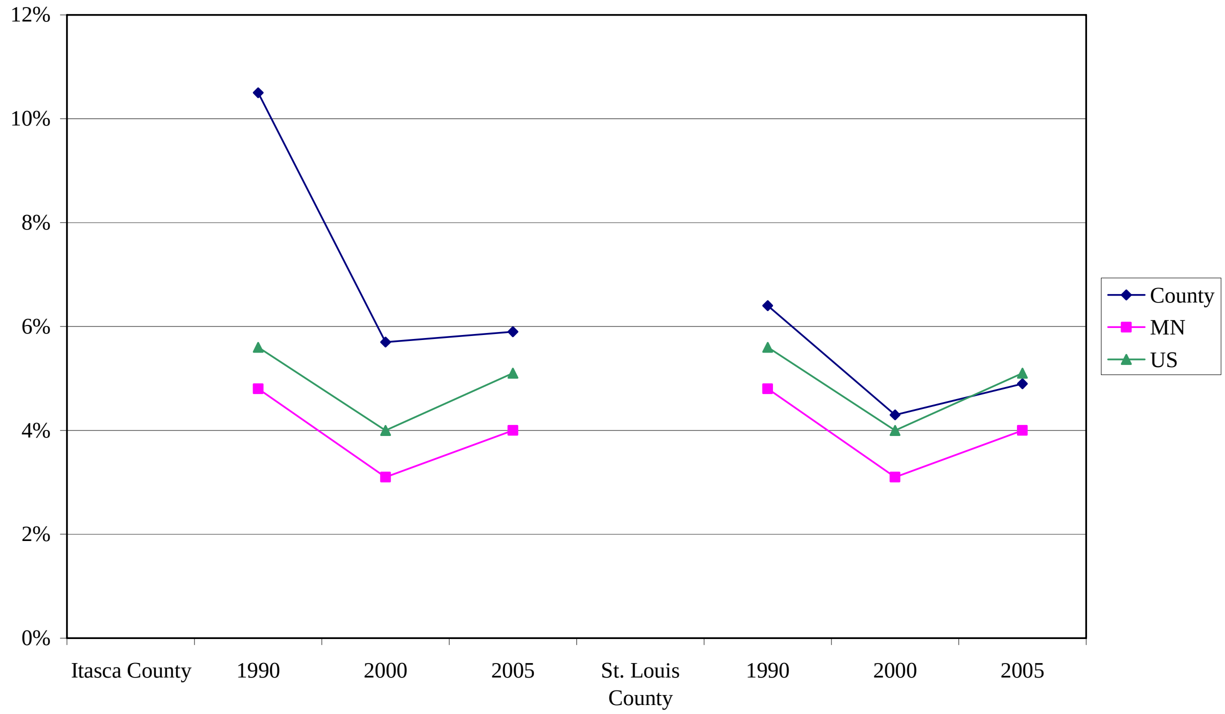
TABLE 6.14.2 AVERAGE WEEKLY WAGE BY INDUSTRY

Itasca County	**1980**	**1990**	**2000**	**% change 1980-1990**	**% change 1990-2000**	**% change 1980-2000**
Mining*	unav	unav	unav			unav
Construction	$318	unav	$585			84.0
Manufacturing	$352	$605	$900	71.9	48.8	155.7
Transportation/Utilities	$372	$539	$803	44.9	49.0	115.9
Finance, Insurance, Real Estate	$251	$340	$540	35.5	58.8	115.1
Services	$202	$345	$441	70.8	27.8	118.3
Public Administration	$178	$415	$594	133.1	43.1	233.7
Trade	$153	$214	$300	39.9	40.2	96.1
Total All Industries	**$268**	**$399**	**$527**	**48.9%**	**32.1%**	**96.6%**
*data unavailable due to confidentiality rules						
St. Louis County	**1980**	**1990**	**2000**	**% change 1980-1990**	**% change 1990-2000**	**% change 1980-2000**
Mining	$467	$701	$975	50.1	39.1	108.8
Construction	$385	$553	$714	43.6	29.1	85.5
Manufacturing	$274	$438	$621	59.9	41.8	126.6
Transportation/Utilities	$332	$540	$730	62.7	35.2	119.9
Finance, Insurance, Real Estate	$245	$381	$654	55.5	71.7	166.9
Services	$222	$375	$540	68.9	44.0	143.2
Public Administration	$325	$427	$712	31.4	66.7	119.1
Trade	$178	$246	$354	38.2	43.9	98.9
Total All Industries	**$275**	**$392**	**$557**	**42.5%**	**42.1%**	**102.5%**

Source: Data from MN Department of Employment and Economic Development (DEED) website

The rate of unemployment in the vicinity of the Proposed Project has typically been higher than the state and national averages; and the state average is generally lower than the national average. In 1990, unemployment was particularly high in Itasca County (over 10 percent). The closing of Butler Taconite and other Iron Range industry facilities may have contributed to this high unemployment rate. Unemployment has declined since 1990 with Itasca County average unemployment rates closer to the national average.

ILLUSTRATION 6.14.1 UNEMPLOYMENT TRENDS



Source: Data from MN DEED website

Increased unemployment may have influenced the substantial increase between 1990 and 2000 in the number of people in Grand Rapids and Hibbing indicating in Census surveys that their commute time is between 60 and 89 minutes (Iowa State University – Office of Social and Economic Trend Analysis [SETA] website). Instead of moving away for new employment, people were apparently driving farther distances to work. This may include commuting to the Duluth metropolitan area, which is approximately 85 miles from Hibbing and about 80 miles from Grand Rapids.

6.14.2 Environmental Consequences

6.14.2.1 Project-Related Impacts

Under the No Build Alternative, the socioeconomic impacts, both positive and negative, from the Proposed Project would not be realized. The following sections describe the socioeconomic impacts of the Proposed Action. All other EIS alternatives would have similar impacts.

Project-related socioeconomic impacts were analyzed for three general categories: economic development, tax base, and demand for public services. Economic development is estimated by the amount of money expended and potential local economic benefits generated and the number of jobs created as a result of the Proposed Action. The impacts on the tax base were estimated based on anticipated changes in taxable real estate. The demand for public services was assessed based on what the project facilities would likely require in terms of police and fire services, health care, and schools for employees' families.

Economic Development Impacts

A study was completed in April 2006 by the University of Minnesota – Duluth (UMD), which analyzed the potential economic impact from constructing and operating the Proposed Project (*The Economic Impact of Constructing and Operating Minnesota Steel Industries LLC in Itasca County, Minnesota*, April 2006, hereafter called the UMD Study.) This study was part of a group of larger and region-wide studies of proposed Iron Range projects done by UMD.

The study used three different variables to determine potential impacts. The variables are:

- Gross output (revenue to businesses, including all project-related expenditures, e.g., capital, construction costs, wages, etc.);
- Value added (the portion of the gross output dollars that are available to re-circulate in the local economy, i.e., wages [primary source], rents, interest and profits) and;
- Employment (number of jobs created in each industry).

Each variable was quantified by inputting the direct expenditures (Minnesota Steel spending), and modeling the indirect (other business spending) and induced (consumer spending by employees from the direct and indirect businesses) impacts. Separate model runs were performed for 1) construction and 2) operational economic impacts assessment.

According to the UMD Study, the completion of the construction phase of the Proposed Project (phase I – 2009 and phase II – 2011) would generate over $2.6 billion in output (direct, indirect, and induced combined) and $1.3 billion in value-added spending (direct, indirect, and induced combined) in Itasca and St. Louis Counties. Of these total dollars spent, Minnesota Steel's direct spending would be approximately $1.6 billion in total output (materials, labor, fees, etc., i.e., total project cost) on construction. The remaining $1 billion of the $2.6 billion total output dollars would come from indirect and induced expenditures. Approximately $695 million of the total construction spending by Minnesota Steel would be value-added spending (wages, rents, interest, and profits). The total construction expenditures are one time costs, which do not recur annually.

Total Output (Direct, indirect and induced combined)

Total construction spending in the two counties:	$2.6 billion
Portion of the total that is value added (wages, etc.):	$1.3 billion

Minnesota Steel Output (Direct)

Minnesota Steel's share of the total spending:	$1.6 billion
Portion of the Minnesota Steel share that is value added (wages):	$0.7 billion

During the two peak years of construction, the Minnesota Steel project is anticipated to directly employ over 2,000 people. Indirect and induced impacts from the project could potentially lead to another 1,500 or more spin-off jobs, including temporary, part-time, and full-time jobs created elsewhere in the two counties. Indirect and induced jobs include retail trade, professional-scientific and technical services, and administrative. These impacts would be short-term and likely end at the completion of the construction period.

In addition, the UMD Study estimates that once the operations of the Proposed Project reach their full capacity in 2012, the facility would be generating $1.35 billion in total output spending and $457 million in total value-added spending in Itasca and St. Louis Counties annually for the operating life of the facility. Minnesota Steel would be directly spending about $888 million in output, including $187 million in total value-added spending during operations each year, while indirect and induced operations would generate an additional $460 million in output. Once fully operational, Minnesota Steel is anticipated to directly employ an estimated 700 people. An additional 1,550 fulltime, part-time, and/or temporary jobs could potentially be created around the region.

Total Output (Direct, indirect and induced combined)	
Estimated total annual spending for operations:	$1.35 billion
Portion of the total that is value-added (wages, etc.):	$0.46 billion
Minnesota Steel Output (Direct)	
Minnesota Steel's share of the annual spending:	$888 million
Portion of Minnesota Steel's share that is value-added (wages):	$187 million

The UMD Study provides an in-depth analysis of the estimated impact of the proposed Minnesota Steel project, including the direct, indirect, induced, and total overall effects from the expenditures during construction and operation of the facility.

Tax Revenue Impacts

Using aerial photos, properties with structures were identified within the Ambient Air Quality Boundary (AAQB) identified for the Minnesota Steel facilities. Parcel data from the Itasca County Assessor's Office was reviewed for the identified properties to determine an estimated market value for land and buildings combined, as well as property taxes paid in 2006.

Five private properties that have associated buildings/homes, located within the AAQB, were identified as residential properties or improved recreational land. These properties have an estimated 2007 total market value of $502,200. The total revenue from these properties to be paid to Itasca County for 2007 is $3,340. It is assumed that this would be the gross loss to the local tax base once they are purchased by Minnesota Steel and removed from the local tax rolls.

The Proposed Project would have different taxable values, since the facility would be considered a commercial/industrial use and taxed accordingly. This would offset the loss in residential tax revenue from the existing properties. Based on the estimated $1.6 billion construction cost, it is assumed that the value of the Proposed Project facilities would be substantially more than the combined total value of the residential properties removed from within the AAQB, resulting in an increase in property taxes paid to the County.

Demand for Public Services

The Proposed Project would create additional demand for local public services, such as police and fire services, healthcare for employees, and schools for employees' families. The steel plant would likely have its own security, but local police and sheriff's departments may be asked to increase their time spent patrolling in the vicinity of the plant than is currently done. Local law enforcement may also be asked to assist plant security if needs arise.

The new facilities and associated structures may also require improved or increased fire department services, including fire response times, staff training, and local rescue squad and EMT training and staffing. Increased industrial employment plus potential local population increases related to job creation could increase the demand on the local hospital potentially requiring expansion of its capacity.

It is also likely that employees relocating to the Nashwauk area or other nearby communities may have families with children that need educational services. This could place an increased demand on schools in the area to accommodate an influx of new students. Additional teachers may be needed and capacity and adequacy of the existing school buildings would need to be determined as necessary to accommodate demand.

6.14.2.2 Combined Impacts

While this EIS focuses on the Proposed Project near Nashwauk, it should be noted that there are several other industrial projects being proposed within close proximity to the Minnesota Steel project that may further impact the socioeconomics of the area, particularly the need for a capable workforce and housing. These impacts would be both temporary and long-term. The other proposed projects (see Table 6.14.3) include the Excelsior Energy Plant site alternative in Taconite; the Thunderhawk Project of UPM-Blandin Paper in Grand Rapids; and the Laurentian Energy Authority Biomass Project in Hibbing and Virginia. All of these projects, with the exception of the Laurentian Energy Authority, which is already moving forward, are still in the decision-making process, but anticipate beginning construction around 2007 or 2008 and begin some phase of operation by 2008 or 2009.

TABLE 6.14.3 PLANNED MAJOR EXPANSION PROJECTS IN THE VICINITY OF NASHWAUK

Major Planned Expansions	City/Cities	County	# of Projected Jobs Created	Construction Date/ Operational Date
Blandin Thunderhawk	Grand Rapids	Itasca	30 – 50	2006/2009
Hibbing Motorplex	Hibbing	St. Louis	100	2006/2007
Intermet Foundry	Hibbing	St. Louis	20 - 30	2005/2006
Laurentian Energy Authority	Hibbing, Virginia	St. Louis	65 – 100	na/2006
Excelsior Energy	Taconite	St. Louis, Lake, Itasca	100 – 150	2008/2011
Minnesota Steel	Nashwauk	Itasca	700	2007/2009
Total			**915 – 1,130**	

Source: DEED, Hibbing Economic Development Authority

If this occurs, there would be a substantial increase in development in a short period of time. While the positive economic benefits of this would be substantial for the region, it may result in some negative impacts as the area grows with the new economy. There would be a demand for a skilled workforce, which would likely require additional people moving into the area, creating a subsequent demand for housing and public services. These demands would need to be anticipated and planned for, including affordable housing, infrastructure needs, job training, schools, local emergency services, and healthcare. The area may experience a workforce and housing shortage at certain times during the construction and initial operation of the Minnesota Steel project. This situation could be exacerbated by the combined effect of other major projects if they are developed in the region within the same timeframe.

Studies in the project area have recently been conducted to examine the potential economic impacts from the construction and operation of the Proposed Project facility and other industrial projects in the vicinity. These studies were completed by the communities in the area in an effort to prepare and plan for potential future workforce, housing, and public service needs. The studies were reviewed in this EIS to provide information on the existing economy and to determine the potential socioeconomic impacts from the Proposed Project on the nearby communities within a reasonable commuting distance to the project site. These studies included:

- Housing Impact Analysis – Rebecca Cohen, May 2006 (Grand Rapids Study)
- Housing Market Analysis and Demand Estimates for Hibbing, Minnesota – Maxfield Research Inc., November 2005 (Hibbing Study)

The two studies both focus on the potential impacts from the Proposed Project. However, the Hibbing Study also looks at combined impacts from other proposed projects, including the expansion of the Laurentian Energy Authority, Hibbing Motorplex, and the Intermet Foundry. The Grand Rapids Study, in addition to Minnesota Steel, considers potential impacts from Excelsior Energy and the expansion of Blandin Thunderhawk.

Combining data and information from the Grand Rapids study area with information from the Hibbing study area provides a more comprehensive look at employment and housing trends and potential demands within the area in the vicinity of the proposed Minnesota Steel facility. The Hibbing Study area includes the Cities of Hibbing, Chisholm, Buhl, Keewatin, and Nashwauk, and the adjacent townships. The Grand Rapids study area includes the Cities of Grand Rapids, Cohasset, Coleraine, Taconite, Marble, and Calumet, and adjacent townships.

Employment Impacts

Hibbing Study

During the research for the Hibbing Study, interviews were conducted with several major employers in the Hibbing study area. Employers, such as U.S. Steel and the Hibbing Community College, mentioned that there is a lack of skilled workers across the Range and if anything were to hinder regional growth, it is the shortage of skilled workers available locally. Many mining companies in the area currently recruit from areas outside of the Iron Range to find the skilled labor force they require for daily operation. Employers think the proposed projects are good for the region’s economy. However, they are also concerned that if planned commercial expansions in the Arrowhead Region all start within a short timeframe, there would be an even greater demand and subsequent strain to find skilled workers in the Iron Range area.

According to this study, the Proposed Project is expected to be the primary source of employment growth in the Hibbing area. In addition, according to the Hibbing Chamber of Commerce, mining companies are projecting that as many as 60 percent of their employees would be eligible to retire by 2010, though the actual number of employees who would elect to retire is unknown. With retirements, there would be existing job openings to fill. The current low unemployment rate in Hibbing (3.0 percent in 2005) may require efforts to attract workers from outside the region to fill these replacement jobs, plus any newly-created jobs.

Grand Rapids Study

The Grand Rapids Study gave consideration to past and current local workforce capacity. The study reported that when companies such as Blandin and Butler Taconite, both requiring skilled labor and paying higher wages, downsized, a sizeable portion of that workforce accepted jobs for which they were over-qualified in order to remain in the Grand Rapids area. These individuals would likely seek positions at the new facilities which better match their skill levels. Subsequently, this could cause a shift in positions in the community that could result in openings at employers who require a different skill set and have lower paying jobs. There were also many workers who chose to commute longer distances to find employment after the downsizing, while others simply moved away from the area.

Housing Impacts

A housing study of the City of Hibbing and adjacent communities was completed in May 2006 by Maxfield Research, Inc. This study offers projections on housing demand and needs based on current population and job growth trends, anticipated retirements from major employers in the area, and creation of new jobs through the development of the Proposed Project and other projects, such as the Laurentian Energy Authority and Hibbing Motorplex.

Due to the number of variables involved, the Hibbing Study projected population and household growth using three scenarios: low growth, moderate growth, and high growth. For the purposes of this EIS, the high growth scenario was used because it takes into account population and household growth driven by employment growth due to the Proposed Project and other pending commercial projects, as well as accounts for the need for replacement workers to fill jobs created by a large number of retiring employees over the next decade. The Hibbing Study outlined the estimated housing demand for the high growth scenario and recommended developing 230 to 260 for-sale and rental housing units in Hibbing over the next five years.

According to the Grand Rapids Study, a 2003 housing study of Grand Rapids found a vacancy rate of only 1.0 percent for market rate general occupancy rental units. As a result, the option of accommodating construction workers in existing rental housing units may be difficult. This means a temporary housing compound may be a primary option for temporary construction employee housing. Permanent housing would also be in demand for employees choosing to relocate to the Grand Rapids area once the Proposed Project becomes operational.

According to the Grand Rapids Study, the affordable housing market in the Grand Rapids area is tight and the influx of additional households expected to fill new jobs at the Proposed Project and Excelsior Energy plants would further intensify this situation. With a limited number of rental units and a very low vacancy rate, the rental housing market is initially expected to experience a lot of pressure, which may cause rent levels to escalate, causing affordability issues for certain households.

6.14.3 Mitigation Opportunities

Project-Related Impacts

The impacts of the Proposed Project are primarily positive for the socioeconomics of the area. The increased economic development that the Proposed Project is anticipated to create requires no mitigation. Although some housing and associated tax revenue would be lost as a result of the Proposed Project, there would be a substantial net gain to the local tax base as a result of the Proposed Project. The property taxes paid by Minnesota Steel following completion of the project would mitigate property tax losses from acquisitions within the Proposed Project Boundary. The Proposed Project may increase demand on public services, but the taxes paid by Minnesota Steel should offset increased local government spending to provide these services.

Combined Impacts

Many groups and local governments are already aware of the potential impacts resulting from the Proposed Project and are working with Minnesota Steel and others to prepare for them. Itasca and St. Louis Counties are currently studying the potential impacts of not only the Proposed Project, but also the other proposed projects in the region. These studies are helping them plan and prepare for the additional infrastructure and public services that would be needed to support the anticipated workforce that may move to the area.

The local governments and other groups have been working with Minnesota Steel in anticipation of the estimated workforce and housing needs. Grand Rapids Chamber of Commerce, Itasca Economic Development Corporation (IEDC), Iron Range Resources, Itasca Housing and Redevelopment Authority, Hibbing Economic Development Authority, and others are preparing and planning for any shortages that may occur in the workforce and housing market. For example, the Grand Rapids Chamber of Commerce has been working for the past few years on skilled workforce development in anticipation of Proposed Project needs. This has become a major initiative for this organization.

Additionally, IEDC has created action teams to support several of the projects in the area, including Minnesota Steel, Blandin Thunderhawk, and Excelsior Energy. Team meetings provide a forum for team members to ask the projects' managers questions regarding the project as well as raise and work through sometimes difficult issues. Many of the volunteers that make up the teams are from local decision-making bodies and other organizations. The action teams allow people a place to communicate and try to coordinate the various phases of the projects and address any current and future needs.

6.15 MINELAND RECLAMATION

6.15.1 Affected Environment

The Minnesota Steel project is proposed to be located on the site of a former taconite mining/production operation and would make use of a number of existing mine pit, stockpile, transportation, and tailings facilities that remain from previous mining activities. Figure 3.1 shows the areas affected by previous mining activities within and adjacent to the Minnesota Steel Proposed Project area. The first mining on this property occurred in 1902 and the Butler Taconite facility operated at this site from 1967 to 1985. After closure, the Butler Taconite facility production, shop, and auxiliary facilities were torn down and removed, the tailings basin dam was breached and disturbed areas were revegetated based on reclamation requirements. Dewatering of the mine pit stopped (except for maintenance pumping to Oxhide Lake until approximately 1994) resulting in the mine pit refilling with water.

6.15.2 Environmental Consequences

The potential impacts associated with the proposed mining activities at the Minnesota Steel site have been described in other sections of this EIS. Potential project impacts, described in Chapters 4, 5 and 6, that can be mitigated through the implementation of mine reclamation practices include: erosion and sedimentation, wetland impacts, changes in vegetation cover types, wildlife habitat, changes in surface water quality and quantity, air quality (dust), solid waste and visual impacts.

6.15.3 Mitigation Opportunities

The Minnesota Steel Permit to Mine Application, dated December 2006, describes the proposed reclamation plan for mined areas of the project. The reclamation plan must conform to Minnesota Rules 6130 for taconite and iron ore mineland reclamation. As noted above, implementation of mine reclamation practices would be used to mitigate mining-related project impacts. Table 6.15.1 summarizes the type of impact and the planned reclamation practices to mitigate those impacts.

For the mine area, pit slopes should be reclaimed once they reach ultimate limits. Pit overburden slopes would be designed and constructed to meet the requirements of Minnesota Rules, part 6130.2900 and 6130.3600. Select locations of existing mine pit slopes have been identified in Pit 2 as representing stable, reclaimed slopes that would be used as "vegetative reference areas," i.e., the standard for evaluating adequacy of post-mining reclamation grading and re-vegetation.

For the stockpile area, stockpile slopes would be reclaimed as lifts are completed to the planned stockpile limits. Rock and lean ore 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. Existing vegetative reference areas for stockpiles have been identified northwest of Stockpile Area A, to represent stable, reclaimed slopes.

For the tailings basin area, 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. Existing vegetative reference areas for the tailings basin have been identified adjacent to the Tailings Basin area, representing stable, reclaimed slopes.

As described in Section 4.1 (Wetlands) and in the wetland mitigation plan, the reclamation process would include creation of wetlands where feasible, to replace some of the wetland functions and values lost through mining activities. Potential post-mining wetland creation areas include: the tailings basin, reclaim pond, sedimentation ponds, and pit areas with in-pit stockpiling.

All waste rock, lean ore, and coarse tailing stockpile slopes that are within one-quarter-mile of residential or public use areas would be reclaimed to provide aesthetic and compatible areas as per Minnesota Rules, part 6130.3600. After the final closure of operations, plant and shop areas and other structures would be demolished and the sites would be graded for drainage and vegetated to meet the requirements of Minnesota Rules, part 6130.4100.

Dust control is required under Minnesota Rules, part 6130.3700, which states that avoidable dust shall be controlled by techniques such as water spray, chemical binders, anchored mulches, vegetation and enclosure or containment. Minnesota Rules, part 6130.3000 refers to the operation of tailings basins and states that dust should be minimized by maximizing the amount of area that can be permanently reclaimed. Active portions of the tailings basin should be covered with water to the maximum extent possible and beach areas should be temporarily stabilized.

Fertilizing, seeding and mulching should be accomplished, to expedite revegetation and to minimize erosion. Herbaceous plants should be seeded using a hydro-seeder. Seed mixes should be designed to achieve early stabilization and long-term cover. When necessary to control dust, temporary seeding may be utilized. In areas where erosion is a concern, mulch should be used to hasten stabilization. Removal of equipment, facilities and structures should be accomplished and provisions made for subsequent use and continued maintenance where necessary. In all cases, closure would need to meet the requirements of Minnesota Rules, part 6130.4100.

TABLE 6.15.1 MINE RECLAMATION AS MITIGATION FOR MINING IMPACTS

Mining Impact	Description	Reclamation Mitigation Practice
Erosion/sedimentation	Bare soil and sloped ground at stockpiles, tailings basins, etc. increase erosion and sedimentation potential.	• Temporary vegetation of inactive areas • Re-grading • Re-vegetation • Mulching
Wetland impacts	Direct wetland losses resulting from the project.	• Potential for creation of wetlands at storm water ponds, tailings basin, etc. following mining.
Changes in vegetation cover types	Removal of existing vegetation during mining	• Re-vegetation
Wildlife	Loss of wildlife habitat resulting from changes in cover types. Potential barriers to travel in steep-sloped areas created by mining.	• Re-vegetation • Re-grading
Changes in surface water quality and quantity	Increase in runoff (and potential increase in pollutant transport in runoff) due to exposed, compacted soils and steep slopes at stockpiles.	• Re-grading • Re-vegetation • Mulching
Air quality (dust)	Bare soil increases wind transport of soil particles	• Watering or dust suppressant treatment of exposed soil to minimize dust in active mining areas, stockpiles and at the tailings basin. • Temporary vegetation in inactive areas. • Re-vegetation of exposed soil
Solid waste	Creation of waste rock stockpiles near mine pits and tailings storage at tailings basin.	• Re-grading • Cover stockpiles with overburden prior to re-vegetation. • Re-vegetation • Mulching
Visual impacts	Mine features such as stockpiles and tailings basin are large, barren features in the landscape. Large industrial structures are visible in the landscape from relatively long distances.	• Re-grading • Re-vegetation • Razing structures after final closure of operations. • Water-filled mine pits can be a visual amenity

7.0 Phased and Connected Actions

7.1 PHASED ACTIONS

A ‘phased action’ is defined in Minnesota Rules, part 4410.0200, Subp. 60 as follows:

> *"Phased action" means two or more projects to be undertaken by the same proposer that a RGU determines:*
> *A. will have environmental effects on the same geographic area; and*
> *B. are substantially certain to be undertaken sequentially over a limited period of time.*

Connected actions and phased actions are addressed in Minnesota Rules, part 4410.2000, subpart 4 as follows:

> *Multiple projects and multiple stages of a single project that are connected actions or phased actions must be considered in total when determining the need for an EIS and in preparing the EIS.*
>
> *In connected actions and phased actions where it is not possible to adequately address all the project components or stages at the time of the initial EIS, a supplemental EIS must be completed before approval and construction of each subsequent project component or stage. The supplemental EIS must address the impacts associated with the particular project component or stage that were not addressed in the initial EIS….*
>
> *…When review of the total of a project is separated under this subpart, the components or stages addressed in each EIS or supplement must include at least all components or stages for which permits or approvals are being sought from the RGU or other governmental units.*

As described in Chapter 1.0, 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 inferred ore reserves at the proposed Minnesota Steel site are currently estimated at about 1.4 billion tons or 100 years based on the proposed production capacity. Given the extensive resources needed to construct the ore processing plant and steel mill, it is reasonable to assume that Minnesota Steel would want to extend the life of the plant by utilizing the total ore supply. 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.

7.2 CONNECTED ACTIONS

Connected actions are addressed in both state and federal environmental review regulations.

Minnesota Rules, part 4410.0200, subpart 9b states that:

> *Two projects are "connected actions" if a responsible governmental unit determines they are related in any of the following ways:*
> *A. one project would directly induce the other;*
> *B. one project is a prerequisite for the other and the prerequisite project is not justified by itself; or*
> *C. neither project is justified by itself.*

Federal NEPA regulations (40 C.F.R. 1508.25) state that:

> *Actions are connected if they:*
> *(i) Automatically trigger other actions which may require environmental impact statements.*
> *(ii) Cannot or will not proceed unless other actions are taken previously or simultaneously.*
> *(iii) Are interdependent parts of a larger action and depend on the larger action for their justification.*

There are several connected actions that would be required to meet the infrastructure needs of the proposed Minnesota Steel project. These actions include construction of a gas line, electrical power lines, public roadway, railroads and water/sewer lines (see Figure 6.13.1). These infrastructure improvements are described in Section 6.13 (Infrastructure) – including information on the implementing parties, potential environmental impacts and additional environmental review required prior to implementation.

The impacts described in Section 6.13 are based on the best information currently available regarding the location and extent of the proposed infrastructure facilities; however, as plans for each infrastructure component are refined, the anticipated impacts may change. If the re-assessment of impacts based on refined infrastructure plans results in increases in the extent of impacts from those documented in this EIS, a supplemental EIS would be prepared, consistent with Minnesota Rules, part 4410.3000.

8.0 Consultation and Coordination

8.1 CONSULTATION AND COORDINATION WITH OTHER FEDERAL AND STATE AGENCIES

8.1.1 U.S. Fish and Wildlife Service

The USFWS and USACE are currently in informal consultation to determine if formal Section 7 consultation will be required for the Canada lynx and/or the gray wolf on this project. If formal consultation is required, the USACE (as the federal Requesting Agency) will prepare and submit a letter to the USFWS requesting initiation of formal Section 7 consultation. The consultation request letter will be submitted to USFWS shortly after the publication of the Draft EIS.

8.1.2 Minnesota Department of Natural Resources

Preparation of the EIS involved several divisions of the MNDNR including Lands and Minerals, Ecological Services, Trails and Waterways, Fisheries, Wildlife, and Waters. Participation included review and approval of the work plans, analyses, impact assessments, and technical memoranda prepared in support of the Draft EIS.

8.1.3 Minnesota Pollution Control Agency

The MPCA was involved in the preparation of the EIS through coordination regarding the issues of water quality including NPDES/SDS permitting, air quality, mercury, solid waste, fibers review, and evaluation of alternatives.

8.1.4 Minnesota Department of Health

The MDH participated in the review of fibers-related issues and data completed in July 2006 for the Proposed Project.

8.1.5 Native American Tribes

The USACE offered the seven Native American tribes in northern Minnesota an opportunity to consult with the USACE regarding the Proposed Project. Three of the tribes, the Fond du Lac Band of Lake Superior Chippewa, the Grand Portage Band of Chippewa, and the Red Lake Band of Chippewa Indians, requested to consult with the USACE. The USACE will consult with these three tribes regarding potential project impacts. Additionally, one tribal-related organization has requested involvement and/or notification of the project progress: The 1854 Treaty Authority.

8.1.6 State Historic Preservation Office

Consultation with the SHPO was initiated during project scoping, when initial cultural resources investigations were conducted. Consultation continued during preparation of the EIS, resulting in development of a draft Programmatic Agreement among USACE, SHPO, and Minnesota Steel to identify historic properties that may be affected by the project. Section 6.10 provides additional information on the Programmatic Agreement and a copy of the draft agreement in available in Appendix F. Consultation with SHPO will continue throughout the remainder of the EIS process and through project permitting.

8.1.7 Federal Land Managers

The Federal Land Managers (FLMs) are responsible for protecting air quality related values in designated Class I areas. In Minnesota, these Class I areas consist of the Boundary Waters Canoe Area Wilderness, Voyageurs National Park and Isle Royale National Park. The associated FLMs for these areas are the U.S. Forest Service and the National Park Service, respectively. Other, more distant Class I areas also exist in neighboring states. The Proposer and the MPCA are working closely with FLMs to solicit their input on potential project impacts in advance of the completion of the air permit. This will allow the FLMs to review the Proposed Project and associated mitigation plans to ensure compliance with FLMs' guidelines for protection of air quality related values.

8.2 PUBLIC PARTICIPATION

Public notification and opportunities to get information and public comment on the project began during the project scoping process. In July 2005, the MNDNR in partnership with the USACE prepared a Scoping EAW and a 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 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.

This Draft EIS will be published and circulated in accordance with the rules and requirements of Minnesota Rules (EQB Rules) 4410, MEPA, and NEPA requirements. The Draft EIS will be circulated for a 45-day comment period to satisfy NEPA requirements and a concurrent 30-day comment period to satisfy MEPA requirements. Written comments will be accepted during the public comment periods.

A public information meeting will take place during the Draft EIS comment period in an area near the Proposed Project. Comments received will be taken into account in assessing project impacts and potential mitigation for the Final EIS. Following the end of the comment period, responses to substantive comments received will be prepared and a Final EIS will be issued.

8.3 DISTRIBUTION LIST FOR THE DRAFT EIS

As part of the requirements of the NEPA, 42 U.S.C. §§ 4321-4347, NEPA's implementing regulations, 40 C.F.R. §§ 1500-1508, and Minnesota Rules 4410, the Draft EIS will be circulated to the following agencies, organizations, and individuals.

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10.0 References

This chapter includes references used for analysis and information in the development of the Minnesota Steel Draft EIS. Special studies, technical memorandums, and permit applications were also completed for the proposed Minnesota Steel project. The project-related documents are not here, but are listed in Appendix I.

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