Essar Steel Minnesota Modifications Project

Final Supplemental Environmental Impact Statement

December 2011

Minnesota Department of Natural Resources

Signature Page

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT:

Essar Steel Minnesota Modifications Project

The Minnesota Department of Natural Resources (MNDNR) has prepared the Final Supplemental Environmental Impact Statement to evaluate the proposed Essar Steel Minnesota Modifications project in accordance with the Minnesota Environmental Policy Act, Minnesota Statues, § 116D.

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Abstract:

The Final Supplemental Environmental Impact Statement (FSEIS) is consistent with the Final Preparation Notice (July 2010). The FSEIS is provided to inform the permit process and the public of the project. It provides information for use in permitting as well as data and information necessary to allow agencies and the public to understand and comment on the project. The MNDNR in cooperation with the United States Army Corps of Engineers (USACE) prepared a joint state and federal Environmental Impact Statement (EIS) for the Minnesota Steel Industries, LLC (MSI) taconite mine and steel making project. The original MSI project consisted of a taconite mine, crusher, concentrator, pellet plant, direct reduced iron plant, and steel mill to produce sheet steel from taconite ore, near the town of Nashwauk, Itasca County, Minnesota. The joint EIS was completed in August, 2007 in accordance with the provisions of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 - 4347) and the Minnesota Environmental Policy Act (MEPA; Minn. Stat. Ch. 116D). The Draft SEIS (DSEIS) described the proposed Essar Steel Minnesota Modifications (ESMM) project that entails increasing taconite pellet production from 3.8 million metric tons per year (mmtpy) of low flux direct reduced iron (DRI) feed grade taconite pellets to 6.5 mmtpy of high flux blast furnace grade pellets or 7.0 mmtpy of low flux, DRI feed grade taconite pellets, and to reduce the 20-year life of the mine plan to 15 years. The Master Development Agreements (MDA) Alternative described in the FSEIS maintains this pellet production rate but reduces the capacity for producing 2.8 mmtpy DRI and 2.5 mmtpy steel slabs, respectively to 1.8 mmtpy and approximately 1.5 mmtpy of DRI and steel slabs.

Because MSI's mining and processing operations have already been reviewed through the EIS process, state environmental review requirements for the proposed ESMM project are met by preparing a Supplemental EIS. In addition, because there are no additional wetland impacts, the USACE has made a determination that a supplement to the federal EIS under NEPA is not required. Therefore the SEIS for the proposed modifications to the originally-reviewed project is a state-only environmental review. The SEIS analyzes impacts associated with the increase in capacity, construction and operation of the modified mine plan, new crushing/concentrating lines, expansion of the indurating furnace, and reduction in capacity to produce DRI and steel slabs.

Approved for Issuance for Public Comment:

12/05/2011
Date

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ACRONYMS

MDA
Master Development Agreement

DEFINITIONS

Deep Seepage
Deep seepage would follow a groundwater flow pathway that cannot be collected along the toe of the exterior dams of the tailings basin and returned to the tailings basin.

Lateral Seepage
Seepage that is proposed to be collected along the toe of the exterior dams of the tailings basin and returned to the tailings basin.

REFERENCES

Barr Engineering. Essar Steel Minnesota Modifications Project – Water and Chemical Balance Updates. September 19, 2011; Revised October 18 and December 1, 2011. Technical memorandum from Christie Kearney and Nick Nelson to Mike Liljegren (MNDNR) and Jeff Udd (MPCA).

Barr Engineering. Indurating Furnace BACT and Class I Modeling Update. September 19, 2011. Technical memo from Lori Stegink to Trent Wickman (USFS) and Joe Henderson (MPCA).

Barr Engineering. Estimated changes to human health risk based on emissions changes since January 2011. October 17, 2011. Memorandum from Lori Stegink to Lisa Fay (MNDNR).

Barr Engineering. Master Development Agreement Alternative. October 18, 2011. Technical memorandum from Lori Stegink to Lisa Fay (MNDNR).

Executive Summary

INTRODUCTION

The Minnesota Department of Natural Resources (MNDNR) published the Draft Supplemental Environmental Impact Statement (DSEIS) on the proposed Essar Steel Minnesota Modifications (ESMM) project (http://www.dnr.state.mn.us/input/environmentalreview/essar/index.html) and accepted public comment from May 2 to June 8, 2011. The MNDNR has prepared this Final Supplemental Environmental Impact Statement (FSEIS) to report on the public comments and resultant changes to the DSEIS, and to evaluate additional information and a new project alternative submitted by Essar Steel Minnesota LLC (Essar), the project proposer. The DSEIS and this FSEIS combined together constitute the SEIS for the proposed ESMM project.

ENVIRONMENTAL REVIEW PROCESS

This SEIS was prepared in accordance with SEIS preparation requirements of the Minnesota Environmental Policy Act (MEPA), Minnesota Statute §116D. In June of 2007, a Final Environmental Impact Statement (FEIS) was issued jointly by the MNDNR and USACE for MSI reactivation of the former Butler Taconite mine and tailings basin area. The MSI FEIS was determined adequate in August 2007 and is incorporated in its entirety by reference in this SEIS. The MSI FEIS is available at:

http://www.dnr.state.mn.us/input/environmentalreview/minnsteel/index.html

In accordance with Minnesota Rules 4410.2300 through 4410.2800 and 4410.3000, this Supplemental Environmental Impact Statement (SEIS) is being prepared as a supplement to the MSI FEIS. Because there are no additional wetland impacts, the USACE has made a determination that a supplement to the federal EIS under NEPA is not required. Therefore the SEIS for the proposed modifications to the originally reviewed project is a state-only environmental review.

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

The MNDNR serves as the Responsible Governmental Unit (RGU) for preparation of this SEIS in accordance with Minnesota Rules from the Minnesota Environmental Policy Act (MEPA). The MNDNR will be responsible for determining SEIS adequacy pursuant to MEPA and will prepare the state Adequacy Decision and Finding of Fact. The roles of consulting agencies are described in Chapter 6.0 of the DSEIS; there are no cooperating agencies for this SEIS.

SUMMARY OF CHAPTER 1.0

An additional project alternative has been brought forth for the proposed ESMM project since publication of and public comment on the DSEIS. The additional information provided by the project proposer to the RGU was determined to require disclosure in the SEIS. The Master Development Agreement (MDA) Alternative is consistent with the Master Development Alternative between Essar, Itasca County and the City of Nashwauk, Minnesota.

The MDA Alternative has been evaluated using data from the following studies as well as submittals for the Air Permit application. All studies are available by request to the RGU.

- Essar Steel Minnesota Modifications Project – Water and Chemical Balance Updates. September 19, 2011; Revised October 18 and December 1, 2011.
- Indurating Furnace BACT and Class I Modeling Update. September 19, 2011.
- Estimated changes to human health risk based on emissions changes since January 2011. October 17, 2011.
- Master Development Agreement Alternative. October 18, 2011

The MDA Alternative has been evaluated based upon the following definition for steel plant in the Master Development Agreement.

> "Steel Plant" shall mean a steel plant to be located on the Plant Site that will have the capacity to produce up to 1.8 million metric tons per year (mmtpy) of direct reduced iron (DRI) into approximately 1.5 mmtpy of steel slabs.

The MDA Alternative applies to the DRI and steelmaking operations of the proposed ESMM project and incorporates a reduction in DRI and steelmaking capacity, but no change in capacity for either type of pellet from that which was evaluated in the DSEIS. Capacities described in the DSEIS and of the MDA Alternative are compared below:

Operation	Product	Original MSI Project Capacity (mmtpy)	Proposed ESMM Project Capacity (mmtpy)	MDA Alternative Capacity (mmtpy)
Single Pelletizing Furnace	Low Flux (DRI grade) Pellet	3.8(1)	7.0(3, 5)	7.0(3, 5)
Single Pelletizing Furnace	High Flux (blast furnace grade) Pellet	0	6.5(4, 5)	6.5(4, 5)
DRI	Direct Reduced Iron	2.8(2)	2.8	1.8(7)
Steelmaking	Steel Slabs	2.5(6)	2.5(6)	1.5(8)

(1) Pelletizing air emission calculations included a 10% safety factor to account for the level of detailed engineering that existed at the time of permitting. Actual capacity used for air emission calculations was 4.1 mmtpy.

(2) For the MSI FEIS and Air Permit #06100067, the capacity of the DRI modules was described as 2.8 mmtpy. However, the MSI air emissions inventory inadvertently used a value of 3.5 mmtpy plus a 10 percent safety factor that equates to 3.85 mmtpy. The Essar emission inventory corrects this throughput and uses the capacity of 2.8 mmt plus a 10 percent safety factor or 3.08 mmtpy in the air emission calculations. The 10 percent safety factor is maintained for the DRI calculations because Essar has not yet completed detailed design engineering of these processes.

(3) Essar will make Low Flux, otherwise known as DRI grade feed, pellets for on-site steelmaking or for sale on the open market. The quantity of this type of pellet to be produced on an annual basis will depend on internal manufacturing needs and on market conditions.

(4) Essar will make High Flux, otherwise known as Blast Furnace grade feed, pellets for Essar Steel Algoma or for sale on the open market. The quantity of this type of pellet to be produced on an annual basis will depend on internal manufacturing needs and on market conditions.

(5) An air emission inventory was prepared for both types of pellets to be produced. The maximum value from either inventory for a given pollutant was used in air dispersion modeling assessments.

(6) Steelmaking capacity includes a 10 percent safety factor because Essar has not yet started detailed engineering of these processes.

(7) DRI capacity as defined in the MDA between Essar, Itasca County and the City of Nashwauk.

(8) Steelmaking capacity as defined in the MDA between Essar, Itasca County and the City of Nashwauk.

Three operational differences have been identified by comparing the MDA alternative to the proposed ESMM project evaluated in the DSEIS. The differences are listed below.

1. Capacity reduction from 2.8 to 1.8 mmtpy DRI and 2.5 to 1.5 mmtpy steelmaking.
2. Mining operations: addition of one haul truck.
3. Pelletizing operations: return of additional water from pelletizing furnace back to concentrating facility. This change is also now incorporated into the proposed ESMM project.

Water Balance and Chemistry

- Overall Process Water Demand

  The maximum appropriation under normal climatic conditions from Pits 1 and 2 precipitation, existing storage, and groundwater overall water balance for the MDA Alternative process needs would be approximately 1405 gpm. This demand is exclusive of stream augmentation. The existing Water Appropriation Permit 2006-0433 allows appropriations from Pits 1 and 2 not to exceed 7,000 gpm or 3,679 million gallons per year.

- Stream Augmentation

  As part of the existing Water Appropriation Permit 2006-0433, a Stream Augmentation Plan must be submitted for Oxhide and Snowball Creeks at least one year prior to the completion of the water transfer from Pit 5 and the Draper Annex Pit, respectively. This Stream Augmentation Plan must comply with the recommended augmentation strategy described in the MSI FEIS.

  The MDA Alternative analysis of Pits 1 and 2 water balance indicates that under dry, normal, and wet weather conditions Pits 1 and 2 will still have water available to meet the requirements necessary for stream augmentation as described in the MSI FEIS. Under normal weather conditions excess water is available for stream augmentation in the range of 1,368 – 2,315 gpm, the lowest and highest values, respectively, for all years 1-15.

- Pellet Plant Return Water and Water Demand

  Process water from the taconite pellet plant would be recycled back to the concentrator and ultimately discharge to the tailings basin. The updated water balance model includes the pellet plant return water to the concentrating water recycling circuit. This is a proposed change for both the proposed ESMM project and MDA Alternative. However, the water demand for DRI and steel is reduced for the MDA Alternative.

- Water Treatment

  Water treatment is proposed for the DRI and steelmaking processes. The treated water from the DRI and steelmaking water treatment system will be reused onsite. No process water from DRI or steelmaking will be discharged to the tailings basin.

  Since the DSEIS was published, Essar proposed Best Available Control Technology (BACT) for both the proposed ESMM project and MDA Alternative. The MDA Alternative and proposed ESMM project include dry air pollution controls as opposed to wet controls that were proposed for the original MSI project. This decision eliminated the need for water scrubbing for particulate and sulfur dioxide control. Therefore, no water treatment is proposed at the pellet plant.

With removal of the water treatment system in the pellet plant, Essar modeled the quality of pellet plant return water to the concentrating circuit, water which eventually discharges to the tailings basin. The modeling results presented in the Water and Chemical Balance Version 4 (Barr 2010a) and described in the DSEIS remain representative of this (including the modeled 0.3 mg/L increase in sulfate concentration in Swan Lake).

The modeled sulfate concentration is being evaluated in permit review along with a number of mitigation measures to reduce or eliminate sulfate in the wastewater flow as much as possible. These mitigation measures, as well as enhanced water quality monitoring, are summarized in Table 1 at the end of this Executive Summary.

- Zero Surface Water Discharge

  The MDA alternative would have no surface water discharge, the same as in the original MSI and the proposed ESMM projects. As described in the DSEIS, lateral seepage from the tailings basin would be collected and returned to the tailings basin as a separate operation from tailings basin water being pumped to the concentrator.

- Deep Seepage to Swan Lake

  The flow rate of deep seepage from the tailings basin is estimated at 199 gpm (year 15) for the MDA Alternative, the same as the proposed ESMM project. The modeled increase of 0.3 mg/L mean sulfate concentration to the main body of Swan Lake is the same for the MDA Alternative as described in the DSEIS for the proposed ESMM project.

Air Emissions

The MDA Alternative is considered a major source of air emissions, as are the ESMM and MSI projects. As with the ESMM project, oxide pellets will be fed at ambient temperatures to the DRI process.

The emission sources for the MDA Alternative are the same as presented in the DSEIS with the one exception of an additional haul truck for mining operations.

The MDA Alternative includes installation low NO_x LE Burners to minimize emissions from the taconite pellet furnace. Since publication of the DSEIS, Essar conducted ¼-scale pilot testing of the LE Burners to quantify the reductions in NO_x emissions that can be achieved with redesigned combustion chamber and low NO_x natural gas LE Burners.

An updated emission inventory, including the additional haul truck, was submitted to the MPCA for review on October 14, 2011.

The emission inventory reflects the output from one DRI line and steel mill in contrast to the ESMM output presented in the DSEIS of two DRI and steel mill lines (ESMM) project. The potential to emit in DRI and steel mill emissions is significantly reduced for the MDA Alternative, with the percent change ranging from 46-53% for DRI and 41-46% for the steel mill in comparison to the original MSI project. In contrast, the percent change for the proposed ESMM project was less than 20% across the board and 0-1% for the steel mill compared to the MSI project.

- Air Dispersion Modeling

  Class I and II modeling of the MDA Alternative was performed for the FSEIS and air permit amendment application submitted to MPCA October 14, 2011 for evaluation. It was found that modeling results did not exceed federal ambient air pollutant standards due to the substantially reduced emissions. The Class I modeling incorporated the additional haul truck in the MDA Alternative and air permit amendment application documents. Similarly, the MDA Alternative modeled below the FLM thresholds for visibility impacts, indicating adverse impacts to visibility would not be expected.

- Human Health and Ecological Risk Assessment

  The human health risk for most chemicals decreased with the MDA Alternative compared to the ESMM project. Although the revised estimated risk for some pollutants is higher than the estimated risk in the January Supplemental HHSLRA, due to the additional haul truck, the overall risk from all pollutants is estimated to be lower. The overall impact on total risk is a 10 percent decrease in cancer risk and a 6.8 percent decrease in non-cancer chronic risk.

  Mercury emissions for the MDA Alternative are slightly less than those for the ESMM project. Most of the mercury is emitted from the taconite pellet plant which will have the same emissions for both the ESMM project and the MDA Alternative. There will be a slight decrease in mercury emissions for the MDA Alternative due to less natural gas combustion and use in the DRI process and in steelmaking.

  No changes to ecological risk are anticipated with the MDA alternative.

- Cumulative Air Emissions of the MDA Alternative

  Cumulative effects analysis on Class I areas utilizes emission rates for particulate matter (PM), sulfur (SO_2), and nitrogen oxide (NO_x). The total emissions from the MDA Alternative are lower than the emissions for the ESMM project shown in the DSEIS. Visibility effects are related to emissions of fine particulates, SO_2 and NO_x. Acid deposition and ecosystem acidification are related to emissions of SO_2 and NO_x. The potential cumulative impacts from the MDA Alternative are thus expected to be less than those estimated for the ESMM project.

Energy and Waste Management

The plan for energy management presented in the DSEIS for the ESMM project also applies to the MDA Alternative. Along with the updated emissions inventory for the MDA Alternative, updated reporting for GHG emissions was performed. The results show total direct and indirect emissions of approximately 3.2 million metric tons carbon dioxide equivalents per year for the MDA Alternative. This is in contrast to approximately 3.8 million metric tons carbon dioxide equivalents for the MSI project and 4.5 million metric tons carbon dioxide equivalents for the proposed ESMM project.

The MDA Alternative is different from the original MSI project in generation rates of some items in the waste stream. The differences in waste generation would be related to changes in production rates for the crusher/concentrator and taconite pellet plant operations. The DRI process and the steel mill waste generation rates for the MDA Alternative would decrease compared to both the original MSI project and the ESMM project. The proposed methods of disposal would not differ from either project.

Employment

The total number of jobs expected for the ESMM project and MDA Alternative, despite the differences in DRI and steelmaking capacities, is 500. The original MSI project was estimated to create 700.

SUMMARY OF CHAPTER 2.0

The DSEIS describes the project effects of the proposed ESMM project. No changes are made to the DSEIS chapters, other than as described below. This FSEIS serves to update information on six items described in the DSEIS.

Water Treatment Change to the Proposed ESMM Project

On page 3.0-15 under Water Management, the DSEIS identifies process wastewater reuse onsite or treatment by the water recovery and reuse system (WRRS). The WRRS treatment in the pellet plant has been removed from the proposed ESMM Project and is also not included in the MDA Alternative. Process water from the taconite pellet plant would be recycled back to concentrating and ultimately discharged to the tailings basin. The updated water balance model includes the pellet plant return water to the concentrating water recycling circuit. This is a proposed change for both the ESMM project and MDA Alternative as described in the preceding Summary of Chapter 1.0.

Air Emissions Best Available Control Technology (BACT)

The DSEIS in Chapter 3.3.2 describes partial requirements for BACT for the proposed ESMM project. Essar submitted the remaining BACT requirements for the air permit amendment application in the report, Indurating Furnace BACT and Class I Modeling Update, September 19, 2011 (Barr Engineering). The findings have been evaluated by the MPCA for reporting in the FSEIS.

Essar engaged Fives North American Combustion, Inc. to perform quarter (1/4) scale Low NO_x LE Burner testing to evaluate the ability to at least achieve an emission rate of 0.39 lb/mmBTU or lower and scalability of this technology. Three 3-hour test runs were conducted with continuous data collection. This resulted in a data set with 99 percent of all data points at or below 0.25 lbs NO_x/mmBTU. The findings suggest that an emission factor of 0.25 lb NO_x/mmBTU is conservative and can be used for permitting.

The air permit amendment application contains full information on the details of emission sources and modeling. The draft permit will be placed on public notice and will provide opportunity for public comment in addition to the SEIS. The draft permit will be for the MDA Alternative (one line of DRI and steelmaking), which does not model adverse impacts to visibility. As acknowledged in the DSEIS, the ESMM project (two lines of DRI and steelmaking) modeled above thresholds of concern at the BWCAW, indicating that adverse impacts to visibility could be anticipated. If Essar decides to pursue a second line of DRI and steelmaking, the company will need to work with the MPCA and the FLMs regarding potential adverse impacts to visibility.

New or Modified Emission Sources of Mercury – Plan To Reduce Mercury Releases to the Air

The DSEIS described project-specific mercury risks in Chapter 4.3, Human Health Risk Assessment, and cumulative mercury effects in Chapter 5.3, Cumulative Mercury Deposition. Regulatory requirements for reporting are summarized on page 5.3-2 of the DSEIS, and this FSEIS clarifies the Air Permit related requirements of Essar for reporting.

In an appendix to Minnesota's Plan to Reduce Mercury Releases by 2025 are the Guidelines for New and Modified Mercury Air Emission Sources. Essar's proposed project does not propose an increase in mercury emissions beyond what was previously permitted for the MSI project, and therefore the guidelines as specified in the plan do not apply. The taconite production industry sector as a whole is required to come up with a proposal to meet the requirements of the plan. The proposal will be due in 2016.

The SEIS Preparation Notice (July 2010) indicated that the SEIS would include the company's plan for reducing mercury emissions in accordance with the state guidelines. Since the guidelines are not applicable to the project, this information is not included.

Essar will submit Air Quality Form HG-1, Mercury Releases to Ambient Air, as part of the air permit amendment application.

Human Health Risk Reporting Correction to Draft SEIS Chapter 4.3

This FSEIS corrects an error reported on page 4.3-17 of the DSEIS regarding the non-cancer incremental guideline value of 1.0 being discussed regarding the data in Table 4.3-3. The DSEIS paragraph reports a value of 0.1 for non-cancer. The correct value is 1.0 non-cancer.

Table 4.3-3 of the DSEIS correctly shows the guideline value of 1.0 for non-cancer.

Energy Reporting Details of Major Project Operations

The DSEIS reports total power demand on page B-6 of Appendix B as 2,649,000 MWh/year. This reporting was in error by 6,000 MWh/year over the correct value (2,643,000 MWh/year) from the Climate Change Evaluation, Version 1, September 2010, Table 3-6.

Property Acquisition Status

The DSEIS reported on the mitigation measures in accordance with the MSI FSEIS for acquisition of six properties within the Permit to Mine and Air Permit ambient air quality boundary. The status of property acquisition was described on page 4.5-1, Chapter 4.5 of the DSEIS.

The acquisition of all six properties was completed September 20, 2011, thus fulfilling the commitment made previously by MSI.

SUMMARY OF PROPOSED ESMM PROJECT AND MDA ALTERNATIVE MITIGATION

Table 1 of this FSEIS provides the mitigation commitments for the MDA Alternative, as well as the mitigation commitments for the ESMM project that are in Table Ex-3 of the DSEIS.

Essar has committed to an enhanced water quality monitoring and study program for the tailings basin area and Swan Lake. The NPDES/SDS water quality permit that is being evaluated for reissuance in 2012 will consider these monitoring measures, as well as the mitigation measures. The monitoring measures committed to by Essar are listed below, and Table 1 provides these commitments as an abbreviated list.

1. Increase the frequency of sulfate water quality sampling in the tailings basin, tailings basin perimeter groundwater wells, and Swan Lake from two (2) to four (4) times per year when Swan Lake is ice-free. This will provide a larger data set from which to assess water quality conditions as needed and will also serve as a means of assessing any correlation between tailings basin, groundwater and Swan Lake water quality.

2. If the annual average sulfate concentration in the tailings basin exceeds 50 mg/L, sulfate water quality sampling frequency will be increased from four (4) to eight (8) times per year when Swan Lake is ice-free. 50 mg/L represents a mid-range of the concentration data seen in National Steel data (42 to 65 mg/L). 50 mg/L will serve as an early indicator or potential difference developing from the values used in the modeling. Additionally, a source

identification study will be conducted to identify sources of sulfate loading that may be different than previously predicted. Lastly, the tailings basin, groundwater and Swan Lake water quality data will be evaluated for any correlations that may exist.

3. In the event that an upward trend in sulfate concentrations is observed in groundwater well or lake sampling and that trend can be correlated to an upward trend in the tailings basin sulfate concentration, potential water treatment options will be evaluated. This could include removal of sulfate from process streams via suitable water treatment technology, such as, but not limited to reverse osmosis, ion exchange, chemical treatment and/or some other appropriate water management strategy or technology that is determined to be feasible based on the results of the study. If feasible, water management options that could be considered include concentrating and removing sulfate from the water stream, using source water alternatives, and/or channeling the recirculating water to other parts of the plant for use in other operations such that it never reaches the tailings basin.

Table 1. Summary of Mitigation Measures Proposed and Identified for the ESMM Project and MDA Alternative.

Potential Environmental Effect	Mitigation Incorporated into Proposed ESMM Project and MDA Alternative	Additional Mitigative Measures Identified
	Water Resources and Wild Rice (DSEIS Chapter 4.1)	
• Potential for decreased stream flow due to pit dewatering • Modeled increase of 0.3 mg/L in sulfate concentrations in Swan Lake from tailings basin seepage • No impacts are anticipated to wild rice due to changes in water levels or sulfate concentrations	• Adaptive Management • Special Conditions of existing MSI NPDES/SDS permit, including continued monitoring of ground water, surface waters, and tailings basin influent • Stream Augmentation Plan per existing Water Appropriations Permit • Hydrologic Monitoring per existing Water Appropriations Permit • Maintain zero liquid surface water discharge and water reuse & recycling strategy • Removal of sulfur from the process through dry air pollution control systems for the indurating furnace which eliminate a scrubber blowdown stream and a sulfuric acid backwash stream • Water conservation measures that include source reduction and recycling • Tailings basin lateral seepage collection • Tailings basin seepage rate modeled less than that which is allowed for a lined basin (less than 500 gallons/per acre/ per day) • Water entering the tailings basin will only be from precipitation and water used to convey tailings to the basin from the concentrator • Water treatment for DRI and steelmaking which may present an option to treat pellet plant water in the future, if required	• Increased frequency of sulfate water quality sampling in the tailings basin, tailings basin perimeter groundwater wells, and Swan Lake • Source identification study to identify sources of sulfate loading that may be different from previously predicted • Evaluation of water quality data from the tailings basin, groundwater, and Swan Lake water quality data for correlations • Potential water treatment options such as reverse osmosis, ion exchange, chemical treatment and/or some other appropriate water management strategy or technology to remove sulfate from process streams • Potential water management strategies such as concentrating and removing sulfate from the water stream, using source water alternatives, and/or channeling the recirculating pellet plant water to other parts of the plant for use in the other operations such that it never reaches the tailings basin

Potential Environmental Effect	Mitigation Incorporated into Proposed ESMM Project and MDA Alternative	Additional Mitigative Measures Identified
	Air Quality (DSEIS Chapter 4.2)	
• Fugitive dust emissions • Major stationary sources of air emissions • Air quality impacts to Class I areas • Air quality impacts to Class II areas • Mercury bioaccumulation in fish • Exceedance of state and federal NO_x and SO_2 air emissions standards	• Implement fugitive dust control plan • Installation of best available control technologies • Installation of New Combustion Chamber Design and LE Burners • Installation of activated carbon injection for control of mercury emissions • Use of larger trucks to reduce fugitive dust emissions and diesel exhaust emissions	• Accepting a lower NO_x limit than currently modeled, contingent upon results of ¼ scale pilot test of Low NO_x LE Burners for new indurating furnace • Reducing NO_x emissions from other sources or purchasing tradable NO_x or SO_2 emissions allowances from sources impacting surrounding Class I areas • Install additional NO_x emission reduction technology after testing to determine feasibility
	Human Health Risk (DSEIS Chapter 4.3)	
• Small incremental increase in potential human health risks (but below Minnesota Department of Health guidelines)	• Installation of New Combustion Chamber Design and Low NO_x LE Burners • Installation of activated carbon injection system to reduce mercury emissions from the indurating furnace • Use of larger trucks to reduce fugitive dust emissions and diesel exhaust emissions	None
	Ecological Risk (DSEIS Chapter 4.4)	
• Low increase in concentrations of chemicals in surface soils and sediments • Moderate risk for manganese and low risk due to iron would be possible for Snowball Lake and other lakes along the south boundary of the mine • Low risk due to magnesium would be possible for Swan Lake compared to background levels	• Installation of best available control technologies • Implement fugitive dust control plan • Maintain zero liquid surface water discharge and water reuse & recycling strategy • Mitigation measures to reduce air emissions applicable to the chemicals potentially posing moderate levels of risks	None
	Socioeconomics (DSEIS Chapter 4.5)	
• Same housing effects as in original MSI FEIS • Additional jobs created for construction and operation at a smaller number than the original MSI project • A change in demand for public services	• Acquisition of 6 onsite properties	None

Potential Environmental Effect	Mitigation Incorporated into Proposed ESMM Project and MDA Alternative	Additional Mitigative Measures Identified
	Cumulative Air Quality Class I Particulates and Visibility (DSEIS Chapter 5.1)	
• Emissions of haze-producing air pollutants • Cumulative impacts to visibility at surrounding Class I areas	• Same measures identified for Air Quality	• Accepting a lower NO_x limit than currently modeled, contingent upon results of ¼ scale pilot test of Low NO_x LE Burners for new indurating furnace • Reducing NO_x emissions from other sources or purchasing tradable NO_x or SO_2 emissions allowances from sources impacting surrounding Class I areas
	Cumulative Air Quality Class I Acid Deposition (DSEIS Chapter 5.2)	
• Ecosystem acidification	• Installation of best available emission controls for NO_x and SO_2. • Installation of New Combustion Chamber Design and Low NO_x LE Burners	None
	Cumulative Mercury Deposition (DSEIS Chapter 5.3)	
• Mercury emissions • Mercury bioaccumulation in fish • Health impacts due to fish consumption	• Installation of an activated carbon injection system to reduce mercury emissions and corresponding permit limits • Clean fuels (natural gas is low in mercury)	None
	Cumulative Climate Change (DSEIS Chapter 5.4)	
• Environmental effects on climate change • Increases in GHG emissions	• Best available control technology and corresponding permit limits • Use of larger trucks to reduce vehicle miles traveled thereby reducing fuel usage and associated GHG emissions • Dry cobbing of crude ore • Use autogenous grinding • Elimination of steel balls from SAG grinding • Use of hydraulic AG mill trommel • Use of ball mill instead of cyclone in primary screening circuit • Maximize use of gravity flow to transport through crushing/grinding/concentration circuits • Filtration using ceramic filters	• Carbon offset credits could be considered at some point in the future for the proposed ESMM project

Introduction

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ENVIRONMENTAL REVIEW PROCESS

This SEIS was prepared in accordance with SEIS preparation requirements of the Minnesota Environmental Policy Act (MEPA), Minnesota Statute §116D. In June of 2007, a Final Environmental

Impact Statement (FEIS) was issued jointly by the MNDNR and USACE for MSI reactivation of the former Butler Taconite mine and tailings basin area. The MSI FEIS was determined adequate in August 2007 and is incorporated in its entirety by reference in this SEIS. The MSI FEIS is available at:

http://www.dnr.state.mn.us/input/environmentalreview/minnsteel/index.html.

In accordance with Minnesota Rules 4410.2300 through 4410.2800 and 4410.3000, this Supplemental Environmental Impact Statement (SEIS) is being prepared as a supplement to the MSI FEIS. Because there are no additional wetland impacts, the USACE has made a determination that a supplement to the federal EIS under NEPA is not required. Therefore the SEIS for the proposed modifications to the originally reviewed project is a state-only environmental review.

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

The MNDNR serves as the Responsible Governmental Unit (RGU) for preparation of this SEIS in accordance with Minnesota Rules from the Minnesota Environmental Policy Act (MEPA). The MNDNR will be responsible for determining SEIS adequacy pursuant to MEPA and will prepare the state Adequacy Decision and Finding of Fact. The roles of consulting agencies are described in Chapter 6.0 of the DSEIS; there are no cooperating agencies for this SEIS.

The FSEIS is comprised of two primary chapters. The following sections describe the content of each of these chapters. The list of commenters, responses to comments, and comment letters received are provided as appendices.

SUMMARY OF CHAPTER 1.0 - MASTER DEVELOPMENT AGREEMENT (MDA) ALTERNATIVE

An additional project alternative has been brought forth for the proposed ESMM project since publication of and public comment on the DSEIS. The additional information provided by the project proposer to the RGU was determined to require disclosure in the SEIS. The Master Development Agreement (MDA) Alternative is consistent with the Master Development Agreement between Essar, Itasca County and the City of Nashwauk, Minnesota.

The MDA Alternative has been evaluated using data from updated studies as well as submittals for the Air Permit application. All studies are available by request to the RGU.

SUMMARY OF CHAPTER 2.0 – PROJECT EFFECTS CHANGES FROM THE DRAFT SEIS

The DSEIS serves to describe the full project effects of the proposed ESMM project. No changes are made to the DSEIS chapters other than where described below. This FSEIS serves to update selected information on six items described in DSEIS.

- Water Treatment Change to the Proposed ESMM Project – update to the information described on page 3.0-15 of the DSEIS.
- Air Emissions BACT – update to the information described on pages 3.0-17 – 3.0-19 of the DSEIS.
- New or Modified Emission Sources of Mercury – Plan to Reduce Mercury Releases to the Air – update to the requirements for mercury reporting are described on page 5.3-2 of the DSEIS.
- Human Health Risk Reporting Correction to DSEIS Chapter 4.3 – correction to page 4.3-17 of the DSEIS.
- Energy Reporting Details of Major Project Operations – correction to page B-6, Appendix B of the DSEIS.
- Property Acquisitions Status – update to information on page 4.5-1 of the DSEIS.

Chapter 1.0 Master Development Agreement (MDA) Alternative

An additional project alternative has been brought forth for the proposed ESMM project since publication of and public comment on the DSEIS. The additional information provided by the project proposer to the RGU was determined to require disclosure in the SEIS. The Master Development Agreement (MDA) Alternative is consistent with the Master Development Agreement between Essar, Itasca County and the City of Nashwauk, Minnesota. The technical memorandum, Master Development Agreement Alternative, October 18, 2011, has been used to describe the MDA alternative in this chapter of the FSEIS.

1.1 DATA EVALUATED FOR THE MDA ALTERNATIVE

The MDA Alternative has been evaluated using data from the following studies as well as submittals for the Air Permit application. All studies are available by request to the RGU.

- Essar Steel Minnesota Modifications Project – Water and Chemical Balance Updates. September 19, 2011; Revised October 18 and December 1, 2011.
- Indurating Furnace BACT and Class I Modeling Update. September 19, 2011.
- Estimated changes to human health risk based on emissions changes since January 2011. October 17, 2011.
- Master Development Agreement Alternative. October 18, 2011

1.2 OPERATIONS AND PRODUCTION CAPACITY

The MDA Alternative has been evaluated based upon the following definition for steel plant in the Master Development Agreement.

> "Steel Plant" shall mean a steel plant to be located on the Plant Site that will have the capacity to produce up to 1.8 million metric tons per year (mmtpy) of direct reduced iron (DRI) into approximately 1.5 mmtpy of steel slabs.

The MDA Alternative applies to the DRI and steelmaking operations of Essar's proposed modifications and incorporates a reduction in DRI and steelmaking capacity (Table 2), but no change in capacity for either type of pellet from that which was evaluated in the DSEIS.

Table 2. Production Capacities of the MSI Project and ESMM Project and MDA Alternative.

Operation	Product	Original MSI Project Capacity (mmtpy)	Proposed ESMM Project Capacity (mmtpy)	MDA Alternative Capacity (mmtpy)
Single Pelletizing Furnace	Low Flux (DRI grade) Pellet	3.8(1)	7.0(3, 5)	7.0(3, 5)
Single Pelletizing Furnace	High Flux (blast furnace grade) Pellet	0	6.5(4, 5)	6.5(4, 5)
DRI	Direct Reduced Iron	2.8(2)	2.8	1.8(7)
Steelmaking	Steel Slabs	2.5(6)	2.5(6)	1.5(8)

(1) Pelletizing air emission calculations included a 10% safety factor to account for the level of detailed engineering that existed at the time of permitting. Actual capacity used for air emission calculations was 4.1 mmtpy.
(2) For the MSI FEIS and Air Permit #06100067, the capacity of the DRI modules was described as 2.8 mmtpy. However, the MSI air emissions inventory inadvertently used a value of 3.5 mmtpy plus a 10 percent safety factor that equates to 3.85 mmtpy. The Essar emission inventory corrects this throughput and uses the capacity of 2.8 mmt plus a 10 percent safety factor or 3.08 mmtpy in the air emission calculations. The 10 percent safety factor is maintained for the DRI calculations because Essar has not yet completed detailed design engineering of these processes.
(3) Essar will make Low Flux, otherwise known as DRI grade feed, pellets for on-site steelmaking or for sale on the open market. The quantity of this type of pellet to be produced on an annual basis will depend on internal manufacturing needs and on market conditions.
(4) Essar will make High Flux, otherwise known as Blast Furnace grade feed, pellets for Essar Steel Algoma or for sale on the open market. The quantity of this type of pellet to be produced on an annual basis will depend on internal manufacturing needs and on market conditions.
(5) An air emission inventory was prepared for both types of pellets to be produced. The maximum value from either inventory for a given pollutant was used in air dispersion modeling assessments.
(6) Steelmaking capacity includes a 10 percent safety factor because Essar has not yet started detailed engineering of these processes.
(7) DRI capacity as defined in the MDA between Essar, Itasca County and the City of Nashwauk.
(8) Steelmaking capacity as defined in the MDA between Essar, Itasca County and the City of Nashwauk.

Three operational differences have been identified by comparing the MDA Alternative to the proposed ESMM project evaluated in the DSEIS. The differences are listed below.

1) Capacity reduction from 2.8 to 1.8 mmtpy DRI and 2.5 to 1.5 mmtpy steelmaking .
2) Mining operations: addition of one haul truck.
3) Pelletizing operations: return of additional water from pelletizing furnace back to concentrating facility. This change is also now incorporated into the proposed ESMM project.

The return water change is also proposed for the ESMM project and is discussed both in this chapter and Chapter 2.0 of this FSEIS.

1.3 WATER BALANCE AND WATER CHEMISTRY

1.3.1 Water Balance Summary

The water balance for the MDA Alternative and proposed ESMM project are summarized in Tables 3-5. The production capacities used for the analysis are as follows:

- Proposed ESMM Project – 6.5/7.0 mmtpy pellets, 2.8 mmtpy DRI and 2.5 mmtpy steel slabs
- MDA Alternative – 6.5/7.0 mmtpy pellets, 1.8 mmtpy DRI and 1.5 mmtpy steel slabs

The water balance summary tables used the following definitions.

A = Pits 1/2 water available from surface runoff and groundwater sources

B = Process water supply available from surface runoff and groundwater sources

C = Total Water Supply Available

D = Total Water Demand as established by Essar for each scenario

E = Process Water Balance = D – B = additional water needed from Pits 1/2 to satisfy process water demand

F = Pit 1/2 Water Balance = A – E and/or C – D = Pits 1/2 water available for stream augmentation

The process water balance, E, is the difference between the total water supply from stormwater ponds (i.e., Sullivan and Ann Pits) and Pits 5/6 pit dewatering (process water) and the total water demand.

Illustrations 1 and 2 present water flow scenarios for the MDA alternative and proposed ESMM project under normal weather conditions.

1.3.2 Overall Process Water Demand

The maximum appropriation under normal climatic conditions from Pits 1 and 2 precipitation, existing storage, and groundwater overall water balance for the MDA Alternative process needs would be approximately 1405 gpm (see Table 3 MDA process water balance, E). This demand is exclusive of stream augmentation. The existing Water Appropriation Permit 2006-0433 allows appropriations from Pits 1 and 2 not to exceed 7,000 gpm or 3,679 million gallons per year. Therefore, no additional water appropriations are needed over those currently permitted.

1.3.3 Stream Augmentation

As part of the existing Water Appropriation Permit 2006-0433, a Stream Augmentation Plan must be submitted for Oxhide and Snowball Creeks at least one year prior to the completion of the water transfer from Pit 5 and the Draper Annex Pit, respectively. This Stream Augmentation Plan must comply with the recommended augmentation strategy described in the MSI FEIS.

The Pits 1 and 2 water balance, F, provides the amount of water that is available for stream augmentation, which is calculated after Pits 1 and 2 supply the remaining process water demand. Note that Pits 1 and 2 water balance does not account for the water stored in Pits 1 and 2, which would also be available to supplement stream augmentation as needed. A target flow rate for stream augmentation is yet to be established. The MSI FEIS recommends an Alternative Augmentation Plan of 1,470 gpm for Oxhide Creek and 220 gpm for Snowball Creek on average.

The ESMM Pits 1 and 2 water balance, F, indicates that sufficient water supply for stream augmentation may be lacking in years 11-15 when DRI and steelmaking operations are at full capacity under normal weather conditions (Table 2), and all years under dry weather conditions (Table 3).

The MDA Alternative analysis of Pits 1 and 2 water balance (F in Table 2-Table 4) indicates that under dry, normal, and wet weather conditions Pits 1 and 2 will have water available to meet the requirements necessary for stream augmentation as described in the MSI FEIS. For example, under normal weather conditions (Table 2) excess water is available for stream augmentation in the range of 1,368 – 2,315 gpm, the lowest and highest values, respectively, for all years 1-15.

1.3.4 Pellet Plant Return Water and Water Demand

Process water from the taconite pellet plant would be recycled back to the concentrator and ultimately discharge to the tailings basin. The updated water balance model includes the pellet plant return water to the concentrating water recycling circuit. This is a proposed change for both the proposed ESMM project and MDA Alternative.

The main source of water to the pellet plant area is the water used to convey the concentrate in slurry form from the concentrating plant to the pellet plant approximately two miles away. At the pellet plant, concentrate slurry is filtered to remove water and increase the solids content of the iron concentrate prior to the balling discs. Filtrate water is mixed with water slurry from other pellet plant areas in a pellet plant thickener. As shown on Illustrations 1 and 2 in the small cloud area, there is excess water flow (modeled at 1,372 gpm) from the pellet plant to the concentrator where it will mix with approximately 100,000 gpm of water that is circulating on a continuous basis within the concentrating circuit. This is a water recycling measure to further minimize the demand for fresh make-up water from the pits.

Updated water balance calculations by Essar included water conservation measures that reduce pellet plant water demand. These measures are listed below.

- Recycling washdown and dust collection slurry water through a spiral classifier and thickener allowing for reuse in the pellet plant without chemical treatment which reduces the total water demand by 50 gpm;

- Selecting thin fan cooling vs cooling towers which reduces evaporative losses and saves about 200 gpm of water;

- Sending acid cleaning solution to gas suspension absorber for neutralization which reduces make-up water demand by 30 gpm;

- Returning excess pellet plant water back to concentrating which reduces concentrating make-up water demand by 1400 gpm.

1.3.5 Water Treatment

Water treatment is proposed for the DRI and steelmaking processes. The treated water from the DRI and steelmaking water treatment system will be reused onsite. No process water from DRI or steelmaking will be discharged to the tailings basin.

It should be noted that DRI and steelmaking involves the use of large quantities of water for quenching and cooling of steel immediately prior to rolling. Therefore, a water treatment system is required as part of the DRI and steelmaking operation. However, the water demand for DRI and steel is reduced for the MDA Alternative, as shown in the large cloud area of Illustration 1 compared to Illustration 2.

Since the DSEIS was published, Essar proposed Best Available Control Technology (BACT) for both the ESMM project and MDA Alternative. The MDA Alternative and proposed ESMM project include dry air pollution controls as opposed to wet controls that were proposed for the original MSI project. This decision eliminated the need for water scrubbing for particulate and sulfur dioxide control. Therefore, no water treatment is proposed at the pellet plant.

Essar selected a dry air pollution control system for the Hood and Windbox Exhausts at the pelletizing furnace. This decision was part of the BACT requirements for air permitting (FSEIS Chapter 2.0 describes BACT). Wet (water) scrubbing would have been needed for particulate and sulfur dioxide control and would generate a sulfur laden wastewater stream requiring treatment prior to being reused in the process.

With removal of the water treatment system in the pellet plant, Essar modeled the quality of pellet plant return water to the concentrating circuit, water which eventually discharges to the tailings basin. The modeling results presented in the Water and Chemical Balance Version 4 (Barr 2010a) and described in the DSEIS remains representative of this (including the modeled 0.3 mg/L increase in sulfate concentration in Swan Lake). The modeling was based upon the analog of National Steel which contains pellet plant return water like that proposed here. The MNDNR has reviewed and accepted this analog. A description of the modeling and the analog is provided below.

The italicized text below is from Water and Chemical Balance Version 4 (Barr 2010a) that was approved for the DSEIS.

> *Essar's operation will be most in line with National's operation in that there will be magnetic separation and no products of combustion from the air pollution control system going to the Tailings Basin. Essar's operation is less than 10 miles west of National's operation, which is now called Keewatin Taconite due to a change in ownership. The 1999 data from National is representative of full scale operations with similar ore being processed with similar methods (magnetic separation with no scrubber water or materials of combustion being added). This makes the 1999 data for National a good analog for the expected water quality in Essar's Tailings Basin. This analog modeling approach provides empirical data that accounts for the scale and size of the operation, operational conditions, and environmental conditions. Because the water samples from the pilot plant testing were not properly filtered or analyzed for carbonate species, creating incomplete water quality data, the data provided for National from this 1999 study provides a more robust analog for the expected water quality from Essar's Tailings Basin than the results of the mass balance evaluation. There will be some differences in the resultant water chemistry for Essar's Tailings Basin due to variability in the ore and the water budgets (make-up water quality and quantity), but these differences are expected to be minor.*

As stated above, National Steel, at the time of water quality sampling in 1999, had not yet installed the wet scrubber on their furnace, so there was no scrubber water associated with the operation. Essar plans to use a dry air pollution control system so there will not be any scrubber water. According to a retired National Steel engineer (Robert Westlund, October 14, 2011 telephone interview with Barr Engineering), in 1999 National Steel's concentrator water went to the pellet plant with the concentrate. Excess water from the pellet plant went to the tailings thickener and out to the tailings basin. Similarly, Essar will recirculate water from the pellet plant to the concentrator, which will then go to the tailings basin. The total make-up water from freshwater sources for the proposed Essar operations is also very similar to the Keetac operation.

1.3.6 Zero Surface Water Discharge

The MDA alternative would have no surface water discharge, the same as in the original MSI and proposed ESMM projects. Pit 5 and Draper Annex Pit would have on-going maintenance dewatering and be used as a source of process water once mining activities begin (Illustration 1). As described in the DSEIS, lateral seepage from the tailings basin would be collected and returned to the tailings basin as a separate operation from tailings basin water being pumped to the concentrator.

1.3.7 Deep Seepage to Swan Lake

The flow rate of deep seepage from the tailings basin is estimated at 199 gpm (year 15) for the MDA Alternative, the same as the proposed ESMM project.

The MDA Alternative is not predicted to change the quality of deep seepage flow to Swan Lake from that described in the DSEIS for the proposed ESMM project. The quality of pellet plant return water was taken into account in the analog model described above, and thus is applicable to the MDA Alternative. The modeled increase of 0.3 mg/L mean sulfate concentration to the main body of Swan Lake is the same for the MDA Alternative as described in the DSEIS for the proposed ESMM project, as shown in Table 5.

Table 3. Water Balance Under Normal Weather Conditions.

Water Demand / Supply Component	Ave. for Years 1 to 15 (gpm)	Years 1 to 10 (gpm)	Years 11 to 15 (gpm)
Water Sources – Pits 1 & 2 Water			
Average surface water supply	1,129	1,105	1,177
Average groundwater supply	1,668-1,713	1,668	1,668-1,802
A = Pit 1&2 Water Supply (3)	2,797-2,842	2,773	2,845-2,979
Water Sources – Process Water (Stormwater and Pits 5/6)			
Average surface water supply	841	832	857
Average groundwater supply	1,498-2,036	1,217-1,653	2,061-2,084
Tailings basin precipitation yield	230	197	298
B = Process Water Supply (3)	2,569-3,107	2,246-2,682	3,216-3,959
C = Total Water Supply Available	5,411-5,904	5,019-5,455	6,195-6,803
ESMM Project			
Process water for steel production	2,615	2,025	3,794
Process water for pellet plant	587	576	609
Ore moisture recovery	(138)	(135)	(145)
Loss to tailings basin voids	1,826	1,767	1,944
Tailings basin loss to groundwater	138	115	183
D= Total Water Demand (2)	5,027	4,348	6,385
E = Process Water Balance	(2,458)-(1,920)	(2,102)-(1,666)	(3,169)-(2,426)
F = Pits 1 & 2 Water Balance (2)	384-877	671-1,107	(190)-418
MDA Alternative (Single DRI and Steel Line)			
Process water for steel production	1,518	1,328	1,897
Process water for pellet plant	587	576	609
Ore moisture recovery	(138)	(135)	(145)
Loss to tailings basin voids	1,826	1,767	1,944
Tailings basin loss to groundwater	138	115	183
Total Water Demand (2)	3,930	3,651	4,488
E = Process Water Balance	(1,361)-(822)	(1,405)-(969)	(1,272)-(529)
F = Pits 1 & 2 Water Balance (2)	1,436-1,975	1,368-1,804	1,572-2,315

(1) Normal Conditions: Based on expected steel production rates and expected groundwater increases from mine pit development; water sources do not include initial pit dewatering flows that discharge to Oxhide Creek. Normal conditions reflect the climate normal period 1971-2000.

(2) Process water balance does not include water needed for stream augmentation. Excess Pits 1 & 2 water would be used for augmentation of Oxhide and Snowball Creeks; augmentation plans for Oxhide Creek and Snowball Creek would be developed prior to the end of dewatering of Pit 5 and Draper Annex Pit, respectively. As described in the original EIS, Hill Annex Pit may also be used for Oxhide and Snowball Creek augmentation.

(3) Net water demand does not take into account the water stored in Pits 1 and 2, which is already permitted for appropriation under Appropriation Permit 2008-0433.

Table 4. Water Balance Under Dry Weather Conditions.

Water Demand / Supply Component	Ave. for Years 1 to 15 (gpm)	Years 1 to 10 (gpm)	Years 11 to 15 (gpm)
Water Sources – Pits 1 & 2 Water			
Average surface water supply	540	537	547
Average groundwater supply	1,698-1,787	1,668-1,7350	1,758-1,892
A = Pit 1&2 Water Supply[3]	2,238-2,328	2,205-2,272	2,304-2,439
Water Source – Process Water (Stormwater and Pits 5/6)			
Average surface water supply	399	396	406
Average groundwater supply	1,498-2,036	1,217-1,653	2,061-2,084
Tailings basin precipitation yield	(316)	(342)	(265)
B = Process Water Supply[3]	1,581-2,119	1,270-1,706	2,202-2,945
C = Total Water Supply Available	3,908-4,357	3,543-3,911	4,640-5,249
ESMM Project			
Process water for steel production	2,615	2,025	3,794
Process water for pellet plant	587	576	609
Ore moisture recovery	(138)	(135)	(145)
Loss to tailings basin voids	1,826	1,767	1,944
Tailings basin loss to groundwater	138	115	183
D = Total Water Demand[2]	5,027	4,348	6,385
E = Process Water Balance	(3,446)-(2,908)	(3,078)-(2,642)	(4,183)-(3,440)
F = Pits 1 & 2 Water Balance [2]	(1,119)-(670)	(805)-(437)	(1,745)-(1,136)
MDA Alternative (Single DRI and Steel Line)			
Process water for steel production	1,518	1,328	1,897
Process water for pellet plant	587	576	609
Ore moisture recovery	(138)	(135)	(145)
Loss to tailings basin voids	1,826	1,767	1,944
Tailings basin loss to groundwater	138	115	183
Total Water Demand[2]	3,930	3,651	4,488
E = Process Water Balance	(2,349)-(1,811)	(2,380)-(1,945)	(2,286)-(1,543)
F = Pits 1 & 2 Water Balance [2]	(21)-427	(108)-260	152-761

(1) Dry Conditions: Rather than the normal climatic period of 1971-2000, the dry weather scenario models water years 1971-1972 recurring to show continuous dry conditions.

(2) Process water balance does not include water needed for stream augmentation. Excess Pits 1 & 2 water would be used for augmentation of Oxhide and Snowball Creeks; augmentation plans for Oxhide Creek and Snowball Creek would be developed prior to the end of dewatering of Pit 5 and Draper Annex Pit, respectively. As described in the original EIS, Hill Annex Pit may also be used for Oxhide and Snowball Creek augmentation.

(3) Net water demand does not take into account the water stored in Pits 1 and 2, which is already permitted for appropriation under Appropriation Permit 2008-0433.

Table 5. Water Balance Under Wet Weather Conditions.

Water Demand / Supply Component	Ave. for Years 1 to 15 (gpm)	Years 1 to 10 (gpm)	Years 11 to 15 (gpm)
Water Sources – Pits 1 & 2 Water			
Average surface water supply	1,792	1,812	1,753
Average groundwater supply	1,668	1,668	1,668
A = Pit 1&2 Water Supply(3)	3,460	3,480	3,421
Water Sources – Process Water (Stormwater and Pits 5/6)			
Average surface water supply	1,276	1,291	1,247
Average groundwater supply	1,498-2,036	1,217-1,653	2,061-2,084
Tailings basin precipitation yield	332	363	271
B = Process Water Supply(3)	3,107-3,645	2,870-3,306	3,579-4,322
C = Total Water Supply Available	6,567-7,150	6,350-6,786	7,001-7,744

ESMM Project			
Process water for steel production	2,615	2,025	3,794
Process water for pellet plant	587	576	609
Ore moisture recovery	(138)	(135)	(145)
Loss to tailings basin voids	1,826	1,767	1,944
Tailings basin loss to groundwater	138	115	183
D = Total Water Demand(2)	5,027	4,348	6,385
E = Process Water Balance	(1,382)-(1,920)	(1,042)-(1,478)	(2,063)-(2,806)
F = Pits 1 & 2 Water Balance (2)	1,540-2,078	2,002-2,438	616-1,358

MDA Alternative (Single DRI and Steel Line)			
Process water for steel production	1,518	1,328	1,897
Process water for pellet plant	587	576	609
Ore moisture recovery	(138)	(135)	(145)
Loss to tailings basin voids	1,826	1,767	1,944
Tailings basin loss to groundwater	138	115	183
Total Water Demand(2)	3,930	3,651	4,488
E = Process Water Balance	(285)-(823)	(345)-(781)	(166)-(908)
F = Pits 1 & 2 Water Balance (2)	2,637-3,175	2,699-3,135	2,513-3,255

(1) Wet Conditions: Rather than the normal climatic period of 1971-2000, the wet weather scenario models water years 1973-1974 recurring to show continuous wet conditions.

(2) Process water balance does not include water needed for stream augmentation. Excess Pits 1 & 2 water would be used for augmentation of Oxhide and Snowball Creeks; augmentation plans for Oxhide Creek and Snowball Creek would be developed prior to the end of dewatering of Pit 5 and Draper Annex Pit, respectively. As described in the original EIS, Hill Annex Pit may also be used for Oxhide and Snowball Creek augmentation.

(3) Net water demand does not take into account the water stored in Pits 1 and 2, which is already permitted for appropriation under Appropriation Permit 2008-0433.

Table 6. Incremental Swan Lake Sulfate Concentrations for Different Lake Outflow Volumes.

Swan Lake Outflow Parameter	Outflow[3] (acre-feet/year)	Swan Lake Background Sulfate Concentration (mg/L)[3]	With Pellet Plant Return Water[1,2] Incremental Swan Lake Sulfate Concentrations with Dilution (mg/L) (MDA Alternative) Revised Project[4]	Previous Total (V4, 2010)[2] Incremental Swan Lake Sulfate Concentrations with Dilution (mg/L) (ESMM Project) Revised Project[4]	Incremental Swan Lake Sulfate Concentrations with Dilution (mg/L) (MSI Project) Original (FEIS) Project[3]
Mean	44,200	24	0.3	0.3	3.3
Minimum	20,400	18	0.8	0.8	7.4
Maximum	72,600	31	0.2	0.2	2.1
Standard Deviation	15,900				NA
Wet (Mean + S.D.)	58,600		0.3	0.3	2.5
Dry (Mean – S.D.)	29,900		0.5	0.5	5.2

(1) Highlighted values have changed since Version 4 of the Water and Chemical Balance (November 2010) referenced in the DSEIS.

(2) National Steel analog model water quality.

(3) Outflow data and FEIS Project data is from the *Swan Lake Nutrient Study* (Wenck Associates, 2006) referenced in the DSEIS. The main body of Swan Lake background sulfate concentrations were updated from 20 mg/L based on the results of the *2010 Water Quality and Wild Rice Monitoring Report: Version 2* (Barr Engineering, 2010b) referenced in the DSEIS. Sulfate concentrations in this report ranged from 18 to 31 mg/L for the main body of Swan Lake.

(4) Revised project data are based on Year 11-15 load.

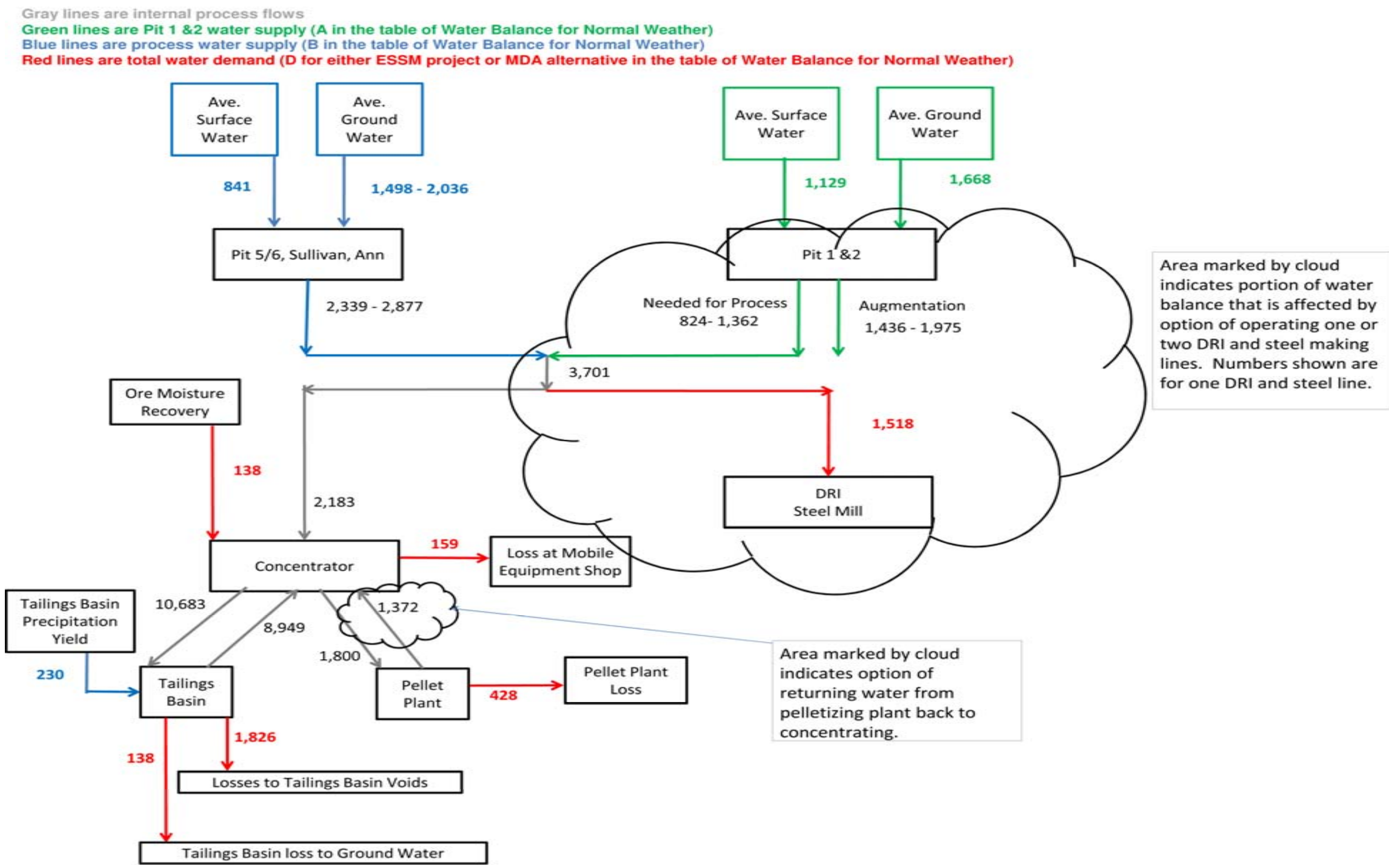

Illustration 1. MDA Alternative Water Flow.

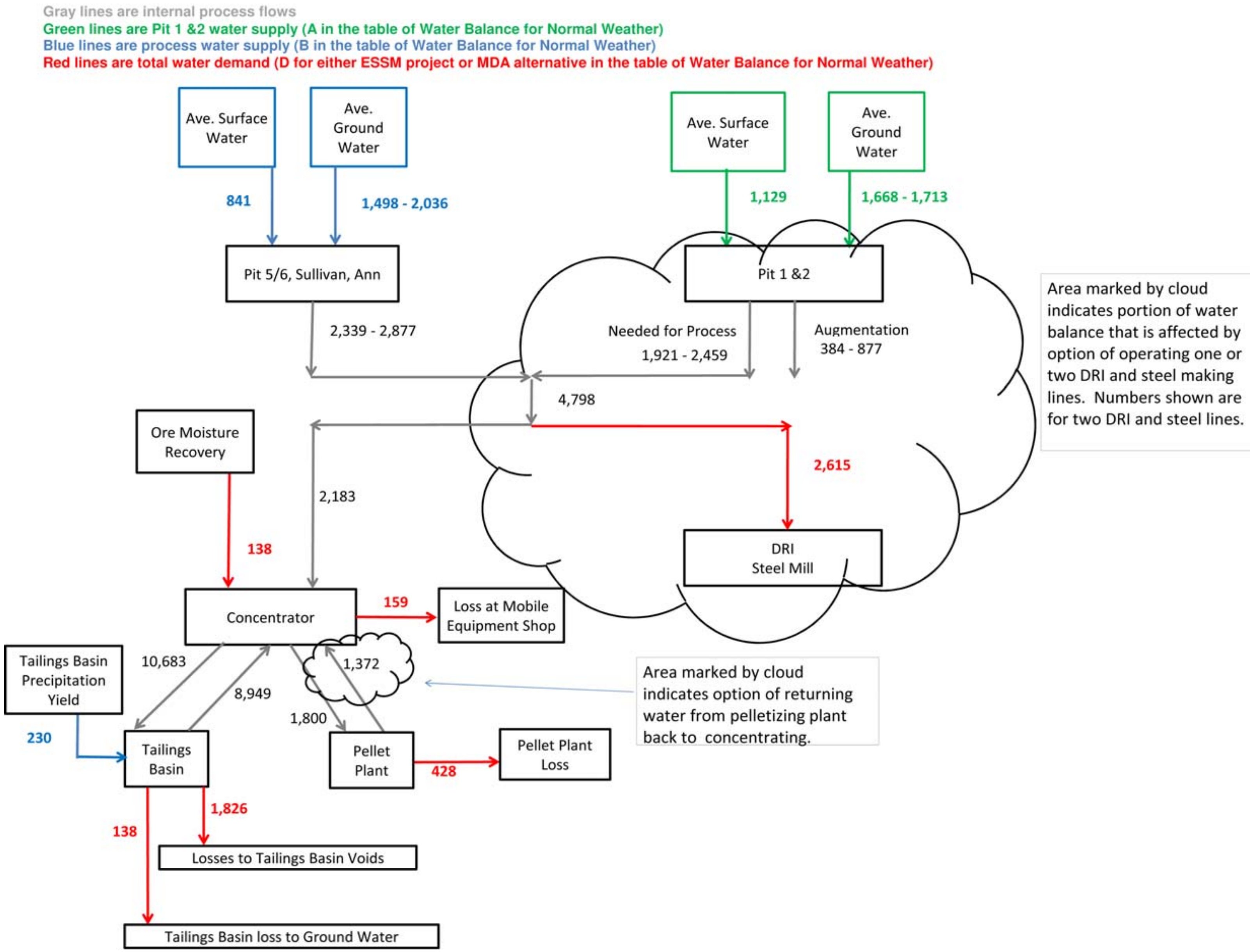

Illustration 2. ESMM Water Flow.

1.4 AIR EMISSIONS

The MDA Alternative is considered a major source of air emissions, as are the ESMM and MSI projects. As with the ESMM project, oxide pellets will be fed at ambient temperatures to the DRI process.

The emission sources for the MDA Alternative are the same as presented in the DSEIS with the exception of an additional haul truck for mining operations.

The MDA Alternative includes installation of low NO_x LE Burners to minimize emissions from the taconite pellet furnace. Since publication of the DSEIS, Essar conducted ¼-scale pilot testing of the LE Burners to quantify the reductions in NO_x emissions that can be achieved with a redesigned combustion chamber and low NO_x natural gas LE Burners.

An updated emission inventory, including the additional haul truck, was submitted to the MPCA for review on October 14, 2011. The results are presented in Table 7 and compare the MDA Alternative to the original MSI project.

The emission inventory reflects the output from one DRI line and steel mill in contrast to the ESMM output presented in the DSEIS of two DRI and steel mill lines (ESMM project). The potential to emit in DRI and steel mill emissions is significantly reduced for the MDA Alternative, with the percent change ranging from 46-53% for DRI and 41-46% for the steel mill in comparison to the original MSI project. In contrast, the percent change for the ESMM project was less than 20% across the board and 0-1% for the steel mill compared to the MSI project (Table 4.2-4 of the DSEIS).

1.4.1 Air Dispersion Modeling

Class I and Class II modeling of the MDA Alternative was performed for the FSEIS and air permit amendment application submitted to MPCA October 14, 2011 for evaluation. It was expected that the potential to exceed federal ambient air pollutant standards would be low due to the substantially reduced emissions. The Class I modeling incorporated the additional haul truck in the MDA Alternative and air permit amendment application documents.

The Class II results in Table 8 show modeled concentrations for all pollutants are below the ambient air quality standards.

Class I area modeling results provided in tables with the air Permit papplication are as follows:

- Table 9. Class I Areas Sulfur, Nitrogen, and PM_{10} Increment Modeling
- Table 10. Class I Areas Visibility Modeling
- Table 11. Class I Areas Mean Annual Sulfur Terrestrial Deposition
- Table 12. Class I Areas Sulfur and Nitrogen Terrestrial Deposition Analysis
- Table 13. Class I Areas Sulfur and Nitrogen Aquatic Deposition Analysis
- Table 14. Air Emission Rates for Cumulative Effects Analysis

These tables present Class I modeling results and thresholds of concern being used by the Federal Land Managers (FLMs) to evaluate the environmental consequences of the MDA Alternative, as well as the air permit amendment application. The findings are summarized below.

The Class I area increment modeling results in Table 9 show that the MDA Alternative does not exceed the allowed increment standards.

Likewise, the MDA Alternative modeled below the FLM screening criteria for visibility impacts. This is demonstrated in Table 10, with the data of interest being the 8th highest Db_{ext}(%) (otherwise referred to as the 20th%ile)..

The FLM-approved green line concentrations used as the threshold for air emissions deposition effects on terrestrial and aquatic land areas were compared to the updated modeled concentrations for sulfur (SO_2) and NO_x (total nitrogen). Table 11 shows the annual average sulfur concentration modeled as deposition for both land cover types in the Class I areas. Table 12 shows annual average, 3-hour maximum, and total sulfur deposition and total nitrogen for terrestrial land areas, whereas Table 13 shows deposition on aquatic areas for total sulfur and nitrogen. In all cases, green line deposition analysis thresholds are not exceeded.

1.4.2 Human Health and Ecological Risk Assessment

The hazardous pollutants evaluated for the DSEIS emissions inventory (EI) were evaluated for the FSEIS using the updated EI. The differences are presented in Table 15 and assume a linear relationship between the facility-wide emission change and receptor risk. For each pollutant, the receptor with the highest risk for that pollutant is considered, thus the estimated revised risks in Table 15 are pollutant-specific and do not, in sum, describe the risk at any receptor, but a combination of several receptors. The methodology used to determine revised risk estimates at the pollutant level uses the facility-wide increase in emissions for each pollutant and applies the percent increase or decrease in emissions to the risk estimate for that pollutant at the risk receptor with the highest risk for that pollutant. The January 2011 Supplemental HHSLRA for the ESMM project evaluated the risk associated with a subset of chemicals emitted from the facility that are either considered to be risk drivers or were not evaluated in the 2007 HHSLRA for the original MSI project. Only chemicals evaluated in the January 2011 Supplemental HHSLRA are considered here.

The MDA Alternative risk for the majority of chemicals decreased. Although the revised estimated risk for some pollutants is higher than the estimated risk in the January Supplemental HHSLRA, due to the additional haul truck, the overall risk from all pollutants is estimated to be lower. The overall impact on total risk is a 10 percent decrease in cancer risk and a 6.8 percent decrease in non-cancer chronic risk.

Qualitative human health risks from the MDA Alternative are considered similar to the ESMM project risk as described in Section 4.3.2.2 of the DSEIS.

Mercury emissions for the MDA Alternative are slightly less than those for the ESMM project. Most of the mercury is emitted from the taconite pellet plant which will have the same emissions for both the ESMM project and the MDA Alternative. There will be a slight decrease in mercury emissions for the MDA Alternative due to less natural gas combustion and use in the DRI process and in steelmaking.

The affected environment for the MDA Alternative is the same as described in Section 4.4.1 of the DSEIS on Ecological Risk. Table 4.4-2 of the DEIS shows the chemicals of greatest risk with respect to potential ecological impact for the ESMM project. None of the emissions of these chemicals substantially change for the MDA Alternative. There is also no change in the deep seepage rate from the tailings basin, compared to the ESMM project.

1.4.3 Cumulative Air Emissions of the MDA Alternative

Cumulative effects analysis on Class I areas utilizes emission rates for particulate matter (PM), sulfur (SO_2), nitrogen oxide (NO_x), mercury, and GHGs. As such, the emission rates used for cumulative effects analysis presented in the DSEIS are shown relative to the emission rates for the MDA Alternative (Table 14). The total emissions from the MDA Alternative are lower than the emissions for the ESMM project shown in the DSEIS. Visibility effects are related to emissions of fine particulates, SO_2 and NO_x. Acid deposition and ecosystem acidification are related to emissions of SO_2 and NO_x. The potential cumulative impacts from the MDA Alternative are thus expected to be less than those estimated for the ESMM project.

Table 7. Air Emissions Controlled Potential to Emit for the MDA Alternative and Original MSI Project.

Area	Project	CO	F	H_2S	H_2SO_4	NO_x	Pb	PM	PM_{10}	$PM_{2.5}$	SO_2	VOC
Mining & Crushing	MDA Alt.	---	0.0011	---	---	---	0.01	1459	396	61	---	---
	MSI	---	0.0017	---	---	---	0.02	1733.4	484.0	--	---	0.37
	Increase	---	0	---	---	---	0	-274	-88	61	---	---
	%Change	---	-35%	---	---	---	-35%	-16%	-18%	---	---	---
Concentrator	MDA Alt.	2	0.0005	---	---	11	0.001	495	237	41	0	0
	MSI	2.5	0.0005	---	---	11	0.001	489.1	233.4	--	0.24	0.36
	Increase	0	0	---	---	0	0	6	4	41	0	0
	%Change	0%	1%	---	---	0%	6%	1%	2%	---	0%	0%
Pelletizer	MDA Alt.	97	89	---	1	499	0.15	212	371	366	319	46
	MSI	64	1.0	---	0.86	794	0.10	210	356	--	172	30
	Increase	32	88	---	0	-295	0	3	15	366	147	15
	%Change	50%	9113%	---	50%	-37%	53%	1%	4%	---	86%	52%
Direct Reduced Iron (DRI)	MDA Alt.	290	0.003	31	---	124	0.002	72	65	60	4	17
	MSI	540	0.007	65.2	---	241	0.004	145	132	--	6.8	31
	Increase	-250	0	-34	---	-117	0	-74	-67	60	-3	-14
	%Change	-46%	-52%	-53%	---	-49%	-50%	-51%	-51%	---	-48%	-45%
Steel Mill	MDA Alt.	1674	2.5	---	0	268	0.7	51	76	76	132	111
	MSI	3082	4.6 [1]	---	0.05	460	1.4	86	131	--	242	202
	Increase	-1408	-2	---	0	-193	-1	-35	-56	76	-110	-90
	%Change	-46%	-45%	---	-45%	-42%	-45%	-41%	-42%	---	-45%	-45%
Slag Processing	MDA Alt.	---	0.8	---	---	---	---	7.8	3.6	0.8	---	---
	MSI	---	1.4	---	---	---	---	13.6	6.2	---	---	---
	Increase	---	-0.584	---	---	---	---	-5.84	-2.66	1	---	---
	%Change	---	42.8%	---	---	---	---	-42.8%	-42.5%	---	---	---
Total (tpy)	MDA Alt.	2,063	92	31	1.3	901	0.9	2,297	1,148	604	455	174
	MSI	3,689	7	65	0.9	1,505	1.5	2,677	1,343	---	421	263
	Increase	-1626	85	-34	0.4	-604	-0.6	-380	-194	604	34	-89
	%Change	-44%	1238%	-53%	45%	-40%	-39%	-14%	-14%	---	8%	-34%

Table 8. Class II Air Dispersion Modeling for the MDA Alternative.

Model Run	Pollutant	Averaging Period	Standard (µg/m3) (1)	Maximum Modeled Concentration (µg/m3) (2)	Background (µg/m3) (3)	Total Modeled Concentration (µg/m3) (4)	Percent of Standard
PSD Increment	PM_{10}	24-hour	30	25	--	25	84%
		Annual	17	3.6	--	3.6	21%
	SO_2	3-hour	512	41	--	41	8%
		24-hour	91	12	--	12	13%
		Annual	20	1.6	--	1.6	8%
	NO_2	Annual	25	3.9	--	3.9	16%
NAAQS/MAAQS	PM_{10}	24-hour	150	27	30	57	38%
		Annual *	50	5.8	11	17	34%
	$PM_{2.5}$	24-hour	35	15	15.7	31	89%
		Annual	15	1.5	5.6	7.1	48%
	SO_2	1-hour	197	163	7.7	171	87%
		3-hour**	915	108	10	118	13%
		24-hour	365	30	4	34	9%
		Annual***	60	3.0	2	5.0	8%
	NO_2	1-hour	188	138	28	166	89%
		Annual	100	13	7	20	20%
	CO	1-hour	40000	229	575	804	2%
		8-hour	10000	85	345	430	4%

(1) The NAAQS and MAAQS are the same unless otherwise specified. The more restrictive standard is listed.
* Annual PM10 standard is MAAQS only
** 915 µg/m^3 is SO_2 3-hour standard for Northern Minnesota. NAAQS is 1300 µg/m^3.
*** 60 µg/m^3 is SO_2 annual MAAQS. NAAQS is 80 µg/m^3.

(2) SO_2 1-hour NAAQS is 5-year average of maximum daily 1 hour H4H concentrations.
NO_2 1-hour NAAQS is 5-year average of maximum daily 1 hour H8H concentrations.
CO averaging periods use H1H concentrations.
SO_2 3 and 24 hour averaging periods are H2H concentrations
PM_{10} 24-hour increment is H2H of five individual years.
PM_{10} 24-hour NAAQS is H6H over five years.
$PM_{2.5}$ 24-hour NAAQS is 5-year average of H1H concentrations.
Annual concentrations are highest of five individual years.
H1H monthly value used to compare to lead quarterly standard.

(3) Background concentrations reflect Option 2 "Rest of MN" values taken from an updated MPCA Background Concentrations Table from the Standardized Air Modeling Spreadsheet (SAM V09293). PM2.5 background concentrations represent the 2008-2010 average H2H PM2.5 concentrations from the Virginia, MN monitor multiplied by 0.95 factor. 1 Hour NO_2 background concentration represents 2003-2005 1-hour max daily H8H concentration from Cloquet, MN monitor with 80% reduction for Option 2. SO_2 1 hour background is 2007-2009 1-hour High 4th High SO_2 concentration for 442 Monitor (Rosemount, MN) with 80% reduction for Option 2.

(4) NAAQS/MAAQS concentration includes modeled concentration plus background.

Table 9. Class I Areas Sulfur, Nitrogen, and PM_{10} Increment Modeling for the MDA Alternative.

Pollutant	Averaging Period	PSD Class I Increment (µg/m³)	U.S. EPA Significant Impact Level (µg/m³)	Modeled Results			
				Boundary Waters Canoe Area Wilderness (µg/m³)	Voyageurs National Park (µg/m³)	Isle Royale National Park (µg/m³)	Rainbow Lake Wilderness (µg/m³)
SIL Modeling Results							
SO_2	3-Hour	25	1	0.000	0.000	0.000	0.000
	24-Hour	5	0.2	1.000	0.484	0.324	0.074
	Annual	2	0.1	0.200	0.191	0.123	0.026
NO_2	Annual	2.5	0.1	0.000	0.000	0.000	0.000
PM_{10}	24-Hour	8	0.3	0.100	0.016	0.011	0.002
	Annual	4	0.2	0.300	0.377	0.270	0.102
Cumulative Increment Modeling for PM_{10}							
PM_{10}	24-Hour	8	0.3	3	NR	NR	NR

Table 10. Class I Areas Visibility Modeling for the MDA Alternative.

MDA Alternative	Natural Background					
	FLAG 2000 Method 2 (hourly RH, average annual background)			FLAG 2010 Method 8 (monthly RH, 20% best days background)		
	2002	2003	2004	2002	2003	2004
BWCAW						
Maximum Db_{ext} (%)	13.91	5.43	12.46	11.52	6.22	10.95
8th highest Db_{ext} (%)	5.85	3.99	3.33	4.83	4.46	4.12
Days with Db_{ext} ^{3} 5%	12	1	3	6	2	3
Days with Db_{ext} ^{3} 10%	1	0	1	1	0	1
98th %ile days with Db_{ext} ^{3} 5%	-	-	-	0	0	0
98th %ile days with Db_{ext} ^{3} 10%	-	-	-	0	0	0
Voyageurs						
Maximum Db_{ext} (%)	10.24	7.12	14.6	6.43	4.72	8.56
8th highest Db_{ext} (%)	4.58	4.78	3.34	3.82	3.71	3.09
Days with Db_{ext} ^{3} 5%	5	6	3	3	0	3
Days with Db_{ext} ^{3} 10%	1	0	1	0	0	0
98th %ile days with Db_{ext} ^{3} 5%	-	-	-	0	0	0
98th %ile days with Db_{ext} ^{3} 10%	-	-	-	0	0	0
Isle Royale						
Maximum Db_{ext} (%)	4.69	3.08	4.9	3.14	1.51	3.05
8th highest Db_{ext} (%)	1.74	1.15	1.43	1.18	0.76	1.04
Days with Db_{ext} ^{3} 5%	0	0	0	0	0	0
Days with Db_{ext} ^{3} 10%	0	0	0	0	0	0
98th %ile days with Db_{ext} ^{3} 5%	-	-	-	0	0	0
98th %ile days with Db_{ext} ^{3} 10%	-	-	-	0	0	0

Table 11. Class I Areas Mean Annual Sulfur Terrestrial Deposition for the MDA Alternative.

Location	Background Air Concentration (1) (μg/m³)	Modeled MDA Alt. Concentration(2) (μg/m³)	Total Projected Air Concentration (μg/m³)	Green Line Concentration(3) (μg/m³)
BWCAW	1.2	0.006	1.2	5
Isle Royale National Park	2.0	0.001	2.0	5
Rainbow Lake Wilderness	1.6	0.003	1.6	5
Voyageurs National Park	0.7	0.006	0.7	5

(1)Mean annual SO_2 concentration (μg/m³)

(2)Modeled ambient air concentration in Class I area using CALPUFF modeling system.

(3)Green line concentration from Admas et al.

Table 12. Class I Areas Sulfur and Nitrogen Terrestrial Deposition Analysis for the MDA Alternative.

Location (2)	Pollutant	Background Data (1)	Model Air Concentration or Calculated Project-Related Deposition (3)	Total Concentration or Deposition	Green Line Value Or Deposition Analysis Threshold (4) (5)
BWCAW – Ely	Ann. avg. SO_2 (μg/m³) 3-hour max. SO_2 (μg/m³) Total Sulfur (kg/ha/yr) Total Nitrogen (kg/ha/yr)	1.2 10.8 2.85 4.75	0.006 0.484 0.004 0.005	1.2 11.3 2.85 4.76	5 μg/m³ 100 μg/m³ 5-7 kg/ha/yr S 5-8 kg/ha/yr N
Isle Royale National Park	Ann. avg. SO_2 (μg/m³) 3-hour max. SO_2 (μg/m³) Total Sulfur (kg/ha/yr) Total Nitrogen (kg/ha/yr)	2.0 18 2.15 3.85	0.001 0.074 0.001 0.001	2.0 18.1 NA NA	5 μg/m³ 100 μg/m³ 0.01 kg/ha/yr S 0.01 kg/ha/yr N
Rainbow Lake Wilderness	Ann. avg. SO_2 (μg/m³) 3-hour max. SO_2 (μg/m³) Total Sulfur (kg/ha/yr) Total Nitrogen (kg/ha/yr)	1.6 14.4 2.98 5.88	0.003 0.183 0.002 0.002	1.6 14.6 2.98 5.88	5 μg/m³ 100 μg/m³ 5-7 kg/ha/yr S 5-8 kg/ha/yr N
Voyageurs National Park	Ann. avg. SO_2 (μg/m³) 3-hour max. SO_2 (μg/m³) Total Sulfur (kg/ha/yr) Total Nitrogen (kg/ha/yr)	0.7 6.3 1.84 3.87	0.006 0.324 0.006 0.005	0.7 6.6 NA NA	5 μg/m³ 100 μg/m³ 0.01 kg/ha/yr S 0.01 kg/ha/yr N

(1) Mean annual SO_2 concentrations (μg/m³):

Annual average SO_2 (μg/m³) concentrations calculated from data (1991-1993) in Table 1 of Pratt et al. "Estimation of dry deposition of inorganics using filter pack data and inferred deposition velocity", Environmental Science and Technology, 30:2168-2177, 1996.

BWCAW: data from Ely, MN site applied to BWCAW

Isle Royale National Park: data from the Finland, MN site applied to Isle Royale National Park.

Rainbow Lake Wilderness: data from the Sandstone, MN site applied to Rainbow Lake Wilderness.

Voyageurs National Park: data from Annual Data Summary, Voyageurs National Park 2002, National Park Service, Gaseous Air Pollutant Monitoring Network, Report No. NPS D-139.

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

Annual wet deposition data from NAPD data base (http://nadp.sws.uiuc.edu)

BWCAW: data for Hovland Site, Cook County, MN (1997-2003)

Isle Royale National Park: data for Fernberg Site, Lake County, MN (1997-2003)

Rainbow Lake Wilderness: data for Spooner Site, Washburn County, WI (1997-2003)

Voyageurs National Park: data for Voyageurs National Park, Sullivan Bay, St. Louis County, MN (2000-2003)

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

(2) Highest Modeled air concentration in each Class I area.

(3) Model estimated ambient air concentrations using the CALPUFF modeling system.

(4) Green line concentration from Pratt et al. "Estimation of dry deposition of inorganics using filter pack data and inferred deposition velocity", Environmental Science and Technology, 30:2168-2177, 1996. Deposition Analysis Threshold (DAT) is based on National Park Service Guidance for the Eastern U.S.

(5) S = sulfur; N = nitrogen.

Table 13. Class I Areas Sulfur and Nitrogen Aquatic Deposition Analysis for the MDA Alternative.

Location (4)	Pollutant (1)	Background Deposition (2) (kg/ha/yr)	Estimated Project-Related Deposition (kg/ha/yr)	Total Deposition (Project + Background) (kg/ha/yr)	Green Line Value or Deposition Analysis Threshold (3) (kg/ha/yr)
BWCAW – Ely	Total Sulfur Total S + 20% of Total N	2.85 3.80	0.004 0.006	2.85 3.81	7.5 - 8.0 9 – 10
Isle Royale National Park	Total Sulfur Total N	2.15 3.85	0.001 0.001	NA NA	0.01 0.01
Rainbow Lake Wilderness	Total Sulfur Total S + 20% of Total N	2.98 4.16	0.002 0.002	2.98 4.16	3.5 - 4.5 4.5 – 5.5
Voyageurs National Park	Total Sulfur Total N	1.84 3.87	0.006 0.005	NA NA	0.01 0.01

(1) S = Sulfur; N = Nitrogen.

(2) Annual wet deposition data from NAPD data base (http://nadp.sws.uiuc.edu)

BWCA: data for Hovland Site, Cook County, MN (1997-2003)

Isle Royale National Park: data for Fernberg Site, Lake County, MN (1997-2003)

Rainbow Lake Wilderness: data for Spooner Site, Washburn County, WI (1997-2003)

Voyageurs National Park: data for Voyageurs National Park, Sullivan Bay, St. Louis County, MN (2000-2003)

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

(3) Green line concentration from Adams et al., "Screening Procedures to Evaluate Effects of Air Pollution on Eastern Wildernesses Cited as Class I Air Quality Areas", USDA, Forest Service, Northeast Forest Experiment Station, General Technical Report NE-151, September 1991. Deposition Analysis Thresholds based on National Park Service guidance for the eastern U.S.

(4) Highest modeled deposition used in the assessment.

Table 14. Air Emission Rates for Cumulative Effects Analysis for the MDA Alternative and ESMM Project.

Pollutant	Total Emissions	
	ESMM Project[(2)] Emission Rates Used in Cumulative Studies	MDA Alternative[(1)]
PM_{10} (short tons per year)	1,485	1,148
SO_2 (short tons per year)	728	455
NO_x (short tons per year)	1,628	901
Mercury (30% control without Activated Carbon) (lbs/year)	93[(3)]	84
GHG (Direct + Indirect) CO_2-eq. (million metric tons per year)	4.5[(4)]	3.2

[(1)] MDA Alternative: Air Permit Application EI

[(2)] ESSM Project: PM_{10}, SO_2 & NOx from DSEIS Table 5.1-3

[(3)] 93: Estimated Mercury Air Emissions and Local Deposition

and the Potential for Bioaccumulation in Fish – Dec 2010 Table 2

[(4)] 4.5: DSEIS Table 5.4-2

Table 15. Human Health Screening Level Risk Assessment (HHSLRA) Revisions for the MDA Alternative.

Chemical Name	January 2011 Total Facility Emissions (lb/hr)	October 2011 Total Facility Emissions (lb/hr)	Percent Change	Highest Cancer Risk by Pollutant for all Receptors, Jan 2011	Highest Chronic Non Cancer Risk by Pollutant for all Receptors, Jan 2011	October 2011 Cancer Risk Estimate by Pollutant	October 2011 Chronic Non Cancer Risk Estimate by Pollutant
Acenaphthene	3.66E-04	3.70E-04	1.04%				
Acenaphthylene	7.33E-04	7.42E-04	1.16%				
Acetaldehyde	7.03E-03	7.1E-03	0.37%	6.08E-12	7.29E-07	6.10E-12	7.32E-07
Acrolein	1.21E-03	1.2E-03	0.67%				
Aluminum Compounds	2.94E+00	2.9E+00	-0.20%				
Anthracene	1.10E-04	1.1E-04	-0.10%				
Aluminum Oxide	2.26E+00	2.2E+00	-0.34%				
Antimony Compounds	8.76E-04	7.8E-04	-11.31%				
Arsenic	1.50E-01	1.5E-01	-2.63%	2.88E-06	3.07E-02	2.80E-06	2.99E-02
Arsenic (III)	7.41E-05	6.9E-05	-6.57%				
Arsenic (V)	1.40E-01	1.4E-01	-0.01%				
Barium Compounds	1.39E-02	1.1E-02	-20.60%				
Benzene	6.92E-02	6.9E-02	-0.59%				
Benz(a)anthracene	6.19E-05	6.2E-05	-0.64%				
Benzo(a)pyrene	2.32E-05	2.3E-05	-1.84%	8.38E-07	N/A	8.23E-07	N/A
Benzo(b)fluoranthene	8.81E-05	8.8E-05	0.12%				
Benzo(g,h,i)perylene	4.77E-05	4.8E-05	-0.25%				
Benzo(k)fluoranthene	2.13E-05	2.0E-05	-3.81%				
Beryllium Compounds	5.01E-04	3.7E-04	-26.63%				
Boron Compounds	3.65E-03	3.4E-03	-7.07%				
1,3 Butadiene	2.61E-04	2.6E-04	0.00%				
Butane	4.45E+00	3.2E+00	-27.15%				
Cadmium Compounds	1.41E-02	7.7E-03	-45.59%				
Calcium Carbonate	3.40E-02	3.4E-02	-0.30%				
Calcium Compounds	1.68E+01	1.5E+01	-10.69%				
Calcium oxide	1.63E+01	1.5E+01	-10.01%				
Carbon Monoxide	1.14E+03	7.1E+02	-37.83%				
Chloride salts	5.37E-01	2.7E-01	-49.29%				
Chlorine	5.13E+00	4.9E+00	-5.12%				
5-Chloro-2-methyl-4-isothiazolin-3-one	2.61E-05	1.1E-05	-56.45%				
Chromium Compounds	4.87E-01	4.3E-01	-12.40%				
Chromium total	1.35E-01	1.4E-01	-0.01%				
Chromium (III)	3.73E-03	3.3E-03	-10.82%				
Chromium, hexavalent	3.62E-03	3.6E-03	-0.03%	4.93E-08	5.20E-04	4.93E-08	5.20E-04
Chrysene	1.21E-04	1.2E-04	0.45%				

Chemical Name	January 2011 Total Facility Emissions (lb/hr)	October 2011 Total Facility Emissions (lb/hr)	Percent Change	Highest Cancer Risk by Pollutant for all Receptors, Jan 2011	Highest Chronic Non Cancer Risk by Pollutant for all Receptors, Jan 2011	October 2011 Cancer Risk Estimate by Pollutant	October 2011 Chronic Non Cancer Risk Estimate by Pollutant
Cobalt Compounds	4.07E-03	3.8E-03	-6.79%				
Copper Compounds	6.20E-02	3.5E-02	-43.60%				
Dibenz(a,h)anthracene	3.25E-05	3.2E-05	-1.03%	1.63E-06	N/A	1.61E-06	N/A
Dichlorobenzenes	2.54E-03	1.9E-03	-27.15%				
Dimethylbenzo(a)anthracene, 7,12-	3.39E-05	2.5E-05	-27.15%	1.47E-06	N/A	1.07E-06	N/A
Ethane	6.57E+00	4.8E+00	-27.15%				
Fluoranthene	3.61E-04	3.6E-04	0.67%				
Fluorene	1.17E-03	1.2E-03	0.99%				
Dichlorotolyltriazole	1.30E-06	5.7E-07	-56.45%				
Ferro niobium	1.44E-02	7.2E-03	-50.02%				
Fluorine, Flourides	2.80E+01	2.7E+01	-3.30%				
Fluoride Salts	3.48E+00	3.4E+00	-2.44%				
Formaldehyde	4.45E-01	4.0E-01	-9.88%				
Hexane	3.81E+00	2.8E+00	-27.15%				
Hydrogen Chloride (as Cl)	4.74E+00	4.7E+00	0.00%				
Hydrogen Fluoride (as F)	2.64E+01	2.6E+01	-1.14%				
Indeno(1,2,3-cd)pyrene	3.75E-05	3.7E-05	-1.62%				
Iron	3.06E+02	2.7E+02	-13.24%	N/A	1.04E-01	N/A	9.01E-02
Iron II	9.57E+01	8.4E+01	-11.99%				
Iron III Oxide	2.33E+02	2.0E+02	-12.69%				
Isoparafinic petroleum distillate	4.43E-05	2.3E-05	-47.19%				
Lead	5.65E-01	3.3E-01	-41.64%				
Lithium Compounds	1.33E-03	9.0E-04	-32.40%				
Magnesium Compounds	1.89E+01	1.8E+01	-2.16%				
Magnesium nitrate	4.43E-05	2.3E-05	-47.19%				
Magnesium oxide	2.06E+01	2.0E+01	-1.84%				
Manganese	4.08E+00	3.6E+00	-12.64%	N/A	9.50E-02	N/A	8.30E-02
Manganese Dioxide	3.95E+00	3.5E+00	-11.70%				
Mercury Compounds	1.19E-02	1.1E-02	-5.52%				
Methylcholanthrene, 3-	3.81E-06	2.8E-06	-27.15%				
Methylnapthalene, 2-	5.09E-05	3.7E-05	-27.15%				
Molybdenum Compounds	2.36E-03	1.7E-03	-27.48%				
Naphthalene	1.17E-02	1.1E-02	-1.86%				
Nickel Compounds	6.44E-02	6.0E-02	-6.78%				
Nitrogen dioxide (1-hour)	7.37E+02	5.8E+02	-21.53%				
Pentane	5.51E+00	4.0E+00	-27.15%				
Phenanthrene	3.31E-03	3.3E-03	0.98%				
Phosphorous Compounds	2.33E-01	1.9E-01	-17.93%				

Chemical Name	January 2011 Total Facility Emissions (lb/hr)	October 2011 Total Facility Emissions (lb/hr)	Percent Change	Highest Cancer Risk by Pollutant for all Receptors, Jan 2011	Highest Chronic Non Cancer Risk by Pollutant for all Receptors, Jan 2011	October 2011 Cancer Risk Estimate by Pollutant	October 2011 Chronic Non Cancer Risk Estimate by Pollutant
Phosphorous Total	1.24E-01	1.0E-01	-16.14%				
Potassium Compounds	1.23E+00	1.1E+00	-10.65%				
Propane	3.39E+00	2.5E+00	-27.15%				
Potassium Oxide	4.62E-01	3.3E-01	-28.39%				
Propylene	2.27E-01	2.3E-01	1.27%				
Pyrene	3.22E-04	3.2E-04	0.29%				
Selenium Compounds	9.53E-04	7.3E-04	-23.60%				
Silicon Compounds	2.65E+02	2.6E+02	-0.49%				
Silicon Dioxide	1.62E+02	1.6E+02	-0.43%	N/A	3.12E-01	N/A	3.11E-01
Silver Compounds	2.30E-04	2.0E-04	-13.42%				
Sodium Carbonate	1.04E-01	1.0E-01	-1.60%				
Sodium Compounds	5.77E-01	4.1E-01	-29.06%				
Sodium Molybdate	4.43E-05	2.3E-05	-47.19%				
Sodium Nitrate	4.43E-05	2.3E-05	-47.19%				
Sodium Oxide	4.68E-01	3.0E-01	-35.29%				
Sodium Tolytriazole	4.43E-05	2.3E-05	-47.19%				
Strontium Compounds	1.05E-02	5.3E-03	-49.81%				
Sulfur Compounds	5.77E+00	5.8E+00	0.85%				
Sulfur Dioxide	1.99E+02	1.2E+02	-37.16%				
Sulfuric Acid	3.84E-01	3.7E-01	-3.15%				
Thallium	4.47E-03	4.3E-03	-2.83%				
Tin Compounds	3.75E-03	3.7E-03	-1.88%				
Titanium Compounds	1.09E-01	1.1E-01	-3.59%				
Toluene	3.11E-02	2.9E-02	-5.36%				
Titanium Dioxide	1.19E-01	1.1E-01	-5.54%				
Vanadium Compounds	4.46E-02	3.9E-02	-11.63%				
Xylene	1.64E-02	1.7E-02	1.21%				
Zinc Compounds	4.34E+00	2.2E+00	-49.61%				
Polycyclic Organic Material	1.83E-02	1.8E-02	-0.87%				
Diesel Particulate	2.92E+00	2.9E+00	0.00%	N/A	5.28E-03	N/A	5.28E-03
TetraCDD, 2,3,7,8-	2.02E-08	1.20E-08	-40.33%	6.29E-07	2.73E-02	3.75E-07	1.63E-02
PAH	1.81E-03	9.06E-04	-50.00%				
Total HAP	46.0	43.7	-4.96%				
						Cancer Risk	**Chronic Non Cancer Risk**
Estimated Percent Change to Total Risk						-10.15%	-6.77%

1.5 ENERGY AND WASTE MANAGEMENT

1.5.1 Energy Management

The plan for energy management presented in the DSEIS for the ESMM project also applies to the MDA Alternative. As described in the DSEIS, the majority of energy consumed would be as electricity and fuel used in process equipment. The remainder of the energy consumed would be building heat, lighting, mobile equipment fuel, and similar uses. Essar has selected natural gas as a process fuel as an approach to reducing stationary combustion and greenhouse gas emissions. Natural gas usage results in lower emissions of SO_2, CO, PM, VOCs, GHGs, metals (including mercury) and other hazardous air pollutants (excluding NO_x) based on stack tests, CEMS and AP-42 test data compared to the use of coal and other fossil fuels.

In accordance with air permit application requirements for GHG emissions reporting, operations and energy planning items evaluated were identified, comparative analysis of GHG emissions of operations was performed, and GHG emissions with respect to climate change were summarized in the DSEIS, Chapter 5.4. Along with the updated emissions inventory for the MDA Alternative, updated reporting for GHG emissions was performed. The results show total direct and indirect emissions of approximately 3.2 million metric tons carbon dioxide equivalents per year for the MDA Alternative (Table 16). This is in contrast to approximately 3.8 million metric tons carbon dioxide equivalents for the MSI project and 4.5 million metric tons carbon dioxide equivalents for the proposed ESMM project.

1.5.2 Solid and Hazardous Waste Generation

The MDA Alternative is different from the original MSI and proposed ESMM projects in generation rates of some items in the waste stream. The waste generation rates are the same for the crusher/concentrator and taconite pellet plant operations. The DRI process and the steel mill waste generation rates for the MDA Alternative would decrease both compared to the original MSI project and the proposed ESMM project. The proposed methods of disposal for the MDA Alternative would not differ from either project. Fugitive dust emissions, emission control dust, and slag are part of the solid waste stream evaluated for air pollutant effects. Other wastes would be addressed according to state statutory requirements such as those applicable to storage tanks and hazardous waste generation.

Table 16. GHG Emissions for the MDA Alternative.

Process Area	Overall (direct and indirect) Worst Case Production Scenario(1,3)
Mining and Crushing (Mobile Sources)	490,773
Concentrator	
Pelletizer (4)	
Furnace	808,231
Emergency engines	417
DRI (2)	896,512
Steel Mill	973,847
Space Heaters	11,166
Facility-wide	3,180,947

(1) CO_2e in metric tons per year includes emissions of CH_4 and N_2O. Emission factors used for most sources based on Climate Registry or EPA GHG data.

(2) HYL vendor data used for natural gas usage at DRI and Steel Plant for Essar. "Natural Gas Tables" used for MSI natural gas usage.

(3) Worst case scenario based on pelletizer throughputs of 5.05 mmtpy high flux and 1.95 mmtpy low flux pellets.

(4) Process emissions are 42% of direct emissions for low flux scenario, which compares favorably to Keetac stack test results (44.5% non-combustion direct emissions).

1.6 EMPLOYMENT

The total number of jobs expected for the ESMM project and MDA Alternative, despite the differences in DRI and steelmaking capacities, is 500. This is the same number of jobs (500) that was used in the economic analysis prepared for the proposed ESMM project. The original MSI project was estimated to create 700 jobs.

Chapter 2.0 – Project Effects Changes from the Draft SEIS

2.1 INTRODUCTION

The DSEIS describes the project effects of the proposed ESMM project. No changes are made to the DSEIS chapters, other than as described below. This FSEIS serves to update information on the following six items described in the DSEIS.

Water Treatment Change to the Proposed ESMM Project – update to the information described on page 3.0-15 of the DSEIS.

Air Emissions BACT – update to the information described on pages 3.0-17 to 3.0-19 of the DSEIS.

New or Modified Emission Sources of Mercury – Plan to Reduce Mercury Releases to the Air – update to the requirements for mercury reporting are described on page 5.3-2 of the DSEIS.

Human Health Risk Reporting Correction to DSEIS Chapter 4.3 – correction to page 4.3-17 of the DSEIS.

Energy Reporting Details of Major Project Operations – correction to page B-6, Appendix B of the DSEIS.

Property Acquisitions Status – update to information on page 4.5-1 of the DSEIS.

2.2 WATER TREATMENT CHANGE TO THE PROPOSED ESMM PROJECT

On page 3.0-15 under Water Management, the DSEIS identifies process wastewater reuse onsite or treatment by the water recovery and reuse system (WRRS). The WRRS treatment in the pellet plant has been removed from the proposed ESMM Project and is also not included in the MDA Alternative described in Chapter 1.0. This FSEIS describes the rationale for the change, potential effects, and mitigation measures to be evaluated for the next reissuance of the existing NPDES/SDS Permit.

Process water from the taconite pellet plant would be recycled back to concentrating and ultimately be discharged to the tailings basin. The updated water balance model includes the pellet plant return water to the concentrating water recycling circuit. This is a proposed change for both the proposed ESMM project and MDA Alternative.

The main source of water to the pellet plant area is the water used to convey the concentrate in slurry form from the concentrating plant to the pellet plant approximately two miles away. At the pellet plant, concentrate slurry is filtered to remove water and increase the solids content of the iron concentrate prior to the balling discs. Filtrate water is mixed with water slurry from other pellet plant areas in a pellet plant thickener. As shown in Chapter 1.0 of this FSEIS on Illustrations 1 and 2 in the small cloud area, there is excess water flow (modeled at 1,372 gpm) from the pellet plant to the concentrator where it will mix with approximately 100,000 gpm of water that is circulating on a continuous basis within the concentrating circuit. This is a water recycling measure to further minimize the demand for fresh make-up water from the pits.

Updated water balance calculations by Essar included water conservation measures that reduce pellet plant water demand. These measures are listed below.

- Recycling washdown and dust collection slurry water through a spiral classifier and thickener allowing for reuse in the pellet plant without chemical treatment which reduces the total water demand by 50 gpm;

- Selecting thin fan cooling vs cooling towers which reduces evaporative losses and saves about 200 gpm of water;

- Sending acid cleaning solution to gas suspension absorber for neutralization which reduces make-up water demand by 30 gpm;

- Returning excess pellet plant water back to concentrating which reduces concentrating make-up water demand by 1400 gpm.

Water treatment is proposed for the DRI and steel making processes. The treated water from the DRI and steelmaking water treatment system will be reused onsite. No process water from DRI or steelmaking will be discharged to the tailings basin.

It should be noted that DRI and steelmaking involve the use of large quantities of water for quenching and cooling of steel immediately prior to rolling. Therefore, a water treatment system is required as part of the DRI and steelmaking operations. However, the water demand for DRI and steel is reduced for the MDA Alternative, as shown in the large cloud area of Illustration 1 compared to Illustration 2 in Chapter 1.0 of this FSEIS.

Since the DSEIS was published, Essar proposed Best Available Control Technology (BACT) for both the proposed ESMM project and MDA Alternative. Both propose dry air pollution controls as opposed to wet controls that were proposed for the original MSI project. This decision eliminated the need for water scrubbing for particulate and sulfur dioxide control. Therefore, no water treatment is proposed at the pellet plant.

The dry air pollution control systems selected would be for the Hood and Windbox Exhausts at the pelletizing furnace. Wet (water) scrubbing that would have been needed for particulate and sulfur dioxide control, would have generated a sulfur laden wastewater stream requiring treatment prior to being reused in the process.

With removal of the water treatment system, Essar modeled the quality of pellet plant return water to the concentrating loop, which ultimately discharges to the tailings basin. The modeling results presented in the Water and Chemical Balance Version 4 (Barr 2010a) and described in the DSEIS were found to remain representative (including the modeled increase of 0.3 mg/L in sulfate concentrations in Swan Lake). The modeling was based upon the analog of National Steel which contains pellet plant return water like that proposed here. The MNDNR has reviewed and accepted this analog. A description of the modeling and the analog is provided below.

The italics text is from Water and Chemical Balance Version 4 (Barr 2010a) that was approved for the DSEIS.

> *Essar's operation will be most in line with National's operation in that there will be magnetic separation and no products of combustion from the air pollution control system going to the Tailings Basin. Essar's operation is less than 10 miles west of National's operation, which is now called Keewatin Taconite due to a change in ownership. The 1999 data from National is representative of full scale operations with similar ore being processed with similar methods (magnetic separation with no scrubber water or materials of combustion being added). This makes the 1999 data for National a good analog for the expected water quality in Essar's Tailings Basin. This analog modeling approach provides empirical data that accounts for the scale and size of the operation, operational conditions, and environmental conditions. Because the water samples from the pilot plant testing were not properly filtered or analyzed for carbonate species, creating incomplete water quality data, the data provided for National from this 1999 study provides a more*

robust analog for the expected water quality from Essar's Tailings Basin than the results of the mass balance evaluation. There will be some differences in the resultant water chemistry for Essar's Tailings Basin due to variability in the ore and the water budgets (make-up water quality and quantity), but these differences are expected to be minor.

As stated above, National Steel, at the time of water quality sampling in 1999, had not yet installed the wet scrubber on their furnace, so there was no scrubber water associated with the operation. Similarly, there will not be scrubber water at the Essar project either, as the company plans to use a dry air pollution control system. According to a retired National Steel engineer (Robert Westlund, October 14, 2011 telephone interview with Barr Engineering), in 1999 National Steel's concentrator water went to the pellet plant with the concentrate. Excess water from the pellet plant went to the tailings thickener and out to the tailings basin. Similarly, Essar will recirculate water from the pellet plant to the concentrator, which will then go to the tailings basin. The total make-up water from freshwater sources for the proposed Essar operations is also very similar to the operations submitted for permitting of the Keetac project.

The existing NPDES/SDS permit for the Essar project is due for reissuance in July 2012. The MPCA and Essar agreed that the company would submit the permit application for reissuance November 2011. The modeled sulfate concentration will be evaluated in the permit reissuance process along with a number of mitigation measures to reduce or eliminate sulfate in the wastewater flow as much as possible. These mitigation measures are summarized below.

1. Removal of sulfur from the process through dry air pollution control systems for the indurating furnace which eliminate a scrubber blowdown stream and a sulfuric acid backwash stream.

2. Water conservation measures that include source reduction and recycling.

3. Tailings basin lateral seepage collection.

4. Tailings basin seepage rate modeled less than that which is allowed for a lined basin (less than 500 gallons/per acre/ per day).

5. Water entering the tailings basin will only be from precipitation and water used to convey tailings to the basin from the concentrator.

6. Water treatment for DRI and steelmaking which may present an option to treat pellet plant water in the future, if required.

Some uncertainty in using an analog model exists since the former National Steel and Essar pellet making processes are not perfectly identical, and the possibility exists for unforeseen differences in operation and ore composition to emerge. As such, Essar has committed to an enhanced water quality monitoring and study program is proposed for the tailings basin area and Swan Lake.

1. Increase the frequency of sulfate water quality sampling in the tailings basin, tailings basin perimeter groundwater wells, and Swan Lake from two (2) to four (4) times per year when Swan Lake is ice-free. This will provide a larger data set from which to assess water quality conditions as needed and will also serve as a means of assessing any correlation between tailings basin, groundwater and Swan Lake water quality.

2. If the annual average sulfate concentration in the tailings basin exceeds 50 mg/L, sulfate water quality sampling frequency will be increased from four (4) to eight (8) times per year when Swan Lake is ice-free. 50 mg/L represents a mid-range of the concentration data seen in National Steel data (42 to 65 mg/L). 50 mg/L will serve as an early indicator or potential difference developing from the values used in the modeling. Additionally, a source identification study will be conducted to identify sources of sulfate loading that

may be different from previously predicted. Lastly, the tailings basin, groundwater and Swan Lake water quality data will be evaluated for any correlations that may exist.

3. In the event that an upward trend in sulfate concentrations is observed in groundwater well or lake sampling and that trend can be correlated to an upward trend in the tailings basin sulfate concentration, potential water treatment options will be evaluated. This could include removal of sulfate from process streams via suitable water treatment technology, such as, but not limited to reverse osmosis, ion exchange, chemical treatment and/or some other appropriate water management strategy or technology that is determined to be feasible based on the results of the study. If feasible, water management options that could be considered include concentrating and removing sulfate from the water stream, using source water alternatives, and/or channeling the recirculating water to other parts of the plant for use in other operations such that it never reaches the tailings basin.

2.3 AIR EMISSIONS BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

The DSEIS in Section 3.3.2 describes partial requirements for BACT that have been achieved by Essar. This FSEIS describes how Essar intends to meet the full requirements for BACT as part of their Air Permit application.

In accordance with the SEIS Preparation Notice, two technology alternatives were evaluated for the proposed ESMM project. The technologies for control of mercury emissions were examined and reported in detail in Mercury Control Technology Evaluation, September 2010, by Barr Engineering. The findings are summarized in the DSEIS Section 3.3.1. A second technology alternatives analysis was undertaken to re-evaluate the best available control technology (BACT) for criteria pollutants whose emissions are estimated to increase in amounts greater than the significant increase thresholds. The BACT technology assessment findings are summarized in DSEIS Section 3.3.2, and include a review of the report, Air Pollution Control Alternatives Analysis, November 2010 by Barr Engineering.

The Air Pollution Control (APC) Alternatives Analysis addressed the first 3 steps and part of the 4th step in the 5 Step BACT Process:

Step 1 – Identify All Control Technologies

Step 2 – Eliminate Technically Infeasible Options

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Step 4 – Evaluate Most Effective Control Technologies and Document Results

In Step 3 each technology was ranked based on its control efficiency or expected controlled emission rate. This provided the information for an understanding of the alternatives available and the degree of mitigation that each would provide. Step 4 of the BACT process evaluates the top ranking technologies with respect to other environmental impacts and in some cases cost effectiveness if the top ranking control technology is not selected. The other significant environmental impacts were identified in the last section of the APC alternatives report. However, no economic analyses were conducted because Essar was still obtaining from vendors the final technical and cost information. The economic analyses which are part of Step 4 of the BACT process is only required if a project proposer wishes to rule out top ranking control technologies in a final permit based on cost effectiveness (e.g. $/ton removed).

The BACT report prepared for air permitting addresses the remainder of Step 4 and Step 5 (select BACT) that are not covered in the APC Report. Step 5 involves a final pollution control technology selection and details regarding permit limits, compliance demonstration methods, and recordkeeping and reporting which are needed for the air permit application. The SEIS Preparation Notice identified that BACT alternatives analysis would be performed. The selection of BACT, a requirement of permitting, is not a requirement of a state-only SEIS. During preparation of the FSEIS the BACT selection was submitted for the Air Permit application and is summarized in this chapter of the FSEIS.

Essar submitted the remaining BACT requirements for the air permit amendment application in the report, Indurating Furnace BACT and Class I Modeling Update, September 19, 2011 (Barr Engineering). The findings which have been evaluated by the MPCA for reporting in the FSEIS are summarized below.

Essar engaged Fives North American Combustion, Inc. to perform quarter (1/4) scale Low NO_x LE Burner testing to evaluate the ability to at least achieve an emission rate of 0.39 lb/mmBTU or lower and scalability of this technology. Three 3-hour test runs were conducted with continuous data collection. This resulted in a data set with 99 percent of all data points at or below 0.25 lbs NO_x/mmBTU. The findings suggest that an emission factor of 0.25 lb NO_x/mmBTU is conservative and can be used for permitting.

The 0.25 lb NO_x/mmBTU indurating furnace emission rate as well Tier II and IV haul truck emission factors and final furnace stack design and layout were used to update the Class I areas modeling. The results are summarized in Chapter 1.0 of this FSEIS. For the pellet plant operation and the MDA Alternative, there is no exceedance of the visibility thresholds that are used to indicate adverse impacts to visibility and the need for mitigation. In other words, there were no modeled 98% impacts >5% Δb_{ext} (%) at any of the Class I areas for the MDA Alternative. For the proposed ESMM project evaluated in the DSEIS, with full mining fleet and Tier IV compliant haul trucks, the modeled 98% impacts at three Class I areas are zero and at BWCAW there are 4 days > 5% using the emission rate of 0.25 lbs NO_x/MMBtu. As acknowledged in the DSEIS, the ESMM project modeled above thresholds of concern at the BWCAW, indicating that adverse impacts to visibility could be anticipated.

Essar has initiated discussions with mining equipment suppliers to fully understand the schedule for commercial availability of mining equipment that meets the EPA's Tier IV interim / final emission standards. Based on these conversations, Essar will be able to purchase several pieces of mining equipment that meet Tier IV interim / final standards during the initial phases of mining. However, a few major pieces of equipment including 240-ton trucks and drills will not be available in Tier IV compliant models until later in 2015. Suppliers have indicated that Tier IV production test vehicles will be available for use by Essar but will not be commercially proven and available until 2016. To account for the lack of Tier IV compliant mining equipment in its mine plan, the Class I Visibility modeling submitted recently for the air permit amendment application used a mix of Tier II and Tier IV compliant mining equipment.

The air permit amendment application contains full information on the details of emission sources and modeling. The draft permit will be placed on public notice and will provide opportunity for public comment in addition to the SEIS. The draft permit will be for the MDA Alternative, which does not model adverse impacts to visibility. If Essar decides to pursue a second line of DRI and steelmaking, the company will need to work with the MPCA and the FLMs regarding potential adverse impacts to visibility.

Regenerative Selective Catalytic Reduction (RSCR) cost basis ($/ton pollutant removed) as a BACT alternative technology was evaluated using the NOx emission rate of 0.25 lb/mmBTU. Assuming a 75 percent control efficiency for RSCR, the cost for RSCR is $21,000. Based on this value RSCR is not considered cost effective.

2.4 NEW OR MODIFIED EMISSION SOURCES OF MERCURY – PLAN TO REDUCE MERCURY RELEASES TO THE AIR

The DSEIS described project-specific mercury risks in Chapter 4.3, Human Health Risk Assessment, and cumulative mercury effects in Chapter 5.3, Cumulative Mercury Deposition. Regulatory requirements for reporting are summarized on page 5.3-2 of the DSEIS, and this FSEIS clarifies the air permit related requirements of Essar for reporting.

On April 22, 2008 the MPCA published Estimated Mercury Emissions in Minnesota for 2005 to 2018. The document is available on the internet at http://www.pca.state.mn.us/index.php/view-document.html?gid=11481#page=105 and MPCA website for Minnesota's Plan to Reduce Mercury Releases by 2025. The Appendix of the plan provides Guidelines for New and Modified Mercury Air Emission Sources. Any existing mercury-emitting facility with an MPCA air permit seeking to modify its permit or any new facility with permitted potential mercury emissions totalling greater than 3 lb/yr or its equivalent should implement the measures in the plan to address the increases.

New emission sources permitted as of May 1, 2008, but not yet operational, such as the original MSI project, are considered as existing emission sources. Essar's proposed project does not propose an increase in mercury emissions over what was previously permitted for MSI, and therefore the guidelines for New and Modified Mercury Air Emission Sources as specified in the plan do not apply. The taconite production industry sector as a whole is required to come up with a proposal to meet the requirements of the plan, which requires a 75% reduction from the numbers listed in the plan. The proposal will be due in 2016.

The SEIS Preparation Notice (July 2010) indicated that the SEIS would include the company's plan for reducing mercury emissions in accordance with the state guidelines. Since the guidelines are not applicable to the project, this information is not included.

Essar will submit Air Quality Form HG-1, Mercury Releases to Ambient Air as part of the air permit amendment application materials.

2.5 HUMAN HEALTH RISK REPORTING CORRECTION TO DRAFT SEIS CHAPTER 4.3

This FSEIS corrects an error reported on page 4.3-17 of the DSEIS regarding the non-cancer incremental guideline value of 1.0 being discussed regarding the data in Table 4.3-3. The DSEIS paragraph reports a value of 0.1 for non-cancer. The correct value of 1.0 non-cancer is reported below. The corrected value is underlined.

> For all three receptor types (resident, fisher, farmer), individual risks and summed risks for all chemicals at all locations did not exceed the guideline values of 1E-05 for cancer or <u>1.0 for non-cancer</u>. For cancer and non-cancer acute toxicity, the risks for the proposed ESMM project are below risks for the original MSI project. Acute toxicity results are listed only once in Table 4.3-3 because the maximum predicted chemical concentrations across all locations are compiled to produce a single hypothetical exposure scenario. However, NOx (evaluated as NO_2) accounted for 0.35 of the 0.4 summed hazard quotient for all chemicals evaluated (NO_2, arsenic, and acetaldehyde); suggesting limited conservatism resulted from using a single hypothetical exposure. For non-cancer chronic toxicity, the reported hazard quotients for the proposed ESMM project are slightly higher for some receptors and locations.

Table 4.3-3 of the DSEIS correctly shows the guideline value of 1.0 for non-cancer.

2.6 ENERGY REPORTING DETAILS OF MAJOR PROJECT OPERATIONS

The DSEIS reports total power demand on page B-6 of Appendix B as 2,649,000 MWh/year. This reporting was in error by 6,000 MWh/year over the correct value (2,643,000 MWh/year) that is supported by the details shown below.

Details of major project operations are found in the report, Climate Change Evaluation, Version 1, September 2010, Table 3-6. This is available upon request. The major project operations estimated power demand from Table 3-6 are shown below.

Crushing/Concentrating: 542,500 MWh/yr (62 MW)

Pelletizer: 280,000 MWh/yr (32 MW)

DRI: 308,000 MWh/yr (35 MW)

Steel Mill: 1,512,500 MWh/yr (173 MW)

TOTAL: 2,643,000 MWh/yr (302 MW)

This is a total reduction of 148 MW and [(450-302)/450=] 33% compared to the original MSI project total power demand of 450 MW. As operational details are refined and submitted to MPCA by Essar in support of their air permit application, evaluation is conducted to look for all possible operational efficiencies to reduce greenhouse gas emissions and related reductions in energy demand. The draft permit will be placed on public notice and will provide opportunity for public comment in addition to the SEIS.

2.7 PROPERTY ACQUISITIONS STATUS

The DSEIS reported on the mitigation measures in accordance with the MSI FSEIS for acquisition of six properties within the Permit to Mine and Air Permit ambient air quality boundary. The status of property acquisition was described on page 4.5-1, Chapter 4.5 of the DSEIS.

The acquisition of all six properties was completed September 20, 2011, thus fulfilling the commitment made previously by MSI.