APPENDIX D

Cumulative Impact Analyses –

Approach, Air (D1), Health Risk (D2), Water Resources (D3), Wetlands (D4), Wildlife Habitat (D5), Rail Traffic (D6)

(Note: Color versions of figures in this Appendix are included in the file posted at the DOE NEPA website: http://www.gc.energy.gov/NEPA/final_evironmental_impact_statements.htm)

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D. APPROACH TO CUMULATIVE IMPACTS ANALYSIS

D.1 PURPOSE

The U.S. Department of Energy (DOE) and Minnesota Department of Commerce (MDOC) are preparing an Environmental Impact Statement (EIS) for the Mesaba Energy Project in the Iron Range of northeastern Minnesota as announced in a Notice of Intent published in the *Federal Register* on October 5, 2005. This paper specifically and exclusively provides an intended approach for addressing cumulative environmental impacts of the Mesaba Energy Project that will satisfy the Federal National Environmental Policy Act (NEPA) requirements and the Minnesota Rules promulgated in accordance with the Minnesota Power Plant Siting Act (Statutes 116C.51 through 116C.69).

D.2 BACKGROUND

D.2.1 Federal Requirements

The President's Council on Environmental Quality (CEQ) defined "cumulative impact" in regulations implementing the procedural provisions of NEPA as follows:

> *"Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.* (40 CFR 1508.7)

In its implementing procedures for NEPA, DOE has stated its policy "…to follow the letter and spirit of NEPA; comply fully with the CEQ Regulations; and apply the NEPA review process early in the planning stages for DOE proposals" (10 CFR 1021.101). Therefore, DOE regulations require the consideration of cumulative impacts in published NEPA documents.

D.2.2 State Requirements

Minnesota Rules Chapter 4410, Parts 4410.0020 through 4410.6500 implement the environmental review procedures established by the Minnesota Environmental Policy Act (MEPA). Part 4410.1700, Subpart 7, Item B, specifically requires the responsible governmental unit (RGU) to consider the "cumulative potential effects of related or anticipated future projects." However, because it involves a large electric power generating plant (LEPGP), the Mesaba Energy Project is not subject to the requirements of Chapter 4410 (see Part 4400.1700, Subpart 12). Instead the project is subject to Minnesota Rules Chapter 4400, which does not require the consideration of cumulative impacts comparable to Part 4410.1700, Subpart 7. Therefore, no specific state requirement for consideration of cumulative impacts for the Mesaba Energy Project is indicated. However, MDOC may consider cumulative impacts in response to comments received during the state scoping process.

D.3 REASONABLY FORESEEABLE FUTURE ACTIONS

Based in part on the Scoping Environmental Assessment Worksheet (EAW) for the proposed Minnesota Steel Project near Nashwauk, Minnesota, which is subject to Minnesota Rules Part 4410.1700, Subpart 7, Item B (defined above), the following past and ongoing actions and potential projects represent

"reasonably foreseeable future actions" in the vicinity of the preferred and alternative sites for the proposed Mesaba Energy Project.

D.3.1 Ongoing Actions

- National Pollutant Discharge Elimination System (NPDES) permitted discharges to the Swan River and Prairie River.
- NPDES permitted discharges to the St. Louis River watershed.
- Logging of state and county lands in the Arrowhead Region.
- Logging on private lands in the Arrowhead Region.
- Butler Taconite and predecessor natural ore operations.
- Keewatin Taconite Company and predecessor natural ore operations.
- Hibbing Taconite Company and predecessor natural ore operations.
- Cliffs-Erie and predecessor natural ore operations.
- Other taconite operations located in the Arrowhead Region.
- Minnesota Power plant operations in Itasca County (Clay Boswell), St. Louis County (Syl Laskin, M.L. Hibbard), and Lake County (Taconite Harbor).
- Public utility power plants in Hibbing and Virginia.
- UPM-Kummene Blandin Paper Mill in Grand Rapids and proposed expansion.
- Non-utility electric power plants in Arrowhead Region (Silver Bay, Alliant Energy, Lake Superior Paper).
- Planned or ongoing roadway improvements or substantial tracts of commercial/residential development that have been identified in any comprehensive planning documents, or that have been approved by the county or city.

D.3.2 Potential Future Emissions Sources

- Proposed Minnesota Steel Project – north of Nashwauk
- Proposed PolyMet Mining project – north of Hoyt Lakes
- Proposed Mesabi Nugget plant – north of Hoyt Lakes
- Proposed Laurentian Wood-Fired Generation Plants – near Hibbing and Virginia (The Laurentian Energy project is a semi-public partnership involving Hibbing Public Utilities and Virginia Public Utilities to provide renewable energy to Xcel Energy. Two wood-fired boilers for power generation, less than 25 MW each, would be built at each existing facility.)

D.4 POTENTIALLY AFFECTED RESOURCES

Although the lists of ongoing activities and potential future emissions sources in the regions of influence for the West and East Range Sites are substantial, various factors affect the potential for cumulative impacts on potential resources. For example, potential impacts on vegetation and archeological resources generally would be limited to the locations of anticipated land disturbance, which are specific to the individual projects. However, the impacts of air emissions may extend many miles beyond the individual project areas. Based on consideration of the regions of influence for impacts on environmental resources, the following resources have been identified that may be affected by cumulative impacts from the Mesaba Energy Project (including Phase II) in combination with other reasonably foreseeable actions in the Arrowhead Region. The potential cumulative impacts have been listed respectively for the preferred West Range Site and the alternative East Range Site.

D.4.1 West Range Site

- Air quality in Federally administered Class I areas (e.g., Boundary Waters Canoe Area Wilderness [BWCAW], Voyageurs National Park [VNP]) including "regional haze."
- Water quality in Federally administered Class I areas (e.g., BWCAW, VNP) due to deposition of pollutants and acidification.
- Deposition and bioaccumulation of mercury emissions in water resources/aquatic species.
- Effects of inhalation of air toxics emissions.
- Effects on water supplies, quantity, and quality in the Swan River watershed.
- Loss of wetlands in the Swan River watershed.
- Wildlife habitat loss, fragmentation, and obstruction of travel corridors in the Swan River watershed.
- Impacts of increased train traffic on regional communities between (and including) Grand Rapids and Hibbing along the US 169 corridor (noise, delays at grade crossings, obstruction of emergency vehicle access to service areas), taking into consideration the potential for disproportionate impacts on low-income populations (environmental justice).

D.4.2 East Range Site

- Air quality in Federally administered Class I areas (e.g., BWCAW, VNP) including "regional haze."
- Water quality in Federally administered Class I areas (e.g., BWCAW, VNP) due to deposition of pollutants and acidification.
- Deposition and bioaccumulation of mercury emissions in water resources/aquatic species.
- Effects of inhalation of air toxics emissions.
- Effects on water supplies, quantity, and quality in the Partridge River watershed.
- Loss of wetlands in the Partridge River watershed.
- Wildlife habitat loss, fragmentation, and obstruction of travel corridors in the Partridge River watershed.
- Impacts of increased train traffic and lengths on regional communities between (and including) Hoyt Lakes, Virginia, and Iron Junction (noise, delays at grade crossings, obstruction of emergency vehicle access to service areas), taking into consideration the potential for disproportionate impacts on low-income populations (environmental justice).

D.5 RESOURCES NOT LIKELY TO BE AFFECTED CUMULATIVELY (WITH BASIS)

Based on currently available information, there are some resources that are not expected to experience measurable cumulative impacts, although the EIS for the Mesaba Energy Project will address the specific impacts of the project on these resources in accordance with NEPA and Minnesota Rules Chapter 4400. Also, as additional information becomes available or as a result of public comments received, the need for a cumulative impact analysis for these resource areas will be reassessed. The resource areas and the basis for not including a cumulative impact analysis for these areas at this time are as follows:

- Demographics – The Mesaba Energy Project (including Phase II) is estimated to create approximately 182 permanent jobs by 2013, which, when added to other foreseeable actions in the region, would not affect population and housing substantially given that the population of Itasca County is expected to grow by 3,600 persons and St. Louis County is expected to grow by 5,400 (between 2000 and 2010).

- Community Services – As in the case of demographics, the project, when added to other foreseeable actions, is not expected to affect demands on local community services substantially, other than the impacts from the frequency and length of trains.
- Land Use – The Mesaba Energy Project and other foreseeable projects would have relatively small areas of influence in the context of land use, and the areas of influence would not be expected to overlap.
- Environmental Justice – As in the case of land use, areas of influence for environmental justice would not be expected to overlap for the respective projects.
- Traffic – As in the case of demographics and land use, the respective foreseeable projects would not contribute substantial amounts of new automobile traffic and would not utilize the same roadways and intersections concurrently.
- Geology and Soils – Potential adverse impacts on earth resources would be site-specific in context (small areas of influence) and not substantially cumulative provided that appropriate erosion and sedimentation controls are implemented in accordance with state and Federal regulations.
- Cultural Resources – As in the case of geology and soils, potential adverse impacts would be site-specific.
- Materials and Waste Management – The Mesaba Energy Project and other foreseeable projects would have relatively small areas of influence in the context of material and waste management, and the areas of influence would not be expected to overlap.
- Noise – An increase to noise levels will likely result from the increase in the number, frequency and length of trains, plant noise, and truck traffic. Cumulatively, noise levels would not affect the local areas where each project is located. Impacts from the Mesaba Energy Project and other foreseeable projects would affect relatively small areas of influence that would not be expected to overlap.
- Light and Glare – As in the case of land use, areas of influence for light and glare would not be expected to overlap for the respective projects.
- Safety and Health – There is a potential for cumulative impacts of mercury deposition and bioaccumulation to water resources and aquatic species. Otherwise, the foreseeable projects are not expected to contribute to substantial cumulative impacts on safety and health based on distance between potential radii of influence areas.
- Biological Resources – No known populations of endangered plant species have been identified that would be impacted by the Mesaba Energy Project.

D.6 RECOMMENDED CUMULATIVE ANALYSIS

D.6.1 Air Quality Impacts on Class I Areas

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request the following information from Excelsior as part of the Environmental Information Volume: air quality modeling to assess the cumulative impacts of continuous air emissions from Mesaba Energy Project emissions at the respective West and East Range Sites, taking into account projected emissions from the reasonably foreseeable projects listed in Section 3.2. The air quality model would provide an air quality analysis to determine the impacts on the national ambient air quality standards (NAAQS) and Prevention of Significant Impacts (PSD) increments associated with the construction and operation of the Mesaba Energy Project (including Phase II) combined with the proposed foreseeable projects. Excelsior would be required to obtain, from publicly available information, projected emissions from these foreseeable sources. These foreseeable sources are potentially new major sources of regulated

pollutant emissions that would be required to provide the following information in order to comply with the PSD regulations:

- Background concentrations of each regulated pollutant using distant and regional sources in order to establish baseline concentrations.
- Variance in land use and topography in the proposed locations for the future projects in order to determine air dispersion of pollutants.
- Highest concentration for each pollutant under the facilities' various worst-case operating scenarios (e.g., startup, normal operations, flaring, etc.) in order to establish potential to emit.
- Identification of all best available control technologies (BACT) through a BACT analysis in order to establish mitigation measures.

For instances in which the data is not publicly available, Excelsior will provide an estimated representation of the emissions based on similar types of operations and activities. Adjustment of modeling parameters for other existing and foreseeable emission sources to account for reductions in emissions based on potential changes in regulatory controls on emissions would also be performed. Additionally, an impact analysis to assess the cumulative impact of air emissions on visibility caused by any increase in emissions from the Mesaba Energy Project combined with the reasonably foreseeable projects would be conducted, including the cumulative visibility effects on Federal Class I areas within 250 kilometers of the Mesaba Energy Project and the future projects. Overall, the cumulative impact analysis for air quality will take into consideration recommendations by the U.S. Department of Agriculture (USDA) Forest Service, Superior National Forest, as a cooperating agency for the EIS.

D.6.2 Water Quality Impacts on Class I Areas

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, deposition modeling to predict the cumulative effects of deposition on water quality in Class I areas within 250 kilometers, taking into account the existing and reasonably foreseeable emission sources. Overall, the cumulative impact analysis for water quality will take into consideration recommendations by the USDA Forest Service, Superior National Forest, and the U.S. Army Corps of Engineers (USACE), as cooperating agencies for the EIS.

D.6.3 Mercury Deposition and Bioaccumulation

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, deposition modeling to predict the cumulative effects from deposition of mercury on bioaccumulation in fish and qualitative impacts on eagles, taking into account the existing and reasonably foreseeable emission sources.

D.6.4 Air Toxics Inhalation Risk

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, air emission risk assessment modeling to predict the cumulative effects of inhalation of air toxics emissions. Emissions generated by the Mesaba Energy Project (including Phase II) in combination with future projects may potentially contribute other hazardous air pollutants such as acetophenone, 2-chloroacetophenone, hexane, hydrogen fluoride, manganese, methyl methacrylate, methyl tert butyl ether, 5-methylchrysene, sulfuric acid, cadmium, indeno(1,2,3-cd)pyrene, arsenic, and acrolein. It is possible that the atmospheric load contributed by the Mesaba Energy Project may increase the load emitted by the other potential future

emission sources listed in Section 3.2. However, based on the results of the current air emission modeling effort for the Mesaba Energy Project, the contribution is anticipated to be negligible.

D.6.5 Water Supply, Quantity, and Quality

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, estimates of water withdrawals and effluent pollutant loadings, respectively in the Swan River and Partridge River watersheds, based on projections from water and sewer utilities and reasonably foreseeable projects identified in Section 3. These projections should then be added to the water withdrawals and discharges by Mesaba Energy Project (including Phase II) to predict the cumulative effects on water quantity and quality in the respective watersheds.

D.6.6 Loss of Wetlands

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, estimates of wetland acreage that may be lost due to development of foreseeable projects identified in Section 3. Estimates of wetlands lost to development may be derived from available approved permits. In some cases the USACE lists permits that have been approved on its website and includes the acreages of wetlands impacted. In such situations, rough estimates of wetland acreage lost could be determined by coordinating with the regulatory agencies. The estimated acreage to be lost for development of foreseeable projects should then be added to the acreage expected to be lost for the respective Mesaba Energy Project (including Phase II) at preferred and alternative sites, and the cumulative acreage should be compared to the estimated total wetland acreage in respective watersheds, Swan River and Partridge River, for the West and East Range Sites. Consideration should be given to wetland acreage that would be replaced through mitigation, taking into account the comparative quality of wetlands lost/replaced and the effects of wetland fragmentation.

Overall, the cumulative impact analysis for wetlands will take into consideration recommendations by the USACE, St. Paul District, and the USDA Forest Service, Superior National Forest, as cooperating agencies for the EIS. When making recommendations about wetland impacts, a cooperating agency would be expected to provide appropriate data to support the suggested analysis, such as baseline acreage for past and present wetlands in the affected watersheds, descriptions of the functions and values of the wetlands to the respective watersheds, and the likelihood for wetland mitigation to be required within the watershed for ongoing and future projects.

D.6.7 Wildlife Habitat Loss, Fragmentation, and Obstruction of Movement

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request the following information from Excelsior as part of the Environmental Information Volume: estimates of wildlife habitat acreage that may be lost for development of foreseeable projects identified in Section 3. Overall, the cumulative impact analysis for wildlife habitat loss will take into consideration recommendations by the USDA Forest Service, Superior National Forest, as a cooperating agency for the EIS. When making recommendations about wildlife impacts, the cooperating agency would be expected to identify particular species of interest and provide estimates of habitat location (maps) and acreage in the Iron Range for use in the cumulative impact analyses. The cooperating agency would also be expected to provide estimates of locations (maps) and growth in acreage of non-native invasive and predator species in the Iron Range along with estimations of the types of human activities that have caused the influx and growth of these species.

The estimated acreage to be lost for development of foreseeable projects should be added to the acreage expected to be lost for the respective Mesaba Energy Project (including Phase II) preferred and alternative sites, and the cumulative acreage should be compared to the estimated total wildlife habitat acreage in respective watersheds for the West and East Range Sites based on general vegetated acreage and on specific estimates of habitat acreage for species of interest as provided by the cooperating agency. Consideration should be given to the cumulative effects on habitat fragmentation and the obstruction of wildlife travel corridors by combined project actions. Possible cumulative effects metrics could include increases in miles and density of roads (and trails) affecting habitat for lynx and wolf, and reductions in nest trees for eagles.

D.6.8 Impacts of Increased Frequency and Lengths of Trains

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request the following information from Excelsior as part of the Environmental Information Volume: estimates of rail traffic requirements, including frequencies and lengths of trains, to serve foreseeable projects identified in Section 3. The anticipated routes of trains should be projected and added to the rail traffic requirements and projected routes of trains for the Mesaba Energy Project (including Phase II) at respective West and East Range Sites. The results should be evaluated for cumulative impacts on communities along the respective rail routes between Grand Rapids and Hoyt Lakes, with particular consideration for at-grade crossings causing obstruction of emergency vehicle access to service areas, traffic delays, and increased noise. These cumulative impacts should be evaluated also for potential disproportionate effects on low-income populations in compliance with environmental justice requirements.

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APPENDIX D1
Air

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CUMULATIVE AIR QUALITY IMPACT ANALYSES FOR CLASS I AREAS

1. Introduction

Air quality modeling was conducted to assess the potential cumulative impacts of existing and reasonably foreseeable future sources at Class I areas that included the Boundary Waters Canoe Area, Voyageurs National Park, Isle Royale National Park and The Rainbow Lakes Wilderness Area. For each Class I area where the modeled impacts for Mesaba One and Mesaba Two exceeded the significant impact levels (SILs) that necessitate multi-source modeling, recently updated SO_2 and PM_{10} multi-source inventories were used to evaluate Prevention of Significant Deterioration (PSD) increment consumption[1]. The multi-source modeling results for the same pollutants were also used in combination with historical monitoring data obtained in or nearby each Class I area to provide an indication of cumulative source impacts on ambient air quality therein. Cumulative Class I area impacts on the deposition of sulfur and nitrogen compounds were estimated using historical monitoring data collected in or nearby each Class I area and adding to them the modeled impacts of Mesaba One, Mesaba Two, and other reasonably foreseeable future sources for which Class I area impacts had been modeled and were publically available.

Based on comments provided in response to the Draft Environmental Impact Statement (EIS), cumulative impacts on visibility in Class I areas[2] have been evaluated in conjunction with the draft state implementation plan (SIP) published by the Minnesota Pollution Control Agency (MPCA) in February 2008[3] for public comment. The evaluation presented herein supersedes the cumulative visibility analysis presented in the Draft EIS. The impacts of Mesaba One and Mesaba Two on visibility in Class I areas are presented in Section 4.3.2.5 of Volume 1 along with an analysis of how such impacts could be mitigated.

Maximum predicted mercury emissions from Mesaba One and Mesaba Two were modeled to predict average concentrations of mercury in air at receptors in each Class I area. The mercury concentration results were compared to global background levels to provide a basis for estimating the relative impact of the Project's emissions on the potential ambient concentrations of mercury in or nearby each Class I area.

2. Cumulative Air Impacts Modeling Methodology

All cumulative air impacts modeling in Class I areas utilized the CALPUFF modeling system, the U.S. Environmental Protection Agency (EPA) Guideline methodology for simulation of long-range transport and dispersion. As noted in Section B.2.1.3 of Appendix B (Volume 2), modeling of Mesaba One and Mesaba Two impacts on PSD increment consumption at Class I area receptors within 50 km of the source (hereafter "Near-Field Receptors" or NFRs)[4] was

[1] None of the modeled impacts from Mesaba One and Mesaba Two at receptors within the referenced Class I areas exceeded the annual SIL concentration for NO_2, therefore, no additional cumulative impact modeling was required or performed.
[2] Visibility is not considered a critical value for the Rainbow Lakes Wilderness Area, therefore, no visibility assessment for this Class I area was conducted.
[3] Minnesota *State Register*, Monday, February 25, 2008, page 1643 (**32 SR 1643**).
[4] Such Near-Field Receptors are only found at the East Range site.

also conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD)[5]. Such use of AERMOD was originally specified and approved by the FLMs as part of the proponent's Class I area modeling protocol[6]. However, relative to CALPUFF, the impacts on PSD increment consumption predicted by AERMOD at NFRs were found to be systematically lower for all short and long term concentrations of SO_2 and PM_{10}; this observation was true for both the single and multisource runs conducted[7]. Therefore, for purposes of conservatism, all cumulative impacts presented in this Appendix D reflect the predictions modeled using the CALPUFF modeling system.

The CALPUFF system includes CALMET for preparation of meteorological data, CALPUFF for calculation of pollutant concentrations, and CALPOST for processing of results to generate average concentrations and deposition rates. The Class I modeling protocol approved by the Federal Land Managers (FLMs) and referenced above defined the baseline configuration of options and input variables in which CALPUFF model system runs were to be conducted. One year of MM5 data – 2002 – used 12 km resolved wind fields developed by EPA and available in the public domain; the remaining years – 2003 and 2004 – used 36 km resolved wind fields obtained from and used by the Minnesota Pollution Control Agency in their current regional haze and Best Available Retrofit Technology (BART) analyses. For use in the present cumulative modeling analyses, the MM5 data were augmented by regional meteorological observations from surface, upper air, and precipitation monitoring stations. The MM5 and supplemental meteorological data were processed with CALMET to produce a complete meteorological input dataset to CALPUFF for each of the three model years.

Receptors for cumulative impacts modeling consisted of the high resolution receptor grids provided by the National Park Service for each of the four Class I areas[8]. Using the multi-

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[5]Full documentation of the AERMOD modeling system is provided on the EPA's website at http://www.epa.gov/scram001/dispersion_prefrec.htm#aermod.

[6] The modeling protocol approved by the FLMs consists of the following correspondence:

- TRC, et al., "Mesaba Energy Project, Mesaba One and Mesaba Two, Class I Area Modeling Protocol," October 2008.
- December 1, 2008 letter from James Sanders and Jeanne Higgins (representing the U.S. Forest Service's Superior and Chequamegon-Nicolet National Forests, respectively) providing comments on the October 2008 Class I Area Modeling Protocol.
- December 8, 2008 email response from Excelsior Energy Inc. to December 1, 2008 comments from Mr. Sanders and Ms. Higgins.
- TRC, et al., "Mesaba Energy Project, Mesaba One and Mesaba Two, Class I Area Modeling Supplemental Protocol," January 2008 (transmitted via email and letter of January 15, 2009 to Carolina Espejel-Schutt of the MPCA). This document addressed issues discussed in telephone conference calls on December 11th and 12th between Excelsior Energy Inc., its consultants, and regulatory personnel from MPCA, EPA, and the FLMs, such discussions described in Section 2.1 of the Supplemental Protocol.
- March 5, 2009 letter from John Bunyak, U.S. Department of Interior, National Park Service ("NPS") to Carolina Espejel-Schutt providing the basis on which modeling acceptable to the FLMs should be undertaken and providing the option to submit supplemental information.
- March 6, 2009 email message from Trent Wickman, U.S. Forest Service to Bob Evans confirming that the U.S. Forest Service would accept Excelsior's modeling protocol provided the NPS approved it.
- March 9, 2009 email message from Andrea Stacy, NPS stating that the March 5, 2009 letter to Carolina Espejel-Schutt confirmed NPS's conditional acceptance of Excelsior's modeling protocol.

[7] The comparison of AERMOD and CALPUFF predictions using identical source inventories is presented in Appendix B-2.

[8] *See* http://www.nature.nps.gov/air/maps/Receptors/index.cfm#info.

source inventory described in Section 3.0 below, model-predicted SO_2 and PM_{10} concentrations were calculated for each receptor on an hourly basis.

Post-processing of CALPUFF results provided the following information for each receptor:

- Maximum predicted average concentrations for applicable time periods
  - SO_2 - 3-hour, 24-hour, annual
  - PM_{10} - 24-hour and annual
  - NO_2 - annual (for Mesaba One and Mesaba Two only)
- Annual deposition of sulfur and nitrogen (for Mesaba One and Mesaba Two only)

The post-processing programs summarize outputs in terms of the highest and second-highest short-term average (i.e., 3-hour and 24-hour) concentrations at any receptor in each Class I area and the highest annual average concentration at any receptor therein.

The impact of mercury emitted from Mesaba One and Mesaba Two relative to existing ambient concentrations of mercury was estimated using the CALPUFF modeling system and assuming a non-reactive or depleting specie as a surrogate.[9] The resulting predicted impacts were normalized for the specie emission rate and converted to ambient concentrations of mercury for all receptors in the Class I areas of interest for the West and East Range sites. Predicted concentrations for mercury therefore represent a conservative estimate of maximum mercury concentration in the ambient air for all mercury species combined. The ambient air concentrations of mercury derived in this manner for Mesaba One and Mesaba Two were compared to commonly accepted global background concentrations of elemental mercury found in the literature.

3.0 Multi-Source Inventory Used for Cumulative Impact Assessments

3.1 Data Sources

Emissions data and source parameters for increment consuming/expanding sources of SO_2 and PM_{10} within a 300 km radius of each Class I area were assembled for the cumulative Class I modeling analyses. Such data were requested of and provided by the FLMs, MPCA, the Wisconsin Department of Natural Resources, and the Michigan Department of Environmental Quality. These data, along with information acquired from permit applications, publically available regulatory submittals, the respective State regulatory agency websites, and the construction and operating permits issued for each facility were used in creating SO_2 and PM_{10} emissions inventories that were reviewed for accuracy by the proponent's consultants. The resulting inventories were also compared with information on increment consuming sources obtained from MPCA in 2005 for the initial Mesaba permit application modeling, with data for other sources provided by MPCA in October 2006 in response to a specific request for

[9] This assumption is appropriate based on tests that have been performed on the Wabash River Coal Gasification Repowering Project that have shown that 100 percent of the mercury emitted from the E-Gas™ technological system is in its elemental (i.e., gaseous) form, a long-lived non-reactive species in rural environments. USEPA (April 2002). "Control Of Mercury Emissions From Coal-Fired Electric Utility Boilers: Interim Report Including Errata Dated 3-21-02", United States EPA-600/R-01-109, page 6-57. Prepared for Office of Air Quality Planning and Standards by National Risk Management Research Laboratory, Research Triangle Park, NC.

cumulative Class I source information, and with information contained in the March 2009 Mesabi Nugget Class I modeling report. The sources of data used to assemble the Class I multi-source inventory are presented in Table 1.

3.2 General Description of Source Types

All SO_2 and PM_{10} sources can be classified into the following groups:

(1) Existing sources that have not experienced significant permit modifications or actual increment consuming/expanding emissions changes since the applicable PSD baseline dates. These sources do not affect PSD increment consumption, and were assumed to continue operation in the future at their current emission rates. They were not included in the modeling; their impacts are expected to be represented in the existing monitoring data.

(2) Any existing sources that permanently ceased operations or otherwise permanently reduced their actual emissions by unknown amounts since the applicable baseline date; these emission changes would expand the available increments. Such sources were not included in the modeling; their impacts are also expected to be represented in the existing monitoring data. Sources that permanently ceased operations or otherwise permanently reduced their actual emissions by quantifiable amounts since the applicable baseline date; these emission changes would expand the available increments and were included in the modeling.

(3) Existing sources that have submitted applications or received permits or permit modifications after the applicable baseline dates. For these sources, emission changes (increases or decreases) since the applicable baseline date were modeled for the cumulative PSD increment analyses.

(4) Proposed sources not yet in operation. Proposed sources were modeled, at their proposed permit limits, for all PSD increment analyses.

(5) Existing sources that are expected to reduce emissions in the future as a result of pollution control projects required for compliance with BART or other regulations. The sources in this category are the Minnesota Power Clay Boswell and Taconite Harbor generating stations. The actual emission rate reductions that these future requirements are expected to achieve were taken into account in the PSD increment modeling analyses.

Table 1. Data Sources Used in Developing the Multi-Source Inventory for Cumulative Impact Assessments

Data Source	Contact(s)	Information Provided	Comment
Minnesota Pollution Control Agency	L. Brietenbach	PSD increment consuming/expanding sources within specified Minnesota counties.	Provided electronic inventory in response to proponent's request for public data; supplied with caution "some of these files may be old and/or outdated."
	R. Roberson	Keetac expansion Class I modeling report.	Contains updated inventory for project located approximately 15 miles west-northwest of Mesaba One and Mesaba Two; supplied in response to proponent's request for public data.
		Keetac expansion Class II model input data files	Electronic input data files supplied in response to proponent's request for public data..
	C. Nelson	Minnesota Steel Industries, LLC (MSI) Class I model input data files; Class I and Class II inventory of relevant sources for proponent's air permit application (June 2006) and cumulative modeling studies (October 2006).	Electronic input data files supplied in response to proponent's request for public data.
	Not applicable	Permit database on MPCA's website (http://www.pca.state.mn.us/air/permits/issued/index.html) providing permits and permit revisions for new & existing sources, respectively.	Where appropriate, used to update/confirm information provided in electronic files.
U.S. EPA	Not applicable	U.S. EPA Clean Air Markets pre-packaged hourly emissions databases available at the following website: ftp://ftp.epa.gov/dmdnload/emissions/hourly/quarterly/.	Used for determining actual emissions from electric generating units.
Wisconsin DNR	J. Roth	Wisconsin PSD increment consuming/expanding sources within 300 km of Class I areas.	Information supplied in response to proponent's request for public data.
Michigan DEQ	J. Haywood, A. Ostrander, G. Serrano, S. Vorce, and V. Hellwig	Michigan PSD increment consuming/expanding sources within 300 km of Class I areas.	Information supplied in response to proponent's request for public data. In addition, provided inventories of all permitted sources.
Barr Engineering Co.	A. Skoglund	MSI Class II modeling input data files; Mesabi Nugget Phase I Class II model input data files.	Provided to proponent at request of MPCA's R. Roberson.
Minnesota DNR	W. Johnson	Mesabi Nugget Phase II Class I air modeling report.	Modeling report submitted as a review draft in support of Environmental Impact Statement; supplied in response to proponent's request for public data.
Federal Land Managers	H. Gebhart	Mesabi Nugget Phase II Class I air modeling input data.	Electronic input data files supplied in response to proponent's request for public data.
		Keetac expansion Class I air modeling input data.	

3.3 Source Emission Rates

The emissions data for the sources provided by MPCA for the increment analyses were based on MPCA's records of pollutant-specific baseline dates for northern Minnesota. Where reasonable, emissions from multiple stacks or emission points at a single facility were combined for modeling. The total emissions were represented as occurring from one or several stacks with stack parameters typical of the majority of emissions.

For most regional sources, emissions data were available only for SO_2, PM_{10} and NO_x. Since the maximum annual NO_2 impacts of Mesaba One and Mesaba Two were below the corresponding SIL, SO_2 and PM_{10} were the only pollutants modeled for the regional sources. Where SO_4 and/or speciated particulate matter data were available, as for Mesaba One and Mesaba Two, the additional pollutant forms were modeled. Generally only short-term potential emission rates were available. Where rates were given for several averaging times for a given source, the applicable maximum (potential) emissions were modeled. For Mesaba One and Mesaba Two, maximum proposed (permit limit) emission rates were modeled for each averaging time.

3.2 Specific Identification of Sources in Multi-Source Inventory

The PSD increment consuming/expanding emission sources for SO_2 and PM_{10} are shown in Table 2. The sources and emission rates provided in these tables are identical to those presented in Appendix B-1. It should be noted that Table 2 provides the maximum actual SO_2 emission rates for the existing power plant sources required to monitor and report such emissions (i.e., those sources having their hourly emissions presented in the EPA Clean Air Markets database); the table provides estimated maximum actual PM_{10} emission rates that are proportional to the maximum actual SO_2 emission rates for those same sources. For all other facilities, Table 2 contains the maximum SO_2 and PM_{10} emission rates allowed by the permits. As actual emissions on any given day are substantially less than the maximum emissions allowed by each permit, the increment consuming emissions included in the modeling are almost certainly a very conservative estimate of the actual or typical pollutant emissions to the atmosphere.

Table 2. PSD Increment Consuming/Expanding[1] SO_2 and PM_{10} Sources and Their Corresponding Emission Rates

Source	SO_2		PM_{10}	
	lb/hr	g/s	lb/hr	g/s
Alltrista Consumer Products	0.8	0.1	6.4	0.8
American Crystal Sugar – Crookston	-	-	43.6	5.49
American Crystal Sugar – E Grand Forks	-	-	194	24.4
Blandin Paper Company	596	75.1	53.7	6.76
Boise White Paper LLC	176	22.2	26.7	3.36
Duluth Steam Cooperative Association	-	-	4.3	0.54
Georgia-Pacific – Duluth Hardboard	-	-	64.2	8.09
Great Lakes Comp # 5	-	-	-3.6	-0.46
Hanna (Butler Mining)	-	-	-171	-21.5
Hibbing Public Utilities Commission (Laurentian)	-	-	12.8	1.61
Hibbing Taconite Company	772	97.3	560	70.6
Ispat Inland Mining Co (Arcelor Mittal)	3.2	0.4	18.3	2.3
Lamb Weston RDO Frozen	271	34.1	31.9	4.02
LTV Cliffs Erie	-195	-24.6	-2,311	-291.2
Marvin Windows and Doors	-	-	12.9	1.63
Mesabi Nugget LLC	96.5	12.2	127	16.0
Minnesota Power – Clay Boswell*	-2,841	-358	-71.0	-8.94
	4,300 / 2,703	542 / 341	204	25.7
Minnesota Power – Hibbard*	-724	-91.2	-18.6	-2.34
	350 / 254	44.1 / 32.0	5.5	0.69
Minnesota Power – Taconite Harbor*	-399	-50.3	-153	-19.3
	329 / 269	41.4 / 33.9	92.3	11.6
Minnesota Steel Industries	116	14.6	309	38.9
Norbord Industries Inc	11.5	1.4	55.1	6.94
Northshore Mining – Silver Bay	-48.6	-6.1	-106	-13.4
	27.8	3.5	35.1	4.42
Royal Oak Enterprises Inc	-	-	-97.8	-12.3
SAPPI – Cloquet	-917	-116	-19.8	-2.49
	883	111	111	14.0
U.S. Steel – Keetac	-189	-23.8	-109	-13.7
	263	33.1	54.9	6.92
U.S. Steel – Minntac	-	-	-467	-58.9
	157	19.8	65.9	8.30
United Taconite – Fairlane Plant	-	-	136	17.1
USG Interiors Inc, Cloquet	-	-	-11.2	-1.41
	-	-	74.0	9.32
Verso (formerly IP) Paper – Sartell	433	54.5	41.9	5.28
Virginia Dept of Public Utilities (Laurentian)	-125	-15.7	9.7	1.22
Flambeau River Papers	534	67.3	48.6	6.12
Graymont (CLM Corporation)	559	70.4	42.9	5.40

Source	SO_2		PM_{10}	
	lb/hr	**g/s**	**lb/hr**	**g/s**
Great Lakes Gas #6 – Iron River	-	-	6.8	0.86
Louisiana – Pacific Hayward	-	-	89.6	11.3
Murphy Oil USA, Inc.	300	37.8	18.8	2.37
Packaging Corp of America	1,320	166	33.0	4.16
Empire Iron Mining Partnership	1,196	151	45.6	5.74
Grede Foundries Inc	13.8	1.7	26.6	3.35
L'Anse Warden Power Plant	-303	-38.2	-10.5	-1.32
Marquette Board of Light & Power	230	29.0	15.5	1.95
Mathy Construction Company	65.7	8.3	15.1	1.90
Northern Michigan University	51.3	6.5	6.1	0.77
Smurfit-Stone Container	454	57.2	30.8	3.88
Tilden Mining Company L.C.	1,709	215	239	30.1
Verso (IP) Paper – Quinnesec	726	91.5	116	14.6
White Pine Electric Power LLC	79.2	10.0	4.8	0.60
Wisconsin Electric Power Co.*	-19.7	-2.5	-1.1	-0.14
	2,947 / 2,848	371 / 359	216	27.2

1. Negative emission rates in the table represent known reductions that have occurred at a source since the PSD baseline date was established. Entries in the table separated by a "/" represent the actual maximum measured 3-hour and 24-hour average emission rates, respectively, in 2006 or 2007.

3.3 Conservatism Present in Multi-Source Cumulative Analysis

Table 2 indicates that net increases in SO_2 and PM_{10} emissions may have occurred since the PSD baseline dates. However, as stated above, for most sources, Table 2 contains their maximum allowable emission rates, which normally substantially exceed their actual emission rates. As noted in Section 3.2, paragraph (2) Table 2 may not include all sources that have permanently ceased operations, or have otherwise reduced their actual emission rates since the applicable baseline date. Therefore, the modeling analyses performed using the emission rates shown in Table 2 provides very conservative estimates of the amounts of PSD increment consumption in the Class I areas.

Since nearly all of the sources listed in Table 2 presently exist and are in operation, their actual emissions already contribute to the air pollutant concentrations, deposition rates and other air quality-related value (AQRV) impacts observed in Class I areas. Therefore, the summation of the maximum modeled impacts of the maximum allowable emission rates of the sources in Table 2 more than double counts their actual impacts on the Class I areas, because those actual impacts are already included in the monitoring data that have been recorded there. The planned addition of new sources, including Mesaba One and Mesaba Two, will contribute only a small quantity of SO_2, PM_{10} and other AQRV impacts relative to the existing sources whose impacts are already accounted for in the monitoring data recorded in the Class I areas.

4.0 Historical Monitoring Data Utilized in Cumulative Impact Assessments

4.1 SO_2 and PM_{10} Concentrations in Ambient Air

Daily average concentrations of SO_2 have been measured and recorded as part of background ambient air quality monitoring programs in Voyageurs National Park and Isle Royale National Park, such programs being operative during the periods 1988-1993 and 1988-1991, respectively[10,11]. In addition, 7-day average SO_2concentrations are available from the Clean Air Status and Trends Network (CASTNET)[12] monitoring sites at Voyageurs National Park and Perkinstown, Wisconsin (about 90 miles south-southeast of the Rainbow Lakes Wilderness Area). Therefore, for the Class I areas of interest, it is possible to gain insight into historical short and long term ambient concentrations of this pollutant. Because of their relative proximity and rural nature, information about ambient SO_2 concentrations in the Boundary Waters Canoe Area are inferred from the data monitored in Voyageurs National Park. The CASTNET data base makes available maps which show isopleths of annual ambient SO_2 concentrations across the United States and can be used to corroborate the long-term averages calculated from the older 24-hour data from Voyageurs National Park and Isle Royale National Park and the more recent 7-day average data collected at CASTNET monitoring sites[13].

Daily concentrations of PM_{10} are derived through ambient measurements taken at Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring networks located at each of the Class I areas for which visibility is considered a critical value, the resulting values being posted on the IMPROVE web site[14]. The maximum average 24-hour PM_{10} concentration in the 2000-2003 data set for each Class I area in which Mesaba One and Mesaba Two have triggered the 24-hour PM_{10} SIL was identified; the annual average PM_{10} concentration was calculated as the arithmetic average of the 24-hour values observed during each year in the 2000-2003 database.

4.2 Sulfur and Nitrogen Deposition: Wet & Dry

Sulfur and nitrogen in precipitation are currently monitored in the Boundary Waters Canoe Area[15] and Voyageurs National Park[16] as part of the National Atmospheric Deposition Program (NADP). Measurements of such deposition in Isle Royale National Park[17] have been made under auspice of the same program, but precipitation samples are not collected throughout the

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[10] Swackhamer, D.L. and Hornbuckle, K.C., "Assessment of Air Quality and Air Pollutant Impacts in Isle Royale National Park and Voyageurs National Park," report prepared for the U.S. National Park Service, September 1, 2004.

[11] The 24-hour data are available and can be downloaded from EPA's Technology Transfer Network ("TTN") Air Quality System ("AQS") data mart after obtaining an Exchange Network* Node account at http://www.epa.gov/ttn/airs/aqsdatamart/access.htm . The direct interface web page is accessed at http://www.epa.gov/ttn/airs/aqsdatamart/access/interface.htm.

[12] The CASTNET monitoring sites are illustrated on a U.S. map at http://www.epa.gov/castnet/sites.html; the 7-day average SO_2 data for the Voyageurs National Park and Perkinstown, Wisconsin monitoring sites can be downloaded at http://www.epa.gov/castnet/data.html.

[13] *See* http://www.epa.gov/castnet/mapconc.html.

[14] *See* http://vista.cira.colostate.edu/improve/Data/IMPROVE/summary_data.htm .

[15] *See* http://nadp.sws.uiuc.edu/sites/siteinfo.asp?net=NTN&id=MN18.

[16] *See* http://nadp.sws.uiuc.edu/sites/siteinfo.asp?net=NTN&id=MN32.

[17] *See* http://nadp.sws.uiuc.edu/sites/siteinfo.asp?net=NTN&id=MI97.

year. Data collected at the NADP site operated at Hovland, Minnesota[18] by MPCA are used as a surrogate for Isle Royale National Park (the Hovland NADP site is located approximately 33 miles west of the park). The closest NADP monitoring site to Rainbow Lakes Wilderness Area is located near Spooner, Wisconsin[19] at a site about 49 miles south-southwest of the wilderness area.

Over time, a robust dataset of precipitation amounts and chemistry has been collected at each of the above stations. The time period 2000-2007, inclusive, was selected for use in computing the annual average sulfur and nitrogen deposited via precipitation. Only one year of data from one of the stations listed was excluded from the analysis over this time period.[20]

Dry deposition of sulfur and nitrogen compounds is monitored at sites in the CASTNET system. EPA uses a Multi-Layer Model – which uses estimated deposition velocities that are based on surface conditions – to estimate dry deposition from data collected in the network.[21] The resulting estimates of nitrogen and sulfur compounds are provided to the public on the CASTNET website.[22] As recommended by EPA in worksheets documenting the structure of data files providing such estimates, the proponent has calculated the annual average dry deposition of nitrogen and sulfur compounds for years where data completeness at each of the sites exceeds 69%.

4.3 Elemental Mercury Concentration in Ambient Air

The global background of elemental mercury in ambient air is commonly presumed to be between 1-2 nanograms per cubic meter (ng/m^3)[23, 24]. Given that the deposition of elemental mercury from the atmosphere will be independent of whether it is from the global background concentration or from Mesaba One or Mesaba Two, a relative indication of the importance of Mesaba One and Mesaba Two to the deposition of elemental mercury can be estimated.

5.0 Results and Discussion

5.1 Pollutant Concentrations in Class I Areas Solely Due to Operation of Mesaba One and Mesaba Two

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[18] *See* http://nadp.sws.uiuc.edu/nadpdata/ads.asp?site=MN08.
[19] *See* http://nadp.sws.uiuc.edu/sites/siteinfo.asp?net=NTN&id=WI37.
[20] The year 2000 at Voyageurs National Park was excluded because the number of valid samples collected during that year dropped below a 65% threshold.
[21] Multi-Agency Critical Loads Workshop, "Sulfur & Nitrogen Deposition Effects on Freshwater and Terrestrial Ecosystems," May 23-25, 2006, Final Report, November 2006, page 21. Report prepared by Ecologic Analysis & Communications for ICF International and submitted to EPA under Contract No. EPA 68-W-03-02. See http://nadp.sws.uiuc.edu/cladws/finalreport.pdf.
[22] *See* http://www.epa.gov/CASTNET/data.html.
[23] USEPA (December 1997). "Mercury Study Report to Congress Volume IV: An Assessment of Exposure to Mercury in the United States", EPA-452/R-97-006, Office of Air Quality Planning & Standards and Office of Research and Development, Table 2-3, page 2-4.
[24] USEPA (December 1997). "Mercury Study Report to Congress Volume III: Fate and Transport of Mercury in the Environment", EPA-452/R-97-005, Office of Air Quality Planning & Standards and Office of Research and Development, pages 5-2 and 5-3.

Class I impacts associated with operation of Mesaba One and Mesaba Two are discussed in Appendix B-2, however, the results of the analyses relevant to establishing cumulative impacts are reproduced in this Appendix for convenience. As noted in Section B.2.1.3, worst case emissions from Mesaba One and Mesaba Two differ between the West and East Range sites as a consequence of the East Range site's closer proximity to the Boundary Waters Canoe Area. In order to minimize modeled impacts of two source operations on AQRVs in this Class I area, enhanced controls are required on Mesaba Two relative to those placed on Mesaba One. These two scenarios – best available control technology (BACT) controls on Mesaba One and Mesaba Two at the West Range site and BACT controls on Mesaba One and Beyond BACT[25] controls on Mesaba Two at the East Range site – will represent the worst case operating conditions creating maximum impacts at each site.

Tables 3 and 4 present CALPUFF model-predicted impacts of Mesaba One and Mesaba Two, operating at the West Range and East Range sites, respectively. These two tables present the highest predicted concentrations of pollutants (for which ambient air increments have been established) modeled for each Class I area, year, pollutant, and averaging time. Note that no analyses of Mesaba One and Mesaba Two impacts on Isle Royale National Park are required for the West Range site based on the closest distance between the two points exceeding 300 km.

Despite the added controls placed on Mesaba Two at the East Range site, impacts in the Boundary Waters Canoe Area are higher than those attending operation of Mesaba One and Mesaba Two at the West Range site where both facilities operate with BACT controls. This observation generally holds true for Rainbow Lakes Wilderness Area as well; there, the predicted annual average concentration of NO_2 is the only pollutant/averaging period where operation of Mesaba One and Mesaba Two on the West Range site exceed the impacts shown in Table 4 reflecting operations of Mesaba One and Mesaba Two at the East Range site. At Voyageurs National Park, impacts caused by operations of Mesaba One and Mesaba Two at the West Range site exceed those modeled for the East Range site for every pollutant/averaging period.

[25] Emission rates modeled for BACT and "Beyond BACT" control scenarios are provided in Tables B.2-2 and B.2-3of Appendix B (Volume 2), respectively. BACT emission rates reflect control of sulfur in product syngas via an amine-based solvent (methyldiethanolamine, or MDEA) and control of nitrogen oxides via nitrogen dilution; "Beyond BACT" rates assume control of sulfur in syngas via Selexol™ (a physical solvent) and control of nitrogen oxides via selective catalytic reduction, or SCR.

Table 3. Class I PSD Increment Modeling Results for West Range Site[1]: Mesaba One & Mesaba Two with BACT Controls[2] (All Tabulated Values Expressed in µg/m^3)

Pollutant	Averaging Period	Year Evaluated			Class I Increment (µg/m^3)	Class I SIL (µg/m^3)	Max Impact (µg/m^3)
		2002	2003	2004			
Boundary Waters Canoe Area Wilderness							
SO_2	3-Hour	1.74	1.42	1.93	25	1	**1.93**
	24-Hour	0.39	0.35	0.56	5	0.2	**0.56**
	Annual	0.018	0.018	0.018	2	0.1	0.019
NO_2	Annual	0.017	0.015	0.017	2.5	0.1	0.019
PM_{10}	24-Hour	0.25	0.37	0.25	8	0.3	**0.37**
	Annual	0.012	0.013	0.012	4	0.2	0.014
Voyageurs National Park							
SO_2	3-Hour	1.28	2.05	1.77	25	1	**1.77**
	24-Hour	0.33	0.40	0.64	5	0.2	**0.64**
	Annual	0.018	0.024	0.022	2	0.1	0.024
NO_2	Annual	0.016	0.023	0.020	2.5	0.1	0.023
PM_{10}	24-Hour	0.29	0.26	0.56	8	0.3	**0.56**
	Annual	0.012	0.015	0.015	4	0.2	0.016
Rainbow Lakes Wilderness Area							
SO_2	3-Hour	0.49	0.43	0.41	25	1	0.49
	24-Hour	0.11	0.09	0.09	5	0.2	0.11
	Annual	0.010	0.009	0.007	2	0.1	0.010
NO_2	Annual	0.009	0.015	0.006	2.5	0.1	0.015
PM_{10}	24-Hour	0.13	0.11	0.09	8	0.3	0.13
	Annual	0.008	0.008	0.006	4	0.2	0.008

1. The values shown for all modeled values are the highest concentrations modeled over the time period 2002-2004.
2. Impacts reflect Mesaba One and Mesaba Two operating under 100% capacity factor and normal operating conditions (i.e., both Mesaba One and Mesaba Two operating at full load for all hours of the year).

Source: Excelsior

Table 4. Class I PSD Increment Modeling Results for East Range Site[1]: Mesaba One with BACT & Mesaba Two with Beyond BACT Controls[2] (All Tabulated Values Expressed in µg/m^3)

Pollutant	Averaging Period	Year Evaluated			Class I Increment (µg/m^3)	Class I SIL (µg/m^3)	Max Impact (µg/m^3)
		2002	2003	2004			
Boundary Waters Canoe Area Wilderness							
SO_2	3-Hour	3.77	3.46	3.49	25	1	**3.77**
	24-Hour	0.72	0.73	1.02	5	0.2	**1.02**
	Annual	0.041	0.053	0.044	2	0.1	0.053
NO_2	Annual	0.050	0.067	0.057	2.5	0.1	0.067
PM_{10}	24-Hour	0.77	0.53	0.40	8	0.3	**0.77**
	Annual	0.023	0.026	0.022	4	0.2	0.026
Voyageurs National Park							
SO_2	3-Hour	1.28	0.89	0.96	25	1	**1.28**
	24-Hour	0.26	0.23	0.25	5	0.2	**0.26**
	Annual	0.010	0.011	0.012	2	0.1	0.012
NO_2	Annual	0.010	0.010	0.012	2.5	0.1	0.012
PM_{10}	24-Hour	0.19	0.25	0.20	8	0.3	0.25
	Annual	0.008	0.009	0.009	4	0.2	0.009
Rainbow Lakes Wilderness							
SO_2	3-Hour	0.72	0.70	0.69	25	1	0.72
	24-Hour	0.17	0.12	0.19	5	0.2	0.19
	Annual	0.008	0.009	0.010	2	0.1	0.010
NO_2	Annual	0.007	0.009	0.010	2.5	0.1	0.010
PM_{10}	24-Hour	0.16	0.11	0.21	8	0.3	0.21
	Annual	0.008	0.008	0.009	4	0.2	0.009
Isle Royale National Park							
SO_2	3-Hour	0.24	0.27	0.36	25	1	0.36
	24-Hour	0.07	0.05	0.08	5	0.2	0.08
	Annual	0.004	0.004	0.004	2	0.1	0.004
NO_2	Annual	0.005	0.003	0.004	2.5	0.1	0.005
PM_{10}	24-Hour	0.15	0.08	0.07	8	0.3	0.15
	Annual	0.008	0.007	0.006	4	0.2	0.008

1. The values shown for all modeled values are the highest concentrations modeled over the time period 2002-2004.
2. Impacts reflect Mesaba One and Mesaba Two operating under 100% capacity factor and normal operating conditions (i.e., both Mesaba One and Mesaba Two operating at full load for all hours of the year).

Source: Excelsior

Mesaba Project concentrations are "significant" under the PSD regulations for short-term SO_2 and PM_{10} emissions at the Boundary Waters Canoe Area and Voyageurs National Park. All annual average impacts (SO_2, PM_{10} and NO_2) at these two Class I areas are insignificant, as are all impacts on both the Rainbow Lakes Wilderness Area and Isle Royale National Park. Even in the cases of short-term SO_2 and PM_{10}, where Mesaba One and Mesaba Two impacts are significant under the PSD regulations, they are far below the allowable PSD increment.

5.2 Pollutant Concentrations in Class I Areas Due to Operation of PSD Increment Consuming/Expanding Sources Inclusive of Mesaba One and Mesaba Two

Multi-source PSD increment modeling results are shown in Table 5. It can be concluded from the results in Tables 3, 4, and 5 that the projected future regional emission scenario, including Mesaba One and Mesaba Two at either the West Range or East Range site, will not pose a threat to the Class I PSD increments or ambient air quality standards in the relevant Class I areas.

As noted in Section 4.1, the highest ambient SO_2 concentrations monitored for the 24-hour, 7-day, and annual averaging periods in Voyageurs National Park, Isle Royale National Park, and CASTNET data sets have been identified in order to evaluate cumulative SO_2 impacts. In like manner, ambient 24-hour and annual average concentrations of PM_{10} from the IMPROVE monitoring network have been identified. The fourth column of Table 6 presents the highest monitored ambient concentrations of SO_2 and PM_{10} in their respective multi-year datasets for each averaging period in each affected Class I area; where appropriate, the table also provides an estimate of the 3-hour average SO_2 concentration as derived from an EPA endorsed algorithm identified in Footnote p of the table. These highest monitored concentrations are added to the highest predicted concentrations derived from the multi-source modeling studies described herein (the highest values modeled for the West Range site are shown in the fifth column of Table 6; the highest modeled results for the East Range site are shown in the sixth column) to produce conservatively high estimates of cumulative impacts in the relevant Class 1 areas that can be used to assess concerns regarding overall ambient air quality impacts (the resulting sum for the West Range site is shown in the seventh column of Table 6; the sum for the East Range site is shown in the eighth column). Comparing the estimated total cumulative ambient air impacts to applicable state and federal ambient air quality standards provides evidence that there will be no threat to such standards in any Class I area in which Mesaba One and Mesaba Two create impacts above the applicable SILs. Further, the cumulative impacts analyses demonstrate that there is little difference between cumulative impacts noted for the West Range versus East Range sites.

Table 5. Estimated Impacts of Mesaba One, Mesaba Two and all Other Existing/Planned Increment Consuming/Expanding Sources on PSD Increments[1] at Relevant Class I Area Receptors (All Tabulated Concentrations Expressed in µg/m^3).

Class I Area	Pollutant	Averaging Time	Mesaba One & Two[2] Plus All Other Sources: West Range	Mesaba One & Two[3] Plus All Other Sources: East Range	Allowable Increment	Minn/NAAQS
Boundary Waters Canoe Area	SO_2	3-hour	8.63	8.06	25.0	915
		24-hour	2.68	2.45	5.0	365
		annual	NAR	NAR	2.0	60
	PM_{10}	24-hour	1.21	1.18	8.0	150
		annual	NAR	NAR	4.0	50
Voyageurs National Park	SO_2	3-hour	8.13	7.33	25.0	915
		24-hour	1.90	1.82	5.0	365
		annual	NAR	NAR	2.0	60
	PM_{10}	24-hour	1.03	0.98	8.0	150
		annual	NAR	NAR	4.0	50
Rainbow Lakes Wilderness Area	SO_2	3-hour	No SILs exceeded by operation of Mesaba One and Mesaba Two for any pollutant and its averaging period at either site			
		24-hour				
		annual				
	PM_{10}	24-hour				
		annual				
Isle Royale National Park	SO_2	3-hour	Park is located outside of 300 km radius from stacks on West Range site.	No SILs exceeded by operation of Mesaba One and Mesaba Two for any pollutant and its averaging period.		
		24-hour				
		annual				
	PM_{10}	24-hour				
		annual				

Notes:

1. Impacts are shown for those pollutants and averaging periods for which Mesaba One and Mesaba Two operating under 100% capacity factor and normal operating conditions (i.e., both Mesaba One and Mesaba Two operating at full load for all hours of the year) create impacts above the SILs (see Tables 3 and 4) over the time period 2002-2004. The values shown for 3-hour and 24-hour average concentrations are "highest second-high" values modeled at receptors; annual concentrations are highest values modeled at those receptors.
2. The "worst case" ambient impact scenario presented for the West Range site is BACT emission controls on both Mesaba One and Mesaba Two. Multi-source modeling results taken from ***Mesaba Energy Project, Mesaba One and Mesaba Two: Class I Area Interim Modeling Report in Support of NEPA Review Process***, TRC, April 2009, Table 4-8, page 26.
3. The "worst case" ambient impact scenario presented for the East Range site is BACT emission controls on Mesaba One and Beyond BACT controls on Mesaba Two. Multi-source modeling results taken from ***Mesaba Energy Project, Mesaba One and Mesaba Two: Class I Area Interim Modeling Report in Support of NEPA Review Process***, TRC, April 2009, Table 4-9, page 27.

Table 6. Estimated Cumulative Impacts of Mesaba One and Mesaba Two[1], All Existing Sources, and Reasonably Foreseeable Future Sources[2] on Ambient Air Quality at Relevant Class I Area Receptors (All Tabulated Concentrations Expressed in μg/m^3).

Class I Area	Pollutant	Averaging Time	Maximum Historical Background Data	Increment Consuming & Expanding Source Impacts: West Range	Increment Consuming & Expanding Source Impacts: East Range	Cumulative Mesaba West Range Impacts	Cumulative Mesaba East Range Impacts	Most Constraining State or National AAQS
Boundary Waters Canoe Area	SO_2	3-hour	See SO_2	9.8	8.4	29[p]	28[p]	915
		24-hour	Results for	4.1	3.7	13	12	365
		annual	VNP Below	NAR	NAR	NAR	NAR	60
	PM_{10}	24-hour	30.4[a]	2.4	2.3	33	33	150
		annual	7.4[b]	NAR	NAR	NAR	NAR	50
Voyageurs National Park	SO_2	3-hour	19[p]	12	11	31[p]	30[p]	915
		24-hour/7-day	8.6[c]/3.8[e]	2.4	2.1	11	11	365
		annual	0.76[d],0.97[f]	NAR	NAR	NAR	NAR	60
	PM_{10}	24-hour	34[g]	1.5	1.4	36	35	150
		annual	7.6[h]	NAR	NAR	NAR	NAR	50
Rainbow Lakes Wilderness Area	SO_2	3-hour	NA	No SILs exceeded for any pollutant and its averaging period.		NAR for any normal operating scenario		
		24-hour/7-day	NA/7.9[i]					
		annual	1.8[j]					
	PM_{10}	24-hour	NA					
		annual	<10[k]					
Isle Royale National Park	SO_2	3-hour	NA	Park is located outside of 300 km radius from stacks on West Range site.	No SILs exceeded for any pollutant and its averaging period.	NAR for any normal operating scenario		
		24-hour	4.0[l]					
		annual	0.60[m]					
	PM_{10}	24-hour	36.7[n]					
		annual	8.2[o]					

Abbreviations:

NA = Not Available VNP = Voyageurs National Park RLWA = Rainbow Lakes Wilderness Area SIL = Significant Impact Level
NAR = No Analysis Required IRNP = Isle Royale National Park MEP = Mesaba Energy Project WR = West Range
ER = East Range AAQS = Ambient Air Quality Standard

Notes & References (Continued on the following page):

1. Impacts are shown for those pollutants for which Mesaba One and Mesaba Two operating under 100% capacity factor and normal operating conditions (i.e., both Mesaba One and Mesaba Two operating at full load for all hours of the year) create impacts above the SILs (see Tables 3 and 4). The values shown for all modeled values are the highest concentrations modeled over the time period 2002-2004. For the West Range site, cumulative impacts are based on Mesaba One and Mesaba Two operating at BACT emission rates; cumulative impacts for the East Range site are based on operation of Mesaba One and Mesaba Two

at BACT and Beyond BACT emission rates, respectively. Multi-source modeling results taken from ***Mesaba Energy Project, Mesaba One and Mesaba Two: Class I Area Interim Modeling Report in Support of NEPA Review Process***, TRC, April 2009, Tables 4-8 and 4-9, pp 26 and 27.

2. The method used to estimate cumulative impacts on ambient SO_2 and PM_{10} concentrations in affected Class I areas involves: i) modeling emissions of known increment consuming sources and reasonably foreseeable future sources (including Mesaba One and Mesaba Two) within a 300 km radius of the Class I Area, and ii) using ambient monitoring data to estimate the contribution of long standing, unmodified emission sources within and outside the 300 km radius. The ambient air quality monitoring data will include the impacts of many existing increment consuming sources, so the modeling double counts their impacts. This will result in a conservatively high estimate of cumulative ambient air impacts.

References

a. IMPROVE database for BOWA1 monitoring site (see Footnote 9 in Section 4.1, BOWA1 dataset); maximum 24-hour value observed for Total PM_{10} mass between January 1, 2000 and December 29, 2003 was on October 12, 2000.
b. IMPROVE database for BOWA1 monitoring site; maximum annual average obtained by averaging valid samples for Total PM_{10} mass for calendar years 2000-2003 was for 2000 (86 observations between January 1, 2000 and December 11, 2000).
c EPA TTN AQS Data Mart (see Footnote 6 in Section 4.1, VNP#1 dataset); maximum 24 hr value observed between May 28, 1988 and August 28, 1993 (481 values) was on January 20, 1993.
d. EPA TTN AQS Data Mart, maximum annual average obtained by averaging non-negative observations within a given calendar year between 1988 and 1993 was for 1993 (48 observations between January 2, 1993 and August 28, 1993.
e CASTNET database for VOY413 monitoring site (see Footnote 7 in Section 4.1, VOY413 dataset); maximum 7-day value observed for Total SO_2 (wso2 + 0.667*nso4) between October 13, 1998 and October 20, 1998.
f. CASTNET database for VOY413 monitoring site; maximum annual average obtained by averaging valid samples for Total SO_2 (wso2 + 0.667*nso4) for calendar years between 1996 and 2007 was for 1997 (52 observations between December 31, 1996 and December 30, 1997).
g. IMPROVE database for VOYA2 monitoring site; maximum 24-hour value observed for Total PM_{10} mass between January 1, 2000 and December 29, 2003 was on July 19, 2002.
h. IMPROVE database for VOYA2 monitoring site; maximum annual average obtained by averaging valid samples for Total PM_{10} mass for calendar years 2000-2003 was for 2003 (117 observations between January 3, 2003 and December 29, 2003).
i. CASTNET database for PRK134 monitoring site; maximum 7-day value observed for Total SO_2 (wso2 + 0.667*nso4) observed during December 12, 2000 to December 19, 2000 monitoring period.
j. CASTNET database for PRK134 monitoring site; maximum annual average obtained by averaging valid samples for Total SO_2 (wso2 + 0.667*nso4) for calendar years between 1998 and 2007 was for 1999 (52 observations between January 6, 1999 and January 4, 2000).
k. IMPROVE website graphic viewer at http://vista.cira.colostate.edu/improve/Data/Graphic_Viewer/seasonal.htm provides 10 $\mu g/m^3$ annual average Total PM_{10} mass isopleth at approximate location of RLWA for time period 1996 to1998.
l EPA TTN AQS Data Mart ISRO dataset; maximum 24 hr value observed between June 1, 1988 and July 27, 1991 (161 values) was on February 4, 1989.
m. EPA TTN AQS Data Mart ISRO dataset, maximum annual average obtained by averaging non-negative observations within a given calendar year between 1988 and 1991 was for 1989 (55 observations between January 18, 1989 and October 18, 1989.
n. IMPROVE database for ISLE1 monitoring site; maximum 24-hour value observed for Total PM_{10} mass between January 1, 2000 and December 29, 2003 was on June 28, 2002.
o. IMPROVE database for ISLE1 monitoring site; maximum annual average obtained by averaging valid samples for Total PM_{10} mass for calendar years 2000-2003 was for 2002 (122 observations between January 2, 2002 and December 31, 2002).
p. In the absence of historical 3-hour average ambient air quality monitoring data, an estimate for the 3-hour average concentration has been derived using an algorithm taken from "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised", EPA Office of Air Quality and Standards, EPA454/R-92-019, October 1992. The estimate involves dividing the 24-hour SO_2 concentration by 0.4 and multiplying the resulting value by 0.9.

5.3 Terrestrial and Aquatic Impacts:

Deposition of Sulfur and Nitrogen

The CALPUFF/CALPOST programs generate calculations of total annual sulfur and nitrogen deposition to the ground surface by summing contributions from all sulfur and nitrogen species (gaseous and particulate) at each Class I receptor. Results presented here for each of the foreseeable future projects that have submitted formal Class I modeling reports to a public agency represent the highest annual deposition value for any receptor and any of the three years modeled, for each relevant Class I area.

Table 7 presents total (wet plus dry) sulfur and nitrogen deposition predictions for Mesaba One and Mesaba Two alone. Table 8 provides historical wet and dry sulfur deposition monitored at NADP and CASTNET sites and derived as noted in Section 4.2. Table 9 presents the summation of sulfur deposition across Mesaba One and Mesaba Two, the maximum sulfur deposition presented in foreseeable source modeling studies placed in the public domain, and historical data as noted above. The highest Mesaba deposition relative to total cumulative deposition ranges from 1.8 percent for East Range sulfur impacts in the Boundary Waters, to 0.6% for East Range nitrogen impacts in the Boundary Waters.

Tables 10 and 11 present comparable nitrogen deposition estimates to those presented for sulfur deposition in Tables 8 and 9, respectively.

For NPS Class I areas (Voyageurs NP) no acceptable deposition values for impacts on soils or waters have been established. A "deposition analysis threshold" of 0.01 kg/ha-yr is given as a level below which no adverse impacts are expected.

The U.S. Forest Service has defined screening criteria for terrestrial and aquatic impacts of deposition. The "Green Line" criteria define levels "at which it was reasonably certain that no significant change would be observed in ecosystems that contain large numbers of sensitive components". The USFS Green Line levels for the Boundary Waters Canoe Area and Rainbow Lakes Wilderness Area are shown in Tables 9, 11, and 12. Table 12 indicates that total sulfur and nitrogen deposition, including background, will be within the acceptable Green Line ranges.

SO_2 Concentration

Table 13 provides a comparison between the U.S. Forest Service's Green Line criteria established for SO_2 in the Eastern United States. The tabulated values in Table 13 have been taken from earlier tables and, together with background concentrations of SO_2 monitored in or near Class I areas of interest, demonstrate that Mesaba One and Mesaba Two will have very little effect in moving the concentration of SO_2 in such areas closer to the Green Lines identified.

Table 7. Total Sulfur and Nitrogen Deposition[1]: Mesaba One and Mesaba Two[2]

Class I Area	West Range Site						East Range Site					
	Wet + Dry Sulfur Deposition (kg/ha-yr)			Wet + Dry Nitrogen Deposition (kg/ha-yr)			Wet + Dry Sulfur Deposition (kg/ha-yr)			Wet + Dry Nitrogen Deposition (kg/ha-yr)		
	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
Boundary Waters Canoe Area	0.012	0.014	0.011	0.0077	0.0082	0.0075	0.035	0.036	0.038	0.022	0.025	0.023
Voyageurs National Park	0.015	0.016	0.015	0.0084	0.0099	0.0092	0.012	0.011	0.012	0.0061	0.0059	0.0074
Rainbow Lakes Wilderness Area	0.0060	0.0065	0.0059	0.0040	0.0042	0.0040	0.0044	0.0061	0.0067	0.0027	0.0043	0.0047
Isle Royale National Park	Isle Royale National Park Greater Than 300 km Distant from Mesaba One and Mesaba Two at West Range Site						0.0045	0.0040	0.0048	0.0017	0.0015	0.0017
FLM DAT[3]	0.01			0.01			0.01			0.01		

1. Values represent maximum deposition modeled via CALPUFF at Class I area receptors, inclusive of those within parts of the Boundary Waters Canoe Area (BWCA) that are located less than 50 km from Mesaba One and Mesaba Two. Use of CALPUFF to provide deposition at BWCA receptors less than 50 km from Mesaba One and Mesaba Two approved by FLMs in Proponents Class I Area Modeling Protocol (see Footnote 4)
2. West Range results are based on normal operation of Mesaba One and Mesaba Two at BACT emission rates; the East Range results are based on normal operation of Mesaba One and Mesaba Two at BACT and Beyond BACT emission rates, respectively. Normal conditions reflect full load operation of Mesaba One and Mesaba Two over all hours in a calendar year.
3. The deposition analysis threshold (DAT) represents the additional amount of nitrogen or sulfur deposition within a Class I area below which estimated impacts from a proposed new or modified source are considered by the Federal Land Managers to be negligible. See page 95 from "Federal Land Managers' Air Quality Related Values Workgroup (Flag), Phase I Report—*Revised*", U.S. Forest Service – Air Quality Program, National Park Service – Air Resources Division, U.S. Fish And Wildlife Service – Air Quality Branch (June 27, 2008 Draft). Guidance on the use of DATs is provided on the Federal Land Manager's AQRV Group website at http://www.nature.nps.gov/air/Pubs/pdf/flag/nsDATGuidance.pdf.

Table 8. Annual Average Sulfur Deposition Derived from Historical Data Collected Over 2000-2007 Time Period at CASTNET and NADP Monitoring Sites Located In Or Nearby Class I Areas within 300 km of Mesaba One and Mesaba Two

Class I Area	Boundary Waters Canoe Area	Voyageurs National Park	Rainbow Lakes Wilderness Area	Isle Royale National Park
Annual Average Wet Sulfur Deposition (kg/ha-year)	1.61[a]	1.59[b]	2.35[c]	2.21[d]
Annual Average Dry Sulfur Deposition (kg/ha-year)	0.4[e]	0.4[e]	0.87[f]	0.4[e]
Annual Average Historical Wet + Dry Deposition (kg/ha-year)	2.01	1.98	3.21	2.61

a. Wet sulfur deposition from NADP monitoring site (MN18) located at the end of the Fernberg Road near Ely, Minnesota.
b. Wet sulfur deposition from NADP monitoring site (MN32) located in Park at Sullivan Bay.
c. Wet sulfur deposition from NADP monitoring site (W137) located near Spooner, Wisconsin.
d. Wet sulfur deposition from NADP monitoring site (MN08) located near Hovland, Minnesota.
e. Dry sulfur deposition from CASTNET monitoring site (VOY413) co-located at NADP monitoring site in Park at Sullivan Bay.
f. Dry sulfur deposition from CASTNET monitoring site (PRK134) located 90 miles south-southwest of Wilderness Area.

Table 9. Cumulative Sulfur Deposition in Class I Areas within 300 km of Mesaba One and Mesaba Two (All Tabulated Values in kg/ha-year)

Class I Area	Boundary Waters Canoe Area		Voyageurs National Park		Rainbow Lakes Wilderness Area		Isle Royale National Park	
Emission Source	**West Range**	**East Range**	**West Range**	**East Range**	**West Range**	**East Range**	**West Range**	**East Range**
Mesaba One/Two[1]	0.014	0.038	0.016	0.012	0.0065	0.0067	NA	0.0048
Essar Steel[2]	0.006		0.005		0.002		0.001	
Mesabi Nugget I[3]	0.017		0.002		0.002		0.006	
Mesabi Nugget II[4]	0.019		0.006		0.003		0.002	
Keewatin Taconite[5]	0.005		0.005		0.002		0.001	
Annual Average Historical Wet + Dry Sulfur Deposition	2.01		1.98		3.21		2.61	
Total Sulfur Deposition	2.07	2.09	2.01	2.01	3.23	3.23	NA	2.62
Green Line Value[6] Or Deposition Analysis Threshold (DAT)[7]	5-7		0.01		5-7		0.01	

Abbreviations:
NA = Not Applicable NAR = No Analysis Required

Notes:

1. From Table 6.
2. From Table 4-5 in "Class I Air Modeling Report", March 2007, prepared for Minnesota Steel Industries, LLC (aka Essar Steel Minnesota) by Barr Engineering Co.
3. From Table 3-8 in "Class I Air Modeling Report, Mesabi Nugget, LLC, Hoyt Lakes, Minnesota", May2005, prepared by Mesabi Nugget, LLC and Barr Engineering Co.
4. From Table 4-3 in "Class I Air Modeling Report, Mesabi Nugget Phase II Project", March 2009, prepared for Steel Dynamics, Inc. and Mesabi Mining, LLC by Mesabi Nugget and Barr Engineering Co. NOTE: Report submitted as a draft version for agency review therefore, results are to be deemed preliminary.
5. From Table 4-3 in "Class I Air Modeling Report, Keetac Expansion Project", January 2009, prepared for U.S. Steel by Barr Engineering Co.
6. Green line deposition from Adams et al., "Screening Procedures to Evaluate Effects of Air Pollution on Eastern Wildernesses Cited as Class I Air Quality Areas", USDA, Forest Service, Northeast Forest Experiment Station, Generator Technical Report NE-151, September 1991.
7. See page 95 from "Federal Land Managers' Air Quality Related Values Workgroup (Flag), Phase I Report—*Revised*", U.S. Forest Service – Air Quality Program, National Park Service – Air Resources Division, U.S. Fish And Wildlife Service – Air Quality Branch (June 27, 2008 Draft).

Table 10. Annual Average Nitrogen Deposition Derived from Historical Data Collected Over 2000-2007 Time Period at CASTNET and NADP Monitoring Sites Located In Or Nearby Class I Areas within 300 km of Mesaba One and Mesaba Two

Class I Area	Boundary Waters Canoe Area	Voyageurs National Park	Rainbow Lakes Wilderness Area	Isle Royale National Park
Annual Average Wet Nitrogen Deposition	3.15[a]	3.51[b]	1.12[c]	3.79[d]
Annual Average Dry Nitrogen Deposition	0.69[e]	0.69[e]	4.92[f]	0.69[e]
Annual Average Historical Wet + Dry Nitrogen Deposition	3.85	4.2	6.03	4.48

a. Wet nitrogen deposition from NADP monitoring site (MN18) located at the end of the Fernberg Road near Ely, Minnesota.
b. Wet nitrogen deposition from NADP monitoring site (MN32) located in Park at Sullivan Bay.
c. Wet nitrogen deposition from NADP monitoring site (W137) located near Spooner, Wisconsin.
d. Wet nitrogen deposition from NADP monitoring site (MN08) located near Hovland, Minnesota.
e. Dry nitrogen deposition from CASTNET monitoring site (VOY413) co-located at NADP monitoring site in Park at Sullivan Bay.
f. Dry nitrogen deposition from CASTNET monitoring site (PRK134) located 90 miles south-southwest of Wilderness Area.

Table 11. Cumulative Nitrogen Deposition in Class I Areas within 300 km of Mesaba One and Mesaba Two (All Tabulated Values in kg/ha-year)

Class I Area	Boundary Waters Canoe Area		Voyageurs National Park		Rainbow Lakes Wilderness Area		Isle Royale National Park	
Emission Source	**West Range**	**East Range**	**West Range**	**East Range**	**West Range**	**East Range**	**West Range**	**East Range**
Mesaba One/Two[1]	0.0082	0.025	0.0099	0.0074	0.0042	0.0047	NA	0.0017
Essar Steel[2]	0.007		0.008		0.003		0.001	
Mesabi Nugget I[3]	0.016		0.001		0.002		0.005	
Mesabi Nugget II[4]	0.024		0.006		0.003		0.001	
Keewatin Taconite[5]	0.001		0.001		0.000		0.000	
Annual Average Historical Wet + Dry Deposition	3.85		4.20		6.03		4.48	
Total Nitrogen Deposition	3.91	3.92	4.23	4.22	6.04	6.04	NA	4.49
Green Line Value[6] Or Deposition Analysis Threshold[7]	5-8		0.01		5-8		0.01	

Abbreviations:
NA = Not Applicable NAR = No Analysis Required
Notes:

1. From Table 6.
2. From Table 4-5 in "Class I Air Modeling Report", March 2007, prepared for Minnesota Steel Industries, LLC (aka Essar Steel Minnesota) by Barr Engineering Co.
3. From Table 3-8 in "Class I Air Modeling Report, Mesabi Nugget, LLC, Hoyt Lakes, Minnesota", May2005, prepared by Mesabi Nugget, LLC and Barr Engineering Co.
4. From Table 4-3 in "Class I Air Modeling Report, Mesabi Nugget Phase II Project", March 2009, prepared for Steel Dynamics, Inc. and Mesabi Mining, LLC by Mesabi Nugget and Barr Engineering Co. NOTE: Report submitted as a draft version for agency review, therefore, results are to be deemed preliminary.
5. From Table 4-3 in "Class I Air Modeling Report, Keetac Expansion Project", January 2009, prepared for U.S. Steel by Barr Engineering Co.
6. Green line deposition from Adams et al., "Screening Procedures to Evaluate Effects of Air Pollution on Eastern Wildernesses Cited as Class I Air Quality Areas", USDA, Forest Service, Northeast Forest Experiment Station, Generator Technical Report NE-151, September 1991.
7. See page 95 from "Federal Land Managers' Air Quality Related Values Workgroup (Flag), Phase I Report—*Revised*", U.S. Forest Service – Air Quality Program, National Park Service – Air Resources Division, U.S. Fish And Wildlife Service – Air Quality Branch (June 27, 2008 Draft).

Table 12. Comparison of Annual Cumulative Sulfur and Nitrogen Deposition to Green Line Criteria for Impacts to Terrestrial and Aquatic Ecosystems.

Class I Area	Parameter	Background (1) (kg/ha-yr)	Reasonably Foreseeable Project Impacts(2) (kg/ha-yr)	Mesaba One & Mesaba Two(3) (kg/ha-yr)		Cumulative Impacts (kg/ha-yr)		Green Line (4) Value or DAT (kg/ha-yr)
				West Range	East Range	West Range	East Range	
BWCA	Terrestrial							
	Total S Depo	2.01	0.047	0.014	0.038	2.07	2.10	5-7
	Total N Depo	3.85	0.048	0.0082	0.025	3.91	3.92	5-8
	Aquatic							
	Total S Depo	2.01	0.047	0.014	0.038	2.07	2.10	7.5-8
	S + 20% N	2.78	0.057	0.016	0.043	2.85	2.88	9-10
RLWA	Terrestrial							
	Total S Depo	3.21	0.009	0.0065	0.0067	3.23	3.23	5-7
	Total N Depo	6.03	0.008	0.0042	0.0047	6.04	6.04	5-8
	Aquatic							
	Total S Depo	3.21	0.009	0.0065	0.0067	3.23	3.23	3.5-4.5
	S + 20% N	4.42	0.011	0.0073	0.0076	4.43	4.43	4.5-5.5
VNP	Terrestrial							
	Total S Depo	1.98	0.012	0.016	0.012	2.01	2.00	0.01
	Total N Depo	4.20	0.016	0.0099	0.0074	4.23	4.22	0.01
	Aquatic							
	Total S Depo	1.98	0.012	0.016	0.012	2.01	2.00	0.01
	S + 20% N	2.82	0.015	0.018	0.013	2.85	2.85	0.01
IRNP	Terrestrial							
	Total S Depo	2.61	0.010	Not	0.0049	Not	2.62	0.01
	Total N Depo	4.48	0.007	Applicable	0.0017	Applicable	4.49	0.01
	Aquatic							
	Total S Depo	2.61	0.010	Not	0.0048	Not	2.62	0.01
	S + 20% N	3.51	0.011	Applicable	0.0051	Applicable	3.52	0.01

(1) From Tables 8 and 10.
(2) From Tables 9 and 11.
(3) From Table 7.
(4) Green Line Values from "Screening Procedure to Evaluate Effects of Air Pollution on Eastern Region Wilderness Cited as Class I Air Quality Areas", USFS, 1991. Deposition analysis threshold from Table 7.

Table 13. Comparison of Cumulative[1,2] SO_2 Concentrations to Green Line Criteria for Impacts to Terrestrial Ecosystems, Flora and Fauna (All Tabulated Concentrations Expressed in µg/m^3).

Class I Area	Pollutant	Averaging Time	Maximum Historical Background Data	Increment Consuming & Expanding Source Impacts: West Range	Increment Consuming & Expanding Source Impacts: East Range	Cumulative Mesaba West Range Impacts[3]	Cumulative Mesaba East Range Impacts[3]	Green Line Criteria[4]
BWCA	SO_2	3-hour	19[a]	9.8	8.4	29[p]	27[p]	100
		24-hour[5]	8.6					
		annual	0.76[d],0.97[f]	No multi-source analysis required		0.097+0.018[j]= 0.12	0.097+0.053[j]= 0.15	5
VNP	SO_2	3-hour	19[a]	12	11	31[p]	30[p]	100
		24-hour[5]	8.6[c]					
		annual	0.76[d],0.97[e]	No multi-source analysis required		0.097+0.024[i]= 0.12	0.097+0.012[j]= 0.11	5
RLWA	SO_2	3-hour	20[b]	No multi-source analysis required		20+0.49[i]= 20	20+0.72[j]= 21	100
		24-hour[5]	NA					
		annual	1.8[f]			1.8+0.01[i]= 1.8	1.8+0.010[j]= 1.8	5
IRNP	SO_2	3-hour	9.0[a]	Site >300 km from West Range site	No multi-source analysis required	Site >300 km from West Range site	9.0+0.36[i]= 9.4	100
		24-hour[5]	4.0[g]					
		annual	0.60[h]				0.60+0.004[j]= 0.60	5

Abbreviations:

NA = Not Available BWCA = Boundary Waters Canoe Area VNP = Voyageurs National Park RLWA = Rainbow Lakes Wilderness Area IRNP = Isle Royale National Park

Notes & References (Continued on the following page):

1. Cumulative impacts from all sources – including Mesaba One and Mesaba Two – are shown for those pollutants for which Mesaba One and Mesaba Two operating under 100% capacity factor and normal operating conditions (i.e., both Mesaba One and Mesaba Two operating at full load for all hours of the year) create impacts above the SILs (see Tables 2 and 3); the values shown for all modeled values in such instances are the highest concentrations modeled using the multi-source inventory over the time period 2002-2004. For the West Range site, cumulative impacts are based on Mesaba One and Mesaba Two operating at BACT emission rates; cumulative impacts for the East Range site are based on operation of Mesaba One and Mesaba Two at BACT and Beyond BACT emission rates, respectively.
2. The method used to estimate cumulative impacts on ambient SO_2 and PM_{10} concentrations in affected Class I areas involves: i) modeling emissions of known increment consuming sources and reasonably foreseeable future sources (including Mesaba One and Mesaba Two) within a 300 km radius of the Class I Area,

and ii) using ambient monitoring data to estimate the contribution of long standing, unmodified emission sources within and outside the 300 km radius. The ambient air quality monitoring data will include the impacts of many existing increment consuming sources, so the modeling double counts their impacts. This will result in a conservatively high estimate of cumulative ambient air impacts.

3. For the Class I areas and/or averaging periods where multi-source modeling was not required, the highest background levels for the applicable averaging period were added to the impacts of Mesaba One and Mesaba Two only to give a indication of the relative difference between the Green Line criterion and the sum of background ambient air and the worst case modeled impacts of Mesaba One and Two
4. Green Line Values from "Screening Procedure to Evaluate Effects of Air Pollution on Eastern Region Wilderness Cited as Class I Air Quality Areas", USFS, 1991.
5. There is no "green line" SO_2 concentration for the 24-hour averaging period. Monitored SO_2 concentrations for the 24-hour averaging period are shown because where they exist, they are used to estimate the concentrations for 3-hour averaging periods using an algorithm taken from "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised", EPA Office of Air Quality and Standards, EPA454/R-92-019, October 1992, page 4-15. The estimate involves dividing the 24-hour SO_2 concentration by 0.4 and multiplying the resulting value by 0.9.

References

a. The 3-hour average shown is calculated from the 24-hour average SO2 concentration monitored at or near the specified Class I area (see note 5 above).
b. The 3-hour SO_2 concentrations shown has estimated from the annual average concentration monitored at a location relatively close to RLWA using an algorithm taken from "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised", EPA Office of Air Quality and Standards, EPA454/R-92-019, October 1992, page 4-15. The estimate involves dividing the annual average SO_2 concentration by 0.08 and multiplying the resulting value by 0.9.
c EPA TTN AQS Data Mart (see Footnote 6 in Section 4.1, VNP#1 dataset); maximum 24 hr value observed between May 28, 1988 and August 28, 1993 (481 values) was on January 20, 1993.
d. EPA TTN AQS Data Mart, maximum annual average obtained by averaging non-negative observations within a given calendar year between 1988 and 1993 was for 1993 (48 observations between January 2, 1993 and August 28, 1993.
e. CASTNET database for VOY413 monitoring site; maximum annual average obtained by averaging valid samples for Total SO_2 (wso2 + 0.667*nso4) for calendar years between 1996 and 2007 was for 1997 (52 observations between December 31, 1996 and December 30, 1997).
f. CASTNET database for PRK134 monitoring site; maximum annual average obtained by averaging valid samples for Total SO_2 (wso2 + 0.667*nso4) for calendar years between 1998 and 2007 was for 1999 (52 observations between January 6, 1999 and January 4, 2000).
g. EPA TTN AQS Data Mart ISRO dataset; maximum 24 hr value observed between June 1, 1988 and July 27, 1991 (161 values) was on February 4, 1989.
h. EPA TTN AQS Data Mart ISRO dataset, maximum annual average obtained by averaging non-negative observations within a given calendar year between 1988 and 1991 was for 1989 (55 observations between January 18, 1989 and October 18, 1989.
i. From Table 3.
j. From Table 4.

5.4 Cumulative Visibility Impacts

In its comments on the DEIS[26], the U.S. Forest Service stated "the assessment of cumulative visibility impacts [in the Boundary Waters Canoe Area and Voyageurs National Park] are probably best dealt with through the regional haze program and plan being developed by the State of Minnesota."

The state's program and plan to address regional haze are in support of its responsibilities under the federal Regional Haze Regulations promulgated by EPA on July 1, 1999[27] and codified at 40 CFR Part 51, §§ 51.300 through 51.309. The requirements of 40 CFR 51.308(d)(1) call for states to establish Reasonable Progress Goals (RPGs) for each Class I area within its boundaries; under 40 CFR 51.308(d)(3), states are required to submit a long term strategy that includes measures to achieve such goals; and under 40 CFR 51.308(d)(4) specify emission limitations representing Best Available Retrofit Technology (BART).

In 2005, EPA promulgated final guidelines for BART determinations and codified them in Appendix Y to 40 CFR Part 51.[28] In Section IV(D) of Appendix Y, EPA specifies five steps of determining BART on a case by case basis, the first step of which addresses how to identify all available retrofit emission control techniques[29]. Paragraph 7 of the first step involves identifying potentially applicable retrofit control technologies that represent the full range of ***demonstrated*** alternatives [emphasis added]. Examples are given of general information sources to consider, one of which includes technical reports issued as part of the U.S. Department of Energy's Clean Coal Program.

EPA released final guidance on June 1, 2007 to use in setting RPGs.[30] In Section 1.2 on page 1-2, the EPA guidance states:

> "RPGs are interim goals that represent incremental visibility improvement over time toward the goal of natural background conditions and are developed in consultation with other affected States and Federal Land Managers (FLMs). In determining what would constitute reasonable progress, section 169A(g) of the CAA requires States to consider the following four factors:
>
> - The costs of compliance;
> - The time necessary for compliance;
> - The energy and non-air quality environmental impacts of compliance; and
> - The remaining useful life of existing sources that contribute to visibility impairment.
>
> States must demonstrate in their SIPs how these factors are taken into consideration in selecting the RPG for each Class I area in the State... the Regional Haze Rule establishes an additional analytical requirement for States in the process of establishing the RPG. This analytical requirement requires States to determine the rate of improvement in visibility needed to reach

[26] December 17, 2007 letter from James Sanders (Forest Supervisor, Superior National Forest, U.S. Forest Service, U.S. Department of Agriculture) to Richard Hargis, Jr. (National Energy Technology Laboratory, U.S. Department of Energy).
[27] *See* 64 Fed. Reg. 35714.
[28] *See* 70 Fed. Reg. 39104.
[29] *See* 70 Fed. Reg. 39164.
[30] *See* http://www.pca.state.mn.us/publications/rhsip-chapter10-11.pdf, page 75.

natural conditions by 2064, and to set each RPG taking this 'glidepath' into account…EPA adopted this approach, in part, to ensure that States use a common analytical framework that accounts for the regional difference affecting visibility and, in part, to ensure an informed and equitable decision making process. The glidepath is not a presumptive target, and States may establish a RPG that provides for greater, lesser, or equivalent visibility improvement as that described by the glidepath."

In Chapter 10 of Minnesota's Draft Regional Haze State Implementation Plan[31], MPCA lays out its long term strategy for achieving its RPGs and in Appendix 10.4 lays out its "Concept Plan for Addressing Major Point Sources in Northeastern Minnesota"[32] (hereafter, the "Plan"). The Plan establishes five principles under which it proposes to attain its vision and goals. The fourth of the five goals is as follows:

4. The MPCA commits to develop a Regional Haze State Implementation Plan (SIP) that spurs development of innovative emission control strategies in source sectors that currently are uncontrolled or under-controlled.

The goals of the Plan and Mesaba One/Two align with one another as exemplified by the first of the Project's two statements of Purpose and Need:

> Confirm the commercial viability of generating electrical power by means of a fuel-flexible integrated gasification combined cycle (IGCC) technology in a utility-scale application.

The Project is designed to achieve SO_2 and NO_X emission rates that other coal-fired steam electric generating technologies will find difficult to rival. The only reason that IGCC technology is kept from being considered as a BART alternative for relevant facilities or as BACT for new sources or those undergoing major modification is that IGCC has not been commercially ***demonstrated*** in a large, utility-scale application [emphasis added]. Once the Project demonstrates the commercial readiness of IGCC using ConocoPhillips' E-Gas™ technology the capital costs of the equipment is expected to decrease. Such decreases will lower the cost of compliance allowing IGCC to be considered a future BART and BACT alternative for sources using a host of different fuels.

Although projections of net effects of commercialization of IGCC technology alone are not currently available, DOE has made projections of the market penetration of various technologies under various scenarios of fuel prices and regulations to estimate the benefits of the implementation of the fossil energy R&D program (DOE, 2007). This analysis considers the potential market penetration of fossil energy technologies, as well as nuclear and renewable energy technologies. Depending on the scenario considered, the implementation of the fossil energy R&D program would result in IGCC capturing from three percent to nine percent of the total market by 2025. Since fossil energy would still provide a substantial portion of the nation's electricity supply under all scenarios, the analysis shows that implementation of the fossil energy R&D program, which includes IGCC, would result in

[31] *See* http://www.pca.state.mn.us/air/regionalhaze.html.
[32] *See* http://www.pca.state.mn.us/publications/rhsip-appendix10.pdf.

emission reductions of NO_X, SO_2, and CO_2 by the year 2025, relative to a scenario that does not involve fossil energy R&D and the subsequent advancement of IGCC technology.

Given the number of sources that use subbituminous coal inside and upwind of Minnesota, the Project potentially represents a very important element in achieving the state's ultimate goal to enhance visibility in the State's Class I areas and those nearby.

5.3 Estimated Maximum Ambient Air Concentration of Mercury in Class I Areas Due to Operation of Mesaba One and Mesaba Two

Tables 14 and 15 provide – using the assumptions given in Section 1 – estimates of the maximum concentration of elemental mercury in each Class I area due to operating Mesaba One and Mesaba Two at the West Range and East Range sites, respectively. The concentrations shown, in ng/m^3, represent the 3-year average highest ambient elemental mercury concentration at any point in each Class I area. The highest values in the tables can be compared to the commonly accepted[33] background ambient air concentration of elemental mercury of 1 to 2 ng/m^3 to obtain an indication of the overall impact of Mesaba One and Mesaba Two. Presuming the background ambient air concentration of elemental mercury in rural areas to be 1.5 ng/m^3, Tables 14 and 15 provide a relative indication of the contribution Mesaba One and Mesaba Two (operating at the West Range and East Range sites, respectively) would have on background elemental mercury concentrations.

Table 14. Maximum Estimated West Range Mercury Concentration & Impacts on Background Mercury Concentration[34]

Year	Boundary Waters Canoe Area (ng/m3)	Voyaguers National Park (ng/m3)	Rainbow Lake Wilderness Area (ng/m3)
2002	1.34E-03	1.57E-03	7.96E-04
2003	1.23E-03	1.59E-03	6.82E-04
2004	1.19E-03	1.52E-03	5.27E-04
	Mesaba One and Mesaba Two Impacts on Ambient Mercury Concentration Presuming Background Ambient Air Concentration of Elemental Mercury Is 1.5 ng/m^3		
	0.09%	0.11%	0.05%

[33] See footnotes 23 and 24 and also http://daq.state.nc.us/toxics/studies/mercury/ and http://www.dnr.state.wi.us/air/toxics/mercury/Mon/

[34] See ***Mesaba Energy Project, Mesaba One and Mesaba Two: Class I Area Interim Modeling Report in Support of NEPA Review Process***, TRC, April 2009, Table 4-16, page 39.

Table 15. Maximum Estimated East Range Mercury Concentration & Impacts on Background Mercury Concentration[35]

Year	Boundary Waters Canoe Area (ng/m3)	Voyaguers National Park (ng/m3)	Rainbow Lake Wilderness Area (ng/m3)	Isle Royale National Park (ng/m3)
2002	3.55E-03	1.13E-03	8.58E-04	7.25E-04
2003	4.14E-03	1.10E-03	8.73E-04	6.42E-04
2004	3.46E-03	1.15E-03	9.87E-04	6.30E-04
	Mesaba One and Mesaba Two Impacts on Ambient Mercury Concentration Presuming Background Ambient Air Concentration of Elemental Mercury Is 1.5 ng/m^3			
	0.28%	0.08%	0.07%	0.05%

[35] See ***Mesaba Energy Project, Mesaba One and Mesaba Two: Class I Area Interim Modeling Report in Support of NEPA Review Process***, TRC, April 2009, Table 4-17, page 39.

APPENDIX D2
Health Risk

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MEMORANDUM

TO: Robert Evans, Excelsior Energy, Inc.

FROM: Gloria Chojnacki, SEH Inc.

DATE: February 20, 2009

RE: Cumulative Risk Impacts Evaluation – Mesaba Energy Project
SEH No. EXENR 102654 14.00

Cumulative impacts resulting from air toxics emissions from the Mesaba Energy Project (Mesaba), nearby existing facilities, and other potential future emission sources listed in Section D.3 of this appendix (Draft EIS Appendix D) are evaluated at both the Mesaba East Range location near Hoyt Lakes, Minnesota and the West Range location near Taconite, Minnesota. In addition to the Mesaba facility, future operations at the proposed Minnesota Steel Industries (MSI) plant near the Mesaba West Range location are considered in this evaluation. Emission sources evaluated at the Mesaba East Range location include the existing Laskin Energy Center (southwest of Mesaba), the proposed Mesabi Nugget facility (northwest of Mesaba) and the proposed PolyMet Mining (PolyMet) project (north of Mesaba). It is noted that only the Laskin Energy Center (Laskin) is currently in operation near the proposed East Range location.

Two proposed wood-fired boilers at the Laurentian Wood-Fired Generation Plants located near Virginia, Minnesota and Hibbing, Minnesota are also listed in Section D.3 of this appendix (Draft EIS Appendix D) as potential future emission sources. The Laurentian facility at Hibbing would be approximately 35 kilometers (km) from the proposed West Range Mesaba location, and the Laurentian facility at Virginia would be approximately 40 km from the proposed East Range location. Because of the relatively large distances from the Mesaba plant, the incremental risk which the Laurentian facilities would contribute due to exposure to air toxics would not be significant and so are not evaluated further.

Approach

In order to evaluate cumulative risk impacts from the proposed Excelsior Energy Project, other exiting sources of pollutants, and ambient background pollutant levels, the “20D Rule” was used. The object of the “20D Rule” is to determine which, if any, sources of air pollutants are likely to have a significant impact inside the significant impact area (SIA). Guidance from MPCA was used to evaluate future or ongoing sources in a 10 km zone surrounding the proposed Mesaba facility as well as ambient air monitoring data. For this project, 10 km is the maximum SIA. Guidance on the “20D Rule” was supplied in an e-mail from MPCA dated April 30, 2008 (MPCAa).

“D” is taken to be the distance in kilometers from the additional source to the proposed Mesaba Energy facility’s maximum air emissions impact location. The value at “D” in kilometers is then multiplied by 20 to obtain the “20D” value of emissions in terms of tons per year. If the additional facility-wide allowable emission rate in tons per year is greater than the “20D” value, then the sources at the additional facility are included in the background. If the allowable emissions are less than “20D,” then the additional facility emissions are not included in the evaluation.

Ambient monitoring data representing the rural Iron Range in Minnesota was provided by the MPCA in an e-mail dated January 23, 2009 (MPCAb). The ambient monitoring data were used to calculate summed risks from measured air concentrations of volatile organic chemicals (VOCs), carbonyls, and metals. Due to the location and population density surrounding the proposed Mesaba sites, rural VOC and carbonyl data were used. Since the proposed facility site locations are in the Iron Range of Minnesota, the most recent data as measured at Virginia, Minnesota was used in this evaluation.

Where modeling data is available, as is the case with Mesaba, Mesabi Nugget, and PolyMet, estimated risk for the subsistence farmer scenario at the maximum air emissions impact location was used, as these tend to result in higher risk impacts. However the location of maximum impact does not necessarily occur at a location where a subsistence farm could be located in the future. For example, the projected Mesaba East Range maximum impact receptor is located on a small tract of land used by the City of Hoyt Lakes for biosolids disposal. A subsistence farm would be prohibited in this area.

Based on discussion and guidance from the MPCA, if chronic or acute hazard indices for any individual facility are greater than one, the hazards for that facility should be further refined by separating the risks by health endpoint, pollutant family (i.e., metals, VOCs, carbonyls, etc.), or by risk drivers. Because MPCA is conducting cumulative risk evaluations only for inhalation risks at this time, inhalation values, when known, are presented in parentheses.

West Range – Taconite, Minnesota

Based in part on the Scoping EAW for the proposed MSI Project near Nashwauk, MN, the proposed MSI facility is the closest "reasonably foreseeable future or ongoing action" in the vicinity of the Project located near Taconite, MN. As shown in Figure 1, "MN Steel DRI Plant Cumulative Impact Buffers," the location of highest air emission impact for the proposed Mesaba facility (Receptor 3) is outside of the MSI 10 km buffer.

Since the closest additional facility that would contribute to increased air concentrations is greater than 10 km away, only risk associated with background ambient air data is considered along with the calculated Mesaba Energy risk.

Total cumulative risk for the Mesaba Energy Project – West Range is as follows:

	Total Cancer Risk	**Total Chronic Non-Cancer HI**	**Total Acute Non-Cancer HI**
Mesaba Energy (Farmer scenario at highest impact location – Receptor 3)	3×10^{-06} (1.4×10^{-06} – inhalation)	0.08 (0.08 – inhalation)	0.7
Background Data (population density <500/mi^2)	3×10^{-05} (inhalation not specified)	1 (0.41 – inhalation)	0.5 (0.40 – inhalation)
Cumulative Risks	**3×10^{-05}**	**1 (0.5 – inhalation)**	**1**

Because MPCA is conducting cumulative risk evaluations only for inhalation risks at this time, inhalation values, when known, are presented in parentheses.

The predicted total cumulative cancer risk for the West Range Mesaba facility as calculated using background information supplied by MPCA is 3×10^{-5}. The MPCA cancer risk guidelines suggest an upper bound of 1 additional case of cancer in a population of 100,000 (1×10^{-5}) people for a new facility, project, or modification. The U.S. Environmental Protection Agency (U.S. EPA) National Contingency Plan suggests the adoption of an upper bound cancer risk of 1 additional case of cancer in a population of 10,000 people (1×10^{-4}) when cumulative risk analyses are being conducted. Background individual lifetime cancer risk is 3×10^{-5}, exceeding the MPCA acceptable limit for individual projects, but within the upper bound U.S. EPA guideline for cumulative risks. The cumulative cancer risk for the Mesaba Energy facility does not exceed the U.S. EPA National Contingency Plan limit.

The cumulative total chronic non-cancer hazard index is predicted at 1.1 (0.5 - inhalation endpoint) and the acute non-cancer hazard index is predicted at 1.2. Due to the uncertainty in the summed inhalation hazard indices, the cumulative total hazard indices may be rounded as per U.S. EPA guidance to acute and chronic hazard indices of 1. The predicted cumulative total chronic and acute non-carcinogenic hazard indices attributable to the proposed facility, therefore, do not exceed the acceptable MPCA risk value of 1.

East Range – Hoyt Lakes, Minnesota

Four facilities are located within a 10 km buffer surrounding the location of highest air emission impact for the proposed Mesaba facility. These facilities include Mesaba, Mesabi Nugget, Laskin Energy Center, and PolyMet. The general area potentially impacted by these four facilities can be seen on Figure 2, "Cumulative Impact Buffer – East Range."

Information regarding maximum cancer risks and hazard indices are obtained from the following sources:

- Mesaba Energy Project AERA, dated January 2009
- PolyMet Mining, Inc. AERA, dated March 2007
- Mesabi Nugget, LLC, MPCA AERA Internal Form-03, dated April 7, 2005
- MPCA Annual Emissions Inventory record for year 2005, Laskin Energy Center as supplied by MPCA on February 3, 2009 (MPCAc)

Screening risk values for the Mesaba East Range location are obtained from the Mesaba West Range AERA, dated January 2009. Since the site plan for the two locations is nearly identical and the terrain similar, dispersion modeling for the East Range location has not been conducted to date. Risk estimates for the West Range location are assumed at the East Range location. The location of maximum emissions impact at the East Range for this exercise is southeast of the emission sources, the same distance from the source centroid as at the West Range.

The MPCA AERA Internal Form-03 for Mesabi Nugget presented two sets of air toxics risk data. The "far field" data, representing the area at or beyond the Cliffs Erie property boundary, is used for this evaluation. Since acute non-cancer risk is not calculated for the "far field" location, the acute "far field" risk is conservatively estimated from chronic "far field" risk as detailed in the U.S. EPA document titled *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised* (U.S. EPA, 1992).

Although Laskin has been in operation for some time, an air emissions risk assessment has not been completed for this facility. The most recent air toxics data for the potential risk drivers was obtained from

the MPCA. The most recent data available was the 2005 Air Toxics Emission Inventory. Laskin recently installed low-NOx burners at the facility. MPCA estimated worst case NOx concentrations for Laskin which are used in this evaluation.

Using the Laskin emission source information, dispersion modeling of Laskin emissions using AERMOD was conducted at a 1 g/sec dispersion rate. Receptors having the maximum dispersion concentrations were identified. Emission rates for risk drivers from the 2005 data and dispersion modeling factors were entered into the most recent version of the MPCA Risk Assessment Screening Spreadsheet (RASS) (dated September 4, 2007). Total cancer risk and non-cancer hazard indices were then generated by RASS.

The location of estimated maximum risk impact for each of the four facilities is indicated on Figure 2.

Total cumulative risks for the Mesaba Energy Project – East Range are as follows:

	Total Cancer Risk	**Total Chronic Non-Cancer HI**	**Total Acute Non-Cancer HI**
Mesaba Energy (Farmer scenario at highest impact location – Receptor 3)	3×10^{-06} (1.4×10^{-06} – inhalation)	0.08 (0.08 – inhalation)	0.7
Laskin Energy Center	4×10^{-07} (6×10^{-10} – inhalation)	0.04 (0.04 – inhalation)	0.1
PolyMet	5×10^{-06} (4×10^{-06} – inhalation)	0.2 (0.2 – inhalation)	0.2
Mesabi Nugget	4×10^{-06} (1.8×10^{-06} – inhalation)	0.3 (0.3 – inhalation)	0.3
Iron Range Background Data (population density <500/mi^2)	3×10^{-05} (inhalation not specified)	1 (0.41 – inhalation)	0.5 (0.40 – inhalation)

Because MPCA is conducting cumulative risk evaluations only for inhalation risks at this time, inhalation values, when known, are presented in parentheses.

Hazard indices and cancer risks are additive if a receptor experiences emissions from all sources simultaneously. That is, emissions must be co-located both spatially and temporally. As indicated on Figure 2, the locations at which maximum risks are calculated for the four facilities are not co-located. Meteorological conditions that would cause maximum concentrations from one facility at a specific receptor location would cause reduced concentrations at that same location from other facilities. Therefore, total risk results as presented above, with the exception of estimated background data, are not additive. Co-located risk estimates are not known based on the information sources referenced above.

Background individual total lifetime cancer risk for the Iron Range is the same for the East Range and the West Range locations (discussed above) at 3×10^{-5}. The background lifetime cancer risk exceeds the MPCA acceptable limit for individual projects (1×10^{-5}), but is within the upper bound U.S. EPA guideline for cumulative risks (1×10^{-4}). Maximum total lifetime cancer risk as estimated for each individual facility is below the MPCA acceptable limit for individual projects. Lifetime inhalation cancer

risks for each individual project ranges from 6 x 10^{-10} to 4 x 10^{-06} and are also well below the MPCA acceptable limit.

The background total chronic non-cancer hazard index for the Iron Range is the same for the East Range and West Range locations (discussed above) at 1. The predicted total and inhalation maximum chronic non-carcinogenic hazard quotients for facilities evaluated at the East Range Mesaba Energy project location range from 0.04 to 0.3. Each facility evaluated is well below the MPCA acceptable limit.

The background total acute non-cancer hazard index for the Iron Range is the same for the East Range and West Range locations (discussed above) at 0.5. The predicted total maximum chronic non-carcinogenic hazard quotients for facilities evaluated at the East Range Mesaba location range from 0.1 to 0.7. All facilities are below the MPCA acceptable limit for individual projects.

Conclusions

Total cumulative impacts of air toxics from reasonably foreseeable projects in the vicinity of the Mesaba project West Range and East Range locations have been examined using conservative assumptions. Nearly all chronic and acute non-cancer hazard indices are attributable to the inhalation endpoint. Total cancer risks as well as chronic and acute non-cancer risk at each individual facility evaluated are below the MPCA acceptable limits.

Data Refinements

To the extent that better data becomes available for the Mesaba Energy Project, Laskin Energy Center, Mesabi Nugget, and PolyMet Mining, subsequent revisions of this Air Toxics Cumulative Risk Evaluation will be made to determine whether the above conclusions are maintained. In general, risks associated with emissions are found to decrease as the analysis of air toxic impacts become more refined.

References

MPCAa. Personal correspondence from Mary Dymond, MPCA (Mary.Dymond@state.mn.us) dated April 30, 2008, 4:04 PM, regarding “General Guidance for Choosing Ambient Background Data for Cumulative Effects Analysis” and “Guidance for the Sources to Include: http://daq.state.nc.us/permits/psd/docs/cliffside/October_2006_Addendum.pdf”. Attachment in e-mail titled “Comments to address from 2006.doc.”

MPCAb. Personal correspondence from Kristie Ellickson, MPCA (Kristie.Ellickson@state.mn.us) dated January 23, 2009, 1:58 PM, regarding “Cumulative Information Request.”

MPCAc. Personal correspondence from Kristie Ellickson, MPCA (Kristie.Ellickson@state.mn.us) dated February 2, 2009, 4:56 PM, regarding “Information to Gloria_SEH_Cumulative Risk_020309.xls.”

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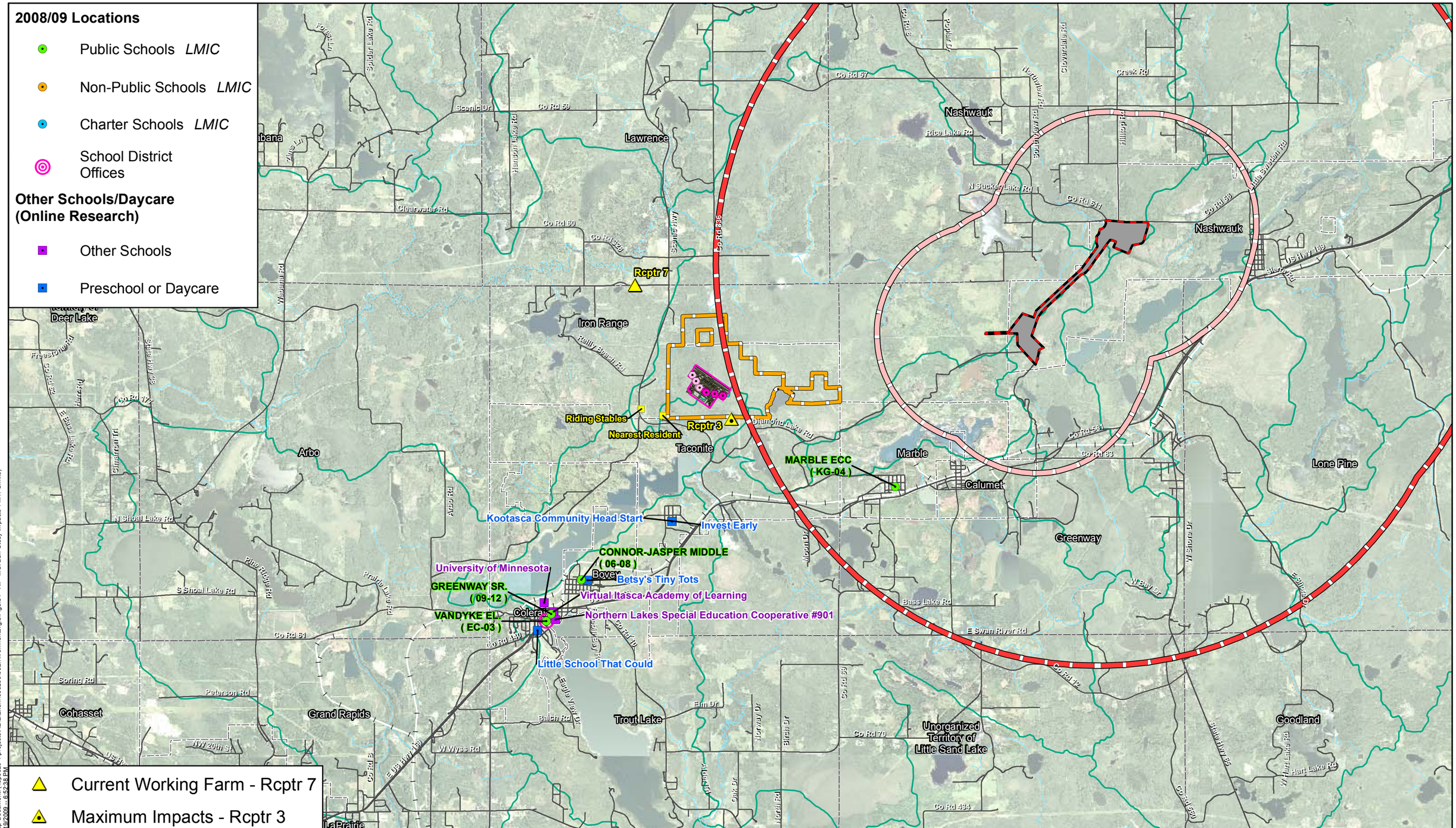

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West Range Site

January 2009

Legend

- West Range Site
- Fence Line
- Footprint
- Phase 1 Stacks
- Phase 2 Stacks
- MSI Footprint (3 km Buffer) *Barr*
- MSI Centroid (10 km Buffer) *Barr*
- Plant Footprint (2006) *Barr*
- Essar Steel Minnesota Approx. Plant Site Boundary (08-30-2008) *AMEC*
- Existing Roads
- Existing Railroads
- Streams
- Watersheds

Appendix D

Source: NAIP 2006, Itasca County, Mn/DNR, Mn/DOT, USGS, LMIC, Fluor, Excelsior Energy, MN Steel, Barr, AMEC and SEH, © 2009 SEH

Figure 1 of 2

MN Steel DRI Plant Cumulative Impact Buffers West Range

Itasca County - South Coordinate System

N W E S

0 2.5 Kilometers

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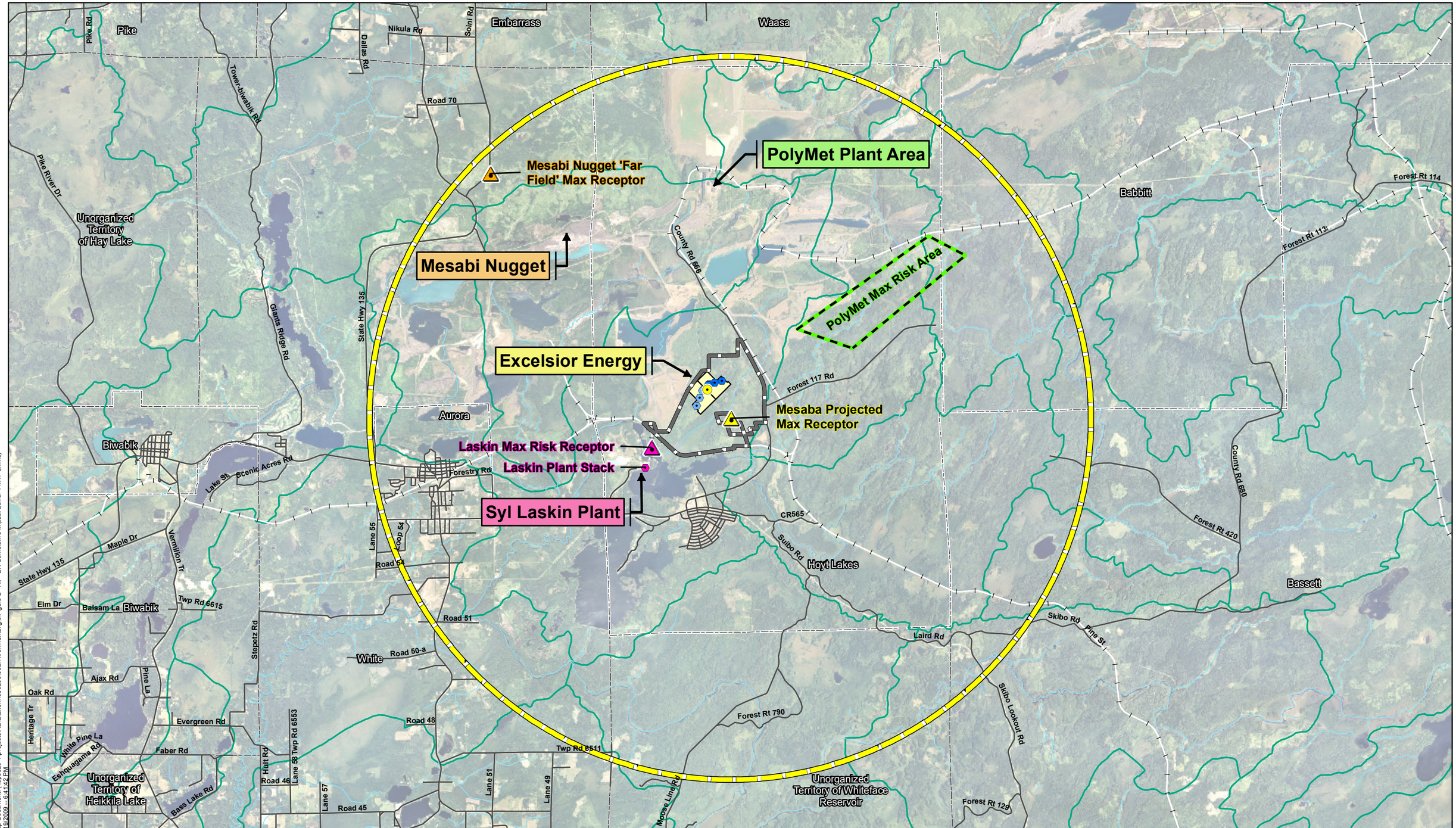

Map Document: (\\sp3020-1\projects\AE\E\Exen\050200\03Environmental\gis\Figure 2 - Air - ER Cumulative Impact Buffer 11x17 L.mxd)
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East Range Site

February 2009

Legend

- East Range Site
- Footprint
- Phase 1 Stacks
- Phase 2 Stacks
- East Range Stacks Centroid
- Mesaba Max Receptor (Projected from WR Site)
- Max Receptor (10 km Buffer)
- Existing Roads
- Existing Railroads
- Municipal Boundaries
- Civil Townships
- Streams
- Watersheds

Appendix D

Source: NAIP 2008, Mn/DNR, Mn/DOT, USGS, LMIC, Fluor, Barr-Polymet AERA 2007, Excelsior Energy and SEH.

Figure 2 of 2

Cumulative Impact Buffer East Range

St. Louis County - Central Coordinate System

N W E S

0 2.5 Kilometers