U.S. Department of Energy
in cooperation with
Minnesota Department of Commerce

MESABA ENERGY PROJECT

FINAL
ENVIRONMENTAL IMPACT STATEMENT
VOLUME 2: APPENDIX

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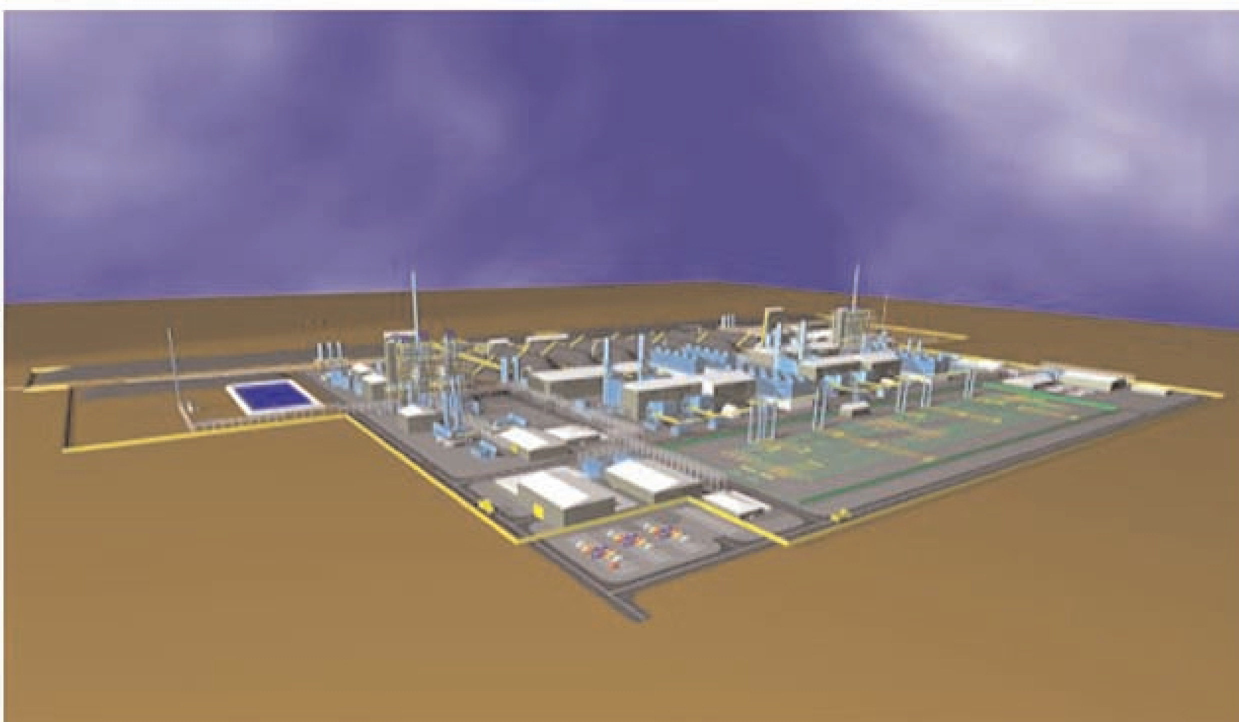

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Office of Fossil Energy
National Energy Technology Laboratory

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Carbon Capture and Sequestration –

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APPENDIX A1
Excelsior's Plan for Carbon Capture and Sequestration

(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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PUBLIC VERSION

Mesaba Energy Project

Mesaba One and Mesaba Two

Plan for Carbon Capture and Sequestration

Prepared by

EXCELSIOR ENERGY INC.

October 10, 2006

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Executive Summary

Excelsior Energy Inc., the developer of the Mesaba Energy Project has prepared this plan to identify the opportunities for capture and sequestration of carbon dioxide (“CO_2”) emissions from its integrated gasification combined-cycle (“IGCC”) power stations. This carbon capture and sequestration plan (“CCS Plan”) was prepared to provide a concrete option for the State of Minnesota to meet its obligations under future CO_2 regulations, which if promulgated, would affect coal-fired power plants, including the Mesaba Energy Project. We undertook the plan with the goal of providing the Minnesota Public Utilities Commission (the “Commission”) with information about all options that are available now and in the future with respect to carbon management through capture and geological sequestration from the Mesaba Project.

The decision to implement a carbon capture and sequestration (“CCS”) program is one that the Commission must weigh from time to time, based upon the costs to ratepayers associated with CCS and the benefits to ratepayers associated with a CCS program. This Plan provides a framework within which the Commission can make such a decision. The costs to ratepayers of implementing CCS would include additional capital and operating costs, reduced output and plant efficiency, and potential downtime to implement the system. The benefits would include any revenues from enhanced oil recovery (“EOR”), and the ability to cost-effectively comply with any form of legislation limiting or regulating carbon dioxide emissions as part of an initiative to stabilize atmospheric concentrations of greenhouse gases (“Carbon Constraints”), whether in the form of avoiding carbon taxes or the purchase of allowance credits, or the ability to reduce carbon emissions to levels specified on a fleetwide or statewide basis.

The first option for CCS presented by the Mesaba Project entails capture and sequestration of carbon dioxide present in the syngas, which represents 30% of the total carbon dioxide emissions from the plant. Technologically, this option would entail the installation of amine scrubbers downstream of the acid gas removal system in the IGCC power stations to remove up to 85% of the CO_2 in the synthesis gas that fuels the plants. This process would result in an overall CO_2 capture rate of 30% for the plant. This technology is available now to achieve 30% capture at a relatively low cost to ratepayers. This option could be implemented as early as 2014, following the commercial operation date for the first unit of the Mesaba Energy Project. Implementation of CCS prior to the availability of credits or carbon avoidance benefits would rely exclusively on revenues that may be available from EOR. Sequestration at EOR sites would have higher costs, due to the longer distances to the candidate oil fields, than would sequestration in saline formations closer to the plant site. Those additional costs would be weighed against the revenues that would accompany the supply of CO_2 for EOR. A decision to implement this form of CCS prior to the imposition of Carbon Constraints would have to weigh the likelihood that the base line emissions year would be established such that reductions implemented before that date would be given credit.

The second, longer-term option for CCS presented by the Mesaba Project would reduce CO_2 emissions by approximately 90%. This option could be implemented following the successful demonstration by the United States Department of Energy’s FutureGen project of full capture from an IGCC plant. The costs of this option are significantly higher than the 30% capture approach using currently available technology. Significant ongoing research and development efforts sponsored by the Department of Energy ("DOE") are expected to reduce these costs significantly and result in commercial offerings of these technologies. Given the fact that IGCC is a least-cost source of carbon reductions in the power sector,[1] these deeper reductions are likely to be cost justified in the event Carbon Constraints are imposed that require any meaningful reduction in total greenhouse gas emissions. Implementation of the 30% capture option would not preclude later decisions to increase capture levels to 90%.

In an EOR scenario, the captured carbon dioxide would be transported via pipeline to oil fields in North Dakota, southwestern Manitoba, and/or southeastern Saskatchewan. Once the CO_2 arrives at its destination, it would be sequestered underground, potentially in connection with enhanced oil recovery operations.

Alternatively, the saline formation scenario would entail transporting the CO_2 to a saline formation located much closer to the plant site, reducing the pipeline costs but also eliminating the revenues associated with the sale and beneficial use of the CO_2.

The economics of CCS look promising. The 30% capture option identified in the CCS Plan would enable CO_2 capture at a cost per ton below that of any other existing power plant in the state.[2] IGCC plants' ability to economically capture CO_2, combined with the potential for revenues described above, have the potential to significantly decrease the cost of CCS.

Under this proposed CCS Plan, Excelsior would commit to undertake capture, transportation and sequestration of carbon dioxide, upon a decision by, and at the direction of, the Commission, upon approval of a modification to the proposed power purchase agreement that would allow for Excelsior to be compensated at a reasonable cost of capital for the necessary capital investments, and to be made whole on the other costs associated with the CCS program. This commitment, together with Excelsior's ongoing work to refine the costs and technical means to implement CCS, will position the state to respond in a timely and economic fashion to carbon constraints.

I. Introduction

This ability to capture and sequester CO_2 is important because Carbon Constraints are likely to be implemented within the next ten years. As evidence of this, various proposals to regulate

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[1] See the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472-/M-05-1993. Also, see presentation by Julianne M. Klara, NETL/DOE, Gasification Technologies Conference, *Federal IGCC R&D: Coal's Pathway to the Future*, Oct. 4, 2006, a*vailable at* http://gasification.org/Docs/2006_Papers/49KLAR.pdf.

[2] According to a compilation of studies by the Intergovernmental Panel on Climate Change, the net cost of 90% capture for an IGCC plant is $18/ton less than a new supercritical coal plant and $30/ton less than a new natural gas plant. This difference would increase significantly when considering 30% capture at an IGCC plant, and increase further when compared to retrofitting existing plants. As Minnesota currently has no identified geological sequestration options, pipeline costs would be significant for any plant in the state. Even allowing for a shorter pipeline, no existing or new non-IGCC power plant in Minnesota could capture at a price per ton as low as Mesaba Energy Project. Intergovernmental Panel on Climate Change, *IPCC Special Report: Carbon Dioxide Capture and Storage*, p. 25 (2005), *available at* http://arch.rivm.nl/env/int/ipcc/pages_media/SRCCS-final/ccsspm.pdf.

greenhouse gas emissions ("GHGs") have been introduced in the United States Congress, and various states have embarked upon their own GHG programs.

Identification of strategies to comply with likely Carbon Constraints is a critical element of protecting Minnesota's consumers and economy. Excelsior is working in conjunction with the Energy and Environmental Research Center ("EERC") as part of the Plains CO_2 Reduction Partnership ("PCOR") initiative to develop CO_2 management options for the Mesaba Energy Project based on evaluations of sequestration opportunities associated with regional geologic formations/features and nearby terrestrial features.[3]

What follows is Excelsior's CCS Plan for the first two of six IGCC units to be constructed over time on three state-authorized sites within the Taconite Tax Relief Area of northeastern Minnesota. The proximity of the three sites with IGCC units, together with the potential opportunities for carbon sequestration identified by the EERC, affords the State of Minnesota the opportunity to carefully plan for and implement the most cost-effective and flexible response to carbon constraints.

II. Background: Mesaba Energy Project Phases I and II

The IGCC Power Station described in this document consists of Phase I and Phase II of the Mesaba Energy Project ("Mesaba One" and "Mesaba Two," respectively). Each phase is nominally rated at peak to deliver 606 megawatts ("MW") of electricity to the bus bar.

Excelsior has submitted the necessary regulatory petitions and preconstruction permit applications to support construction of Mesaba One and Mesaba Two. The key pending regulatory filings made in connection with the Mesaba Project include the following: On December 22, 2005, Excelsior submitted to the Commission a petition to approve a Power Purchase Agreement with Xcel Energy under Minn. Stat. § 216B.1693 and 1694. On June 16, 2006, Excelsior submitted a Joint Permit Application for a Large Electric Power Generating Plant Site Permit, a High Voltage Transmission Line Route Permit, and a Natural Gas Pipeline Route Permit to the Commission for Mesaba One and Mesaba Two. On June 28, 2006, Excelsior submitted applications for New Source Review Construction Authorization and National Pollutant Discharge Elimination System Permits to the Minnesota Pollution Control Agency for Mesaba One and Mesaba Two. On June 29, 2006, Excelsior submitted an application for a Water Appropriation Permit to the Minnesota Department of Natural Resources.

When operational, the Mesaba Energy Project will allow Minnesota and the nation to benefit from the environmental advantages that IGCC technology offers over conventional, solid fuel alternatives. Beyond its capability for achieving an emission profile unmatched by conventional coal combustion systems, IGCC is adaptable to capture significant amounts of carbon dioxide

[3] The EERC is part of the University of North Dakota and has been selected by the Department of Energy to develop a regional vision and strategy for dealing with carbon management in the Plains Region (including the Canadian Provinces of Alberta, Saskatchewan, and Manitoba, and the states of Montana, NE Wyoming, North Dakota, South Dakota, Nebraska, Minnesota, Wisconsin, Iowa, and Missouri). *See* PCOR Partnership Profile, http://www.undeerc.org/pcor/partnership.asp.

from the synthesis gas prior to its combustion. Mesaba One and Two will be configured to allow for the installation of additional equipment that can capture up to 30% of the potential carbon in its selected feedstock.

III. Regulatory Context for Carbon Capture and Sequestration

Excelsior's intent in proposing a framework for CCS is to commence a process to identify and define conditions for development of CCS when state or national considerations require GHG reductions, and/or when such reductions might otherwise become an economic choice for the ratepayers of Northern States Power Company under the PPA, in the context of Mesaba One and Mesaba Two. Excelsior's efforts will advance state decision makers' practical knowledge regarding the role IGCC and the Mesaba Energy Project can play in achieving actual reductions in the state's CO_2 emissions.

Several states are undertaking initiatives to reduce greenhouse gas emissions, most notably carbon dioxide, in isolated sectors of their economies.[4] To achieve significant reductions of such emissions, it is probable that future climate change initiatives will extend nationwide and to all sectors of the economy. The ability to physically reduce the volume of GHG emissions from Minnesota's economic activity will be a critical component to the state's economic health,

[4] Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York and Vermont have formed the Regional Greenhouse Gas Initiative ("RGGI") with the goal of creating a regional cap-and-trade program. The plan will begin addressing carbon dioxide emissions from power plants in the member states by capping 2009 carbon dioxide emissions at current levels. Beginning in 2015, RGGI states will begin reducing carbon dioxide emissions to achieve a 10% reduction by 2019. To facilitate the process, power plants will receive CO_2 emission allowances, which they may trade with other power plants. *See* Press Release, Regional Greenhouse Gas Initiative, States Reach Agreement on Proposed Rules for the Nation's First Cap-and-Trade Program to Address Climate Change (Aug. 15, 2006), *available at* http://www.rggi.org/docs/model_rule_release_8_15_06.pdf; Regional Greenhouse Gas Initiative, Model Rule (Aug. 15, 2006), *available at* http://www.rggi.org/docs/model_rule_8_15_06.pdf.

Similarly, California recently enacted legislation that calls for the development of regulations and market mechanisms that will reduce the state's greenhouse gas emissions by 25% by 2020. The law will impose mandatory caps beginning in 2012 and will incrementally tighten emission limits to reach the 2020 goals. *See* Press Release, Gov. Arnold Schwarzenegger, Gov. Schwarzenegger Signs Landmark Legislation to Reduce Greenhouse Gas Emissions (Sept. 27, 2006), *available at* http://gov.ca.gov/index.php?/press-release/4111/; California Global Warming Solutions Act of 2006, Assembly Bill No. 32, *available at* http://www.leginfo.ca.gov/pub/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf.

In 2001, Massachusetts developed regulations that apply to power plants in the state. Under the regulations, CO_2 emissions may not exceed the historical actual emissions for the three-year period from 1997 to 1999, and CO_2 emissions may not exceed 1800 lbs/MWh. See Massachusetts Dept. of Environmental Protection, Governor Swift Unveils Nation's Toughest Power Plant Regulations, Inside DEP, April/May 2001, at 1, *available at* http://www.environmentalleague.org/Issues/Enforcement/DEPMay2001.pdf#search=%22Governor%20Swift%20air%20regulations%22; 310 Mass. Code Regs. 7.29 (2004), *available at* http://enviro.blr.com/display_reg.cfm/id/48436.

whether the constraints require roll-backs from any one sector or sources, or whether the constraints take the form of a tax or a cap-and-trade system. The precise form that the Carbon Constraints take is outside the scope of this CCS Plan, and in any event is not critical to the analysis of IGCC, which has the lowest cost of capture of any fossil fuel technology.[5] In a carbon-managed economy, large sources of CO_2 emissions that can economically achieve significant GHG reductions will likely be the major source of CO_2 offsets for other economic sectors whose only meaningful alternative for achieving reductions may be the purchase of GHG offset credits. Because IGCC is the technology best suited to carbon capture of all the fossil technologies,[6] it is a least-cost means to achieve actual reductions in GHG emissions, and will therefore very likely be able to achieve emission reductions at a cost below where credits will trade or where tax levels are established in order to signal sufficient reductions to meet the national program goals. Mesaba One and Mesaba Two are therefore likely to be ideal sources of carbon offsets under such circumstances, and are likely to provide the state with a meaningful, cost-effective hedge in meeting any federally-imposed GHG reductions.

IV. Preliminary Plan Description and Analysis

There are two primary components of the CCS Plan. First, Excelsior identifies the most promising, commercially available CO_2 capture technology to install at the IGCC power station. As described later in this section, an amine scrubber process currently has the most potential for carbon capture at the Mesaba Project. Second, Excelsior develops engineering plans for different methods of sequestering the captured CO_2. Based upon studies to date, the CCS Plan suggests a staged development of CO_2 pipelines from its Iron Range plant sites to North Dakota oil fields and proximate locations. The pipelines would likely utilize existing railroad, pipeline, or transmission line rights of way.

A. CO_2 Capture

Several processes have been proposed for carbon capture in coal power plants, consisting primarily of scrubbing or membrane separation-based processes. In conventional coal plants, the carbon must be scrubbed from very large volumes of stack gases at low pressures and temperatures. The most mature and proven of these is amine scrubbing, which is similar to the process used by the Mesaba Energy Project to capture sulfur from the syngas. In this process, the amine solution first adsorbs carbon dioxide from the gas being treated, and then CO_2-enriched amine is regenerated, recycling the amine and producing a relatively pure stream of CO_2.

IGCC plants enable pre-combustion capture of CO_2, which provides the intrinsic advantages of treating an undiluted and pressurized gas stream. An additional advantage enjoyed by IGCC is that CO_2 captured from high-pressure syngas requires less compression before transport and/or storage.[7]

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[5] See Ref. 1.
[6] *Ibid*.
[7] The volumetric flow of the pre-combustion IGCC syngas stream is far smaller than the post-combustion

The Mesaba Energy Project features a design that is adaptable to carbon capture, which enables relatively simple upgrades to be made in order to commence carbon capture. These upgrades entail installing a CO_2 amine scrubber downstream of the acid gas removal system and adding driers and compressors for captured CO_2. In this design, the CO_2 available for capture is limited by the proportion of carbon dioxide in the syngas, which varies for different fuels. Up to 30% of the potential CO_2 could be removed from the design subbituminous coal, while up to 20% could be removed from other design feedstocks.

Higher capture rates are not commercially available today, but will be demonstrated in the future. This is the primary objective of DOE's FutureGen project, which aims to capture at least 90% of the CO_2 from a non-commercial plant to begin operation in 2013. After such a demonstration of commercial viability, the Mesaba Energy Project could achieve 90% capture by adding a gas reheater and a water gas shift reactor upstream of the CO_2 amine scrubber. The shift reactor process converts CO to CO_2 by the following reaction:

$$CO + H_2O \rightarrow CO_2 + H_2$$

Nearly all of the carbon in the resulting syngas stream is in the form of CO_2, enabling the amine scrubber to remove at least 90% of the CO_2. However, at the current state of technology, this process would increase capital cost and reduce efficiency of the plant, making it more expensive for capturing CO_2 on a per ton basis than the 30% configuration. It should be noted that a plant that has implemented 30% capture would still be technically capable of being converted to capture 90% once the technology is demonstrated by DOE's FutureGen project.

Because the 90% approach has not yet been demonstrated and the 30% approach is the most mature and proven option, Excelsior concludes that the 30% approach is the most likely candidate for CCS in the near term. The 30% CO_2 capture configuration represents a cost-effective, commercially available option today for the Mesaba Project.[8]

B. Economic Considerations Relating to Sequestration

The potential economic drivers for CCS by the Mesaba Energy Project include opportunities to supply the CO_2 to an oil field for sale and use in enhanced oil recovery ("EOR"), and the opportunity for financial benefits to ratepayers from reductions in the costs of complying with carbon limits imposed in the future. This CCS Plan contains information on economical sequestration opportunities within the oil fields located in closest proximity to the Mesaba IGCC power stations. Because CO_2 used for EOR is also sequestered, the Mesaba Energy Project would likely earn carbon credit revenues (or avoid costs in other carbon limit scenarios) once regulations limit CO_2 emissions, which would be in addition to the EOR revenues. Therefore, investments in pipeline infrastructure for EOR will provide additional value as a method of sequestration once a carbon credit market is established.

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stream in a conventional coal plant, which enables the size of treatment equipment to be reduced. Also, as this treatment is conducted at approximately 400 psi, the additional compression required to pipeline the CO_2 is reduced.

[8] See the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472-/M-05-1993.

1. Enhanced Oil Recovery

Carbon dioxide has been proven to be very effective for secondary and tertiary oil recovery by both displacing and decreasing the viscosity of otherwise unrecoverable oil. Upon extraction of the oil, the EOR process easily removes pressurized CO_2 and recycles it by reinjecting into the pool. Economic benefits from EOR have been realized in at least two regions in North America. Kinder Morgan CO_2 has a CO_2 pipeline network of 1100 miles servicing the Permian Basin in western Texas and eastern New Mexico.[9] Similarly, the Dakota Gasification Project in the Northern Plains pipes CO_2 over 200 miles to the Weyburn oil field in southeastern Saskatchewan. The market for CO_2-based EOR is still available in oil fields across the country, so the Mesaba Energy Project, by virtue of its advanced stage of development, may be poised to exploit some of the most economical oil recovery operations available to the benefit of Minnesota ratepayers.

2. Carbon Credits or Other Economic Benefits of CCS

Carbon credits or other economic benefits derived from CCS under other forms of potential carbon regulation also represent a potential economic driver for the Mesaba CCS development, with future regulation in the U.S. determining the final value of the carbon benefits generated by CCS undertaken by the Mesaba Energy Project.

D. CCS Approach

This CCS Plan analyzes the most promising initial approach for CCS from the Mesaba Energy Project under present circumstances, which would entail capture of 30% of the CO_2 generated by the power stations and would direct that captured CO_2 to EOR sites. This approach requires a longer pipeline than would direct sequestering of CO_2 in closer, non-EOR sites. Therefore, targeting EOR sites will require higher front-end costs than if Excelsior were to sequester carbon simply to meet carbon limits without providing CO_2 for EOR opportunities. EOR and future carbon credit markets may offset the higher costs associated with initially targeting EOR sequestration sites.

While the timetable for implementation of regulations governing the operation of a carbon-managed economy is unknown, Excelsior anticipates that it would have adequate time to implement the power station upgrades and construct a CO_2 pipeline.

Numerous in-depth studies exist describing the technological means to capture 90% of the carbon dioxide from an IGCC plant.[10] Because of the real-time research and development efforts with respect to 90% capture, and the expected reductions in costs of this option as the technologies are demonstrated, Excelsior has not attempted to quantify the costs nor describe the technological approach in detail in this phase of the plan.

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[9] See Kinder Morgan CO_2, http://www.kindermorgan.com/about_us/about_us_kmp_co2.cfm.
[10] For a summary of such studies, see the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472/M-05-1993.

V. Currently Available Regional Sequestration Studies and Experience with CO_2 Pipelines

A. Regional Sequestration Studies

The EERC has extensively characterized three major types of sinks for carbon sequestration that are within the appropriate geographic proximity of the Mesaba Energy Project. The options are geological sequestration in oil fields (for enhanced oil recovery or storage only) or saline formations, and terrestrial sequestration (primarily using wetlands). Terrestrial sites are not suited to accommodate direct injection of CO_2 because such sites rely on changing the existing physical configuration of large areas of the earth's surface, rather than accepting the direct input of CO_2 at a stationary point. This CCS Plan focuses on geological sequestration, to which IGCC is uniquely suited.

Oil fields have proven to be CO_2 sinks with sufficient storage capacity to accommodate CCS projects equivalent to the long-term output of all six phases of the Mesaba Energy Project. Fields in the Permian Basin in western Texas have sequestered CO_2 for decades at scales even larger than those addressed in this CCS Plan.

During Phase I of the PCOR project, the EERC conducted exhaustive bottom-up characterizations of the EOR potential for each field in the PCOR region.[11] The EERC's methodology has produced reliable and conservative estimates of the CO_2 capacity for EOR in each field. This data forms the basis for the EOR-driven scenarios in the CCS Plan by the Mesaba Energy Project presented below. The economic benefits that could be achieved from EOR alone (that is, not including sales of carbon credits) are substantial. For example, the EERC projects that the total value of oil that could be recovered by EOR in North Dakota alone exceeds $15 billion (at a price per barrel of $59.50).[12]

Saline formations have the potential for still greater sequestration capacity than oil fields. The EERC's studies of the CO_2 sequestration capacity of the Broom Creek Formation in North Dakota have confirmed this observation.[13]

B. Experience with CO_2 Pipelines

Carbon dioxide suppliers, purchasers, and third parties that own existing CO_2 pipelines provide practical knowledge about how such pipelines operate. CO_2 pipelines are similar to natural gas pipelines, and they can transport CO_2 from its source to a sink. The primary difference between CO_2 and natural gas pipelines is that CO_2 pipelines require higher pressures (roughly 2,000 psi

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[11] *See* PCOR Partnership, *Plains CO2 Reduction (PCOR) Partnership (Phase I) Final Report/July–September 2005 Quarterly Report*, January 2006, *available at* http://gis.undeerc.org/website/PCORP/cdpdfs/FinalReport.pdf.

[12] EERC, Presentation, Potential Sequestration Options in the Plains CO2 Reduction (PCOR) Partnership Region & Estimated Capacities, Aug. 9, 2006 (on file with Excelsior Energy).

[13] Testimony of Edward N. Steadman, Oct. 10, 2006, MPUC Docket No. E-6472/M-05-1993, OAH Docket No. 12-2500-17260-2.

instead of 1,000 psi). Dedicated CO_2 pipelines are currently used for EOR in the Permian Basin and the Weyburn Oil Field. In the Kinder Morgan pipeline, which services the Permian Basin, 1 billion cubic feet per day of CO_2 is compressed from 800 to 2,000 psi and transported 500 miles.[14] Applying this knowledge, IGCC power stations will dry and compress carbon dioxide and inject it into pipelines. Over long pipeline distances, booster stations will periodically recompress the CO_2.

VI. Scenarios to Be Further Investigated

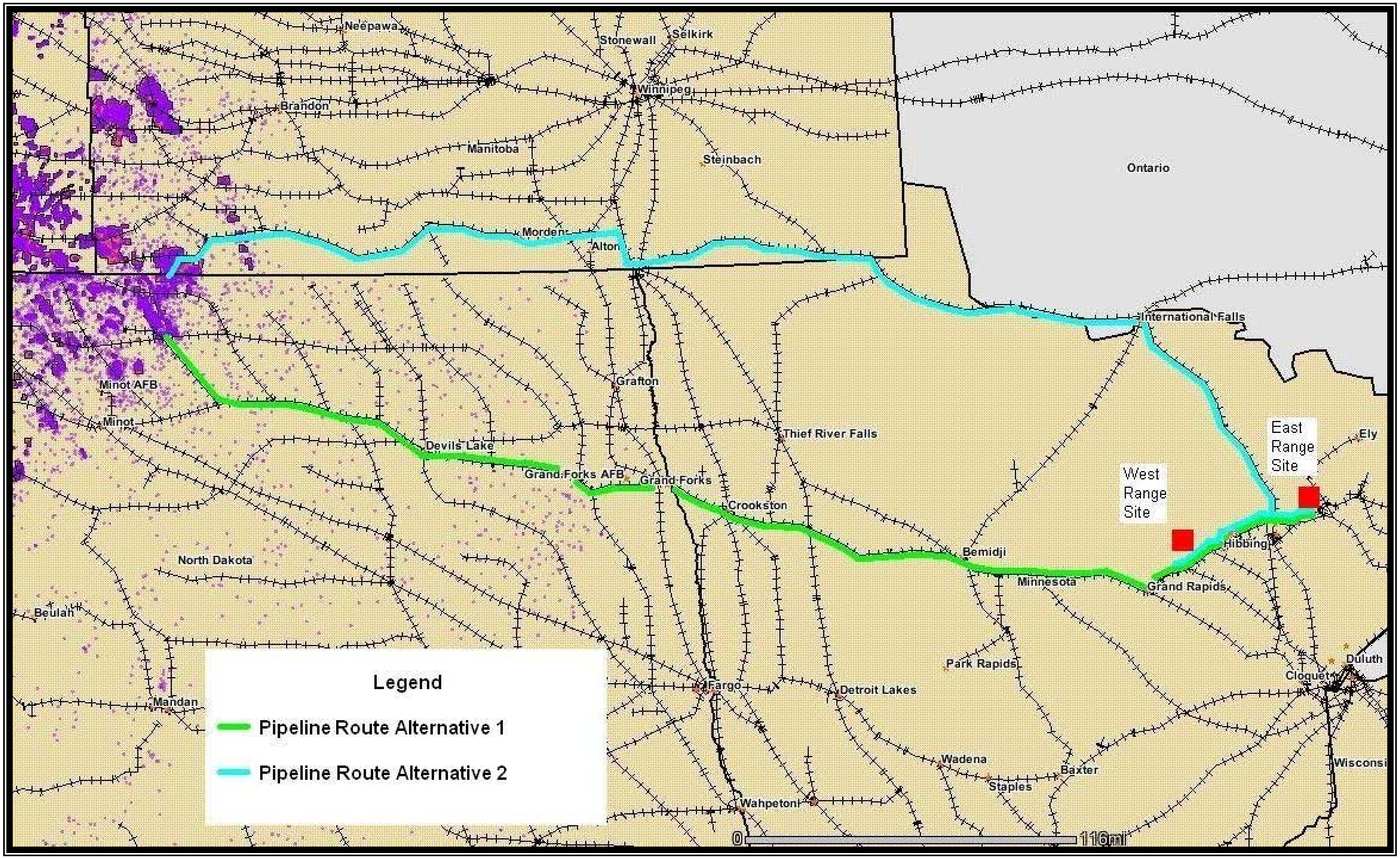
This section evaluates five CCS configurations associated with the Mesaba Energy Project in an effort to give policymakers further information about potential CCS options. CCS based on EOR alone will be examined for the 30% capture configuration, across one to six Mesaba Energy Project units (each unit is assumed to have roughly 600 megawatts of capacity). As discussed in Section IV, the 90% capture configuration is not yet commercially available. Therefore, although this may change in time, Excelsior does not assume 90% capture for the purpose of generating the economics in this CCS Plan. As a simplifying baseline assumption, this CCS Plan further assumes that cost-sharing opportunities with other CO_2 sources will not be available.

A. Scenario 1

For Scenario 1 and its alternatives, pipelines would be constructed between the three Mesaba Energy Project's Iron Range plant sites (each site containing two generating units) and a cluster of oil fields in north central North Dakota, the southwestern corner of Manitoba, and the southeastern corner of Saskatchewan. Many of these oil fields are either unitized or run by a single operator, which expedites the establishment of EOR in a field. (Unitization is a process by which field operators combine all oil and gas interests in a field into a single operation.) Non-unitized, multiple operator fields may take longer to set up EOR, so the readily available fields would be advantageous and the likely economic choice. For the main trunk pipeline connecting the plants and oil fields, two options for rights of way ("ROWs") are shown in Figure 1. The pipeline corridors in these scenarios follow existing rail ROWs only for the purpose of illustration – other potential corridors may exist.

[14] Kinder Morgan, Cortez Pipeline and McElmo Dome, http://www.kindermorgan.com/business/co2/transport_cortez.cfm.

Figure 1. Potential Pipeline Routes for the Mesaba Energy Project CO_2 Pipeline

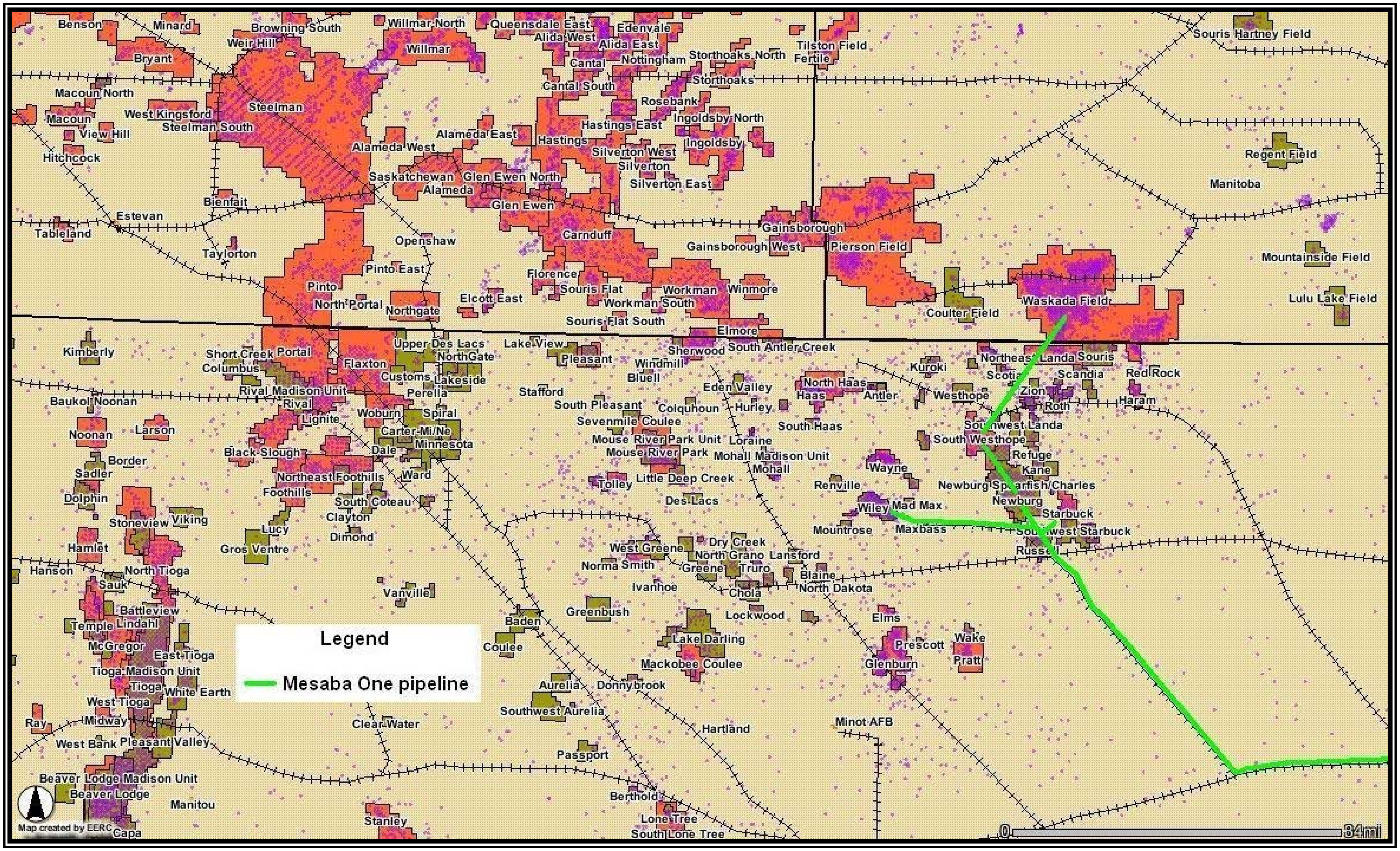


Source: EERC

B. Scenario 1A

For the CO_2 captured at Mesaba One, a cluster of oil fields in north-central North Dakota and southwestern Manitoba are targeted, with preliminary expectations that such fields could accommodate EOR for 22 years. This duration, which is used throughout the analysis of the various scenarios, corresponds to that of the financial model and does not reflect cessation of capture. Following existing railroad track (for purposes of illustration) from the preferred West Range site, a 12-inch pipeline approximately 405 miles long could reach the first proposed oil field. Over the course of 22 years, an additional 40 miles of pipeline would be needed to connect to nearby fields. Two of the fields are unitized. The pipeline network needed to serve this scenario is shown in Figure 2.

Figure 2. Western Terminus of CO_2 Pipeline Serving Mesaba One

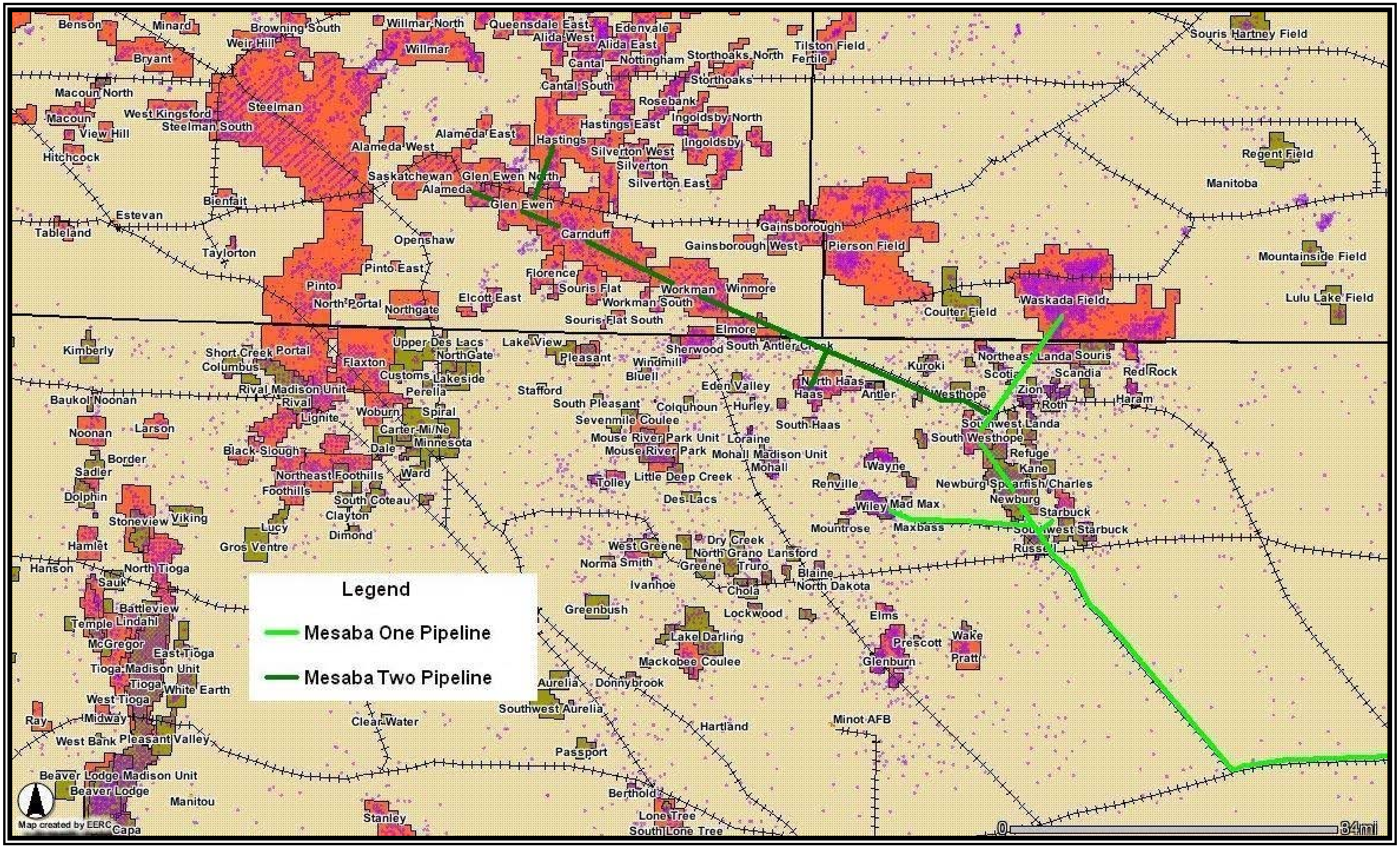


Source: EERC

C. Scenario 1B

For Mesaba One and Two, the network of pipelines would expand to a chain of oil fields in southeastern Saskatchewan. To accommodate 22 years of EOR from both units, approximately 120 additional miles of pipeline would be added for a total system length of 525 miles. This length is inclusive of additions required for a single unit as described above, and such additions could be staged. To illustrate the economies of scale, it will be assumed that the trunk pipeline is sized to accommodate two units, such that looping (i.e., duplicating) the 405 mile base pipeline is not necessary. The pipeline network for this scenario is shown in Figure 3.

Figure 3. Extension of Western Terminus of Mesaba One Pipeline to Accommodate Mesaba Two



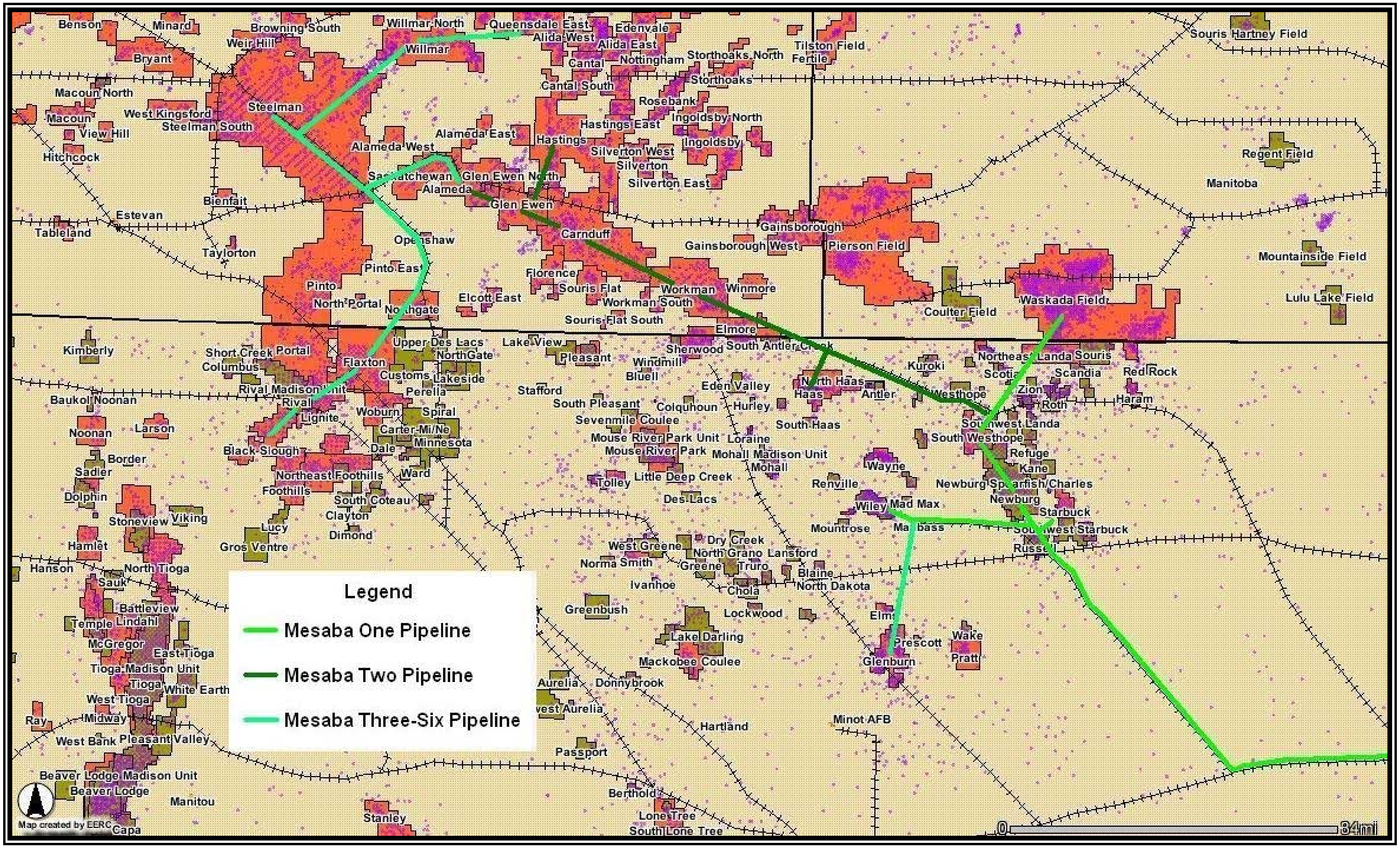
Source: EERC

D. Scenario 1C

For Mesaba Units One through Six, the pipeline network could reach much larger fields in Saskatchewan and North Dakota. The incremental pipeline additions for these units would include 85 new miles, for a total system length of 610 miles, as shown in Figure 4. While this scenario would be the most efficient and economical, the degree of uncertainty is too great to model even on a preliminary basis at this time. This scenario demonstrates that the potential for EOR present a CCS opportunity, and that a cost-shared pipeline accommodating multiple sources is a very promising means to defray the overall final costs of CCS.

The introduction of carbon credits or other benefits for reductions under mandated carbon constraints to these scenarios would improve the economics presented in the CCS Plan and would not otherwise intrinsically alter the ideal implementation of pipeline routes. Other sources may be induced to pursue EOR, but the relative cost competitiveness among those sources would not likely change.

Figure 4. Extension of Western Terminus of Pipeline to Accommodate Mesaba One Through Mesaba Six



Source: EERC

E. Scenario 2

Scenario 2 considers CCS based solely on carbon credit revenues or other benefits of CCS under carbon constraints, with the Mesaba Energy Project as the only source. In this case, CO_2 would only need to be piped approximately 265 miles from the West Range site to the Lower Cretaceous saline formation in eastern North Dakota.[15] Once again, existing right-of-way is shown for purposes of illustration. The EERC projects that the capacity of this saline formation dwarfs that of the oil fields considered in Scenario 1, so it is expected that the same pipeline route could serve all units at 30% or 90% capture.[16] The route in Scenario 2 is shown in Figure 5.

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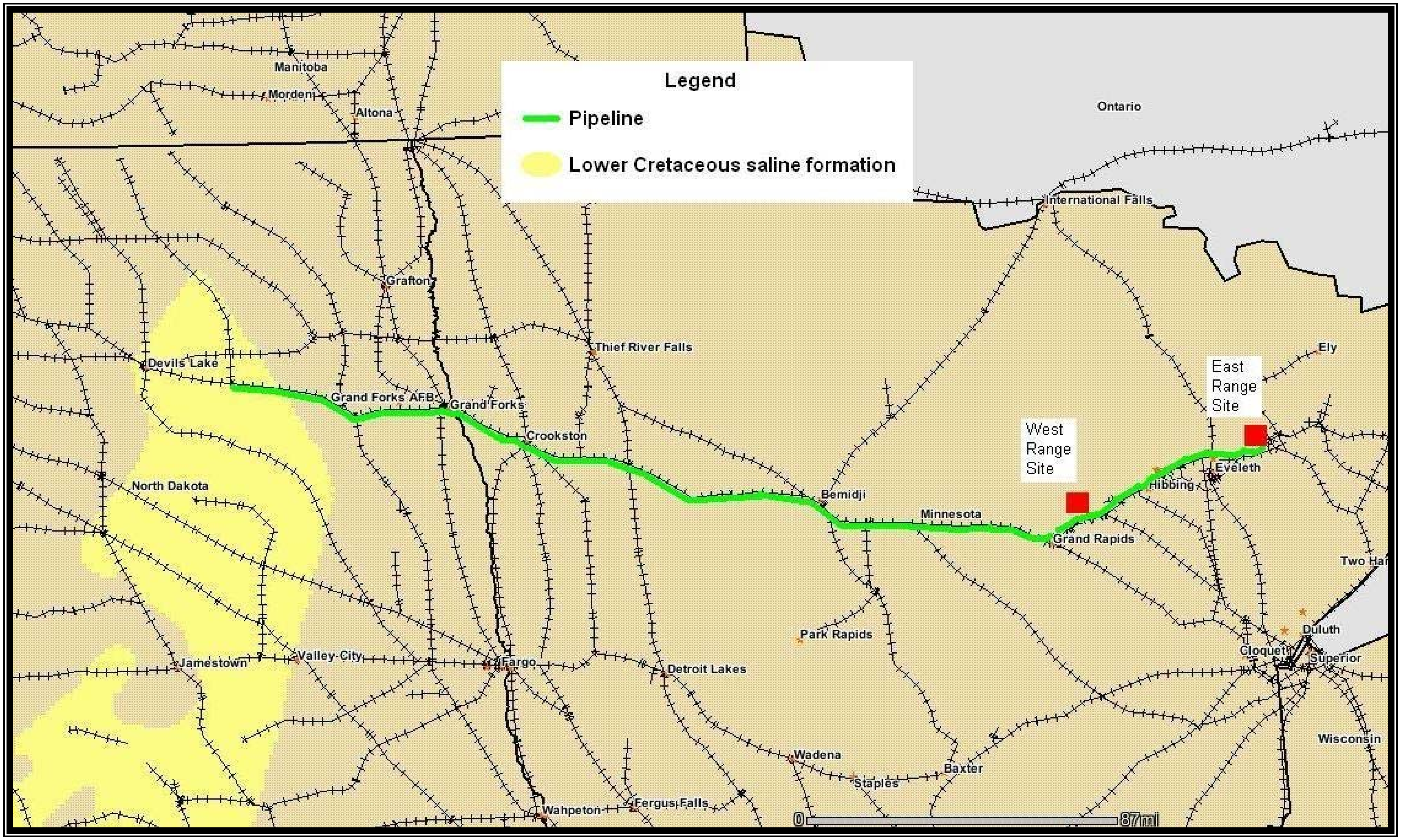
[15] See the Oct. 10, 2006 testimony of Edward N. Steadman, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472-/M-05-1993

[16] EERC, Presentation, Potential Sequestration Options in the Plains CO2 Reduction (PCOR) Partnership Region & Estimated Capacities, Aug. 9, 2006 (on file with Excelsior Energy).

Figure 5. CO_2 Pipeline to Saline Formations for Carbon Credits (No EOR)

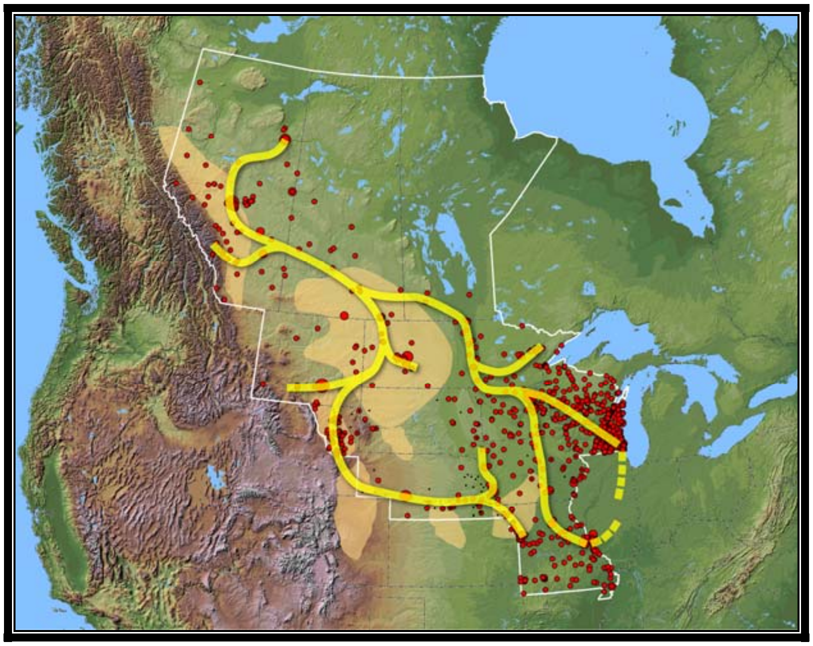


Source: EERC

E. Scenario 3

As Scenario 1C begins to demonstrate, the economies of scale for CO_2 transport could be significant. In a fully implemented GHG regulatory scheme, it would be conceivable that the majority of large industrial facilities (epitomized by large electric generation facilities) would be capturing CO_2. The EERC's vision for a major pipeline system serving the PCOR region is laid out in Figure 6. As the map shows, the concentration of industry on the Iron Range makes it a likely route for a major artery of the CO_2 network.

Figure 6. EERC's Vision of CCS in a Carbon Managed Economy



Source: EERC

VII. Preliminary Economic Analysis

Excelsior used the Mesaba Energy Project's proprietary financial model to identify the breakeven value of CO_2 (in 2006$ per ton) captured in the 30% approach for each scenario identified in Section VI. This modeling is preliminary in nature and is intended to i) illustrate economic dependencies around important CCS Plan variables rather than absolute costs and ii) determine whether a more thorough investigation is justified. All cases assumed that capital outlays associated with CCS occur in 2011, and that CO_2 capture commences in the third quarter of 2014 and continues for 22 years (through the duration of the financial model).

The financing structure and economic assumptions used in the modeling of these carbon capture scenarios are consistent with Excelsior's assumptions in its current financial model used to evaluate the Mesaba Energy Project. The cases are modeled to recover the costs associated with the CCS program and maintain the required return to the projects equity investors. The effects of the sensitivities shown below are displayed as changes in NPV from a base case and are calculated using an 8% discount rate. Estimates for the cost of 90% removal are not available, so only 30% capture was modeled.

Fluor developed an estimate for the cost of the 30% capture configuration,[17] and Excelsior integrated that estimate into the Mesaba Energy Project's financial model. There are two main economic impacts associated with carbon capture: equipment capital cost and reduced plant capacity, which also causes an increase in plant heat rate. The equipment includes the amine stripper and the CO_2 drier and compressor. Plant capacity is reduced and heat rate is increased because these processes are steam driven, and because the CO_2 would need to be replaced by steam as a diluent for NO_x control. In an attempt to determine if CCS can be accomplished without additional costs to utility ratepayers, the cost of fuel increase on a megawatt-hour (MWh) basis corresponding to the heat rate increase was attributed and charged to the CCS project in the model assumptions. Total capital cost additions are currently estimated to be [**BEGIN TRADE SECRET: END TRADE SECRET**] and the anticipated increased O&M costs for that equipment is [**BEGIN TRADE SECRET: END TRADE SECRET**]. The capacity reduction for the IGCC Power Station is currently estimated to be [**BEGIN TRADE SECRET: END TRADE SECRET**], with the increased heat rate expected to be [**BEGIN TRADE SECRET: END TRADE SECRET**].

As for pipeline cost estimates, the Dakota Gasification Project's ("DGP") CO_2 pipeline to the Weyburn oil field was used as the basis for estimating costs. The DGP pipeline was built for $120 million in 1997, and consisted of 204 miles of nominal 12" and 14" Schedule 40 pipeline.[18] Conservatively assuming it was all 12" pipeline and escalated to 2005 dollars, the total cost for a CO_2 pipeline in the Northern Plains is assumed to be $60,920 per inch-mile. Based on the design capacity of the Weyburn pipeline, a nominal 12" Schedule 40 pipeline is sufficient to transport CO_2 produced by 30% capture at Mesaba One, with the Mesaba One and Two units requiring a 14" pipeline. A further conservative assumption utilized in the analysis is that the total pipeline network is built up front. Costs could be reduced by deferring network expansions to additional oil fields

Excelsior Energy modeled Scenarios 1A, 1B, and 2, and the results are presented in Table 2. For Scenarios 1A and 1B, revenues could be earned from both EOR and carbon credits sales (or through other carbon reduction benefits to ratepayers when constraints are imposed). This data illustrates that the economies of scale are important for CCS – the required price per ton drops significantly with larger volumes of CCS, despite the fact that 80 additional miles and an increased diameter for the pipeline would be necessary. Scenario 2 demonstrates that the Mesaba Energy Project could capture and sequester carbon at an even lower overall cost, although such capture could not reap EOR revenues. As explained above, these cost estimates are illustrative rather than predictive, and conclusions should be limited accordingly. The accuracy of these estimates must be refined by additional study before the economic viability of the project can be judged.

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[17] Fluor Enterprises, Inc., *Mesaba Energy Project Partial Carbon Dioxide Capture Case*, October 2006, attached as Exhibit DC __ (DC-7) to the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472/M-05-1993.

[18] See p. 857 of Kovschek, A. R. *Screening Criteria for CO2 Storage in Reservoirs*, Petroleum Science and Technology, 2002. Vol. 20, No. 7&8, pp. 841-866. Also, see Dakota Gasification Company, *available at* http://www.dakotagas.com/SafetyHealth/Pipeline_Information.html.

Table 2. Cost of Captured CO_2

	EOR	Pipeline length	Total CCS Cost ($/ton)
Scenario 1A	Yes	445 miles	$40
Scenario 1B	Yes	525 miles	$35
Scenario 2	No	265 miles	$32

Due to the high degree of uncertainty in many of the important assumptions, Excelsior conducted a sensitivity analysis. Scenario 1A was used as the base case for this analysis, and the results are shown in Table 3. Pipeline costs represent the greatest source of uncertainty, both in terms of the uncertainty of the cost assumed and impact that assumption has on total project cost. It is crucial that the range of this cost be narrowed, and the engineering studies proposed in Section I would address these and other issues. While the effect of capacity loss is nearly as material to the analysis, there is greater modeling certainty in the assumed values.

Table 3. Sensitivity Analysis of CCS Costs

Factor	Case	Input Value Assumed	Required CO2 Value/Total CCS Cost
Pipeline Cost	Low	$30,145/in-mi	$30/ton CO_2
	Base	$60,290/in-mi	$40/ton CO_2
	High	$90,435/in-mi	$50/ton CO_2
Plant Capital	Low	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	Base	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	High	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
Capacity/ Heat Rate	Low	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	Base	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	High	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
Plant O&M	Low	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	Base	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	High	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
Pipeline O&M	Low	$890/mi-yr	$40/ton CO_2
	Base	$1,780/mi-yr	$40/ton CO_2
	High	$2,760/mi-yr	$41/ton CO_2

It is important to note that the greatest uncertainty surrounding the economics of a CCS project is revenue, as EOR depends upon volatile oil prices and carbon credit prices (or other economic benefits from reductions under carbon constraints) depend upon future regulation. However, such uncertainties are not specific to the Mesaba Energy Project and must be overcome by any major undertaking of CCS. The figures presented in the remainder of this section elaborate upon the modeled impact of CO_2 prices on the net present value of different scenarios in the CCS Plan.

Figure 7 shows the impact that the value of CO_2 has on project economics. This value for CO_2 is derived from either EOR or a combination of EOR and carbon credits or other CCS regulatory benefits, and corresponds to Scenario 1A with the baseline assumptions described above. Similarly, Figure 8 examines this impact if revenues are from carbon credits exclusively (that is, no EOR). CO_2 would be sequestered in saline formations, corresponding to Scenario 2. Thus, for Figure 8 the impact to the NPV is based on Scenario 2's $32/ton case as the $0 NPV reference.

Figure 7. Sensitivity to Changes in Total CO_2 Revenue (\$/ton CO_2) in Scenario 1A

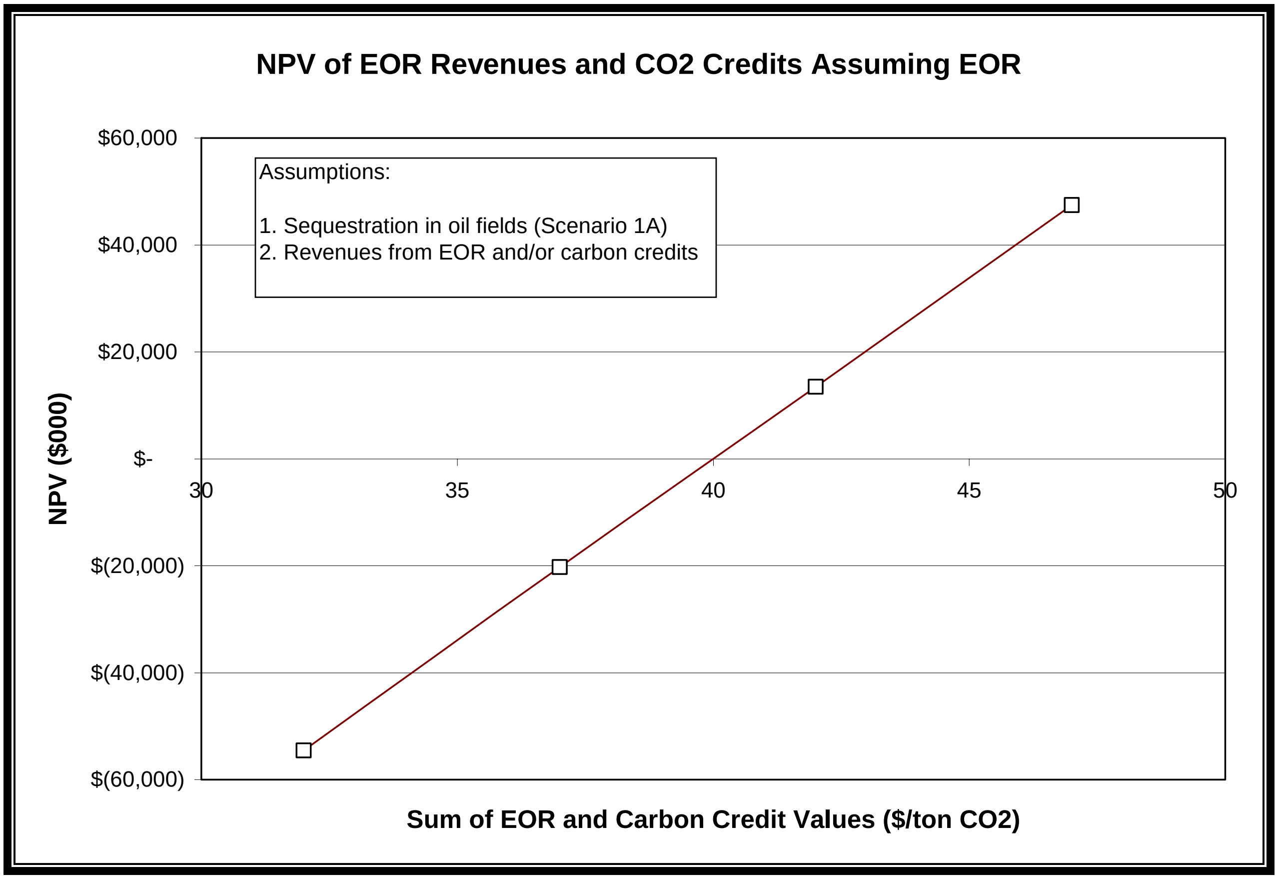
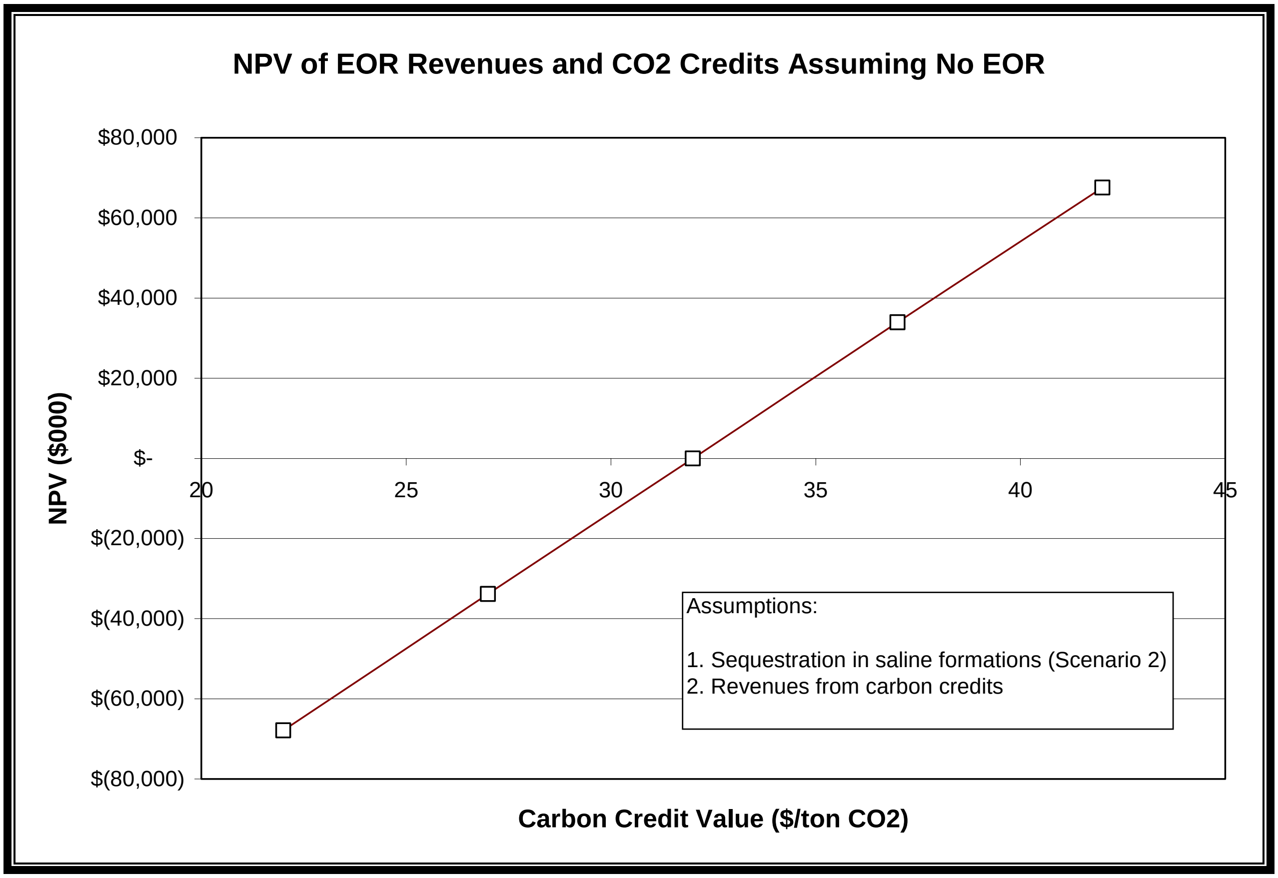
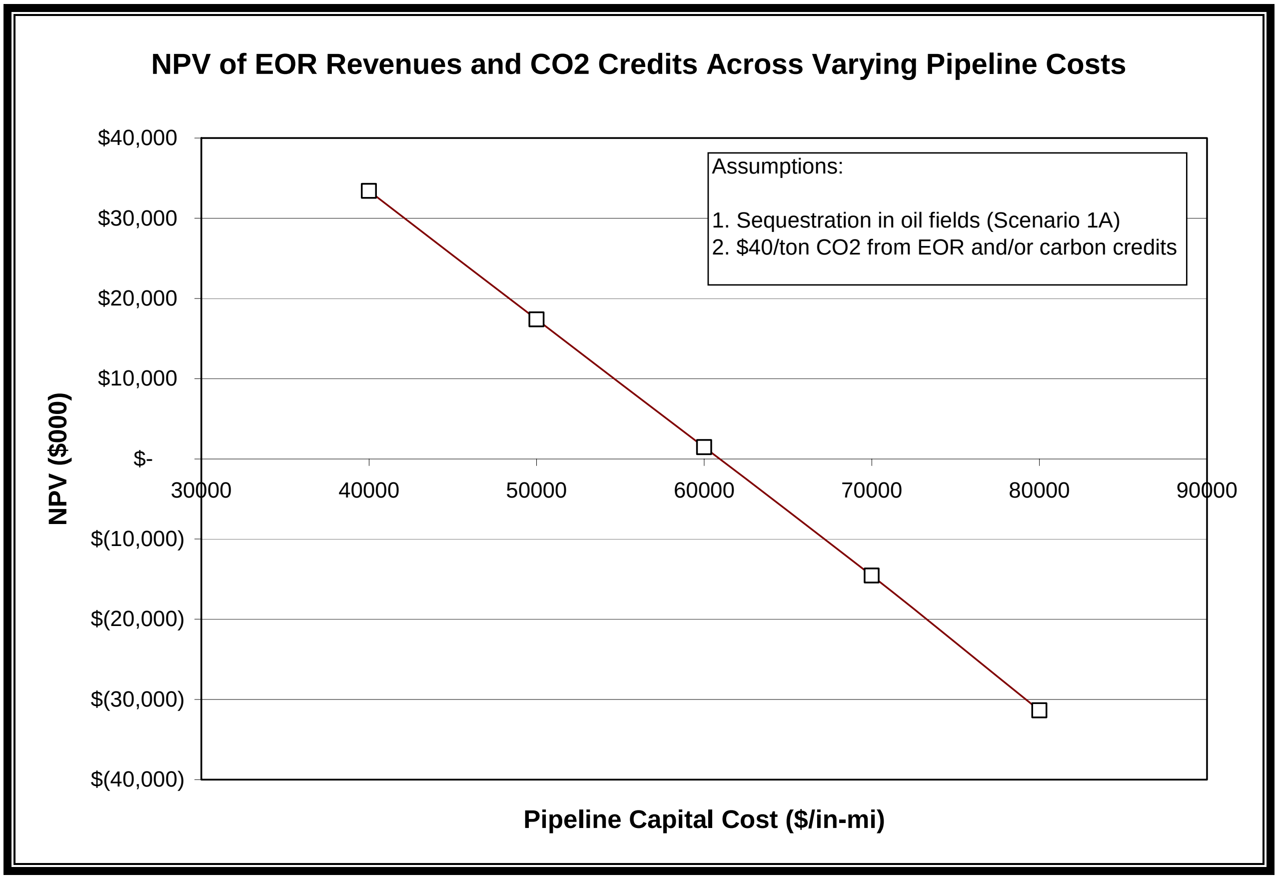


Figure 8. Sensitivity to Changes in Carbon Credit Revenue ($/ton CO_2) in Scenario 2



Changes in the NPV of different scenarios in the CCS Plan due to changes in pipeline costs are shown in Figure 9. This figure assumes that the total value of CO_2 will average $40/ton.

Figure 9. Sensitivity to Changes in Pipeline Costs ($/in-mi) in Scenario 1A



Carbon credits are currently trading at approximately $17/ton in Europe.[19] The value of CO_2 for EOR is highly variable according to oil prices, specific field geology, and source competition. At oil prices of $15–20/bbl, CO_2 can be worth $10–16/ton for EOR, and more at higher prices of oil.[20] As carbon regulations are introduced and become stricter, and as the price of oil increases, the price of CO_2 can be expected to rise. Although it is premature to conclude whether CCS in any scenario presented here is economical, Excelsior believes that additional study towards that end is warranted.

The alternative sources of CO_2 for EOR in the fields identified in Scenario 1 are limited. The largest of these by far are conventional coal plants in the region, but post-combustion CO_2 capture for such sources has only been demonstrated at pilot scale. The cost per ton is expected to be higher for conventional coal than for the Mesaba Energy Project, even if a much shorter pipeline is assumed for the former.[21] Ethanol plants and natural gas processing facilities are able

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[19] The market closing price on October 18 was €12.90 (http://www.pointcarbon.com), which is equivalent to $16.25 USD.

[20] Intergovernmental Panel on Climate Change, IPCC Special Report: Carbon Dioxide Capture and Storage, p. 33 (2005), *available at* http://arch.rivm.nl/env/int/ipcc/pages_media/SRCCS-final/ccsspm.pdf.

[21] See Ref. 2.

to produce CO_2 at a much lower cost than conventional coal plants, but lack the capacity to saturate the EOR market. Fields along the pipeline built by the Dakota Gasification Project can accommodate its supply for decades to come. Therefore, it is reasonable to expect that EOR revenues could be available to the Mesaba Energy Project across the time frames proposed.

Excelsior assumes that it will be positioned to obtain partial DOE cost sharing for construction of the CO_2 pipeline. However, irrespective of such funding potential, Excelsior believes it is in the interests of the both the Mesaba Project and the state to better understand the economic drivers for CCS programs and the need to firm up equipment/construction costs at the plant, along the pipeline route, and at the oil fields. Detailed engineering studies conducted under carefully defined scopes of work will help refine such costs.

The EERC, in conjunction with Excelsior, will develop CO_2 management options for the Mesaba Energy Project based on evaluations of sequestration opportunities associated with regional geologic formations/features and nearby terrestrial features. The study will match carbon sinks to the Mesaba Project and rank the sinks according to engineering, economic, and public-acceptance considerations. The schedule calls for the EERC to complete an analysis of the identified CO_2 management options in December 2006. Excelsior will use the results of this analysis to narrow the scope of its Phase III proposal to the DOE for demonstrating the commercial readiness of carbon sequestration via IGCC.

In preparing the Phase III proposal, the EERC and Excelsior will formulate best practices required to accomplish sequestration of CO2 from IGCC facilities and publish the results as part of a manual that can be used by others undertaking IGCC projects.

VIII. Summary and Conclusions

Excelsior has prepared this CCS Plan to offer the Commission and Minnesota ratepayers options to capture and sequester a significant portion of the CO_2 emissions from the Mesaba Energy Project. Based on the scientific and technical considerations, marketplace and operating assumptions, the financial analyses, and future carbon regulations assumed in this CCS Plan, Excelsior anticipates that future technical studies will verify that it will be feasible to capture and sequester CO_2 emissions from the Mesaba Energy Project. As explained in the CCS Plan, the most promising CCS scenario is for Excelsior to transport its CO_2 via high-pressure pipelines to the depleted oil fields associated in the Williston Basin located in North Dakota, southwestern Manitoba, and southeastern Saskatchewan.

This CCS Plan reflects the work undertaken to date by Excelsior and the PCOR initiative. Significant work remains to refine the engineering and economic information it contains. This work will be advanced by the PCOR initiative. Excelsior will continue to update this information as its work with PCOR progresses. Excelsior would be amenable to exploring a commitment with the Commission to apply the final $2 million of its RDF award to further efforts to refine this plan. If feasible from the Commission's perspective, Excelsior would propose to accelerate the funding of that amount in order to facilitate a more rapid completion of a detailed engineering plan and cost proposal for CCS. Excelsior anticipates that such a detailed plan could be developed within a year from the date such funding is made available. The CCS Plan could also serve as the foundation for a competitive proposal in response to the Department of Energy's ("DOE") planned Phase III solicitation for demonstrating full scale CCS projects. Accelerating development of a very detailed plan would enhance Minnesota and the Mesaba Project's prospects to obtain federal matching funds under DOE programs.

It is in the long-term interests of the state to proceed expeditiously with the development of feasible CCS options. Excelsior looks forward to working with regulators, stakeholders, and industry participants to provide the important hedge to Minnesota consumers offered by the timely development of carbon capture and sequestration.

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APPENDIX A2
DOE Analysis of Feasibility of Carbon Capture and Sequestration for the Mesaba Energy Project

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APPENDIX A2
DOE ANALYSIS OF FEASIBILITY OF CARBON CAPTURE AND SEQUESTRATION FOR THE MESABA ENERGY PROJECT

This section discusses carbon capture and sequestration (CCS) and examines why it is not commercially feasible for the proposed action. The discussion includes consideration of the technical and economic feasibility of CCS given current and expected state-of-the-art technologies, foreseeable developments, market forces, and the regulatory framework in relation to the expected in-service date of the project.

The Mesaba Energy Project was selected in 2004 under the Clean Coal Power Initiative (CCPI) Round 2 Funding Opportunity Announcement. CCS was not a requirement of the Round 2 announcement, was not proposed in Excelsior's application submitted in response to the announcement, nor is it included within the project as negotiated and awarded in the DOE Cooperative Agreement. CCS will be the focus of the future CCPI Round 3 Funding Opportunity Announcement.

DOE has parallel research programs aimed at reducing the cost of electricity associated with power production and proving the technical viability of CCS technology. Advancements in gasification, turbine, and CCS technology must converge to make CCS technically and economically feasible. Projects like Mesaba will advance the state-of-the-art in gasification technology thereby making CCS more likely to be deployed in the future.

DOE expects that the combined efforts of these programs will enable large-scale plants to come on-line by 2020 that offer 90% carbon capture with 99% storage permanence at less than a 10% increase in the cost of energy services[1]. The planned in-service date for the Mesaba Energy Project is well in advance of the timeline for achieving the DOE goal.

<u>Technical Feasibility of Carbon Capture</u>

As discussed in Section 2.2.1.3, Section 5.1.2, and Appendix A1, Excelsior has presented a multiple-option carbon management plan to the Minnesota Public Utilities Commission (PUC). At its baseline, the Mesaba Energy Project would be designed with sufficient space available in its footprint for future installation of carbon capture equipment. Adjacent systems would also be designed to facilitate modification for interfacing the carbon capture equipment.

The plan includes the option of using commercially available amine scrubbers to remove carbon dioxide from the syngas stream prior to combustion in the gas turbines that would, assuming 100% subbituminous coal input, result in a nominal 30% reduction in overall carbon dioxide emissions from the plant. Incorporation of this base case carbon capture scenario would result in an adverse impact to plant efficiency and the price of electricity. Other commercially available capture technologies, such as Selexol® and Rectisol® would have a greater adverse impact on plant efficiency and the price of electricity[2].

Excelsior's carbon management plan for the Mesaba Energy Project includes an additional option to convert the carbon monoxide present in the syngas to carbon dioxide for greater removal, if future conditions justified this option. This could conceivably result in about a 90% reduction in overall carbon dioxide emissions from the plant. However, the technologies required for this rely on a gas turbine that is capable of running on hydrogen-rich gas. For example, this process relies on converting water and carbon monoxide to carbon dioxide and hydrogen, as shown in the reaction below, using a water-gas shift reactor.

$$CO + H_2O \rightarrow CO_2 + H_2$$

This results in a carbon monoxide-depleted, hydrogen-rich syngas. Conventional, commercially available combustion gas turbines envisioned for this project cannot operate on carbon monoxide-depleted syngas where the hydrogen concentration approaches 100%. Currently commercially-available combustion gas turbines at sizes much smaller than those envisioned for this project operate on hydrogen-rich fuels. These machines are typically operating on a blend of hydrogen (typically less than 60% hydrogen) and some other energy containing fuel, such as carbon monoxide or methane. However, the size, combustion technology and vintage of these smaller and older machines results in poor performance in terms of low efficiency and high emissions. This current experience, on smaller machines fueled with a hydrogen blend, does not translate to technology for larger machines fueled with nearly 100% hydrogen that would be needed for the Mesaba project, where high efficiency and low emissions are a requirement.

Currently, advanced turbines are in development that address these issues but are not expected to be commercially available at the Mesaba project's in-service date. Even when these advanced turbines are commercially available, the option of precombustion decarbonization to produce a hydrogen fuel would result in substantial capital cost, reduce overall plant efficiency and adversely impact the price of electricity from the Mesaba project. Testimony sponsored by Excelsior in the PUC docket estimated that under the 90% removal scenario, capital equipment cost could increase by up to 40%; corresponding increases in the net plant heat rate would approach 21%[3]. Other independent estimates are that the addition of 90% capture technologies to a gasification plant would increase the cost of energy by about 17%[4] and decrease the net power plant efficiency by about 6-9%[5].

Technical Feasibility of Carbon Dioxide Transport

There are no sufficiently characterized geologic reservoirs capable of sequestering carbon dioxide within the state of Minnesota. The nearest geologic formation of potential interest would be the Lower Cretaceous saline formation approximately 265 miles from the proposed West Range Site. The nearest formation with the potential for revenues would be associated with enhanced oil recovery (EOR) in the Williston Basin of North Dakota. Both scenarios would require a pressurized pipeline; such a pipeline would need to extend at least 400 miles to reach the Williston Basin. Much experience has been gained in the design, construction and operation of pipelines for transport of carbon dioxide for EOR. There are about 3,000 miles of existing carbon dioxide pipeline in the United States, including examples of pipelines up to 500 miles in length. It is therefore technically feasible to build a pipeline to oil fields or other sequestration sites within about 500 miles from the Mesaba Energy Project location. However, assuming rights-of-way, permits and off-take agreements could be obtained, the cost associated with the transport would significantly increase the cost of electricity.

Technical Feasibility of Carbon Sequestration

Sequestration options include suitable EOR and injection into compatible geologic formations. Beneficial reuse, such as carbonation for soda pop, does not constitute sequestration because it ultimately results in release to the atmosphere. Sequestration is the subject of a great deal of research relative to the efficacy of long-term storage (i.e., permanence) and characterizing suitable "carbon sinks" to ensure that any potential adverse environmental impacts are understood and minimized. DOE has created a network of seven Regional Carbon Sequestration Partnerships to develop the technology, infrastructure, and regulatory framework necessary to implement carbon sequestration in different regions of the Nation. Planning for large-scale sequestration tests is scheduled to begin in fiscal year (FY) 2008 and the tests would run through FY 2017. The purpose of the tests is to demonstrate that large quantities (e.g. one million tons of carbon dioxide per year) can be transported, injected, and stored safely, permanently, and economically.[1]

Large-scale and long-term commercial application of carbon dioxide injection for EOR has occurred in the Texas Permian Basin and in the Weyburn field of the Williston Basin. However, these are economically-driven operations to increase oil production not necessarily scientifically-driven to prove the technical feasibility of permanently sequestering carbon.

Therefore, the technical feasibility of carbon sequestration for the Mesaba Energy Project cannot be validated in the near-term until extensive field tests are conducted to fully characterize potential storage sites and the long-term storage of sequestered carbon has been demonstrated and verified. Further, an MIT study[4] concluded that the major uncertainties surrounding geologic sequestration should be resolved within 10-15 years, which is consistent with the DOE Carbon Sequestration Program goal.

Economic Feasibility of Carbon Capture and Sequestration

The effect of CCS on the cost of electricity from the Mesaba Energy Project has not been quantified. However, there have been a number of studies of the costs of CCS for IGCC plants that show the costs of CCS could increase the cost of electricity by as much as 40%,[6] depending on assumptions regarding the value of the carbon dioxide produced. No statutory or regulatory requirement exists for CCS. Nor does a viable market currently exist for carbon credits. Environmental and construction permitting associated with transport and sequestration would significantly delay the project, further increasing the cost of electricity. Even if the carbon dioxide could be sold for EOR operations, the revenues from carbon dioxide (estimated at about $20 per ton) would be grossly insufficient to recover such costs. Hence, imposition of CCS on the project will effectively make the cost of electricity non-competitive.

Summary Conclusion

Carbon capture and sequestration is not considered feasible for the Mesaba Energy Project at this time. However, the carbon management plan for the Mesaba Energy Project is a logical starting point from which the PUC can derive findings and thereby establish the appropriate timing and price at which carbon capture and sequestration becomes in the Minnesota ratepayers' interest. Without an order from the PUC that incorporates the costs associated with CCS within the power purchase agreement, the Mesaba Energy Project would not be economically viable.

References

1. Carbon Sequestration Technology Roadmap and Program Plan, 2007, NETL.
2. Comparative IGCC Performance and Costs for Domestic Coals, Conoco-Phillips, Gasification Technology Council, May 2005.
3. Prepared Rebuttal Testimony of Douglas H. Cortez on behalf of Excelsior Energy Inc. and MEP-I LLC, October 10, 2006, page 9.
4. The Future of Coal in a Greenhouse Gas Constrained World, MIT, http://sequestration.mit.edu/pdf/GHGT8_Herzog_Katzer.pdf
5. DOE/NETL 401/053106
6. Cost and Performance Baseline for Fossil Energy Plants, DOE/NETL-2007/1281, May 2007.

APPENDIX B
Air Quality Analysis Data

(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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B. AIR QUALITY IMPACT ASSESSMENT

B.1 PREDICTIVE (NEAR-FIELD) MODELING

B.1.1 Modeling Approach

The latest available version of AERMOD (07026), the EPA regulatory default model in the nearfield, was utilized to assess impacts from the Mesaba IGCC Power Plant. Model inputs and control parameter options were selected in accordance with the protocol established in *Guideline on Air Quality Models, Revised* (GAQM) and *User's Guide for the AMS/EPA Regulatory Model - AERMOD*, both EPA documents, as well as Minnesota Pollution Control Agency (MPCA) guidance document *MPCA Air Dispersion Modeling Guidance for Title V Modeling Requirements and Federal Prevention of Significant Deterioration (PSD) Requirements (Version 2.2)* (MPCA, October 2004).

For the modeling analysis for Mesaba IGCC Power Plant, AERMOD was set in regulatory default mode and ambient concentrations; no urban location was identified for the source and thus, AERMOD assumed a rural location. Dry or wet plume depletion was not utilized for any pollutant. A receptor grid was generated per MPCA guidance. See B.1.3 for details.

For meteorological data, pre-processed AERMET (06341) data files downloaded from MPCA were utilized, as required by their guidance. Based on the location of West and East Range sites, MPCA required Hibbing meteorological surface data and International Falls upper air data. MPCA generated data files for these two stations for 1972 to 1976 for every 0.5 degree latitude and longitude across Minnesota. Per MPCA guidance, the files with the closest latitude and longitude to the site should be used for the analysis. For the West Range site, the meteorological data files utilized were HI475935.*, while for the East Range site, the meteorological data files employed were HI475920.*.

The initial air quality modeling addressed the individual point sources of the Mesaba Energy Project, Phase I and Phase II, including four combustion turbine generator (CTG) stacks, two tank vent boiler (TVB) stacks, two auxiliary boilers, and two flare stacks, as well as all fugitive PM_{10} sources (Excelsior, 2006). The modeling was conducted to determine which pollutants will have significant ambient air impacts, and to identify the significant impact area (SIA) for each pollutant. Modeling was conducted for the criteria air pollutants, SO_2, carbon monoxide (CO), NO_X, and particulate matter less than 10 microns (PM_{10}), each applicable averaging time, the operating scenarios (i.e., normal operations and an alternative worst-case flaring scenario). Ozone (O_3) emissions could not be modeled or analyzed because O_3 is not emitted directly from a combustion source. Compliance with O_3 standards is normally analyzed as part of a state or regional implementation plan. Emissions of lead (Pb) were not modeled because the potential Pb emissions from the proposed project will be less than the PSD significant threshold.

Table B.1-1. Annual Criteria Air Pollutant Emission (Phase I Only and Phase I & II Combined)

Pollutant	PSD Significance Threshold (TPY)	Phase I Potential to Emit (1) (TPY)	Phase I & II Potential to Emit (1) (TPY)
CO	100	1,270	2,539
NO_X	40	1,436	2,872
SO_2	40	695	1390
PM	25	271(2)/360(3)	542(2)/719(3)
PM_{10}	15	266(2)/355(3)	532(2)/709(3)
O_3 as VOC	40	99	197

Table B.1-1. Annual Criteria Air Pollutant Emission (Phase I Only and Phase I & II Combined)

Pollutant	PSD Significance Threshold (TPY)	Phase I Potential to Emit (1) (TPY)	Phase I & II Potential to Emit (1) (TPY)
Pb	0.6	0.015	0.03
Sulfuric Acid (H_2SO_4) (mist)	7	65	130
Hydrogen Sulfide (H_2S)	10	9	17

(1) The potential to emit is the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design (i.e., the worst-case scenario) and does not include any regulatory limitations. For the Mesaba Generating Station sources, the worst-case scenario assumes full load at 8760 hrs per year.

(2) West Range Site

(3) East Range Site: Higher emissions because water quality at the East Range Site results in higher PM_{10} emissions from the cooling tower.
Source: Excelsior, 2006a

The SIA was determined for those pollutants that are shown to have a significant impact in ambient air at any point. The SIA was defined for each pollutant as a circle, centered on the plant site, with a radius equal to the greatest distance to a significant impact for any applicable averaging time or emission scenario. No further modeling was conducted if any pollutant did not have a significant impact. However, for pollutants with significant impact, additional modeling was carried out to evaluate compliance with PSD increments and national ambient air quality standards (NAAQS) or Minnesota ambient air quality standards (MAAQS). Applicable significant impact levels (SILs), PSD increments, and the stricter of NAAQS and MAAQS are provided in Table B.1-2.

Table B.1-2. Applicable Air Quality Standards, Increments and SILs

Pollutant	Averaging Time	NAAQS / MAAQS ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)
SO_2	1-Hour	1,300	512	25
	3-Hour	915	512	25
	24-Hour	365	91	5
	Annual	60	20	1
NO_2	Annual	100	25	1
PM_{10}	24-Hour	150	30	5
	Annual	50	17	1
CO	1-Hour	40,000	NA	2,000
	8-Hour	10,000	NA	500

Source: Excelsior, 2006a

Source input for increment modeling included all point sources associated with Phase I and Phase II and all regional increment-consuming sources included in the emissions inventory, which included data provided by MPCA and accumulated from recent permit applications. In addition to those sources included in the increment analysis, additional nearby sources (provided by MPCA and accumulated from recent permit applications) were added to the source inventory for the NAAQS analysis. Regional source impacts were included (for worst-case modeled impact times and receptors), by modeling the First-Approximation Run Data (FARDATA) emission inventory appropriate to the West Range Site and East

Range Site, as provided by MPCA modeling staff. For comparison to the NAAQS, a background concentration representing natural background was added to all model-predicted concentrations.

In addition to the modeling analyses described above, model results were applied to address other PSD requirements: the potential need for pre-construction monitoring and additional impact analyses relating to growth, soils and vegetation, visibility impairment, and deposition.

B.1.2 Modeled Emissions Rates

The maximum expected point source criteria pollutant emission rates from each phase of the Mesaba Energy Project for different averaging times and operating scenarios, as presented in Tables B.1-3 and B.1-4, were used as model input for the air modeling analyses. The stack parameters in Table B.1-5 were also used as input data. The data presented in Table B.1-3 represent emissions during normal operation of Phases I and II, which were modeled as the "base case" to define the expected air quality impacts of the Mesaba IGCC Power Plant. In response to comments from the Federal Land Managers, Excelsior has identified the worst-case emission scenarios that are possible in various operating scenarios including flaring. To address emission rates and stack gas conditions for these worst-case short-term scenarios, air modeling was also carried out for applicable averaging times (24 hours and less) using the emission rates given in Tables B.1-4. The emission rates represent worst-case maximum emissions for each scenario.

Other sources at the Mesaba IGCC Power Plant will consist of two emergency fire pumps and two emergency diesel generators per phase. Because these sources will operate for only short time periods, when the primary emission sources will not be in operation, they were not included in the air modeling analyses. Hours of operation for these other sources will likely be limited by permit conditions. The emissions from periodic testing of these emergency resources are negligible in comparison to the sources shown in Tables B.1-3 and B.1-4. Fugitive emissions of PM_{10} will result from the storage and handling of coal and other materials and have been modeled under normal operations as described in Appendix D of Excelsior's Air Permit Application.

Table B.1-3. Emission Rates (in g/s) for Normal Operation Scenario – Mesaba I & II

Averaging Time	CTs (each of 4)	TVB (each of 2)	Flare (each of 2)	Aux Boiler (each of 2)	Cooling Twr[1] (each of 34)
One-Hour					
SO_2	22.3	1.06	0.001	0.05	0
CO	12.0	0.74	0.14	1.21	0
Three-Hour					
SO_2	18.5	0.94	0.001	0.05	0
Eight-Hour					
CO	12.0	0.74	0.14	1.21	0
24-Hour					
SO_2	14.0	0.81	0.001	0.05	0
PM_{10}	3.15	0.088	0.002	0.08	*
Annual					
SO_2	9.32	0.45	0.35	0.01	0
PM_{10}	3.15	0.03	0.05	0.02	*
NO_x	19.91	0.76	0.39	0.15	0

(1) Cooling Tower PM10 emission rates vary by tower and plant site. Emission rates per cell are:

West Range Site:	12 cell towers	0.0410 g/s
	5 cell towers	0.0390 g/s
East Range Site:	12 cell towers	0.2181 g/s
	5 cell towers	0.2130 g/s

Table B.1-4. Emission Rates (in g/s) for Alternate Flaring Scenarios – Mesaba I & II[1]

Averaging Time	First CT (each of 2)	Second CT (each of 2)	TVB (each of 2)	Flare (each of 2)
One-Hour				
SO_2	22.30	0.74	1.06	65.52
CO	345.23	345.23	0.74	357.8
Three-Hour				
SO_2	18.5	0.74	0.94	46.3
Eight-Hour				
CO	68.21	68.21	0.74	336.73
24-Hour				
SO_2	7.7	7.7	0.81	9.5
PM_{10}	2.9	2.9	0.09	0.44
Annual				
Not Applicable	---	---	---	---

(1) Emissions from Auxiliary Boilers and Cooling Towers are the same as for Normal Operation Scenario.

Table B.1-5. Mesaba I & II Stack Parameters

Source	Height (m)	Diameter (m)	Temp (deg K)	Velocity (m/s)
Combustion Turbines (each of four)				
All scenarios	45.72	6.1	394.3	20.1
Tank Vent Boilers (each of two)				
One-to-24 Hour	64.01	1.83	579.8	8.46
Annual	64.01	1.83	579.8	1.95
Auxiliary Boiler (each of two)				
All scenarios	12.19	1.52	422.1	9.70
Cooling Towers (each of 34 cells)				
All Scenarios	14.63	10.06	313.0	8.14
Flare (each of two)				
Normal Operation	56.39	0.25	1273.0	20.0
Flaring Scenario				
One-Hour	56.39	7.57	1273.0	20.0
Three-Hour	56.39	7.35	1273.0	20.0
Eight-Hour	56.39	7.35	1273.0	20.0
24-Hour	56.39	6.87	1273.0	20.0

As part of the NAAQS analysis, a Good Engineering Practice (GEP) stack height analysis was conducted. The evaluation demonstrated that all the stacks are less than GEP; therefore they were modeled at their actual heights.

B.1.3 Receptor Grid

For both the West and East Range site locations, discrete receptors in NAD83 UTM zone 15 coordinates were generated based on MPCA modeling guidance, using the Title V modeling policy. The receptor grids are based on a Cartesian coordinate system. Receptor grids for each site are independent of each other, but were generated based on the same methodology using a series of nested grids centered on site location. The placement for these nested grids and associated receptor spacing are summarized in Table B.1-6.

Table B.1-6. Mesaba IGCC Power Plant Receptor Grids

Distance from Property Boundary (km)	Receptor Spacing (m)	Grid Type
At Fence Line	10	Cartesian
0.025 to 0.25	25	Cartesian
0.30 to 0.50	50	Cartesian
0.60 to 1.0	100	Cartesian

1.2 to 2.0	200	Cartesian
2.5 to 4.5	500	Cartesian
5.0 to 10.0	1,000	Cartesian
20.0 to 50.0	10,000	Polar-Based with Cartesian Coordinates

Source: Excelsior

Property boundary (fence line) receptors were set at a spacing of 10 meters. Starting from the fence line and out to about 250 meters, discrete receptors were set at a spacing of 25 meters. From 300 to 500 meters from the property boundary, discrete receptors were spaced at 50 meters, and so on as shown in the table. Using this placement scheme, 8,528 receptors were generated for the West site and 7,295 receptors were generated for the East site. Figure B.1-1 displays the full receptor grid for the West Range site and Figure B.1-2 depicts the full receptor grid for the East Range site.

Figure B.1-1 Full Receptor Grid for Mesaba Energy West Range Site

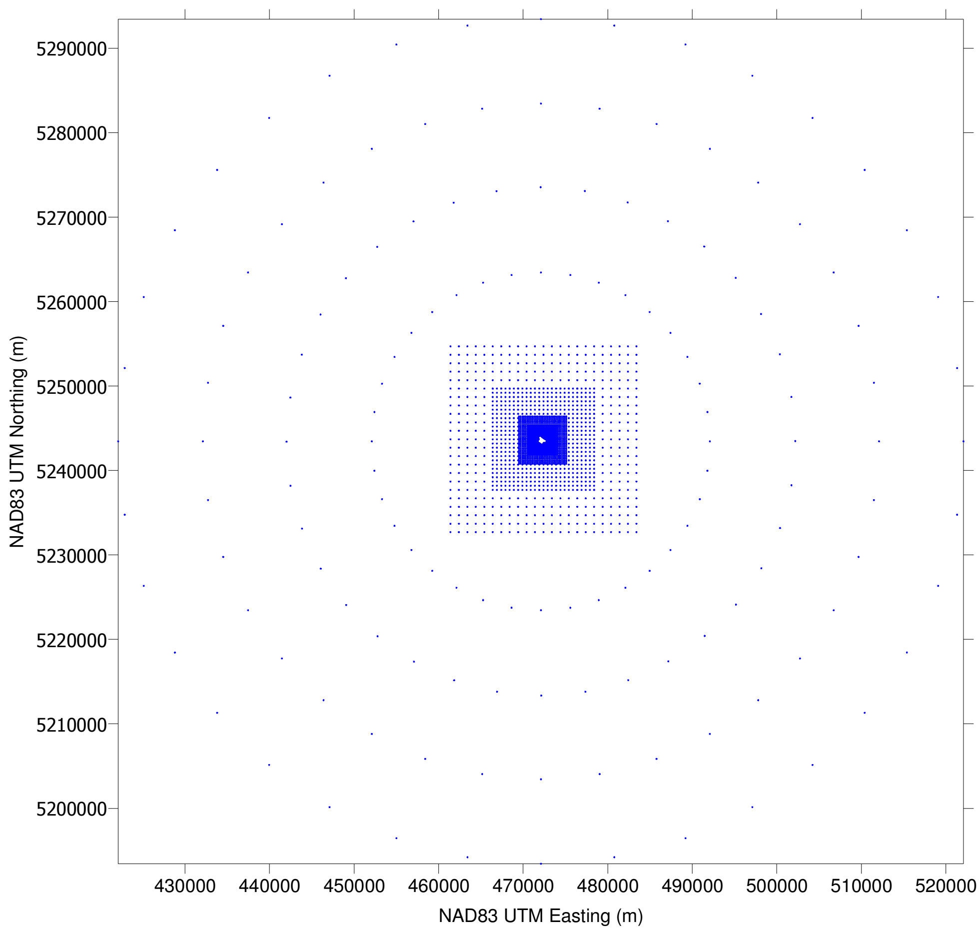
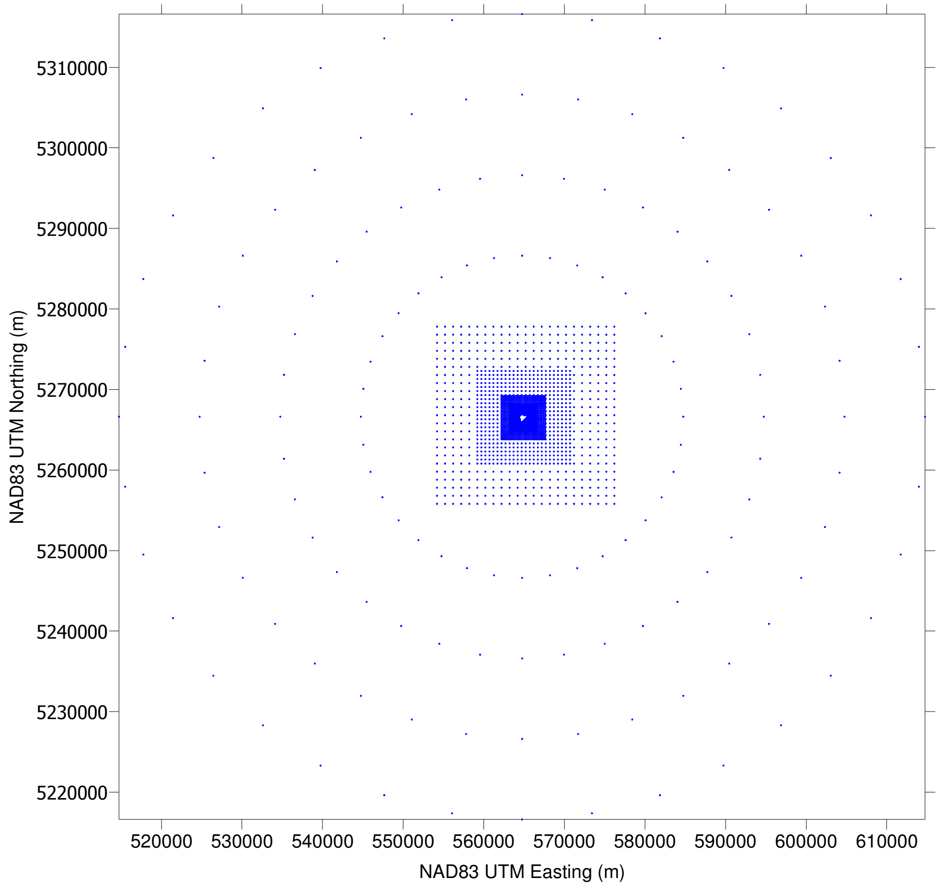


Figure B.1-2 Full Receptor Grid for Mesaba Energy East Range Site



For each site, receptors generated above were processed through AERMAP (version 06341). (Note that AERMAP version 09040 was released after significant impact analysis modeling for the project was completed, and as no significant differences in results between the two pre-processors are expected based on the release notes and comparisons with other projects, the receptor grid was not re-processed through AERMAP 09040). For the West Range Site, 132 7.5-minute 30-meter DEM maps were used, and for the East Range site 137 DEM maps were employed, with all DEM maps in North American Datum 1927 (NAD27). The receptors and domain area were set in AERMAP in NAD83, i.e., option '4' in the program control file. No shift was incorporated into the ANCHORXY control parameter, i.e., AERMAP was told that all receptors imported were in NAD83 UTM coordinates and no local coordinate system was used. Given this setup for the project, AERMAP converted the DEM map data from NAD27 to NAD83. AERMAP generated an output receptor file consisting of UTM Easting (m), UTM Northing (m), MSL elevation (m), and hill profile (m) parameters for each receptor. Figures B.1-3 and B.1-4 show resultant terrain in meters, as calculated by AERMAP, for the receptor grid within approximately 5 kilometers of the West Range and East Range sites, respectively. A waste rock storage pile located in close proximity to the East Range site is not included in the AERMAP terrain output. However, prior model analyses for that site incorporated the elevations of the waste rock deposit, and showed no effect on highest model-predicted concentrations.

Figure B.1-3 Close-In Receptor Grid and Terrain (m) from AERMAP for the West Range Site

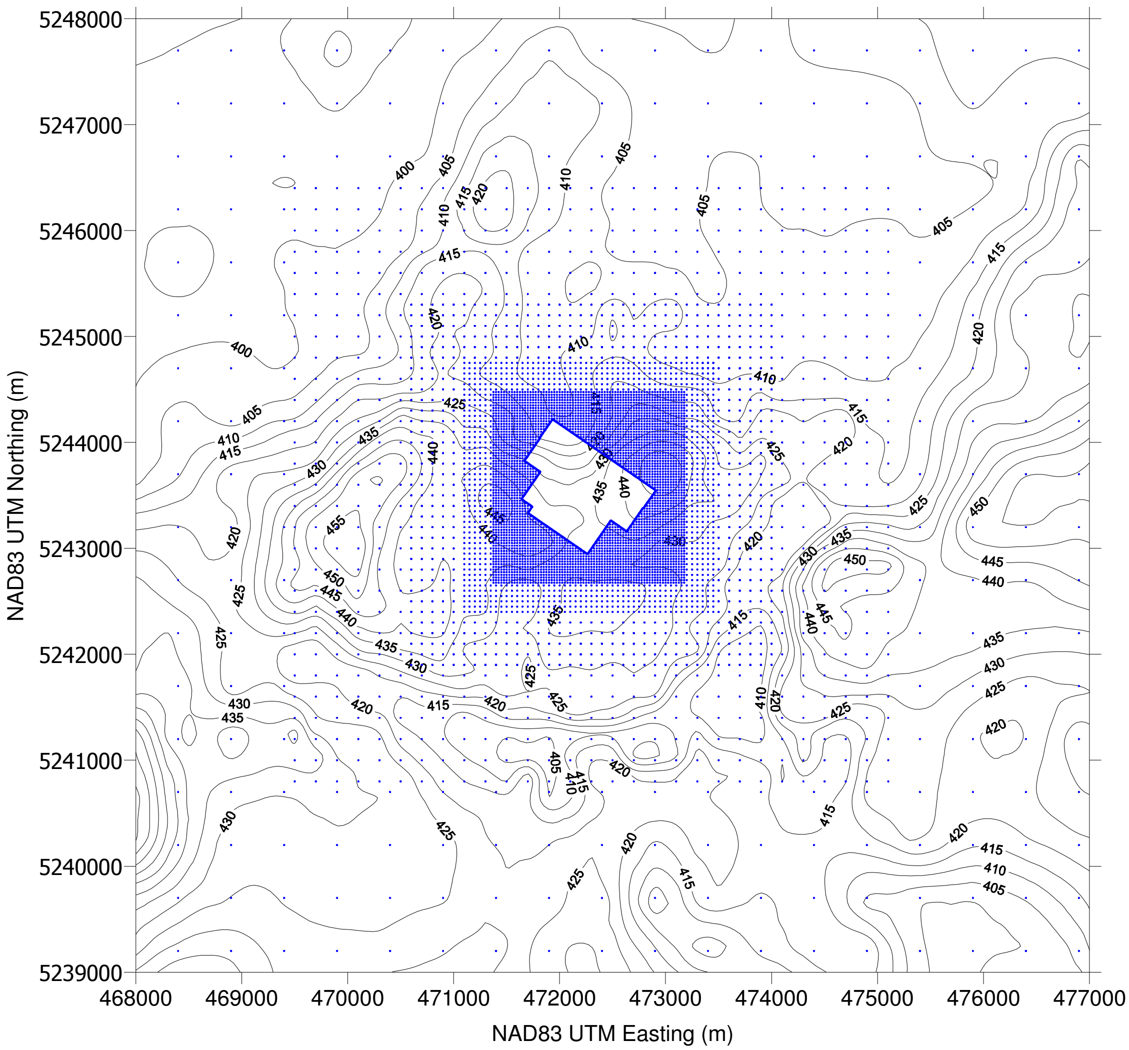
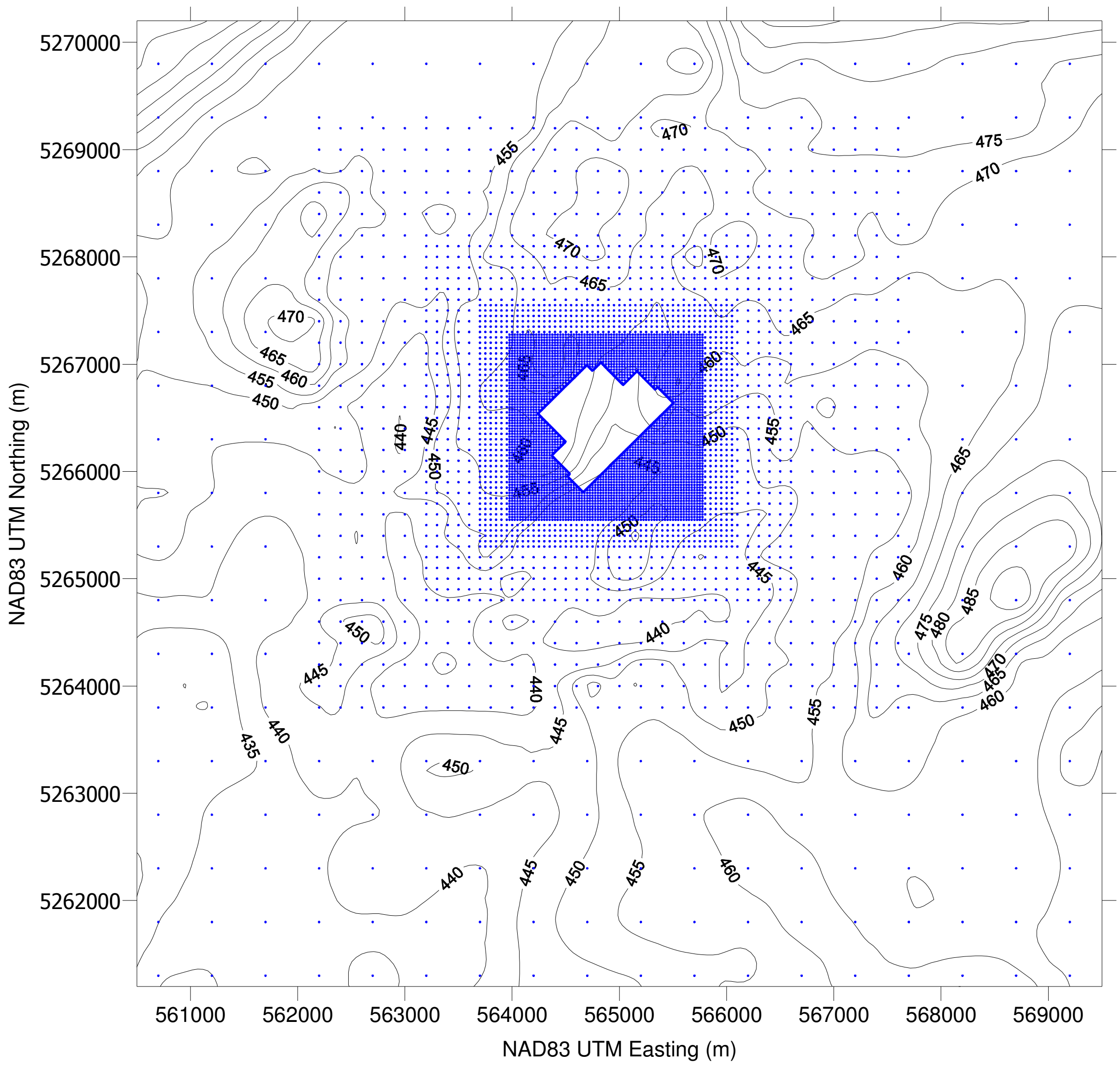


Figure B.1-4 Close-In Receptor Grid and Terrain (m) from AERMAP for the East Range Site



In addition, for the East site, a small portion of the Class I Area BWCA is located within 50 kilometers of the site, and thus falls inside the near-field range required to be modeled with AERMOD. To account for this, receptor locations for BWCA were downloaded from the National Park Service (NPS) web site (http://www.nature.nps.gov/air/maps/Receptors/index.cfm). The receptor data from NPS includes latitude and longitude in NAD83, as well as MSL elevation. The latitude and longitude values were converted to NAD83 UTM coordinate system using a shareware software package. Based on the location of the northeast corner of the fence line, all receptors within a distance of 50.1 kilometers were extracted. Figure 3-5 displays the 52 NPS BWCA receptors that fell within 50.1 kilometers (orange), as well as a portion of the southwestern receptors for BWCA (red). The 52 receptors falling inside 50.1 km radius were entered into AERMAP with the same 137 DEM maps from above, and MSL elevation and hill profile data were generated. While MSL elevations are included with the NPS receptors from the NPS web site, these data were not used. AERMAP calculates elevation and hill profile values based on the DEM map data, and these parameters are interrelated. In addition, this method also maintains consistency with the Class II modeling analysis by relying on the same pre-processor to develop receptor elevations.

B.1.4 Regional Source Input and Background Concentrations

To account for impacts of distant and regional sources, the FARDATA approach developed by MPCA was applied. With this approach, a distant/regional modeling inventory FARDATA was included in AERMOD EVENT model runs for the highest impact cases. The FARDATA modeling provided an approximation of the date-/time-specific impacts of all regional sources, which were added to the impacts from the Mesaba Energy Project and nearby sources. Regional source inventories applicable to modeling for the Mesaba IGCC Power Plant prospective project sites were included in all PSD increment and NAAQS modeling analyses. Data on increment-consuming (or expanding) sources were accumulated from MPCA and recent permit applications.

For NAAQS modeling, total allowable emissions from significant nearby sources were included in the input file, and total modeled emissions of regional sources are listed in Table B.1-7. Emissions from sources that were not specifically modeled are still reflected in the results due to the use of FARDATA. The same inventory was used for both the West and East Range Sites.

For increment modeling, increment consuming emissions were included in the input file as positive numbers and increment-expanding emissions (decreases since the baseline date) were included as negative numbers. Total modeled emissions of regional increment sources are listed in Table B.1-8. The Class II increment inventory consists of sources within 100km of each site. Most sources shown in the table were modeled for both sites; in cases where a source was within 100km of one site and not the other, the site for which the source was modeled is indicated next to the source name in the table. The increment inventory varies from the NAAQS inventory because the former is based on changes in emissions since the PSD baseline date. Also, the NAAQS inventory did not directly model some smaller and more distant sources in order to reduce computing time, and because those sources were represented with the FARDATA approach.

Table B.1-7. Regional Sources Modeled Emissions for Mesaba Energy Project – NAAQS Modeling

Source	SO_2		PM_{10}		NO_x	
	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Arcelor Mittal Minorca Mine (Ispat)	1,079	136	-	-	-	-
Blandin Paper Company	649	81.8	72.2	9.10	416	52.4
Hibbing Public Utilities (Laurentian)	1,071	135	80.2	10.1	384	48.4
Hibbing Taconite	714	89.9	652	82.2	2,571	324
Mesabi Nugget	225	28.4	113	14.2	253	31.9
Minnesota Steel	144	18.1	921	116	400	50.4
MN Pwr – Boswell	25,548	3,219	2,706	341	6,564	827
MN Pwr – Laskin	2,698	340	798	100.6	660	83.2
US Steel - Keetac	258	32.5	678	85.4	1,889	238
US Steel - Minntac	1,635	206	1,230	155	3,040	383
United Taconite - Fairlane	929	117	-	-	3,651	460
Virginia Public Util. (Laurentian)	2,500	315	-	-	-	-

Source: Excelsior

Table B.1-8. Regional Sources Modeled Emissions for Mesaba Energy Project - Class II PSD Increment Modeling

Source	SO_2		PM_{10}		NO_x	
	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Altrista Consumer Prod	0.8	0.1	6.4	0.8	6.4	0.8
Arcelor Mittal Minorca Mine (Ispat)	3.2	0.4	18.3	2.3	201	25.3
Blandin Paper [WR only]	596	75.1	53.7	6.8	417	52.5
Duluth Steam Coop [ER only]	-	-	4.3	0.5	65.1	8.2
Hibbing Public Utilities (Laurentian)	-	-	12.8	1.6	374	47.1
Mesabi Nugget	96.5	12.2	127	16.0	272	34.3
MN Pwr – Boswell [WR only]	-2,841	-358.0	-71.0	-8.9	-1,153	-145.3
	4,300	541.8	204	25.7	1,769	222.9
MN Pwr – Tac Harbor [ER only]	-399	-50.3	-153	-19.3	-249	-31.4
	329	41.5	92.3	11.6	77.8	9.8
MN Pwr – Hibbard [ER only]	-724	-91.2	-18.6	-2.3	-	-
	350	44.1	5.5	0.7	175	22.1
Minnesota Steel	116	14.6	309	38.9	436	54.9
Sappi – Cloquet	-917	-115.5	-19.8	-2.5	-104	-13.1
	883	111.3	111	14.0	303	38.2
USG Interiors – Cloquet	-	-	-11.2	-1.4	-	-
	-	-	74.0	9.3	-	-
Virginia Public Util.	-125	-15.7	9.7	1.2	281	35.4
Hibbing Taconite	772	97.3	560	70.6	2,547	320.9
Northshore - Silver Bay [ER only]	-48.6	-6.1	-106	-13.4	-89.7	-11.3
	27.8	3.5	35.1	4.4	657	82.8
US Steel - Keetac	-189	-23.8	-109	-13.7	-1,812	-228.4
	263	33.1	54.9	6.9	2,728	343.7
US Steel - Minntac	-	-	-467	-58.9	-1.370	-172.6
	157	19.8	65.9	8.3	890	112.1
Great Lakes Comp # 5	-	-	-3.6	-0.5	71.5	9.0
Hanna (Bulter)	-	-	-171	-21.5	-	-
LTV Cliffs Erie	-195	-24.6	-2,311	-291	-46.8	-5.9
Cutler Magner (Graymont) [ER only]	559	70.4	42.9	5.4	225	28.3
Murphy Oil [ER only]	300	37.8	18.8	2.4	33.3	4.2

Source: Excelsior

For the NAAQS analyses, a "natural background" concentration was added to total model-predicted concentrations (Excelsior, 2006a). The natural background concentrations utilized are shown in Table B.1-9, and were recommended by MPCA.

Table B.1-9. Natural Background Concentration Modeled

Pollutant	Average Time	Concentration (µg/m³)
SO_2	Short-term	10
	Annual	2
NO_2	Annual	5
PM_{10}	24-Hour	20
	Annual	10

Source: Excelsior 2006

B.1.5 Near-Field Modeling Results

State and Federal air quality rules prohibit emissions from a new facility that cause or contribute to ambient concentrations that exceed the MAAQS or NAAQS. In addition, emissions cannot cause concentrations that exceed established PSD increments. To demonstrate compliance with these requirements, an air dispersion modeling analysis for the Mesaba Generating Station at the West Range Site was conducted. The results are discussed below.

Significant Impact Analysis

Table B.1-10 shows modeled impacts at normal operation and at the alternative short-term/flaring scenarios described in Section B.1.1.1.

Table B.1-10. Highest Project Impacts and PSD SILs

Pollutant	Averaging Time	West Range Site		East Range Site		SIL µg/m³
		Normal Operation µg/m³	Alternative Flaring µg/m³	Normal Operation µg/m³	Alternative Flaring µg/m³	
SO_2	1-hour	124.1	93.1	304.1	140.5	25
	3-hour	74.7	53.5	208.7	82.3	25
	24-hour	31.1	21.7	62.5	35.4	5
	Annual	4.01	N/A	3.70	N/A	1
PM_{10}	24-hour	28.2	28.2	32.6	28.2	5
	Annual	1.75	N/A	4.15	N/A	1
CO	1-hour	158.7	2,034	178.2	4,716	2000
	8-hour	60.1	260.4	116.9	634.7	500
NO_X	Annual	7.16	N/A	7.93	N/A	1

Source: Excelsior

Results of AERMOD modeling of operations at the Mesaba Generating Station produce the following conclusions:

- Impacts are above the applicable SIL for all pollutants, and all averaging times, except for eight hours for CO at the West Range Site.
- Impacts are greatest under normal operating conditions, except for CO; highest CO impacts would occur during the alternative scenario.

Wherever modeled pollutant concentration increases exceed the SILs, further modeling is required under PSD rules to ensure that the Class II PSD increment for the area is not violated. Because the highest predicted impacts were significant, increment and NAAQS compliance modeling was necessary for SO_2, PM_{10}, and NO_X. This further evaluation included all sources within 50 kilometers (31 miles) of the project's area of impact. There are no applicable PSD increments for CO. The normal operation scenario was addressed in PSD increment and NAAQS analyses for SO_2, PM_{10}, and NO_X since they represent the highest concentrations. The alternative flaring scenario was addressed only for the CO NAAQS demonstration.

The farthest distance from the site where the SILs are exceeded determines the SIA. Based on the modeling results, the maximum radius of the SIA for each pollutant is 50 kilometers (31 miles) for SO_2, 2 kilometers (1.2 miles) for PM_{10}, 3.0 kilometers (1.9 miles) for NO_X, and 0.8 kilometers (0.5 miles) for CO. The highest predicted concentrations for any pollutant were found to occur within approximately 1 kilometer (0.6 miles) of either site. Thus, impacts of Mesaba Generating Station would be limited to a small area in close proximity to the site.

PSD Increment Analysis

Increment analyses were completed for SO_2, PM_{10}, and NO_X. The modeling included all Mesaba One and Two sources at maximum emission rates in normal operation plus all nearby increment consuming (and expanding) emissions sources. The results of the increment analyses are shown in Table B.1-11 and B.1-12, along with a comparison to the allowable Class II PSD increments. This demonstrates that the Mesaba Energy Project, in combination with all other nearby and regional PSD sources, would comply with all state and Federal Class II increment limits.

Table B.1-11. Results of Class II PSD Increment Analysis at West Range Site

Pollutant	Averaging Time	Highest* Concentration (μg/m^3)	PSD Increment Limits (μg/m^3)
SO_2	1-hour	118.2	512
	3-hour	71.2	512
	24-hour	21.0	91
	Annual	4.2	20
PM_{10}	24-hour	24.8	30
	Annual	1.7	17
NO_2	Annual	7.6	25

*For short-term periods, the highest second-high concentration from five years of meteorological data is shown. For annual average, the highest concentration for any of the five years is listed.

Table B.1-12. Results of Class II PSD Increment Analysis at East Range Site

Pollutant	Averaging Time	Highest* Concentration ($\mu g/m^3$)	PSD Increment Limits ($\mu g/m^3$)
SO_2	1-hour	294.3	512
	3-hour	200.4	512
	24-hour	52.5	91
	Annual	2.9	20
PM_{10}	24-hour	26.3	30
	Annual	0.7	17
NO_2	Annual	8.1	25

*For short-term periods, the highest second-high concentration from five years of meteorological data is shown. For annual average, the highest concentration for any of the five years is listed.

Class II NAAQS Evaluation

The NAAQS modeling calculated the maximum impact of the Mesaba Generating Station and all other regional sources and compared the highest total impacts, plus background concentrations, to the applicable MAAQS and NAAQS. Maximum emission rates in normal operation were modeled for all Mesaba Generating Station sources and pollutants, except in the case of CO for which the flaring scenario had the maximum impacts. Excelsior did not quantify or model the $PM_{2.5}$ emissions from the proposed power plant. Compliance with PM_{10} standards was used to serve as a surrogate demonstration of $PM_{2.5}$ compliance.

Table B.1-13 summarizes results of the NAAQS model analysis and the $PM_{2.5}$ estimation. For SO_2, PM_{10}, and NO_X the table shows maximum impacts of the Mesaba Energy Project, plus local sources that were explicitly included in the five-year model runs, plus all regional sources from FAR modeling of the highest impact days, plus the background values supplied by MPCA. For CO, no inventory of regional emissions is available. Therefore, the data in Table B.1-13 show CO concentrations from the Mesaba Energy Project alone (using the worst case flaring scenario) and conservative total concentration estimates obtained by adding an urban background concentration to the predicted Mesaba Generating Station impacts. All predicted concentrations are far below allowable levels, and the results demonstrate compliance with all MAAQS and NAAQS. Data for $PM_{2.5}$ were estimated using PM_{10} concentrations as a basis for modeled sources and IMPROVE ambient monitoring for background. The majority of PM_{10} impacts are a result of fugitive emissions. A multiplier in the range of 0.06 to 0.11 has been shown to be a reasonable estimate of $PM_{2.5}$ impacts from fugitive PM_{10} impacts. When using a multiplier of 0.11 for relative $PM_{2.5}$ to PM_{10}, the resulting concentrations of 24-hour and annual $PM_{2.5}$ would not exceed their respective NAAQS. Additionally, there are very low impacts of regional sources within the Phase I and II Mesaba Generating Station's SIA.

Table B.1-13a. Results of Class II NAAQS Modeling

Pollutant	Averaging Time	Background ($\mu g/m^3$)	Total (1) West Range ($\mu g/m^3$)	Total (1) East Range ($\mu g/m^3$)	N/MAAQS ($\mu g/m^3$)
SO_2	1-hour	10	521.9	565.1	1300
	3-hour	10	237.6	360.4	915
	24-hour	10	73.3	166.5	365
	Annual	2	8.6	30.8	60
PM_{10} (2)	24-hour	20	126.1	112.2	150
	Annual	10	37.9	32.9	50
NO_X	Annual	5	17.0	32.5	100
CO	1-hour	7,000(3)	8,959	11,565	40,000

(1) Listed Highest Concentrations include Mesaba, all regional sources, and background. They are highest second-high for one to 24-hour averaging times except for PM_{10}, which is the highest 6th high from five years. Annual average values are the highest for any year.
(2) Although the EPA revoked the annual PM10 standard in December 2006, the standard is still in the Minnesota regulations.
(3) Background CO concentrations are very conservative estimates from urban monitors in Minneapolis/St. Paul. No background data exist for the Mesaba Generating Station area.
Source: Excelsior

Table B.1-13b. Estimated $PM_{2.5}$ Concentration(1)

Pollutant	Averaging Time	Ambient ($\mu g/m^3$)	West Range ($\mu g/m^3$)	East Range ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
$PM_{2.5}$	24-hour	20	11.7	10.1	35
	Annual	5	3.1	2.5	15

(1) $PM_{2.5}$ concentrations are estimated based on the 0.11 ratio of $PM_{2.5}$ to PM_{10}. Ambient concentrations were calculated from IMPROVE ambient monitoring data from nearby Class I areas (BWCAW and VNP), using available data from 2000-2003. This is very conservative, because recent ambient data already includes many sources that were also modeled, and therefore the results reflect substantial double-counting.
Source: Excelsior

Minnesota and PSD Regulations Monitoring Requirements

Minnesota and Federal PSD regulations specify *de minimis* monitoring concentrations. Pre-construction monitoring may be required to accurately characterize existing air quality. Under PSD regulations, preconstruction monitoring may be required if projected emissions from the Mesaba Energy Project exceed the *de minimis* threshold and background concentrations related to existing sources in the vicinity of the proposed Mesaba Generating Station are exceeding the *de minimis* levels. The PSD *de minimis* monitoring concentrations are shown in Table B.1-14, in addition to the maximum projected Mesaba Energy Project SO_2, PM_{10}, NO_2, and CO concentrations (see also Tables B.1-11 and B.1-12). The Pb and O_3 emissions were not modeled because O_3 is not emitted directly from a combustion source and potential Pb emissions from the proposed project are negligible.

Table B.1-14 PSD Significant Monitoring Concentrations and Maximum Impacts

Pollutant	Averaging Time	Highest West Range Impact (µg/m^3)	Highest East Range Impact (µg/m^3)	*De Minimis* Monitoring Level (µg/m^3)
SO_2	24-hour	31.1	62.4	13
PM_{10}	24-hour	28.2	32.6	10
NO_2	Annual	7.2	7.9	14
CO	8-hour	260	635	575

Source: Excelsior

Table B.1-14 indicates that the Phase I and Phase II impacts for NO_2 are below the *de minimis* monitoring concentrations and SO_2, and PM_{10} (and CO at the East Range Site), model-predicted impacts from the Mesaba Energy Project exceed the threshold monitoring concentrations. However, based on background PM_{10} monitoring data available in northeast Minnesota from Virginia, Duluth, and from IMPROVE monitoring in the northern Class I areas, background PM_{10} concentrations are below *de minimis* levels. Additionally, limited SO_2 data from Ely, MN and Voyageurs National Park also indicate that background SO_2 concentrations are low in northern Minnesota, and are generally below the *de minimis* monitoring levels. No CO monitoring data was available near the proposed sites, but only the flaring scenario at the East Range Site exceeded monitoring thresholds. An application requesting a waiver of the preconstruction monitoring requirements was submitted to MPCA with the application for a Part 70/New Source Review Construction Authorization Permit. Section 3.3.3 provides existing local and regional air quality data.

The results of the NAAQS compliance analysis (see Table B.1-13) indicate that the Mesaba Energy Project, Phase I and II, would not violate any air quality standards and total ambient pollutant concentrations levels would remain well below applicable limits. The combination of existing representative regional monitoring data and low predicted ambient pollutant concentration levels, which do not violate any NAAQS, indicate that preconstruction monitoring is not necessary and would not contribute to a significant improvement in impact assessment.

B.2 CLASS I AREA-RELATED (FAR-FIELD) MODELING

B.2.1 Modeling Approach

Air quality modeling analyses were conducted to estimate the impacts of the Phase I and Phase II Mesaba IGCC Power Plant on air quality in Class I areas. Separate sets of Class I modeling analyses addressed the PSD Class I increments for SO_2, PM_{10}, and NO_X, and the air quality related values (AQRVs) of sulfur (S) and nitrogen (N) deposition, and visibility impairment (regional haze). The dispersion modeling analysis used recommended EPA long-range transport modeling methodologies, and followed guidance as presented in EPA's Guideline on Air Quality Models, the IWAQM Phase 2 report, the FLAG Phase I report, and the proposed FLAG Phase I Report – Revised (FLAG, 2008). The analyses also incorporated suggestions and guidance received in meetings, conference calls, and written correspondence with the U.S. Forest Service, the National Park Service, and the US Fish and Wildlife Service[2]. The Class I analyses addressed impacts to the Boundary Waters Canoe Area Wilderness (BWCAW), Voyageurs National Park (VNP), the Rainbow Lakes Wilderness (RLW), and Isle Royale National Park (IRNP). The distance from the West Range Site to the closest point in each of these Class I areas is approximately 61 miles (98 kilometers) for the BWCAW, 75 miles (121 kilometers) for VNP, 117 miles (188 kilometers) for RLW, and 195 miles (313 kilometers) for IRNP. This is slightly beyond the 300-km distance where long-range transport modeling has been shown to provide realistic impact predictions, and therefore IRNP is not modeled for the West Range Site. The distance from the East Range Site to the closest point in each of these Class I areas is approximately 24 miles (39 kilometers) for the BWCAW, 54 miles (87 kilometers) for VNP, 87 miles (140 kilometers) for RLW, and 136 miles (218 kilometers) for Isle Royale National Park.

[2] 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 2009 (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, National Park Service ("NPS") stating that March 5, 2009 letter to Carolina Espejel-Schutt confirmed NPS's conditional acceptance of Excelsior's modeling protocol.

The CALPUFF air quality model was used for all Class I area analyses where the receptors were more than 50 km from the Mesaba IGCC Power Plant. For the few receptors in the BWCAW within 50 km of the East Range Site, Class I increment analyses were conducted using both CALPUFF and separately using AERMOD (based on the meteorology and methodology described in Section B-1). CALPUFF is the approved EPA long-range transport model referenced in the Guideline on Air Quality Models and consists of the following three components:

The CALMET model for processing of meteorological data;
The CALPUFF model for the transport and dispersion calculations; and
The CALPOST model for analysis and post-processing of model results.

In the process of responding to comments on the Draft EIS, Excelsior prepared an updated Class I air modeling protocol (Excelsior, 2008). Changes included updates to use more recent meteorology than had been available previously, corrections of inaccurate land use data, integration of data from buoys in Lake Superior, and a finer CALPUFF grid resolution of 1km. The FLMs provided technical comments in December of 2008 and Excelsior and the FLMs subsequently engaged in a number of conference calls in which many technical matters regarding the protocol were resolved. In a March 2009 letter, the FLMs identified the model settings that they would accept for the Mesaba Energy Project. The letter also noted that Excelsior could submit supplemental model runs. Table B.2-1 presents the model settings and parameters used for the CALMET and CALPUFF modeling conducted in accordance with the FLMs recommendations. Parameters/settings not specified are assumed to be at default settings. The letter specifies that the air quality impact analysis should be performed with two years of 36 km MM5data and a CALMET grid resolution of 4km in addition to another one or two years of 12 km MM5 data and a CALMET grid resolution of 1km. Because 2002 was the only year for which 12km MM5 data was available in the public domain, the higher-resolution modeling was performed for that year. For 2003 and 2004, only 36km MM5 data was available, so the 4km CALMET grid resolution was used for those two years. The letter also stated that Excelsior can provide additional modeling results as supplemental information, so additional modeling was conducted for 2002 at 4km resolution and for 2003 and 2004 at 1km resolution. Finally, due to the much larger domain required for multi-source modeling and the increased computational time that would be incurred, the 4km grid resolution was used for multi-source modeling for all three years.

Table B.2-1. CALMET/CALPUFF Input Parameters

Input Group	Parameter	Mesaba Selection	Explanation
CALMET - 1km grid resolution			
5	RMAX 1	10	No default values
	RMAX 2	15	No default values
	RMAX 3	75	No default values
	TERRAD	10	No default values
	R1	5	No default values
	R2	7.5	No default values
N/A	Use of buoy data	Hourly data only	Exclude monthly average data when buoy not present
CALMET - 4km grid resolution			
5	RMAX 1	30	No default values
	RMAX 2	50	No default values
	RMAX 3	75	No default values
	TERRAD	10	No default values

Table B.2-1. CALMET/CALPUFF Input Parameters

Input Group	Parameter	Mesaba Selection	Explanation
	R1	10	No default values
	R2	20	No default values
N/A	Use of buoy data	Hourly data only	Exclude monthly average data when buoy not present
CALPUFF			
3	Species Modeled	SO_2, SO_4, NO_X, EC, SOA, $PM_{2.5}$, HNO_3, NO_3	Modeled all species emitted by Mesaba sources, and others (HNO_3, NO_3) involved in plume chemistry
4	LSAMP	F	No gridded receptors (sampling grid) used
8	Part. Size	Mean = 0.48	All particulate species assumed $PM_{2.5}$
		Std. Dev. = 2	
11	$BCKNH_3$	1.0 ppb	Conservative background ammonia concentration (0.5 ppb recommended for forested lands)
12	NSPLIT	3	Puff-splitting used (default)

Source: Excelsior, 2008

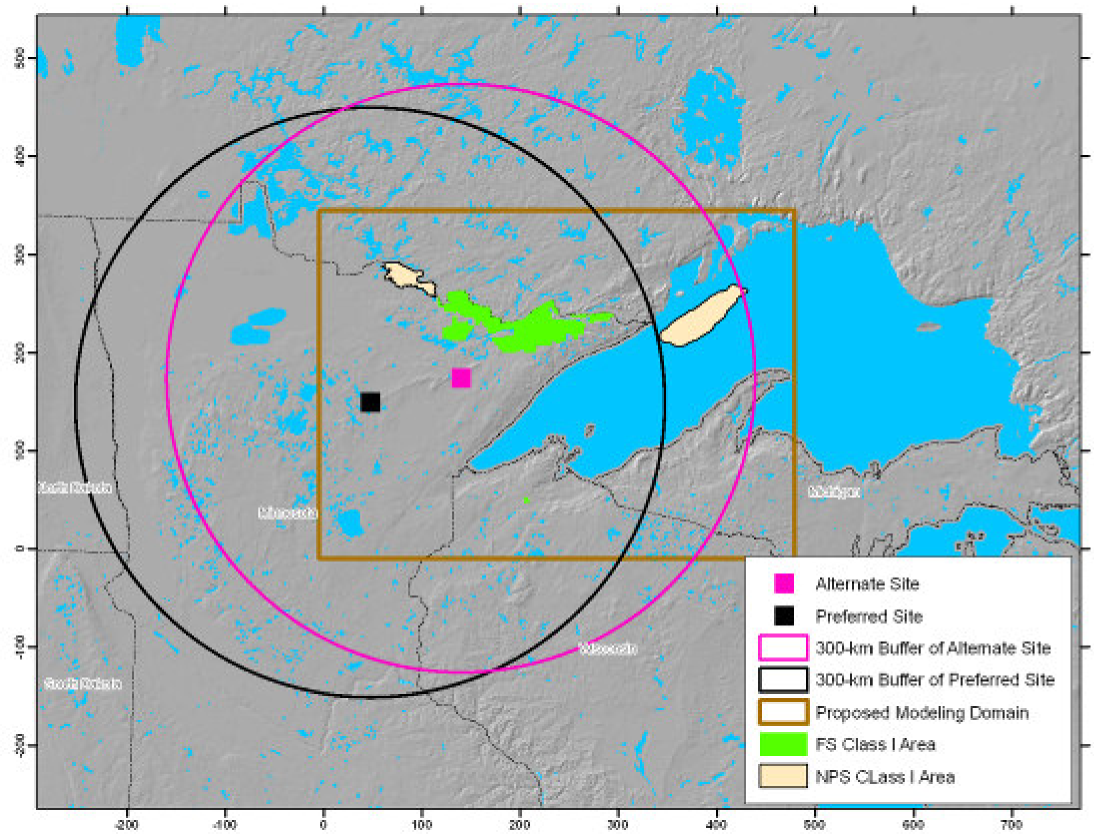
The CALPUFF modeling analyses used meteorological data for the years 2002-2004. Additional surface, upper air, and precipitation data were used in CALMET to refine the meteorological fields. For the smaller grid resolution (shown below), Figure B.2-1 shows the locations of meteorological stations used for the single-source CALMET processing. For multisource modeling additional observation data were used due to the larger domain.

B.2.1.1 Class I Areas Modeling Domain

For modeling using a 1-km CALMET grid resolution, the CALMET/CALPUFF modeling domain was a 485- by 355-kilometer area approximately centered on the Class I areas in the vicinity of the two sites being considered for the Mesaba IGCC Power Plant. The coordinate system was Lambert Conformal WGS-84. Receptor locations within each of the Class I areas were obtained from the National Park Service. Hourly surface data from 35 stations (with two additional buoy stations) were used along with precipitation data from 26 stations and upper air data from one station. Figure B.2-1 shows the proposed site location, the Class I areas of interest, and the modeling domain used for 1-km grid resolution modeling of the Mesaba Project.

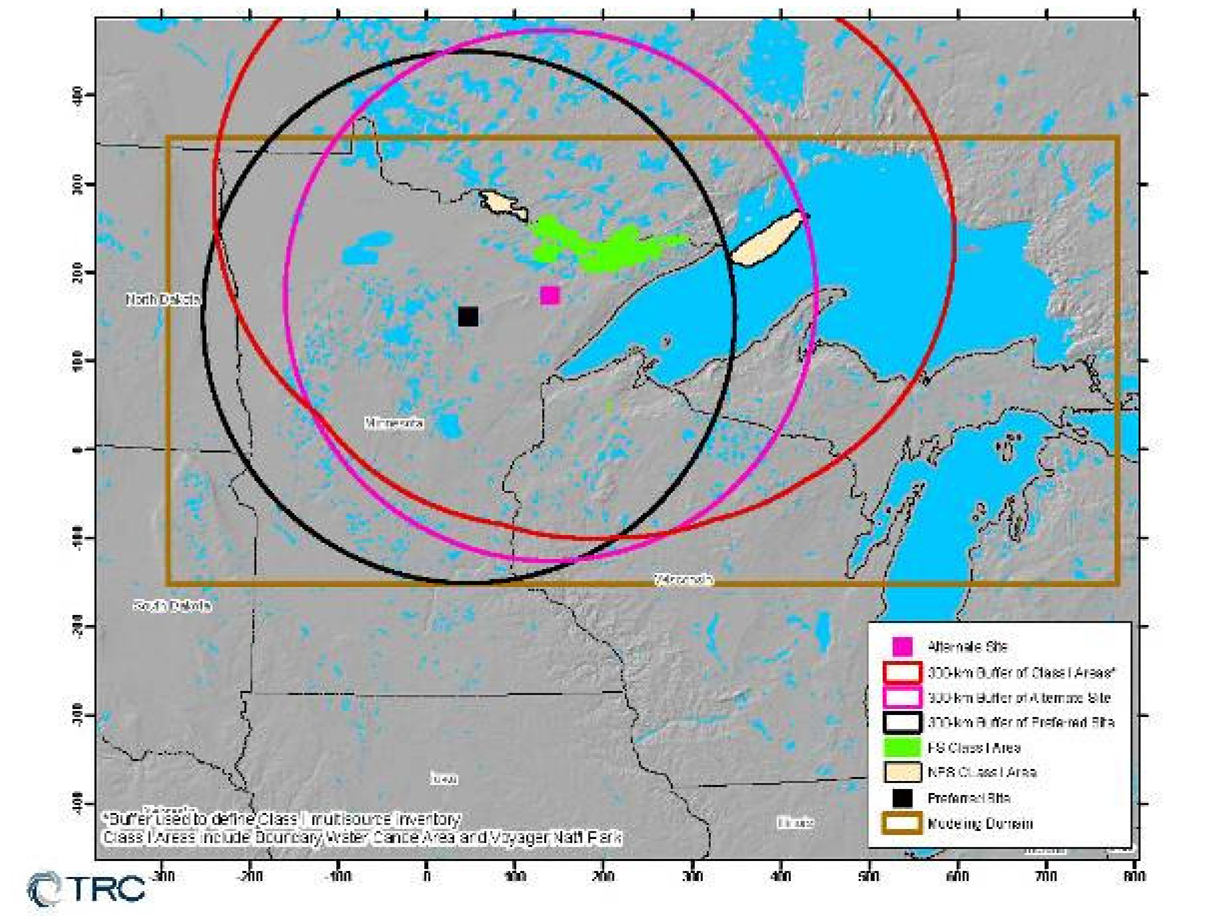
For modeling using a 4-km CALMET grid resolution, which was also used for the multi-source runs, a much larger domain was necessary due to the broader geographical area over which these sources were spread. The domain consisted of a 1,072- by 504-kilometer area approximately centered on the VNP and BWCA Class I areas. Hourly surface data from 142 stations (with four additional buoy stations) were used along with precipitation data from 158 stations and upper air data from four stations. Figure B.2-2 shows the proposed site locations, the Class I areas of interest, the regions within 300km of those site locations and Class I areas, and the modeling domain used for the 4-km grid resolution modeling.

Figure B.2-1: Single-Source Modeling Domain for the Excelsior Mesaba IGCC Project



TRC

Figure B.2-2: Multi-Source Modeling Domain for the Excelsior Mesaba IGCC Project



B.2.1.2 Modeled Emission Rates

In response to comments on the Draft EIS, Excelsior has modeled a range of emission rates and scenarios for Mesaba One and Two, as presented to the FLMs in the protocol and its supplement. The scenarios include the proposed level of emission controls, an enhanced level of emission controls, as well as reasonably worst-case sensitivity scenarios for short-term startup and shutdown conditions. Pollutant emission rates are shown in Tables B.2-2 to B.2-4 and represent the maximum expected emissions and the appropriate averaging times from the Mesaba IGCC Power Plant per phase and are used for all CALPUFF modeling. For the AQRV modeling analyses, particulate matter speciation was calculated using FLM guidance for gas-fired combustion turbines. In some cases, modeled scenarios include Mesaba One at one level of emission controls with Mesaba Two at a different level of emission controls.

Table B.2-2: Modeling Parameters for Mesaba CALPUFF Modeling: for All Scenarios Analyzing Proposed Emission Rates (Per Phase)

Parameter	Combustion Turbines (each of two)		Tank Vent Boilers (each)	
	AQRV	Increment	AQRV	Increment
stack height (m)	45.72	45.72	64.01	64.01
stack diameter (m)	6.1	6.1	1.83	1.83
temp (K)	394.3	394.3	579.8	579.8
Velocity (m/s)				
short-term	20.1	20.1	8.46	8.46
Annual	20.1	20.1	1.95	1.95
SO_2 - 3-hr (g/s)	17.2	18.5	0.87	0.94
24-hr	13.0	14.0	0.75	0.81
Annual	8.67	9.32	0.42	0.45
NO_x – 3-hr (g/s)	19.66	19.66	2.46	2.46
24-hr	19.66	19.66	2.46	2.46
Annual	19.91	19.91	0.76	0.76
Elemental Carbon (g/s) all time periods	0.79	0	0	0
Sulfate (g/s) all time periods	0.97	0	0	0
Organic aerosol (g/s) all time periods	1.368	0	0	0
$PM_{2.5}$ (g/s) all time periods	0	0	0.088	0
PM_{10} (g/s) all time periods	0	3.15	0	0.088

Table B.2-3: Modeling Parameters for Mesaba CALPUFF Modeling: for All Scenarios Analyzing Enhanced Controls Emission Rates (Per Phase)

Parameter	Combustion Turbines (each of two)		Tank Vent Boilers (each)	
	AQRV	Increment	AQRV	Increment
stack height (m)	45.72	45.72	64.01	64.01
stack diameter (m)	6.1	6.1	1.83	1.83
temp (K)	394.3	394.3	579.8	579.8
velocity (m/s)				
short-term	20.1	20.1	8.46	8.46
Annual	20.1	20.1	1.95	1.95
SO_2 – 3-hr (g/s)	6.88	7.40	0.57	0.61
24-hr	5.21	5.60	0.51	0.55
Annual	3.47	3.73	0.38	0.41
NO_x – 3-hr (g/s)	6.55	6.55	2.46	2.46
24-hr	6.55	6.55	2.46	2.46
Annual	6.64	6.64	0.76	0.76
Elemental Carbon (g/s) all time periods	0.787	0	0	0
Sulfate (g/s) all time periods	0.398	0	0	0
Organic aerosol (g/s) all time periods	1.96	0	0	0
$PM_{2.5}$ (g/s) all time periods	0	0	0.088	0
PM_{10} (g/s) all time periods	0	3.15	0	0.088

Table B.2-4: Modeling Parameters for Mesaba CALPUFF Modeling: for Sensitivity Scenarios Analyzing High Flaring Emission Rates (Per Phase)

Parameter	Combustion Turbines (each of two)		Flare (each)		Tank Vent Boilers (each)	
	AQRV	Increment	AQRV	Increment	AQRV	Increment
stack height (m)	45.72	45.72	56.39	56.39	64.01	64.01
stack diameter (m)						
3-hr	6.1	6.1	7.35	7.35	1.83	1.83
24-hr	6.1	6.1	6.87	6.87	1.83	1.83
temp (K)	394.3	394.3	1273.0	1273.0	579.8	579.8
velocity (m/s)	20.1	20.1	20.0	20.0	8.46	8.46
SO_2 – 3-hr (g/s)*	17.2, 0.69	18.5, 0.74	43.1	46.3	0.87	0.94
24-hr	7.2	7.7	9.6	9.6	0.75	0.81
NO_x – 24-hr (g/s)	19.7	19.7	2.9	2.9	2.5	2.5
Elemental Carbon (g/s) 24-hr	0.72	0	0	0	0	0
Sulfate (g/s) 24-hr	0.37	0	0	0	0	0
Organic aerosol (g/s) 24-hr	1.8	0	0	0	0	0
$PM_{2.5}$ (g/s) 24-hr	0	0	0.44	0	0.088	0
PM_{10} (g/s) 24-hr	0	2.9	0	0.44	0	0.088

* For the 3-hr case, the SO_2 emissions from the two combustion turbines differ significantly, so both values are shown.

Cumulative modeling was also conducted for the purpose of determining the amounts of Class I increment consumption for the pollutants, averaging periods and Class I areas for which the Mesaba One and Two impacts were predicted to exceed the applicable SIL. Excelsior developed emission inventories of increment consuming and expanding sources within 300 km of the applicable Class I areas based on data supplied by the MPCA, the Wisconsin Department of Natural Resources, the Michigan Department of Environmental Quality, accumulated data from recent air permit applications for other facilities in the region, and data from actual air permits. The emission inventories are presented in Table B.2-5. The rates shown do not reflect total emissions, but rather the emission rate that consumes or expands (shown as a separate negative rate) increment relative to the PSD baseline. They are calculated based on actual emission rates when that data is available, and permitted emission rates when it is not.

Table B.2-5. Regional Sources Modeled Emissions for Mesaba Energy Project - Class I PSD Increment Modeling

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

Table B.2-5. Regional Sources Modeled Emissions for Mesaba Energy Project - Class I PSD Increment Modeling

Source	SO_2		PM_{10}	
	lb/hr	g/s	lb/hr	g/s
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
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

* Based on actual emissions. SO_2 emissions shown for two averaging periods (3-hour / 24-hour)

B.2.1.3 Class I Area Modeling Results

Air quality modeling analyses were conducted to estimate the impact of the Phase I and Phase II Mesaba Energy Project on air quality in Class I areas. The analyses addressed impacts to the BWCAW, VNP, RLW, and IRNP. The Class I Increment analyses addressed the PSD Class I increments for SO_2, PM_{10}, and NO_X, and the AQRV analyses addressed S and N deposition and visibility. The results are discussed below.

Class I Impacts and Increment Consumption

The CALPUFF model was used to calculate pollutant impacts from the Mesaba Energy Project for Class I areas. Supplemental modeling using AERMOD and methodology described in the near-field discussion above was conducted for a small number of receptors in the BWCAW that fell within 50 km of the East Range Site. The two-phase Mesaba Generating Station was modeled at the worst-case emission rates for the West and East Range Sites and the results are compared with Class I PSD increments and SILs (see Tables B.2-6 and B.2-7). For both sites, sensitivity analyses were conducted for Mesaba One which compared impacts of worst-case flaring emissions versus worst-case normal operation emissions, and the results showed that normal operations resulted in higher impacts in all cases except for 3-hour SO_2. Therefore, the results shown in all non-flaring cases below are based on both phases of the West Range Site operating at the proposed emission rates shown in Table B.2-2. The results for the East Range Site assume the first phase operating at those emission rates, but the second phase operating at the enhanced emission rates shown in Table B.2-3, due to the closer proximity of the East Range Site to the Class I areas. Flaring scenario emission rates are shown in Table B.2-4. While modeling runs were conducted for the other scenarios with lower emissions, the modeled impacts were lower, and increment compliance is assured for those scenarios if it can be demonstrated for the worst-case scenarios as shown below.

Table B.2-6. Class I PSD Increment Modeling Results for West Range Site (Phase I & II at 'Proposed' Emission Levels)

Pollutant	Averaging Period	Year Evaluated			Class I Inc ($\mu g/m^3$)	Class I SIL ($\mu g/m^3$)	Max ($\mu g/m^3$)
		2002 (1)	2003 (2)	2004 (2)			
Boundary Waters Canoe Area Wilderness							
SO_2	3-Hour (N*)	1.74	1.42	1.93	25	1	**1.93**
	3-Hour (2F*)	2.97	2.80	3.12	25	1	**3.12**
	3-Hour (1F*)	1.48	1.43	1.55	25	1	**1.55**
	24-Hour	0.39	0.35	0.56	5	0.2	**0.56**
	Annual	0.018	0.018	0.018	2	0.1	0.018
NO_X	Annual	0.017	0.015	0.017	2.5	0.1	0.017
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	0.013
Voyageurs National Park							
SO_2	3-Hour (N*)	1.28	2.05	1.77	25	1	**2.05**
	3-Hour (2F*)	2.21	3.64	3.32	25	1	**3.64**
	3-Hour (1F*)	1.11	1.81	1.64	25	1	**1.81**
	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_X	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	0.015
Rainbow Lakes Wilderness							
SO_2	3-Hour (N*)	0.49	0.43	0.41	25	1	0.49
	3-Hour (2F*)	0.67	0.76	0.60	25	1	0.76
	3-Hour (1F*)	0.33	0.38	0.31	25	1	0.38
	24-Hour	0.11	0.09	0.09	5	0.2	0.11

Table B.2-6. Class I PSD Increment Modeling Results for West Range Site (Phase I & II at 'Proposed' Emission Levels)

Pollutant	Averaging Period	Year Evaluated 2002 (1)	2003 (2)	2004 (2)	Class I Inc ($\mu g/m^3$)	Class I SIL ($\mu g/m^3$)	Max ($\mu g/m^3$)
	Annual	0.010	0.009	0.007	2	0.1	0.010
NO_X	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

Source: Excelsior
* Normal operation ('N'), two-phase flaring ('2F'), and single-phase flaring ('1F') scenarios were analyzed.
(1) 12km MM5 data, 1km CALMET grid resolution
(2) 36km MM5 data, 4km CALMET grid resolution

Table B.2-7. Class I PSD Increment Modeling Results for East Range Site (Phase I at 'Proposed' Emission Levels; Phase II at 'Enhanced' Emission Levels)

Pollutant	Averaging Period	Year Evaluated 2002 (1)	2003 (2)	2004 (2)	Class I Inc ($\mu g/m^3$)	Class I SIL ($\mu g/m^3$)	Max ($\mu g/m^3$)
Boundary Waters Canoe Area Wilderness							
SO_2	3-Hour (N*)	3.77	3.46	3.49	25	1	**3.77**
	3-Hour (2F*)	7.90	7.75	7.49	25	1	**7.90**
	3-Hour (1F*)	3.96	3.82	3.65	25	1	**3.96**
	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_X	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 (N*)	1.28	0.89	0.96	25	1	**1.28**
	3-Hour (2F*)	3.20	2.18	2.14	25	1	**3.20**
	3-Hour (1F*)	1.60	1.09	1.07	25	1	**1.60**
	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_X	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 (N*)	0.72	0.70	0.69	25	1	0.72
	3-Hour (2F*)	1.64	1.80	1.50	25	1	**1.80**
	3-Hour (1F*)	0.79	0.86	0.78	25	1	0.86

Table B.2-7. Class I PSD Increment Modeling Results for East Range Site (Phase I at 'Proposed' Emission Levels; Phase II at 'Enhanced' Emission Levels)

Pollutant	Averaging Period	Year Evaluated 2002 (1)	2003 (2)	2004 (2)	Class I Inc (µg/m³)	Class I SIL (µg/m³)	Max (µg/m³)
	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_X	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 (N*)	0.24	0.27	0.36	25	1	0.36
	3-Hour (2F*)	0.57	0.69	1.01	25	1	**1.01**
	3-Hour (1F*)	0.28	0.34	0.52	25	1	0.52
	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_X	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

Source: Excelsior
* Normal operation ('N'), two-phase flaring ('2F'), and single-phase flaring ('1F') scenarios were analyzed.
(1) 12km MM5 data, 1km CALMET grid resolution
(2) 36km MM5 data, 4km CALMET grid resolution

The data indicate that maximum Mesaba Energy Project impacts are below allowable increments for all pollutants in the Class I areas. Impacts are also below the SILs in most cases, indicating that impacts would be insignificant, with no further analysis necessary. However, for short-term SO_2 and PM_{10} concentrations, impacts are indicated to exceed some SILs in the BWCAW and VNP (see bolded values in the tables above). These results were consistent with those from the AERMOD modeling for BWCAW receptors within 50km of the East Range Site – i.e., the same SILs were triggered. Because of the 3-hour and 24-hour SO_2 and 24-hour PM_{10} projected impacts, it was necessary to conduct a cumulative impact analysis, including other regional SO_2 and PM_{10} increment sources as well as reasonably foreseeable sources (see Table B.2-3), to quantify the total PSD increment consumption.

While the flaring scenario for the East Range Site also indicated potential impacts above some SILs for RLW and IRNP, a cumulative analysis was not conducted for those Class I areas for a number of reasons. The first flaring scenario is very conservative; it assumed no enhanced controls for either Mesaba One or Two and was based on concurrent startup and upset events, which would occur very rarely (i.e., fewer than 20 times per year). Additional refinement may show that those SILs would not be triggered. Second, cumulative analyses based on rare startup/shutdown/malfunction occurrences are not appropriate as the underlying assumption is that these conditions would prevail continuously every hour of each year, which is not possible given the limited number of potential hours of flaring events and also, because they are unlikely to coincide with the maximum impacts shown by other sources.[3] Finally, as

[3] *See* discussion under '3. Actual Emissions Rates Used to Model Short-Term Increment Compliance' of USEPA. "Prevention of Significant Deterioration New Source Review: Refinement of Increment Modeling Procedures;

shown for the second flaring scenario, where flaring only occurs for one Phase at a time, none of the predicted impacts for RLW or IRNP exceed the SILs, so no cumulative analyses were warranted for those two Class I areas.

The results of the cumulative analyses are shown in Table B.2-8 and B.2-9. In accordance with PSD regulations, the highest second-high values are shown for each year.

Table B.2-8. Class I PSD Increment Cumulative Modeling Results – West Range Site (1)

Pollutant	Averaging Period	Year Evaluated (2)			Class I Inc ($\mu g/m^3$)	Max ($\mu g/m^3$)
		2002	2003	2004		
Boundary Waters Canoe Area Wilderness						
SO_2	3-Hour	7.04	7.54	8.63	25	8.63
	24-Hour	1.95	1.93	2.68	5	2.68
PM_{10}	24-Hour	1.21	0.94	1.17	8	1.21
Voyageurs National Park						
SO_2	3-Hour	8.13	7.87	7.53	25	8.13
	24-Hour	1.90	1.74	1.65	5	1.90
PM_{10}	24-Hour	0.74	0.98	1.03	8	1.03

(1) Emissions: Mesaba One and Two at 'Proposed' emissions levels
(2) 36km MM5 data, 4km CALMET grid resolution for all three years

Table B.2-9. Class I PSD Increment Cumulative Modeling Results – East Range Site (1)

Pollutant	Averaging Period	Year Evaluated (2)			Class I Inc ($\mu g/m^3$)	Max ($\mu g/m^3$)
		2002	2003	2004		
Boundary Waters Canoe Area Wilderness						
SO_2	3-Hour	6.50	6.75	8.06	25	8.06
	24-Hour	1.68	1.74	2.45	5	2.45
PM_{10}	24-Hour	1.18	0.86	1.11	8	1.18
Voyageurs National Park						
SO_2	3-Hour	7.33	6.70	6.54	25	7.33
	24-Hour	1.82	1.48	1.46	5	1.82

(1) Emissions: Mesaba One at 'Proposed' emissions levels; Mesaba Two at 'Enhanced' emission levels
(2) 36km MM5 data, 4km CALMET grid resolution for all three years

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Proposed Rule." Federal Register Vol. 72, No. 108, p.31389-90, June 6, 2007. Available: http://edocket.access.gpo.gov/2007/pdf/E7-10459.pdf.
See also "Unless the startup/ shutdown/malfunctions conditions are requested for an extended period or have unusually high emission rates, predicted significant impacts during these scenarios will not require a multisource modeling analysis." Section 7.9 on p. 7-6 of New Jersey Department of Environmental Protection. "Technical Manual 1002: Guidance on Preparing an Air Quality Modeling Protocol." August, 1997. Available: www.nj.gov/dep/aqpp/downloads/techman/**1002**.PDF.

As indicated in Tables B.2-8 and B.2-9, the cumulative modeling analyses show compliance with the PSD increments. The maximum consumption is shown in the right-most column, and the allowable consumption (the increment) is shown in the second column from the right. In fact, in all cases, even with the conservative nature of the modeled inventory, no more than 54 percent of the increment is predicted to be consumed.

Cumulative modeling conducted using AERMOD for the receptors in BWCAW within 50km of the East Range Site showed even lower impacts. Table B.2-10 shows that the AERMOD modeling results are well below the allowable increment and consistently lower than the CALPUFF results in Table B.2-9, confirming the conclusion of compliance for all PSD increments.

Table B.2-10. Class I PSD Increment Cumulative Modeling Results – East Range Site (AERMOD Analysis of Receptors within 50 km)

Pollutant	Averaging Period	Year Evaluated					Class I Inc ($\mu g/m^3$)	Max ($\mu g/m^3$)
		1972	1973	1974	1975	1976		
Boundary Waters Canoe Area Wilderness								
SO_2	3-Hour	5.35	5.02	5.50	5.59	5.31	25	5.59
	24-Hour	1.10	0.90	1.19	1.27	1.29	5	1.29
PM_{10}	24-Hour	0.63	0.49	0.56	0.52	0.55	8	0.63

Class I Visibility/Regional Haze Analyses

Visibility/regional haze impact analyses were carried out for BWCAW and VNP for both sites, as well as for IRNP for the East Range Site. The West Range Site is more than 300 km from IRNP, and visibility is not a designated AQRV for RLW. The recommended methodology for assessing visibility impacts according to the Federal Land Managers' Air Quality Related Values Work Group (FLAG) guidance involves the use of CALPOST to process the data on concentrations of pollutants from the CALPUFF modeling of 24-hour emissions. In CALPOST, a daily value of light extinction is defined by the concentrations of each pollutant that can affect visibility, taking into account the efficiency of each particulate type in scattering light, and the relative humidity which influences the size of sulfates and nitrates. The FLM has established threshold changes in light extinction (Δb_{ext}) as a percentage of natural background that are believed to represent potential thresholds of concern that may lead to adverse impacts on visibility. These thresholds are 5 percent (a potentially detectable change) and 10 percent (a level that may represent an unacceptable degradation).

Current FLM guidance specifies the use of "Method 2" of CALPOST for calculation of visibility impacts. The FLAG Method 2 represents a conservative approach, which is expected to yield high extinction values and over-predict potential visibility degradation. In Method 2, relative humidity data from the nearest surface weather station is used to calculate both source and background light extinction. Since the issuance of FLAG 2000, the science of visibility modeling has progressed and the need to address the inherent conservative assumptions and resulting over-predictions under Method 2 has become apparent. FLMs have developed a revised draft FLAG document that was released for comment in June 2008 proposing a new methodology for calculating visibility impacts. Although the revised FLAG document has not yet been finalized, in the March 2009 letter, the FLMs indicated that supplemental visibility calculations can be submitted using "Method 8" of CALPOST, which is the suggested new method in the draft FLAG guidance. Therefore, both Method 2 and Method 8 results will be presented. The FLAG 2000 Method 2 approach relies on the maximum extinction values for comparison to the threshold levels of concern, and focuses on the number of days modeled per year above the 5% and 10% light extinction thresholds, while FLAG 2008 focuses on the light extinction modeled for the 8^{th} worst day of each year (i.e., the 98th percentile). Therefore, the results of the two methods are presented on those bases.

As discussed previously, a range of emission scenarios were modeled and the results for visibility are presented in Tables B.2-11 and B.2-12 below. ‘Proposed’ refers to the controlled emission rates listed in Table B.2-2, ‘Enhanced’ refers to the controlled emission rates listed in Table B.2-3, and ‘None’ indicates that the scenario is a Phase I only analysis. As with the PSD increment analyses, while flaring scenarios were modeled, the results were lower than (or essentially the same as) their correlative normal operation scenarios, and therefore they do not represent the worst-case operating scenario and need not be considered further. The set of scenarios modeled for the East Range Site considered and included more controls due to its closer proximity to Class I areas.

Table B.2-11. Class I Visibility Modeling Results – West Range Site

Emission Rate		Method 2						Method 8		
		2002 (1)		2003 (2)		2004 (2)		2002 (1)	2003 (2)	2004 (2)
Phase I	Phase II	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness										
Proposed	None	1	0	3	0	1	0	1.80	2.47	2.51
Proposed	Proposed	19	1	21	6	14	6	5.13	4.82	5.04
Proposed	Enhanced	9	0	15	3	11	0	3.86	3.62	4.04
Voyageurs National Park										
Proposed	None	1	0	2	0	6	1	1.98	2.99	2.71
Proposed	Proposed	13	3	16	2	22	7	4.80	5.95	5.46
Proposed	Enhanced	6	0	7	2	15	4	3.73	4.63	4.23

(1) 12km MM5 data, 1km CALMET grid resolution
(2) 36km MM5 data, 4km CALMET grid resolution

The visibility modeling analysis results for the West Range site shown in Table B.2-11 indicate that, considering the most conservative Method 2 results, impacts greater than five or 10 percent could occur at some point within BWCAW and VNP. Using that Method, and depending on the operating scenario, the number of days per year with greater than 5 percent extinction ranges from 1 to 22 at the West Range site. The Method 8 results, which are based on less conservative assumptions and consider to some extent the influence of natural visibility impairment, provide potentially more realistic predicted impacts. Those results indicate that only for the scenario with the highest potential emissions, i.e., the proposed (BACT) emission rates for both Phase 1 and Phase 2, would any 8th highest values be above the 5 percent extinction threshold, and then for only two of the three years in each Class I area. The operating scenario with only Phase I at the proposed emission rates, and the operating scenario with Phase I at the proposed emission rates and Phase II at the enhanced controlled emission rates, are both predicted to result in 8th highest values well below the 5 percent threshold.

Table B.2-12. Class I Visibility Modeling Results – East Range Site

Emission Rate		Method 2						Method 8		
Phase I	Phase II	2002 (1)		2003 (2)		2004 (2)		2002 (1)	2003 (2)	2004 (2)
		Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	8^{th} high ΔB_{ext} (%)	8^{th} high ΔB_{ext} (%)	8^{th} high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness										
Proposed	None	46	7	15	0	10	0	6.23	6.16	5.30
Proposed	Enhanced	86	29	60	9	47	5	9.89	10.28	8.63
Enhanced	Enhanced	50	8	34	1	19	0	7.42	7.42	6.29
Voyageurs National Park										
Proposed	None	1	0	2	0	3	1	1.94	2.45	2.50
Proposed	Enhanced	3	1	4	0	7	2	2.98	3.81	3.72
Enhanced	Enhanced	1	0	1	0	2	0	2.07	2.54	2.43
Isle Royale National Park										
Proposed	None	1	0	0	0	0	0	1.50	1.24	1.25
Proposed	Enhanced	2	1	0	0	0	0	2.26	1.82	1.86
Enhanced	Enhanced	1	0	0	0	0	0	1.51	1.16	1.24

(1) 12km MM5 data, 1km CALMET grid resolution
(2) 36km MM5 data, 4km CALMET grid resolution

The visibility modeling analysis results for the East Range site shown in Table B.2-12 reflect the influence of the site's closer proximity to BWCAW and the commensurate higher predicted number of days with a change in light extinction above 5 and 10 percent for the same operating scenarios. Both the Method 2 and Method 8 results indicate that emissions associated with any of the operating scenarios and Project Phases have the potential to produce impacts above 5 percent light extinction. Since even the lowest emission rate case based on Phase I and Phase II enhanced emission controls would result in potentially adverse impacts, mitigation of the predicted impacts would likely require either a further refinement of the modeling approach and methodology, or a means of offsetting the predicted impacts through the identification and acquisition of sufficient emissions reductions from non-Project sources.

Since the East Range site is within 50 km of BWCAW, some of the predicted visibility impact events discussed above occurred at receptors within 50 km and, per guidance from the FLMs, those receptors were preliminarily subject to analysis using the CALPUFF modeling system. For such receptors, the visibility analyses could be performed using the PLUVUE model to determine the potential plume blight impacts, instead of using the CALPUFF modeling system. Excelsior proposes that should the East Range site be selected for construction of the Project, a more refined plume blight impact analysis be performed for these receptors.

Additionally, the predicted visibility impacts can be mitigated by offsetting an equivalent number of visibility events in the Class I area by reducing emissions such as SO_2 from sources not associated with the Project. Excelsior has investigated this potential mitigation option and has identified sources of emissions in the vicinity of the East Range site that may be considered for the mitigation effort. A major source of SO_2 emissions located less than 3 km from the East Range site currently has permitted and actual emissions that could be reduced to adequately mitigate the predicted impacts from the Project for most or all of the operating scenarios considered. Excelsior proposes to pursue this mitigation option should the East Range site be selected for the Project.

Thus, use of some combination of appropriate operating scenarios, refined modeling analyses and the acquisition of any necessary emission offsets from nearby sources will be considered to mitigate any predicted adverse visibility impacts from the Mesaba Project.

The predicted visibility impacts on the other Class I areas evaluated for the East Range site, VNP and IRNP, are expected to be very small with only a few days per year predicted to be above the 5 percent threshold based on the conservative Method 2 analyses. The Method 8 results show that all 8th high values at both Class I areas are well below the 5 percent light extinction threshold and are not expected to be of concern.

As discussed above, supplementary modeling was also conducted for various combinations of MM5 and CALMET grid resolutions in order to ascertain whether these model settings impacted the results, and because Excelsior felt that higher resolution modeling is more technically accurate. Table B.2-13 compares the results for these modeling variations for 2002 (the only year in which higher-resolution MM5 data is available), using the ‘Proposed’ emission rates for Mesaba One and ‘Enhanced’ emission rates for Mesaba Two as a test case.

Table B.2-13a. Class I Visibility Modeling – Comparison of Meteorological Data Resolutions for 2002 – West Range Site (1)

Resolution		Method 2		Method 8
MM5	CALMET	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness				
12 km	1 km	9	0	3.86
36 km	1 km	9	1	3.82
36 km	4 km	9	1	3.91
Voyageurs National Park				
12 km	1 km	6	0	3.73
36 km	1 km	13	0	3.50
36 km	4 km	16	0	4.48

(1) Emissions: Mesaba One at ‘Proposed’ emissions levels, Mesaba Two at ‘Enhanced’ emissions levels

Table B.2-13b. Class I Visibility Modeling – Comparison of Meteorological Data Resolutions for 2002 – East Range Site (1)

Resolution		Method 2		Method 8
MM5	CALMET	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness				
12 km	1 km	86	29	9.89
36 km	1 km	90	33	10.29
36 km	4 km	83	24	9.58

Table B.2-13b. Class I Visibility Modeling – Comparison of Meteorological Data Resolutions for 2002 – East Range Site [1]

Resolution		Method 2		Method 8
MM5	CALMET	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)
Voyageurs National Park				
12 km	1 km	3	1	2.98
36 km	1 km	7	1	3.39
36 km	4 km	8	2	3.77

[1] Emissions: Mesaba One at 'Proposed' emissions levels, Mesaba Two at 'Enhanced' emissions levels

For BWCAW, the predicted visibility impact results in Table B.2-13 show little change and no trend as a function of the resolution of the meteorological data. In contrast, for VNP, as the resolution of the meteorological data and grid increases, the visibility impact results show a significant reduction in both the frequency of predicted light extinction events above 5 percent and in the magnitude of the maximum predicted event. For the impacts of the East Range site on BWCAW, both the maximum frequency of light extinction events above 5 percent and the maximum event occurred using the 36 km MM5 data together with a CALMET grid resolution of 1 km. For the impacts of both the West Range and East Range sites on VNP, both the maximum frequency of light extinction events above 5 percent and the maximum event occurred using the 36 km MM5 data together with a CALMET grid resolution of 4 km.

Unfortunately, 12km MM5 data is not available for 2003 and 2004. However, Excelsior conducted some additional modeling as supplementary information using 1km CALMET grid resolution for those years. These results are shown in Tables B.2-14 and B.2-15, including 2002 using 12km MM5 data.

Table B.2-14a. Class I Visibility Supplementary Modeling Results – West Range Site

Emission Rate		Method 2						Method 8		
		2002 [1]		2003 [2]		2004 [2]		2002 [1]	2003 [2]	2004 [2]
Phase I	Phase II	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness										
Proposed	None	1	0	3	0	1	0	1.80	2.17	2.36
Proposed	Enhanced	9	0	7	1	5	0	3.86	3.34	3.79
Voyageurs National Park										
Proposed	None	1	0	2	0	3	0	1.98	2.46	2.19
Proposed	Enhanced	6	0	5	1	7	2	3.73	3.87	3.35

[1] 12km MM5 data, 1km CALMET grid resolution
[2] 36km MM5 data, 1km CALMET grid resolution

Table B.2-14b. Class I Visibility Supplementary Modeling Results – West Range Site [1]

Emission Rate		Method 2						Method 8		
Phase I	Phase II	2002		2003		2004		2002	2003	2004
		Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness										
Proposed	None	1	0	3	0	1	0	2.52	2.17	2.36
Proposed	Enhanced	9	1	7	1	5	0	3.82	3.34	3.79
Voyageurs National Park										
Proposed	None	2	0	2	0	3	0	2.32	2.46	2.19
Proposed	Enhanced	13	0	5	1	7	2	3.50	3.87	3.35

(1) 36km MM5 data, 1km CALMET grid resolution

For the West Range site, the effects of the higher resolution MM5 data are relatively small and they are partially obscured by the year to year variability that apparently occurred in the meteorological data. Nonetheless, the results presented in Table B.2-14b show that the 2002 meteorological data tended to produce a higher frequency of predicted days with a light extinction above 5 percent, compared to the results for the 2003 and 2004 data, all of which had the same 36 km MM5 and 1 km CALMET grid resolution. In contrast, the results presented in Table B.2-14a for the more refined 12 km MM5 meteorological data used for 2002 are nearly indistinguishable from the results for the 2003 and 2004 data, which were based on the less refined 36 km MM5 data. Thus, in this instance, the use of the more refined 12 km MM5 data canceled the effect of the year to year variability in the meteorological data.

Table B.2-15a. Class I Visibility Supplementary Modeling Results – East Range Site

Emission Rate		Method 2						Method 8		
Phase I	Phase II	2002 [1]		2003 [2]		2004 [2]		2002 [1]	2003 [2]	2004 [2]
		Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness										
Proposed	None	46	7	26	3	14	2	6.23	6.54	6.29
Proposed	Enhanced	86	29	65	13	49	7	9.89	10.76	9.70
Voyageurs National Park										
Proposed	None	1	0	3	0	3	0	1.94	2.12	2.05
Proposed	Enhanced	3	1	5	1	6	2	2.98	3.44	3.20

(1) 12km MM5 data, 1km CALMET grid resolution
(2) 36km MM5 data, 1km CALMET grid resolution

Table B.2-15b. Class I Visibility Supplementary Modeling Results – East Range Site (1)

Emission Rate		Method 2						Method 8		
Phase I	Phase II	2002		2003		2004		2002	2003	2004
		Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)	8th high ΔB_{ext} (%)
Boundary Waters Canoe Area Wilderness										
Proposed	None	48	7	26	3	14	2	6.44	6.54	6.29
Proposed	Enhanced	90	33	65	13	49	7	10.29	10.76	9.70
Voyageurs National Park										
Proposed	None	1	0	3	0	3	0	2.22	2.12	2.05
Proposed	Enhanced	7	1	5	1	6	2	3.39	3.44	3.20

(1) 36km MM5 data, 1km CALMET grid resolution

For the East Range site, the effects of the higher resolution MM5 data are even smaller and more obscured by the year to year variability that apparently occurred in the meteorological data. As was the case for the West Range site, the East Range site results presented in Table B.2-15b show that the 2002 meteorological data tended to produce a higher frequency of predicted days with a light extinction above 5 percent, compared to the results for the 2003 and 2004 data, all of which had the same 36 km MM5 and 1 km CALMET grid resolution. In contrast to the results for the West Range site, the East Range site results presented in Table B.2-15a also show that the more refined 12 km MM5 meteorological data used for 2002 tended to produce a higher frequency of predicted days with a light extinction above 5 percent, compared to the results for the 2003 and 2004 data, which were based on the less refined 36 km MM5 data. Thus, in this instance, the use of the more refined 12 km MM5 data did not cancel the effect of the year to year variability in the meteorological data.

More discussion regarding the determination and selection of the CALMET grid resolution is available in Excelsior's January 2009 Class I Area Modeling Protocol Supplement.

Finally, Excelsior conducted supplemental modeling analyses of the effectiveness of a sample offset scenario at reducing model-predicted visibility impacts. These analyses were conducted only as examples to provide information and illustrate the concept of mitigation. They do not represent a proposal, because the necessity of mitigation has not been established, and the practicability of the scenarios has not been confirmed. The scenario studied was the offset of SO_2 emissions via allowance purchases and/or emission reductions from Laskin Energy Center (LEC). This scenario was chosen due to the proximity of LEC to the East Range Site, where model-predicted visibility impacts were highest, and due to the existence of an established program for SO_2 allowance trading.

The analyses used actual SO_2 emissions from 2006 and 2007 (an average of 755 lb/hr) as a baseline case, and studied offset cases of allowance purchases and/or emission reductions equal to 35% and 50% of actual emissions. NO_X and PM emissions from LEC were not modeled, so the results do not reflect LEC's total modeled visibility impact. The air modeling methodology was the same as for the multi-source analyses described above. The predicted impacts are calculated using Method 2 and are compared to the Method 2 predicted impacts for the Mesaba Energy Project. It should be noted that the conservatism of Method 2 is likely to over-predict both the impacts of Mesaba and LEC.

Table B.2-16 shows the results of the offset scenario analyses. Results for LEC alone (SO_2 emissions only) are presented on the left part of the table. Results of the remaining impact of Mesaba after subtracting the number of days of modeled visibility impact eliminated by the LEC offset are presented on the right part of the table (only the aggregate of the three years is shown). The results from Table B.2-16 show that emission offsets can be a viable approach to reducing the number of days for which modeled visibility impacts are predicted.

Table B.2-16. Class I Visibility Supplementary Modeling Results – Offset Scenarios (1)

Scenario	Emission Rate (lb/hr)	Laskin Energy Center (2) 2002		2003		2004		Total		Mesaba with LEC Offset (3) East Range(4)		West Range(5)	
		Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%	Days ≥ 5%	Days ≥ 10%
Boundary Waters Canoe Area Wilderness													
Baseline	755	37	11	10	3	9	3	56	17	190	38	58	14
-35%	490	20	4	4	2	5	2	29	8	163	29	31	5
-50%	377	11	3	3	0	3	1	17	4	151	25	19	1
Voyageurs National Park													
Baseline	755	8	3	5	1	7	2	20	6	19	4	62	11
-35%	490	4	0	1	0	5	1	10	1	9	-1 (6)	52	6
-50%	377	3	0	1	0	2	0	6	0	5	-2 (6)	48	5

(1) 36km MM5 data, 4km CALMET grid resolution and Method 2 for all analyses.
(2) Results based on SO2 emissions only and therefore do not reflect actual visibility impacts; NOX and PM10 were not modeled.
(3) Results are for Mesaba alone for Baseline LEC scenario, and for Mesaba with offset benefit from LEC for reduction scenarios.
(4) Emissions: Mesaba One at 'Proposed' emissions levels, Mesaba Two and 'Enhanced' emissions levels.
(5) Emissions: Mesaba One and Two at 'Proposed' emissions levels.
(6) Negative number because LEC offsets reduce more days than Mesaba would have impacted.

In addition to the discussion noted above regarding the modeled results and potential mitigation of any adverse impact, it is also important to recognize and take into account the Draft FLAG Phase I Report, which includes an expanded discussion of the process for adverse impact determination that in the event that initial modeling predicts calculated visibility impacts greater than the defined thresholds (e.g., 5%). That report states that further analysis can be conducted and additional contextual factors considered before a project-specific determination is made. According to the draft, the defined threshold does not represent a bright line test for adverse impact determination, but rather a level at which additional analysis is triggered, similar to the Deposition Analysis Threshold for nitrogen and sulfur deposition, discussed below. The following are examples of other factors to consider:

- Current pollutant concentrations and AQRV impacts in the Class I area
- Air quality trends in the Class I area
- Emission changes that have occurred or would occur (i.e., enforceable) by the time the new source begins operation
- Whether there are approved SIPs that account for new source growth and demonstrate attainment of national ambient air quality standards and "reasonable progress" toward visibility goals
- The expected useful life of the source
- The stringency of the emission limits (e.g., Best Available Control Technology)
- Other considerations such as options put forth by the applicant that would produce ancillary environmental benefits to AQRVs (e.g., reductions in toxic air contaminants, pollution prevention investments)

- Comments received from the public or other agencies during the comment period prior to issuing the permit

Minnesota is developing a State Implementation Plan for implementing the Regional Haze Rule, and that plan would certainly be a contextual consideration.

Deposition of Nitrogen and Sulfur

Potential impacts to soils, waters, and vegetation in Class I areas were evaluated on the basis of the model-predicted pollutant concentrations and the magnitude of predicted annual deposition of S and N. Criteria for assessment of deposition impacts are different for USFS areas (BWCAW and RLW) and National Park Service (NPS) areas (i.e., VNP). The NPS has established a Deposition Analysis Threshold (DAT) of 0.01 kilograms per hectare per year for both S and N deposition for Class I areas in the eastern United States. A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant.

The CALPUFF results for each of the Class I areas were processed with CALPOST to calculate total annual deposition of N and S at each receptor as a result of Mesaba Generating Station emissions. Total sulfur deposition is calculated from the wet (rain, snow, fog) and dry (particle, gas) deposition of SO_2 and sulfate; total nitrogen is represented by the sum of nitrogen from wet and dry fluxes of nitric acid, nitrate, ammonium sulfate and ammonium nitrate, and the dry flux of NO_X. Results are shown in Tables B.2-17 and B.2-18.

Table B.2-17. Class I Deposition Modeling Results – West Range Site

Emission Rate		Nitrogen Deposition (kg/ha-yr)			Sulfur Deposition (kg/ha-yr)		
Phase I	**Phase II**	**2002 (1)**	**2003 (2)**	**2004 (2)**	**2002 (1)**	**2003 (2)**	**2004 (2)**
Boundary Waters Canoe Area Wilderness							
Proposed	None	0.0039	0.0041	0.0038	0.0058	0.0069	0.0057
Proposed	Proposed	0.0077	0.0082	0.0075	**0.0115**	**0.0138**	**0.0114**
Proposed	Enhanced	0.0053	0.0056	0.0052	0.0081	0.0097	0.0080
Voyageurs National Park							
Proposed	None	0.0042	0.0049	0.0046	0.0074	0.0079	0.0075
Proposed	Proposed	0.0084	0.0099	0.0092	**0.0146**	**0.0159**	**0.0150**
Proposed	Enhanced	0.0058	0.0068	0.0063	**0.0103**	**0.0112**	**0.0106**
Rainbow Lakes Wilderness							
Proposed	None	0.0020	0.0021	0.0020	0.0030	0.0033	0.0029
Proposed	Proposed	0.0040	0.0042	0.0040	0.0060	0.0065	0.0059
Proposed	Enhanced	0.0027	0.0029	0.0027	0.0042	0.0046	0.0041

(1) 12km MM5 data, 1km CALMET grid resolution
(2) 36km MM5 data, 4km CALMET grid resolution

Table B.2-18. Class I Deposition Modeling Results – East Range Site

Emission Rate		Nitrogen Deposition (kg/ha-yr)			Sulfur Deposition (kg/ha-yr)		
Phase I	**Phase II**	**2002 (1)**	**2003 (2)**	**2004 (2)**	**2002 (1)**	**2003 (2)**	**2004 (2)**
Boundary Waters Canoe Area Wilderness							
Proposed	None	**0.0156**	**0.0176**	**0.0166**	**0.0246**	**0.0255**	**0.0269**
Proposed	Enhanced	**0.0219**	**0.0247**	**0.0230**	**0.0346**	**0.0359**	**0.0376**
Enhanced	Enhanced	**0.0128**	**0.0144**	**0.0130**	**0.0202**	**0.0211**	**0.0219**
Voyageurs National Park							
Proposed	None	0.0044	0.0042	0.0054	0.0082	0.0075	0.0087
Proposed	Enhanced	0.0061	0.0059	0.0074	**0.0115**	**0.0105**	**0.0122**
Enhanced	Enhanced	0.0035	0.0034	0.0042	0.0067	0.0062	0.0071
Rainbow Lakes Wilderness							
Proposed	None	0.0020	0.0031	0.0034	0.0032	0.0044	0.0048
Proposed	Enhanced	0.0027	0.0043	0.0047	0.0044	0.0061	0.0067
Enhanced	Enhanced	0.0015	0.0024	0.0025	0.0026	0.0036	0.0039
Isle Royale National Park							
Proposed	None	0.0012	0.0011	0.0012	0.0032	0.0028	0.0034
Proposed	Enhanced	0.0017	0.0015	0.0017	0.0045	0.0040	0.0048
Enhanced	Enhanced	0.0009	0.0008	0.0009	0.0026	0.0023	0.0028

(1) 12km MM5 data, 1km CALMET grid resolution
(2) 36km MM5 data, 4km CALMET grid resolution

As shown in Table B.2-17, the CALPUFF model results for nitrogen deposition for the West Range Site are below the DAT. The sulfur deposition model results are below the DAT for Mesaba One only, are slightly above the DAT with Mesaba Two at enhanced controls in VNP only, and are above the DAT for Mesaba One and Two with proposed controls at VNP and BWCAW.

As shown in Table B.2-18, deposition results for the East Range are below the DAT for IRNP, RLW, and VNP, except for one case for sulfur deposition at VNP where the results are slightly above the DAT. Results are above the DAT for both nitrogen and sulfur deposition at BWCAW. The analysis is conservative since it uses worst-case emissions and 100% operation. The DAT represents a screening level to assess any possibility of adverse impact, and is not a regulatory limit. Additionally, based on the deposition assessment criteria that the USFS used, the S and N deposition rates from the Mesaba Energy Project are well below Green Line at BWCAW (see Appendix D-1).

APPENDIX C

Air Emission Risk Analysis Data

(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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Final Air Emission Risk Analysis

Excelsior Energy Inc.
Mesaba Energy Project - West Range

Taconite, Itasca County, Minnesota

SEH No. EXENR 102654

June 2009

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Final Air Emission Risk Analysis

Excelsior Energy Inc.
Mesaba Energy Project - West Range
Taconite, Itasca County, Minnesota

Prepared for:
Excelsior Energy Inc.

Prepared by:
Short Elliott Hendrickson Inc.
809 North 8th Street, Suite 205
Sheboygan, WI 53081-4032

Signature Page

Excelsior Energy Inc.
Mesaba Energy Project – West Range
Final Air Emission Risk Analysis
June 2009

6/19/09

(Signature) (Date)

Thomas A. Henning, PE, Project Engineer

6-19-09

(Signature) (Date)

Gloria Chojnacki, Senior Scientist

List of Abbreviations/Terms

AERA	Air Emissions Risk Analysis
AERMOD	a steady-state plume air dispersion model
AGR	Acid gas removal
AP-42	Compilation of Air Pollutant Emission Factors
benzo(a)phenanthrene	chrysene
bis(2-ethylhexyl)phthalate	DEHP
bromoethane	methyl bromide
Btu	British thermal unit
butanone, 2-	methyl ethyl ketone
CD	compact disc
chloroethane	ethyl chloride
chloromethane	methyl chloride
chrysene	benzo(a)phenanthrene
cm/yr	centimeters per year
COPC	chemicals of potential concern
CTG	combustion turbine generator
DEHP	bis(2-ethylhexyl)phthalate
EC	exposure concentration
ELCR	excess lifetime cancer risk
dibromoethane	ethylene dibromide
dichloroethane, 1,2-	ethylene dichloride
dichloromethane	methylene chloride
dioxin	2,3,7,8-tetrachlorodibenzo-p-dioxin equivalents
ethyl chloride	chloroethane
ethylene dibromide	dibromoethane
ethylene dichloride	dichloroethane 1,2-
Excelsior	Excelsior Energy Inc.
ft	feet
g/sec	grams per second
g/yr	grams per year
HAP	Hazardous Air Pollutant
Hg^0	elemental mercury
HHRAP	Human Health Risk Assessment Protocol
HI	hazard index
HHRAP	Human Health Risk Assessment Protocol
HRV	health risk value
HVTL	high voltage transmission line
hydrofluoric acid	hydrogen fluoride
hydrogen fluoride	hydrofluoric acid
HQ	hazard quotient
I	inhalation exposure concentration
IGCC	Integrated Coal Gasification Combined Cycle
IHB	inhalation health benchmarks
IRAP	Industrial Risk Assessment Program – Human Health
kg	kilogram
kg/day	kilogram per day
km	kilometer
m	meters
methyl bromide	bromoethane

List of Abbreviations/Terms (continued)

methyl chloride	chloromethane
methyl chloroform	trichloroethane, 1,1,1-
methyl ethyl ketone	butanone, 2-
methylene chloride	dichloromethane
MDNR	Minnesota Department of Natural Resources
mg/kg-day	milligram per kilogram per day
mi	miles
MDH	Minnesota Department of Health
MN	Minnesota
MNDOT	Minnesota Department of Transportation
MMBtu/hr	million Btu per hour
MPCA	Minnesota Pollution Control Agency
m/s	meters per second
MWe	megawatts of electricity
m/yr	meters per year
m^3/yr	cubic meters per year
NE	northeast
PBT	persistent, bioaccumulative, and toxic chemical
perchloroethylene	tetrachloroethylene
ppm	parts per million
Project	Mesaba Energy Project, Mesaba One and Mesaba Two
Q	COPC emission rate
Q/CHI	Q (Emission Rate)/Critical Health Index
RASS	Risk Assessment Screening Spreadsheet
T	COPC inhalation health benchmark (IHB)
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin equivalents
tetrachloroethylene	perchloroethylene
trichloroethane, 1,1,1-	methyl chloroform
TVB	tank vent boiler
$\mu g/m^2$-yr	micrograms per square meter per year
$\mu g/m^3$	micrograms per cubic meter
U of M	University of Minnesota
UR	chemical specific unit risk
U.S. EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator mapping coordinates
yr	year
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
10^{-5}	1 in 100,000
10^{-6}	1 in 1,000,000 or one millionth
%	percent

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Air Emission Risk Analysis

Excelsior Energy Inc.
Mesaba Energy Project - West Range

Prepared for Excelsior Energy Inc.

1.0 Introduction

Excelsior Energy Inc. (Excelsior), an independent energy development company based in Minnetonka, MN, is proposing to build, own, and operate (potentially under agreement with an operating company) the Mesaba Energy Project (the "Project"), an Integrated Coal Gasification Combined Cycle (IGCC) power plant located on Minnesota's Iron Range. The Project consists of a proposed two-phase generating station (the "IGCC Power Station"), each phase of which would nominally generate 600 megawatts of electricity (MWe) for export to the electrical grid. The commercial in-service date for Phase I is scheduled for 2011; Phase II is scheduled for 2013.

Figure 1, "Site Location Map" is a general location map showing the general area within which Excelsior has focused its search for potential Project sites on Minnesota's Western Iron Range (West Range). The Project search area is located within a larger region in Northern Minnesota identified as the Taconite Tax Relief Area. Figure 2, "Facility Plan - Aerial View" provides a local aerial view of the West Range site ("site"), the Project's current site plan, and the infrastructure required to support Project operation.

2.0 Process and Sources Description

Excelsior's corporate vision is to bring to Minnesota, via the application of advanced technologies, energy, innovation, and economic development. Excelsior has chosen IGCC as the vehicle to achieve this mission. The Project would use ConocoPhillips' E-Gas™ Technology for solid feedstock gasification. A full description of the process technology is included in the Project's Application to the Minnesota Pollution Control Agency for a New Source Review Construction Authorization Permit dated June 2006 (Excelsior, 2006), hereafter referred to as the "Application".

The Project will consist of two mirror image phases called Mesaba One and Mesaba Two. Each phase will consist of the following emission sources:

- 2 – gas combustion turbine generators (CTGs), each having a maximum syngas fuel incineration rate of 2,115 MMBtu/hr
- 1 – flare having a maximum syngas combustion rate of 3,730 MMBtu/hr (1-hr average), 280 MMBtu/hr (30-day average), and 50 MMBtu/hr (annual average)
- 1 – tank vent boiler (TVB) having a maximum syngas combustion rate of 65 MMBtu/hr (1-hr and 30-day average) and 15 MMBtu/hr (annual average)
- Fugitive emission sources are included to account for leaks in equipment and storage tanks

While particulate matter emissions may be generated from roadway traffic or storage piles, these emissions are not included in the Air Emissions Risk Analysis (AERA) because the dust emitted contains negligible amounts of the compounds included in this analysis.

2.1 East Range Discussion

An alternate facility location was chosen on Minnesota's East Iron Range (East Range) near the City of Hoyt Lakes, Minnesota. The facility on the East range would have identical process and stack characteristics as presented above with identical air emission rates. An AERMOD dispersion model evaluation was conducted to demonstrate National Ambient Air Quality Standards (NAAQS) compliance at both the East Range and West Range locations. The results of these two evaluations were very similar, indicating that dispersion characteristics are also very similar between the two locations. This is reasonable considering the two locations share many similarities: identical stack parameters and the same meteorological data set. Therefore, the risk assessment evaluation results at the East Range will be similar to that of the West Range.

An evaluation was conducted at the East Range location to identify receptors within three kilometers of the stack centroid. The northern most portion of the City of Hoyt Lakes and a development on the south shore of Colby Lake are located within the three-kilometer buffer area. No farms, schools, nursing homes, assisted living facilities, or licensed daycare centers are located within the three-kilometer buffer zone.

Because the dispersion trajectory is similar between the East and West Range locations, project mercury deposition to the watershed and lakes located near the East Range location will also be similar to that of the West Range site. Colby Lake is approximately the same distance from the East Range location as Big Diamond Lake is from the West Range site, therefore, mercury deposition to Colby Lake will be similar to that of Big Diamond Lake.

The results of the AERA conducted on the West Range site and presented in this document are also used to assess potential risks associated with the East Range location.

3.0 AERA Methodology

An AERA was conducted on the Project to identify the sources or groups of sources, chemicals, and associated pathways that may pose an unacceptable risk to the public as a result of air emissions. In general, the term "risk" refers to the excess risk of developing cancer and the potential for non-cancer health effects as the result of exposure to air emissions. The AERA, as developed by the Minnesota Pollution Control Agency (MPCA), includes both a quantitative and qualitative evaluation of emissions and potential pathways. The AERA is conducted in accordance with the procedures contained in the MPCA Air Emissions Risk Analysis (AERA) Guide viewed on-line (MPCA, 2007a).

Because emission source stacks are less than 100 meters in height, AERA evaluation was completed for the area within a three-kilometer radius of the proposed facility emission points (MPCA, 2007a.) The three-kilometer buffer radius for both the Phase I and Phase II stack centroid can be seen on Figure 2.

MPCA AERA forms are included in Appendix A, "AERA Forms."

3.1 Quantitative Evaluation

The quantitative analysis is conducted using several methods as follow.

3.1.1 RASS and Q/CHI

Risk Assessment Screening Spreadsheets (RASS) are risk assessment screening tools developed by MPCA which are sometimes used as a preliminary evaluation of risk for a proposed project. With the RASS, dispersion factors found on "look-up" tables are used to predict pollutant concentrations (i.e. off-site impacts) at specific locations. Excelsior has elected to conduct detailed risk evaluations that use more sophisticated dispersion modeling techniques to better refine the evaluations. Because the more detailed risk evaluations are completed, the RASS screening evaluation is not necessary and therefore not included in this AERA. However, toxicity values and other risk information included in the RASS are used in the acute and sub-chronic evaluations (see Section 4.0).

One method Excelsior uses to evaluate risk is called the Q/CHI method (Q = emission rate and CHI = Critical Health Index). The Q/CHI method is also a screening method by which risk is estimated at each emission source stack by computing a Q/CHI quotient for the chemicals of concern. A Q/CHI quotient is arrived at by dividing the chemical emission rates by the individual chemical inhalation health benchmarks (IHBs). The combined Q/CHI quotients are then evaluated at specific receptor locations by inputting the quotients into a refined dispersion model. The Q/CHI approach calculates risk while correlating both time and space for each location. The Q/CHI method is used in this project to predict acute and sub-chronic risks associated with the facility. Additional refined risk analysis to predict chronic risk (annual emission average) was conducted using the Industrial Risk Assessment Program – Health View (IRAP) program.

With the Q/CHI method, risk due to the inhalation pathway is estimated for chemicals causing carcinogenic and non-carcinogenic effects. For chemicals contributing to non-carcinogenic effects, risk is evaluated for acute (1-hour emission average) and sub-chronic (1-month average) time periods. Risks for chemicals contributing to carcinogenic effects are based on the probability that an individual will develop cancer over a lifetime.

3.1.2 IRAP

The IRAP model is used by Excelsior to predict chronic risks. IRAP was developed by Lakes Environmental Software, Inc. to comply with the requirements of the *U.S. EPA Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (HHRAP) guidance document (U.S. EPA, 2005).

This complex protocol was developed to estimate human health risk at hazardous waste combustion facilities from multi-pathway exposure to chemicals released to the ambient air. With IRAP, risk is predicted via direct (inhalation) and indirect (ingestion of or contact with soil, plants, fruits, vegetables, beef and milk, chicken and eggs, and fish) pathways for each scenario (resident adult, resident child, farmer adult, etc.) specified. Worst-case maximum annual emission rates are used in the IRAP evaluation.

3.1.3 Fish Consumption

Risk associated with ingestion of fish tissue potentially contaminated with mercury is evaluated using the *MPCA Mercury Risk Estimation Method (MMREM) for the Fish Consumption Pathway: Impact Assessment of a Nearby Source* (MPCA, 2006a). This method assumes that there is a linear relationship in a given lake between the atmospheric mercury deposition rate and fish tissue methylmercury concentrations. The relationship is used to estimate the non-cancer oral hazard quotients due to fish tissue ingestion based on increases in mercury deposition as a result of facility emissions.

The method combines estimated current fish tissue mercury concentrations with potential increases in atmospheric deposition to arrive at an estimate of future methylmercury tissue concentrations. Risk associated with ingestion of fish tissue potentially affected by other contaminants of concern associated with the facility is evaluated using the IRAP model.

3.2 Qualitative Evaluation

Because many issues that could potentially impact health cannot be readily quantified, a qualitative analysis is conducted that provides supplementary information to the quantitative assessment. Information that may be included in the qualitative assessment includes, among others: land use and receptor information; sensitive populations; persistent, bioaccumulative, and toxic chemicals (PBTs); farmer, resident, and fisher populations; emissions related to shutdowns and startups; internal combustion engine generators; and chemicals emitted but not assessed quantitatively. At times, chemicals may not have readily available IHBs, or may have a closely related chemical toxicity value as a surrogate, or a PBT may not have multimedia factors developed. These issues may be discussed in the qualitative evaluation.

4.0 Quantitative Analysis

4.1 Chemicals of Potential Concern

Chemicals of potential concern (COPC) are chemicals that could be released from a facility, regardless of their toxicity or emission rate. The COPCs included in the AERA are the federal Hazardous Air Pollutants (HAPs) and other compounds listed in the Project's Application. Note that we have excluded the AERA emissions from insignificant emission sources that meet the definitions found in Minn. R. 7007.1300. These units emit very small quantities of COPCs. These units will emit much less than 1 percent of the COPCs emitted by the project's significant emission units. The insignificant activities listed in the Application are:

- Portable space heaters for miscellaneous winter use during construction and plant operations and maintenance. Infrared heaters
- Diesel fuel storage tanks
- Plant Chemical Laboratory
- Office Blueprint Machine
- Construction and Maintenance Activities:
  - Hydraulic and hydrostatic testing of equipment
  - Brazing, soldering, and welding
  - Various cleaning and janitorial operations
  - Miscellaneous spray painting

In response to MPCA comments on the Draft EIS regarding the level of conservatism used to develop the emissions inventory used in the AERA analysis (i.e. COPC emission rates were derived by averaging the results from valid stack tests at the Wabash River Coal Gasification Repower Project), Excelsior has adopted a more conservative basis for establishing the AERA emissions inventory. The approach the company is taking to provide this added degree of conservatism involves using the highest measured value of any COPC quantified in a valid stack test (instead of using the average of several valid tests). Although this approach provides a basis for eliminating any uncertainty with respect to the level of conservatism applied to both the acute and chronic risk assessments included herein, it does not represent a realistic basis for establishing the IGCC Power Station's long term potential to emit COPCs (e.g., over the period of one year) and, therefore, should not be used for such purposes. Assembling a long term emission inventory of COPCs would better be served through use of average emission rates collected during stack tests, rather than maximum rates.

In general, the COPCs include those federal HAPs that either have been measured at the Wabash River gasification plant or are chemicals listed in the U.S. EPA document AP-42 for coal combustion. Emission rates for these compounds are estimated using the following sources (listed in order of preference):

- Results of regulatory test programs at the existing Wabash River Coal Gasification Repowering Project in Terre Haute, Indiana, – adjusted, if appropriate, for the expected worst-case feeds to the Project. Where multiple tests results were available for one compound, the results from the highest test were used.
- Equipment supplier information

- Published emission factors and reports applicable to IGCC facilities
- Engineering calculations and judgment
- U.S. EPA emission factors (AP-42)

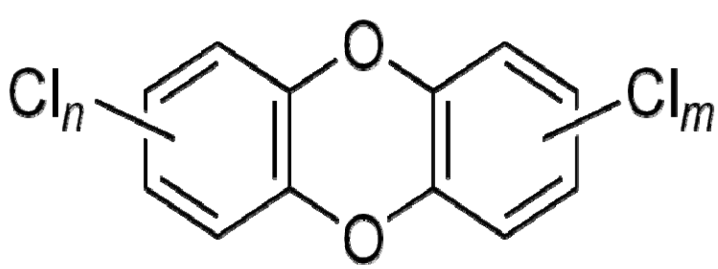
COPC emissions at the IGCC Power Station will be reduced by the inherently low polluting IGCC technology and many of the same process features that control criteria emissions. A large portion of the heavy metals and other undesirable constituents of the feed will be immobilized in the non-hazardous, vitreous slag by-product and prevented from causing adverse environmental effects. Gaseous and particle-bound COPCs that may be contained in the raw syngas exiting the gasifiers will be totally or partially removed in the syngas particulate matter removal system, water scrubber, and Acid Gas Removal (AGR) systems. In addition, the mercury removal carbon absorption beds will ensure that mercury emissions from the IGCC Power Station will be less than 10 percent of the mercury present in the feedstock, as received.

Table 1a, “Chemicals Evaluated in the AERA – Annual Emissions (Phase I plus Phase II)” presents a summary of maximum estimated COPC emissions for the Phase I and Phase II IGCC Power Station. Table 1b, “Chemicals Evaluated in the AERA – Sub-chronic Emissions (Phase I plus Phase II)” and Table 1c, “Chemicals Evaluated in the AERA – Acute Emissions (Phase I plus Phase II)” present a summary of 1-hour and 30-day estimated emissions for the proposed facility. COPCs included in the sub-chronic and acute risk analysis include those with MPCA-approved inhalation health benchmark values. Additional detail regarding the sources and calculation methods used to estimate facility emissions is found in the Mesaba Energy Project’s Application dated June 2006 (Excelsior, 2006).

The following chemicals do not have toxicity information included in IRAP nor supplied by MPCA: 2-chloracetophenone, 5-methylchryssene, biphenyl, carbonyl sulfide, cobalt, dimethyl sulfate, hexane, hydrogen fluoride, manganese, methyl methacrylate, methyl hydrazine, methyl tert butyl ether, proprionaldehyde, selenium, and sulfuric acid. As directed by MPCA, these chemicals do not need to be added to nor evaluated in the annual risk model.

4.1.1 Dioxins and Furans

A dioxin is any compound that contains the dibenzo-p-dioxin nucleus; a furan is any compound that contains the dibenzofuran nucleus (U.S. EPA, 1997). The chemical structure of dioxin is provided below:



The most toxic forms of dioxins are those that are chlorinated. Such substances are formed as a by-product of combustion when hydrocarbons are burned in the presence of chlorine. Dioxin and furan formation is an important concern at medical waste and municipal waste incinerators where chlorine from plastics or other sources are burned with organic wastes.

Chlorinated dioxin and furan emissions are expected to be negligible from the IGCC Power Station. We expect the chlorine concentration in the product syngas to be low, as chlorine is expected to be removed both by the gasification process itself and also during the water wash treatment process prior to syngas combustion. Data from the Wabash River plant shows chlorine concentrations to be below test detection limits. Mesaba also features activated carbon bed treatment, during which the intimate contact between syngas and activated carbon will likely scrub any potential organic compounds to de minimis levels, thereby avoiding the potential that such compounds could form dioxins or furans during their subsequent combustion.

The combustion characteristics of syngas further support the expectation that dioxin and furan emissions will be insignificant. Formation of condensation substances like dibenzodioxins and dibenzofurans is more likely where free radicals (e.g., ·RH, ·RH2, ·RH3, etc.) are in high concentration and can readily combine with other radicals (e.g., ·OH, ·OOH, and ·Cl, having as their source air or contaminants present in the fossil fuel itself) to form higher molecular weight substances as a plasma cools. In contrast to the combustion precursors in conventional fossil fuel combustion, IGCC has as its main precursors carbon monoxide (“CO”) and hydrogen (“H2”). In the presence of excess air at high temperatures in the combustion turbine, these two species are quickly oxidized to CO2 and water, with far less probability of going through the intermediate formation of high molecular weight condensation substances. From this it follows that syngas would be even less likely to form dioxin and furan than natural gas (“CH4”) combustion turbines, for which dioxin and furan emission is generally assumed not to occur.[1]

Although dioxin and furan emissions are expected to be insignificant, at the MPCA’s request, a sensitivity analysis was conducted to determine the emission rate for each source associated with a total dioxin risk (as equivalents of 2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD]), of one in one million (10-6). Once the facility is operational, Excelsior will perform testing to confirm that dioxin formation is indeed insignificant.

4.1.1.1 Dioxin Sensitivity Analysis

A sensitivity analysis on the risk impact of dioxin (as equivalents) was conducted at two receptor locations near the proposed Mesaba One and Mesaba Two facility. In this evaluation, annual emissions rates of dioxin from all emission sources were adjusted to result in a carcinogenic risk due to dioxin equivalents alone of 10^{-6}. The two scenarios selected for this evaluation were the adult farmers and adult fishers, as these two populations are predicted to be most at risk at these two locations. The risk locations are as follows:

[1] Excelsior’s and MPCA’s separate reviews of various data sources located no data on emission factors of dioxins or furans from natural gas-fired combustion turbines.

- Receptor 3 – The location of maximum predicted project impacts outside of the property boundary is southeast of the property boundary.

- Receptor 7 – The location of an existing working farm northwest of the proposed facility site is northwest of the property boundary.

Receptor 3 represents the worst case risk location, while Receptor 7 is in an area that is relatively clear of trees and brush and represents the more likely location for a working farm. Both Receptor 3 and Receptor 7 are indicated on Figure 2. Table 2, "IRAP Receptor Locations and Scenarios Evaluated" identifies the grid location for both locations.

The evaluation was conducted under two separate operating scenarios. In the first scenario, both Mesaba One and Mesaba Two are operating at full capacity with the emission sources being two CTGs, one flare, and one TVB for each phase. In the second scenario, only the eastern-most phase is operational at maximum emission rates.

The results of this evaluation indicate that dioxin emission rates predicted to result in a 10^{-6} dioxin equivalent risk are the lowest at Receptor 3 for the farmer scenario. These rates are the lowest with either both phases or one phase operating. Operation of one phase results in emission rates that are roughly one half of those from both phases. Therefore, the emission rate required to produce a risk of 10^{-6} with one phase operating is approximately double the rate with both phases running.

The analysis also indicates that the fisher scenario at Receptor 7 results in emission rates that are lower than those for the farmer scenario. All modeling conducted for this analysis resulted in a cumulative risk from all COPCs which did not exceed one in 100,000 (10^{-5}).

Results of this sensitivity analysis are summarized on Table 3, "CTG Emission Rates that Result in a 10^{-6} Cancer Risk." For presentation purposes, only emission rates for the CTGs are included in Table 3. However, all COPC emissions from all emission sources are included in this evaluation. Dioxin emissions from the flare are approximately 2.4 percent (%) of the CTGs and emissions from the TVB are approximately 0.71% of the CTGs.

4.1.2 Chromium

The total chromium emissions are based on testing of product (cleaned) syngas at the Wabash River plant. Chromium exists primarily in two oxidative states, hexavalent chromium (Cr^{+6}) and trivalent chromium (Cr^{+3}). Because Cr^{+6} is significantly more toxic than Cr^{+3}, it is important that the appropriate inhalation health benchmarks and emission rates are used in the calculation of risk. The following information documents the approach for calculating the chromium emission rates used in the IRAP risk model.

Although the test result showed the chromium concentration was below the detection limit, one half the test's detection limit was used as the basis for the chromium emission rate calculation for Mesaba Energy. There is no test data for hexavalent chromium. Therefore, the ratio of the emission factors for hexavalent chromium to total chromium emission factors found in Table 1.1-

18 in AP-42 Chapter 1.1 (Bituminous and Subbituminous Coal Combustion in Boilers) were used. The ratio is 30%.

The method of estimating hexavalent chromium emissions is very conservative. First, the only chromium species stable enough to survive the high temperatures within the gasifier are the metal itself, chromium (III) nitride, chromium (III) sulfide, chromium (II) sulfide, chromium (II) selenide, or chromium (III) oxide. As noted below, these species have melting points at or near the operative temperature in the gasifier (approximately 2,500°F in the first stage and 1,700°F in the second stage).

Chromium Species	Melting Point	Boiling Point
Chromium (III) chloride	2,100°F	Decomposes @ 2,370°F
Chromium nitride	Decomposes @ 2,340°F	Not applicable
Chromium (III) sulfide	Decomposes @ 2,460°F	Not applicable
Chromium (II) sulfide	2,850°F	Unpublished
Chromium (II) selenide	2,730°F	Unpublished
Chromium (III) oxide (CR_2O_3)	5,430°F	Unpublished
Chromium (VI) oxide	390°F	Decomposes to CR_2O_3 @ 480°F
Chromium	3,370°F	4,860°F

From:

1.J.A. Dean (ed.) in *Lange's Handbook of Chemistry*, McGraw-Hill Book Company, New York, Thirteenth Edition, 1985 pp 4-42 to 4-44.

2. CRC Handbook of Chemistry and Physics, CRC Press LLC, New York, 84th Edition, 2003, Page 4-52 and 4-53.

3. www.webelements.com/webelements/compounds/text/Cr/

Therefore, such species will not be gases, rather, they are likely to be retained on particles and ultimately partitioned within the slag matrix. Second, chromium (VI) oxide melts at 390°F and decomposes above 480°F to chromium (III) oxide. Third, there are several steps in the syngas cleanup process that will remove particles and the chromium bound to them so that the amount of total chromium entering the turbines is expected to be very low.

As a matter of completeness, emission factors for hexavalent and total chromium from turbines burning natural gas/refinery gas, and distillate oil are available on the California Air Resources Board (CARB) Air Toxics Emission Factor Database (www.arb.ca.gov/ei/catef/catef.htm). The ratios of hexavalent to total chromium emission factors for turbines burning these fuels are 14%, 11%, and 2.5%, respectively. These ratios are considerably less than the 30% we have used in our calculations.

All of these considerations indicate that the assumption that 30% of chromium entering the turbines becomes hexavalent chromium overestimates hexavalent chromium emissions and so the results we have provided are very conservative.

4.2 Exposure Assessment

The exposure assessment quantifies the intake and uptake into the body of COPCs by several exposure pathways. In the Q/CHI Method, potential risk via the inhalation pathway only is evaluated. Health risks are assessed for short-term (acute) and mid-term (sub-chronic) exposures.

After importing dispersion model files specific for the facility, the grid location having the highest modeled emissions concentrations outside of the facility property boundary is identified. A receptor (Receptor 3) is placed at this maximum impact location. Receptor 3 is located at the property boundary in the south-east area of the property (approximately 1 km from the stack centroid.) Exposure scenarios are then selected. Exposure scenarios evaluated included adult and child farmer, adult and child resident, and adult and child fisher. Risk for each exposure pathway is calculated by IRAP for all exposure scenarios selected. Table 2, identifies the maximum impact grid receptor for this facility and the pathways chosen for risk estimation using IRAP. Table 4, "IRAP Exposure Pathways Evaluated" identifies the exposure pathways evaluated as recommended by HHRAP (U.S. EPA, 2005). Figure 2 indicates the maximum impact receptor location evaluated.

Per discussion with the MPCA, the primary concern regarding mercury is consumption of mercury contained in fish tissue. Risk attributable to the ingestion of fish tissue potentially contaminated with mercury is evaluated using MPCA methodology (MPCA, 2006a). Therefore, mercury is not included in the IRAP model evaluation. The fisher scenario as modeled in IRAP includes the ingestion of all COPCs contained in fish tissue, with the exception of mercury.

4.3 Toxicity Assessment

Inhalation toxicity values are used to calculate potential facility-specific inhalation risks from COPCs emitted to the air. Acute and sub-chronic toxicity values compiled by MPCA and the Minnesota Department of Health (MDH) from readily available, and acceptable sources are included in the RASS and are used as IHBs for the Q/CHI method (MPCA, 2007a.) The various sources of the IHBs are referenced in the RASS (MPCA, 2007b).

Toxicity values compiled by MPCA in a spreadsheet file titled "MNRiskS_final run_March 12 2008.xls" (MPCA, 2008B) are used as IHBs for the IRAP method. Only chemicals with MPCA defined toxicity information were modeled using IRAP. Additional fate and transport data found in this file was also used to complete IRAP modeling. If fate and transport information is not included in the spreadsheet of toxicity values obtained from the MPCA, U.S. EPA HHRAP default information included in IRAP is used for the IRAP evaluation method (U.S. EPA, 2005).

For risk assessment purposes, COPCs fall into either or both of two categories: those having the potential for producing carcinogenic (cancer) effects and those that may produce non-carcinogenic effects. Some chemicals are capable of producing both responses.

The dose-response assessment for COPCs producing carcinogenic effects assumes that there is no toxicity threshold dose. In other words, any dose of carcinogenic compounds is potentially associated with risk. The IHBs found in RASS (MPCA, 2007b) and the MPCA spreadsheet (MPCA, 2008B) are specified so the additional lifetime cancer risk to an individual exposed for a lifetime to the COPC is expected to be equal to or less than 10^{-5} of developing cancer (MPCA, 2007a).

The dose-response assessment for COPCs producing non-carcinogenic effects assumes that an exposure level exists below which no adverse health effects would be expected. This threshold dose, in theory, is protective of all receptors that may be exposed at that level, including sensitive populations. The IHBs found in RASS and the MPCA spreadsheet are expected to be below this threshold dose.

4.4 Risk Characterization

Risk characterization summarizes the exposure and toxicity assessment outputs to describe the risks from COPCs emitted to the air from the facility. This includes assessment of cancer risk in excess of that expected over a lifetime of exposure and acute, sub-chronic, and chronic non-cancer risk.

Based on MPCA guidance, if the cancer risk for each COPC evaluated is less than or equal to 10^{-6}, or the individual COPC non-cancer hazard quotient is does not exceed 0.1, the risk is considered acceptable. In addition, if the sum of the individual COPC cancer risks is does not exceed 10^{-5} and the sum of the individual non-cancer hazard quotients (hazard index) does not exceed 1, quantitative risk associated with the facility is considered acceptable. However, a qualitative analysis must still be conducted.

Health risk calculation for the inhalation of COPCs producing carcinogenic effects is as follows:

$$ELCR = (EC)(UR)$$

where:
ELCR = Excess Lifetime Cancer Risk
EC = Exposure concentration in the air (μg/m^3)
UR = Chemical Specific unit risk, (μg/m^3)$^{-1}$

Health risk for the inhalation of COPCs producing non-carcinogenic effects is evaluated by comparing an exposure concentration in the air with the IHB, also referred to as the hazard quotient, as follows:

$$HQ = \frac{I}{IHB}$$

where:
HQ = Hazard Quotient
I = exposure concentration (μg/m^3)
IHB = Inhalation Health Benchmark (μg/m^3)

To express the overall potential for non-carcinogenic effects posed by exposure to more than one chemical or to more than one pathway, the U.S. EPA has developed an approach which assumes that simultaneous exposures to multiple chemicals could result in an adverse health effect assuming the same mechanism of action, or target organ. This approach is called the hazard index and is expressed as follows:

$$HI = \sum_{i=1}^{n} HQ_i$$

where:
HI = Hazard Index
HQ_i = Hazard quotient for the *i*th chemical
N = number of chemical HQs

4.5 Quantitative Results – Q/CHI

The Q/CHI approach to calculating risk from air emission contaminants estimates risk at each stack by computing chemical-specific air toxic Q/CHI quotients for COPCs having both carcinogenic and non-carcinogenic endpoints. Q/CHI quotients are calculated as follows:

$$Q/CHI\ Quotient = \frac{Q}{T}$$

where:
Q = COPC emission rate (grams/second)
T = corresponding COPC IHB ($\mu g/m^3$)

Toxicity values or IHBs, as supplied by MPCA in the RASS spreadsheet, are used in this process (MPCA, 2007b). A combined Q/CHI quotient of COPCs for each emission point is then calculated for acute (hourly) and sub-chronic (30-day) non-cancer endpoints.

4.5.1 Dispersion Modeling Scenario

The Q/CHI quotients are evaluated at multiple receptors on a grid using AERMOD, a refined dispersion model.

In previous studies designed to identify worst-case health risks associated with Mesaba One and Mesaba Two, Excelsior modeled mutually exclusive (i.e., impossible) operating scenarios and used pollutant emission rates for COPCs that were based on the average of validated stack testing results, where such tests were available from IGCC units using E-Gas™ technology. At the time, the company believed the combination of operating conditions would produce risk estimates that could be accepted as worst-case, and this is the case with modeling the worst-case for sub-chronic risk.

To avoid the possibility of providing artificially high indications of risk that would result from using the highest measured value of any COPC in combination with mutually exclusive operating scenarios, Excelsior has confirmed the operating conditions it believes would be realistic of worst-case conditions.

As noted above, Excelsior's original AERA reflected operationally impossible conditions in which all emissions points are venting at or near capacity for a one-hour period. This cannot occur since emissions from some points are mutually exclusive. For example, the full syngas output from a gasification train cannot be combusted in the combustion turbine and vented simultaneously by the flare. Since the flare is responsible for most of the risk in the acute analysis, Excelsior has adopted the following conservative worst-case scenarios for the combined operation of Mesaba One and Mesaba Two under one-hour or acute conditions:

Scenario #1:

- Mesaba One: One combustion turbine operating at 100%, open flare operating at 1,480 MMBtu/hour (39.7% of maximum)
- Mesaba Two: No combustion turbines operating, open flare operating at 3,278 MMBtu/hour (87.9% of maximum)

or

Scenario #2:

- Mesaba One: No combustion turbines operating, open flare operating at 3,278 MMBtu/hour (87.9% of maximum)
- Mesaba Two: One combustion turbine operating at 100%, open flare operating at 1,480 MMBtu/hour (39.7% of maximum)

Two scenarios were modeled because the worst-case conditions could occur in either Mesaba One or Mesaba Two resulting in slightly different dispersion patterns.

In the worst-case operating scenario, one gasification train is operating on coal at 88% capacity on an hourly average basis and venting syngas to the flare. This would only occur if the train had been operating normally, but the combustion turbine became unavailable. Syngas production would be ramped down to 70% (which can be done in less than an hour) and then maintained for a period of time while operators determined whether the combustion turbine could be brought back into service. Two gasification trains would be operating on coal at 80% capacity and venting syngas to the flare. This is consistent with the maximum flaring rate during controlled startup or shutdown. Controlled startup and shutdown procedures would be staged such that both trains within one plant phase would not be starting up or shutting down simultaneously. The remaining gasification train would be operating on coal at 100% capacity and supplying syngas to one combustion turbine.

The resulting worst-case hourly syngas flare rate for Mesaba One and Two would be 4,758 MMBtu/hr. This value is very conservative. First, the flaring stage of startup and shutdown is relatively short. Second, combustion turbines experience very few forced outages, so the upset condition resulting in an 88% flaring rate would be exceedingly rare. It would be extraordinarily rare that such an upset would occur during the startup and shutdown of two other gasification trains. Finally, the event of multiple turbines failing or becoming unavailable would almost certainly be caused by a loss of connection to the electrical grid. This would cause the air separation units to lose electrical power and result in a very rapid shutdown of the entire facility.

This conservatism is additional to the conservative emission rates. A significant portion of the acute risk during flaring is attributed to volatile metals. The emissions inventory used in the AERA is based on stack tests conducted for the Wabash IGCC plant, which unlike Mesaba One and

Mesaba Two, has no activated carbon beds. Therefore, the emissions inventory is conservative in that it does not reflect the removal of volatile metals that is known to occur in activated carbon beds. Therefore, the worst-case acute scenario that Excelsior has adopted still results in a very conservative estimate of worst-case acute risk.

The acute and sub-chronic Q/CHI quotients are modeled for five years of meteorological data (1972, 1973, 1974, 1975, and 1976).Meteorological data regarding wind speed and direction for the five years modeled are included in Appendix C, "Meteorological Data." The modeling result is a prediction of combined hazard indices, correlated for time and space, at each receptor location.

Supporting documentation for the Q/CHI dispersion model input and output is included in Appendix B, "Electronic Submittals."

4.5.2 Air Toxics Screen Results

The acute and sub-chronic health risks attributable to facility emissions as calculated by the Q/CHI method indicate the following:

1. The maximum modeled impacts for acute inhalation occurred under Scenario #2 described above. The maximum modeled acute inhalation non-cancer hazard index is 0.72.

2. The maximum modeled sub-chronic non-cancer index is 0.041.

Both modeled Q/CHI hazard indices are below the MPCA acceptable total hazard index of 1.0.

A summary of the Q/CHI modeled air toxics acute and sub-chronic pollutant screen is found on Table 5, "Q/CHI COPC Screen Results – Phase I and II." The maximum-modeled Q/CHI acute values occur approximately 187 meters to the southeast of the proposed location of the Phase I open flare. The maximum modeled Q/CHI sub-chronic values occur northwest of the proposed facility approximately 485 meters from the Phase II open flare. An isoconcentration plot of Q/CHI modeled values are shown on Figure 3, "Acute Q/CHI Impacts" and Figure 4, "Sub-chronic Q/CHI Impacts".

4.6 Quantitative Results – IRAP

The IRAP method of estimating risk associated with the proposed facility is conducted at the receptor location having maximum impact from all the sources combined for each air parameter. The receptor location represents the worst-case location where a rural resident, farmer, or fisher may be found off the proposed facility property boundary. The maximum impact receptor location can be seen on Figure 2.

4.6.1 Dispersion Modeling

The AERMOD air dispersion model is used to determine how pollutants emitted from the plant are dispersed beyond the plant's fenceline. For the evaluation, a unit emission rate of 1 gram per second (g/sec) is modeled to calculate the concentration of pollutants that result from the unit emission rate. The results could be called a "dispersion factor." The dispersion factor is used in the IRAP model to calculate actual pollutant concentrations and the associated risk from the pollutant using actual emission rates of each pollutant. For example, if the unit emission rate results in a maximum off-property concentration of 15 micrograms per cubic meter (ug/m^3), then an actual emission rate of 2 g/sec (twice the unit emission rate) will result in a concentration of 30 ug/m^3. The IRAP model makes this calculation for each pollutant using each pollutant's actual emission rate.

Modeling is performed to evaluate risk for the vapor and particulate matter phases. The particulate matter phase requires a size distribution of particles by mass ("particle phase") and by particle surface area ("particle-bound phase"). For this analysis, all particles are assumed to be 2.5 microns in diameter occupying equal surface area. Therefore, particle and particle-bound phases are modeled in IRAP using AERMOD "particle phase" files. The particle phase modeling includes wet and dry vapor deposition, and wet and dry vapor depletion. For the vapor phase, both wet and dry vapor deposition and wet depletion are included.

Per MPCA AERA Guidance, fugitive HAP emission sources are included to account for leaks in equipment and storage tanks. For this analysis, one fugitive source is modeled as an area source in AERMOD. The location of the area encompasses much of the equipment near the turbines and extends the width of the facility.

Particulate emissions from roadway traffic or storage piles are not included in the risk modeling because the dust emitted contains negligible amounts of the compounds included in this analysis.

Modeling is conducted using five years of meteorological data (1972, 1973, 1974, 1975, and 1976). Dispersion model input and plot files are imported into IRAP and all sources, as described in Section 2.0, are included to complete the IRAP risk assessment.

Supporting documentation for dispersion modeling used for the IRAP method is included in Appendix B. Chronic impacts are shown on Figure 5, "Chronic Dispersion Modeling Impacts."

4.6.2 IRAP Set-up

Assumptions for site parameters and exposure scenario assumptions used in IRAP are those recommended in the U.S. EPA HHRAP guidance document (U.S. EPA, 2005) or specified by MPCA (as is the case for the adult consumption rate of fish.) Assumptions used are summarized on Table 6, "IRAP Site Parameter Assumptions" and Table 7, "IRAP Exposure Scenario Assumptions."

4.6.2.1 Fishable Bodies of Water

The tallest stacks at the facility are the tank vent boiler stacks at 64.01m (210 ft). Based on AERA guidance (MPCA, 2006a), for facilities with stack heights less than 100 meters, fishable lakes within a 3 km radius should be considered under the fish consumption pathway. "Fishable" bodies of water are those that contain water year-round in a year that receives at least 75 percent of the normal annual precipitation for that area. Four fishable bodies of water lie, at least in part, within 3 km of the proposed facility stacks:

Dunning Lake, Big Diamond Lake, Little Diamond Lake, and the Canisteo Mine Complex. These bodies of water can be seen on Figure 2.

Dunning Lake is located approximately 1,830 meters (1.1 mi) east, Big Diamond Lake is located approximately 1,820 meters (1.1 mi) southeast, Little Diamond Lake is located approximately 1,980 meters (1.2 mi) south, and the Canisteo Mine Complex is located approximately 1,740 meters (1.1 mi) south of the point of maximum deposition. Biologists from SEH conducted a site reconnaissance and determined that no fishable streams are located within 3 km of the proposed facility. Water from Big Diamond Lake flows through a wetland system to Little Diamond Lake, which in turn flows to Holman Lake to the south.

Approximately nine property owners currently have seasonal homes on Big Diamond Lake; one or two properties have residents living on the lake year-round. The other three bodies of water within 3 km of the facility have fewer, if any, residences located on their shores and access to these lakes is limited. Dispersion modeling for mercury indicates Big Diamond Lake is in the approximate center of the release plume of potential future facility emissions and therefore the most impacted lake. In addition, Big Diamond Lake had the most readily available lakes data. Figure 6, "Mercury Emissions Dispersion Model Isoconcentrations" shows the isoconcentrations resulting from the dispersion modeling of mercury in relation to the vicinity bodies of water. Based on the above information, Big Diamond Lake is the body of water chosen to evaluate consumption of potentially contaminated fish tissue.

4.6.2.2 Site-specific Assumptions

Site-specific assumptions used for all receptors in the IRAP evaluation include the following:

- Big Diamond Lake chosen as the water body evaluated
- Big Diamond Lake watershed chosen as the watershed evaluated

The Big Diamond Lake watershed boundary is determined using the Metadata for Minnesota Watershed Boundaries database available from the Minnesota Department of Natural Resources (MDNR) website. The watershed boundary was modified near some mining pits to reflect current topography.

- USLE cover management factor = 0.1 (U.S. EPA recommendation for grass and agricultural cover as default. HHRAP B-4-13) (U.S. EPA, 2005)
- USLE rainfall (erosivity) factor = 75 yr^{-1} (U.S. EPA Fact Sheet 3.1 833-F-00-014 - Storm Water Phase II Final Rule - Erosivity Index Zone Map (U.S. EPA, 2001))
- Depth of water column = 9 m (MDNR Lake Finder)
- Current velocity = 0 (Not used in the equation for lakes - HHRAP p.4-9) (U.S. EPA, 2005)

- Average volumetric flow rate through Big Diamond Lake = 387,000 m^3/yr (watershed area * 0.5 * average annual surface run-off from HHRAP p. 4-9 (U.S. EPA, 2005))
- Ave. annual run-off = 0.23 m/yr - MPCA “Detailed Assessment of Phosphorus Sources to Minnesota Watersheds” Figure 3-2 (MPCA, 2004); Techniques for Estimating Peak Flow on Small Streams in Minnesota, Water-Resources Investigations Report 97-4249 (MNDOT, 1997))
- Average annual evapotranspiration = 48.26 cm/yr (Climate of Minnesota Technical Bulletin 322 (U of M, 1979))
- Average annual irrigation = 0 (no irrigation assumed)
- Average annual precipitation = 71.4 cm/yr (MPCA “Detailed Assessment of Phosphorus Sources to Minnesota Watersheds” Figure 3-1 (MPCA, 2004))
- Average annual runoff = 23 cm/yr (MPCA “Detailed Assessment of Phosphorus Sources to Minnesota Watersheds” Figure 3-2 (MPCA, 2004); Techniques for Estimating Peak Flow on Small Streams in Minnesota, Water-Resources Investigations Report 97-4249(MNDOT, 1997))
- Wind velocity = 3.9 m/s (Default - HHRAP Table B-4-20 and Table B-4-21 (U.S. EPA, 2005))

Exposure scenarios selected for receptors include adult and child resident, adult and child farmer, and adult and child fisher.

4.6.3 IRAP Results

Chronic health risk attributable to facility emissions is calculated by the IRAP method at the modeling grid node having the maximum impact from all the sources combined outside of the proposed facility property boundary. The receptor location represents a worst-case receptor location.

Cancer risk at the maximum impact receptor location ranges from 2.5 x 10^{-6} to 2.2 x 10^{-7} with the highest total facility cancer risk predicted for an adult farmer. The maximum impact receptor location is southeast of the site outside the facility property boundary.

Non-cancer hazard indices are 0.08 at the maximum impact receptor location. Predicted non-cancer hazard indices are nearly the same for all populations evaluated. The non-cancer hazard indices predicted by the IRAP model do not include the ingestion of fish tissue potentially contaminated by mercury. This evaluation was conducted using MPCA methodology. The receptor location at the maximum impact location can be seen on Figure 2.

IRAP results indicate that the predicted maximum chronic carcinogenic risk for all populations evaluated does not exceed 10^{-5} and the maximum non-carcinogenic hazard index does not exceed 1.0.

Individual receptor cancer risk and hazard indices can be found in Table 8, “IRAP Risk Summary by Exposure Scenarios.” Table 9, “IRAP Cancer Risk Summary by Exposure Pathways” and Table 10, “IRAP Hazard Index

Summary by Exposure Pathways" break down the individual receptor risks by intake pathways.

The chemicals contributing to the majority of predicted carcinogenic impact to adult residents, adult and child fishers, and adult and child farmers are 2,3,7,8-TCDD (dioxin equivalents), arsenic, and cadmium, while the chemicals contributing to the majority of predicted risk to a resident child are cadmium, arsenic, and chromium. The chemicals contributing to the majority of predicted non-carcinogenic impact to adult and child residents, fishers, and farmers are cadmium, and acrolein. The dioxin equivalent emissions were assumed to be at a rate that would produce a 10^{-6} risk. All other chemical risks are below 10^{-5}, the acceptable MPCA risk value for individual chemicals.

4.7 Fish Consumption Pathway – Mercury

Risk estimated for the fish consumption pathway due to the ingestion of mercury contained in fish tissue follows the *MPCA Mercury Risk Estimation Method (MMREM) for the Fish Consumption Pathway: Impact Assessment of a Nearby Emission Source* (MPCA, 2006a).

Big Diamond Lake is the body of water chosen to evaluate consumption of potentially contaminated fish tissue. The rationale for this decision is discussed in Section 4.6.2.1

4.7.1 Mercury Risk Estimation for Subsistence Fish Consumption

The estimation of risk is completed using the MPCA Local Mercury Assessment spreadsheet, "Calculation of Local Mercury Hazard Quotients (HQ) from Mercury Emissions from a Project", version 1.4, dated April 13, 2006 (MPCA, 2006b). See Appendix D, "Risk Associated with Mercury in Fish Ingestion" for the evaluation results.

4.7.1.1 Fish Consumption Model Input

The source of specific input information required for the estimation of risk associated with fish consumption is as follows:

- Background mercury deposition:
  - wet-plus-dry ambient deposition (flux) = 12.5 $\mu g/m^2$-yr – Minnesota default to lake surfaces and 33.6 $\mu g/m^2$-yr to rest of the watershed
  - 10 percent watershed deposition transported to water body
  - Lake Finder database lake area for Big Diamond Lake = 122 acres (MNDR Lake Finder)
  - Watershed area for Big Diamond Lake = 760 acres
- Mercury mass deposited to lake and watershed due to facility emissions
  - Determined by site-specific air dispersion modeling in AERMOD
  - Modeled concentration over lake and watershed (from AERMOD modeling) = 1.3 x 10^{-5} ug/m^3
  - Hg^0 Depositional Velocity = 0.01 cm/sec over the lake and 0.05 cm/sec over the rest of the watershed

- All mercury emissions are assumed to be elemental mercury (Hg^0)

- Risk assumptions
  - Daily fish consumed = 0.142 kg/day for subsistence fisher and 0.03 kg/day for recreational fisher
  - Adult body weight = 70 kg
  - Reference dose for methyl mercury = 1.0 x 10^{-4} mg/kg-day

4.7.1.2 Current Total Mercury in Fish Tissue Estimation

Because no actual mercury in fish tissue data is available for fish in Big Diamond Lake, data from the five lakes nearest Big Diamond Lake was evaluated for the years 1997-2007. These lakes include: Snowball Lake (31-0108-00), Trout Lake (31-0216-00), Swan Lake (31-0067-00), Ox Hide Lake (31-0106-00), and Lower Panasa Lake (31-0112-00). The upper 95 percent confidence interval of the mean mercury concentration in fish was calculated for each of the five lakes. The highest value, 0.51 ppm (from Snowball Lake), was used to represent the concentration of the fish in Big Diamond Lake. SEH obtained the mercury in fish tissue data from Bruce Monson with MPCA.

4.7.2 Mercury in Fish Tissue Risk Results

Estimation of risk associated with fish consumed by adult subsistence and recreational fishers on Big Diamond Lake as conducted with the MPCA Local Mercury Assessment spreadsheet indicates the following:

- Mercury Loading Summary:
  - Mercury loading to the lake from the project = 0.08 g/yr
  - Background mercury loading to the lake = 16.5 g/yr
- Incremental mercury in fish from the project = 0.003 ppm
- Water quality Standard Hazard Quotient:

  Ambient Hazard Quotient relative to water quality standard = 2.55

  Incremental Hazard Quotient relative to water quality standard from the project = 0.01
- Hazard Quotients:
  - Subsistence Fisher

    Ambient Hazard Quotient = 11.1

    Incremental Hazard Quotient from the project = 0.06
  - Recreational Fisher

    Ambient Hazard Quotient = 2.35

    Incremental Hazard Quotient from the project = 0.01

4.7.3 Discussion of Results of Mercury in Fish Tissue

Predicted concentrations of mercury in fish tissue under ambient conditions, assuming no significant local sources of mercury, indicate that a subsistence adult fisher consuming 0.142 kg per day of fish caught in Big Diamond Lake would have a hazard quotient of 11.1.

The proposed facility has the potential to increase the hazard quotient by 0.06. Thus risk to a subsistence fisher due to ingestion of fish tissue after the facility is constructed is roughly increased by 0.5 percent. The predicted non-carcinogenic hazard quotient attributable to the proposed facility does not exceed the acceptable MPCA risk value of 1.0 via the fish ingestion pathway of fish caught from Big Diamond Lake

Copies of the MPCA Local Mercury Assessment spreadsheet as well as the fish database used to calculate ambient mercury concentrations in fish are included in Appendix B and Appendix D.

4.8 Fish Consumption Pathway - PBTs

In order to assess the impact of contaminants other than mercury on the ingestion of fish tissue by subsistence fishers caught from Big Diamond Lake, mercury emissions were not included in the IRAP model.

The cancer risk is 3.1×10^{-7} for an adult subsistence fisher and 2.7×10^{-8} for a child subsistence fisher. The non-cancer hazard index not including mercury is 0.0005 for an adult fisher and 0.0002 for a child fisher. When the non-cancer hazard index for the ingestion of mercury contaminated fish tissue as predicted by the MPCA methodology is added to the IRAP predictions, a total non-cancer hazard index for an adult subsistence fisher is 0.06.

Risk results for the fish ingestion pathway for both the IRAP and MPCA methods are summarized on Table 11, “Risk Summary by Fish Consumption Pathway.”

5.0 Qualitative Analysis

The qualitative analysis provides supplementary information to the quantitative risk assessment. This information provides a description of the facility location, potential receptors at risk, and facility emissions that could not be evaluated in the quantitative evaluation.

5.1 Land Use/General Neighborhood Information

The project site includes approximately 1,727 acres of mostly undeveloped property for which Excelsior has obtained, from RGGS Land & Minerals, LTD., L.P., an option to purchase 1,260 acres of surface rights. There are currently no residences on the site and the property has no direct access. Figure 2 provides a location map of this site, the Project’s current site layout plan, and the infrastructure required to support Project operations. Figure 7, “Existing Land Use/Land Cover” shows current land use near the Project site.

The Project is located in Town 56, Range 24, Section 10, Itasca County, Minnesota. The site is generally bounded by County Road No. 7 to the west, the city limits of Taconite to the south, a high voltage transmission line (HVTL) corridor to the north, and the Township boundary to the east. The site is zoned industrial according to the Iron Range Township Zoning map.

Grand Rapids, Minnesota (Itasca County, population 7,764) (City-Data.com, 2005) is located approximately 15 km (9 mi) to the southwest and Hibbing, Minnesota (St. Louis County, population 17,071) (City-Data.com, 2005) is located approximately 32 km (20 mi) to the east of the proposed facility. The area within 1.5 km (1 mi) of the proposed facility stacks is rural and not populated. The land is rocky, hilly, and boggy.

Itasca County has a population density of 16.5 persons per square mile (based on the 2000 census). There are no cities or towns located within 3 km of the facility stacks. The town of Marble (population 695 in year 2000) (City-Data.com, 2005) is located 6.5 km (4 mi) southeast of the proposed facility. The towns of Taconite (population 315) (City-Data.com, 2005) and Bovey (population 662) (City-Data.com, 2005) are located 4.4 km (2.7 mi) and 6.3 km (4 mi), respectively, southwest of the facility stacks.

The poverty rate in Itasca County is approximately 8.6 percent of the population.

The Envirofacts database (U.S. EPA) lists one source of potential air pollutants in the 55786 zip code (Taconite, MN) area where the facility will be located. Taconite, MN is located approximately 2.7 miles southwest of the proposed facility. The listing is for Troumbly Bros. Inc., a non-metallic crushed rock and broken limestone construction sand and gravel facility. An additional source of air pollutants is found in the adjacent 55709 Bovey, MN zip code area. Wm J. Schwartz & Sons Inc., a non-metallic crushed and broken limestone mining and quarrying facility, is listed in this zip code area Bovey, MN, approximately 4.4 miles southwest of the proposed facility. No toxic releases are noted within either zip code area.

5.2 Receptor Information

5.2.1 Sensitive Receptors

There is one residence located within 1.4 km of the proposed facility stack centroid. No other sensitive receptors, such as schools, daycare facilities, recreation centers, playgrounds, nursing homes, or hospitals are located within 1.5 km of the proposed facility stack centroid.

5.2.2 Farmers and Residents

The Project site is fairly remote and the land Excelsior Energy as optioned provides a more than 0.5-mile buffer between the nearest residence and the facility stack centroid. The nearest residence is located approximately 1.4 km (0.9 mi) southwest of the facility. A hobby farm and horse riding recreational facility is located approximately 1.6 km (1 mi) west-southwest of the proposed Mesaba Energy facility. No subsistence farms are located within 1.5 km of the proposed facility. The nearest farm is located approximately 2.9 km (1.8 mi) northwest of the facility. Cattle, horses, and ponies appear to be raised on this farm, with hay as a crop. All distances are measured from the stack centroid.

5.3 Mixtures and Surrogate Values

Similar chemicals or chemicals within a mixture may be grouped to evaluate risk. When grouped, an IHB for a specific chemical within that group may be applied to the compounds, groups, or mixtures containing a fraction of that specific chemical. The IHB applied to the group or mixture is known as a surrogate value.

All chemicals included in the Project's AERA, with the exception of cyanide and nickel, are evaluated using their own respective IHBs. The toxicity value for hydrogen cyanide is used as a surrogate for cyanide in the acute risk evaluation and the toxicity value for nickel subsulfide is used as a surrogate for nickel in the chronic cancer risk evaluation.

5.4 Sensitizers

Chemical sensitizers are those that may cause severe reactions to those persons who may have been exposed to the chemical previously and have become sensitized to that chemical. A person may also have a sensitized reaction to chemicals that may be structurally similar to the original exposure chemical. Chemicals that are known respiratory sensitizers that are included in the AERA and have an IHB are beryllium, formaldehyde, and nickel. Any persons sensitive to the above chemicals could be affected by emissions from the proposed facility.

An evaluation was performed based on the Q/CHI modeling results that showed which of the sensitizers (and developmental toxicants described in Section 5.5) are most culpable to the overall modeled risk. Since the Q/CHI impacts are directly proportional to the Q/CHI modeled 'emission rates,' the percent of total modeled risk was calculated by dividing the Q/CHI modeled 'emission rate' by the total Q/CHI modeled 'emission rate for each source.' As shown in Table 12, "Sensitizer and Developmental Toxicant Culpability," arsenic is the largest contributor (among sensitizers and developmental toxicants).

5.5 Developmental Toxicants

Several chemicals evaluated in the Project's AERA have been assigned Health Risk Values (HRVs) by the Minnesota Department of Health and California Reference Exposure Levels as known developmental toxicants. These chemicals may have an adverse effect on a developing fetus and therefore should be given special consideration. The chemicals listed in Tables 1a, 1b and 1c as a developmental toxicant include arsenic, benzene, carbon disulfide, chloroform, ethyl benzene, ethyl chloride, and mercury.

The acute HRVs are considered to be ceiling values, which should not be exceeded for developmental toxicants. An evaluation was performed based on the Q/CHI modeling results that showed which of the developmental toxicants are most culpable to the overall modeled risk. Since the Q/CHI impacts are directly proportional to the Q/CHI 'emission rates,' the percent of total modeled risk was calculated by dividing the Q/CHI modeled 'emission rate' by the total Q/CHI modeled 'emission rate for each source.' As shown in Table 12, arsenic is the largest contributor of all the developmental toxicants (most of the emissions are from the flare).

Dispersion modeling was performed for arsenic to determine the total impacts from all sources and compared to the acute (1-hour average) HRV for arsenic. Using the actual maximum emission rate of arsenic in grams per second for each source, the maximum modeled impact is 0.096 $\mu g/m^3$. This is considerably less than the acute HRV or ceiling value of 0.19 $\mu g/m^3$. Individual modeling was not performed for the other developmental toxicants since the emission rates are significantly lower and the HRVs for those pollutants are higher than for arsenic.

5.6 Persistent, Bioaccumulative, and Toxic Chemicals

All PBTs identified as COPCs from the proposed facility and found on Tables 1a, 1b, and 1c have been evaluated in the AERA. No additional PBTs have been identified.

5.7 Additivity by Toxic Endpoint

Risk predicted by the Q/CHI method indicated that acute and sub-chronic non-carcinogenic inhalation risks are at acceptable levels for the proposed facility. IRAP modeling predicted that both carcinogenic and non-carcinogenic chronic risks within a 3 km radius of the proposed facility are also at acceptable levels.

The risk conclusions are arrived at by adding individual chemical hazard quotients across all pathways and COPCs regardless of the organs or body systems affected (toxic endpoints). This is a very conservative approach to evaluating risk to human health because in reality, different chemicals may impact different systems or toxic endpoints. A refined risk evaluation would allow for determining risk by focusing on the risk related to individual body systems.

Since the risk evaluations based on the Q/CHI and IRAP methods using the conservative approach has determined that human health risk is at acceptable levels, a refined evaluation by toxic endpoints will not be conducted.

5.8 $PM_{2.5}$

Particulate matter with diameters less than 2.5 microns ($PM_{2.5}$) is included in the AERA analysis because of the potential health effects associated with this pollutant. To demonstrate that the risks associated with $PM_{2.5}$ emissions are acceptable, we reference the National Ambient Air Quality Standards Dispersion Modeling results shown in Table 7.7-1 of the Application. These results show the impacts of PM_{10} emissions from the plant. The impacts from PM_{10} emissions meet state and federal ambient $PM_{2.5}$ standards as indicated on Table 13, "Comparison of PM_{10} Class II Modeling Results with $PM_{2.5}$ Standards."

Rounding to two significant figures, the impacts from the Mesaba project with the impacts of nearby sources and background concentrations are less than Minnesota and federal $PM_{2.5}$ ambient standards. In addition, note that MPCA does not publish a $PM_{2.5}$ background concentration in their Air Dispersion Modeling Guidance Document. The $PM_{2.5}$ background concentration is likely less than the PM_{10} background concentration, so the impacts from the proposed facility plus nearby sources and background are likely even less than those shown on Table 13.

6.0 Cumulative Risk

In order to evaluate cumulative risk impacts from the proposed Excelsior facility, 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 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 (MPCA, 2008a).

"D" is taken to be the distance in kilometers from the additional source to the proposed Mesaba Energy facility's maximum impact location (Receptor 3). 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.

Based in part on the Scoping EAW for the proposed Minnesota Steel Project (MSI) 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. The proposed MSI facility is located approximately 11.5 km from the Project's maximum impact location (Receptor 3). Figure 8, "Cumulative Impacts Buffer," indicates the relative distances between the two facilities.

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

Ambient monitoring data representing the rural Iron Range in Minnesota was provided by the MPCA in an e-mail dated January 23, 2009 (MPCA, 2009). The ambient monitoring data were used to calculate summed inhalation risks from measured air concentrations of volatile organic chemicals (VOCs), carbonyls and metals. Due to the location and population density surrounding the facility site, rural VOC and carbonyl data were used. Since the facility site is located in the Iron Range, the most recent metals data from that region of Minnesota was used (Virginia, MN).

Cumulative risks for the Mesaba Energy facility are as follows:

	Cancer Risk	Chronic Non-Cancer HI	Acute Non-Cancer HI
Mesaba Energy	3×10^{-06}	0.08	0.7
Background Data (population density <500/mi^2)	3×10^{-05}	1	0.5
Cumulative Risks	**3.3×10^{-05}**	**1**	**1**

6.1 Discussion of Cumulative Risk Results

The predicted ambient or background lifetime cancer risk as calculated using background information supplied by MPCA is 3.3×10^{-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 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 EPA guideline for cumulative risks. The cumulative cancer risk for the Mesaba Energy facility does not exceed the EPA National Contingency Plan limit.

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

7.0 AERA Summary

An AERA is conducted on the Project to identify the sources or groups of sources, chemicals, and associated pathways that may pose an unacceptable health risk to the public as a result of the proposed facility air emissions.

7.1 Acute and Sub-chronic Risk

The AERA is completed using several methods. Acute and sub-chronic risks are determined by the Q/CHI methodology. Chronic risks are determined using the IRAP model methodology. Risk associated with mercury-contaminated fish tissue ingestion is determined using the MPCA Mercury Risk Estimation Method, and IRAP is used to determine risk associated with fish contaminated by COPCs other than mercury. Because detailed risk evaluations are completed for this project, MPCA's screening evaluation using the RASS process is not included in the AERA.

The acceptable MPCA risk level for chemicals producing carcinogenic effects from all combined facility emission sources does not exceed 10^{-5}. For chemicals producing non-carcinogenic effects, a hazard index that does not exceed 1.0 is acceptable.

The acute and sub-chronic health risks as determined by the Q/CHI method are 0.72 and 0.041, respectively. Both hazard indices are below the acceptable MPCA total hazard index of 1.0.

7.2 Chronic Risk

7.2.1 Without Mercury Ingestion

Chronic health risks as determined by IRAP at the maximum impact receptor location indicate:

- Maximum cancer risk equals 2.5×10^{-6}
- Maximum non-cancer hazard index equals 0.08

The highest total facility cancer risk is predicted for an adult farmer. Predicted non-cancer hazard indices are nearly the same for all populations evaluated and do not include the ingestion of mercury contaminated fish tissue.

7.2.2 Ingestion of Fish Tissue

Predicted risk associated with the ingestion of mercury in fish tissue caught from Big Diamond Lake indicates that the hazard quotient incremental contribution of mercury in fish tissue to subsistence fishers is 0.06.

The maximum predicted cancer risk attributable to the ingestion fish tissue contaminated with COPCs (other than mercury) is 3.1×10^{-7}. The maximum predicted non-cancer hazard index contaminated with COPCs (other than mercury) is 0.0005.

Total risk due to the ingestion of contaminated fish tissue only is as follows:

- Cancer risk equals 3.1×10^{-7}
- Non-cancer hazard index is 0.06

Both the cancer and non-cancer risk estimations are below the acceptable MPCA health risk levels.

7.3 Cumulative Risk

Background or ambient data values used are supplied by the MPCA. The cumulative individual lifetime cancer risk is predicted at 2.4×10^{-5}. The incremental individual lifetime cancer risk associated with the project is 2.5×10^{-6}. The cumulative chronic non-cancer hazard index is 0.65 and the acute non-cancer hazard index is 0.96.

The lifetime cancer risk does not exceed the U.S.EPA risk standard of 1×10^{-4}, which is acceptable by the MDH. The non-cancer risk estimations do not exceed the acceptable MPCA health risk level of 1.0.

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Table 1a
Chemicals Evaluated in the AERA – Annual Emissions
(Phase I plus Phase II)

Reflecting Additional Conservatism for Risk Assessment

CAS or MPCA No.	Compound	Annual HAP Emission (Ton/year, per source)			Total Phase 1 Ton/year	Phase 1 and Phase 2 Ton/year
		CTGs	TVB	Flare		
75-07-0	Acetaldehyde	0.044	1.6E-04	3.9E-04	0.045	0.089
98-86-2	Acetophenone	0.022	7.9E-05	2.0E-04	0.022	0.045
107-02-8	Acrolein	0.43	1.5E-03	3.8E-03	0.44	0.87
7440-36-0	Antimony	0.027	7.4E-04	1.8E-03	0.030	0.059
7440-38-2	Arsenic	0.098	2.3E-03	5.7E-03	0.11	0.21
71-43-2	Benzene	0.061	0.133	0.333	0.52	1.0
100-44-7	Benzyl chloride	1.03	3.7E-03	9.2E-03	1.0	2.1
7440-41-7	Beryllium	6.4E-03	7.9E-06	2.0E-05	64E-03	0.013
92-52-4	Biphenyl	2.5E-03	9.0E-06	2.2E-05	25E-03	5.1E-03
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	0.11	3.9E-04	9.6E-04	0.11	0.22
75-25-2	Bromoform	0.06	2.0E-04	5.0E-04	0.057	0.11
7440-43-9	Cadmium	0.46	1.1E-04	2.8E-04	0.46	0.92
75-15-0	Carbon disulfide	1.13	4.0E-03	1.0E-02	1.1	2.29
532-27-4	Chloroacetophenone, 2-	0.010	3.7E-05	9.2E-05	0.010	0.020
108-90-7	Chlorobenzene	0.032	1.1E-04	2.8E-04	0.032	0.065
67-66-3	Chloroform	0.088	3.2E-04	7.9E-04	0.089	0.18
0-00-5	Chromium, total	0.013	1.4E-03	3.6E-03	0.018	0.036
7440-47-3	Chromium, (trivalent)	0.01	9.8E-04	2.5E-03	0.013	0.027
18540-29-9	Chromium, (hexavalent)	3.8E-03	4.3E-04	1.1E-03	53E-03	0.011
7440-48-4	Cobalt	7.4E-03	4.5E-03	1.1E-02	0.023	0.046
98-82-8	Cumene	7.8E-03	2.6E-05	6.6E-05	79E-03	0.016
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	0.140	1.1E-02	2.8E-02	0.18	0.36
77-78-1	Dimethyl sulfate	0.071	2.5E-04	6.3E-04	0.072	0.14
121-14-2	Dinitrotoluene, 2,4-	4.2E-04	1.5E-06	3.7E-06	4.3E-04	8.5E-04
100-41-4	Ethyl benzene	0.14	0.097	0.244	0.48	0.95
75-00-3	Ethyl chloride (Chloroethane)	0.061	2.2E-04	5.5E-04	0.062	0.12
106-93-4	Ethylene dibromide (Dibromoethane)	1.8E-03	6.3E-06	1.6E-05	1.8E-03	3.6E-03
107-06-2	Ethylene dichloride (1,2-Dichloroethane)	0.059	2.1E-04	5.3E-04	0.060	0.12

Table 1a
Chemicals Evaluated in the AERA – Annual Emissions
(Phase I plus Phase II)

Reflecting Additional Conservatism for Risk Assessment

CAS or MPCA No.	Compound	Annual HAP Emission (Ton/year, per source)			Total Phase 1 Ton/year	Phase 1 and Phase 2 Ton/year
		CTGs	TVB	Flare		
56-55-3	Benz[a]anthracene	5.6E-05	2.0E-07	5.0E-07	5.7E-05	1.1E-04
207-08-9	Benzo(k)fluoranthene	1.6E-04	5.8E-07	1.4E-06	1.6E-04	3.2E-04
50-32-8	Benzo[a]pyrene	5.6E-05	2.0E-07	5.0E-07	5.7E-05	1.1E-04
218-01-9	Chrysene (Benzo(a)phenanthrene)	1.5E-04	5.3E-07	1.3E-06	1.5E-04	3.0E-04
50-00-0	Formaldehyde	0.42	1.5E-03	3.7E-03	0.43	0.85
110-54-3	Hexane	0.10	3.5E-04	8.8E-04	0.10	0.20
7647-01-0	Hydrochloric acid	0.096	3.0E-04	7.4E-04	0.097	0.19
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	1.2	5.3E-05	1.3E-04	1.2	2.4
193-39-5	Indeno(1,2,3-cd)pyrene	9.1E-05	3.2E-07	8.1E-07	9.2E-05	1.8E-04
78-59-1	Isophorone	0.86	3.1E-03	7.6E-03	0.87	1.7
7439-92-1	Lead	0.022	6.3E-05	1.6E-04	0.022	0.044
7439-96-5	Manganese	0.025	5.9E-03	1.5E-02	0.046	0.092
7439-97-6	Mercury	0.012	1.5E-03	3.8E-03	0.017	0.035
74-83-9	Methyl bromide (Bromomethane)	1.23	0.022	0.056	1.3	2.6
74-87-3	Methyl chloride (Chloromethane)	0.78	0.011	0.026	0.82	1.6
71-55-6	Methyl chloroform (1,1,1 - Trichloroethane)	0.029	1.1E-04	2.6E-04	0.029	0.059
3697-24-3	Methylchrysene, 5-	3.2E-05	1.1E-07	2.8E-07	3.2E-05	6.5E-05
78-93-3	Methyl ethyl ketone (2-Butanone)	0.58	2.1E-03	5.1E-03	0.59	1.2
60-34-4	Methyl hydrazine	0.25	9.0E-04	2.2E-03	0.25	0.51
80-62-6	Methyl methacrylate	0.029	1.1E-04	2.6E-04	0.029	0.059
1634-04-4	Methyl tert butyl ether	0.051	1.8E-04	4.6E-04	0.052	0.10
75-09-2	Methylene chloride (Dichloromethane)	0.056	8.8E-04	2.2E-03	0.059	0.12
91-20-3	Naphthalene	0.074	2.1E-03	5.3E-03	0.081	0.16
7440-02-0	Nickel	9.6E-03	0.013	0.034	0.057	0.11
108-95-2	Phenol	1.76	0.036	0.091	1.9	3.8
123-38-6	Proprionaldehyde	0.56	2.0E-03	5.0E-03	0.57	1.1
7784-49-2	Selenium	0.022	7.4E-04	1.8E-03	0.025	0.049

Table 1a
Chemicals Evaluated in the AERA – Annual Emissions
(Phase I plus Phase II)

Reflecting Additional Conservatism for Risk Assessment

CAS or MPCA No.	Compound	Annual HAP Emission (Ton/year, per source)			Total Phase 1 Ton/year	Phase 1 and Phase 2 Ton/year
		CTGs	TVB	Flare		
7664-93-9 14808-79-8	Sulfuric acid and sulfates	62.0	0.2	0.6	62.8	125.6
100-42-5	Styrene	0.037	1.3E-04	3.3E-04	0.037	0.075
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin (as equivalents)	1.7E-09	4.0E-11	1.2E-11	1.7E-09	3.5E-09
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.063	2.3E-04	5.7E-04	0.064	0.13
108-88-3	Toluene	8.1E-04	0.028	0.0692	0.098	0.20
108-05-4	Vinyl acetate	0.011	4.0E-05	1.0E-04	0.011	0.022
1330-20-7	Xylenes	0.055	0.032	0.080	0.17	0.33

Table 1b
Chemicals Evaluated in the AERA – Sub-Chronic Emissions
(Phase I plus Phase II)

Reflecting Additional Conservatism for Risk Assessment

CAS or MPCA No.	Compound	1-hour HAP Emission (lb/hour, per source)				Phase I and Phase II (lb/hour)
		CTGs	TVB	Flare	Fugitive	
107-02-8	Acrolein	0.10	1.1E-03	4.6E-03		0.21
7440-36-0	Antimony	6.5E-03	5.5E-04	2.2E-03		0.019
75-15-0	Carbon disulfide	0.27	3.0E-03	0.012	8.0E-03	0.59
00-00-5	Chromium, total	3.1E-03	1.1E-03	4.2E-03		0.017
18540-29-9	Chromium, hexavalent	9.2E-04	2.3E-04	1.3E-03		0.042
98-82-8	Cumene	1.9E-03	2.0E-05	7.8E-05		0.040
75-00-3	Ethyl chloride (Chloroethane)	0.015	1.6E-04	6.5E-04		0.032
106-93-4	Ethylene dibromide (Dibromothane)	4.2E-04	4.7E-06	1.9E-05		8.9E-04
7439-97-6	Mercury	2.9E-03	1.1E-03	4.5E-03		0.017
78-93-3	Methyl ethyl ketone (2-Butanone)	0.14	1.5E-03	6.1E-03		0.30
75-09-2	Methylene chloride (Dichloromethane)	0.014	6.5E-04	2.6E-03		0.035
100-42-5	Styrene	8.9E-03	9.8E-05	3.9E-04		0.019
108-05-4	Vinyl acetate	2.7E-03	3.0E-05	1.2E-04		5.7E-03

Table 1c
Chemicals Evaluated in the AERA – Acute Emissions
(Phase I plus Phase II)

Reflecting Additional Conservatism for Risk Assessment

CAS or MPCA No.	Compound	1-hour HAP Emission (lb/hour, per source)				Phase I and Phase II (lb/hour)[1]
		CTGs	TVB	Flare	Fugitive	
107-02-8	Acrolein	0.10	1.1E-03	0.065		0.19
7440-38-2	Arsenic	0.024	1.7E-03	0.096		0.15
71-43-2	Benzene	0.015	0.099	5.7	1.4E-03	7.49
100-44-7	Benzyl chloride	0.25	2.7E-03	0.16		0.46
75-15-0	Carbon disulfide	0.27	3.0E-03	0.17	8.0E-03	0.51
67-66-3	Chloroform	0.021	2.3E-04	0.013		0.038
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	0.034	8.3E-03	0.47	2.0E-03	0.65
100-41-4	Ethyl benzene	0.034	0.072	4.2	1.2E-06	5.54
75-00-3	Ethyl chloride (Chloroethane)	0.015	1.6E-04	9.3E-03		0.027
50-00-0	Formaldehyde	0.10	1.1E-03	0.063	2.6E-07	0.18
7647-01-0	Hydrochloric acid	0.023	2.2E-04	0.013	8.0E-03	0.056
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	0.29	3.9E-05	2.2E-03		0.29
7439-97-6	Mercury	2.9E-03	1.1E-03	0.065		0.088
74-83-9	Methyl bromide (Bromomethane)	0.30	0.017	0.95		1.55
71-55-6	Methyl chloroform (1,1,1 - Trichloroethane)	7.1e-03	7.8E-05	4.5E-03		0.013
78-93-3	Methyl ethyl ketone (2-Butanone)	0.14	1.5E-03	0.088		0.26
75-09-2	Methylene chloride (Dichloromethane)	0.014	6.5E-04	0.037		0.063
91-20-3	Naphthalene	0.018	1.6E-03	0.090	5.9E-06	0.14
7440-02-0	Nickel	2.3e-03	0.01	0.57		0.75
10102-44-0	Nitrogen oxide (NO2)	226	14	0.12		255
108-95-2	Phenol	0.42	0.027	1.5	1.8E-08	0.63
100-42-5	Styrene	8.9E-03	9.8E-05	5.6E-03		1.92
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.015	1.7E-04	9.7E-03		0.022
108-88-3	Toluene	1.9E-04	0.021	1.2	1.5E-04	0.05
1330-20-7	Xylenes	0.013	0.024	1.4	2.3E-06	1.59

1. Total emissions (Phase I + Phase II) are based on the following worst-case scenario:
Phase I: No turbines + TVBs + (0.879 * Flare emissions) + Fugitive VOCs;
Phase II: One turbine + TVBs + (0.397 * Flare emissions) + Fugitive VOCs

Table 2
IRAP Receptor Locations and Scenarios Evaluated

Receptor #	UTM X	UTM Y	Exposure Scenario Evaluated					
			Adult Resident	Child Resident	Adult Farmer	Child Farmer	Adult Fisher	Child Fisher
3	472825	5242650	X	X	X	X	X	X
7	470200	5246375	X		X		X	

Table 3
CTG Emission Rates that Result in a 10^{-6} Cancer Risk

Receptor Location	Scenario	Dioxin Emission Rate	
		Mesaba One and Two Emission Units (g/sec) per turbine	Mesaba One Emission Units (g/sec) per turbine
Receptor 3 (maximum impact location)	Adult Farmer	2.1×10^{-10}	3.9×10^{-10}
	Adult Fisher	1.2×10^{-9}	2.2×10^{-9}
	Adult Resident	1.2×10^{-9}	2.2×10^{-9}
Receptor 7 (Existing Farm)	Adult Farmer	1.1×10^{-7}	2.3×10^{-7}
	Adult Fisher	2.0×10^{-9}	3.6×10^{-9}
	Adult Resident	1.9×10^{-7}	3.9×10^{-7}

Table 4
IRAP Exposure Pathways Evaluated

Exposure Pathways	Exposure Scenarios (Receptors)					
	Adult Farmer	Child Farmer	Adult Resident	Child Resident	Adult Fisher	Child Fisher
Inhalation of vapors and particulates	X	X	X	X	X	X
Incidental ingestion of soil	X	X	X	X	X	X
Ingestion of homegrown produce	X	X	X	X	X	X
Ingestion of beef	X	X				
Ingestion of milk from homegrown cows	X	X				
Ingestion of homegrown chicken	X	X				
Ingestion of homegrown pork	X	X				
Ingestion of fish					X	X

Table 5
Q/CHI COPC Screen Results
Phase I and Phase II

Inhalation Q/CHI	Averaging Period	Totals – Two Phases	Acceptable Value	Passed/Failed
Acute Non-Cancer	1-hour	0.72	1.0	Passed
Sub-Chronic Non-Cancer	30-day	0.041	1.0	Passed

Table 6
IRAP Site Parameter Assumptions

Site Parameters	Value	Symbol	Units
Soil dry bulk density	1.5	bd	g/cm^3
Forage fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_forage	--
Grain fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_grain	--
Silage fraction grown on contam. eaten by CATTLE	1.0	beef_fi_silage	--
Qty of forage eaten by CATTLE each day	8.8	beef_qp_forage	kg DW/day
Qty of grain eaten by CATTLE each day	0.47	beef_qp_grain	kg DW/day
Qty of silage eaten by CATTLE each day	2.5	beef_qp_silage	kg DW/day
Grain fraction grown on contam. soil eaten by CHICKEN	1.0	chick_fi_grain	--
Qty of grain eaten by CHICKEN each day	0.2	chick_qp_grain	kg DW/day
Average annual evapotranspiration	48.26	e_v	cm/yr
Fish lipid content	0.07	f_lipid	--
Fraction of CHICKEN's diet that is soil	0.1	fd_chicken	--
Universal gas constant	8.205e-5	gas_r	atm-m^3/mol-K
Average annual irrigation	0	i	cm/yr
Plant surface loss coefficient	18	kp	yr^-1
Fraction of mercury emissions NOT lost to the global cycle	0.48	merc_q_corr	--
Fraction of mercury speciated into methyl mercury in produce	0.22	mercmethyl_ag	--
Fraction of mercury speciated into methyl mercury in soil	0.02	mercmethyl_sc	--
Forage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_forage	--
Grain fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_grain	--
Silage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_silage	--
Qty of forage eaten by MILK CATTLE each day	13.2	milk_qp_forage	kg DW/day
Qty of grain eaten by MILK CATTLE each day	3.0	milk_qp_grain	kg DW/day
Qty of silage eaten by MILK CATTLE each day	4.1	milk_qp_silage	kg DW/day
Averaging time	1	milkfat_at	yr
Body weight of infant	9.4	milfat_bw_infant	kg
Exposure duration of infant to breast milk	1	milkfat_ed	yr
Proportion of ingested dioxin that is stored in fat	0.9	milkfat_f1	--
Proportion of mothers weight that is fat	0.3	milkfat_f2	--
Fraction of fat in breast milk	0.04	milkfat_f3	--
Fraction of ingested contaminant that is absorbed	0.9	milkfat_f4	--
Half-life of dioxin in adults	2555	milkfat_h	days
Ingestion rate of breast milk	0.688	milkfat_ir_milk	kg/day
Viscosity of air corresponding to air temp.	1.81e-04	mu_a	g/cm-s

Table 6
IRAP Site Parameter Assumptions

Site Parameters	Value	Symbol	Units
Average annual precipitation	71.4	p	cm/yr
Fraction of grain grown on contam. soil eaten by PIGS	1.0	pork_fi_grain	--
Fraction of silage grown on contam. soil and eaten by PIGS	1.0	pork_fi_silage	--
Qty of grain eaten by PIGS each day	3.3	pork_qp_grain	kg DW/day
Qty of silage eaten by PIGS each day	1.4	pork_qp_silage	kg DW/day
Qty of soil eaten by CATTLE	0.5	qs_beef	kg/day
Qty of soil eaten by CHICKEN	0.022	qs_chick	kg/day
Qty of soil eaten by DAIRY CATTLE	0.4	qs_milk	kg/day
Qty of soil eaten by PIGS	0.37	qs_pork	kg/day
Average annual runoff	23	r	cm/yr
Density of air	1.2e-3	rho_a	g/cm^3
Solids particle density	2.7	rho_s	g/cm^3
Interception fraction - edible portion ABOVEGROUND	0.39	rp	--
Interception fraction - edible portion FORAGE	0.5	rp_forage	--
Interception fraction - edible portion SILAGE	0.46	rp_silage	--
Ambient air temperature	298	t	K
Temperature correction factor	1.026	theta	--
Soil volumetric water content	0.2	theta_s	mL/cm^3
Length of plant expos. to depos. - ABOVEGROUND	0.164	tp	Yr
Length of plant expos. to depos. - FORAGE	0.12	tp_forage	Yr
Length of plant expos. to depos. - SILAGE	0.16	tp_silage	Yr
Average annual wind speed	3.9	u	m/s
Dry deposition velocity	0.5	vdv	cm/s
Wind velocity	3.9	w	m/s
Yield/standing crop biomass - edible portion ABOVEGROUND	2.24	yp	kg DW/m^2
Yield/standing crop biomass - edible portion FORAGE	0.24	yp_forage	kg DW/m^2
Yield/standing crop biomass - edible portion SILAGE	0.8	yp_silage	kg DW/m^2
Soil mixing zone depth	2.0	z	cm

Table 7
IRAP Exposure Scenario Assumptions

DESCRIPTION	Resident Adult	Resident Child	Farmer Adult	Farmer Child	Fisher Adult	Fisher Child	UNITS
Averaging time for carcinogens	70	70	70	70	70	70	yr
Averaging time for noncarcinogens*	30	6	40	6	30	6	yr
Consumption rate of BEEF	0.0	0.0	0.00122	0.00075	0.0	0.0	kg/kg-day FW
Body weight	70	15	70	15	70	15	kg
Consumption rate of POULTRY	0.0	0.0	0.00066	0.000425	0.0	0.0	kg/kg-day FW
Consumption rate of ABOVEGROUND PRODUCE	0.00032	0.00077	0.00047	0.00113	0.00032	0.00077	kg/kg-day DW
Consumption rate of BELOWGROUND PRODUCE	0.00014	0.00023	0.00017	0.00028	0.00014	0.00023	kg/kg-day DW
Consumption rate of DRINKING WATER	1.4	0.67	1.4	0.67	1.4	0.67	L/day
Consumption rate of PROTECTED ABOVEGROUND PRODUCE	0.00061	0.0015	0.00064	0.00157	0.00061	0.00150	kg/kg-day DW
Consumption rate of SOIL	0.0001	0.0002	0.0001	0.0002	0.0001	0.0002	kg/d
Exposure duration*	30	6	40	6	30	6	yr
Exposure frequency	350	350	350	350	350	350	day/yr
Consumption rate of EGGS	0.0	0.0	0.00075	0.00054	0.0	0.0	kg/kg-day FW
Fraction of contaminated ABOVEGROUND PRODUCE	1.0	1.0	1.0	1.0	1.0	1.0	--
Fraction of contaminated DRINKING WATER	1.0	1.0	1.0	1.0	1.0	1.0	--
Fraction contaminated SOIL	1.0	1.0	1.0	1.0	1.0	1.0	--
Consumption rate of FISH	0.0	0.0	0.0	0.0	0.00203	0.00088	kg/kg-day FW
Fraction of contaminated FISH	1.0	1.0	1.0	1.0	1.0	1.0	--
Inhalation exposure duration*	30	6	40	6	30	6	yr
Inhalation exposure frequency	350	350	350	350	350	350	day/yr
Inhalation exposure time	24	24	24	24	24	24	hr/day
Fraction of contaminated BEEF	1	1	1	1	1	1	--
Fraction of contaminated POULTRY	1	1	1	1	1	1	--
Fraction of contaminated EGGS	1	1	1	1	1	1	--
Fraction of contaminated MILK	1	1	1	1	1	1	--
Fraction of contaminated PORK	1	1	1	1	1	1	--
Inhalation rate	0.83	0.30	0.83	0.30	0.83	0.30	m^3/hr
Consumption rate of MILK	0.0	0.0	0.01367	0.02268	0.0	0.0	kg/kg-day FW
Consumption rate of PORK	0.0	0.0	0.00055	0.00042	0.0	0.0	kg/kg-day FW
Time period at the beginning of combustion	0	0	0	0	0	0	yr
Length of exposure duration*	30	6	40	6	30	6	yr

* The IRAP model complies with protocol established by the U.S. EPA in the Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) guidance document (U.S. EPA, 2005). Exposure duration is the length of time a receptor is exposed to a specific pathway of exposure. Exposure duration values recommended by HHRAP are based on mobility rate and median time in a residence at one location. For noncarcinogenic COPCs, the exposure duration is recommended to be the value used for averaging time. The values above are those recommended by HHRAP, Chapter 6, page 6-20.

Table 8
IRAP Risk Summary by Exposure Scenarios

Location	Risk	Exposure Scenario Evaluated						
		Resident		Farmer		Fisher		Risk Acceptance Criteria Ca = 1 x 10^{-5} HQ = 1
		Adult	Child	Adult	Child	Adult	Child	
Rcptr_3 SE property edge	Cancer Risk	1.4 x 10^{-6}	2.3 x 10^{-7}	2.5 x 10^{-6}	4.6 x 10^{-7}	1.4 x 10^{-6}	2.5 x 10^{-7}	Passed
	Hazard Index	0.080	0.081	0.081	0.082	0.080	0.081	Passed

Table 9
IRAP Cancer Risk Summary by Exposure Pathways

Location	Scenario	Pathway									Total Risk	Acceptance Criteria = 1 x 10^{-5}
		Inhalation	Produce	Beef	Poultry	Eggs	Fish	Milk	Pork	Soil		
Rcptr_3 SE prop edge	Farmer Adult	1.4 x 10^{-6}	6.9 x 10^{-8}	2.5 x 10^{-7}	2.2 x 10^{-10}	1.4 x 10^{-10}		7.9 x 10^{-7}	1.3 x 10^{-8}	1.1 x 10^{-9}	2.5 x 10^{-6}	Passed
	Farmer Child	2.1 x 10^{-7}	2.5 x 10^{-8}	2.3 x 10^{-8}	2.3 x 10^{-11}	1.6 x 10^{-11}		2.0 x 10^{-7}	1.5 x 10^{-9}	1.5 x 10^{-9}	4.6 x 10^{-7}	Passed
	Fisher Adult	1.0 x 10^{-6}	3.6 x 10^{-8}				3.1 x 10^{-7}			8.1 x 10^{-10}	1.4 x 10^{-6}	Passed
	Fisher Child	2.1 x 10^{-7}	1.7 x 10^{-8}				2.7 x 10^{-8}			1.5 x 10^{-9}	2.5 x 10^{-7}	Passed
	Resident Adult	1.0 x 10^{-6}	3.6 x 10^{-8}							8.1 x 10^{-10}	1.4 x 10^{-6}	Passed
	Resident Child	2.1 x 10^{-7}	1.7 x 10^{-8}							1.5 x 10^{-9}	2.3 x 10^{-7}	Passed

Note: Blank cells indicate pathway was not evaluated for the scenario.

Table 10
IRAP Hazard Index Summary by Exposure Pathways

Location	Scenario	Pathway									HQ Total	Acceptance Criteria = 1
		Inhalation	Produce	Beef	Poultry	Eggs	Fish	Milk	Pork	Soil		
Rcptr_3 SE prop edge	Farmer Adult	0.079	0.0007	0.0002	0.00000004	0.00000003		0.0004	0.000004	0.0000003	0.081	Passed
	Farmer Child	0.079	0.002	0.0001	0.00000003	0.00000002		0.0006	0.000003	0.000003	0.082	Passed
	Fisher Adult	0.08	0.0005				0.0005			0.0000003	0.080	Passed
	Fisher Child	0.079	0.001				0.0002			0.000003	0.081	Passed
	Resident Adult	0.079	0.0005							0.0000003	0.080	Passed
	Resident Child	0.079	0.001							0.000003	0.081	Passed

Note: Blank cells indicate pathway was not evaluated for the scenario.

Table 11
Risk Summary by Fish Ingestion Pathway

Location	Risk	IRAP – Total COPCs without Mercury	MPCA Method – Mercury only	Total Risk due to Fish Ingestion
		Adult Fisher	Adult Subsistence Fisher	Adult Subsistence Fisher
Big Diamond Lake Subsistence Fisher	Cancer Risk	3.1×10^{-7}	N/A	3.1×10^{-7}
	Hazard Quotient	0.0005	Ambient = 11.1	Ambient = 11.1
			Facility increment = 0.06	Facility increment = 0.06

Table 12
Sensitizer and Development Toxicant Culpability

CAS No.	Toxicant	Type[1]	Source with Largest Q/CHI Value for Individual Compound	Percent of Total Modeled Risk for that Source	Acute HRV ($\mu g/m^3$)
7440-38-2	Arsenic	DT	Flare	91%	0.19
71-43-2	Benzene	DT	Fugitive VOC	16%	1,000
7440-41-7	Beryllium[2]	S	None	0%	NA
75-15-0	Carbon disulfide	DT	Fugitive VOC	15%	6,000
67-66-3	Chloroform	DT	Turbines	0.04%	150
100-41-4	Ethyl benzene	DT	Flare	0.07%	10,000
75-00-3	Ethyl chloride (Chloroethane)	DT	Turbines	<0.01%	100,000
50-00-0	Formaldehyde	S	Turbines	0.33%	94
7439-97-6	Mercury	DT	Flare	6.5%	1.8
7440-02-0	Nickel	S	Flare	9.2%	11

1 S = Sensitizer; DT = Developmental Toxicant

2 No IHB exists for this compound. Q/CHI was not calculated.

Table 13
Comparison of PM_{10} Class II Modeling Results with $PM_{2.5}$ Standards

	Mesaba I and II alone ($\mu g/m^3$)	Mesaba and All Other Sources ($\mu g/m^3$)	PM_{10} Background ($\mu g/m^3$)	Mesaba and Other Sources + Background ($\mu g/m^3$)	Minnesota Standards for $PM_{2.5}$ ($\mu g/m^3$)	Federal Standards for $PM_{2.5}$ ($\mu g/m^3$)
24-Hour	11.0	15.4	20	35.4	65	35
Annual	1.86	3.38	10	13.4	15	15

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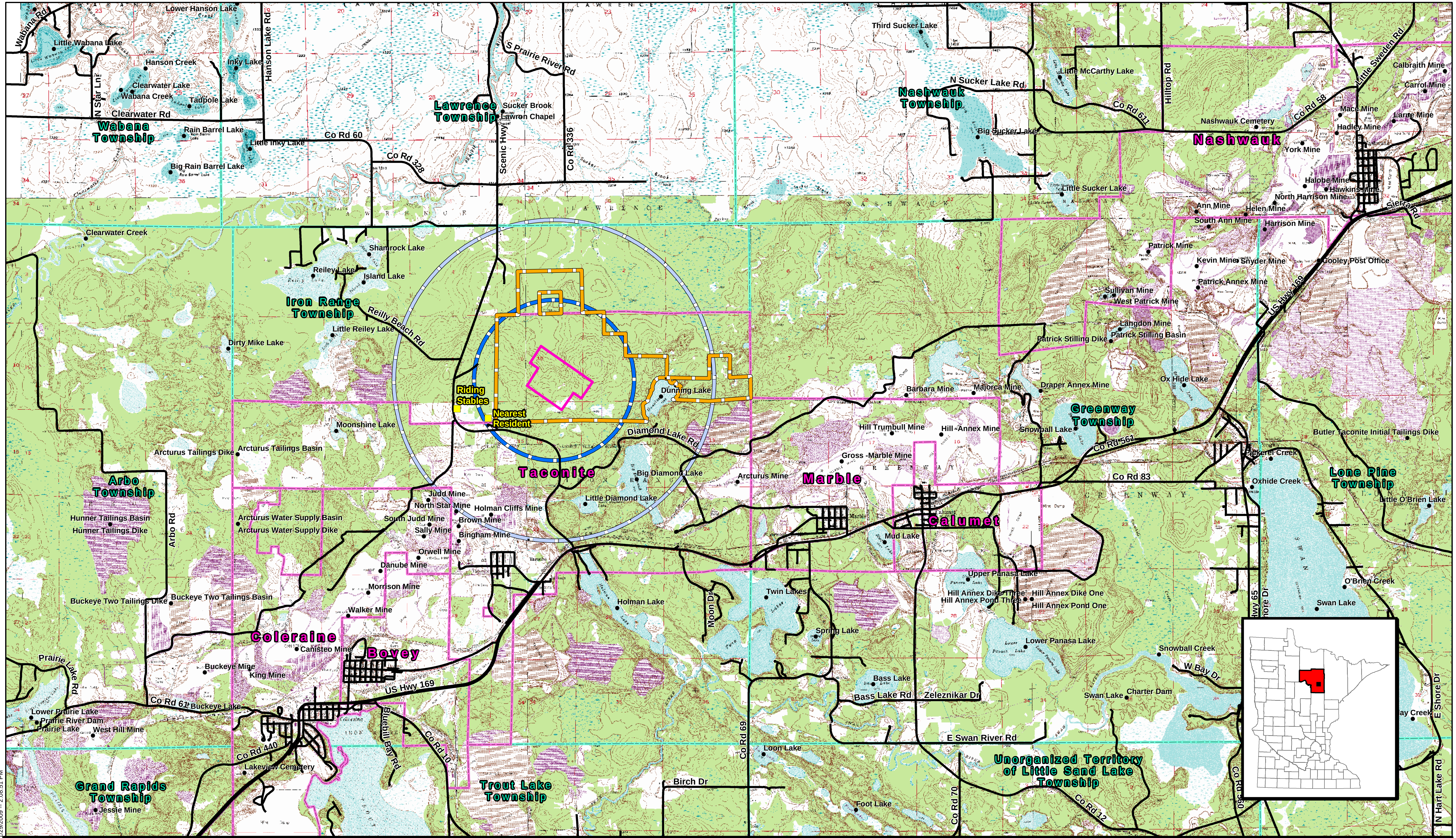


Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range Site

January 2009

Legend

- West Range Site
- Modeled Fence Line
- Stacks Centroid (1.5 km Buffer)
- Stacks Centroid (3 km Buffer)
- Geographic Names
- Roads
- Municipal Boundaries
- Civil Township

Appendix C

Source: USGS, Itasca County, Mn/DNR, Mn/DOT, Fluor, Excelsior Energy, and SEH.

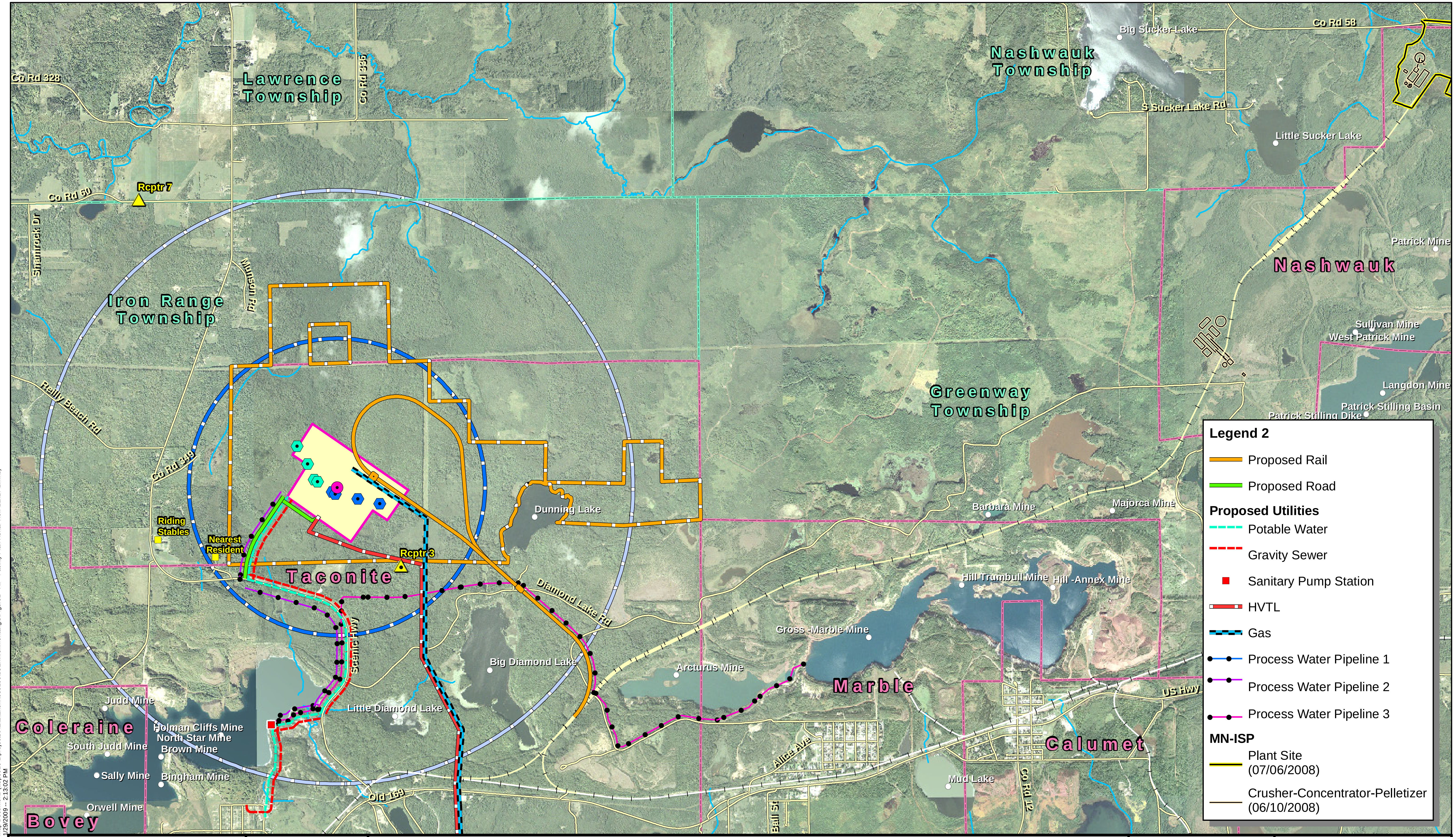
Figure 1 of 8

Site Location Map

Itasca County - South Coordinate System

N W E S

0 1 Kilometers



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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

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Legend

- West Range Site
- Modeled Fence Line
- Phase 1 Stacks
- Phase 2 Stacks
- Stacks Centroid
- Maximum Impacts - Rcptr 3
- Current Working Farm - Rcptr 7
- Stacks Centroid (1.5 km Buffer)
- Stacks Centroid (3 km Buffer)
- Streams
- Existing Roads
- Existing Railroads
- Railroad in Development
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix C

Source: NAIP 2006, USGS, Itasca County, Mn/DNR, Mn/DOT, MN Steel, Fluor, Excelsior Energy, and SEH.
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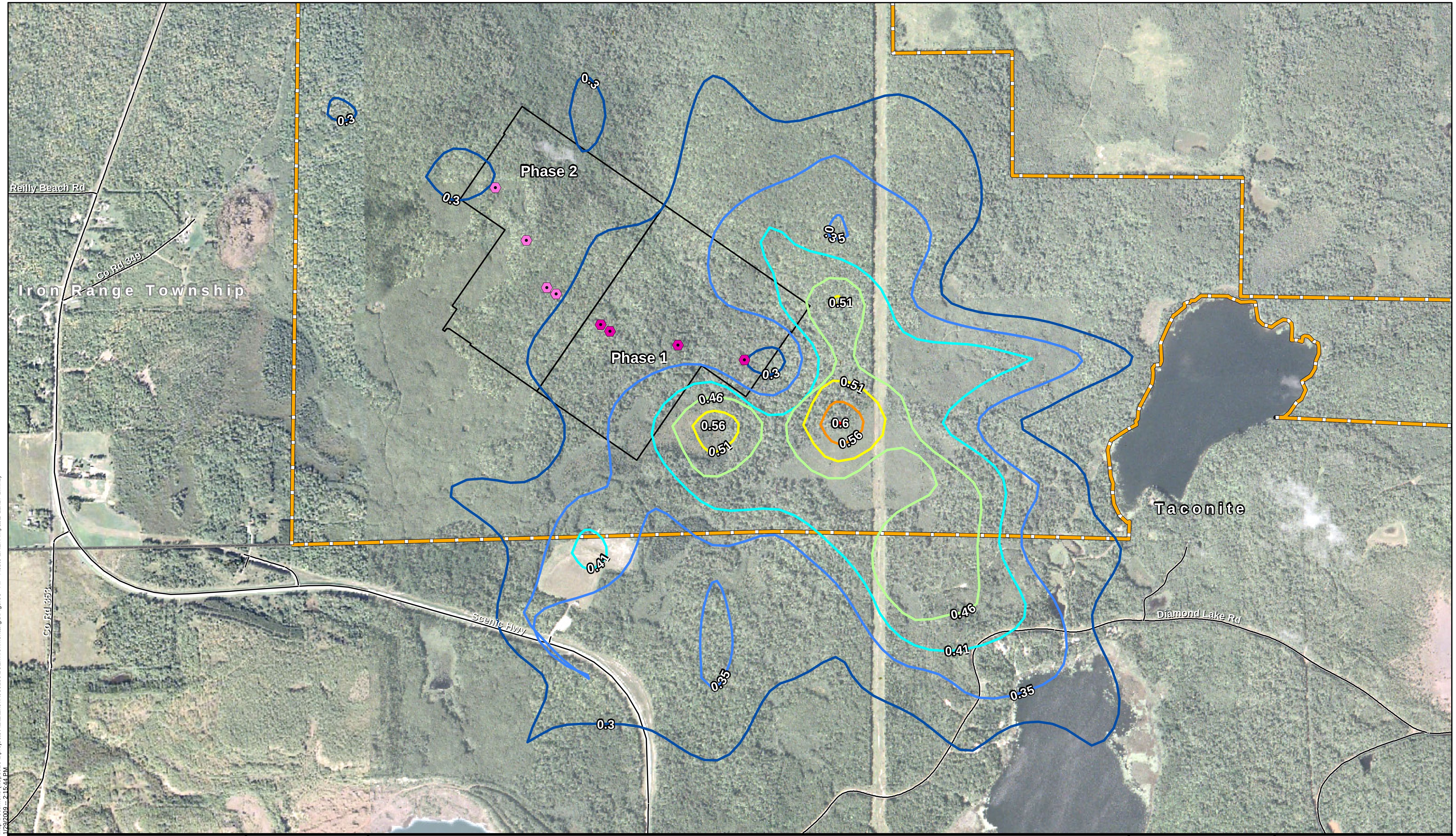
Figure 2 of 8

Facility Plan Aerial View

Itasca County - South Coordinate System

N W E S

0 3,000 Feet



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Excelsior Energy Inc.

Mesaba Energy Project
Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range Site

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Legend

- West Range Site
- Phase 1 Stacks
- Phase 2 Stacks

Acute Q/CHI Impacts

- 0.30
- 0.35
- 0.41
- 0.46
- 0.51
- 0.56
- ≥0.60 Appendix C

- Municipal Boundaries
- Civil Township
- Existing Roads
- Existing Railroads

Source: NAIP 2006, Itasca County, Mn/DNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

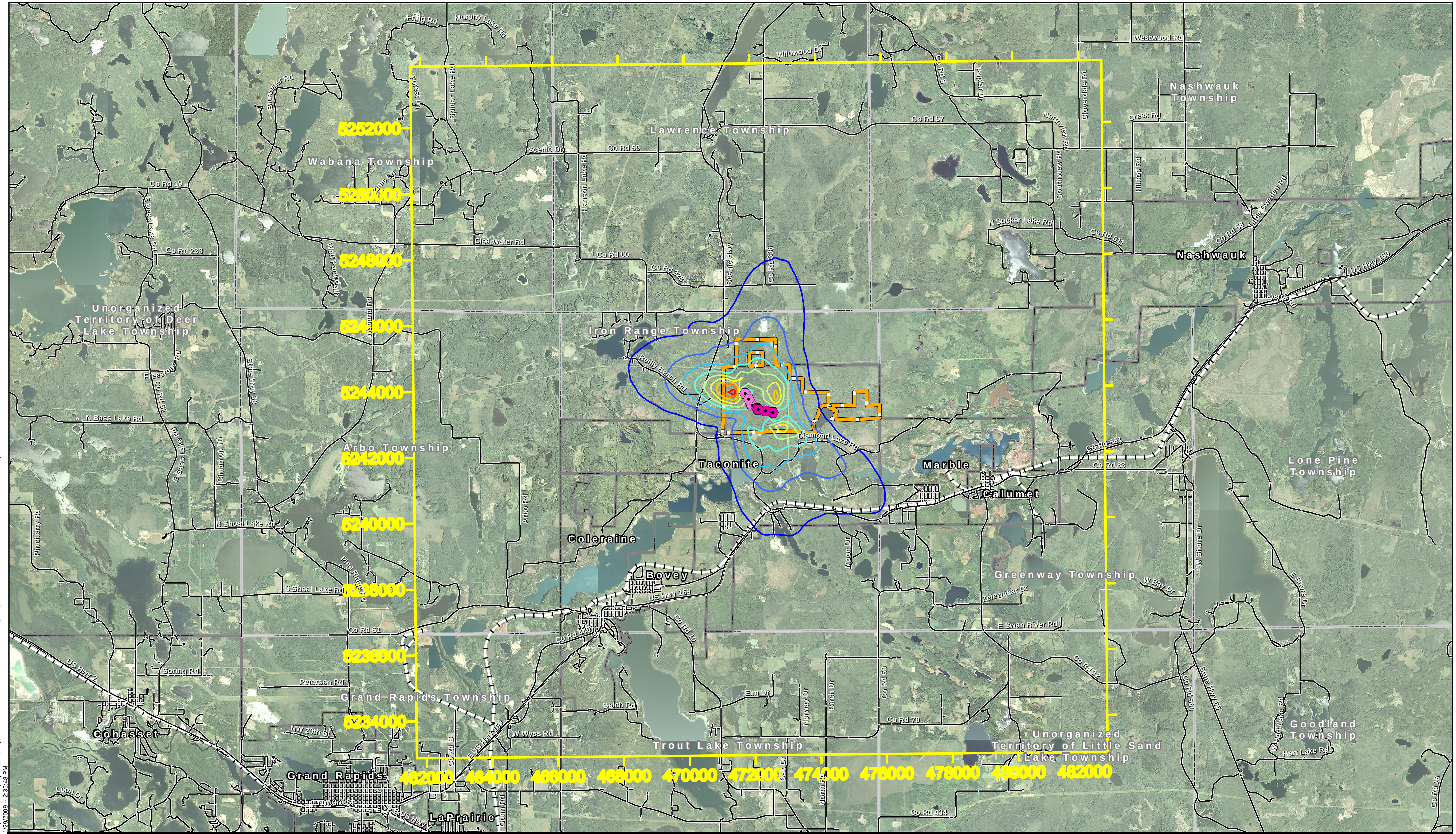
Figure 3 of 8

Acute Q/CHI Impacts

Itasca County - South Coordinate System

N E S W

0 1,000 Feet



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range Site

January 2009

Legend

West Range Site
Phase 1 Stacks
Phase 2 Stacks

Sub-chronic Q/CHI Impacts

- 0.006
- 0.010
- 0.014
- 0.018
- 0.022
- 0.026
- 0.029
- 0.033
- ≥ 0.037

Municipal Boundaries
Civil Township
Existing Roads
Existing Railroads

Source: NAIP 2006, Itasca County, Mn/DNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

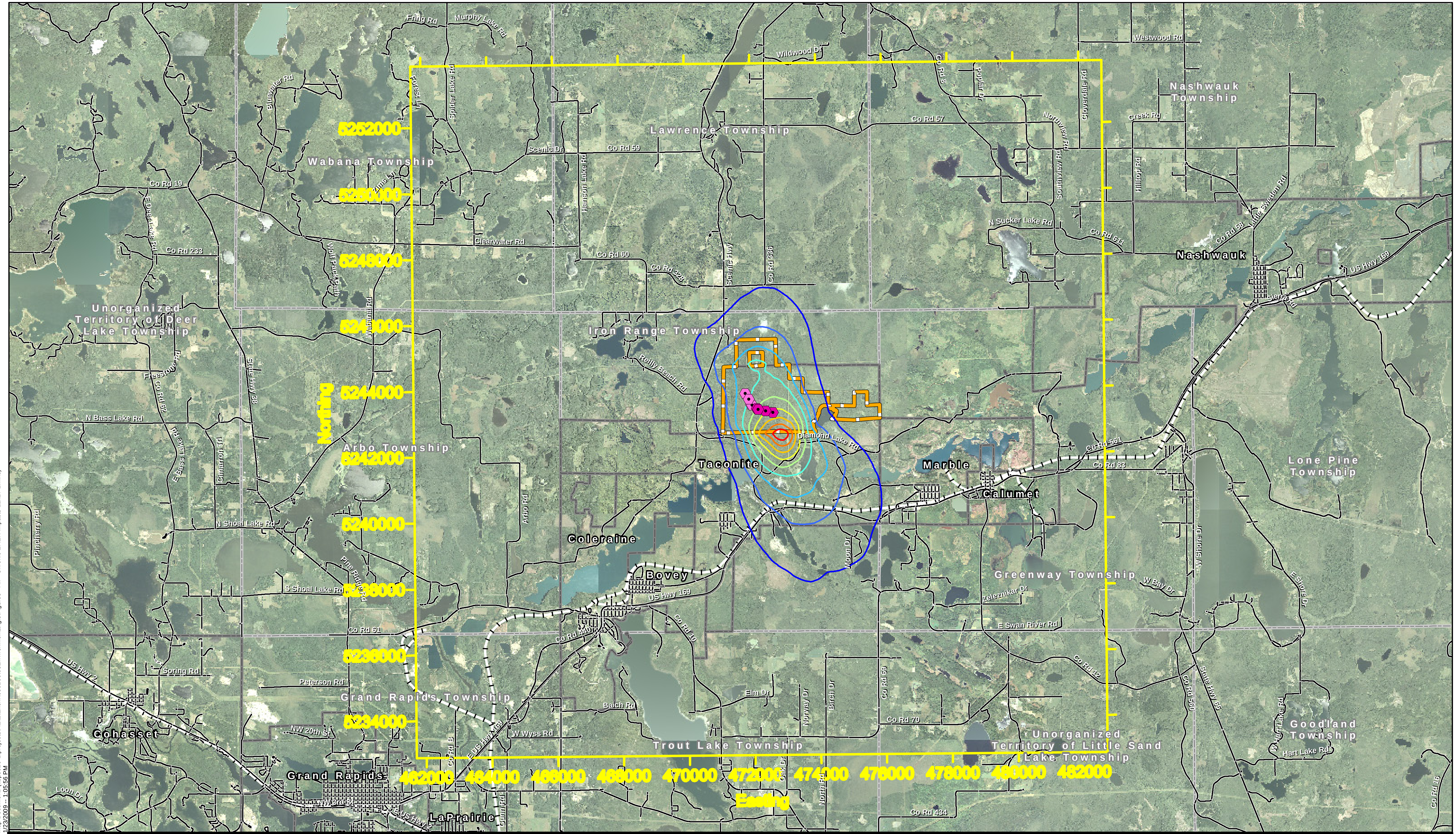
Figure 4 of 8

Sub-chronic Q/CHI Impacts

Itasca County - South Coordinate System

N S W E

0 9,000 Feet



Map Document: (\\ssp3020-1\projects\A\E\Excel\0502003\Environmental\gis\Figure5 - Air - Chronic ERER Impacts 11x17 L.mxd)
1/23/2009 -- 1:05:56 PM

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11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
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West Range Site

January 2009

Legend

- West Range Site
- Phase 1 Stacks
- Phase 2 Stacks

Chronic Dispersion Modeling Impacts (ug/m^3) using a 1 g/sec emission rate for each source

- 0.15
- 0.23
- 0.32
- 0.40
- 0.49
- 0.58
- 0.66
- 0.75
- ≥ 0.83

- Municipal Boundaries
- Civil Township
- Existing Roads
- Existing Railroads

Appendix C

Source: NAIP 2006, Itasca County, Mn/DNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
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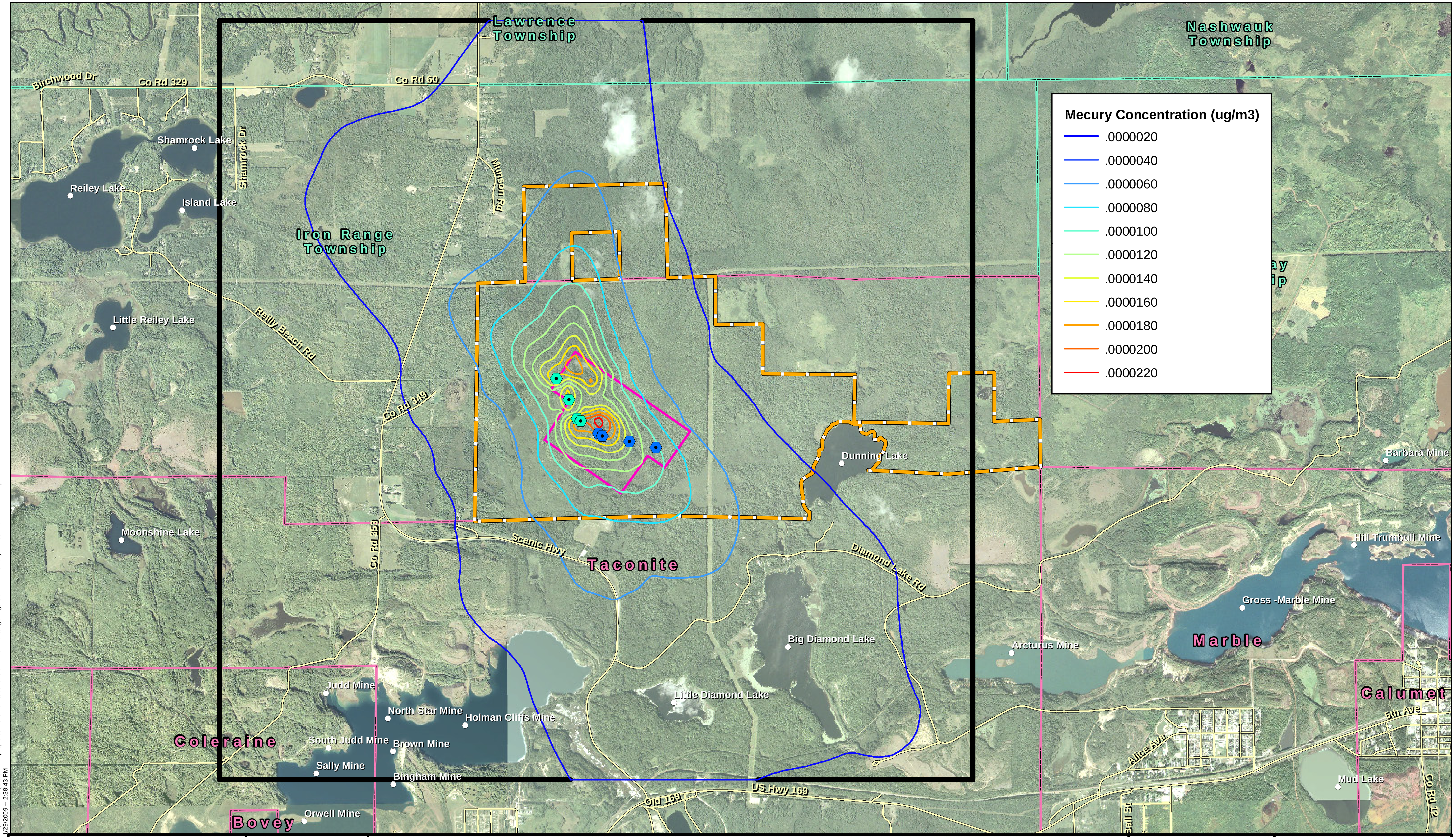
Figure 5 of 8

Chronic Dispersion Modeling Impacts

Itasca County - South Coordinate System

N S E W

0 9,000 Feet



Map Document: (\\Sp3020-1\projects\AE\E\Exenr\0502000\03Environmental\gis\Figure6 - Air - Mercury Emissions 11x17 L.mxd)
1/29/2009 -- 2:38:43 PM

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Phone 952.847.2360 Fax 952.847.2373

West Range Site

January 2009

Legend

- West Range Site
- Modeled Fence Line
- Phase 1 Stacks
- Phase 2 Stacks
- Geographic Names
- Existing Roads
- Municipal Boundaries
- Civil Township

Appendix C

Source: NAIP 2006, USGS, Itasca County, Mn/DNR, Mn/DOT, Fluor, Excelsior Energy, and SEH.
© 2009 SEH

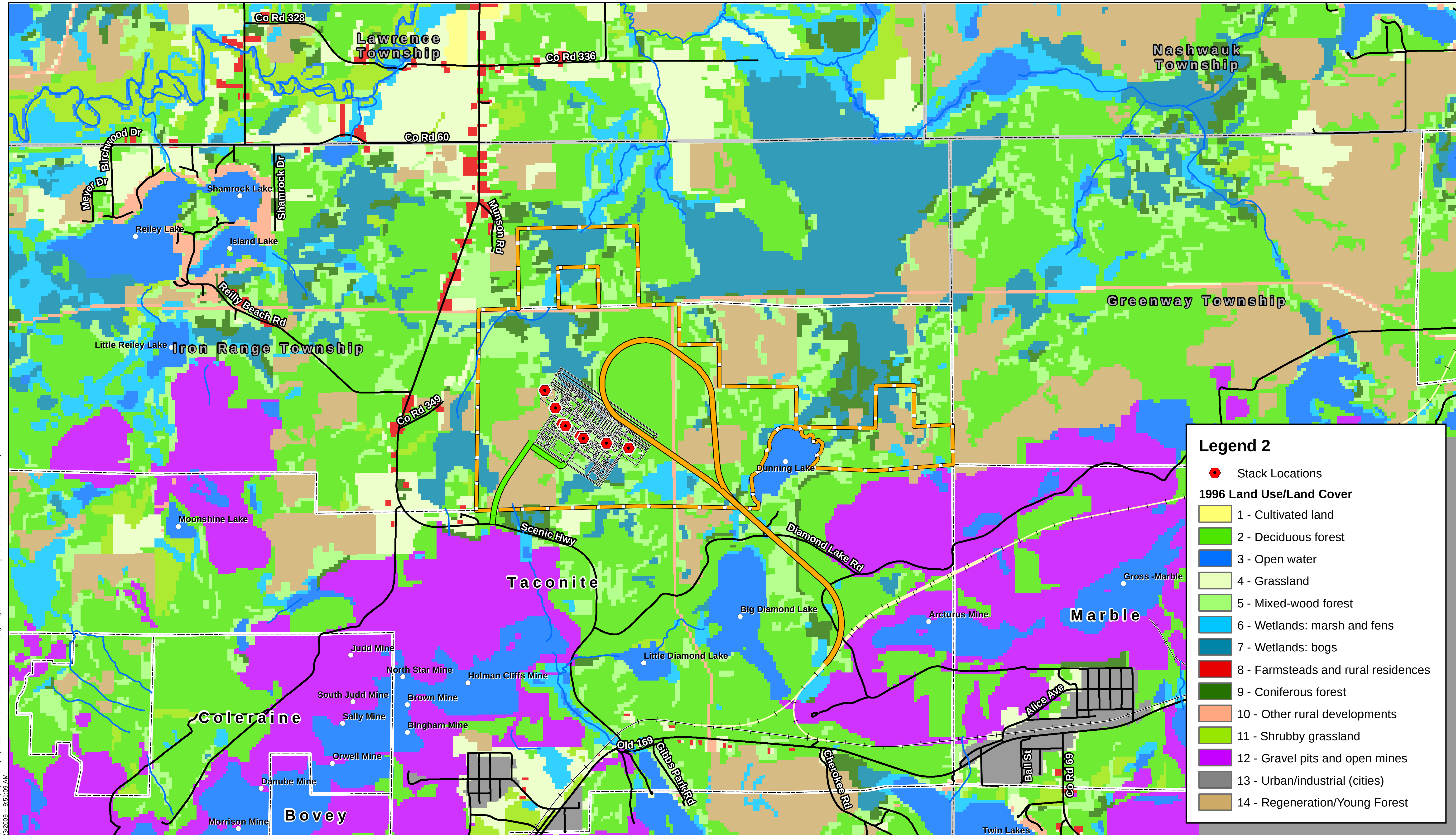
Figure 6 of 8

Mercury Emissions Dispersion Model Isoconcentrations

Itasca County - South Coordinate System

N E S W

0 2,500 Feet



Map Document: (\\sj3020-1\projects\AEIE\Exen\050200\03Environmental\gis\Figure7 - Air - Existing Land Use Land Cover 11x17 L.mxd)
1/23/2009 -- 9:51:09 AM

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Phone 952.847.2360 Fax 952.847.2373

West Range Site

January 2009

Legend

- Modeled Plant Layout
- West Range Site
- Proposed Rail Alt B
- Proposed Road
- Geographic Names
- Municipal Boundaries
- Civil Township Boundaries
- Existing Roads
- Existing Railroads
- Railroad in Development
- Streams

Appendix C

Source: Manitoba Remote Sensing Centre, Itasca County, Mn/DNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
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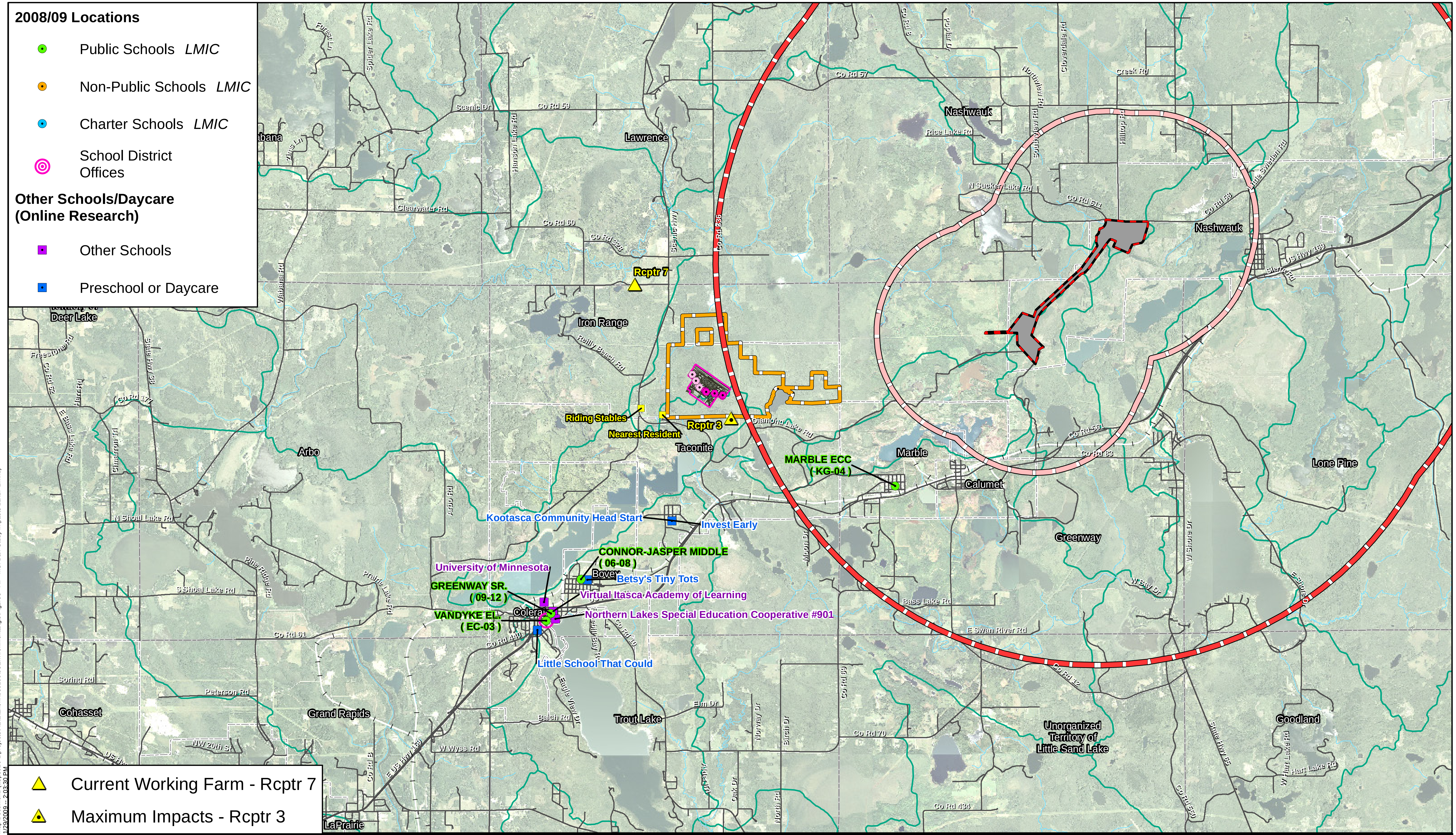
Figure 7 of 7

Existing Land Use Land Cover

Itasca County - South Coordinate System

N W E S

0 3,000 Feet



Excelsior Energy Inc.

Mesaba Energy Project
Energy, Innovation, and Economic Development for Minnesota

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Phone 952.847.2360 Fax 952.847.2373

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 *AMEC* (08-30-2008)
- Existing Roads
- Existing Railroads
- Streams
- Watersheds

Appendix C

Source: NAIP 2006, Itasca County, Mn/DNR, Mn/DOT, USGS, LMIC, Fluor, Excelsior Energy, MN Steel, Barr, AMEC and SEH.
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Figure 8 of 8

MN Steel DRI Plant Cumulative Impact Buffers

Itasca County - South Coordinate System

N W E S

0 2.5 Kilometers

Appendix A

AERA Forms

AERA-01: Deliverable Checklist
AERA-02: Maps Form
AERA-03: Dispersion Factor Analysis
AERA-04: Emergency Internal Combustion Engine Certification
AERA-05: Emissions
AERA-06: Cumulative Air Emissions Risk Analysis

Permit Forms
(See Mesaba Energy Project Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)

GI-01: Facility Information
GI-02: Process Flow Diagram
GI-03: Facility and Stack/Vent Diagram
GI-04: Stack/Vent Information
MI-01: Building and Structure Information
CR-01: Certification

Mercury Guidance and Form
(See Mesaba Energy Project Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)
Hg-2003: Assessing the Impacts of Mercury Release to Ambient Air

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-01 INSTRUCTIONS

AIR EMISSIONS RISK ANALYSIS

1a) AQ Facility ID No.: ______

1b) AQ File No.: ______

2) Facility Name: Excelsior Energy Inc. Mesaba Energy Project

3) Facility Location:

Street Address: ______

City: Taconite State: MN ZIP Code: 55786 County: Itasca

To facilitate review, please provide the following documents, forms or information:

Please submit three hard copies of all AERA submittals including forms and supplemental information, and electronic versions of DISPERSE summary reports/figures and the RASS.

AERA Forms

X	Form AERA-01 Deliverable Checklist (this form)
X	Form AERA-02 Maps Form
X	Form AERA-03 Dispersion Factor Analysis
X	Form AERA-04 Emergency Internal Combustion Engine Certification
X	Form AERA-05 Emissions

Permit Forms

X*	Form GI-01: Facility Information
X*	Form GI-02: Process Flow Diagram
X*	Form GI-03: Facility and Stack/Vent Diagram
X*	Form GI-04: Stack/Vent Information
	Form GI-05D: Fugitive Emission Source Information (if applicable)
X*	Form MI-01: Building and Structure Information
X	Form CR-01: Certification of the AERA submittal

X* - forms are included in the Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)

Dispersion Submittals (electronic only)

	DISPERSE summary report and summary figures
X	Model input/output if other dispersion modeling used for dispersion factor (e.g. SCREEN3, ISCST3, ISC-PRIME, AERMOD, BPIP, BPIP-PRIME)

Mercury Guidance and Form

X*	Hg 2003 Assessing the Impacts of Mercury Releases to Ambient Air

X* - forms are included in the Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)

RASS Submittals

RASS is based on what type of emission rates? (Check one)

	Potential to Emit (PTE)
	Future Projected Actuals
	PTE and Future Projected Actuals (i.e., a separate and complete RASS for each)

Assumed receptor location(s): (Check one)

	Two Separate RASS: (1) Chronic (annual) exposure receptors "at or beyond" the fenceline and (2) Acute (maximum 1 hour exposures) on the property
	One RASS: ~~Chronic~~ Sub-chronic and acute exposure receptors located "at or beyond" the fenceline

RASS excludes chemicals of relatively low risk dropped from analysis (Check one)

	RASS submittal includes all emitted chemicals
	Two submittals: RASS submittal for all emitted chemicals *and* second RASS submittal excluding chemicals previously found to be less than < 10-6 additional cancer risk or < 0.1 hazard quotients

For Modifications (Check one)

	Estimated risks for total facility are greater than risk management thresholds. RASS are provided to characterize the pre-modification (baseline) condition.
	Estimated risks for total facility are below risk management thresholds and no pre-modification (baseline) RASS are needed.

Total Number of RASS submittal(s) ________ (electronic only)

Additional information that would facilitate MPCA understanding the assessment or the results.
Please describe any additional attachments in the format below.

Attachment Reference Number (or other identifier)	Title	Purpose
Application dated: June 2006	**Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)**	**Process & source description, Construction permit forms**
Electronic spreadsheet & AERA report	**Q/CHI Evaluation**	**Sub-chronic and acute risk evaluation**
Electronic submittal & AERA report	**IRAP Evaluation**	**Chronic risk evaluation for inhalation and non-inhalation pathways including fish ingestion**
Electronic submittal & AERA report	**MPCA Mercury Risk Estimation Method for Fish Consumption**	**Risk evaluation for the fish ingestion pathway – mercury only**

Description of missing information and/or substitutes for the above: ____________________

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-02
MAPS

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.02 May 2004

1) AQ Facility ID No.: ________________

2) AQ File No.: ________________

3) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project**

See Figure 2, "Facility Plan – Aerial View"

Maps provide a pictorial representation of information and allow for significant abbreviation of text submittals.

1. Provide a "sensitive population receptor" map of the facility and the surrounding area with the following features. The map should cover a circular area around an emissions facility. At a minimum, the radius of the circle should be 1 km from all emission points. This map should be submitted whether or not "sensitive population receptors" are present.
   a. Facility location
   b. Schools
   c. Daycares
   d. Public recreation areas (could include playgrounds, swimming pools, tennis courts, city parks, etc.)
   e. Nursing homes
   f. Hospitals
   g. Other locations where sensitive receptors congregate

2. Facilities emitting PBTs should provide a map showing the following features:

   a. **Fishable water bodies.** A water body may be considered "fishable" if it typically contains water year-round in a year that receives at least 75 percent of the normal annual precipitation for that area. For facilities with stack heights less than 100 meters, provide a map showing lakes, rivers and streams within a 3 km radius (approx. 2 miles). For facilities with stack heights greater than 100 meters, show lakes, rivers and streams for the area within a 10 km radius (6 miles). Also show water bodies outside the specified area that may be fed by rivers and streams lying within the radius of interest. The length of the reach of river or stream (or extent of a lake) outside the radius that must be shown will be determined case-by-case based on local data and conditions. The map should be labeled to identify the fishable waterbodies.

   b. **Farming locations.** If no information is available regarding land use, the default assumption will be that a farmer could be impacted by facility emissions, and the farmer's risks will be used as a basis for decisions. If land use information is provided to the MPCA indicating that the area within a 2-mile radius (6 miles for stack heights greater than 100 meters) is entirely residential (or that it is not and will not be agricultural), only the indirect risks for the resident (which will be lower than the risks to the farmer) will be considered in any risk-based determinations to be made regarding a facility.

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-03
DISPERSION FACTOR ANALYSIS

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.03 May 2004

1) AQ Facility ID No.: ____________________

2) AQ File ID No.: ____________________

1) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project - West Range Site**

Purpose
This worksheet is provided to help describe the assumptions made to determine dispersion factors within the air emissions risk evaluation. This worksheet will act as a completeness checklist. If the requested data or forms are not included, please describe why they are not included, and indicate if substitutes are provided.

Information Requested for All Submittals:

1. Does the modeling include any point sources? **Yes**

2. Does the modeling include any fugitive sources? **No**

3. Are <u>all</u> dispersion factors from the DISPERSE Look-Up Table? **No – for Q/CHI and IRAP evaluations.**

4. Enter the maximum terrain variation (meters) (as applicable):

   a. Within 10m of shortest stack: ____**2**_____.
   b. Within 100m of shortest stack: ____**5**___.
   c. Within 1000m of shortest stack: ____**20**__.

   d. Within 10m of lowest fugitive source: __**N/A**________.
   e. Within 100m of lowest fugitive source: __**N/A**_______.
   f. Within 1000m of lowest fugitive source: __**N/A**______.

5. Stacks/Vents (if applicable)

   a. Are all stacks considered? **Yes**
   b. Were any stacks merged? **No – for the Q/CHI and IRAP evaluations.**
   c. Were stacks merged per MPCA DISPERSE guidance? **No**
   d. Does the shortest modeled stack height in the RASS equal the shortest height on Form GI-04? **No – RASS not conducted**

6. Fugitive Emission Sources (Not Applicable)

   a. Are there any onsite paved roads? **YES** No
   b. Are there any onsite unpaved roads? **YES** No
   c. Are there any onsite storage/surge piles? **YES** No
   d. Are there any onsite material handling operations? **YES** No
   e. Are there any other types of onsite fugitive sources? **YES** No (Equipment Leaks)

   f. Does the modeling consider all onsite fugitive sources? Yes **NO**
   g. Does the modeling consider most onsite fugitive sources? Yes **NO**

7. Stack Parameters (modeled values should match Form GI-04 values unless merged):

Modeled Stacks and Stack Parameters (see example below):

Model ID & Form GI-04 SV_ID_No.	~~RASS~~ Stack ID number	Stack Height (meters)	Stack Temperature (Kelvin)	Stack Velocity (m/sec)	Stack Diameter (meters)
1 CT1PI	**CT1PI**	**45.72**	**394.3**	**20.08**	**6.1**
2 CT2PI	**CT2PI**	**45.72**	**394.3**	**20.08**	**6.1**
3 TVBPI	**TVIPI**	**64.01**	**579.8**	**8.46 short-term** **1.95 annual**	**1.83**
4 FLRPI	**FLRPI**	**56.39**	**1273.0**	**20.00**	**0.25**
5 CT1PII*	**CT1PII**	**45.72**	**394.3**	**20.08**	**6.1**
6 CT2PII*	**CT2PII**	**45.72**	**394.3**	**20.08**	**6.1**
7 TVBPII	**TVIPII**	**64.01**	**579.8**	**8.46 short-term** **1.95 annual**	**1.83**
8 FLRPII	**FLRPII**	**56.39**	**1273.0**	**20.00**	**0.25**
9					
10					

8. Fugitive Source Release Heights and Area Coverage
   Please indicate in Table 7 if any fugitive/area source was modeled as a point source

Model ID & Form GI-05D FS_ID_No.	RASS Stack ID number	Release Height (meters)	Area Coverage (m^2)	Brief Description of Fugitive Source
1 FUGVOC	**-**	**3.05**	**272,381**	**Normal equipment leaks from valve seals, pump and compressor seals, pressure relief valves, flanges, etc.**
2				
3				
4				
5				
6				
7				
8				

EXAMPLE of Merged and Unmerged Stack Parameters

Model ID & Form GI-04 SV_ID_No.	RASS Stack ID number	Stack Height (meters)	Stack Temperature (Kelvin)	Stack Velocity (m/sec)	Stack Diameter (meters)
1 (3 merged stacks from Form GI-04): SV001 SV002 SV003		10.0 (lowest of 3 values below) 10.0 11.0 12.0	293 (lowest of 3 values below) 300 310 293	2.5 (lowest of 3 values below) 3.3 2.5 2.7	1.0 (lowest of 3 values below) 1.1 1.1 1.0
2 (SV004 only)		20	400	3.3	1.0
3 (SV005 only)		15	350	11.1	3.2
4 (Coal Pile)		1	293	0.001	20

Supplemental Information Requested when using DISPERSE Batch Programs: (Not Applicable)

9. Building Data

   a. Circle the Building Profile Input Program (BPIP) option used:
      i. BPIP option 1: MPCA defined "square" structure
      ii. BPIP option 2: User defined "rectangular" structure
      iii. BPIP option 3: pre-existing BPIP file; Filename: ________________________.
   b. Is the tallest modeled building height greater than or equal to the tallest height on Form MI-01? Yes No

10. Circle the Land Use Land Cover (LULC) option used:

    a. Cultivated land (a.k.a. row crops or cropland; z_o~0.01m to 0.2m);
    b. 50/50 mix of cultivated land and deciduous forest (z_o ~0.3m to 0.8m);
    c. Deciduous forest (and major urban downtown areas) (z_o ~0.5m to 1.3m);
    d. Unknown

11. Does the modeling use five years of meteorological data? Yes No

12. Are all DISPERSE stack locations at the "building" center? Yes No

Supplemental Information Requested when using other modeling (e.g., ISCST3, ISC-PRIME, or AERMOD):

13. Is a CD-ROM included with all modeling input/output files (BPIP; ISCST3 or ISC-PRIME or AERMOD)? **Yes**

14. Indicate the model (version number), model options (e.g., DFAULT, CONC, FLAT, ELEV, RURAL, URBAN), and POLLUTID, AVERTIME, MULTYEAR, and HnH selections:

Q/CHI Modeling:
AERMOD (04300)
CO MODELOPT DFAULT CONC
CO AVERTIME 1 or MONTH or ANNUAL
CO POLLUTID OTHER

IRAP and Mercury Vapor Phase Modeling:
AERMOD (04300)
CO MODELOPT CONC WDEP WETDPLT TOXICS
CO AVERTIME ANNUAL
CO POLLUTID OTHER
CO GDSEASON 4 4 4 5 5 5 1 1 1 2 3 3
CO GDLANUSE 36*2

IRAP Particle Phase Modeling:
AERMOD (04300)
CO MODELOPT CONC DEPOS DDEP WDEP DRYDPLT WETDPLT TOXICS
CO AVERTIME ANNUAL
CO POLLUTID OTHER
CO GDSEASON 4 4 4 5 5 5 1 1 1 2 3 3
CO GDLANUSE 36*2

15. Is terrain considered? **Yes** If yes, circle DEM data: 1-degree, **7.5 minute**, mix, other.

16. Surface meteorological station: __**14918 (International Falls)**

17. Upper air meteorological station: _**14918 (International** Falls)

18. Years of meteorological data: **1972-1976**

19. Does the modeling calculate high-first-high (H1H) values? **Yes**

20. Does the RASS only use H1H values? **Not Applicable**

21. Other comments to help understand the modeling (e.g., describe receptor grids, BPIP, etc.):

Receptor grid and BPIP are the same as was used for criteria pollutant modeling.

Supplemental Information Requested (Optional)

22. Do you think this project would significantly benefit from improved dispersion factors? Yes No

23. If 22 is yes, please rank the top 3 items you think would be most helpful:

- Improved stack parameters (height, diameter, temperature, velocity)
- Improved fugitive source information (release height, area coverage)
- Improved general building dimensions
- Improved specific building dimensions
- Improved joint stack/building data (Building Profile Input Program (BPIP) data)

- Fewer merged stacks
- More meteorological options
- More Land Use Land Cover (LCLC) options
- Non-H1H values for short-term criteria pollutants (e.g., H6H 24-hour PM10 values)*

- Terrain options*
- 1.0 degree USGS Digital Elevation Model (DEM) data*
- 7.5 minute USGS Digital Elevation Model (DEM) data*

- Values paired in time*
- Values paired in space*
- Values paired in space & time*

- Facility-specific receptors (e.g., company fence line and/or property line)*
- Source-by-Source impacts (i.e., culpability tables via EVENTFIL option)*

- Other suggestions (list and rank):

___
___
___
___
___
___
___

* Probably means refined modeling instead of screening modeling.

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-04
CERTIFICATION FOR EMERGENCY INTERNAL COMBUSTION ENGINES

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.04 May 2004

1) AQ Facility ID No.: ______________________

2) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project**

This certification must be signed by a responsible official and submitted with any Air Emissions Risk Analysis where emissions from an internal combustion engine are not assessed because the engine is associated with emergency use only. Please review additional background information found in the accompanying instructions.

CERTIFICATION FOR EMERGENCY INTERNAL COMBUSTION ENGINES

I certify under penalty of law that the emission units listed below are for emergency use only, where an emergency internal combustion engine is an engine that is operated when unforeseen conditions result in disruption of electrical power to the stationary source.

"Emergency" or "emergency use only" does NOT include:

a. electrical generators used to supply electricity to a stationary source with an interruptible electrical power supply during times that the supplier has interrupted the supply as provided in the agreement governing the interruptible supply;

b. electrical generators operated at the request of the electric power supplier to assist in meeting peak electrical energy demand.

"Interruptible power supply" means that the owner/operator of a stationary source has agreed with the supplier of electricity which allows the supplier to restrict or discontinue supply of electricity for some specified time period after providing adequate prior notice.

3) Emission unit description

(Column 1)	IC engine #1	IC engine #2	IC engine #3&4	IC engine #5	IC engine #6	IC engine #7&8
Stack/Vent No.	**SV-006**	**SV-007**	**SV-008&9**	**SV-018**	**SV-019**	**SV-020&21**
Type of Use	**Emergency generator**	**Emergency generator**	**Fire pump engines (2)**	**Emergency generator**	**Emergency generator**	**Fire pump engines (2)**
Rated heat input (mmBtu/hr)	*	*	*	*	*	*
Rated mechanical output (HP and RPM)	*	*	*	*	*	*
Fuel type (include % sulfur)	*	*	*	*	*	*
Fuel consumption rate (gal/hr or cf/hr)	*	*	*	*	*	*
Stack height (m)	*	*	*	*	*	*
Engine Location[1] UTM coordinates in NAD 1983	*	*	*	*	*	*
Testing frequency and duration	*	*	*	*	*	*

***See Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two) .**

4) Additional information (optional)

	IC engine #1	IC engine #2	IC engine #3	IC engine #4	IC engine #5
Stack inside diameter (m)					
Stack velocity or flow Show units (m/s, m^3/s, or ft^3/min)					
Stack temperature (K)					
Urban or rural					
Nearest receptor distance (m)					

[1] Please provide a facility map, clearly labeling IC engines and their locations.

I also certify, in accordance with Minnesota Rules 7007.0500, subp. 2 (K)(2) and subp. 2 (K)(3), that I have reviewed the procedures implemented by my facility to maintain compliance and that those procedures are, to the best of my knowledge and belief, reasonable to maintain compliance with all applicable requirements.

Owner:		**Operator:**	
Mr./Ms.	______________________	Mr./Ms.	______________________
Title:	______________________	Title:	______________________
Signature:	______________________	Signature:	______________________
Date:	______________________	Date:	______________________
Phone:	______________________	Phone:	______________________

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-05
EMISSIONS

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.05 May 2004

1) AQ Facility ID No.: ______________________

2) AQ File ID No.: ______________________

3) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project**

Purpose

The purpose of this form is to describe and document the process used to generate emission rates. The project proposer may choose to assess emissions at the facility's potential to emit (PTE) as defined by state and federal rules. Alternatively, the project proposer may estimate another future operating scenario, defined in AERA as "future estimated actual emissions."

Submittals

Provide answers below or reference attachments.

4) List emission sources at facility that do not have to be quantified *(AERA guide section 2.3.2)*
1. Emission units that only burn natural gas
2. Emergency generators and fire water pumps (diesel internal combustion engines) See Form AERA-04

5) Were insignificant activities included? If included, describe assessment. *(AERA Guide Section 2.3.2)*
Insignificant activities are not included.

6) List of data sources used to generate emission factors: *(AERA Guide section 2.3.3)*
   a. Specific citations of emissions data sources used
      i. Reference, table number (etc.), publication date
      ii. Rationale for selecting data sources

Sources of emission factors are described in detail in the appendices of the Prevention of Significant Deterioration Permit to Constuct Application. In summary, emission rates from the emission units are estimated using:

- **Plant performance characteristics**
- **Equipment supplier data**
- **BACT requirements**
- **Test results for similar equipment at other IGCC facilities, especially the existing Wabash River IGCC plant (which also used E-Gas gasification technology)**

- **Engineering calculations, experience, and judgement**
- **Published and accepted average emission factors, such as the U.S. EPA Compilation of Air Pollutant Emission Factors (AP-42)**

Chemical(s)	Reference	Table Number	Date	Rationale

7) Description of treatment of data sources in producing the hourly and annual emission rate estimate *(AERA Guide section 2.3.5)*
See the response to question 6.

8) Description of operating scenario being assessed, and if estimated future actual, documentation of future business case. *(AERA Guide section 2.3.7)*
The operating scenario used in the emission calculations is described in the Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two. In general, it is annual PTE.

9) Derivation of operating scenario provided: PTE or future estimated actual emissions.
Our emission calculations are based on PTE.

10) If future estimated actual emissions are used, provide business case description to support future case, three years of TRI information for existing facilities, and propose production-based permit limits.

11) Determination of Technical and Economic Feasibility. If risk estimates are above risk criteria, a demonstration of technical and economic feasibility must be prepared. *(AERA Guide Section 3.9)*
A Determination of Technical and Economic Feasibility is not necessary since risks are within acceptable levels.

Minnesota Pollution Control Agency

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-06
CUMULATIVE AIR EMISSIONS RISK ANALYSIS

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.0X February 2009

1. **AQ Facility ID No.:** ______
2. **AQ File No.:** ______
3. **SIC Code:** ______
4. **Facility Name:** **Excelsior Energy Inc. Mesaba Energy Project**
5. **Facility Location:**
   Street Address: ______

   City: **Taconite** **State:** **MN** **ZIP Code:** **55786** **County:** **Itasca**
6. **Date of submittal:** ______ : ______ 7. To whom: ______

Cumulative air emissions risk analyses are intended to provide information about risks from sources of air toxics that may interact with the project in such a way as to cause cumulative impacts and are not typically included in AERAs.

8. CD including the following elements for off-site sources and on-site sources (if not submitted for an AERA) :
   a. All RASS and/or Q/CHI spreadsheets
   b. Modeling input/output/plot files if applicable (e.g. AERMOD, BPIP)
   c. The following map files: (*.mxd when possible)
      1. Locations and coordinates of receptors within 10 km including closest residences, schools, daycare centers, hospitals, farms, and fishable water bodies.
      2. Locations and coordinates with potential air emission sources within 10 km. Potential maps can be found on the "What's In My Neighborhood" and "Environmental Data Access" Web sites for potential maps.
      3. Locations and coordinates of nearby monitoring stations, if applicable (e.g. proposer is using customized data).
      4. Locations, coordinates, and values for maximum risks.

9. Zip code population density of the most impacted ~~area~~ from the project/modification? What ambient monitoring data were used (circle: low or intermediate population density or customized)? **15 people per square mile (based ~~on~~ estimated 2007 census)**

   If data was customized, why?

Please ~~circle the off-site sources this data~~ set is being used to reflect: (mobile, area, point and background sources).

Briefly (one page or less) discuss the surrounding vehicular traffic pattern density and how this proposal will change them.

The traffic forecasts indicate that volumes on State Highway 169 and County Highway 7 (north of the plant site) would have modest traffic increases that are not significantly different from the forecasted No-Build scenarios. County Highway 7, between State Highway 169 and the plant site, would see its highest volumes (around 3,720 vehicles per day) during peak construction periods (expected in 2010), then would drop off after construction with an estimated 2,140 vehicles per day in 2028. The local roadway segments show forecasted volumes that could be comfortably handled by the roadway type.

10. What off-site sources were modeled?

For each off-site point source within 10km, briefly (one page or less total) discuss why it was modeled or not? For off-site point sources of potential concern, not modeled and emitting pollutants not reflected in the monitoring data set (see How To Document) please include any available information about distance to the potentially most impacted area, emissions profile, process and fuel type, historical regulatory compliance, public complaints, dispersion characteristics (stack height, prevailing wind direction), etc.

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

11. Summary table for quantitative results:

	Cancer Risk	Chronic Non-Cancer Hazard Index *	Acute Hazard Index *
1. Proposed facility or modification (from AERA)	**3 in 1,000,000**	**0.08**	**0.7**
2. Existing Facility (from AERA)	**N/A**	**N/A**	**N/A**
3. Off-site sources quantitatively assessed:			
a.) ambient monitoring data	**3 in 100,000**	**1**	**0.5**
b.) modeled off-site sources (separated by source)			

*** If hazard indices are above one, separate by health endpoints. See examples below.**

Ambient monitoring data representing the rural Iron Range in Minnesota was provided by MPCA on January 23, 2009. The ambient monitoring data were used to calculate summed risks from measured air concentrations of volatile organic chemicals (VOCs), carbonyls, and metals. The most recent metals data (2005-2007) as measured at Virginia, Minnesota was used and carbonyls and VOCs adjusted to reflect rural background air concentrations. MPCA Table 1, "Ambient Moniotr-Based Risk Results and Risk Drivers," is attached to this form. Information below was not used in this evaluation.

Separation of hazard indices and risks by health end point, pollutant and risk drivers from ambient monitored data by zip code population density.

Risks by target health endpoints for zip code population densities of less than 500 people per square mile

	Respiratory	Nervous System	Eyes	Reproductive	Developmental	Hematopoietic
Chronic	0.41		0.32			
Acute	0.22		0.1			

Risks by pollutant families for zip code population densities of less than 500 people per square mile

Pollutant Group Name	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Metals	0.05	0.1	
VOCs	1.43	0.06	0.01
Carbonyls	0.66	0.41	0.1
NO_2			0.12
Sum	2.14	0.57	0.24

Risk drivers for zip code population densities of less than 500 people per square mile

Pollutant	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Carbon tetrachloride	0.83		
Ethylene chloride	0.10		
Benzene	0.40		
Formaldehyde	0.48	0.32	0.1
Acetaldehyde	0.18	0.09	
NO_2			0.12
Sum of risk drivers	1.99	0.41	0.22

Average risks by target health endpoints for zip code population densities between 500 and 2999 people per square mile

	Respiratory	Nervous System	Eyes	Reproductive	Developmental	Hematopoietic
Chronic	0.81	0.13	0.70			
Acute	0.57		0.30	0.11	0.11	

Risks by pollutant families for zip code population densities between 500 and 2999 people per square mile

Pollutant Group Name	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Metals	**0.94**	**0.27**	**0.19**
VOCs	**2.13**	**0.15**	**0.04**
Carbonyls	**1.27**	**0.81**	**0.3**
NO_2 (Respiratory)			**0.19**
Sum	**4.34**	**1.24**	**0.72**

Risk drivers for zip code population densities between 500 and 2999 people per square mile

Pollutant	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Arsenic	0.55		0.11
Manganese		0.13	
Beryllium	0.13		
Chromium	0.14		
Carbon Tetrachloride	0.83		
Benzene	0.55		
Butadiene, 1,3-	0.24		
Methyl Chloride	0.19		
Ethylene Chloride	0.13		
Tetrachloroethene	0.10		
Formaldehyde	1.10	0.7	0.3
Acetaldehyde	0.23	0.11	
NO_2			0.19
Sum of risk drivers	**4.19**	**0.94**	**0.60**

12. Briefly (one page or less) discuss uncertainties specific to the cumulative analysis for this project.

Risk calculation for the Mesaba Energy Project is based on an emission inventory that assumes a level of conservatism using the highest measured value of any COPC quantified in a valid stack test.

This approach provides a basis for eliminating uncertainty with respect to the level of conservatism applied to both the acute and chronic risk assessments. However, it does not represent a realistic basis for establishing the IGCC Power Station's long term potential to emit COPCs (e.g., over the period of one year). Actual emissions will likely be lower than those assume for this AERA. Assembling a long term emission inventory of COPCs would better be served through use of average emission rates collected during stack tests, rather than maximum rate

The health risks from the proposed Project are approximately 10% of potential cumulative cancer risks and chronic non-cancer hazard index.

Site		Cancer	Chronic non-cancer	Acute non-cancer
1300, 7416		2.95	1.03	0.53

Sites Included: Virginia (1999 - 2000) for vocs and carbonyls and Virginia (2002 - 2007) for metals

Site	Name	Cancer	Chronic non-cancer	Acute non-cancer
Virginia	Metals	0.88	0.57	0.29
Virginia	VOCs	1.42	0.04	0.01
Virginia	Carbonyls	0.66	0.41	0.10
Cloquet	NO_2			0.13
Summed Hazard Indicies and Risk:		2.95	1.03	0.53

Sites Included (site where this type of pollutant is monitored)

Metals	Virginia
VOCs	Virginia with rural substitutions
Carbonyls	Virginia with rural substitutions
NO_2	Cloquet Monitoring Site

Risk Drivers	Cancer	% of total Summed Risks	Chronic Non-Cancer	HQ of Risk Driver	% of total Summed HI	Acute	HQ of Risk Driver	% of total Summed HI
Carbon tetrachloride	0.83	28%	Manganese	0.46	44%	Copper	0.17	31%
Arsenic	0.57	19%	Formaldehyde	0.32	31%	Nitrogen Dioxide	0.13	24%
Formaldehyde	0.48	16%	Acetaldehyde	0.09	9%	Arsenic	0.12	23%
Benzene	0.40	14%				Formaldehyde	0.10	19%
Chromium	0.19	7%						
Acetaldehyde	0.18	6%						
Ethylene chloride	0.08	3%						
Nickel	0.05	2%						

Risk Driver Values Separated by Toxic Endpoint for Inhalation Only:

	Chronic Non-Cancer			Acute			
	respiratory	nervous	eyes	respiratory	developmental	reproductive	eye
Acetaldehyde	0.09						
Arsenic					0.12	0.12	
Copper				0.17			
Formaldehyde	0.32		0.32	0.10			0.10
Manganese		0.46					
Nitrogen Dioxide*				0.13			
	0.41	0.46	0.32	0.40	0.12	0.12	0.10

Kristie Ellickson:
olfactory epithelium degenration

Table 1. Ambient Monitor-Based Risk Results and Risk Drivers from Virginia with vocs and carbonyls adjusted to reflect rural background.

**Prepared by MPCA. Obtained by SEH on January 23, 2009.

Appendix B

Electronic Submittals –

Q/CHI Spreadsheet

Q/CHI Modeling Input/Output/Plot Files

IRAP Input/.csv Files

IRAP Backup File

AERMOD Dispersion Modeling Input/Output/Plot Files

Mercury Dispersion Modeling Input/Output

MPCA Local Mercury Hazard Quotients (HQ) Assessment Spreadsheet

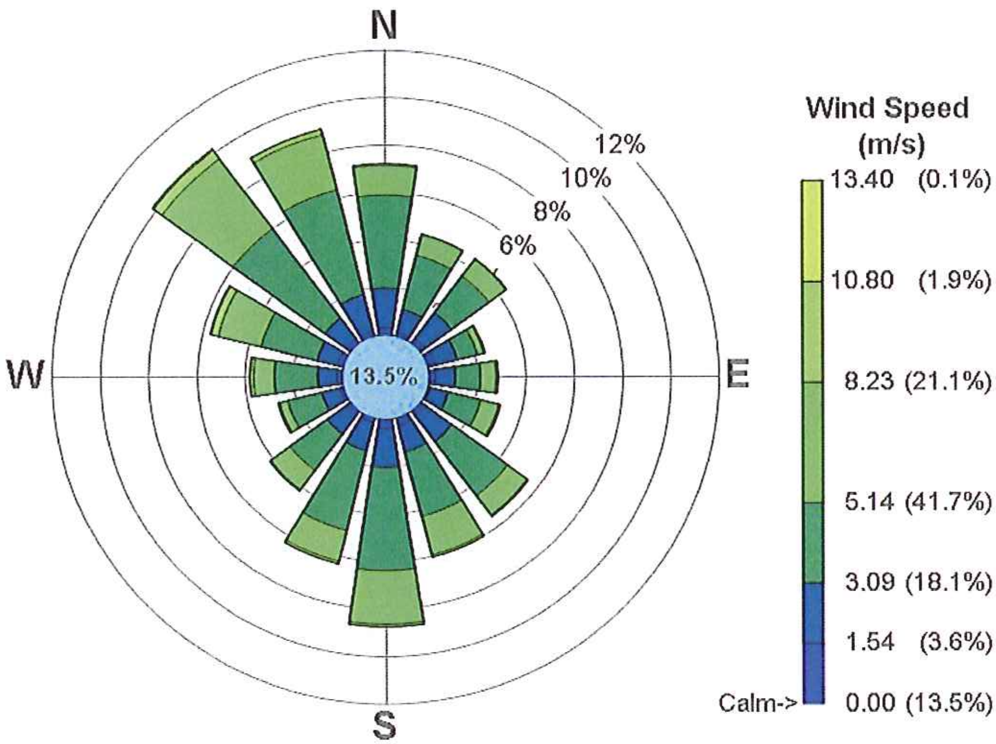
“Allfish2008 Itasca County 1997-2007 and Pre-1997”

The electronic submittal CD will be available in the Prevention of Significant Deterioration Permit to Construct, submitted to Minnesota Pollution Control Agency.

Appendix C

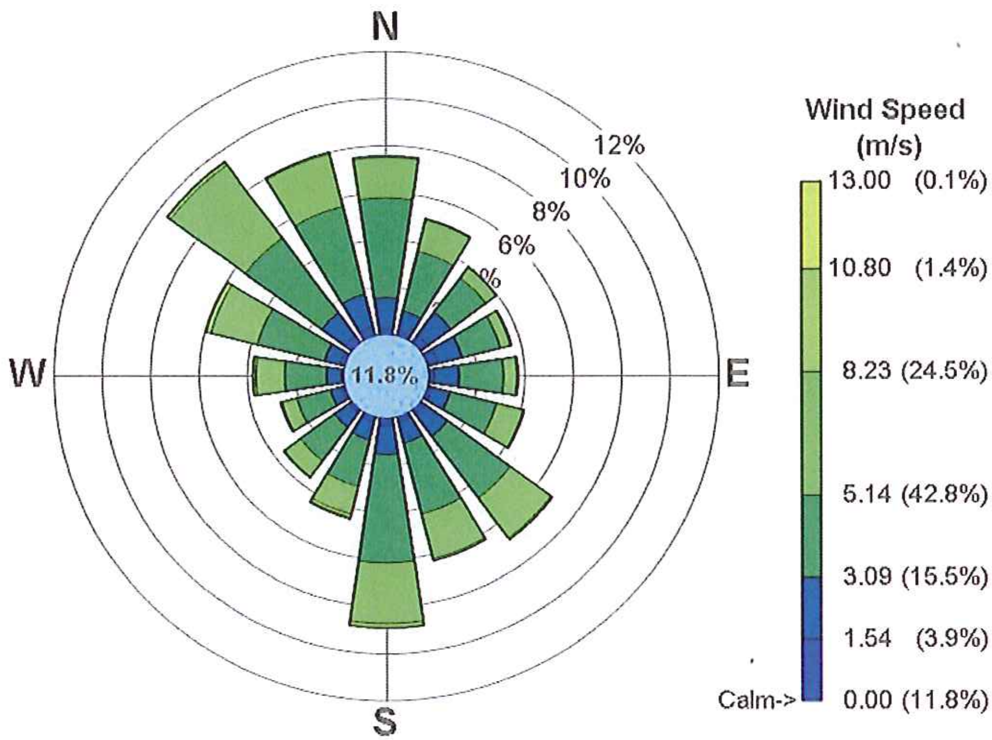
Meteorological Data

1972 Wind Data



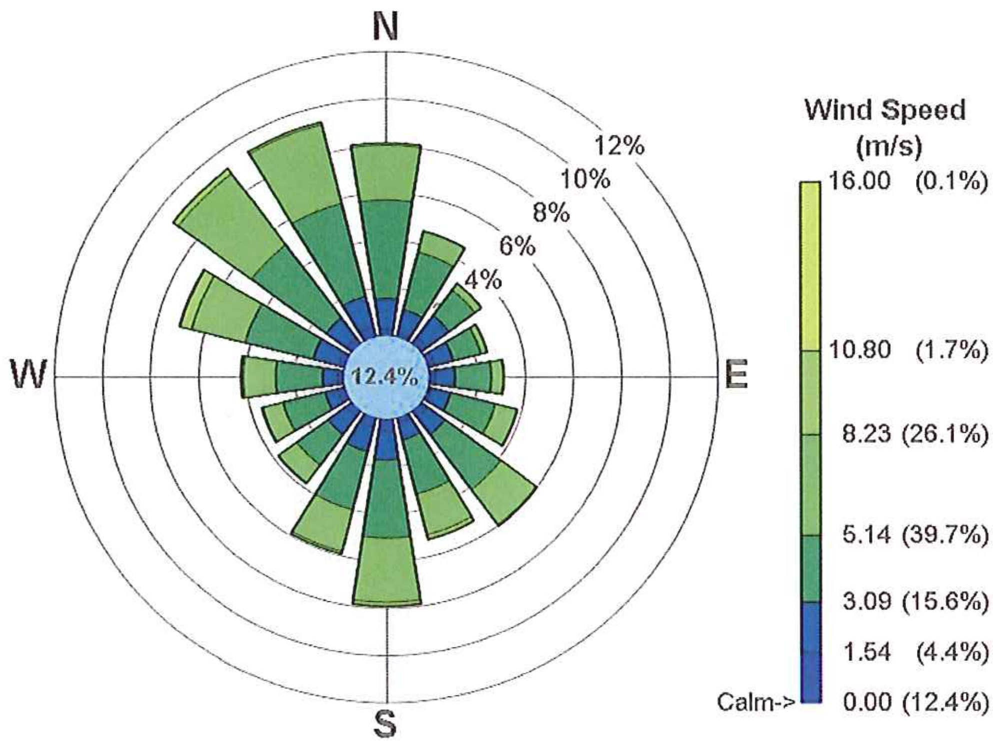
Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.27	1.68	3.93	1.26	0.06	0.00	7.21
22.5	0.15	1.00	2.35	0.90	0.01	0.00	4.41
45.0	0.23	1.37	1.91	0.88	0.02	0.00	4.41
67.5	0.30	0.94	0.85	0.27	0.05	0.00	2.41
90.0	0.23	0.84	1.04	0.63	0.09	0.01	2.83
112.5	0.10	0.76	1.37	0.75	0.08	0.00	3.06
135.0	0.20	1.39	2.83	1.02	0.05	0.02	5.52
157.5	0.31	1.15	2.80	1.67	0.09	0.00	6.02
180.0	0.38	1.64	4.35	2.27	0.10	0.00	8.73
202.5	0.18	1.23	3.46	1.33	0.11	0.00	6.32
225.0	0.23	0.98	1.90	1.00	0.06	0.00	4.17
247.5	0.14	0.77	1.45	0.34	0.07	0.00	2.77
270.0	0.20	0.80	1.79	0.87	0.15	0.01	3.81
292.5	0.25	0.85	2.40	1.82	0.33	0.03	5.69
315.0	0.22	1.09	4.71	3.68	0.43	0.07	10.20
337.5	0.20	1.59	4.55	2.40	0.23	0.00	8.98
Total	3.59	18.10	41.69	21.10	1.92	0.15	86.54
Calms							13.46
Missing							0.00
Total							100.00

1973 Wind Data



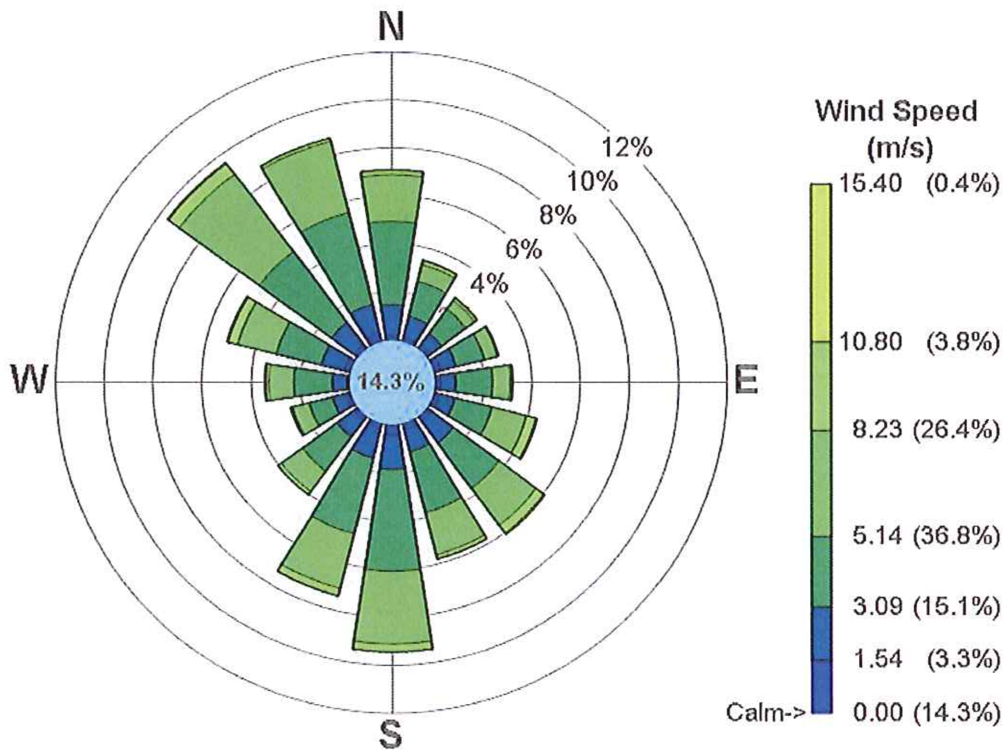
Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.21	1.34	4.24	1.74	0.05	0.00	7.56
22.5	0.21	0.86	2.61	1.37	0.03	0.00	5.08
45.0	0.38	1.21	1.82	0.55	0.02	0.00	3.97
67.5	0.43	1.05	1.64	0.43	0.05	0.00	3.61
90.0	0.21	1.05	1.86	0.55	0.06	0.00	3.72
112.5	0.18	0.78	2.00	1.14	0.05	0.00	4.14
135.0	0.26	1.13	3.25	2.11	0.08	0.00	6.84
157.5	0.23	0.91	3.09	1.96	0.08	0.00	6.28
180.0	0.32	1.21	4.60	2.58	0.19	0.00	8.90
202.5	0.19	0.81	2.02	1.22	0.15	0.06	4.45
225.0	0.14	0.78	1.77	0.84	0.03	0.00	3.56
247.5	0.15	0.47	1.45	0.65	0.06	0.01	2.79
270.0	0.09	0.61	1.78	1.18	0.13	0.00	3.78
292.5	0.18	0.67	2.90	2.00	0.21	0.00	5.96
315.0	0.35	1.20	3.97	3.86	0.15	0.02	9.55
337.5	0.38	1.43	3.84	2.31	0.06	0.00	8.00
Total	3.90	15.49	42.84	24.49	1.38	0.09	88.20
Calms							11.80
Missing							0.00
Total							100.00

1974 Wind Data



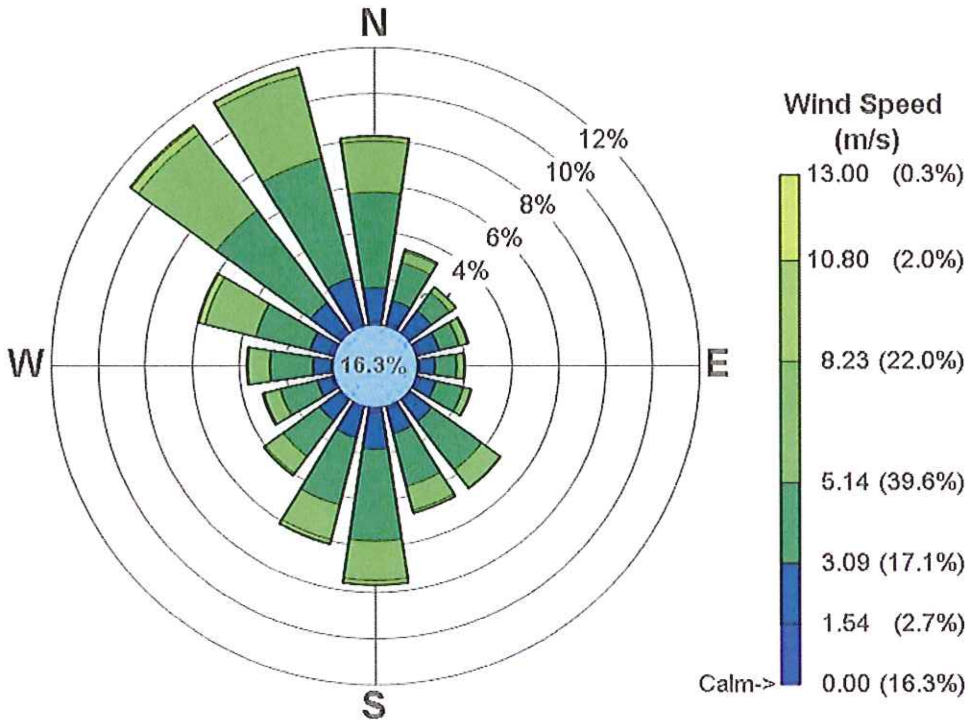
Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.24	1.30	4.17	2.34	0.08	0.00	8.13
22.5	0.16	0.99	2.51	0.89	0.01	0.01	4.58
45.0	0.31	1.15	1.34	0.33	0.01	0.00	3.14
67.5	0.26	0.82	1.18	0.26	0.01	0.00	2.53
90.0	0.21	0.86	1.51	0.50	0.00	0.00	3.07
112.5	0.14	0.82	1.91	0.94	0.01	0.01	3.82
135.0	0.31	0.92	2.88	1.85	0.06	0.01	6.03
157.5	0.19	0.75	2.34	1.78	0.19	0.02	5.29
180.0	0.48	1.23	3.30	2.72	0.17	0.02	7.92
202.5	0.38	1.07	2.53	1.83	0.10	0.00	5.91
225.0	0.29	0.95	1.61	0.91	0.05	0.00	3.80
247.5	0.30	0.55	1.77	0.89	0.03	0.01	3.55
270.0	0.22	0.65	1.93	1.32	0.09	0.02	4.24
292.5	0.25	1.10	2.89	2.31	0.48	0.03	7.05
315.0	0.29	1.05	3.85	3.77	0.25	0.00	9.20
337.5	0.40	1.34	4.05	3.45	0.10	0.00	9.34
Total	4.41	15.56	39.75	26.08	1.66	0.15	87.60
Calms							12.40
Missing							0.00
Total							100.00

1975 Wind Data



Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.18	1.27	3.47	1.95	0.19	0.01	7.08
22.5	0.15	0.90	1.50	0.72	0.17	0.01	3.45
45.0	0.15	0.61	1.27	0.45	0.13	0.01	2.60
67.5	0.26	0.68	1.19	0.56	0.05	0.00	2.74
90.0	0.19	0.65	1.51	0.73	0.10	0.02	3.21
112.5	0.22	0.68	1.55	1.47	0.42	0.07	4.42
135.0	0.22	1.14	2.34	1.92	0.41	0.07	6.10
157.5	0.24	0.95	2.60	1.82	0.18	0.01	5.80
180.0	0.39	1.44	4.25	3.04	0.33	0.00	9.44
202.5	0.19	1.27	3.24	2.35	0.32	0.01	7.39
225.0	0.16	0.88	1.79	1.04	0.16	0.00	4.03
247.5	0.15	0.59	1.00	0.67	0.08	0.01	2.51
270.0	0.07	0.61	1.58	1.02	0.14	0.05	3.45
292.5	0.23	0.99	1.87	1.63	0.39	0.05	5.16
315.0	0.16	1.16	3.68	4.02	0.55	0.06	9.62
337.5	0.30	1.27	3.95	3.06	0.14	0.00	8.71
Total	3.25	15.09	36.78	26.44	3.76	0.38	85.70
Calms							14.30
Missing							0.00
Total							100.00

1976 Wind Data



Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.14	1.46	4.13	2.22	0.19	0.02	8.16
22.5	0.16	0.97	1.67	0.50	0.08	0.01	3.39
45.0	0.19	1.00	0.97	0.28	0.00	0.00	2.45
67.5	0.16	0.85	0.84	0.35	0.06	0.00	2.27
90.0	0.10	0.66	0.88	0.32	0.02	0.00	1.98
112.5	0.20	0.67	1.15	0.34	0.01	0.00	2.38
135.0	0.11	1.09	2.58	0.98	0.03	0.00	4.80
157.5	0.14	1.08	2.35	1.08	0.11	0.01	4.77
180.0	0.20	1.59	3.97	1.71	0.19	0.01	7.68
202.5	0.23	1.18	2.98	1.55	0.18	0.03	6.16
225.0	0.10	1.05	1.94	0.90	0.09	0.02	4.10
247.5	0.11	0.64	1.61	0.69	0.07	0.01	3.13
270.0	0.09	0.76	1.81	0.97	0.05	0.00	3.68
292.5	0.20	0.84	2.38	2.24	0.28	0.05	6.00
315.0	0.24	1.39	4.97	4.14	0.38	0.08	11.20
337.5	0.30	1.83	5.35	3.75	0.28	0.01	11.52
Total	2.69	17.08	39.58	22.03	2.04	0.26	83.67
Calms							16.33
Missing							0.00
Total							100.00

Appendix D

Risk Associated with Mercury in Fish Ingestion

Calculation of Local Mercury Hazard Quotients (HQ) from Mercury Emissions from a Project
version 1.4 April 13, 2006
Direct any comments to Ed Swain edward.swain@pca.state.mn.us

Inputs are in blue and bold | Calculated Outputs are in yellow | Fixed assumptions are not colored

Facility Name: **Mesaba Energy Project (Excelsior Energy, Inc.)**

Information on the water body for which these calculations are made:

Water body name	County Name	MN DNR lake # (if available) (xx-yyyy)	Existing Ambient Fish Concentration (mg/kg Hg) **(see Note)**	Area of fishable waterbody (acres)	Area of rest of watershed (acres)
Big Diamond	**Itasca**	**31-0223-00**	**0.51**	**122**	**760**

Note: No fish data available from Big Diamond Lake. Ambient fish Hg concentration used is the highest 95% UCL calculated from fish in five lakes near Big Diamond Lake:
Swan 31-0067-00
Ox Hide 31-0106-00
Snowball 31-108-00
Lower Panasa 31-0112-00
Trout 31-0216-00
The highest concentration is from Snowball Lake.
Fish Hg from 1997 - 2007 provided by Bruce Monson (MPCA).

Mercury calculations for the increment due to project:

Hg Species	Modeled Increment to Mean Air Conc. µg/m³	Percent of each Mercury species (%)	Dep Velocity (cm/sec)	Calculated Deposition Rate (flux) µg/m²-yr	Area (acres)	Conversion factor (m² / acre)	Annual Mass deposited (µg)	Annual Mass deposited (grams)	Fraction Reaching Waterbody	Annual Mass reaching waterbody (grams)
Fishable Waterbody										
Hg(II)	**0.00E+00**	0.0%	1.10	0.00	122	4,046.9	0.0E+00	0.00	1.00	0.00
Hg(0)	**1.30E-05**	100.0%	0.01	0.04	122	4,046.9	2.0E+04	0.02	1.00	0.02
Hg-p	**0.00E+00**	0.0%	0.05	0.00	122	4,046.9	0.0E+00	0.00	1.00	0.00
Total	1.30E-05	100.0%		0.04						
Rest-of-Watershed (excluding waterbody)										
Hg(II)	**0.00E+00**	0.0%	1.10	0.0	760	4,046.9	0.0E+00	0.00	0.10	0.00
Hg(0)	**1.30E-05**	100.0%	0.05	0.2	760	4,046.9	6.3E+05	0.63	0.10	0.06
Hg-p	**0.00E+00**	0.0%	0.10	0.0	760	4,046.9	0.0E+00	0.00	0.10	0.00
Total	1.30E-05	100.0%		0.2						

Total Hg Mass Modeled to the Waterbody from Project Air Concentrations (Direct to Waterbody, plus 10% from Rest-of-Watershed) = 0.08

Mercury calculations for ambient condition (background), assuming no significant local source*:

	Deposition rate (flux) µg/m²-yr	Area (acres)	Conversion factor (m² / acre)	Annual mass deposited (µg)	Annual mass deposited (grams)	Fraction reaching waterbody	Annual mass reaching waterbody (grams)
Total deposition for the fishable waterbody	12.5	122	4,046.9	6.2E+06	6.17	1.00	6.17
Total deposition for the rest of the watershed	33.6	760	4,046.9	1.0E+08	103	0.10	10.3

Total Hg Mass Modeled to the Waterbody from Project Air Concentrations (Direct to Waterbody, plus 10% from Rest-of-Watershed) = 16.5

Mercury Loading Summary

Grams Hg to water body from project	Grams Hg to water body from background
0.08	16.5

Fish Increment

Incremental Hg in fish from project (mg/kg)
0.003

Water Quality Standard Comparison

Ambient fish Hg conc. relative to WQ STD (0.2 mg/kg)	Incremental fish Hg conc. from project relative to WQ STD
2.55	0.01

Subsistence Fisher Methylmercury Intake Calculations

Assumed daily fish consumed (kg)	Incremental daily Hg consumed (mg)	Incremental daily $HgCH_3$ consumed (mg)	Body weight (kg)	Ambient $HgCH_3$ Exposure mg/kg BW-day	Incremental $HgCH_3$ Exposure mg/kg BW-day	RfD (mg $HgCH_3$/kg bw-day)
0.142	0.0004	0.0004	70	1.11E-03	5.61E-06	1.00E-04

Subsistence Fisher Hazard Quotient

Ambient Subsistence Fisher HQ	Incremental Subsistence Fisher HQ
11.12	0.06

Recreational Fisher Methylmercury Intake Calculations

Assumed daily fish consumed (kg)	Incremental daily Hg consumed (mg)	Incremental daily $HgCH_3$ consumed (mg)	Body weight (kg)	Ambient $HgCH_3$ Exposure mg/kg BW-day	Incremental $HgCH_3$ Exposure mg/kg BW-day	RfD (mg $HgCH_3$/kg bw-day)
0.03	0.00008	0.00008	70	2.35E-04	1.19E-06	1.00E-04

Recreational Fisher Hazard Quotient

Ambient Recreational Fisher HQ	Incremental Recreational Fisher HQ
2.35	0.01

*The ambient condition is assumed to result from the following background air concentrations and deposition velocities:

Hg Species	Modeled Increment to Mean Air Conc. µg/m3	Percent of each Mercury species (%)	Dep Velocity (cm/sec)	Calculated Deposition Rate (flux) µg/m2-yr
Fishable Waterbody				
Hg(II)	2.00E-05	1.2%	1.10	6.9
Hg(0)	1.65E-03	97.6%	0.01	5.2
Hg-p	2.00E-05	1.2%	0.05	0.3
Total	1.69E-03	100.0%		12.5
Rest-of-Watershed (excluding waterbody)				
Hg(II)	2.00E-05	1.2%	1.10	6.9
Hg(0)	1.65E-03	97.6%	0.05	26.0
Hg-p	2.00E-05	1.2%	0.10	0.6
Total	1.69E-03	100.0%		33.6

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. Keetac expansion Class I air modeling input data.	Electronic input data files supplied in response to proponent's request for public 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.

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[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/m³)

Pollutant	Averaging Period	Year Evaluated			Class I Increment (μg/m³)	Class I SIL (μg/m³)	Max Impact (μg/m³)
		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/m³).

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 Results for VNP Below	9.8	8.4	29[p]	28[p]	915
		24-hour		4.1	3.7	13	12	365
		annual		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 Applicable	0.0049	Not Applicable	2.62	0.01
	Total N Depo	4.48	0.007		0.0017		4.49	0.01
	Aquatic							
	Total S Depo	2.61	0.010	Not Applicable	0.0048	Not Applicable	2.62	0.01
	S + 20% N	3.51	0.011		0.0051		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 $\mu g/m^3$).

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.

Short Elliott Hendrickson Inc., 6808 Odana Road, Suite 200, Madison, WI 53719-1137
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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 x 10^{-5}. The MPCA cancer risk guidelines suggest an upper bound of 1 additional case of cancer in a population of 100,000 (1 x 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 x 10^{-4}) when cumulative risk analyses are being conducted. Background individual lifetime cancer risk is 3 x 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.

<u>East Range – Hoyt Lakes, Minnesota</u>

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 6×10^{-10} to 4×10^{-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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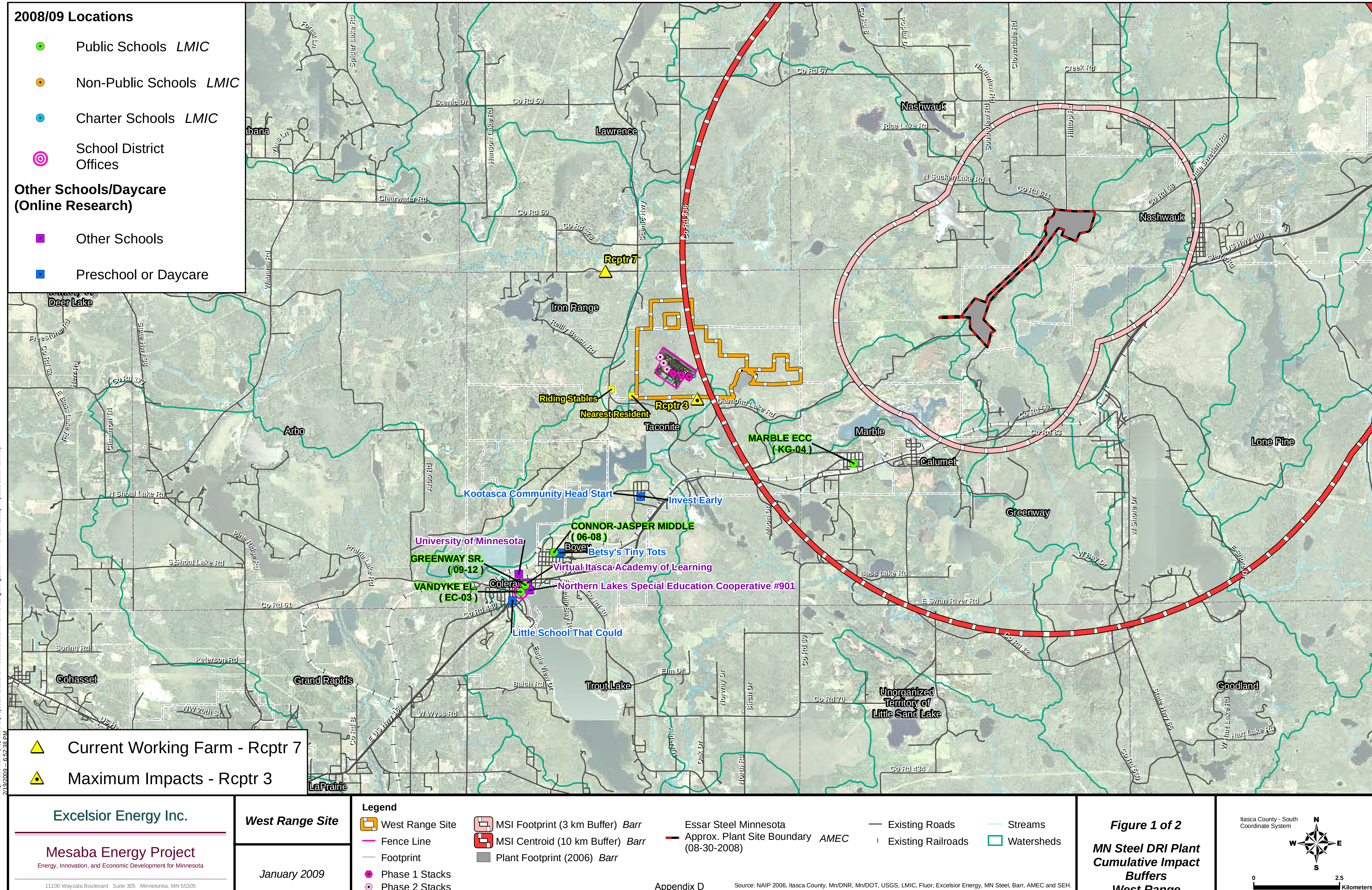
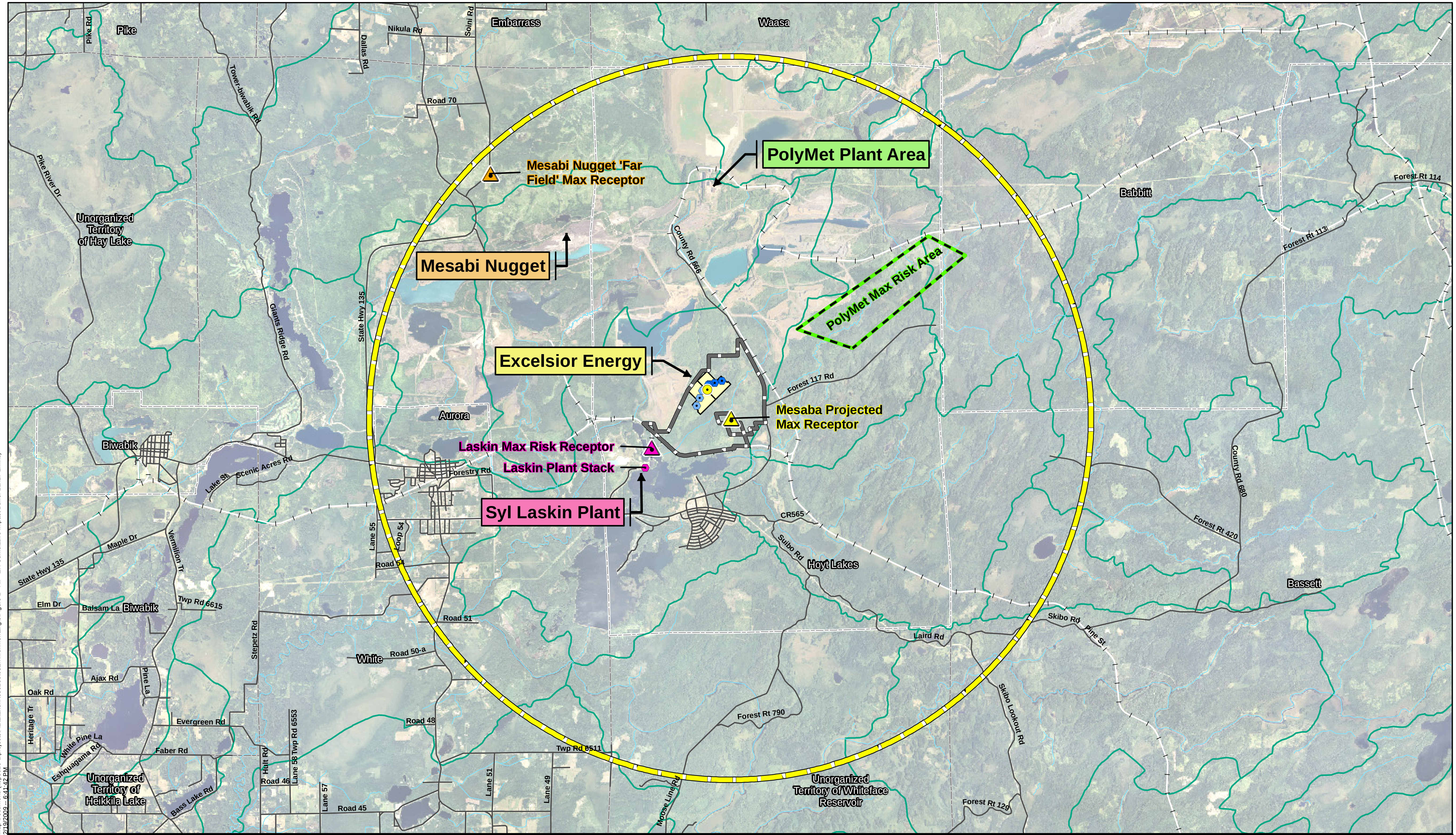

2008/09 Locations
Public Schools LMIC
Non-Public Schools LMIC
Charter Schools LMIC
School District Offices
Other Schools/Daycare (Online Research)
Other Schools
Preschool or Daycare
Current Working Farm - Rcptr 7
Maximum Impacts - Rcptr 3
Rcptr 7
Rcptr 3
Riding Stables
Nearest Resident
Iron Range
Taconite
Lawrence
Nashwauk
Marble
Calumet
Greenway
Lone Pine
Arbo
Bovey
Coleraine
Grand Rapids
Cohasset
Trout Lake
Goodland
LaPrairie
Deer Lake
Unorganized Territory of Little Sand Lake
MARBLE ECC (KG-04)
Kootasca Community Head Start
Invest Early
CONNOR-JASPER MIDDLE (06-08)
Betsy's Tiny Tots
University of Minnesota
GREENWAY SR. (09-12)
Virtual Itasca Academy of Learning
VANDYKE EL. (EC-03)
Northern Lakes Special Education Cooperative #901
Little School That Could
Excelsior Energy Inc.
Mesaba Energy Project
Energy, Innovation, and Economic Development for Minnesota
11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373
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 E S W
0 2.5 Kilometers



Map Document: (\\sp3020-1\projects\AE\E\Exenr\050200\03Environmental\gis\Figure 2 - Air - ER Cumulative Impact Buffer 11x17 L.mxd)
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Excelsior Energy Inc.

Mesaba Energy Project
Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

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 S W E

0 2.5 Kilometers

APPENDIX D3
Water Resources

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Cumulative Water Resources Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

SEH No. EXENR0502.03

November 2006, Revised by Excelsior Energy, February 2009

Cumulative Water Resources Effect Assessment
Mesaba Energy Project

SEH No. EXENR0502.03

Prepared for:
Excelsior Energy Inc.

November 2006, Revised by Excelsior Energy, February 2009

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196
651.490.2000

West Range

I. Introduction

The definition of terms commonly used throughout the Final EIS shall be maintained in this document.

II. Identification and description of affected watershed: Swan River.

The Swan River Watershed is located in Itasca and St. Louis Counties in Northern Minnesota and is part of the Upper Mississippi River Watershed Basin. Figure 1 shows the Swan River Watershed to a point immediately upstream of the confluence with Trout Creek, the location of the IGCC Power Station, and the location of the proposed Minnesota Steel project.

Human influences related to logging, mining, ditch construction, agriculture, dam construction, flow diversion/withdrawal, development of transportation systems, and community development have impacted streams in the Swan River Watershed, including the Swan River.

The watershed area has been altered primarily through past mining actions. The land use/cover type was modified significantly through the construction of mining related facilities and, in turn, this alteration has modified the quantity and timing of surficial runoff to the Swan River.

Impacts resulting from the Minnesota Steel Industries ("MSI") project are hydrologically upstream on the Swan River from the IGCC Power Station. The Swan River watershed study area was selected at a point sufficiently downstream of the Mesaba's impacts in order to encompass the cumulative impacts within the Swan River Watershed with respect to both the MSI project and Mesaba.

NOTE: *The Mesaba West Range Site will have an enhanced Zero Liquid Discharge (ZLD) system and would not contribute to any cumulative impact on water quality in the Swan River resulting from the discharge of wastewater from the project. There is no further discussion of water quality needed.*

III. Identify existing usage:

Existing Water Appropriation permits from surface waters in the Swan River watershed are shown in **Table 1**.

Table 1 - Existing Water Appropriation Permits for Surface Waters Near the West Range Site within the Swan River Watershed

		Permitted		Reported Pumping (Million Gallons)				
Permittee	**Resource**	**GPM**	**MG/Y**	**2000**	**2001**	**2002**	**2003**	**2004**
MDNR	Hill-Annex Tailing Basin	4500	500	ND	ND	ND	ND	70.3
MDNR	Hill-Annex Mine	7000	3416	ND	ND	621.1	1550.3	1374
Swan Lake Country Club	Oxhide Creek	540	10	4.6	8.5	9.2	8.4	5.8
City of Coleraine	Trout Lake	400	41	37	19.7	19.7	12.1	11.9

IV. Effects from new sources/appropriations

a. Quantity:

i. Mesaba One and Mesaba Two:

The Swan River is affected to the degree that Mesaba One and Mesaba Two will pump water out of the Hill-Annex Mine Pit ("HAMP") complex to the CMP instead of the DNR's current practice of pumping water from the HAMP complex to Upper Panasa Lake, which discharges to Lower Panasa Lake and ultimately the Swan River. The DNR's current NPDES permit allows for annual transfers of water from the HAMP complex at an average pumping rate of 6,500 gpm. However, because of the costs associated with pumping such volumes, seasonal freeze-ups, and pump capacity, the HAMP complex is generally dewatered for 6 months per year at a rate of 6,200 gpm (which is the pump capacity). Therefore, loss of such flow would represent the maximum possible loss of flow to the Swan River resulting from the IGCC Power Station's operations (or Minnesota Steel's operations, as discussed below). Although, the DNR has indicated its preference for maintaining some flow from the HAMP Complex to Upper Panasa Lake, such preference appears to be premised on the benefits of reducing algal blooms in Upper and Lower Panasa Lakes, not on augmenting flow in the Swan River.

The maximum water loss specified above would only occur during peak process water demand periods with both Mesaba One and Mesaba Two in operation. Smaller quantities of water are likely to be diverted from the HAMP complex for Mesaba One if the Canisteo Mine Pit yields more water than estimated and/or if above normal precipitation occurs. Excelsior's regulatory documents (the Joint Application, Environmental Supplement, NPDES Permit Application, and the Water Appropriation Permit Application) contain detailed descriptions of Mesaba One and Mesaba Two water uses and the timing of their appropriation.

As the Canisteo Mine Pit does not directly discharge to any surrounding surface waters and Excelsior has announced its intention to maintain water levels therein within a relatively narrow band (i.e., ± 2 feet), water appropriated from it will not affect the Swan River. Excelsior, via its application to the MDNR for Water Appropriation Permits, has requested to withdraw water from the Prairie River (at a point beyond MP's hydroelectric dam) and the Lind Mine Pit for use by the IGCC Power Station. Although such appropriation will reduce flows in the Prairie River downstream of the point of withdrawal, there will not be any cumulative impacts on the resource since MSI's use of water will not reduce flows to the Prairie River watershed. Furthermore, no other reasonably foreseeable projects would negatively impact flow in the Prairie River, so no further analysis of cumulative impacts on that resource is necessary.[1]

ii. Minnesota Steel Industries (MSI)

While the annual consumptive use of water from the MSI project averages 4,910 gpm[2], its impact on the Swan River would be less due to the use of groundwater inflows from existing and new mining pits. Studies done for MSI's Environmental Impact Statement concluded that the net reduction in water flows in the Swan River due to MSI would average 1,660 gpm and would rise to 2,110 gpm in dry years. While higher short-term reductions were predicted, they coincide with periods of high flow in the Swan River, and are therefore not considered to be problematic.

MSI's EIS also states that approximately 1,200 gpm of stream flow augmentation would be required during latter years of operation. The Hill Annex Mine Pit would be the preferred source, although no water appropriation permit application has yet been filed. As discussed above, the maximum impacts are still limited by the existing pumping by DNR. However, to the extent that MSI uses the water for stream augmentations, less impact is attributable to Mesaba.

iii. Nashwauk WWTF

Sanitary wastewater flows to the Nashwauk WWTF from the MSI project could be as high as 21 gpm *(Question 18.b. – MSI EAW).* The effluent would be slightly less that the influent to the WWTF.

iv. Coleraine-Bovey-Taconite WWTF

Mesaba would connect to the wastewater treatment facility for disposal and treatment of domestic wastewater. The maximum estimated increase in 24 hr-averaged flow to the treatment facility during construction would be 31 gpm during construction and 5 gpm during the operational phase of Mesaba Phase I and II. The effluent from the WWTF would be slightly less than the influent.

Due to inflow and infiltration in the existing collection system, sewage bypasses and excess flows relative to the design limit of the treatment plant sometimes occur during times of heavy precipitation or thaw. Excelsior will seek to rehabilitate the collection system or enlarge the pumps to mitigate this situation.

v. Total: Compare to flow of Swan River.

From the above analysis, the maximum short-term cumulative reduction in flow is approximately 8,300 gpm. This is primarily based on MSI's dry-year reductions and the elimination of DNR's pumping from Hill Annex at maximum summer rates. For annual average flows, the maximum cumulative reduction would be approximately 4,800 gpm. This is primarily based on MSI's normal-year reductions and the elimination of DNR's highest annual pumping from Hill Annex.

---

[1] The MDNR has proposed to keep levels in the Canisteo Mine Pit from rising above 1,313 ft msl by creating an overflow that would ultimately divert pit waters to the Prairie River, augmenting flows therein until the IGCC Power Station commences commercial operations and begins to reduce surface water levels in the Pit below 1,313 ft.

[2] Minnesota DNR and US Army Corps of Engineers. "Minnesota Steel Final Environmental Impact Statement." June 2007. Available: http://www.dnr.state.mn.us/input/environmentalreview/minnsteel/index.html.

The historic mean flow of the Swan River is 29,000 gpm (USGS gage data for the period 1965-1990). However, significant mining has taken place within the watershed during the period of record, which could commensurately cause unnaturally high or low flows to be measured in the river as a result of dewatering and stream augmentation practices conducted.

East Range

I. Identification and description of affected watershed: Partridge River.

The Partridge River Watershed is located in St. Louis County in Northern Minnesota. The Partridge River watershed is part of the St. Louis River and Lake Superior Watershed Basin. Figure 2 shows the Partridge River Watershed to a point approximately 5 miles downstream of the confluence with First Creek. The Mesaba Energy Project, Mesabi-Nugget, and PolyMet Projects are located within the watershed study area.

Human influences related to logging, mining, ditch construction, agricultural activity, dam construction, flow diversion / withdrawal, development of transportation systems, and community development activities have impacted streams in the area, including the Partridge River.

The contributing watershed area of the Partridge River has been primarily altered through several past mining actions. The land use / cover type was modified significantly through the construction of mining related facilities and, in turn, this alteration has modified the quantity and timing of surficial runoff to the stream.

Lake levels in Colby Lake are augmented with water from Whitewater Reservoir, which also has impacts on the natural flow regime within the Partridge River.

Impacts resulting from the PolyMet project are hydrologically upstream of the Partridge River from Mesaba. The Mesabi-Nugget project is relatively close to the Mesaba Energy Project and shares some of the same sub watersheds. The Partridge River watershed study area was selected at a point downstream of Mesaba's impacts in order to encompass the cumulative impacts within the Partridge River Watershed with respect to the Mesaba Energy Project, Mesabi-Nugget, and PolyMet.

NOTE: *The Mesaba East Range Site will have an enhanced Zero Liquid Discharge (ZLD) system and would not contribute to any cumulative impact on water quality in the Partridge River resulting from the discharge of wastewater from the project. There is no further discussion of water quality needed.*

II. Identify existing usage:

Existing Water Appropriation permits for surface waters in the Partridge River Watershed are shown in **Table 2**.

Table 2 - Existing Water Appropriation Permits for Surface Waters Around East Range Site within the Partridge River Watershed[3]

		Permitted		Reported Pumping (Million Gallons)				
Permittee	**Resource**	**GPM**	**MG/Y**	**2000**	**2001**	**2002**	**2003**	**2004**
MP & Cliffs Erie LLC	Colby Lake	12000	6307	2945.7	69.2	ND	ND	ND
MP	Colby Lake	100500	50000	71.4	60.4	63.4	96.1	117.2
MP	Colby Lake	100500	50000	23851.7	24061.7	24261.9	24132.9	22458.9
MP	Colby Lake	100500	50000	21734.0	24133.9	24185.4	24132.9	23541.8
MP	Colby Lake	105000	50000	51.1	4.0	3.4	0.0	21.1
MP	Colby Lake	105000	50000	4.3	41.6	28.8	0.1	0.4
MP	Colby Lake	100500	50000	17.3	0.1	ND	ND	ND
MP	Colby Lake	105000	50000	474.0	516.4	523.6	525.5	525.1
City of Hoyt Lakes	Colby Lake	1050	160	123.1	116.4	120.4	122.8	120.4
City of Hoyt Lakes	Partridge River		4	2.4	1.8	1.7	2.2	1.5
Cliffs Erie LLC		3600	1155	1055.4	ND	ND	ND	ND
Cliffs Erie LLC		3600	1155	ND	ND	ND	ND	ND
Cliffs Erie LLC		3600	1155	ND	ND	ND	ND	ND
Cliffs Erie LLC		1500	551	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	1860.2	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
City of Aurora		1020	160	73.7	74.7	81.8	106.5	93.4
Cliffs Erie LLC		5000	788	ND	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	316.9	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	ND	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	ND	ND	ND	ND	ND
Cliffs Erie LLC		3000	1050	ND	ND	ND	ND	ND
Cliffs Erie LLC		3000	1050	1807.2	ND	ND	ND	ND

[3] Minnesota DNR. Permit Information Report, created August 25, 2008. See : http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/index.zip

III. Effects from new sources/appropriations

a. Quantity:

i. Mesaba:

Pits 3 and 5N discharge water to small streams, which flow to the Upper Partridge River, and the Stephens and Knox pits discharge water to small streams that flow to the Lower Partridge River. The Upper Partridge River is defined as the portion of the river upstream of Colby Lake and the Lower Partridge River is the stream reach downstream of the lake.

Pits 3 and 5N currently contribute an estimated mean flow to the Upper Partridge River of 1,100 gpm, which would potentially be eliminated if the water is used by Mesaba.

The Stephens and Knox pits contribute an estimated mean flow of 435 gpm to the Lower Partridge River, which would potentially be eliminated if the water is used by Mesaba.
The water sources that would be used for Mesaba are shown in **Table 3**.

Table 3 - Water Source Supply Capability

Water Source (Pits)	**Est. Range of Flow (gpm)**	**Currently Discharging (yes/no)**	**Assumed Sustainable Flow for Water Balance Modeling (gpm)**
2E	ND	N	112
2W	ND	N	898
2WX	ND	N	673
6	ND	N	1,795
Source: MDNR East Range Hydrology Report	Sub-Total		**3,478**
3	150–450	Y	300
5N	800[1]	Y	800[1]
9 / Donora	130–380	N	260
9S	90–270	N	180
Stephens	190–590	Y	390
Knox	20–70	Y	45
Source: Surface Water Modeling[2]	Sub-Total		**1,975**
Mesabi Nugget Discharge	1000	N	**1,000**
Source: MPCA NPDES Discharge Permit			

[1]Personal communication Jim Scott, representing PolyMet, to Robert Evans, July 3, 2008.
[2]Excelsior estimated the range of flow based only on the surface drainage area to the pit and average yearly rates of runoff. This represents a first order approximation and the actual flow rates are likely much more dependent on groundwater components. The groundwater inflow/outflow component in this area can be highly variable as a result of fractures in the bedrock and/or highly pervious tailings dikes. Due to the complexity associated with the groundwater component, groundwater inflow/outflow has not been evaluated.

ii. PolyMet

PolyMet will not appropriate water directly from the Partridge River, but it may appropriate water from Colby Lake. Since PolyMet would not directly appropriate water from the Partridge River, there would be no direct impacts on stream flow in the river. PolyMet may have some indirect impacts on the stream flow in the Partridge River by cutting off a portion of the runoff to the river and dewatering of the mine pit which could cause a localized drop in the groundwater levels. This impact has not been quantified.

According to the MDNR, PolyMet may need to appropriate as much as 4-8,000 gpm from Colby Lake, but this is a moving target at this time. PolyMet will reportedly employ a Zero Liquid Discharge system, so it would not contribute any new discharges of water to the system.

iii. Mesabi-Nugget

A water appropriation permit has been issued to Mesabi-Nugget. The permit from the MDNR allows Mesabi-Nugget to pump up to 5,000 gpm from Pit 1 and Pit 2WX would be used as a standby source with a permitted appropriation of 5,000 gpm. However, actual average required use is much lower. Pit 2WX does not currently discharge to surface waters. According to water flow records, Pit No. 1 has a base discharge of approximately 3,300 gpm[4] to Second Creek, which subsequently flows to the Lower Partridge River. This would be reduced or eliminated by Mesabi Nugget's use and by Mesaba's potential use of dewatering and wastewater flows from Mesabi Nugget.

Mesabi Nugget is planning a mining project that would use additional water, but specific consumption information is not available at this time.

iv. Hoyt Lakes POTW

At this time, there are no reasonably foreseeable expansions to the Hoyt Lakes POTW. However, Mesaba would connect to the Hoyt Lake wastewater collection and treatment system. The current system discharges to Colby Lake, and additional effluent from the treatment facility would have negligible effects on the Partridge River flows.

The maximum estimated increase in flow to the treatment facility during construction would be 31 gpm during construction and 5 gpm during the operational phase of Mesaba Phase I and II. The effluent would be slightly less than the influent.

v. Total: Compare to low-flow of Partridge River.

Low, average, and high flow estimates for the Upper Partridge River are shown in Table 17-1 of the PolyMet EAW. Low flows are estimated to be in the range of 320-835 gpm, average flow is estimated at 17,500 gpm, and high flows are estimated at 156,000-161,000 gpm. The total maximum flow that Mesaba could remove from the Upper Partridge River could be up to 1,100 gpm.

The total maximum flow that Mesaba and Mesabi Nugget could remove from the Lower Partridge River during low flow conditions could be as much as 3,735 gpm downstream of Second Creek. This is not cumulative with removals from the Upper Partridge River during low

[4] Email communication from Bill Johnson, Minnesota DNR, Feb 20, 2009.

flow conditions, because the water level (and hence outflow) of Colby Lake, which separates the two rivers, is controlled according to existing permits. Currently, a number of different entities appropriate water from Colby Lake. Minnesota Power is required to augment lake levels in Colby Lake by pumping from Whitewater Reservoir and a minimum allowable lake level has been established. When the lake level is at its minimum, flow out of the lake to Lower Partridge River (upstream of Second Creek) is also at its minimum, which is approximately 13 cfs. This means that flows on the Lower Partridge River should never fall below 13 cfs or 5,835 gpm.

The maximum total estimated amount of water that PolyMet and Mesaba could appropriate from Partridge River (Colby Lake) would be determined by the MDNR, and determining precise appropriations and cumulative impacts of all potential projects is difficult at this time, due to the uncertainty of the status and design of each project. The Colby Lake water levels would still be expected to be augmented from Whitewater Reservoir. As discussed in the EIS, Mesaba may use an average of 1,300 gpm from Colby Lake, and peak use could reach 4,300 gpm. Combined with PolyMet's potential use and Mesaba's potential appropriation from Upper Partridge River, total potential short-term use could reach 13,400 gpm, although this would represent a worst case scenario where mine pit storage is unable to reduce short-term appropriation rates. This rate is lower than the historical short-term permit limit of 15,000 gpm for the LTV mine. Minnesota Power has historically appropriated approximately 90,000 gpm from Colby Lake for once-through cooling of its Laskin Energy Center, which is not expected to contribute significantly to water consumption.

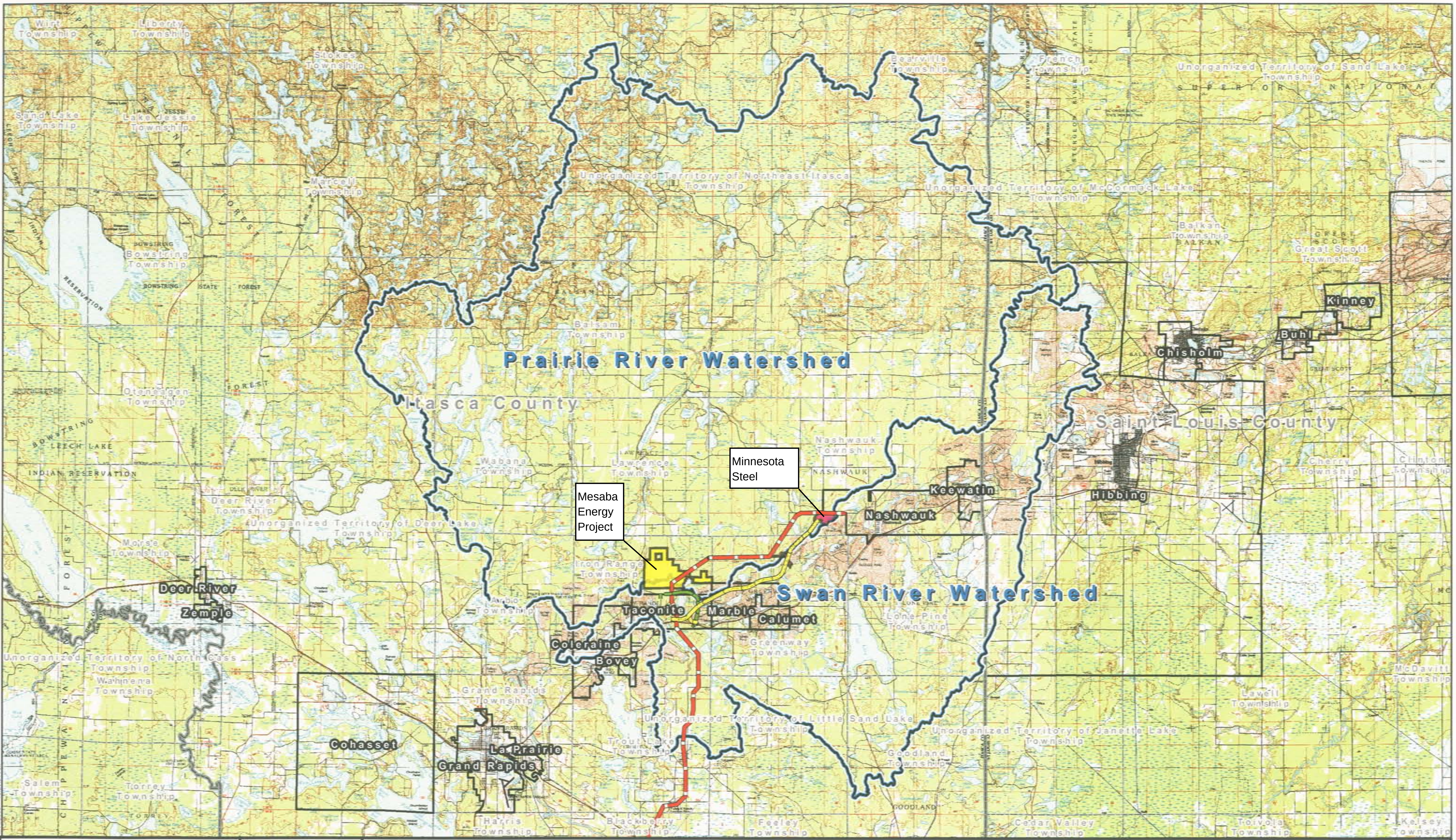
If Colby Lake levels are maintained above minimum levels, fluctuation could occur in Whitewater Reservoir. During historical periods when maximum appropriations from Colby Lake occurred, transfers of water from the reservoir caused short term water level fluctuations therein of up to 5-10 feet. Such water fluctuations could have adverse effects on fish populations, however, fish populations and sizes have generally increased since stocking began, and LTVSMC operated during most of that period of time.[5] Boat access and property values may also be affected.

Reportedly, water losses through leaky dikes in Whitewater Reservoir are estimated to be on the order of 9,000 gpm when water in the reservoir is at high levels.[6] An option for mitigating such fluctuations would be to repair its leaky dikes allowing for water in the reservoir system be more effectively stored. This would allow both Colby Lake and Whitewater Reservoir to be maintained at higher levels, and may allow for Whitewater Reservoir levels to be controlled through the overflow outlet to the St. Louis River, rather than leaving the lake through leakage and required pumping into Colby Lake. Any credit ultimately ascribed to recovering waters leaking from Whitewater Reservoir would be required to be supported by in-depth studies conducted in conjunction with input from the MDNR.

References
Minnesota Department of Natural Resources. "Water Appropriation Permit Index." 2001-2005. Available: http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/idxloc.pdf.

Attachments
Figure 1: Swan River Watershed
Figure 2: Partridge River Watershed
Table 17-1 – PolyMet EAW

[5] Personal communication with Joe Geiss of the MDNR, May 15, 2008.
[6] Id.



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

West Range

November 2006

Reasonable and Foreseeable Actions

Legend

- Swan River Watershed
- Prairie River Watershed
- Excelsior Energy West Range Site
- MN Steel DRI Plant Site
- Nashwauk Gas Pipeline
- Itasca County Road 7 Realignment
- Itasca County Rail Alignment
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, MN Steel, City of Nashwauk and SEH.
© 2006 SEH

Appendix D

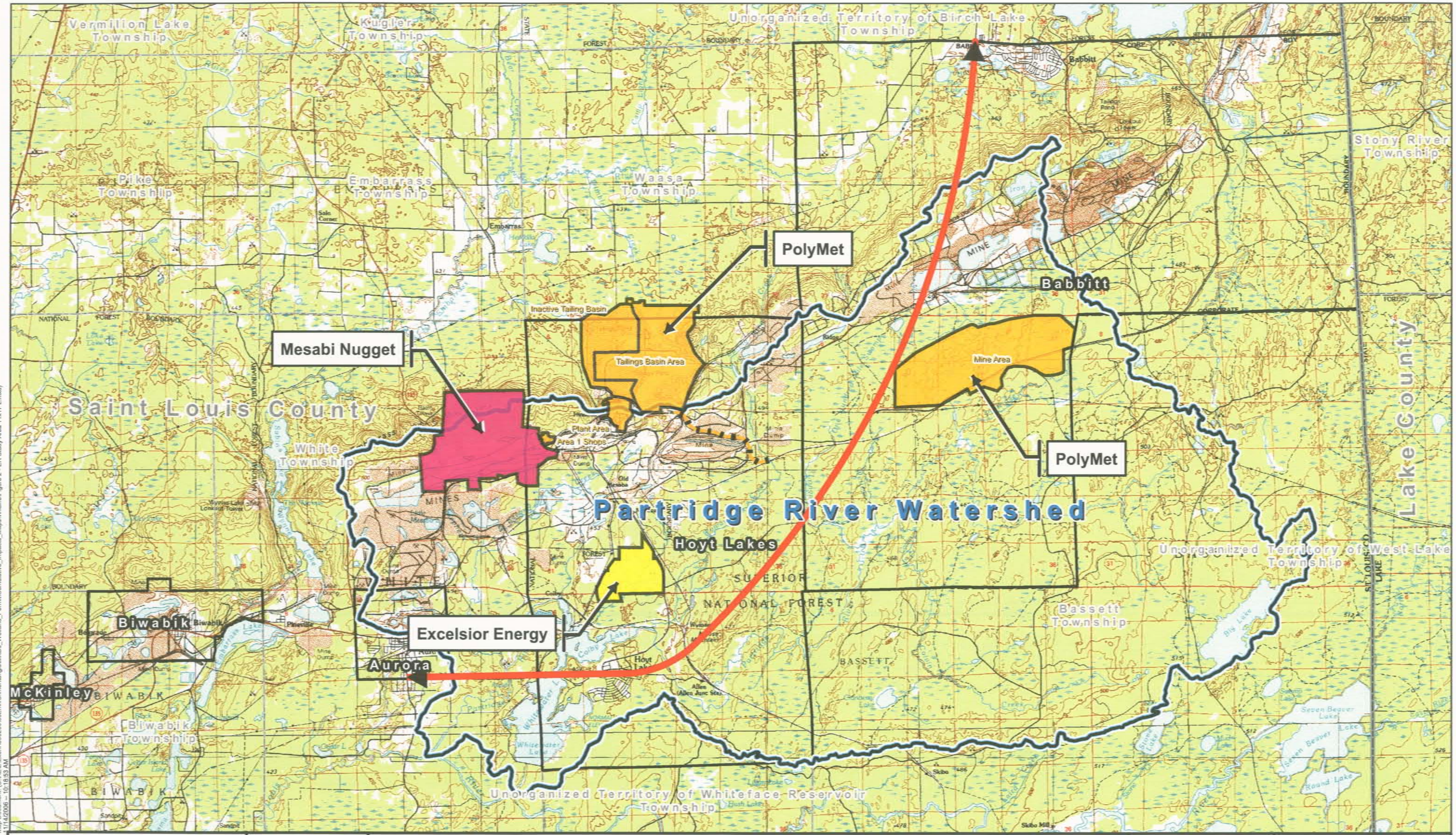
Figure 1

West Range Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 5 Miles



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

East Range

November 2006

Legend

Reasonable and Foreseeable Actions

- Partridge River Watershed
- Excelsior Energy East Range Site
- Mesabi Nugget Plant Site
- PolyMet Sites
- PolyMet Rail Construction
- St. Louis County New Hoyt Lakes to Babbitt Connection
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, and SEH.
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Figure 2

East Range Study Area

UTM, Zone 15, Meters NAD83

N E S W

0 2 Miles

Appendix D

Table 17-1 (of PolyMet EAW) – Calculated Low, High, and Average Flow Statistics for Ungauged Portions of the Partridge River

Location	Drainage Area (mi^2)	Low Flow – 7Q10 (cfs)		High Flow – Q2 (cfs)		Average Flow
		Brooks and White	Siegel and Ericson	Siegel and Ericson	This study	Siegel and Ericson
PU-1 without Pit B Area	10.8	0.23	0.05	90	57	6
PU-1 with Pit B Area	14.4	0.33	0.08	114	78	9
PU-2 without Pit B Area	20	0.49	0.13	149	111	13
PU-2 with Pit B Area	23.6	0.61	0.17	171	132	15
PU-3 without Pit B Area	54.4	1.71	0.65	340	325	37
PU-3 with Pit B Area	58	1.86	0.72	358	348	39

Appendix D

APPENDIX D4
Wetlands

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Cumulative Wetland Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

SEH No. EXENR0801.00

November 13, 2006
Revised – June 5, 2007
Revised – November 25, 2008

Prepared for Excelsior Energy
Cumulative Wetland Effect Assessment
Mesaba Energy Project

SEH No. EXENR0801.00

Prepared for:
Excelsior Energy

November 13, 2006
Revised – June 5, 2007
Revised – November 25, 2008

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196
651.490.2000

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Cumulative Wetland Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

1.0 Introduction

This assessment of cumulative impacts to wetlands has been prepared on behalf of Excelsior Energy for the proposed Mesaba Energy Project and to assist the federal and state agencies in the preparation of the environmental impact statement (EIS).

The Department of Energy (DOE) National Energy Technology Laboratory (NETL) is required by the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321, *et seq*.), the Council on Environmental Quality NEPA regulations (40 Code of Federal Regulations [C.F.R.] Parts 1500-1508), and the DOE NEPA regulations (10 C.F.R. Part 1021) to prepare an EIS as part of its participation in the Mesaba Energy Project.

Similarly, under the Power Plant Siting Act (PPSA) (Minnesota Statutes §§ 116C.51-.697) a site permit from the Public Utilities Commission (PUC) is required to build a large electric power generating plant (LEPGP), including preparation of a State EIS. The EIS requirements under NEPA and the PPSA are substantially similar, and DOE will prepare, in cooperation with the Minnesota Department of Commerce and the Minnesota Public Utilities Commission, a joint EIS that will fulfill the requirements of both state and federal law. The information contained in this report will be used in the preparation of that EIS.

The Minnesota Wetland Conservation Act and Section 404 of the Clean Water Act provide programs for evaluating the project-specific wetland impacts. The NEPA provides the context and carries the mandate to analyze the cumulative effects of federal actions (in this case, funding provided by the DOE). The Council on Environmental Quality (CEQ) regulations for implementing the NEPA defines cumulative effects as:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR § 1508.7).

The consideration of past, present and reasonable foreseeable future actions provide a context for assessing the cumulative impacts on the wetland resources.

2.0 Study Area

The PPSA and Applicable Rules requires definition of at least two potential sites for the proposed project, identification of which a preferred site, and justification for its preference. In compliance with these requirements, Excelsior Energy has identified two potential project sites, the West Range site and the East Range site.

The West Range site includes approximately 1,708 acres of undeveloped land within the city limits of Taconite, Minnesota in Iron Range Township as shown on **Figure 1**. The East Range site includes approximately 1,322 acres of undeveloped property located within the city limits of Hoyt Lakes, Minnesota as shown on **Figure 2**. The West Range site has been identified as the preferred location on which to construct the Mesaba Energy Project, however, final determination of the project site will be made by the Minnesota Department of Commerce and the Minnesota Public Utilities Commission under the PPSA requirements. The EIS includes a description of additional supporting project elements, including roadways, railroad, natural gas and electric transmission, required for operation of the proposed project at both alternative sites. This assessment includes evaluation of the potential wetland impacts from the preferred alternative project elements for each alternate site.

Because many of the primary functions performed by wetlands are related to the surrounding watershed, the study area for the cumulative effects assessment was defined according to the limits of the affected subwatersheds for each alternative site. The paragraphs below describe the study area for both the West Range and East Range sites. The characteristics of the study areas are described in the following sections.

2.1 West Range Site

The West Range site is located within subwatersheds on the boundary between the Swan River and Prairie River watersheds. The study area associated with the West Range site (See **Figure 3**) is defined as follows.

1) That part of the Swan River watershed upstream of the point where Holman Lake discharges to the Swan River. The Holman Lake discharge point represents the point on the Swan River affected by discharge and drainage from the West Range site.

2) That part of the Prairie River watershed upstream of Prairie Lake.

2.1.1 Swan River Watershed

The portion of the Swan River watershed considered within the study area covers approximately 114,266 acres extending from just northeast of the City of Grand Rapids to just northwest of the City of Hibbing (**Figure 3**) and then south and east. Seven small communities (Coleraine, Bovey, Taconite, Marble, Calumet, Nashwauk and Keewatin) are located along the Mesabi Iron Range that lies just south of the divide between the Swan River watershed and the adjacent Prairie River watershed to the north. These communities, along with the associated iron and ore mining that support them, represent the primary development in the study area.

Outside of the small urban areas and scattered farmsteads and rural residences, land uses in the watershed primarily consists of ore mine pits and spoil areas. The remainder of this portion of the study area is a mixture of deciduous and mixed forest and wetland. The MNDNR Census of the Land (1996) identifies the primary land cover in the watershed as gravel pits and open mines, deciduous and mixed wood forest and open water.

2.1.2 Prairie River Watershed

The portion of the Prairie River watershed considered in the study area covers approximately 285,890 acres along the same portion of the Mesabi Iron Range (**Figure 3**) but extending north and west. Because the existing communities lie primarily along the southern edge of the iron formation, there are no established communities within this area of the Prairie River watershed. Outside of widely scattered farmsteads and rural residences, land use in the watershed is primarily mixed wood and deciduous forest and wetland. The MNDNR Census of the Land (1996) identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, wetlands, and water.

2.2 East Range Site

The East Range site is located in a subwatershed of the Partridge River in St. Louis County, Minnesota. The study area of the East Range site (See **Figure 4**) is defined as point on the Partridge River approximately 5 miles downstream of the confluence with First Creek.

2.2.1 Partridge River Watershed

The portion of the Partridge River watershed considered in the study area covers approximately 88,692 acres extending from the City of Aurora northeast toward the City of Babbitt (**Figure 4**). Outside of the small urban areas of Aurora and Hoyt Lakes and widely scattered farmsteads and rural residences, land use in the watershed is primarily mining, mixed wood forest and wetland. The MNDNR Census of the Land (1996) identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, gravel pits and open mines, wetlands, and water.

3.0 Methodology

This analysis includes the evaluation of the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions. The proposed project will be evaluated along with reasonably foreseeable future actions within the study area to determine the potential for cumulative effects on wetland resources for each alternative site.

3.1 Previous Conditions (1980s)

The past condition of wetland resources in the project area is defined as the condition that existed at the time of the National Wetlands Inventory (NWI). The existing NWI data is used to represent the wetland area that existed at the time the aerial photography was flown.

3.2 Existing Conditions

Wetland areas estimated for the existing conditions were developed by compiling the following data.

1. The NWI was used to identify wetlands in most areas, particularly where additional detailed information was unavailable. However more accurate or more detailed data were used in place of NWI data where available, as described below.

2. Wetlands shown to be disturbed by mining and other development and industry were identified through interpretation of aerial photography. Where wetlands were shown to be filled or otherwise obliterated, they were removed from the "existing wetlands" data.

A "composite" wetlands layer was developed by deleting all of the NWI wetlands from the areas where additional data and/or photo interpretation show that wetlands have been impacted.

3.3 Foreseeable Future Conditions

Wetland areas estimated for future conditions were developed by defining reasonably foreseeable projects that are expected to be implemented in the future (± 20 years). In addition to identifying several project currently undergoing separate environmental assessment and permitting, potential future municipal and county highway departments projects were considered. The following table provides a summary of the projects considered reasonably foreseeable in each of the study areas. The potential effects of each project on existing wetland resources was estimated using the existing conditions wetland mapping described above and an assumed footprint of disturbance for each potential future project.

Table 1
Reasonably Foreseeable Future Actions

West Range Site Study Area	East Range Site Study Area
Minnesota Steel Industries	PolyMet Mining NorthMet Project
Nashwauk Gas Pipeline	Mesabi Nugget Phase II
Itasca County Railroad	St. Louis County – new roadway from Hoyt Lakes to Babbitt
Itasca County Highway 7 Realignment	
Keetac Mine Expansion	

4.0 Cumulative Effects Assessment

The past condition of wetland resources in the project area is represented by the resources included on the NWI. Wetland features used in this assessment were mapped as part of the NWI performed by the US Fish and Wildlife Service (USFWS) and made available in ARC/INFO format by the MNDNR GIS Data Deli. The wetland types described in this assessment utilize the Circular 39 Classification (Shaw and Fredine, 1956), a means of classifying the wetland basins of the U.S. It is composed of 20 types of which 8 are found in Minnesota. Three additional types were added into the GIS database to completely classify the Minnesota NWI wetlands into Circular 39 types. These additional classifications include Type 80 (Municipal and industrial activities, water regime), Type 90 (Riverine systems), and Type 98 (Uplands, i.e., the absence of wetland).

4.1 West Range Site

4.1.1 Past Conditions (1980s)

1.1.1.1 Swan River Watershed

The NWI data shows there are approximately 28,554 acres of wetland habitat in that portion of the Swan River watershed within the study area. At the time of the NWI, wetland habitat represented approximately 25% of the landscape within the study area. The majority of the wetland habitat was shallow open water, shrub swamp or bog. **Table 2** below provides a summary of the wetlands by wetland type. For simplification, the Circular 39 classification is used.

Table 2
Past Conditions:
Wetlands Previously in the Swan River Study Area

Wetland Type	Description	Total Wetland Area (acres)	Percent of Wetland Area	Percent of Total Area
Type 1	Seasonally flooded basin or flat	3.95	0.01%	0.004%
Type 2	Wet meadow	855.60	3.00%	0.75%
Type 3	Shallow marsh	1,347.86	4.72%	1.18%
Type 4	Deep marsh	566.36	1.98%	0.50%
Type 5	Shallow open water	6,589.87	23.08%	5.77%
Type 6	Shrub swamp	6,009.28	21.05%	5.26%
Type 7	Wooded swamp	2,318.29	8.12%	2.03%
Type 8	Bog	6,320.11	22.13%	5.53%
Type 80	Municipal and industrial activities, water regime	4,501.66	15.77%	3.94%
Type 90	Riverine systems	40.75	0.14%	0.04%
Total		**28,553.73**		**24.99%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.				

4.1.1.1 Prairie River Watershed

The NWI data shows there are approximately 100,363 acres of wetland habitat in that portion of the Swan River watershed within the study area. At the time of the NWI, wetland habitat represented approximately 35% of the landscape within the study area. As in the adjacent Swan River Watershed, the majority of the wetland habitat was shallow open water, shrub swamp or bog. **Table 3** below provides a summary of the wetlands by wetland type.

Table 3
Past Conditions:
Wetlands Previously in the Prairie River Study Area

Wetland Type	Description	Total Wetland Area (acres)	Percent of Wetland Area	Percent of Total Area
Type 1	Seasonally flooded basin or flat	627.65	0.63%	0.22%
Type 2	Wet meadow	4,171.95	4.16%	1.46%
Type 3	Shallow marsh	2,260.88	2.25%	0.79%
Type 4	Deep marsh	485.25	0.48%	0.17%
Type 5	Shallow open water	23,686.65	23.60%	8.29%
Type 6	Shrub swamp	24,659.21	24.57%	8.63%
Type 7	Wooded swamp	9,233.76	9.20%	3.23%
Type 8	Bog	34,790.63	34.66%	12.17%
Type 80	Municipal and industrial activities, water regime	230.40	0.23%	0.08%
Type 90	Riverine systems	216.40	0.22%	0.08%
Total		**100,362.78**		**35.11%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.				

4.1.2 Existing Conditions

The existing condition is represented by the "composite" wetlands layer developed from NWI data and aerial photo interpretation as described above. The following sections provide a summary of the existing wetland resources in each of the watershed study areas and a description of the wetland losses to the present.

4.1.2.1 Swan River Watershed

The existing conditions data shows there are approximately 25,058 acres of wetland habitat in that portion of the Swan River watershed within the study area. This represents a loss of approximately 3,496 acres or 12.24% of the past wetland habitat. The loss represents approximately 3% of the land cover in the study area. **Table 4** below provides a summary of the wetlands by wetland type.

Table 4
Existing Conditions:
Wetlands in the Swan River Study Area

Wetland Type	Previous Wetland Area from NWI (acres)	Wetlands Lost (acres)	Percent Lost	Remaining Area (acres)	Percent of Total Area
Type 1	3.95	0.00	0.0%	3.95	0.004%
Type 2	855.60	15.35	1.8%	840.85	0.74%
Type 3	1,347.86	168.64	12.5%	1,179.22	1.03%
Type 4	566.36	237.55	41.9%	328.81	0.29%
Type 5	6,589.87	1,105.79	16.8%	5,484.08	4.80%
Type 6	6,009.28	275.80	4.6%	5,733.49	5.02%
Type 7	2,318.29	138.85	6.0%	2,179.44	1.91%
Type 8	6,320.11	100.04	1.6%	6,220.07	5.44%
Type 80	4,501.66	1,454.08	32.3%	3,047.58	2.67%
Type 90	40.75	0.00	0.0%	40.75	0.04%
Totals	**28,553.73**	**3,496.1**	**12.24%**	**25,058.24**	**21.93%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.					

The difference between past and present wetland areas is primarily due to the effects of ore mining and establishment of small urban communities. However, the effects of mining and the related human development in this area extends back to the early 1900s when iron mining and mining camps were established as the precursors of the development seen today. There was certainly additional pre-settlement wetland habitat affected by mining and other human disturbance that was removed prior to development of the NWI and therefore prior to the time considered in the scope of this assessment.

4.1.2.2 Prairie River Watershed

The existing conditions data shows there are approximately 100,264 acres of wetland habitat in that portion of the Swan River watershed within the study area. This represents a loss of approximately 99 acres of wetland or 0.10% of the past wetland habitat. The loss represents only 0.04% of the land cover in the study area. **Table 5** below provides a summary of the wetlands by wetland type. The lesser effect of mining and related human development on the northern side of the iron formation can be seen in the smaller change in wetland loss between the two watersheds.

Table 5
Existing Conditions:
Wetlands in the Prairie River Study Area

Wetland Type	Previous Wetland Area from NWI (acres)	Wetlands Lost (acres)	Percent Lost	Remaining Area (acres)	Percent of Total Area
Type 1	627.65	0.00	0.0%	627.65	0.22%
Type 2	4,171.95	0.86	0.0%	4,171.09	1.46%
Type 3	2,260.88	2.89	0.1%	2,257.99	0.79%
Type 4	485.25	10.97	2.3%	474.28	0.17%
Type 5	23,686.65	0.37	0.0%	23,686.28	8.29%
Type 6	24,659.21	1.01	0.0%	24,658.20	8.63%
Type 7	9,233.76	1.79	0.0%	9,231.97	3.23%
Type 8	34,790.63	2.20	0.0%	34,788.43	12.17%
Type 80	230.40	78.73	34.2%	151.67	0.05%
Type 90	216.40	0.00	0.0%	216.40	0.08%
Totals	**100,362.78**	**98.82**	0.10%	**100,263.96**	35.07%

Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.

4.1.3 Mesaba Energy Project

Table 6 below provides a summary of the wetland impacts from the Mesaba Energy Project on the West Range Site. The wetland impacts shown are a summary of all wetland impacts within the defined study area. and are divided by subwatershed (Swan River and Prairie River). The table excludes temporary wetland impacts or changes in wetland type as well as wetland impacts outside of the cumulative effects study area.

Table 6
Summary of Wetland Fill Impacts
Mesaba Energy Project – West Range Site

Project Element	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Prairie River Impacts		0.04	0.004			1.51	24.19		25.744
Swan River Impacts						10.74	0.80	0.004	11.544
Total Wetland Filling	**0.00**	**0.04**	**0.004**	**0.00**	**0.00**	**12.25**	**24.99**	**0.004**	**37.29**

Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.

4.1.3.1 Swan River Watershed

Table 7 is a summary of wetland fill within the Swan River Watershed that would result from construction of the Mesaba Energy Project on the West Range Site. The table includes only those wetland impacts within the Swan River Watershed portion of the cumulative effects study area and only wetland fill impacts. The table excludes temporary wetland impacts or changes in wetland type as well as wetland impacts outside of the cumulative effects study area. The data show that construction of the proposed Mesaba Energy Project on the West Range Site would affect approximately 0.046% of the existing wetland area in the Swan River Watershed (within the study area).

Table 7
Summary of Mesaba Energy Project Wetland Impacts in Swan River Watershed

Wetland Types	Wetland Impact (acres)	Percent of Existing Wetland Area	Percent of Total Area
Type 1	0.00	0.000%	0.0000%
Type 2	0.00	0.000%	0.0000%
Type 3	0.00	0.000%	0.0000%
Type 4	0.00	0.000%	0.0000%
Type 5	0.00	0.000%	0.0000%
Type 6	10.73	0.187%	0.0094%
Type 7	0.79	0.036%	0.0007%
Type 8	0.0039	0.000%	0.0000%
Total	**11.53**	**0.046%**	**0.0101%**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.			

4.1.3.2 Prairie River Watershed

Table 8 is a summary of wetland fill within the Prairie River Watershed that would result from construction of the Mesaba Energy Project on the West Range Site. The table includes only those wetland impacts within the Prairie River Watershed portion of the cumulative effects study area and only wetland fill impacts. The table excludes temporary wetland impacts or changes in wetland type as well as wetland impacts outside of the cumulative effects study area. The data show that construction of the proposed Mesaba Energy Project on the West Range Site would affect approximately 0.026% of the existing wetland area in the Prairie River Watershed (within the study area).

Table 8
Summary of Mesaba Energy Project Wetland Impacts in Prairie River Watershed

Wetland Types	Wetland Impact (acres)	Percent of Existing Wetland Area	Percent of Total Area
Type 1	0.00	0.000%	0.0000%
Type 2	0.04	0.001%	0.0000%
Type 3	0.004	0.0002%	0.0000%
Type 4	0.00	0.000%	0.0000%
Type 5	0.00	0.000%	0.0000%
Type 6	1.51	0.006%	0.0005%
Type 7	24.18	0.262%	0.0085%
Type 8	0.00	0.000%	0.0000%
Total	**25.73**	**0.026%**	**0.0090%**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.			

4.1.4 Foreseeable Future Conditions

Reasonably foreseeable future projects in the West Range study area include:

- the proposed Minnesota Steel Industries steel plant northeast of the West Range Site,
- a new railroad to serve Minnesota Steel to be constructed by Itasca County,
- a proposed gas pipeline intended to serve Minnesota Steel and others to be constructed by the Nashwauk Public Utilities Commission,
- a proposed realignment of County Road 7 also to be constructed by Itasca County, and
- the Keetac taconite mine expansion approximately one mine northeast of Keewatin, Minnesota.

See **Figure 3** for the location of these potential future projects in relation to the Mesaba Energy Project West Range Site and the cumulative effects study area. No other reasonably foreseeable future projects were identified after consideration of potential projects by the individual municipalities in the study area and the Itasca County Highway Department.

4.1.4.1 <u>Minnesota Steel</u>

Minnesota Steel Industries, LLC proposes to reactivate the former Butler Taconite mine and tailings basin near Nashwauk and add direct-reduced iron production and steel making and rolling equipment in an integrated facility to make steel directly from Minnesota taconite ore. The MNDNR prepared an Environmental Impact Statement (EIS) for the proposed project and made their adequacy determination on August 10, 2007.

The Final EIS for the Minnesota Steel project states that an anticipated total of between 945 and 1,163 acres of wetlands and deepwater habitats will be impacted as a result of the project including: plant facilities, mining activities, tailings basin, tailings pipeline, rock and overburden stockpiling.

Table 9 provides a summary of wetland impacts as reported in the FEIS. The division of impacts between the Swan River and Prairie River watersheds is not known. The Minnesota Steel site lies on or near the division between the two watersheds, similar to the Mesaba Energy Project West Range Site. However, most of the site is believed to be located in the Swan River Watershed.

Table 9
Minnesota Steel
Summary of Wetland Impacts

	Total wetland impacts with Stage I Tailings Basin (acres)	Total wetland impacts with Alternative Tailings Basin (acres)
Type 1	10.5	10.5
Type 2	107.7	71.0
Type 3	94.3	1.1
Type 4	66.1	59.7
Type 5	222.1	99.0
Type 6	231.8	207.8
Type 7	32.1	88.3
Type 8	1.2	9.0
Deepwater	398.2	398.2
Total	**1163.1**	**944.9**
Source: Minnesota Steel Project, Final Environmental Impact Statement (MNDNR, June 2007)		

4.1.4.2 Nashwauk Gas Pipeline

The Nashwauk Public Utilities Commission (NPUC) is planning to construct a natural gas pipeline to provide operating fuel to the Minnesota Steel Industries Nashwauk Taconite Reduction Plant described above. NPUC is proposing to install a 21.5 mile high-pressure natural gas pipeline extending from the existing Great Lakes Gas (GLG) 36-inch pipeline in Blackberry Township to the City of Nashwauk as shown on **Figure 3**.

Construction of the pipeline would result in temporary and some permanent impacts to wetland habitats, although the project has yet to reach a stage in planning where wetland impacts have been assessed. **Table 10** below provides a summary of the wetland habitat identified on the NWI within an assumed 70-foot right-of-way along the proposed alignment. Although the proposed pipeline alignment uses existing rights-of-way where possible, some new ROW will be established, resulting in conversion of wetland types from shrub and forested cover to emergent.

Table 10
Wetland Impacts from Nashwauk Gas Pipeline

Wetland Type	Swan River Watershed	Prairie River Watershed
	Area in permanent ROW (acres)	
Type 1	0.00	0.00
Type 2	0.31	0.00
Type 3	1.56	2.46
Type 4	0.00	0.36
Type 5	0.00	0.00
Type 6	5.60	1.36
Type 7	2.07	5.92
Type 8	1.87	4.08
Totals	**11.41**	**14.18**
Source: Calculated via GIS using Minnesota Department of Commerce approved natural gas pipeline route.		

4.1.4.3 Itasca County Railroad

Itasca County is planning to construct a railroad spur to provide rail access to the Minnesota Steel Industries Nashwauk Taconite Reduction Plant described above. The rail spur is approximately eight miles in length extending from existing rail lines along Highway 169 in a northeasterly direction to the Minnesota Steel Industries site as shown on **Figure 3**. Construction of the railroad is expected to impact approximately 12 acres of wetland, all within the Swan River Watershed.

4.1.4.4 Itasca County Road 7 Realignment

Itasca County is also considering realignment of County Road 7 as shown on **Figure 3**. The new roadway would replace the existing County Road 7 which would become part of the entrance to the Mesaba Energy Project. This realignment would occur only if the Mesaba Energy Project was constructed at the West Range Site. If constructed the roadway would impact approximately 1.8 acres wetland area as shown in **Table 11**. All of the wetland impacts would be in the Swan River Watershed.

Table 11
Wetland Impacts from Itasca County Road 7 Realignment

Wetland Type	Wetland Impact (acres)
Table 1	0.00
Table 2	0.00
Table 3	0.00
Type 4	0.43
Table 5	0.00
Type 6	0.42
Type 7	0.55
Type 8	0.40
Total	**1.80**
Source: Calculated via GIS using Itasca County potential roadway realignment corridor.	

1.1.1.1.1 *U. S. Steel Keetac Mine Expansion Project*

U.S. Steel plans to upgrade and reopen the Phase I production line and expand the mine pit at the Keetac taconite mine and processing facility near Keewatin (see **Figure 3**) to increase taconite production. The proposed project would impact approximately 605 acres of wetland from improvements at the plant facilities, mining activities, tailings basin and stockpiling. These impacts would be in addition to approximately 72 acres of wetlands and 42 acres of deepwater habitat already permitted under previous efforts. All of the wetland impacts would be in the Swan River Watershed.

4.2 East Range Site

4.2.1 Previous Conditions (1980s)

The NWI data shows there are approximately 34,500 acres of wetland habitat in that portion of the Partridge River watershed within the study area. At the time of the NWI, wetland habitat represented nearly 39% of the landscape within the study area. The majority of the wetland habitat (over 60%) was bog. **Table 12** below provides a summary of the wetlands by wetland type.

Table 12
Past Conditions:
Wetlands Previously in the Partridge River Study Area

Wetland Type	Description	Total Wetland Area (acres)	Percent of Wetland Area	Percent of Total Area
Type 1	Seasonally flooded basin or flat	0.00	0.00%	0.00%
Type 2	Wet meadow	235.24	0.68%	0.27%
Type 3	Shallow marsh	552.30	1.60%	0.62%
Type 4	Deep marsh	308.05	0.89%	0.35%
Type 5	Shallow open water	2,847.50	8.25%	3.21%
Type 6	Shrub swamp	4,707.21	13.64%	5.31%
Type 7	Wooded swamp	4,864.80	14.10%	5.49%
Type 8	Bog	20,783.08	60.24%	23.43%
Type 90	Riverine systems	201.90	0.59%	0.23%
Totals		**34,500.08**		**38.90%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.				

4.2.2 Existing Conditions

The existing conditions data shows there are approximately 33,212 acres of wetland habitat in that portion of the Partridge River watershed within the study area. This represents a loss of approximately 1,288 acres or 3.73% of the past wetland habitat. The loss represents less than 0.5% of the land cover in the study area. **Table 13** below provides a summary of the wetlands by wetland type.

Table 13
Existing Conditions:
Wetlands in the Partridge River Study Area

Wetland Type	Previous Wetland Area from NWI (acres)	Wetlands Lost (acres)	Percent Lost	Remaining Area (acres)	Percent of Total Area
Type 1	0.00	0.00	0.0%	0.00	0.00%
Type 2	235.24	10.36	4.4%	224.88	0.25%
Type 3	552.30	39.84	7.2%	512.46	0.58%
Type 4	308.05	169.08	54.9%	138.97	0.16%
Type 5	2,847.50	314.32	11.0%	2,533.19	2.86%
Type 6	4,707.21	176.07	3.7%	4,531.15	5.11%
Type 7	4,864.80	158.71	3.3%	4,706.10	5.31%
Type 8	20,783.08	420.08	2.0%	20,363.01	22.96%
Type 90	201.90	0.00	0.0%	201.90	0.23%
Totals	**34,500.08**	**1,288.46**	**3.73%**	**33,211.66**	**37.45%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.					

As at the West Range Site, the difference between past and present wetland areas is primarily due to the effects of ore mining and establishment of small urban communities. However, the effects of mining and the related human development in this area extends back to the early 1900s when iron mining and mining camps were established as the precursors of the development seen today. There was certainly additional pre-settlement wetland habitat affected by mining and other human disturbance that was removed prior to development of the NWI and therefore prior to the time considered in the scope of this assessment.

4.2.3 Mesaba Energy Project

Table 14 provides a summary of the wetland impacts from the Mesaba Energy Project on the East Range Site.

Table 14
Summary of Wetland Impacts
Mesaba Energy Project – East Range Site

Project Element	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Wetland Fill	0.0006	1.80	0.05	5.94	0.0025	10.03	12.28	0.95	31.06
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type									

Table 15 is a summary of wetland fill within the Partridge River Watershed that would result from construction of the Mesaba Energy Project on the East Range Site. The table includes only those wetland impacts within the Partridge River Watershed portion of the cumulative effects study area and only wetland fill impacts. The table excludes temporary wetland impacts or changes in wetland type as well as wetland impacts outside of the cumulative effects study area. The data show that construction of the proposed Mesaba Energy Project on the East Range Site would affect 0.094% of the existing wetland area in the Partridge River Watershed (within the study area).

Table 15
Summary of Mesaba Energy Project Wetland Impacts
in Partridge River Watershed

Wetland Types	Wetland Impact (acres)	Percent of Existing Wetland Area	Percent of Study Area
Type 1	0.0006	0.00%	0.0000%
Type 2	1.85	0.82%	0.0021%
Type 3	0.05	0.01%	0.0001%
Type 4	5.94	4.27%	0.0067%
Type 5	0.0025	0.0001%	0.0000%
Type 6	9.98	0.22%	0.0113%
Type 7	12.30	0.26%	0.0139%
Type 8	0.95	0.005%	0.0011%
Total	**31.08**	**0.094%**	**0.0350%**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.			

4.2.4 Foreseeable Future Conditions

Reasonably foreseeable future projects in the East Range study area include:

- the mine portion of the PolyMet Mining project (excluding the processing facility),
- the Mesabi Nugget project, and
- the corridor for a new roadway between Hoyt Lakes and Babbitt as proposed by St. Louis County.

See **Figure 4** for the location of these potential future projects in relation to the Mesaba Energy Project East Range Site and the cumulative effects study area. No other reasonably foreseeable future projects were identified after consideration of potential projects by the individual municipalities in the study area and the St. Louis County Highway Department.

4.2.4.1 PolyMet Mining, Inc. NorthMet Project

PolyMet Mining Inc. proposes an open pit mine to extract copper, nickel, cobalt and precious metals by dissolution and precipitation from a low-grade mineral deposit. The project includes a new mine area and use of the currently inactive Cliffs Erie taconite processing facility. The MNDNR is currently preparing an Environmental Impact Statement (EIS) for the proposed project.

The Scoping Environmental Assessment Worksheet (SEAW) prepared for the PolyMet Mining project identifies a total of 1,257 acres of wetland that would be impacted by the proposed mining, construction of mine support facilities, rock and overburden stockpiling, and miscellaneous transportation and utility requirements during the life of the project. Preliminary evaluations indicate that approximately one-half of these wetlands are predominantly bog communities. Approximately one-fourth of the potential wetland impacts are predominantly shrub swamp communities. The remaining one-fourth of the potential wetland impacts includes a mix of wet/sedge meadows, shallow marshes, and lowland hardwood swamps.

Table 16
PolyMet Mining Corp.
Projected wetland impact summary by wetland type

Circular 39 Wetland Classification	Number of Wetlands	Area (acres)
Type 2	6	2.7
Type 2/3	8	24.5
Type 2/7	2	3.3
Type 3	4	32.5
Type 3/6	1	1.9
Type 3/7	1	2.5
Type 3/8	8	48.9
Type 6	12	100.8
Type 6/3	1	4.8
Type 6/7	7	161.5
Type 6/8	4	111.5
Type 7	15	82.5
Type 8	28	647.3
Type 8/7	1	32.0
Total	98	1,256.7
Source: NorthMet Mine and Ore Processing Facilities Scoping Environmental Assessment Worksheet (MNDNR)		

4.2.4.2 Mesabi Nugget

Mesabi Nugget, LLC (MNC) has proposed a new commercial iron production plant that would use a new process for producing high purity iron (97% metallic iron) directly from iron ore. The company has completed a small-scale pilot plant at Silver Bay and proposes a a large scale demonstration plant (LSDP) on the Ling-Temco-Vought (LTV) property near the City of Aurora (see **Figure 4**).

The MNDNR is nearly ready to initiate an Environmental Impact Statement (EIS) for the proposed project. The Scoping Environmental Assessment Worksheet (SEAW) prepared for the Mesabi Nugget project identifies a total of approximately 235 acres of wetland and 1431 acres of deepwater habitat that would be impacted by the proposed mining, construction of mine support facilities, rock and overburden stockpiling, and expansion of haul roads. **Table 17** below provides a summary of the wetland types that would be affected by the project.

Table 17
Mesabi Nugget
Wetlands within project site

Wetland Types	Wetlands Identified within Project Area (acres)
Type 1	0.00
Type 2	7.8
Type 3	28.2
Type 4	0.00
Type 5	0.00
Type 6	11.7
Type 7	157.8
Type 8	29.9
Deepwater	1431.4
Total	**1,666.8**
Source: Mesabi Nugget Phase II Scoping Environmental Assessment Worksheet (MNDNR)	

1.1.1.2 St. Louis County New Hoyt Lakes – Babbitt Connection

St. Louis County has proposed a new roadway segment, a new connection between Hoyt Lakes and Babbitt. This segment is part of a larger initiative to more efficiently link the Iron Range communities of Aurora, Hoyt Lakes, Babbitt, and Ely to enhance the potential for new industry and to help mitigate the existing economic situation in the area by developing a new tranportation corridor. To date, several alternative alignments have been identified and evaluation of those alternatives is proposed to begin in 2007. Therefore, no estimate of potential wetland impacts is available for this future project. However, it is expected that because of the extent of wetland habitat in the area, constrution of the project will result in some impact to wetlands.

5.0 Conclusions

Table 18 provides a summary of the past and present estimates of wetland habitat in the West Range study area and the area of wetland within the study area that would be filled by the proposed Mesaba Energy Project. It also includes a comparison of potential wetland impacts from other reasonably foreseeable future projects in the study area.

Table 18
Summary of Cumulative Wetland Impacts
West Range Site Study Area

	Swan River Watershed		Prairie River Watershed		Total	
	Wetland Area (acres)	Percent of Present Wetland Area	Wetland Area (acres)	Percent of Present Wetland Area	Wetland Area (acres)	Percent of Present Wetland Area
Past	28,554	---	100,363	---	128,917	---
Present	25,058	12.24% lost from past	100,264	0.10% lost from past	125,322	2.79% lost from past
Mesaba Energy Project	11.53	0.046%	25.73	0.026%	37.26	0.03%
Future Projects						
MSI	945 – 1,163*	3.77% - 4.64%*	0*	---	945 – 1,163	0.75% - 0.93%
Railroad	12	0.05%	0	---	12	0.01%
Gas Pipeline	11.41	0.05%	14.18	0.02%	25.59	0.02%
CR 7	1.80	0.007%	0	---	1.8	0.001%
Keetac Mine Expansion	605	2.41%	0	---	605	0.48%

* The vast majority of wetland impacts are known to fall within the Swan River watershed; however, a small portion of this impact may instead fall within the Prairie River watershed.

Mining and other development in the study area has impacted less than 3% of the wetlands identified on the NWI. Of those remaining, the Mesaba Energy Project would affect 0.03% of the wetlands in the study area. Most of the wetland impacts would occur in the Prairie River Watershed.

Conversely, of the reasonably foreseeable future projects, most of the wetland impacts would occur in the Swan River Watershed (within the study area). This is primarily because the existing mining and human development lies on and south of the iron formation and within the Swan River Watershed. There is little development, other than widely scattered rural residences in the Prairie River Watershed (within the study area).

Of the reasonably foreseeable future projects, the Minnesota Steel Industries project represents the greatest potential impact to wetlands in the study area and is of a magnitude 17 to 20 times greater than the Mesaba Energy Project. The Keetac Mine Expansion would have approximately half the wetland impact, but would still be more than 15 time greater than the impact from the Mesaba Energy Project.

Table 19 provides a summary of the past and present estimates of wetland habitat in the East Range study area and the area of wetland within the study area that would be filled by the proposed Mesaba Energy Project. It also includes a comparison of potential wetland impacts from other reasonably foreseeable future projects in the study area.

Table 19
Summary of Cumulative Wetland Impacts
East Range Site Study Area

	Partridge River Watershed	
	Wetland Area (acres)	**Percent of Present Area**
Past	34,500	---
Present	33,212	3.73% lost from past
Mesaba Energy Project	31.08	0.09%
Future Projects		
PolyMet	1,256.7	3.78%
Mesabi Nugget	1,666.8	5.02%
St. Louis County New Hoyt Lakes – Babbitt Connection	Unknown	---

Mining and other development in the study area has impacted less than 4% of the wetlands identified on the NWI. Of those remaining, the Mesaba Energy Project would affect 0.09% of the wetlands in the study area. Of the reasonably foreseeable future projects, the PolyMet NorthMet and Mesabi Nugget projects represent the greatest potential impact to wetlands in the study area. The PolyMet project is of a magnitude over 40 times greater than the Mesaba Energy Project. The Mesabi Nugget project is of a over 50 times greater than the Mesaba Energy Project.

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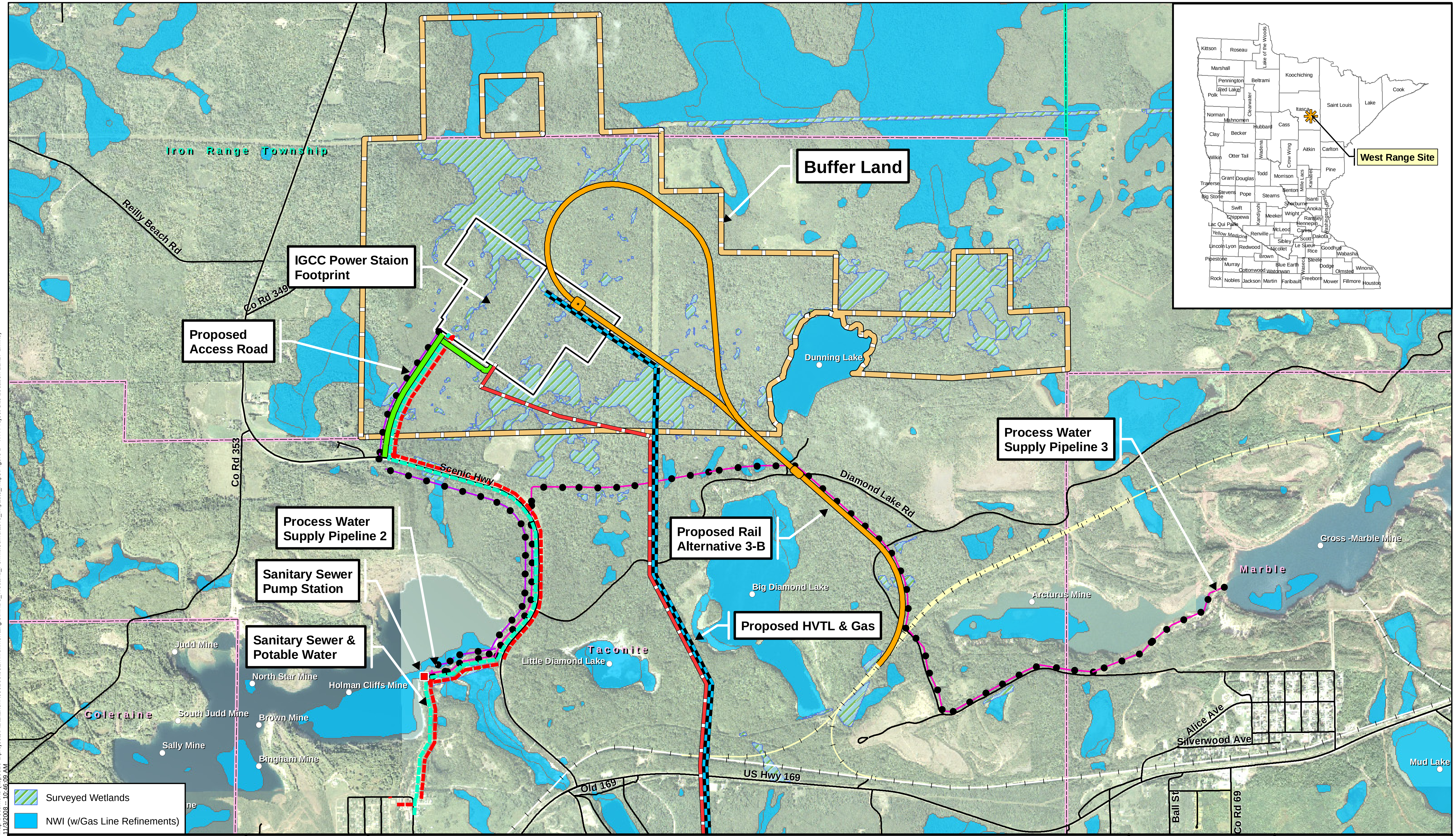
Figure 2 – East Range Site
Figure 3 – West Range Study Area
Figure 4 – East Range Study Area



Map Document: (\\sp3020-1\projects\AE\E\Exenr\0502000\03Environmental\gis\MXDs_Wetland_Permit\Cumulative_Impacts_Maps\Figure 1 - WR Project Site Location 11x17 L.mxd)
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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

- Footprint and Buffer Land
- Preferred (Shifted) Plant Building Pad
- Proposed Rail Alt 3-B
- Proposed Access Road
- Gas Pipeline
- HVTL
- Potable Water
- Gravity Sewer
- Process Water Pipeline 1
- Process Water Pipeline 3
- Process Water Pipeline 2
- Geographic Names
- Municipal Boundaries
- Civil Township
- Existing Roads
- Existing Railroads
- Railroad (In Development)

Appendix D

Source: NAIP 2006, Itasca County, USFWS, USGS, Mn\DNR, Mn/DOT, Fluor, Excelsior Energy, and SEH.

Figure 1

West Range Site Location

Itasca County - South Coordinate System

N W E S

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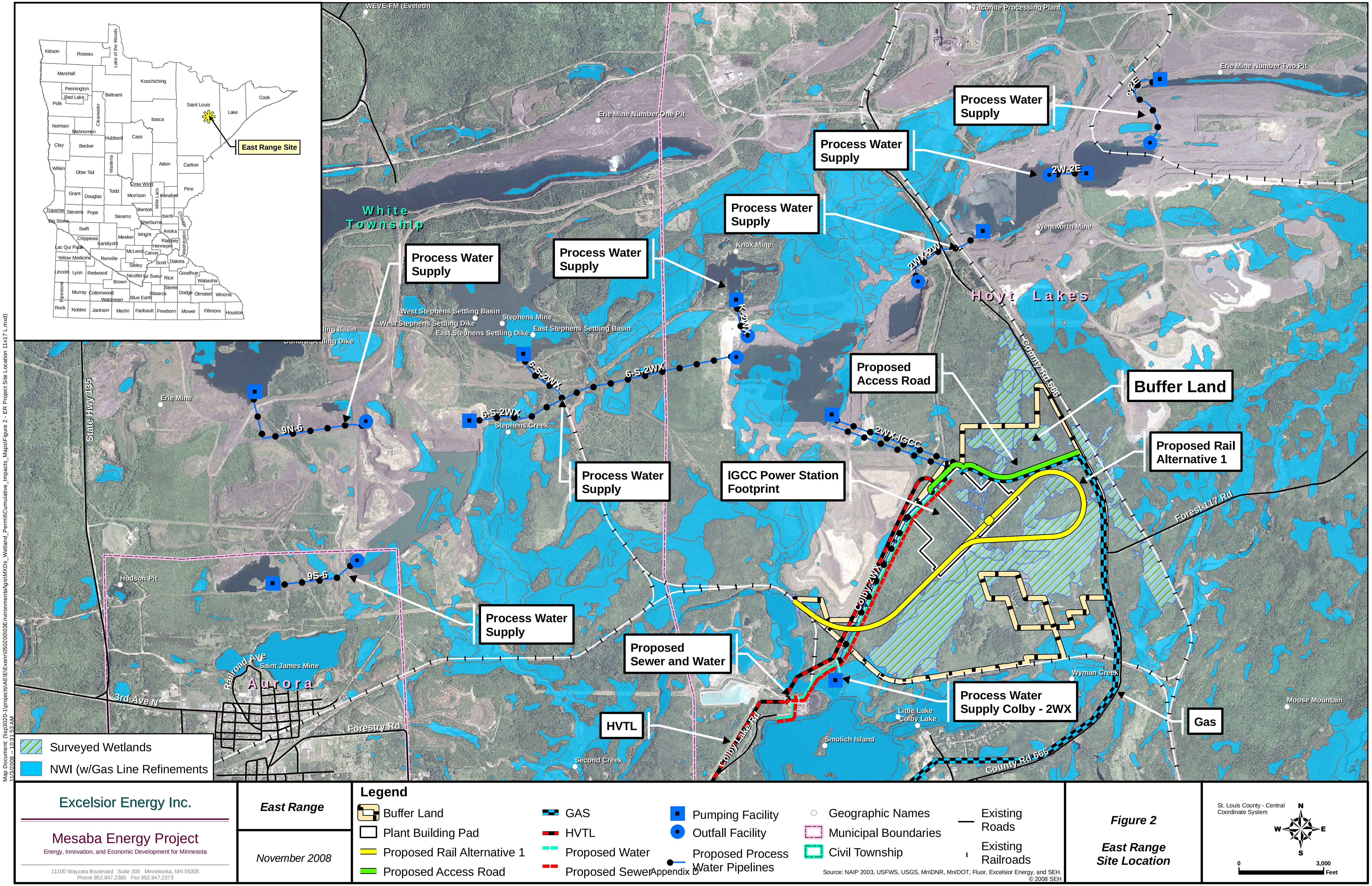

Kittson
Roseau
Lake of the Woods
Marshall
Koochiching
Pennington
Red Lake
Beltrami
Polk
Saint Louis
Cook
Lake
Clearwater
Norman
Mahnomen
Itasca
East Range Site
Clay
Becker
Hubbard
Cass
Wilkin
Otter Tail
Wadena
Aitkin
Carlton
Crow Wing
Grant
Douglas
Todd
Morrison
Mille Lacs
Kanabec
Pine
Traverse
Stevens
Pope
Big Stone
Stearns
Benton
Isanti
Chisago
Swift
Sherburne
Anoka
Chippewa
Kandiyohi
Meeker
Wright
Ramsey
Hennepin
Washington
Lac Qui Parle
Yellow Medicine
Renville
McLeod
Carver
Lincoln
Lyon
Redwood
Sibley
Scott
Dakota
Brown
Nicollet
Le Sueur
Rice
Goodhue
Wabasha
Pipestone
Murray
Cottonwood
Watonwan
Blue Earth
Waseca
Steele
Dodge
Olmsted
Winona
Rock
Nobles
Jackson
Martin
Faribault
Freeborn
Mower
Fillmore
Houston
WEVE-FM (Eveleth)
Taconite Processing Plant
Erie Mine Number Two Pit
Erie Mine Number One Pit
White Township
Process Water Supply
Process Water Supply
Process Water Supply
Process Water Supply
Process Water Supply
Process Water Supply
Process Water Supply
Process Water Supply Colby - 2WX
2W-2E
2WX-2W
Wentworth Mine
Knox Mine
Hoyt Lakes
West Stephens Settling Basin
Stephens Mine
West Stephens Settling Dike
East Stephens Settling Dike
East Stephens Settling Basin
Dunka Settling Basin
K-2WX
6-S-2WX
6-S-2WX
6-S-2WX
Stephens Creek
Erie Mine
State Hwy 135
9N-6
9S-6
2WX-IGCC
County Rd 666
Proposed Access Road
Buffer Land
Proposed Rail Alternative 1
IGCC Power Station Footprint
Forest 117 Rd
Colby-2WX
Hudson Pit
Proposed Sewer and Water
Railroad Ave
Saint James Mine
Aurora
3rd Ave N
Forestry Rd
HVTL
Colby Lake Rd
Little Lake
Colby Lake
Smolich Island
Second Creek
Wyman Creek
Gas
Moose Mountain
County Rd 666
Surveyed Wetlands
NWI (w/Gas Line Refinements)
Excelsior Energy Inc.
Mesaba Energy Project
Energy, Innovation, and Economic Development for Minnesota
11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373
East Range
November 2008
Legend
Buffer Land
Plant Building Pad
Proposed Rail Alternative 1
Proposed Access Road
GAS
HVTL
Proposed Water
Proposed Sewer
Appendix D
Pumping Facility
Outfall Facility
Proposed Process Water Pipelines
Geographic Names
Municipal Boundaries
Civil Township
Existing Roads
Existing Railroads
Source: NAIP 2003, USFWS, USGS, MnDNR, Mn/DOT, Fluor, Excelsior Energy, and SEH.
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Figure 2
East Range Site Location
St. Louis County - Central Coordinate System
N
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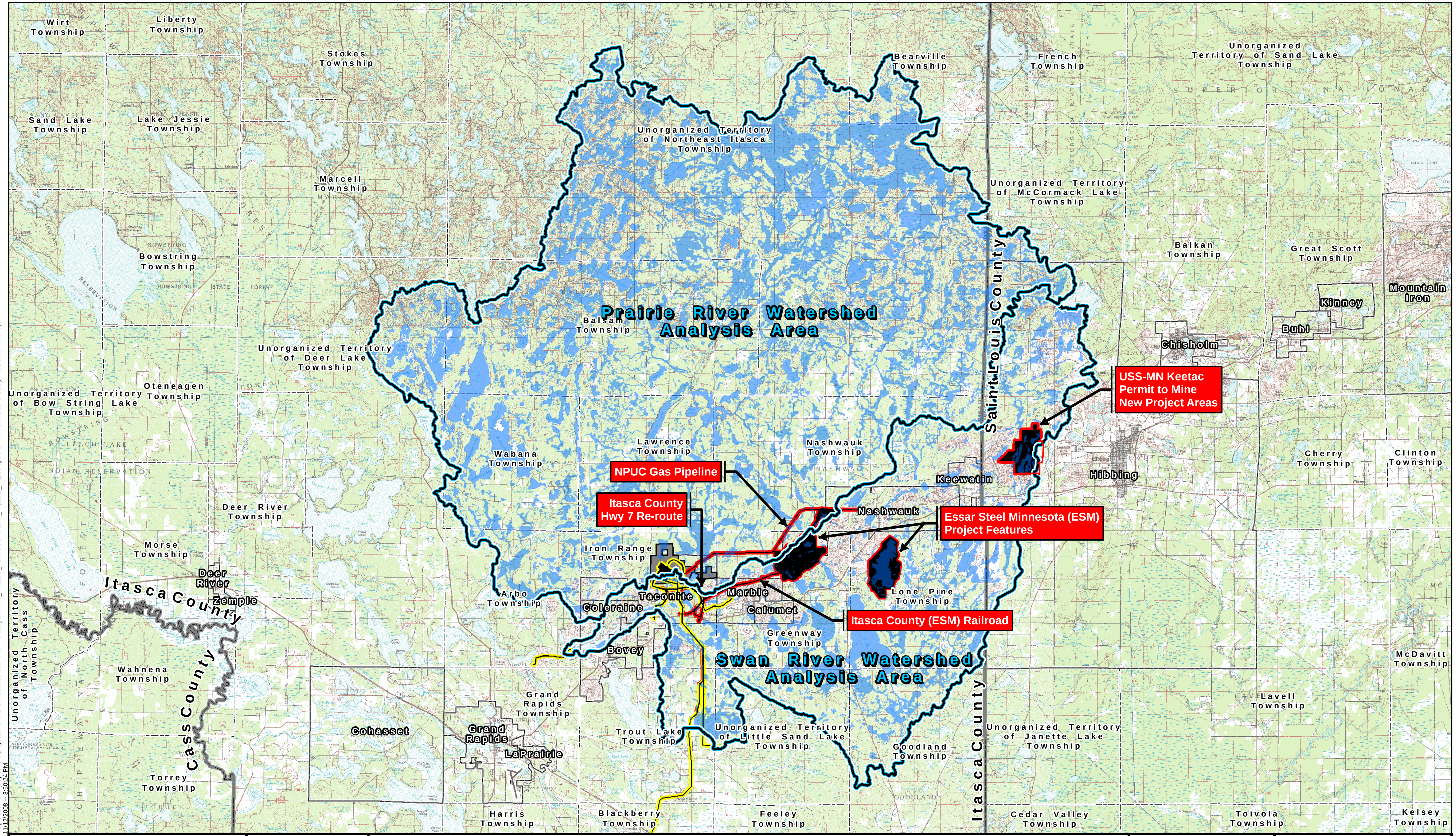
Feet



Map Document: (\\Sp3020-1\projects\AE\E\Exen\0502000\03Environmental\gis\MXDs_Wetland_Permit\Cumulative_Impacts_Maps\Figure 3 - WR Cumulative Study Area 11x17 L.mxd)
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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

- Swan River Watershed - Analysis Area
- Prairie River Watershed - Analysis Area
- NWI
- Excelsior Energy West Range Buffer Land
- Excelsior Energy West Range Footprint
- Other Reasonable & Forseeable Project Footprints
- Municipal Boundaries
- Civil Townships
- County Boundaries

Appendix D

Source: USGS, USFWS, Mn/DNR, Mn/DOT, Itasca County, Essar Steel Minnesota, Nashwauk PUC, USS-MN, Excelsior Energy and SEH.
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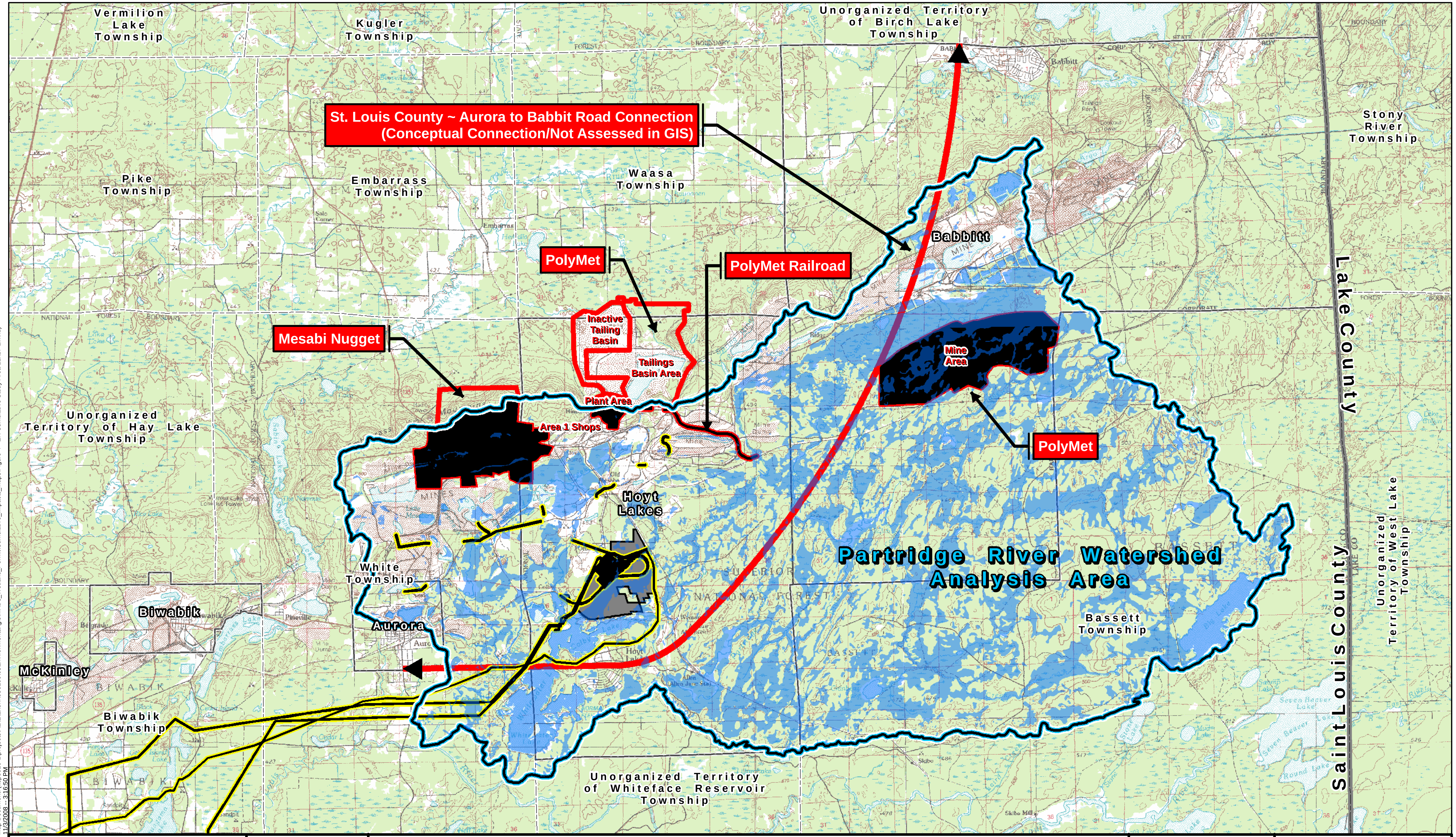
Figure 3

West Range Cumulative Impacts Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 4 Miles



Map Document: (\\sp3020-1\projects\AE\E\Exen\050200\03Environmental\gis\MXDs_Wetland_Permit\Cumulative_Impacts_Maps\Figure 4 - ER Cumulative Study Area 11x17 L.mxd)
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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

East Range

November 2008

Legend

- Partridge River Watershed - Analysis Area
- NWI
- Excelsior Energy East Range Buffer Land
- Excelsior Energy East Range Footprint
- Other Reasonable & Forseeable Project Footprints
- Municipal Boundaries
- Civil Townships
- County Boundaries

Appendix D

Source: USGS, USFWS, Mn/DNR, Mn/DOT, Excelsior Energy and SEH.

Figure 4

East Range Cumulative Impacts Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 2 Miles

APPENDIX D5
Wildlife Habitat

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Cumulative Wildlife Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

SEH No. A-EXENR0801.00

November 17, 2008
Revised January 23, 2009

Prepared for Excelsior Energy
Cumulative Wildlife Effect Assessment
Mesaba Energy Project

SEH No. A-EXENR0801.00

Prepared for:
Excelsior Energy

November 17, 2008
Revised January 23, 2009

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196
651.490.2000

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Cumulative Wildlife Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

1.0 Introduction

This assessment of cumulative impacts to wildlife has been prepared on behalf of Excelsior Energy for the proposed Mesaba Energy Project and to assist the federal and state agencies in the preparation of the environmental impact statement (EIS).

The Department of Energy (DOE) National Energy Technology Laboratory (NETL) is required by the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321, *et seq*.), the Council on Environmental Quality NEPA regulations (40 Code of Federal Regulations [C.F.R.] Parts 1500-1508), and the DOE NEPA regulations (10 C.F.R. Part 1021) to prepare an EIS as part of its participation in the Mesaba Energy Project.

Similarly, under the Power Plant Siting Act (PPSA) (Minnesota Statutes §§ 116C.51-.697) a site permit from the Public Utilities Commission (PUC) is required to build a large electric power generating plant (LEPGP), including preparation of a State EIS. The EIS requirements under NEPA and the PPSA are substantially similar, and DOE will prepare, in cooperation with the Minnesota Department of Commerce and the Minnesota Public Utilities Commission, a joint EIS that will fulfill the requirements of both state and federal law. The information contained in this report will be used in the preparation of that EIS.

The NEPA provides the context and carries the mandate to analyze the cumulative effects of federal actions (in this case, funding provided by the DOE). The Council on Environmental Quality (CEQ) regulations for implementing the NEPA defines cumulative effects as:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR § 1508.7).

The consideration of past, present and reasonably foreseeable future actions provide a context for assessing the cumulative impacts on the wetland resources.

2.0 Study Area

The PPSA and Applicable Rules requires definition of at least two potential sites for the proposed project, identification of which a preferred site, and justification for its preference. In compliance with these requirements, Excelsior Energy has identified two potential project sites, the West Range site and the East Range site.

The West Range site includes approximately 1,260 acres of undeveloped land within the city limits of Taconite, Minnesota in Iron Range Township as shown on **Figure 1**. The East Range site includes approximately 810 acres of undeveloped property located within the city limits of Hoyt Lakes, Minnesota as shown on **Figure 2**. The West Range site has been identified as the preferred location on which to construct the Mesaba Energy Project, however, final determination of the project site will be made by the Minnesota Department of Commerce and the Minnesota Public Utilities Commission under the PPSA requirements. The EIS includes a description of additional supporting project elements, including roadways, railroad, natural gas and electric transmission, required for operation of the proposed project at both alternative sites. This assessment includes evaluation of the potential wildlife impacts from the preferred alternative project elements for each alternate site.

Because other cumulative effects studies performed on wetlands are related to the surrounding watershed, the study area for the cumulative effects assessment was defined according to the limits of the affected subwatersheds for each alternative site. This provides a convenient and meaningful study area boundary for assessing wildlife and habitat. Implications on wildlife and habitat at scales extending beyond the study areas are addressed as well. The paragraphs below describe the study area for both the West Range and East Range sites. The characteristics of the study areas are described in the following sections.

2.1 West Range Site

The West Range site is located within subwatersheds on the boundary between the Swan River and Prairie River watersheds. The study area associated with the West Range site (See **Figure 3**) is defined as follows.

1. That part of the Swan River watershed upstream of the point where Holman Lake discharges to the Swan River. The Holman Lake discharge point represents the point on the Swan River affected by discharge and drainage from the West Range site.
2. That part of the Prairie River watershed upstream of Prairie Lake.

2.1.1 Swan River Watershed

The portion of the Swan River watershed considered within the study area covers approximately 114,266 acres extending from just northeast of the City of Grand Rapids to just northwest of the City of Hibbing (**Figure 1**) and then south and east. Seven small communities (Coleraine, Bovey, Taconite, Marble, Calumet, Nashwauk and Keewatin) are located along the Mesabi Iron Range that lies just south of the divide between the Swan River watershed and the adjacent Prairie River watershed to the north. These communities, along with the associated iron and ore mining that support them, represent the primary development in the study area.

Outside of the small urban areas and scattered farmsteads and rural residences, land uses in the watershed primarily consists of ore mine pits and spoil areas. The remainder of this portion of the study area is a mixture of deciduous and mixed forest and wetland. The Minnesota Department of Natural Resources (MnDNR) Census of the Land (1996) identifies the primary land cover in the watershed as gravel pits and open mines, deciduous and mixed wood forest and open water.

2.1.2 Prairie River Watershed

The portion of the Prairie River watershed considered in the study area covers approximately 285,890 acres along the same portion of the Mesabi Iron Range but extending north and west. Because the existing communities lie primarily along the southern edge of the iron formation, there are no established communities within this area of the Prairie River watershed. Outside of widely scattered farmsteads and rural residences, land use in the watershed is primarily mixed wood and deciduous forest and wetland. The MnDNR Census of the Land identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, wetlands, and water.

2.2 East Range Site

The East Range site is located in a subwatershed of the Partridge River in St. Louis County, Minnesota. The study area of the East Range site (See **Figure 4**) is defined as point on the Partridge River approximately 5 miles downstream of the confluence with First Creek.

2.2.1 Partridge River Watershed

The portion of the Partridge River watershed considered in the study area covers approximately 88,692 acres extending from the City of Aurora northeast toward the City of Babbitt. (**Figure 4**). Outside of the small urban areas of Aurora and Hoyt Lakes and widely scattered farmsteads and rural residences, land use in the watershed is primarily mining, mixed wood forest and wetland. The MnDNR Census of the Land identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, gravel pits and open mines, wetlands, and water.

3.0 Methodology

This analysis includes the evaluation of the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions. The proposed project will be evaluated along with reasonably foreseeable future actions within the study area to determine the potential for cumulative effects on wildlife resources for each alternative site.

Both alternative site study areas for the cumulative effects analyses have been defined to create a scale of reference and a study area boundary that encompasses all the defined reasonably foreseeable actions. But the cumulative effects implications defined in this assessment for wildlife resources extend beyond the study area. Biota interchange and movement, habitat continuity and ecological scales recognize no such boundaries. So this assessment on wildlife resources will address cumulative effects that may extend beyond the study areas as well as those within it. For example, effects at the regional scales of wildlife population should be addressed, besides those at smaller scales or microhabitats that are located entirely within the study area boundary. Ignoring the effects that occur out side of the study area, despite the obvious and direct link or correlation with variables and effects that occur within the boundary would result in an incomplete study on the cumulative effects on wildlife resources.

Two distinct wildlife habitat settings will be analyzed; terrestrial, and aerial habitats. Terrestrial wildlife habitat settings will utilize the GIS GAP land cover classification data, the MNDNR Ecological Classification System (ECS) codes, the MNDNR's *Action Plan for Wildlife* (MNDNR, 2006) with the Species of Greatest Conservation Need (SGCN) habitat type classifications, and the wildlife travel corridor data and criteria determined in a previous cumulative effects analysis on wildlife (MNDNR/EOR, 2006) conducted in the region for projects including some of the reasonably foreseeable actions defined. Terrestrial wildlife habitat analysis will utilize larger mammals as species to measure effects on due to their motility and ability to disperse over measurable distances. Smaller vertebrates, including migratory songbirds will be addressed strictly from a habitat loss, fragmentation and population change perspective, verses addressing travel corridors and migration that would be expected for the larger fauna. Terrestrial habitat and species analyses will address the following:

1. Direct cumulative habitat loss and fragmentation resulting from development of the project alternatives and the other reasonably foreseeable actions to all species of terrestrial vertebrates.
2. Both direct and indirect cumulative effects on faunal populations resulting from development of the project and the other reasonably foreseeable actions.
3. Potential effects on habitat continuity blocks through habitat loss or conversion and fragmentation within the study area boundaries.
4. Cumulative effects on large mammal populations and motilities at local and regional scales that are anticipated under the project alternatives and the reasonably foreseeable actions.

The above referenced ECS data, previous MNDNR/EOR study, the MNDNR SGCN and guidance documents will be utilized for the terrestrial habitat analyses.

Aerial wildlife habitat and species analyses will address the following:

1. The potential for bird strikes resulting from construction of the facility and the reasonably foreseeable actions.
2. Potential effects on seasonal migration patterns and populations of migratory birds.

3.1.1 Terrestrial Wildlife and Habitats

The aerial habitat study will mostly rely on existing parametric data and previous studies. The assessment of terrestrial wildlife species and habitats will be accomplished by the following methods.

3.1.2 Previous Conditions (Pre-settlement, or prior to 1900)

The previous conditions will be based on the MNDNR presettlement vegetative cover mapped through the use of land survey data, known as the Marschner map (Marschner, 1974). The Marschner map vegetative communities represent wildlife habitats that were present prior to European settlement, including those preceding any mining, timber harvesting, or other developments. .

3.1.3 Existing Conditions

The Marschner map being used for the previous condition is based on data collected long before satellite and GIS technologies developed. Today's land cover databases are developed from aerial imagery and ground level data, all combined with advances in wildlife habitat and ecological classifications developed in recent years. The most comparable to Marschner and useful land cover data for this study is the MNDNR ECS and GAP. Some of the higher level GAP land uses were also used, in particular for determining direct habitat losses or when an important habitat element needs to be addressed. Lastly, the MNDNR/EOR biodiversity/animal movement corridors were used to address cumulative effects on these respective elements. The GAP data will reflect and show all of the new developments and effects of land uses that have occurred since the data was collected in the 1870s for the Marschner map. This includes mines, roads, cities and towns, and larger scale land conversions (e.g. agricultural).

The GAP, ECS, and MNDNR/EOR data do not provide extensive details on timber harvest related land temporally short land use changes.

Since the region is vegetated with an intact mosaic of terrestrial upland and wetland habitats and lakes, all natural cover is considered wildlife habitat for the purposes of this study. Habitat is extensive and prevalent among the land uses in the region, with qualitative variation. The only areas completely devoid of any element of suitable habitat are full built out industrial sites, intense developments, and active mines are considered poor or non-existent wildlife habitats. With that in mind, this should even be qualified further with an example. Federally threatened peregrine falcons (*Falco peregrinus*) nest on the emission stacks of power generating plants located in Cohasset and St. Paul, Minnesota. Technically, emission stacks provide nesting habitat for peregrine falcons. At the same time, the facility structure and impact footprint of these facilities may not provide much else for wildlife habitat, but they are important structures for an important single species of wildlife.

3.1.4 Foreseeable Future Conditions

The reasonably foreseeable actions defined below were merged into the GAP, ECS and MNDNR/EOR data and maps assembled for the existing conditions for future conditions scenario. The following table provides a summary of the projects considered reasonably foreseeable in each of the study areas. The potential effects of each project on existing wildlife resources was estimated using the existing conditions mapping described above and an assumed footprint of disturbance for each potential future project.

Table 1
Reasonably Foreseeable Future Actions

West Range Site Study Area	East Range Site Study Area
Minnesota Steel Industries	PolyMet Mining NorthMet Project
Itasca County Railroad	Mesabi Nugget
Nashwauk Gas Pipeline	St. Louis County – new roadway from Hoyt Lakes to Babbitt
Itasca County Highway 7 Realignment	
Keetac Mine Expansion	

4.0 Results - Cumulative Effects Assessment

4.1 Terrestrial Wildlife and Habitats

4.1.1 Ecological Setting, Wildlife Habitats, and Wildlife Ecology Implications

Study considerations include a determination and description of the ecological conditions in the region (both East and West Range Study Areas), the arrangement of wildlife habitats, and wildlife behavioral and ecological factors that all establish the base condition for analyzing and describing the cumulative effects that are anticipated through the analysis. The GAP data, literature, and best professional judgments used in the analysis are also utilized to assemble this baseline condition.

The ***ecological setting*** of Northeast Minnesota including the Mesabi iron range formation is highly influenced by human land uses and practices relating to natural resources, primarily timber related activities and iron ore mining. The region is relatively undeveloped with a low percentage of permanent land use conversions and predominating natural vegetative cover and surface water resources across the landscape.

Although the GAP data is not consistent or compatible with or as detailed as the MNDNR defined vegetative community codes in the Ecological Classification System program (ECS), correlations between the two are fairly obvious and straightforward.

The GAP data layers were the base data used for the analysis and the ECS is utilized when discussing habitats and ecological implications on specific wildlife species or smaller scales.

Wildlife Habitat character is similar both within the study area and throughout the region. Nearly all of the upland forest habitat is second growth and much of it is subjected to timber harvesting. Timber harvesting tracts are influenced by parcel boundaries and harvesting cycles resulting in a mosaic patchwork of tracts ranging from recently clear cut to older growth stands that will be subjected to harvesting again in the near term. Many tracts of timber have been harvested several iterations over the past 120 years or less. Timber harvesting and management heavily influence and define the upland forest habitats in the region. Ecologically, timber harvesting is a source of disturbance, perturbations, and ecological succession of these habitats.

In the ECS, the communities defined as Fire Dependent Forest/Woodland (FP code prefixes) and Mesic Hardwood Forest (MH code) comprise the forested upland habitats in the study area and region. These ECS codes correlate with the Upland codes in the GAP database. Many of these are influenced again by timber harvesting and management, often altering the character of these vegetative communities. Large expanses of upland habitat are characterized with compositions of early successsional tree species, primarily aspen and birch species (*Populus, betula*) that are harvested before the next successional sere develops. With the ECS based on presettlement vegetative communities, the effects of timber harvesting have resulted in an upland forest that often does not fit neatly into any particular ECS code. The pure monotypic stands of quaking aspen (*P. tremula*) so prevalent throughout the region are the main example, there is no comparable ECS code for this community since it was not present prior to settlement. Again, this is why the GAP data is used for most of the analysis, it most consistently represents the habitats present today.

Permanent ***habitat fragmentation*** is also limited in the region compared to areas further south in the state. Agricultural conversions are sparse, rural development is limited, and urbanization is restricted to existing towns and small cities, with relatively slower growth than other regions. Mines, all of which are concentrated on an axis along the Iron Range, represent a permanent conversion except on abandoned mine land where natural cover has reestablished. Linear facilities, including transmission lines, roads, and utility corridors are also a permanent habitat conversion and agent of habitat fragmentation. Timber harvesting is not considered a fragmentation agent since these vegetative communities become reforested after the disturbance.

Compared to other settings where habitat fragmentation has been studied, the region and study area does not have extensive habitat fragmentation or conversion. For example, the Amazon rain forest setting where many fragmentation studies have occurred is a large region never disturbed anthropogenically that is being fragmented by wide scale land clearing and permanent conversion. Or the studies in Southern Illinois on the effects of fragmentation Neotropical migrants located in a highly agricultural landscape setting. Extensive agriculture has fragmented the once contiguous Eastern deciduous forest community into isolated patches or fragments of forest with bird assemblages that demonstrate the effects of fragmentation (Donovan et. al., 1995). In comparison, northeast Minnesota has extensive forested habitats frequently disturbed by timber harvesting with a relatively low amount of habitat that has been permanently converted. Because of this, fragmentation will focus on the habitats that are permanently converted or lost as a result of the reasonably foreseeable actions.

Specific wildlife behaviors and ecologies should be recognized prior to making any interpretations on wildlife. The MNDNR/EOR 2006 wildlife cumulative effects analysis focuses on "***wildlife travel corridors***" in the main part of their analysis. But this study failed to define the species and justifications for designating such corridors. In particular, defining the species that have behaviors or autecologies requiring the presence of travel corridors as a key habitat element was not established. Compared to other parts of the world, Minnesota does not have any large terrestrial fauna that migrate or are dependent on fixed discrete travel corridors. The exception is the semi-migratory deer herd in the Cascade River watershed along the Lake Superior shore of the state (MNDNR, 2006). Habitats in the region are diffusely distributed and widespread geographically, as are the wildlife species present in the region. Larger mammals are also diffusely distributed and move freely throughout these habitats in a pattern defined by their biology, not geography or for some other extrinsic reason. For the larger, motile mammals with the ability to travel widely, types of habitat and habitat needs define species use and movement in the region, not the presence or absence of barriers, travel corridors, or habitat fragmentation.

The wildlife travel corridors identified in the MNDNR/EOR 2006 cumulative effects wildlife analysis were overlaid on the GAP data. These were then redefined and analyzed as ***habitat continuity blocks***. Other areas in the GAP data that were similar as undisturbed polygons of habitat, were also defined as such for discussion in the analysis. This reclassification removes the travel corridor element and replaces with a more ecologically meaningful unit where contiguous and contiguous undisturbed blocks of habitat are defined as the currency. This assumes that these areas provide key linkages for genetic interchange, refugia, and habitat connectivity.

Many smaller species of fauna in the region do have fixed, discrete travel corridors. For example, many reptiles and amphibians make seasonal movements that are habitat based. Aquatic turtles that make annual overland movements to the same upland breeding habitat is a good example. Because these are so numerous and little known, these small travel corridors were not addressed in the analysis. Instead, these small corridors are assumed as habitat losses when they are directly affected by an action. This accounts for all of the effects on the habitat, including the travel corridors when present.

Lastly within this framework, is the subject of ***habitat loss or permanent conversion*** defined as just that; the direct loss or conversion of habitat that will result from the construction of development of infrastructure or permanent fixed facilities. The impact footprint of each reasonably foreseeable action has been cumulatively analyzed to establish the anticipated amount of total habitat loss and conversion.

4.2 West Range Site

4.2.1 Existing Conditions

Under presettlement conditions, there were no anthropogenically driven habitat fragmentation vectors or sources of habitat loss/conversion. Timber harvesting disturbances and perturbations were not present, and no mining had occurred. Mining, timber harvest, and urban development have resulted in a patchwork of temporary and permanent disturbances and habitat conversions throughout the study area. Habitat fragmentation resulting from disturbance and conversion is relatively low in the study area. Development around the towns and transportation corridors represent permanent habitat conversions while forestry practices are temporary disturbances where forested habitat has recovered through ecological succession after a clearcut. As shown in Table 2, forestry industry influenced habitats are the most widespread land use in the study area comprising approximately 43.6% of the study area habitats. The predominance of upland deciduous (aspen birch) habitat is a direct result of ecological succession after forestry and timber harvesting. Approximately 3% of the study area habitats have been permanently converted to intense anthropogenic land uses in the form of urban/developed and barren as shown in Table 2. The remaining 97% of the study area is existing, contiguous wildlife habitat.

Table 2 below provides a summary of existing wildlife habitat in the study area. Excluding urban and developed areas and areas disturbed by mining or otherwise barren leaves 387,754 acres of natural wildlife habitat remaining in the 400,052-acre study area.

Table 2
West Range Site Study Area - Existing Wildlife Habitats

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	7,763	1.9%
Lowland Deciduous	8,172	2.0%
Lowland Deciduous Shrubland	46,527	11.6%
Lowland Conifer	31,731	7.9%
Lowland Conifer Shrubland	212	0.1%
Upland Conifer	22,878	5.7%
Upland Conifer/Deciduous Mix	100	0.0%
Upland Deciduous (Aspen/Birch)	139,407	34.8%
Upland Deciduous (Hardwoods)	12,234	3.1%
Upland Shrub/Woodland	64,509	16.1%
Water	34,281	8.6%
Urban/Developed	11,555	2.9%
Cropland	3,381	0.8%
Grassland	16,559	4.1%
Barren	743	0.2%
Total Area	**400,052**	**100%**
Total Natural Habitat (N.I. Urban or Barren)	**387,754**	**97%**

4.2.2 Mesaba Energy Project

The proposed Mesaba Energy Project would impact approximately 523 acres of wildlife habitat as summarized in **Table 3** below.

Table 3 West Range Site Wildlife Habitat Impacts		
ECS Habitat Type	**Acres**	**Percent of existing area**
Open Wetland	1	0.01%
Lowland Deciduous	9	0.11%
Lowland Deciduous Shrubland	16	0.03%
Lowland Conifer	11	0.03%
Lowland Conifer Shrubland	0	0.00%
Upland Conifer	5	0.02%
Upland Conifer/Deciduous Mix	0	0.00%
Upland Deciduous (Aspen/Birch)	291	0.21%
Upland Deciduous (Hardwoods)	69	0.56%
Upland Shrub/Woodland	114	0.18%
Water	1	0.00%
Urban/Developed	7	0.06%
Cropland	0	0.00%
Grassland	6	0.04%
Barren	0	0.00%
Total Area	**530**	0.13%
Total Natural Habitat (N.I. Urban or Barren)	**523**	0.13%
Notes: Includes only impacts within the defined West Range Site Cumulative Wildlife Assessment Study Area. Data excludes cover within the rail loop.		

4.2.3 Foreseeable Future Conditions

Reasonably foreseeable future projects in the West Range study area include:

- the proposed Minnesota Steel Industries steel plant northeast of the West Range Site,
- a new railroad to serve Minnesota Steel to be constructed by Itasca County,
- a proposed gas pipeline intended to serve Minnesota Steel and others to be constructed by the Nashwauk Public Utilities Commission,
- a proposed realignment of County Road 7 also to be constructed by Itasca County, and
- the Keetac taconite mine expansion approximately one mine northeast of Keewatin, Minnesota.

See **Figure 3** for the location of these potential future projects in relation to the Mesaba Energy Project West Range Site and the cumulative effects study area. No other reasonably foreseeable future projects were identified after consideration of potential projects by the individual municipalities in the study area and the Itasca County Highway Department.

4.2.3.1 Minnesota Steel

Minnesota Steel Industries, LLC will reactivate the former Butler Taconite mine and tailings basin near Nashwauk and add direct-reduced iron production and steel making and rolling equipment in an integrated facility to make steel directly from Minnesota taconite ore. The MNDNR prepared an Environmental Impact Statement (EIS) for the proposed project and made their adequacy determination on August 10, 2007.

A GIS analysis of the Minnesota Steel project footprint shows that the project will impact approximately 3,657 acres within the Cumulative Study Area, including impacts from plant facilities, mining activities, tailings basin, tailings pipeline, rock and overburden stockpiling. Of that, approximately 3,324 acres of wildlife habitat will be affected as summarized in **Table 4**.

Table 4
Minnesota Steel
Wildlife Habitat Impacts

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	91	1.17%
Lowland Deciduous	14	0.17%
Lowland Deciduous Shrubland	677	1.45%
Lowland Conifer	13	0.04%
Lowland Conifer Shrubland	0	0.00%
Upland Conifer	13	0.05%
Upland Conifer/Deciduous Mix	0	0.00%
Upland Deciduous (Aspen/Birch)	860	0.62%
Upland Deciduous (Hardwoods)	233	1.90%
Upland Shrub/Woodland	960	1.49%
Water	360	1.05%
Urban/Developed	333	2.88%
Cropland	33	0.97%
Grassland	70	0.43%
Barren	0	0.00%
Total Area	**3,657**	**0.91%**
Total Natural Habitat (N.I. Urban or Barren)	**3,324**	**0.86%**

4.2.3.2 Itasca County Railroad

Itasca County will construct a railroad spur to provide rail access to the Minnesota Steel Industries Nashwauk Taconite Reduction Plant described above. The rail spur is approximately eight miles in length extending from existing rail lines along Highway 169 in a northeasterly direction to the Minnesota Steel Industries site as shown on **Figure 3**. A GIS analysis of the Itasca County railroad plans shows that the project will impact approximately 125 acres within the Cumulative Study Area. Of that, approximately 122 acres of wildlife habitat will be affected as summarized in **Table 5**.

Table 5
Itasca County Railroad
Wildlife Habitat Impacts

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	0	0.00%
Lowland Deciduous	0[a]	0.00%
Lowland Deciduous Shrubland	3	0.01%
Lowland Conifer	0[a]	0.00%
Lowland Conifer Shrubland	0	0.00%
Upland Conifer	0	0.00%
Upland Conifer/Deciduous Mix	0	0.00%
Upland Deciduous (Aspen/Birch)	72	0.05%
Upland Deciduous (Hardwoods)	3	0.03%
Upland Shrub/Woodland	39	0.06%
Water	4	0.01%
Urban/Developed	3	0.02%
Cropland	0[a]	0.00%
Grassland	1	0.01%
Barren	0	0.00%
Total Area	**125**	**0.03%**
Total Natural Habitat (N.I. Urban or Barren)	**122**	**0.03%**
[a] Less than one acre		

4.2.3.3 Nashwauk Gas Pipeline

The Nashwauk Public Utilities Commission (NPUC) is planning to construct a natural gas pipeline to provide operating fuel to the Minnesota Steel Industries Nashwauk Taconite Reduction Plant described above. NPUC is proposing to install a 21.5 mile high-pressure natural gas pipeline extending from the existing Great Lakes Gas (GLG) 36-inch pipeline in Blackberry Township to the City of Nashwauk as shown on **Figure 3**. A GIS analysis of the Itasca County railroad plans shows that the project will impact approximately 158 acres within the Cumulative Study Area. Of that, approximately 157 acres of wildlife habitat will be affected as summarized in **Table 6**.

Table 6
Nashwauk Blackberry Natural Gas Pipeline
Wildlife Habitat Impacts

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	0	0.00%
Lowland Deciduous	3	0.04%
Lowland Deciduous Shrubland	13	0.03%
Lowland Conifer	5	0.01%
Lowland Conifer Shrubland	0	0.00%
Upland Conifer	6	0.03%
Upland Conifer/Deciduous Mix	0	0.00%
Upland Deciduous (Aspen/Birch)	67	0.05%
Upland Deciduous (Hardwoods)	17	0.14%
Upland Shrub/Woodland	42	0.06%
Water	1	0.00%
Urban/Developed	1	0.01%
Cropland	0	0.00%
Grassland	3	0.02%
Barren	0	0.00%
Total Area	**158**	**0.04%**
Total Natural Habitat (N.I. Urban or Barren)	**157**	**0.04%**

4.2.3.4 Itasca County Road 7 Realignment

Itasca County is also considering realignment of County Road 7 as shown on **Figure 3**. The new roadway would replace the existing County Road 7. A GIS analysis of the County Road 7 alignment shows that the project would impact approximately 64 acres within the Cumulative Study Area. Of that, approximately 59 acres of wildlife habitat will be affected as summarized in **Table 7**.

Table 7
County Road 7 Realignment
Wildlife Habitat Impacts

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	0	0.00%
Lowland Deciduous	0	0.04%
Lowland Deciduous Shrubland	0	0.03%
Lowland Conifer	0	0.01%
Lowland Conifer Shrubland	0	0.00%
Upland Conifer	1	0.03%
Upland Conifer/Deciduous Mix	0	0.00%
Upland Deciduous (Aspen/Birch)	30	0.05%
Upland Deciduous (Hardwoods)	2	0.14%
Upland Shrub/Woodland	24	0.06%
Water	0 [a]	0.00%
Urban/Developed	5	0.01%
Cropland	0	0.00%
Grassland	2	0.02%
Barren	0	0.00%
Total Area	**64**	**0.04%**
Total Natural Habitat (N.I. Urban or Barren)	**59**	**0.04%**

[a] Less than one acre

4.2.3.5 Keetac Mine Expansion

U.S. Steel plans to upgrade and reopen the Phase I production line and expand the mine pit at the Keetac taconite mine and processing facility near Keewatin (see **Figure 3**) to increase taconite production. A GIS analysis of the proposed project footprint shows that the project would impact approximately 1,440 acres within the Cumulative Study Area. Of that, approximately 1,324 acres of wildlife habitat will be affected as summarized in **Table 8**.

Table 8
Keetac Mine Expansion
Wildlife Habitat Impacts

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	21	0.26%
Lowland Deciduous	0	0.00%
Lowland Deciduous Shrubland	237	0.51%
Lowland Conifer	2	0.01%
Lowland Conifer Shrubland	0	0.00%
Upland Conifer	3	0.01%
Upland Conifer/Deciduous Mix	0	0.00%
Upland Deciduous (Aspen/Birch)	565	0.41%
Upland Deciduous (Hardwoods)	26	0.22%
Upland Shrub/Woodland	286	0.44%
Water	160	0.47%
Urban/Developed	105	0.90%
Cropland	2	0.05%
Grassland	22	0.14%
Barren	11	1.53%
Total Area	**1,440**	**0.36%**
Total Natural Habitat (N.I. Urban or Barren)	**1,324**	**0.34%**

4.2.3.6 Summary of Cumulative Effects

The proposed Minnesota Steel Industry (MSI) project, the Mesaba Energy Project, the Nashwauk Public Utilities Natural Gas Pipeline, Itasca County Highway 7 Realignment, and the Itasca County Railroad projects all define the Foreseeable Future Condition for evaluating the cumulative effects on terrestrial wildlife and habitat in the West Range Study Area.

Terrestrial acreages that will be ***habitat losses/conversions*** include ***523 acres*** of upland and wetland habitats resulting from the **Mesaba Energy Project**, ***3,324 acres*** from the **MSI project*, 122 acres*** from the Itasca County Railroad, ***157 acres*** from the Nashwauk Public Utilities Natural Gas Pipeline, ***59 acres*** from the Itasca County Highway 7 Realignment project, and ***1,324 acres*** from the Keetac Mine Expansion. **Cumulatively** these projects combine to impact ***5,509 acres*** of terrestrial upland and wetland habitat found within the study area. The Excelsior Energy Mesaba Energy Project represents approximately 9.5% of the total. A summary of cumulative wildlife habitat impacts is shown in **Table 9**.

Table 9
West Range Site Study Area Habitats – Existing and Future

ECS Habitat Type	Existing Area		Future Development Area		Total Remaining in Future	
	Acres	Percent of existing area	Acres	Percent of existing area	Acres	Percent of existing area
Open Wetland	7,763	1.9%	113	1.4%	7,650	98.6%
Lowland Deciduous	8,172	2.0%	26	0.3%	8,146	99.7%
Lowland Deciduous Shrubland	46,527	11.6%	946	2.0%	45,581	98.0%
Lowland Conifer	31,731	7.9%	31	0.1%	31,700	99.9%
Lowland Conifer Shrubland	212	0.1%	0	0.0%	212	100%
Upland Conifer	22,878	5.7%	28	0.1%	22,850	99.9%
Upland Conifer/Deciduous Mix	100	0.0%	0	0.0%	100	100%
Upland Deciduous (Aspen/Birch)	139,407	34.8%	1,884	1.4%	137,523	98.6%
Upland Deciduous (Hardwoods)	12,234	3.1%	351	2.9%	11,883	97.1%
Upland Shrub/Woodland	64,509	16.1%	1,465	2.3%	63,044	97.7%
Water	34,281	8.6%	527	1.5%	33,754	98.5%
Urban/Developed	11,555	2.9%	453	3.9%	11,102	96.1%
Cropland	3,381	0.8%	35	1.0%	3,346	99.0%
Grassland	16,559	4.1%	104	0.6%	16,455	99.4%
Barren	743	0.2%	11	1.5%	732	98.5%
Total Area	**400,052**	**100%**	**5,974**	**1.5%**	**394,079**	**98.5%**
Total Natural Habitat (N.I. Urban or Barren)	**387,754**	**97%**	**5,510**	**1.4%**	**382,244**	**98.6%**

Under the **Existing Condition,** there is a total of ***387,754 acres*** of wildlife habitat within the West Range Site cumulative study area. In the **Foreseeable Future Condition**, there will be an estimated ***382,244 acres*** of wildlife habitat remaining after the cumulative impacts defined in this study. This represents habitat conversions or direct losses resulting from reasonably foreseeable actions.

These facilities also represent the new wildlife habitat barriers and fragmentation agents. More specifically, the Mesaba Energy Project Site is located directly north of a habitat continuity block delineated in the MNDNR study known as Wildlife Travel Corridor #2 (see **Figure 3**). In comparison, the MSI site is located mostly on the north side of active mine lands and the edge of Wildlife Travel Corridor #3 eastward of the Mesaba Energy footprint. The West Range Site of the Mesaba Energy Project will create permanent habitat loss, fragment habitat, and disrupt habitat continuity along the north side of Wildlife Travel Corridor #2. The MSI Project site will create permanent habitat loss and fragment habitat, and be a wildlife aversion/avoidance element located along the east side of Wildlife Travel Corridor #3.

Results Summary – West Range Site Study Area

1. The most measurable cumulative effects on terrestrial wildlife and their habitats that result from the reasonably foreseeable actions in the West Range Site study area are direct habitat loss/conversion (5,721 acres

total) resulting from construction of the defined reasonably foreseeable projects in the study area. The area of direct habitat loss also represents the extent of habitat fragmentation. Within the West Range Site study area 382,033 acres (98.5%) of wildlife habitat will remain after the cumulative effect.

2. The proposed West Range Site Alternative of the Mesaba Energy facility will be located above the Wildlife Travel Corridor #2 block delineated in the MNDNR study, reclassified as habitat continuity blocks in this study. Since portions of the Mesaba Project site will be permanent habitat losses, this represents a potential barrier to animal movement, habitat connectivity, and at smaller scales, genetic interchange.
3. The Minnesota Steel site is located on the east side of Wildlife Travel Corridor #3, but does not form a geographic barrier for the corridor or affect habitat continuity to the extent that is potential for the Mesaba Project. None of the other reasonably foreseeable projects are anticipated to create barriers to the habitats continuity blocks within the study area.
4. Two additional habitat continuity blocks (Wildlife Travel Corridors #3 and #4) are also located in the study area, but will not be affected.

4.3 East Range Site

4.3.1 Existing Conditions

As described for the West Range study area, under presettlement conditions there were no anthropogenically driven habitat fragmentation vectors or sources of habitat loss/conversion in the area. Timber harvesting disturbances and perturbations were not present, and no mining had occurred. Mining, timber harvest, and urban development have resulted in temporary and permanent disturbances and habitat conversions throughout the study area. Habitat fragmentation resulting from disturbance and conversion is relatively moderate in the study area, especially in the immediate areas surrounding the East Range Site., As shown in Table 10, approximately 11% of the study area habitats have been permanently converted to minelands, urban development, and highway and utility rights of way. The remaining 89% of the study area and surrounding region has been subjected to extensive timber harvesting which represents a temporary habitat disturbance where clearcut areas recover to forested habitats through ecological succession. The upland deciduous (aspen/birch) habitat is a direct result of forestry and timber harvesting practices and is the most common habitat type in the study area. Approximately 89% of the study area is comprised of existing, contiguous habitat.

Table 10 below provides a summary of existing wildlife habitat in the study area. Excluding urban and developed areas and areas disturbed by mining or otherwise barren leaves 92,758 acres of natural wildlife habitat remaining in the 103,563-acre study area.

Table 10 **East Range Site Study Area– Existing Wildlife Habitat**		
	Existing Area	
ECS Habitat Type	**Acres**	**Percent of existing area**
Open Wetland	1,585	1.5%
Lowland Deciduous	1,555	1.5%
Lowland Deciduous Shrubland	14,868	14.4%
Lowland Conifer	18,712	18.1%
Lowland Conifer Shrubland	702	0.7%
Upland Conifer	12,418	12.0%
Upland Conifer/Deciduous Mix	269	0.3%
Upland Deciduous (Aspen/Birch)	27,579	26.6%
Upland Deciduous (Hardwoods)	1,278	1.2%
Upland Shrub/Woodland	6,513	6.3%
Water	5,431	5.2%
Urban/Developed	8,721	8.4%
Cropland	61	0.1%
Grassland	1,787	1.7%
Barren	2,084	2.0%
Total Area	**103,563**	**100%**
Total Natural Habitat (N.I. Urban or Barren)	**92,758**	**89.6%**

4.3.2 Mesaba Energy Project

The proposed Mesaba Energy Project would impact approximately 433 acres of wildlife habitat as summarized in **Table 11** below.

Table 11 **East Range Site Wildlife Habitat Impacts**		
ECS Habitat Type	**Acres**	**Percent of existing area**
Open Wetland	3	0.2%
Lowland Deciduous	18	1.2%
Lowland Deciduous Shrubland	34	0.2%
Lowland Conifer	9	0.1%
Lowland Conifer Shrubland	2	0.3%
Upland Conifer	21	0.2%
Upland Conifer/Deciduous Mix	1	0.4%
Upland Deciduous (Aspen/Birch)	218	0.8%
Upland Deciduous (Hardwoods)	1	0.1%
Upland Shrub/Woodland	42	0.6%
Water	7	0.1%
Urban/Developed	46	0.5%
Cropland	0	0.0%
Grassland	77	4.3%
Barren	0	0.0%
Total Area	**479**	**0.5%**
Total Natural Habitat (N.I. Urban or Barren)	**433**	**0.5%**
Notes: Includes only impacts within the defined East Range Site Cumulative Wildlife Assessment Study Area. Data excludes cover within the rail loop.		

4.3.3 Foreseeable Future Conditions

Reasonably foreseeable future projects in the East Range study area include:

- the mine portion of the PolyMet Mining project (excluding the processing facility),
- the Mesabi Nugget project, and
- the corridor for a new roadway between Hoyt Lakes and Babbitt as proposed by St. Louis County.

See **Figure 4** for the location of these potential future projects in relation to the Mesaba Energy Project East Range Site and the cumulative effects study area. No other reasonably foreseeable future projects were identified after consideration of potential projects by the individual municipalities in the study area and the St. Louis County Highway Department.

4.3.3.1 <u>PolyMet Mining, Inc. NorthMet Project</u>

PolyMet Mining Inc. proposes an open pit mine to extract copper, nickel, cobalt and precious metals by dissolution and precipitation from a low-grade mineral deposit. The project includes a new mine area and use of the currently inactive Cliffs Erie taconite processing facility. The MNDNR is currently preparing an Environmental Impact Statement (EIS) for the proposed project.

A GIS analysis of the PolyMet project footprint shows that the project will impact approximately 3,252 acres within the Cumulative Study Area. Of that, approximately 2,957 acres of wildlife habitat will be affected as summarized in **Table 12**.

Table 12
PolyMet NorthMet Project
Wildlife Habitat Impacts

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	12	0.76%
Lowland Deciduous	1	0.06%
Lowland Deciduous Shrubland	199	1.34%
Lowland Conifer	786	4.20%
Lowland Conifer Shrubland	7	1.00%
Upland Conifer	1,201	9.68%
Upland Conifer/Deciduous Mix	2	0.74%
Upland Deciduous (Aspen/Birch)	640	2.32%
Upland Deciduous (Hardwoods)	23	1.80%
Upland Shrub/Woodland	71	1.09%
Water	10	0.18%
Urban/Developed	295	3.38%
Cropland	0	0.00%
Grassland	4	0.22%
Barren	0	0.00%
Total Area	**3,252**	**3.14%**
Total Natural Habitat (N.I. Urban or Barren)	**2,957**	**3.19%**

4.3.3.2 Mesabi Nugget

Mesabi Nugget, LLC (MNC) has proposed a new commercial iron production plant that would use a new process for producing high purity iron (97% metallic iron) directly from iron ore. The company has completed a small-scale pilot plant at Silver Bay and proposes a a large scale demonstration plant (LSDP) on the Ling-Temco-Vought (LTV) property near the City of Aurora (see **Figure 4**). The MNDNR is nearly ready to initiate an Environmental Impact Statement (EIS) for the proposed project.

A GIS analysis of the Mesabi Nugget project footprint shows that the project will impact approximately 2,253 acres within the Cumulative Study Area, including impacts from plant facilities, mining activities, tailings basin, tailings pipeline, rock and overburden stockpiling. Of that, approximately 1,456 acres of wildlife habitat will be affected as summarized in **Table 13**.

Table 13
Mesabi Nugget
Wildlife Habitat Impacts

ECS Habitat Type	Acres	Percent of existing area
Open Wetland	0	0.00%
Lowland Deciduous	1	0.06%
Lowland Deciduous Shrubland	11	0.07%
Lowland Conifer	9	0.05%
Lowland Conifer Shrubland	318	45.30%
Upland Conifer	45	0.36%
Upland Conifer/Deciduous Mix	0	0.00%
Upland Deciduous (Aspen/Birch)	700	2.54%
Upland Deciduous (Hardwoods)	190	14.87%
Upland Shrub/Woodland	0	0.00%
Water	182	3.35%
Urban/Developed	797	9.14%
Cropland	0	0.00%
Grassland	0	0.00%
Barren	0	0.00%
Total Area	**2,253**	**2.18%**
Total Natural Habitat (N.I. Urban or Barren)	**1,456**	**1.57%**

4.3.3.3 St. Louis County New Hoyt Lakes – Babbitt Connection

St. Louis County has proposed a new roadway segment, a new connection between Hoyt Lakes and Babbitt. This segment is part of a larger initiative to more efficiently link the Iron Range communities of Aurora, Hoyt Lakes, Babbitt, and Ely to enhance the potential for new industry and to help mitigate the existing economic situation in the area by developing a new tranportation corridor. To date, several alternative alignments have been identified but no preferred alignment or alignments have been identified to date. Therefore, no estimate of potential wildlife habitat impacts is available. However, it is expected that because of the extent of habitat in the area, constrution of the project will result in some impact.

4.3.3.4 Summary of Cumulative Effects

The proposed PolyMet Mining NorthMet Project, Mesabi Nugget Mine project, St. Louis County Road Project, and the Mesaba Energy Project define the Foreseeable Future Condition for evaluating the cumulative effects on terrestrial wildlife and habitat in the East Range Study Area.

Terrestrial acreages that will be ***habitat losses/conversion*** include ***433 acres*** of upland and wetland habitats resulting from the **Mesaba Energy Project**, ***2,957 acres*** resulting from the **PolyMet Mining NorthMet Project**, and ***1,456 acres*** from the **Mesabi Nugget Project. Cumulatively** these projects represent ***4,846 acres*** total of habitat conversions or direct losses resulting from reasonably foreseeable actions within the ***92,758 acres*** of wildlife habitat within the study area. The Excelsior Energy Mesaba Energy Project represents approximately 9% of the total. A summary of cumulative wildlife habitat impacts is shown in **Table 14**.

Table 14
East Range Site Study Area Habitats – Existing and Future

ECS Habitat Type	Existing Area		Future Development/Mining Area		Total Remaining in Future	
	Acres	Percent of existing area	Acres	Percent of existing type	Acres	Percent of existing type
Open Wetland	1,585	1.5%	15	1.0%	1,570	99.1%
Lowland Deciduous	1,555	1.5%	20	1.3%	1,535	98.7%
Lowland Deciduous Shrubland	14,868	14.4%	244	1.6%	14,624	98.4%
Lowland Conifer	18,712	18.1%	804	4.3%	17,908	95.7%
Lowland Conifer Shrubland	702	0.7%	327	46.6%	375	53.4%
Upland Conifer	12,418	12.0%	1,268	10.2%	11,150	89.8%
Upland Conifer/Deciduous Mix	269	0.3%	3	1.12%	266	98.9%
Upland Deciduous (Aspen/Birch)	27,579	26.6%	1,558	5.7%	26,021	94.4%
Upland Deciduous (Hardwoods)	1,278	1.2%	214	16.7%	1,064	83.3%
Upland Shrub/Woodland	6,513	6.3%	113	1.7%	6,400	98.3%
Water	5,431	5.2%	199	3.7%	5,232	96.3%
Urban/Developed	8,721	8.4%	1,138	13.1%	7,583	87.1%
Cropland	61	0.1%	0	0.0%	61	100%
Grassland	1,787	1.7%	81	4.5%	1,706	95.5%
Barren	2,084	2.0%	0	0.0%	2,084	100%
Total Area	**103,563**	**100%**	**5,984**	**5.8%**	**97,579**	**94.2%**
Total Natural Habitat (N.I. Urban or Barren)	**92,758**	**89.6%**	**4,846**	**5.2%**	**87,912**	**94.8%**

Under the **Existing Condition,** there is a total of ***92,758 acres*** of wildlife habitat within the East Range Site cumulative study area. In the **Foreseeable Future Condition**, ***87,912 acres*** of terrestrial wildlife habitat will remain after the cumulative impacts defined in this study. These facilities and the new linear transportation corridor also represent the new wildlife habitat barriers and fragmentation agents.

All four of the new reasonably foreseeable projects are set amongst habitats that have been highly fragmented and converted by mining. The Mesaba Energy Project is geographically located south of and between two habitat continuity blocks (Wildlife Travel Corridors #10 and 11 shown on **Figure 4**). The PolyMet Mine project is located within existing mine lands south and west of a habitat continuity block (Wildlife Travel Corridor #12 shown on **Figure 4**). Mesabi Nugget is located on the north side of a habitat continuity black (Wildlife Habitat Block #9, **Figure 4**) and is entirely within mine lands. Of these three projects, the Mesaba Energy Project East Range Site will affect the most wildlife habitat. Despite being on mine lands, the PolyMet Mining NorthMet Project will also result in wildlife habitat losses and conversions.

Results Summary – East Range Site Study Area

1. Within the East Range Site study area, there is 92,758 acres of terrestrial wildlife habitat in the Existing Condition comprised of mostly timber harvesting tracts, wetlands, and other natural vegetative cover. The most measurable cumulative effects on terrestrial wildlife and their habitats that result from the reasonably foreseeable actions in the East Range Site study area are direct habitat loss/conversion (4,846 acres total) resulting from construction of the Mesaba Energy Project, the PolyMet Mining NorthMet Expansion Project, and the Mesabi Nugget Project. The area of direct habitat loss also represents the extent of habitat fragmentation. Within the East Range Site study area 87,912 acres (94.8%) of wildlife habitat will remain after the cumulative effect.
2. Neither the proposed East Range Site Alternative of the Mesaba Energy facility nor any of the other reasonably foreseeable actions will affect any of the four habitat continuity blocks located within the study area.

4.4 Summary Comparison West Range and East Range Study Areas

The following comparisons and conclusions on terrestrial wildlife and habitat are based on the findings above:

1. The West Range study area and the East Range study are located within the same ecological province known as the Laurentian Mixed Forest. Both study areas are similar located in the same type of setting with similar land uses and wildlife habitats.
2. Both study areas have and will continue to be influenced by timber harvesting.
3. Wildlife habitat loss/conversion totals expected from the reasonably foreseeable projects are expected to be 5,510 acres cumulatively within the West Range Site and 4,846 acres cumulatively within the East Range Site study areas respectively.
4. There are four habitat continuity blocks within the West Range Site and one block (Wildlife Travel Corridor #2 shown in **Figure 3**) will be potentially affected by the Mesaba Energy Project. There are four habitat continuity blocks in the East Range Study area (**Figure 4**) and none are anticipated to be affected by the reasonably foreseeable projects.
5. Regionally, the cumulative effects within both study areas are such that no effects on terrestrial species of fauna are anticipated besides direct habitat loss. Cumulative effects on wildlife and habitats within both

study areas are anticipated to have negligible effects for the following reasons:

a. There are no large mammal mass migrations or migration routes within the region or study areas. No disruption of wildlife migration of movement is anticipated as a result of the reasonably foreseeable actions.

b. Besides permanent habitat loss and conversion, fauna in the immediate areas near the reasonably foreseeable actions defined may engage in aversion or avoidance behaviors of these facilities, an effect of habitat loss. With the extensive acreage of habitat expected to remain after these actions, these effects are anticipated to be negligible.

c. The Mesabi Energy Project West Range Site may be a potential barrier located on the north side of a habitat continuity block, representing the only such effect from a reasonably foreseeable action. Three other habitat continuity blocks will remain undisturbed in the West Range study area and none of the four habitat continuity blocks will be disturbed in the East Range study area. Effects on habitat continuity blocks are anticipated to be negligible due to the extensive amount of wildlife habitats that will remain after the reasonably foreseeable actions are expected to occur.

4.5 Aerial Habitat and Migratory Birds

4.6 West Range Site

4.6.1 Previous Conditions

Aerial Habitat Effects

In the previous conditions, there were no aerial habitat obstructions present that were potential bird collision sources within the Swan River and Prairie River Watersheds, hereafter referred as the study area.

4.6.2 Existing Conditions

Aerial Habitat Effects

In the existing condition, there are no comparable existing aerial habitat obstructions present within the study area. Comparable obstructions are defined as emission stack towers, tall buildings, or other facilities of similar size and magnitude. There are six (6) antenna towers within the study area that are considered a risk for bird collisions and will be included in the evaluation.

4.6.3 Foreseeable Future Conditions

Aerial Habitat Effects

The existing condition six (6) antenna towers, the proposed Minnesota Steel Industry (MSI) project, and the Mesaba Energy Project, Phase II define the Foreseeable Future Condition for evaluating the cumulative effects aerial habitat obstructions on bird flight and aerial habitat.

Literature and Data

The Buffalo Ridge bird strike data was the most recent, most geographically proximal and best available study completed in Minnesota as there are no similar studies or data available from the forested habitats of northeastern Minnesota. Bird strike studies from radio towers in the forested habitats of northern Wisconsin were also used in the discussion. The discussion did not specifically address habitat differences and instead focused on taxonomic comparisons and general trends.

A review of the biological sciences literature and data sources confirmed that the majority of the studies and empirical data on bird collisions on stationary structures focused on collisions with radio towers, transmission lines, and windows on buildings. Tower lighting and other light producing structures also generated several studies and data sources. A common thread among these studies is the wide ranging variability of the mortality rates from one site or structure to another. Furthermore, different structures present differing types of mortality. For example, both the poles or towers and the wires produce collision related mortalities on birds on transmission projects. A large body of the bird strike literature addresses bird collisions with moving vehicles, primarily airplanes.

From a bird population perspective, mortality rates in these studies and data sources may number in the thousands, a small percentage of the millions or tens of millions of birds that migrate and have travel flight routes through the study areas of these respective sources. Ecological hypotheses in the literature often focus on addressing acute effects including disproportionate mortalities among certain species, age classes, or temporal periods. Such testing may show that bird collisions can be significant at the species level or during some ecologically driven process.

Lastly, many of these studies, particular those dealing with animal vehicle and bird strikes on airplanes are prevalent in the literature. These studies are conducted from a human safety perspective. Biological effects, if a concern, may often be secondary issues or data in these studies. Some exceptions include studies involving endangered species (e.g. Key deer, bald eagles) or species under some level of threat.

Adequate field sampling and monitoring are required to determine the full cumulative effects of these projects and facilities on bird flight and aerial habitat. Since there is little to no monitoring data results for bird collisions on existing power plant facilities in the Region or beyond and wide variation in the mortality data, calculating a known numerical effect is not possible nor realistic. Instead, this study recognizes the potential for impacts through review and evaluation of these known literature and data sources, followed by projections of potential cumulative effects on bird flight and aerial habitat.

Results – West Range Site Study Area Cumulative Effects on Bird Flight and Aerial Habitat

Data collected on bird collisions with stationary structures show some expected trends (Johnson et al., 2002). Seasonally there are pulses and peaks of collision mortality during the spring and fall migrations. Temporally, collisions peak during night time hours and decline during the day. Ecologically there are differences as well. Migrant passerines often have the highest rates or mortality, a variable driven by a couple of factors including; Passerines include the majority of the bird species found and most migratory birds; passerines are numerically the most abundant bird biomass; and passerines migrate at varying elevations that put them at higher risk for collisions. Behaviorally, certain bird species may be more prone to collisions with structures due to an attractant, mainly lighting. Larger and slower flight birds (e.g. cranes, herons, large raptors) often collide with transmission wires and support wires, another example of a behaviorally driven conflict.

Migrating warbler species often represent the largest numbers of the total passerine mortality in some antenna tower studies (Johnson et. al., Kemper, 1996) . Many authors speculate on and some have investigated the primary causative factors that include behavioral and ecological reason why warblers account for this, and others attempt to demonstrate that the warbler (or similar species) mortality is simply due to their high abundances (Yanagawa, 1999). Behavioral factors are often the sources of collisions with airplanes, for example when gulls or raptors use thermals putting them in zones of conflict and creating species specific disproportionate mortalities in the data.

Several studies on bird collisions with stationary structures have estimated bird mortality rates and the total number of birds in a flight path for comparison. Veltri and Klem (2005) studied the causes of death of birds that collided with antenna towers and windows. They recorded 247 tower confirmed tower collisions during a fall migratory season. The Johnson et.al. studies on bird collisions with wind turbine towers in southwest Minnesota conducted from 1996 to 1999 documented only 55 collision fatalities during this time frame resulting from 354 individual wind towers. After correction factors were applied, they estimated that total annual mortality from the entire project was 72 birds per year for Phase 1 and 314 birds for Phase 2. The radar data showed that an estimated 3.5 million birds migrate over the project each year.

Numerous studies and data gathering efforts have been conducted in the wind turbine study area of southwest Minnesota on elucidating species specific mortality differences and species significant mortalities from collisions with the stationary towers, some with surprising results. Johnson et. al. conducted studies to determine if there was a potential for disproportionate mortality from tower collisions among the raptors that both nest within and migrate through the wind tower study area. They encountered little to no mortalities of raptors, and none for Swainson’s hawks (*Buteo swainsoni*) an uncommon species of hawk in Minnesota. During these and other studies, noticeably high mortality was observed for a species of bat that migrates seasonally through the wind tower (Kolford, 2005) and bird mortalities were relatively low.

The wind tower study area in southwest Minnesota also sheds important insight into the potential importance of setting and topography. The wind tower setting is geologically and geographically similar to Mesabi Iron Range settings of both the West Range and East Range sites. The Iron Range is essentially comprised of a linear northeast/southwest trending ridge, many miles in length that crosses the north-south migration route on a right angle. The wind tower study area is located on the Coteau des Prairie and on the highest ridge of the Coteau that is known locally as Buffalo Ridge, trending for hundreds of miles on a northwest-southeast axis. Both the Iron Range and Buffalo Ridge are linear ridgelines that are as high as 2,100 feet above sea level and are some of the most prominent relief features in the state.

Studies on radio towers have yielded various results. A particular long term study of radio tower bird mortality in Wisconsin (Kemper, 1996) was conducted between 1957 through 1995 counted 121,560 birds comprising 123 species. During this 38 year period, it was estimated that 2 million birds were flying through the study area annually. Radio antenna tower design and lighting may be a source for the higher mortalities compared to the wind tower studies. Birds may be attracted to the warning light beacons on the towers and also colliding with the numerous guy wires and supporting structures in addition to the tower structure itself. Note that the numbers of dead birds are from a long term sample as well.

Besides these previous examples, other studies focus on the behavioral aspects and visual cues that result in bird collisions with structures. Behavioral aspects primarily focus on windows where birds will strike a window in reaction to a reflective image or perceptions that a there are no obstructions. Visual cues apply more often to power lines or other fine structures that need to be more visible to prevent collisions. Neither of these types of studies are relevant to this discussion.

Within the West Range Site study area, two proposed obstructions will be constructed under the future conditions, including the Mesaba Energy Project and the Minnesota Steel Industry facilities. Despite the absence of previous studies or numerical data on power plant towers effects on birds, some general conclusions can be made from the other studies and data.

1. Both structures will cause annual mortality of migrating birds as the results of collisions with the structures, and both are aerial habitat obstructions. Bird mortality will likely be seasonal, with the highest rates occurring during the spring and fall migration periods. The wind tower studies in southwest Minnesota suggest that mortalities may be numerically low or non-existent for some species despite both study areas being located in similar geological/geographical settings.
2. Due to the nature of radio towers and based on previous studies, it is expected the bird mortalities will be highest at the six (6) antenna towers and lowest at the MSI and Mesaba facilities located within the West Range study area.
3. Most species specific bird mortalities occur from conflicts with transportation modes and power transmission lines. Collisions with the antenna towers and facilities structures will likely not be species specific and will mostly be comprised of migrating passerines, possibly warblers, vireos, and other neotropical migrants.
4. The potential bird collision mortality rates at both structures could vary widely between sites, annually, or could be very low to non-existent. Long term monitoring will be necessary after construction of these

facilities to determine the effects on birds and the significance of mortality.

5. Migratory birds that will fly over and through the study area will number in the millions annually. Even if bird collision mortality rates for cumulatively reach the thousands, additional studies are necessary to determine if and what level of mortality is considered significant. These include studies conducted and data gathered elsewhere. Mortality rates from other sources are far greater then those caused by collisions with stationary objects, and those in themselves are not considered significant (Janss, 1997) impacts on species populations in most cases.

6. Based on the findings summarized in 1 – 5, the following assessment statement is provided;

> *Within the West Range Site study area, cumulative effects will occur on aerial habitat and bird migration as a result of the reasonably foreseeable actions defined within the study area. Based on previous studies and existing data on the subject of bird collisions, the cumulative effect will be assumed to be bird mortality resulting from collisions with fixed stationary structures defined as the reasonably foreseeable actions in the study area. Previous studies and data suggest that bird mortality rates that are the result of these collisions will be insignificant on bird populations within or migrating through the West Range Site study area, but future studies are needed to further support this finding. Future studies should evaluate the cumulative effects on higher scales including regionally and globally, and measure against the cumulative effects of actions that extend beyond the West Range Site study area. It's anticipated that mortalities will be highest for neotropical migrants, mostly passerines and these should be the focus of future studies involving power generating facilities similar to the two proposed within the West Range Site study area.*

4.7 East Range Site

4.7.1 Previous Conditions

Aerial Habitat Effects

In the previous conditions, there were no aerial habitat obstructions present that were potential bird collision sources within the Partridge River Watershed hereafter referred as the study area.

4.7.2 Existing Conditions

Aerial Habitat Effects

In the existing condition, the Laskin Energy Center and the three (3) antenna towers within the study area are considered a risk for bird collisions and will be included in the evaluation.

4.7.3 Foreseeable Future Conditions

Aerial Habitat Effects

The three (3) existing condition antenna towers, Laskin Energy Center, the proposed Mesabi Nugget project, proposed PolyMet Mine Expansion project, and the Mesaba Energy Project, Phase II define the Foreseeable Future Condition for evaluating the cumulative effects aerial habitat obstructions on bird flight and aerial habitat in the East Range Site study area.

Literature and Data

A review of the biological sciences literature and data sources confirmed that the majority of the studies and empirical data on bird collisions on stationary structures focused on collisions with radio towers, transmission lines, and windows on buildings. Tower lighting and other light producing structures also generated several studies and data sources. A common thread among these studies is the wide ranging variability of the mortality rates from one site or structure to another. Furthermore, different structures present differing types of mortality. For example, both the poles or towers and the wires produce collision related mortalities on birds on transmission projects. A large body of the bird strike literature addresses bird collisions with moving vehicles, primarily airplanes.

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Adequate field sampling and monitoring are required to determine the full cumulative effects of these projects and facilities on bird flight and aerial habitat. Since there is little to no monitoring data results for bird collisions on existing power plant facilities in the Region or beyond and wide variation in the mortality data, calculating a known numerical effect is not possible nor realistic. Instead, this study recognizes the potential for impacts through review and evaluation of these known literature and data sources, followed by projections of potential cumulative effects on bird flight and aerial habitat.

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Data collected on bird collisions with stationary structures show some expected trends (Johnson et al., 2002). Seasonally there are pulses and peaks of collision mortality during the spring and fall migrations. Temporally, collisions peak during night time hours and decline during the day. Ecologically there are differences as well. Migrant passerines often have the highest rates or mortality, a variable driven by a couple of factors including; Passerines include the majority of the bird species found and most migratory birds; passerines are numerically the most abundant bird biomass; and passerines migrate at varying elevations that put them at higher risk for collisions. Behaviorally, certain bird species may be more prone to collisions with structures due to an attractant, mainly lighting. Larger and slower flight birds (e.g. cranes, herons, large raptors) often collide with transmission wires and support wires, another example of a behaviorally driven conflict.

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Numerous studies and data gathering efforts have been conducted in the wind turbine study area of southwest Minnesota on elucidating species specific mortality differences and species significant mortalities from collisions with the stationary towers, some with surprising results. Johnson et. al conducted studies to determine if there was a potential for disproportionate mortality from tower collisions among the raptors that both nest within and migrate through the wind tower study area. They encountered little to no mortalities of raptors, and none for Swainson’s hawks (*Buteo swainsoni*) an uncommon species of hawk in Minnesota. During these and other studies, noticeably high mortality was observed for a species of bat that migrates seasonally through the wind tower and bird mortalities were relatively low.

The wind tower study area in southwest Minnesota also sheds important insight into the potential importance of setting and topography. The wind tower setting is geologically and geographically similar to Mesabi Iron Range settings of both the West Range and East Range sites. The Iron Range is essentially comprised of a linear northeast/southwest trending ridge, many miles in length that crosses the north-south migration route on a right angle. The wind tower study area is located on the Coteau des Prairie and on the highest ridge of the Coteau that is known locally as Buffalo Ridge, trending for hundreds of miles on a northwest-southeast axis. Both the Iron Range and Buffalo Ridge are linear ridgelines that are as high as 2,100 feet above sea level and are some of the most prominent relief features in the state.

Studies on radio towers have yielded various results. A particular long term study of radio tower bird mortality in Wisconsin (Kemper, 1996) was conducted between 1957 through 1995 counted 121,560 birds comprising 123 species. During this 38 year period, it was estimated that 2 million birds were flying through the study area annually. Radio tower design and lighting may be a source for the higher mortalities compared to the wind tower studies. Birds may be attracted to the warning light beacons on the towers and also colliding with the numerous guy wires and supporting structures in addition to the tower structure itself. Note that the numbers of dead birds are from a long term sample as well.

Besides these previous examples, other studies focus on the behavioral aspects and visual cues that result in bird collisions with structures. Behavioral aspects primarily focus on windows where birds will strike a window in reaction to a reflective image or perceptions that a there are no obstructions. Visual cues apply more often to power lines or other fine structures that need to be more visible to prevent collisions. Neither of these types of studies are relevant to this discussion.

Within the East Range Site study area, three new proposed obstructions will be constructed under the future conditions; the Mesaba Energy Project, PolyMet Mine facilities, and Mesabi nugget facilities. The existing Laskin Energy Center and proposed Mesabi Energy facilities are the most similar, and the PolyMet and Mesabi Nugget projects may not have significant or similar obstructions projected into the aerial flight paths of birds. Despite the absence of previous studies or numerical data on power plant towers effects on birds, some general conclusions can be made from the other studies and data.

1. At least two of the reasonably foreseeable actions defined within the East Range study area will cause annual mortality of migrating birds as the results of collisions with the structures. The Laskin Power Plant and the Mesaba Energy project are the two actions that include or will include aerial habitat obstructions. Bird mortality will likely be seasonal, with the highest rates occurring during the spring and fall migration periods. The wind tower studies in southwest Minnesota suggest that mortalities may be numerically low or non-existent for some species despite both study areas being located in similar geological/geographical settings.
2. Due to the nature of radio towers and based on previous studies, it is expected the bird mortalities will be highest at the three (3) antenna towers and lowest at the Laskin and Mesaba facilities located within the East Range study area.
3. Most species specific bird mortalities occur from conflicts with transportation modes and power transmission lines. Collisions with the radio towers and facilities structures will likely not be species specific and will mostly be comprised of migrating passerines, possibly warblers, vireos, and other neotropical migrants.

4. The potential bird collision mortality rates at both the Laskin and Mesaba facilities could vary widely between sites, annually, or could be very low to non-existent. Long term monitoring will be necessary after construction of these and other facilities will be needed to determine the effects on birds and the significance of mortality.
5. Migratory birds that will fly over and through the study area will number in the millions annually. Even if bird collision mortality rates cumulatively reach the thousands, additional studies are necessary to determine if and what level of mortality is considered significant. These include studies conducted and data gathered elsewhere. Mortality rates from other sources are far greater then those caused by collisions with stationary objects, and those in themselves are not considered significant (Janss, 2000) impacts on species populations in most cases.
6. Based on the findings summarized in 1 – 5, the following assessment statement is provided;

    Within the East Range Site study area, cumulative effects will occur on aerial habitat and bird migration as a result of the reasonably foreseeable actions defined within the study area. Based on previous studies and existing data on the subject of bird collisions, the cumulative effect will be assumed to be bird mortality resulting from collisions with fixed stationary structures defined as the reasonably foreseeable actions in the study area. Previous studies and data suggest that bird mortality rates that are the result of these collisions will be insignificant on bird populations within or migrating through the East Range Site study area, but future studies are needed to further support this finding. Future studies should evaluate the cumulative effects on higher scales including regionally and globally, and measure against the cumulative effects of actions that extend beyond the East Range Site study area. It's anticipated that mortalities will be highest for neotropical migrants, mostly passerines and these should be the focus of future studies involving power generating facilities similar to the two proposed within the East Range Site study area.

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List of Figures

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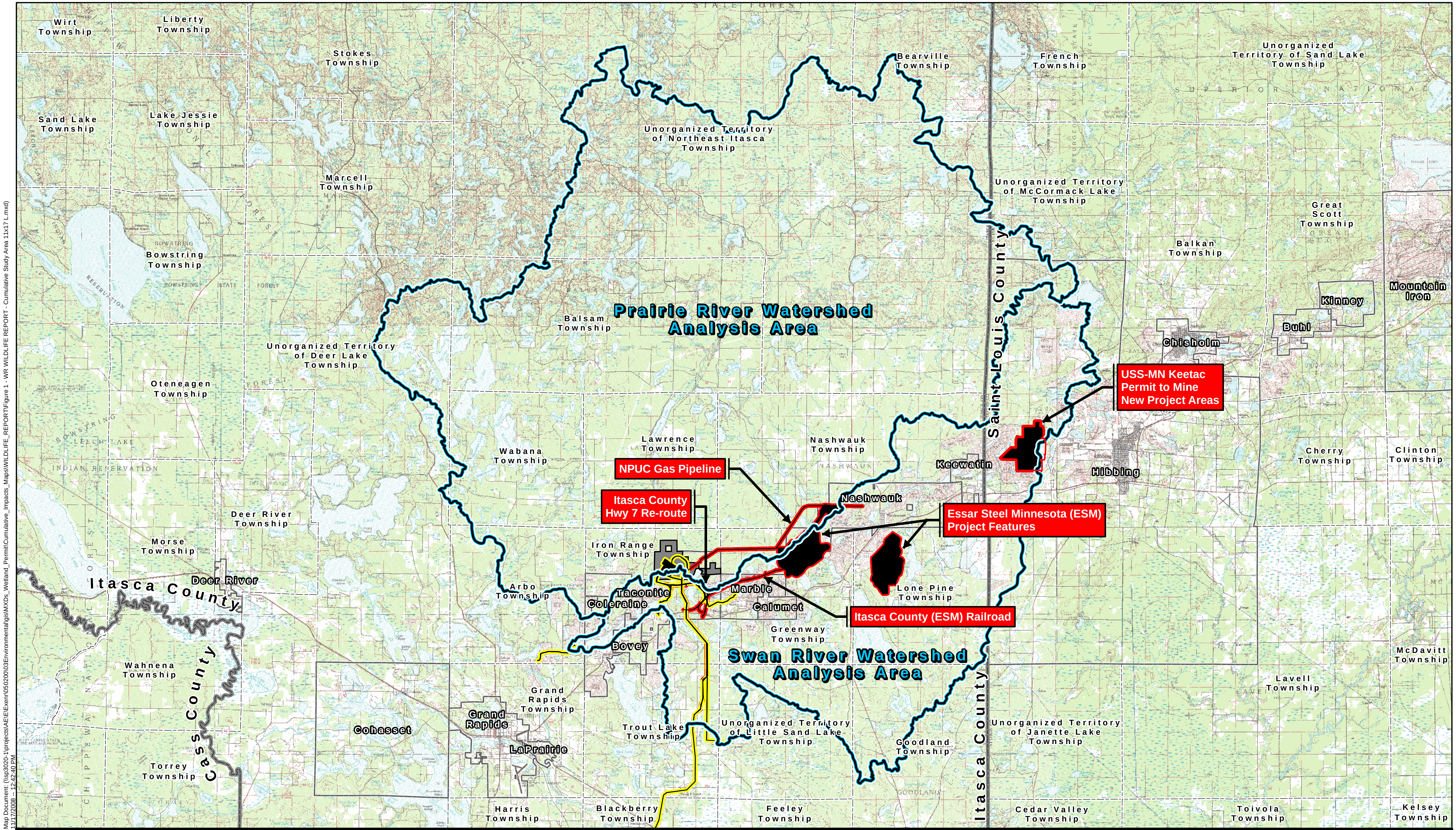
Figure 2 – East Range Site

Figure 3 – West Range Cumulative Study Area

Figure 4 – East Range Cumulative Study Area



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

- Swan River Watershed - Analysis Area
- Prairie River Watershed - Analysis Area
- Excelsior Energy West Range Buffer Land
- Excelsior Energy West Range Footprint
- Other Reasonable & Forseeable Project Footprints
- Municipal Boundaries
- Civil Townships
- County Boundaries

Appendix D

Source: USGS, USFWS, Mn/DNR, Mn/DOT, Itasca County, Essar Steel Minnesota, Nashwauk PUC, USS-MN, Excelsior Energy and SEH.
© 2008 SEH

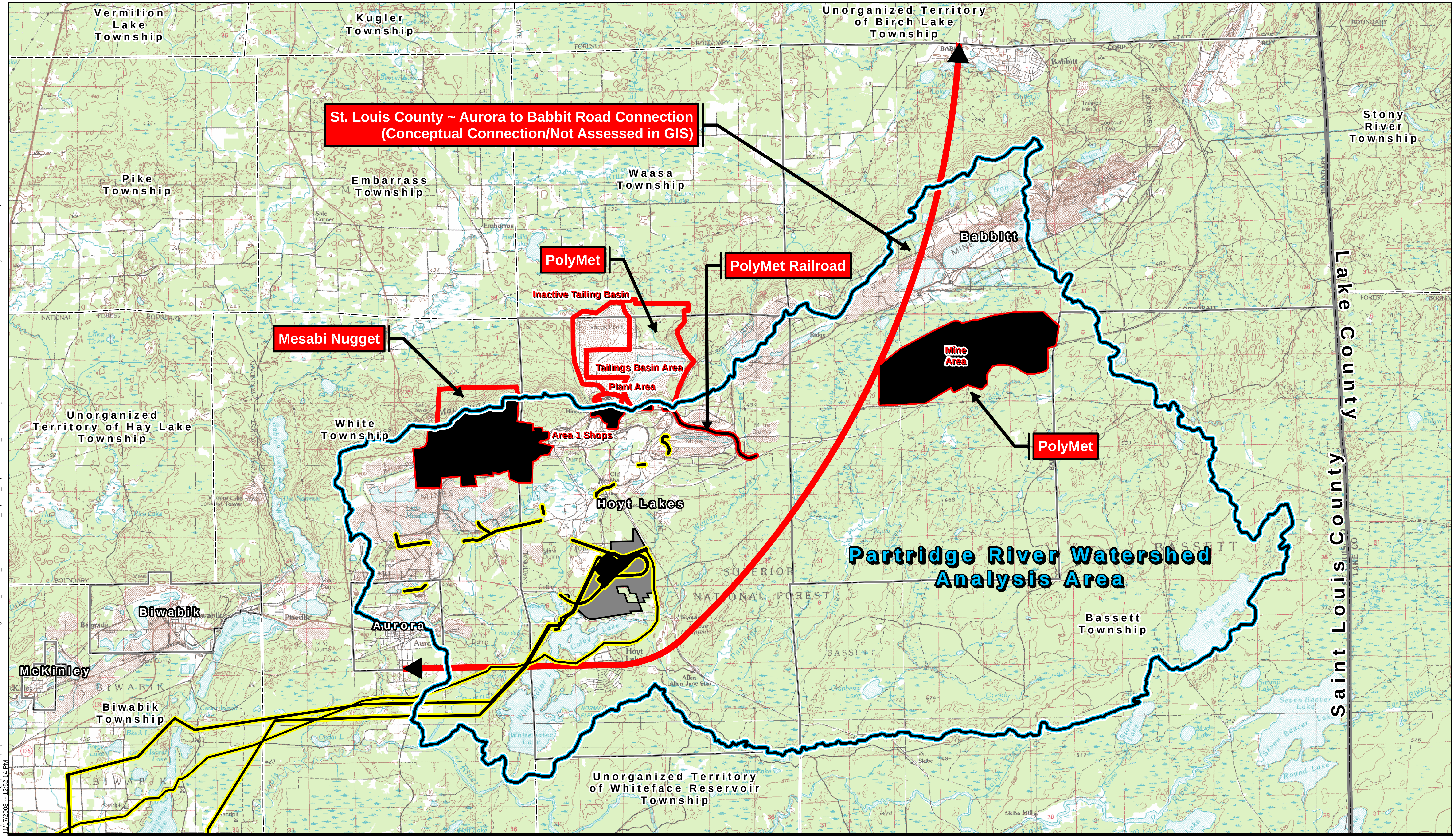
Figure 1

West Range Cumulative Impacts Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 4 Miles



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

East Range

November 2008

Legend

- Partridge River Watershed - Analysis Area
- Excelsior Energy East Range Buffer Land
- Excelsior Energy East Range Footprint
- Other Reasonable & Forseeable Project Footprints
- Municipal Boundaries
- Civil Townships
- County Boundaries

Source: USGS, USFWS, Mn/DNR, Mn/DOT, Excelsior Energy and SEH.
© 2008 SEH

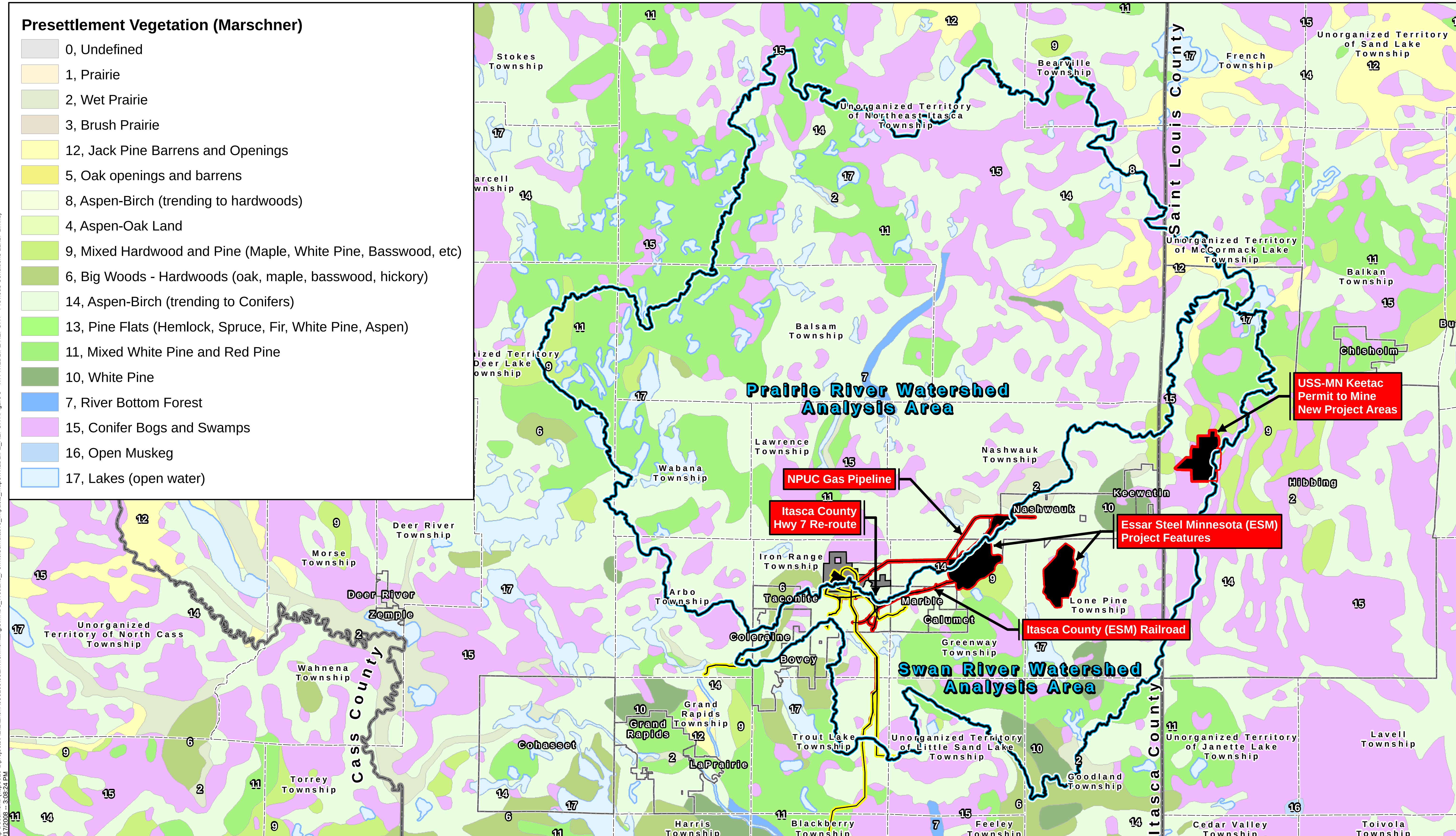
Figure 2

East Range Cumulative Impacts Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 2 Miles



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

- Swan River Watershed - Analysis Area
- Prairie River Watershed - Analysis Area
- Excelsior Energy West Range Buffer Land
- Excelsior Energy West Range Footprint
- Other Reasonable & Forseeable Project Footprints
- Municipal Boundaries
- Civil Townships
- County Boundaries

Appendix D

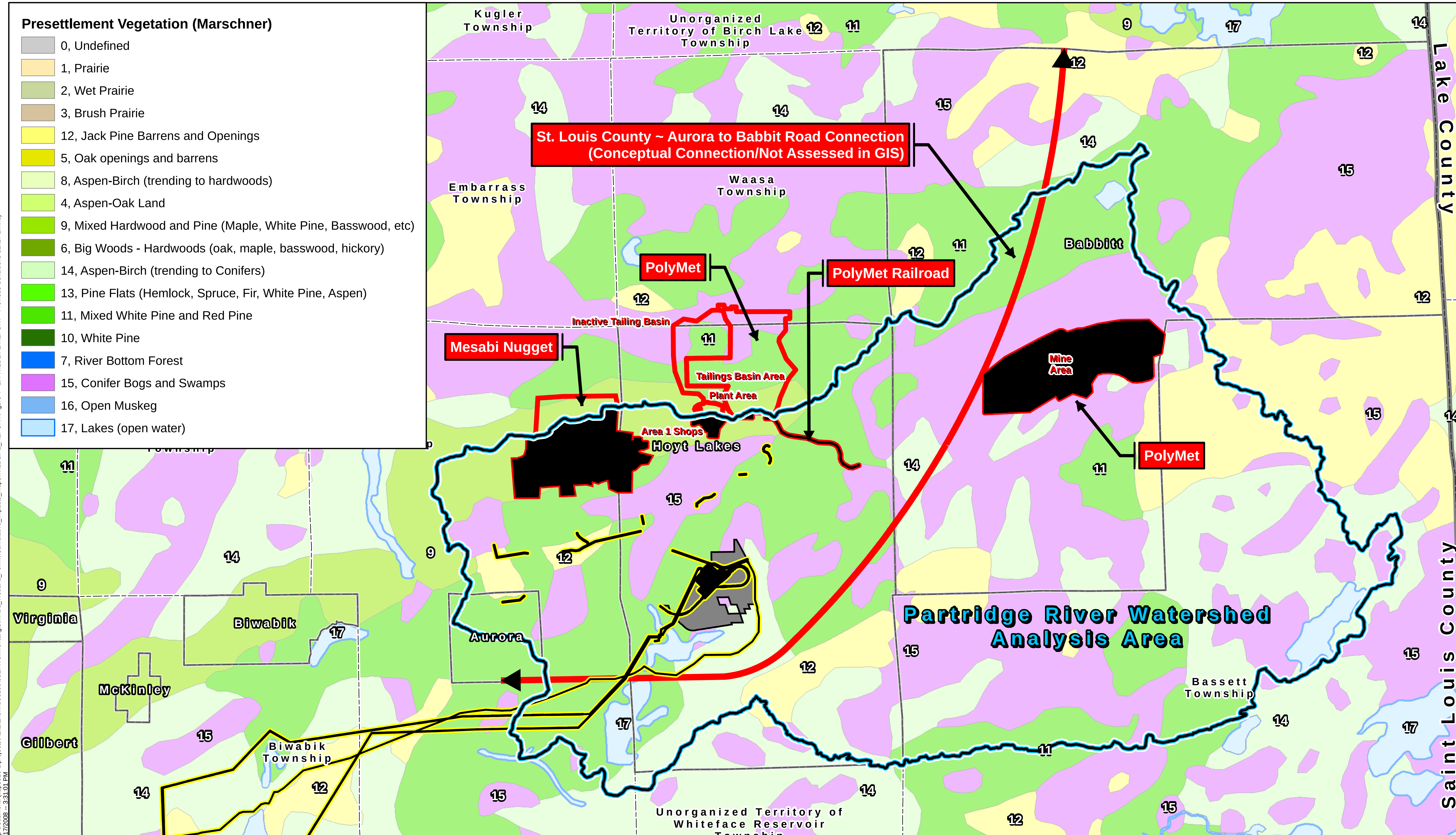
Source: USGS, USFWS, Mn/DNR, Mn/DOT, Itasca County, Essar Steel Minnesota, Nashwauk PUC, USS-MN, Excelsior Energy and SEH.

Figure 3

West Range Study Area Previous Conditions

UTM, Zone 15, Meters
NAD83

0 4 Miles



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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

East Range

November 2008

Legend

- Partridge River Watershed - Analysis Area
- Excelsior Energy East Range Buffer Land
- Excelsior Energy East Range Footprint
- Other Reasonable & Forseeable Project Footprints
- Municipal Boundaries
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- County Boundaries

Appendix D

Source: USGS, USFWS, Mn/DNR, Mn/DOT, Excelsior Energy and SEH.

Figure 4

East Range Study Area Previous Conditions

UTM, Zone 15, Meters
NAD83

N W E S

0 2 Miles

APPENDIX D6
Rail Traffic

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East Range

Current traffic: **12 trains/day** on the DMIR line

Mesabi Nugget (Module 1):

Product hauled away on private line, do not consider for MEP cumulative impacts
400,000 tpy western coal, 150,000 tpy limestone on DMIR line
Assume 119 tons/car and 115 cars/train, train returns empty
Added traffic: 82 trains/yr → **2 trains/day** (maximum; same for 3 modules as 1)

PolyMet:

Two 30-car trains/wk for limestone → **2 trains/day** maximum

Mesaba One and Two would need a maximum of 4 trains/day (for all cases here, a round trip is considered 2 trains/day). The maximum cumulative train traffic on this line is 20 trains/day, and it is clear from the calculations above that this is a conservative estimate.

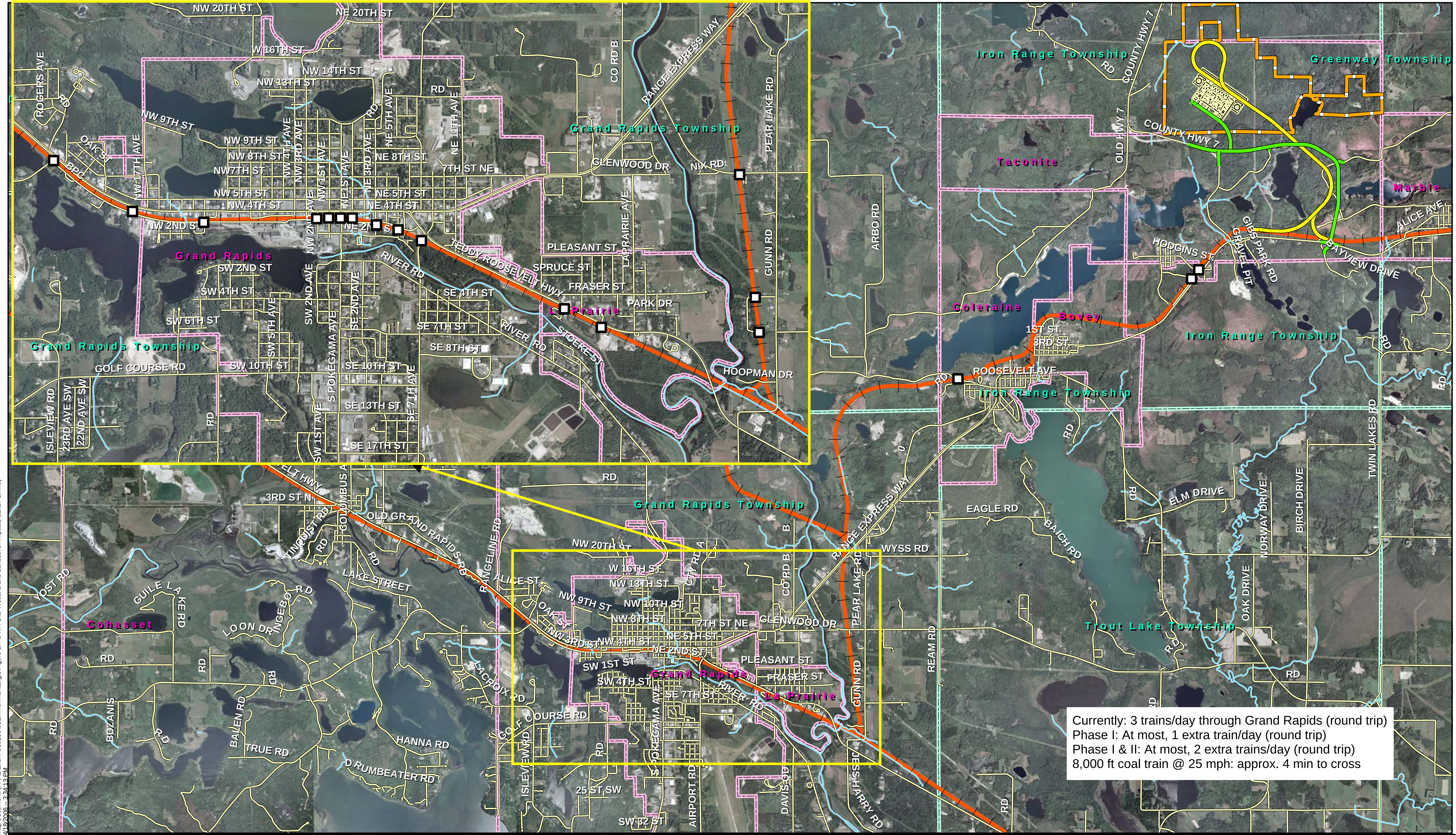
West Range

Rail traffic impacts in Grand Rapids have already been addressed in the permit applications, so focus will be on the segment of rail between Gunn, MN and the proposed site. It is currently inoperable due to rising water levels in the Canisteo Mine Pit, which have weakened the support along the section of track near Bovey, MN. Restoration of service to the line may require dropping of the water levels significantly, followed by reinforcement of the bank along which the rail travels. This has been anticipated, as the permit application describes lowering the water level before plant operation begins. Until this restoration occurs, train traffic from the west to the plant site must be routed south-east to Cloquet, then north and back west by Nashwauk to the plant site.

Current traffic: 0 trains/day now, 4 trains/day 90's-2001, much higher traffic in the 70's

MSI: The local train from Grand Rapids to Superior, WI would likely resume, with up to **4 trains/day**. This could accommodate MSI's needs of 70-90 cars per day (10 incoming, the balance outgoing).

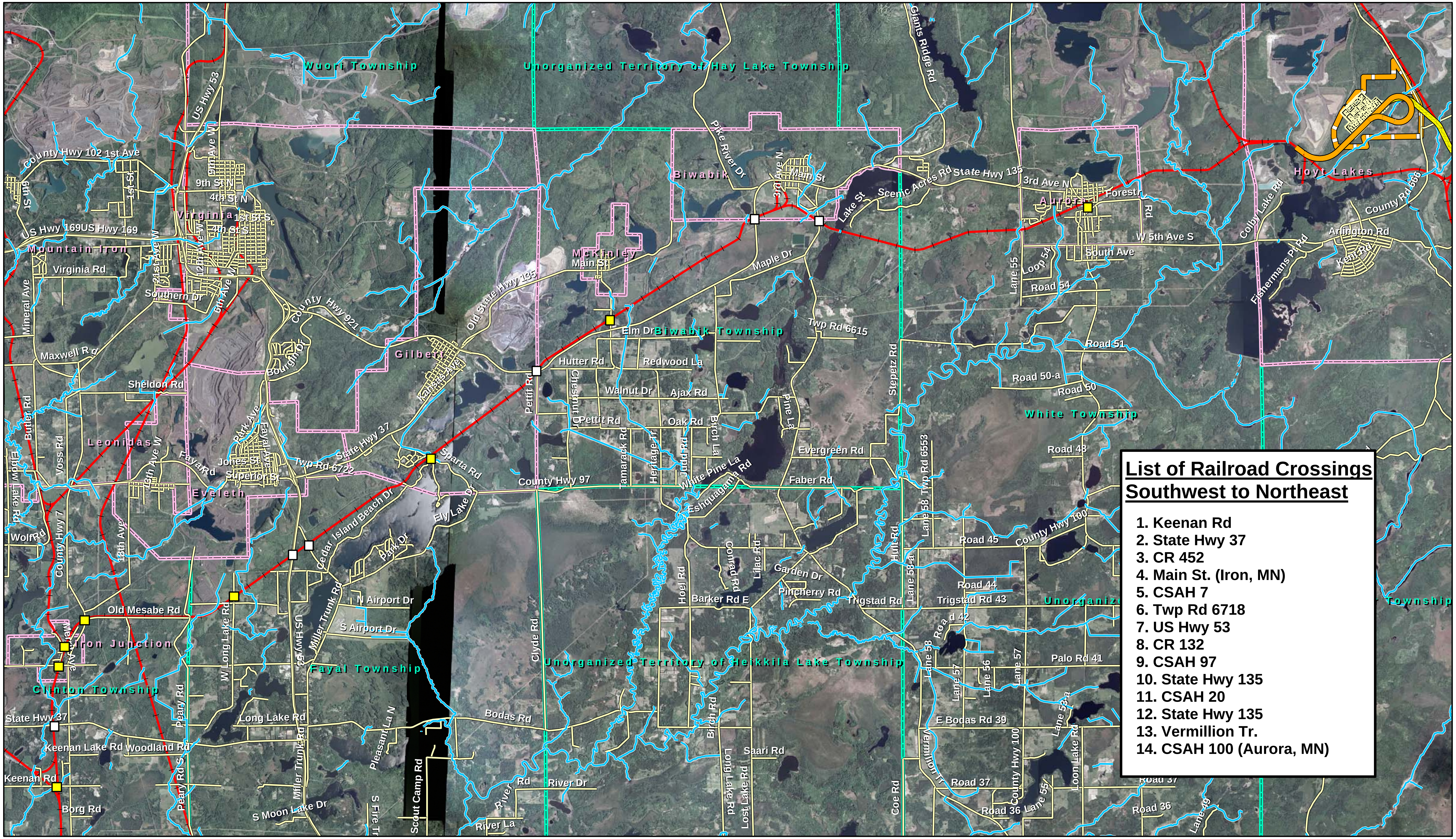
Mesaba One and Two would need a maximum of 4 trains/day, so the maximum cumulative train traffic expected would be 8 trains/day on the segment identified above.



Excelsior Energy Inc.	West Range Site	Legend	Railroad Crossings
Mesaba Energy Project Energy, Innovation, and Economic Development for Minnesota 11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305 Phone 952.847.2360 Fax 952.847.2373	July 2006	Footprint and Buffer Land; Plant Layout; Proposed Roads; Rail Alt 1-A; Geographic Names; Municipal Boundaries; Civil Township; Existing Roads; Existing Railroads; Streams; Railroad Crossings (excludes bridges)	Itasca County - South Coordinate System 0 2,000 Feet

Appendix D

Source: Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.



List of Railroad Crossings Southwest to Northeast

1. Keenan Rd
2. State Hwy 37
3. CR 452
4. Main St. (Iron, MN)
5. CSAH 7
6. Twp Rd 6718
7. US Hwy 53
8. CR 132
9. CSAH 97
10. State Hwy 135
11. CSAH 20
12. State Hwy 135
13. Vermillion Tr.
14. CSAH 100 (Aurora, MN)

Map Document: (X:\ME\Exem\050200\03Environmental\gis\Figure X-X-X ER Site Wetland Impacts 11x17 L.mxd) 2/10/2006 -- 11:30:00 AM

EXCELSIOR ENERGY INC.

MESABA ENERGY PROJECT

ENERGY, INNOVATION, AND ECONOMIC DEVELOPMENT FOR MINNESOTA

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

East Range

September 2006

Legend

- Footprint and Buffer Land
- Plant Layout
- Municipal Boundaries
- Civil Township Boundaries
- Existing Roads
- Existing Railroads
- Streams

Rail Alternatives
- Proposed Rail Alt 1

Rail Alternatives
- Proposed Rail Alt 2

- Railroad crossing with bridge
- Railroad crossing at grade

Appendix D

Source: USDA 2003 DOQQs, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
© 2006 SEH

East Range RR Crossings

St. Louis County - Central Coordinate System

N W E S

0 800 Feet

APPENDIX E
Consultation –

Cooperating Agencies (E1), Endangered Species Act (E2), Cultural Resources (E3), Native American Tribes (E4)

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APPENDIX E1
Letters from Cooperating Agencies

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MINNESOTA
DEPARTMENT OF
COMMERCE

Energy Facility Permitting
85 7th Place East, Ste 500
Saint Paul, MN 55155-2198
Minnesota Department of Commerce

July 31, 2009

Richard Hargis
U.S. Department of Energy
National Energy Technology Laboratory
PO Box 10940
Pittsburgh, PA 15236-0940

RE: Release of the Final Environmental Impact Statement
Minnesota Department of Commerce Energy Facility Permitting Staff
PUC Docket No. E6472/GS-06-668

Dear Mr. Hargis,

I am in receipt of your request concerning the Minnesota Department of Commerce, Energy Facility Permitting staff's concurrence with the release of the FEIS for the Mesaba Energy Project (MPUC Docket No. E6472/GS-06-668)

The MDOC EFP staff concurs with the DOE decision to release the FEIS.

If you have any question or need further information, please do not hesitate to contact me.

As always, MDOC appreciates the assistance and cooperation of the DOE with these issues.

Thank you.

Sincerely,

William Cole Storm,
State Planning Director
Department of Commerce
Energy Planning & Advocacy
Routing & Siting Unit
85 7th Place East
Suite 500
St. Paul, MN 55101-2198

I:\EQB\Power Plant Siting\Projects - Active\Excelsior - Mesaba Energy\External Coorspondence\Ltr-to-DOE-on-concurrence-FEIS.doc

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
SIBLEY SQUARE AT MEARS PARK
190 FIFTH STREET EAST, SUITE 401
ST. PAUL MINNESOTA 55101-1638

REPLY TO
ATTENTION OF

JUN 2 2 2009

Operations
Regulatory (2005-5527-WAB)

Mr. Richard Hargis
NEPA Document Manager
U.S. department of Energy
National Energy Technical Laboratory
PO Box 10940
Pittsburgh, PA 15236

Dear Mr. Hargis;

This letter is in regards to our review of the Final Environmental Impact Statement (FEIS) for the Mesaba Energy Project. To date, we have reviewed and commented on two previous drafts of the EIS (February 23, 2007 and January 21, 2008). In addition, several separate teleconferences and meetings have occurred with the Department of Energy (DOE), Excelsior Energy (applicant) and other agencies to discuss parts of the EIS and/or unresolved issues regarding content of and the scope of the EIS.

As stated in our phone conversations with you in during the week of May 25, 2009, we do not object to the release of the FEIS for public review and comment. At such time that the applicant moves forward into any CWA Section 404 permit evaluation, the Corps will verify that the information and analyses contained in the FEIS is current and addresses any issues to date.

In July 2008, the St. Paul District and Corps Headquarters (HQ) staff, met with DOE National Energy Technology Laboratory (NETL) staff to discuss several issues related to NEPA and Section 404 of the CWA. Subsequent to that meeting, a memo dated August 6, 2008, was prepared on the status of Corps comments and action items for the DOE Mesaba Energy Draft Environmental impact Statement (DEIS). This memo reflects the status of Corps comments and action items for the DOE NETL Mesaba Energy DEIS.

1. Ultimately, it was recognized that the applicant purpose statement for CWA Section 404 is different from DOE's purpose statement. The Corps staff have worked closely with DOE and the applicant to develop Appendix F1. Appendix F1 is referenced in Chapter 1 of the FEIS under 1.4.3. As stated in Appendix F1, the Project purpose and need is to:

a. 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; and
b. Help satisfy Minnesota's need for new and diverse sources of baseload electric power.

In our letter to Excelsior Energy dated December 13, 2006, the Corps indicated that information demonstrating the applicant's statement of projected power needs of the state over the next 10-15 years was necessary so we could perform a reasonable review of the project need in accordance our public interest review

.

The Mesaba project has received several economic and logistic incentives through state and federal processes. Although the Corps has stated that these incentives were not considered part of the project purpose and need for CWA purposes, they were factors used in limiting the search for practicable alternatives to the Taconite Tax Relief Area (TTRA). If the assumptions used in defining the search area change, we may be required to revisit this analysis.

Appendix F1 describes and documents the screening process used by Excelsior Energy to identify/select their preferred and alternate sites. Corps staff has worked with the applicant to include information on alternatives (e.g. Hibbing and Sites 16 & 17) that were previously dismissed by the applicant be disclosed in Appendix F1. This information, along with information presented in the FEIS and any additional analyses as required in a Section 404 permit evaluation will be used to determine the least environmentally damaging practicable alternatives (LEDPA). DOE and Corps HQ have agreed that the Corps would make a LEDPA determination based on wetland and aquatic resource impacts while taking into consideration impacts on other environmental resources (including visibility impacts). Therefore, please remove the statement on Page F2-36 that states "DOE anticipates that subsequent to the release of the FEIS that USACE would formally designate the LEDPA".

2. The Corps provided comments in 116-22 and 116-23 regarding Chapter 4.7 Wetland Impacts in the DEIS. In previous comments on the DEIS, the Corps requested clarification on the presentation of temporary/permanent and permanent/permanent wetland impacts. It appears that DOE has attempted to clarify this by presenting impacts as direct (fill and permanent conversion) and temporary. However, the Corps continues to maintain that the numerous references and tables on wetland impacts in the Chapter makes it difficult to understand the full magnitude of the impacts. In addition, a separate impact analysis presented with different tables is presented in Appendix F2. Upon a cursory cross-reference between the summary tables between Chapter 4.7 and Appendix F2, the following discrepancies are noted:

Chapter 4.7		
West Range	Direct 94.30 acres	Total Direct and Temp 113.62 acres
East Range	Direct 92.43 acres	Total Direct and Temp 143.43 acres
Appendix F2		
West Range	Direct 94.30 acres	Total Direct and Temp 104.16 acres
East Range	Direct 92.43 acres	Total Direct and Temp 117.98 acres

In addition, the discussion of the High Voltage Transmission Line (HVTL) corridor on the East Range site (the HVTL required to connect the plant site to the substation) is confusing when comparing Chapter 4.7 and Appendix F2. There appears to be two alternatives that could be used for this connection, the 38 line, or the 37/39 line. Page 4.7-27 states that the wetland impacts for the two alternatives are comparable and the 37/39 line appears to be included in the applicant's preferred alternative. However, Table F2-28 page F2-66 indicates the 37/39 line alternative would have 59.62 acres of wetland impact through permanent conversion while Table F2-28 page F2-65 indicates that there would be no temporary or permanent conversion impacts for the 38 Line. This will need to be clarified in order for the Corps to utilize the information in determining the LEDPA.

3. Comment 116-05 and 116-27 relates to a previously unresolved issue in that the DEIS did not address a Phase 1 only alternative, which would demonstrate the technology and result in less wetland impact. The FEIS appears to include an analysis of Phase I only impacts for each of the sites.

4. Comment 116 relates to a previously unresolved issue regarding connected actions under NEPA. Specifically, the need for potential transmission upgrades beyond the point of interconnection for the West Range Site. Previous system impact studies for the West Range Site indicated that network upgrades that included a new 230 kv power line for Boswell to Riverton would be needed. The Corps had indicated that wetland and aquatic resource impact information would be needed for this required line in the determination of the LEDPA.

At the request of the applicant, an optional system impact study was completed that included a proposed new 230 kv power line from Grand Rapids to Bemidji, MN (Boswell to Wilton) and a steel manufacturing plant. The optional study concluded that the Boswell to Riverton line would not be required to connect the West Range site as an Energy Resource if the Grand Rapids to Bemidji and the steel plant were in service. However, these results appear to only apply to Phase I of the Mesaba Project. In the event that Excelsior Energy seeks a CWA 404 permit for both Phases of the Mesaba Project, additional information regarding the need for additional transmission upgrades would be required.

We thank you for the continued opportunities to comment on the EIS. We also remain interested in coordinating with you in our review of this proposal. If you have any questions, contact Ms. Kelly Urbanek in our Bemidji Field Office at (218) 444-6381. In any correspondence or inquiries, please refer to the Regulatory number shown above.

Sincerely,

Tamara Cameron

Tamara E. Cameron
Chief, Regulatory Branch

Copy furnished:
Bill Storm, Minnesota Department of Commerce
Bob Cupit, Minnesota Public Utilities Commission

August 17, 2009

Ms. Tamara E. Cameron
Chief, Regulatory Branch
Department of the Army
St. Paul District, Corps of Engineers
190 Fifth Street East, Suite 401
St. Paul, Minnesota 55101-1638

RE: Operations, Regulatory (2005-5527-WAB)

Dear Ms. Cameron:

This is in response to your letter dated June 22, 2009, regarding the U.S. Army Corps of Engineers' review of the Preliminary Final Environmental Impact Statement (EIS) for the Mesaba Energy Project. Your letter accurately summarized the extent of coordination between the U.S. Army Corps of Engineers and the U.S. Department of Energy, which has spanned the duration of this project. We appreciate your participation as a cooperating Federal agency on this EIS.

The specific items listed in your letter and appropriate edits to the Final EIS to address these items have been discussed and coordinated with Ms. Kelly Urbanek of your Bemidji Field Office. A copy of your letter will be included in an Appendix of the Final EIS.

We look forward to your continued involvement and working with your agency as this project goes forward. Thank you.

Sincerely,

Richard A. Hargis, Jr.

Richard A. Hargis, Jr.

Copy to:
Kelly Urbanek

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
hargis@netl.doe.gov@netl.doe.gov • Voice (412) 386-6065 • Fax (412) 386-4604 • www.netl.doe.gov

United States Department of Agriculture | **Forest Service** | **Eastern Region** | **626 E. Wisconsin Suite 800 Milwaukee, WI 53202**

File Code: 2580-2
Date: July 31, 2009

Mr. Richard Hargis, Jr.
NEPA Document Manager
U.S. Department of Energy, NETL
P.O. Box 10940
Pittsburgh, PA 15236-0940

Dear Mr. Hargis:

Please find below our review of the combined federal/state Preliminary Final Environmental Impact Statement (PFEIS) for Excelsior Energy, Inc.'s (Excelsior), Mesabi Energy Project that we received on April 29, 2009. This review also includes the modeling results contained in the report we received on May 21, 2009, and associated modeling files we received the first week of June 2009.

The project is an integrated coal gasification combined cycle (IGCC) electric power generating station. The facility is proposed to be built in two phases; each phase would nominally generate 600 megawatts of electricity. The preferred location for the facility is the "west site" near the town of Taconite in Northeastern Minnesota. At this location, the facility would be 98 kilometers from the Boundary Waters Canoe Area Wilderness (BWCAW) and 188 kilometers from Rainbow Lake Wilderness (RLW). An alternative location is the "east site" near Hoyt Lakes that would place the facility considerably closer to the BWCAW, only about 40 kilometers away.

As a Federal Land Manager (FLM), the Forest Service has an affirmative responsibility to protect the air quality related values of the Class I wilderness areas it administers, as specified in the Federal Clean Air Act. We also have the specific role on this project as a cooperating agency in providing technical expertise in the review of air quality impacts.

As you know, an air emissions permit is also necessary for this project. It is through this process that our concerns are normally addressed, in cooperation with the permitting agencies - the Minnesota Pollution Control Agency (MPCA), the Environmental Protection Agency (EPA), and other FLMs such as the National Park Service. The air permit process for this project is ongoing. We will continue to work with our state and federal partners through the air permit process following this EIS. As a cooperating agency we are submitting these written comments regarding the PFEIS so they can be considered by the Department of Energy (DOE) as it drafts the mitigation section of the Record of Decision. We do not object to the release of the FEIS to the public as long as our concerns in this letter are also communicated to the public.

Our concerns with this project have not changed since our last comment letter sent to you on December 17, 2007. The first is that Excelsior is not proposing to include emission controls that can significantly reduce its emissions similar to those specified on other IGCC projects in the United States. The second is the modeled impacts to visibility in the BWCAW. In the current draft of the PFEIS on page 4.3-23 DOE states, "Based on the predicted impacts to visibility from the West Range site, DOE would likely not require mitigation to protect visual resources in any of the Class I areas. However, DOE recognizes that the FLMs have the responsibility for determining whether a more refined analysis would be required or whether mitigation of these predicted impacts would be recommended. If mitigation is recommended by the FLMs, DOE would consider such mitigation as a condition of the Record of Decision."

We would like to make it clear that we feel the impacts modeled to visibility at EITHER site require mitigation. For the uncontrolled plant at the west site, the modeling shows 14 days in 3 years over a 10 percent change in visibility, which is over our concern threshold of 10 percent according to the current visibility analysis protocol. Even under the proposed new visibility analysis method the project is again over our concern threshold of 5 percent, with 54 days in 3 years over that value. The east site shows similar results even though pollution controls are implemented.

The best possible mitigation for any source is to reduce its own emissions. This mitigation method directly reduces impacts to the Class I area. If Excelsior installs the "enhanced" controls on its entire plant at the west site, it appears the visibility impacts would be below our concern thresholds. The DOE proposes installing these controls on the entire plant at the east site and we suggest they do the same for the west site.

Our remaining technical comments are enclosed. The Forest Service supports the development of new energy technologies that also demonstrate best available emission controls. We look forward to working with you to reduce the impacts from this project on our Wilderness areas.

If you have specific questions on these comments, please contact Trent Wickman at twickman@fs.fed.us or (218) 626-4372.

Sincerely,

/s/ Logan Lee (for)
KENT P. CONNAUGHTON
Regional Forester

Enclosure

cc: Trent Wickman, Jim Sanders, Jeanne Higgins, Don Shepherd, Andrea Stacy, Chris Holbeck, Jennifer Darrow, Carolina Schutt, Marshall Cole, Bill Storm

Technical Comments on the Excelsior Energy, Mesabi Energy Project

1. We would like to make clear that we did not review the Class I Increment modeling and associated emission inventories other than to note the results of the analysis. The MPCA and EPA have the lead in determining whether this analysis was done correctly. We would like to note that an identical analysis for another project in the same area of Minnesota has shown an exceedance of the Class I increment. We are particularly interested in how the MPCA and EPA resolve this discrepancy since the increment analysis for this project does not show an exceedance and the results of the two analysis should be very similar. An exceedance of the increment can affect the ability of the State to issue air permits for new and expanded sources.

2. The EPA Model Clearinghouse recently issued a memo dated May 15, 2009, that clearly states that the use of a 1km grid resolution in CALMET/CALPUFF is not adequately justified in the domain of interest (i.e., Minnesota); i.e., EPA is not convinced that the finer resolution modeling gives a better result. Therefore, there is little value in including in the final EIS the entire section titled “Supplemental Visibility Modeling Analysis” starting on page 4.3-25 which is based on 1km grid resolution modeling. We feel the section should be removed to reduce any potential confusion introduced by presenting an additional set of modeling results.

3. Please include a discussion of the air pollution controls and emission limits in permits for other IGCC plants for sulfur dioxide and nitrogen oxides in the United States and around the world and how those emission rates compare to the Excelsior project. The PFEIS focuses on comparing the plant to pulverized coal technology.

4. Please describe the best available control technology (BACT) analysis as it applies to the project, since the term BACT is used in the PFEIS, but never defined or described. Please remove the “BACT” and “beyond BACT” labels used for different combinations of pollution control equipment in the document (e.g., footnotes on Table 5.2.2-1). As noted in the PFEIS, the BACT decision has not been made by the permitting agency.

5. Section 3.3.3.3 and the visibility discussion starting on page 5.2-7 – please add discussion relating to the “Concept Plan for Addressing Major Point Sources in Northeastern Minnesota” (Northeastern Minnesota Plan) which is included in the Minnesota Regional Haze Plan. The Northeastern Minnesota Plan prescribes a 20 percent reduction from 2002 emission levels from both existing and new sources by 2012 and 30 percent by 2018. Please provide an analysis of how Excelsior’s project will affect those goals.

6. Table 3.3-5 under the Acid Rain Program – “The program is inherently a mitigation tool in that the marketable allowances help limit the amount of SO_2 and NO_X that can be produced by any one facility; thereby mitigating regional effects.” We feel the use of the term “mitigation” here is inappropriate and potentially confusing. The same term is used later to address Class I area impacts. We request that this sentence be removed.

7. Table 4.3-14 - please show the method 8 results versus 20 percent best natural background, not annual average. If method 8 is eventually prescribed as the new analysis

method for visibility, the Forest Service will ask that the analysis be done versus 20 percent best natural background in Minnesota.

8. Please remove this section on page 4.3-30 – "The Acid Rain Program was established as a system of marketable allowances to control emissions that contribute to the formation of acid rain. Although the FLMs do not consider the purchase of acid rain allowances by affected units to be mitigation of impacts, the program is inherently a mitigation tool in that the marketable allowances help limit the amount..." As stated above, the use of the term "mitigation" in this way is inappropriate and potentially confusing.

9. On Table 3.3-5 - under the Regional Haze Program (and in other places in the document) "On February 2008, Minnesota submitted to U.S. EPA a Draft Regional Haze SIP…" To our knowledge Minnesota has not submitted their plan to EPA yet. This section also should include discussion of the Northeastern Minnesota plan and specifically the 20 percent reduction and 30 percent emission reduction goals. Page 5.2-7 mentions the Northeastern Minnesota Plan, but does not address the main point of it; i.e., the 20 and 30 percent reduction goals and how Excelsior will affect these goals.

10. Under the Clean Air Mercury Rule and other sections where mercury is discussed the final EIS needs to discuss how Excelsior will comply with the State of Minnesota's guidelines for new and expanding air emission sources. These guidelines were developed so new facilities do not jeopardize the ability of the State to meets its goals under the statewide mercury TMDL. One of the goals is an overall decrease in emissions of 78 percent from 2005 levels by all sources. The final EIS should discuss how the project will affect both overall state and the utility-specific goals under the implementation plan for the TMDL.

11. Please remove the speculation as to the final form of federal power plant mercury regulations on page 4.3-31. "For new sources, the minimum standard is equivalent to the average level of control achieved by the top 12 percent of existing sources in that industry group. As described below, the Mesaba Energy Project would utilize the most stringent mercury controls available to solid fueled electric generating units and would therefore outperform any likely MACT standard." It is completely unknown how the final regulation will look. For example, EPA could subcategorize IGCCs which would make the previous speculation moot.

12. Page 5.2-13 – The PFEIS compares the additional mercury from Excelsior to the estimated existing concentrations. This type of analysis does not address the need, as outlined in Minnesota Mercury TMDL, to decrease ambient concentrations of mercury and thereby also emissions.

13. Page 4.3.1.2 - Please remove the following sentence, with which we do not agree - "However, because the Method 2 visibility methodology does not consider the effects of natural weather conditions, such as rain, snow, and fog, on background visibility, DOE understands that it is generally accepted by modeling experts that Method 2 is likely to overstate impacts, especially on days with poor natural background visibility." Also on page 4.3-22, as discussed above, please remove "Method 2 represents a conservative screening approach, which generally over-predicts actual visibility effects that would be

observed." Please remove similar language in other areas of the document such as the modifier "conservative" and other similar terms with method 2. While some aspects may be conservative others are not, for example using a 24-hour emission rate to represent phenomena that is seen instantaneously.

14. Page 4.3-17 – we would like to note that the IMPROVE monitors are not federal reference monitors for PM2.5 or PM10. This data can only be used qualitatively.

15. When presenting the visibility data in Table 4.3-14 we believe it is clearer to show the total number of days over 10 percent and days over 5 percent for the three years modeled; i.e., for the BWCAW 13 days over 10 percent for the proposed, 3 days over 10 percent for the enhanced.

16. For the west site Excelsior runs a modeling scenario with only half of the plant operating "enhanced controls" and no scenario with the entire plant controlled. Please describe how controlling only half the plant helps the Class I areas make reasonable progress toward the national visibility goal. To reach this goal, continuous reductions in emissions must be made by all sources over time. New sources must control their new emissions to the greatest extent possible or else they shift more of the burden of future emission reductions to existing sources.

17. Page 4.3-32 – we feel the statement concerning implications of not moving forward with the project is unsupported; i.e., "would jeopardize potential benefits anticipated from the commercial implementation of IGCC. These benefits include more cost effective CCS options, progress in reducing greenhouse gas emissions, and cost-effective reductions of emissions of criteria pollutants beyond levels required by regulatory caps in the utility sector. It should be noted that the implications of commercializing the E-Gas technology is that significant emissions reduction is expected to result in long-term improved visibility overall as IGCC power plants are substituted for conventional coal-fired power plant." Similar statements are made on pages 5.2-8 and 5.2-14.

    CCS (carbon capture and sequestration) will not be installed with this plant (see Page 5.1-2) so we do not understand how the first statement can be made. With regard to the criteria pollutants, feasible controls for those pollutants are not proposed to be implemented at the preferred west site. Existing power plants have a very long life time and as electrical demand continues to increase we see no evidence in the PFEIS that shows that IGCC will replace existing PC power plants and their associated emissions. Instead, the Mesaba project will be an additional source of visibility impairing emissions. The discussion in the PFEIS seems to assume future electrical demand will be provided by either coal-based IGCC or traditional pulverized coal power plants. Future electrical demand could also be provided by renewable energy or through demand management. Minnesota's setting is unique. Minnesota has a 25 percent renewable portfolio standard goal by 2025 and a ban on future coal-based power development. The Regional Haze Rule requires overall emissions to decrease over time for the states to reach their reasonable progress goals. Please describe how this project would not conflict with these goals.

18. The following statement on page 5.2-14 needs more discussion, "The Project's cumulative visibility impacts would be addressed as part of updating Minnesota's State Implementation Plan in compliance with the Federal Regional Haze Rule (RHR). Demonstration of this IGCC technology and widespread commercialization would contribute to the State's goal of reducing regional haze impacts in nearby Class I areas over the long term." Please explain how new emissions contribute to the goals in the Northeastern Minnesota Plan of a 20 percent reduction in emissions in 2012 and 30 percent in 2018. The PFEIS did not demonstrate that any existing coal-fired power plant in Minnesota would shut down because of this project.

19. We are troubled by the following statement, "The impacts of Mesaba Phases I and II on visibility in the Class I areas where visibility is an AQRV have been shown in Section 5.3 for the West Range site to be controllable and/or readily capable of being offset to where guidance proposed by FLAG2008 shows no modeled adverse impacts. Although visibility impacts due to operation of both sources at the East Range site are more pronounced and a much bigger challenge to mitigate than those at the West Range site, Section 5.3 identifies potential options for reducing modeled impacts below levels considered adverse. Also, as discussed in Section 4.3, more in-depth modeling meteorological analyses may be used to demonstrate impacts below such levels." The word "controllable" is ambiguous. If "controllable" means that emission controls can be installed that would alleviate the visibility impacts, then we agree. Since no detailed emission offset or other options for reducing modeled impacts were discussed in the PFEIS we feel it is premature to conclude that the impacts from the east site can be offset. It is completely unknown whether any of the options are even viable. Also, as we have stated in the past, FLAG 2000 is the current guidance document. The final form of the revision to FLAG is unknown so making decisions based on a proposed revision is clearly inappropriate. Any additional modeling done in the future would need to conform to protocols agreed to by the FLMs. We see no reason to believe that additional modeling would produce different results.

20. Section 4.1.4 of the modeling results report titled "Regional Haze Visibility Impacts Mitigation" included tables that attempt to evaluate the impact of an emission reduction project at the Laskin energy facility. We feel the values in the table may be inaccurate depending on how the modeling was done. To do such a comparison the visibility results for each model run need to be paired in space and time and then the subtraction done at each receptor.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

Ref: 8P-AR

MAY 20 2009

Mr. Brian Gustafson, Administrator
Air Quality Program
Department of Environment and Natural Resources
Joe Foss Building
523 E Capitol
Pierre, South Dakota 57501

Dear Mr. Gustafson,

Please find enclosed EPA's comments on the proposed BART modeling protocol, as prepared by TRC Environmental Corporation for Otter Tail's Big Stone Unit I. These comments also include input from the Federal Land Managers (FLMs) and EPA's Office of Air Quality Planning and Standards (OAQPS). We apologize for the delay in providing you with these comments; however, some of the issues are of a national nature and required discussion and input from OAQPS staff and management as well as the other EPA regional offices and the FLMs. Region 8's inquiry to the OAQPS Model Clearinghouse and the Clearinghouse response and recommendations are enclosed for your use, and they will also be posted on EPA's modeling web site (Support Center for Regulatory Atmospheric Modeling - SCRAM).

Once you've had an opportunity to review the comments, my staff will be available for discussions with you, Otter Tail and the FLMs to complete an acceptable protocol. OAQPS will be available to participate, if desired. Let us know when you wish to schedule these discussions.

If you have any questions, please don't hesitate to call me at (303) 312-6434.

Sincerely,

Callie Videtich, Director
Air Program

Enclosures
cc: Tim Allen, USFWS
Bruce Polkowsky, NPS
Trent Wickman, USFS

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAY 1 5 2009

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Model Clearinghouse Review of CALPUFF Modeling Protocol for BART

FROM: Tyler Fox, Leader
Air Quality Modeling Group (C439-01)

TO: Kevin Golden, Lead Regional Modeler
Air Permitting, Monitoring, and Modeling Unit (8P-A)

Carl Daly, Chief
Air Permitting, Monitoring, and Modeling Unit (8P-A)

INTRODUCTION

In response to your memorandum of February 24, 2009, the Model Clearinghouse has reviewed the proposed position and resolution of the issues presented in order to develop a suitable air quality analysis for visibility for the Otter Tail Power Big Stone Unit I located in Eastern South Dakota. The purpose of this analysis is to determine if this source is subject to Best Available Retrofit Technology (BART) requirements under EPA's Region Haze Program regulations.

Guidelines for determining how to identify sources "subject to BART" are provided in section III of EPA's *Guidelines for BART Determination Under the Regional Haze Rule*, which is located in Appendix Y to Part 51 of Title 40 of the Code of Federal Regulations. Section III.A.3.(Option 1) of Appendix Y, allows the use of CALPUFF model to predict the visibility impacts from a single source at a Class I area and states that CALPUFF is the best regulatory model currently available for this application. Furthermore, with respect to the use of CALPUFF for regulatory applications, footnote 8 in this section of Appendix Y references EPA's *Guideline on Air Quality Models (GAQM)*, published in Appendix W of Part 51. Section 6 of the *GAQM* includes recommendations regarding application of CALPUFF for visibility assessments and for long range transport (LRT) applications in general (nominally beyond about 50 kilometers), indicating that such applications "will require significant consultation with the appropriate reviewing authority (paragraph 3.0(b) [of Appendix W]) and the affected FLM(s) [Federal Land Managers]". Appendix Y also recommends developing a modeling protocol and following the guidance contained within the *Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (USEPA, 1998). The IWAQM Phase 2 summary report is also referenced by the *GAQM*. Thus, when CALPUFF is used in this context, it is our understanding that EPA Regional Offices have encouraged following both the IWAQM Phase 2 report and the *GAQM* when conducting modeling for the BART program.

Recently the FLMs have made us aware that a number of the issues identified in the Region's memorandum regarding this BART application also exist for Prevention of Significant Deterioration (PSD) modeling conducted for assessing impacts in mandatory Class I areas. While Appendix Y and the *GAQM* both offer some flexibility in models and procedures for visibility assessments, deviations from the use of preferred models or modifications of preferred models under PSD is discussed in Section 3 of the *GAQM* and requires Regional Office approval in all cases. See also, 40 C.F.R. § 51.166(l)(2). Given the importance of the issues that the Region has identified and their similarity to issues identified by the FLMs in recent PSD applications, the Model Clearinghouse believes it appropriate to evaluate the protocol proposed by Otter Tail power for its scientific merit.

The Model Clearinghouse review has focused upon the primary issues identified in the Region's memorandum, but also identified several other issues that the Region may wish to consider in its ongoing negotiations. In summary,

1) We concur with Region 8's position that the use of a 1 km grid resolution in CALMET/CALPUFF is not adequately justified given the geographical characteristics of the domain of interest and the limitations of the modeling system.

2) We concur with Region 8's view based on EPA guidelines that "blending" National Weather Service (NWS) observations with prognostic model data is the most technically-sound approach to developing meteorological fields for application of the CALPUFF model when prognostic model data are incorporated. This approach should be used unless adequate documentation is provided demonstrating that an alternative approach has equal technical merit. Absent pertinent evaluations, we are unable to endorse use of the NOOBS =1 option recommended in the *Otter Tail Protocol* at this time

3) We defer the decision on the appropriateness of the proposed concentration post-processing procedures to the Regional Office and the FLMs.

In addition, we are proposing revisions to the IWAQM Phase 2 recommendations that are responsive to the issues and concerns raised in this memorandum. A more complete discussion is provided in the draft document *Reassessment of the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report: Revisions to Phase 2 Recommendations* (USEPA, 2009) available for review on EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) website.

The remainder of this memorandum provides background on the Region 8 request and a more detailed explanation for each of the above recommendations.

BACKGROUND

EPA Region 8, in conjunction the US Fish and Wildlife Service, National Park Service, and the state of South Dakota, has worked to develop an adequate CALPUFF modeling protocol for the Best Available Retrofit Technology (BART) analysis for the Otter Tail Power Big Stone Unit I electrical generating unit in eastern South Dakota. Big Stone Unit I is a large uncontrolled coal-fired facility that is approximately 400 km from the nearest Class I areas in Minnesota and South Dakota.

The facility's consultant completed a CALPUFF modeling analysis in September 2008. This analysis was conducted in the absence of a protocol approved by the aforementioned parties. In this submittal, the Big Stone Unit I had an impact of 0.489 delta-deciview (d-dv) on the Boundary Waters (BOWA) Class I area. Other modeling of this facility produced vastly different results, raising concerns that the methods used in the September 2008 analysis may have resulted in the lower modeled impacts. For example, CAMx source apportionment modeling conducted in 2007 by EPA Region 7 on the Big Stone Unit I yielded a maximum change of 1.87 d-dv at BOWA, with ten days exceeding a 0.5 d-dv change.

In January 2009, the facility's consultant submitted the *Otter Tail Protocol* (TRC, 2009) to EPA Region 8 and the FLMs outlining proposed procedures for a revised CALPUFF analysis. The *Otter Tail Protocol* proposed specific changes to the Western Regional Air Partnership (WRAP) BART modeling protocol (WRAP, 2006) including grid resolution, radius of influence values for CALMET, and the CALMET NOOBS options that are not EPA-approved. Additionally, the *Otter Tail Protocol* proposed the use of alternative procedures for post-processing nitrate concentrations that are not consistent with the WRAP BART modeling procedures. Both EPA Region 8 and the FLMs objected to the proposed deviations, but subsequent negotiations with the facility have not yielded any changes to the proposed *Otter Tail Protocol*.

In February 2009 EPA Region 8 referred the *Otter Tail Protocol* to the EPA Model Clearinghouse for review of the Region's position on grid resolution, non-default CALMET options, and CALPUFF post-processing options. This Clearinghouse memorandum will address the specific deviations from the WRAP protocol identified by the Region's Modeling Clearinghouse request.

CALMET/CALPUFF GRID RESOLUTION

The *Otter Tail Protocol* called for the use of three separate CALMET/CALPUFF modeling domains covering mandatory Class I areas in South Dakota, North Dakota, and Minnesota, "[O]wing to the high spatial resolution and the large extent of the area of interest". Each of the proposed modeling domains utilize a horizontal grid resolution of 1 kilometer, deviating from the 4 km horizontal grid resolution recommended by the WRAP protocol. The *Otter Tail Protocol* specifically states that the

> "...complex terrain is best resolved with a 1 km grid. Additionally, the coastline of Lake Superior, close to Boundary Water Canoe Area WA, and of other smaller lakes on the trajectories to the various Class I areas, is also best resolved at 1km resolution."

An argument for the use of finer resolution CALMET wind fields should address two components. The first is that the prognostic meteorological data sets from NWP models lack sufficient resolution to capture meteorological features of interest which would be responsible for transport of airborne contaminants from the source to the Class I area(s) of interest. The second component of the argument is that the diagnostic wind model (DWM), CALMET, can enhance the NWP data used as the first-guess wind field (IPROG=14) sufficiently to adequately replicate the key meteorological features of interest.

Model Clearinghouse Recommendation on Grid Resolution

Based upon a review of the *Otter Tail Protocol* and relevant scientific literature, the Model Clearinghouse offers the following conclusions. First, the *Otter Tail Protocol* presents no scientific evidence to support the claim that 1 km CALMET resolution increases the objective accuracy of the final wind field, especially in areas of relatively modest topographic relief, such as for each of the three domains proposed. The preponderance of scientific literature is consistent in the conclusion that there is a limitation to the benefit of higher resolution gridded meteorological data, whether from NWP or DWM models, especially for areas of modest topographic relief. Higher resolution data does not necessarily improve model performance, but may in fact degrade model performance for some predicted meteorological parameters. Second, CALMET has limited ability to independently capture the full three-dimensional structure of complex flows. Without the benefit of high resolution NWP data or a high density of representative observational data, the ability of the DWM to accurately simulate these conditions is limited. Several studies have documented the inherent limitations of DWM diagnostic algorithms (e.g., Earth Tech, Inc. (2001), Scire (2008), and Scire (2009))

Therefore, we concur with the Region's position that the use of a 1 km grid resolution in CALMET/CALPUFF is not adequately justified given the geographical characteristics of the domain of interest and the limitations of the modeling system. Furthermore, as indicated in our Introduction, the *Otter Tail Protocol* links the limited geographic extent of the three proposed modeling domains to the use of high (1 km) spatial resolution, implying a trade-off in computational resources between grid resolution and spatial coverage. We do not feel that such a trade-off is justified, and are concerned that the proposed domains may not adequately simulate the potential for plume recirculation. Based on a review of the relevant scientific literature and a review of the CALMET capabilities, we also see no evidence to support the use of a 4 km grid resolution for CALMET/CALPUFF in this case, as recommended in the WRAP BART protocol. Note that the WRAP protocol addresses BART evaluations across a wide domain encompassing the most rugged terrain in the U. S., and this assessment regarding the applicability of 4 km grid resolution for the Otter Tail analysis is not intended to suggest that grid resolutions higher than the 36 km MM5 data are not justified for other areas within WRAP.

Based on our review of this issue and given the limitations of the CALMET DWM, our view is that the candidate NWP data used should appropriately characterize the key meteorological features that govern source-receptor relations for the specific application. We also see no clear basis for, or benefit from, extending the CALMET/CALPUFF grid resolution much beyond the resolution of the prognostic model used to specify the first-guess wind field. Since the Model

Clearinghouse recommendation is to maintain the original horizontal grid resolution of the NWP data in most situations, it would be inappropriate to apply CALMET with any diagnostic adjustments, unless a sufficiently dense and representative network of observed data are available, and the improved performance of the CALMET wind fields can be objectively demonstrated. When properly applied with adequately resolved NWP data, the CALMET first-guess field likely already reflects the relevant meteorological features of interest at that resolution.

The Model Clearinghouse recommendation strictly implies that the candidate NWP data used should appropriately characterize the key meteorological features that govern source-receptor relations for the specific application. This places a higher emphasis on ensuring that the candidate NWP dataset is at the appropriate horizontal grid resolution ***and*** that the dataset captures the key meteorological features for the specific application. Therefore, the recommendation for establishing the suitability of NWP dataset under Section 8.3(d) of the *GAQM* is a critical component for planning a successful LRT model application. In light of these concerns, the appropriateness and adequacy of the CALMET/CALPUFF grid resolution, as well as any prognostic model data used as input to CALMET, should be adequately justified based on the specific needs of the application, and measures should be taken to objectively assess the resulting meteorological fields, including both horizontal and vertical velocity fields, prior to their acceptance for use in CALPUFF. In accordance with Section 8.3(d) of the *GAQM*, we must emphasize that acceptance of a prognostic data set is contingent upon concurrence from the appropriate reviewing authority. Therefore, at a minimum, any protocol should include an evaluation of the performance of the candidate NWP dataset prior to acceptance by the reviewing authority. Model performance evaluation procedures should be based on appropriate and acceptable metrics and methods. Further, if the intent is to apply CALMET at resolutions much higher than the original NWP dataset, the suitability of the resultant datasets should also be examined through the appropriate statistical analysis.

A more complete discussion of this issue is provided in the draft document *Reassessment of the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report: Revisions to Phase 2 Recommendations* (USEPA, 2009) available for review on EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) website. This draft report also provides a detailed discussion of model evaluation methods and procedures appropriate for these applications, including procedures for evaluation of diagnostic meteorological fields.

CALMET NON-DEFAULT SETTINGS

As background, when the CALPUFF modeling system was promulgated in April 2003 as the preferred model for LRT regulatory applications under the *GAQM*, the "hybrid" approach referred to in Section 8.3 of the *GAQM* (formerly Section 9.3 prior to 2005) called for both NWS surface and upper air data. Shortly after its promulgation, the EPA-approved version of the CALMET/CALPUFF modeling system included new options which eliminated the need for surface and upper air observations, relying totally upon prognostic data as the sole meteorological input into CALMET. This approach is most commonly referred to as the "NOOBS" approach, and is invoked by selecting the NOOBS = 1 or 2 option in CALMET. The *Otter Tail Protocol* specifically recommends the use of the NOOBS = 1 option of CALMET, which uses NWP data in lieu of twice daily upper air soundings normally employed in the construction of CALMET wind fields, but incorporates surface observations. The NOOBS = 2 option uses no observed surface or upper air data, relying solely on the NWP data. The *Otter Tail Protocol* contends that using upper air observations directly into CALMET is likely to degrade the quality of the wind fields as compared to the use of gridded MM5 data, although no further rationale or objective evidence for this claim is offered.

As discussed in the IWAQM reassessment report (USEPA, 2009), there is a clear body of evidence to suggest that higher spatial and temporal frequency of NWP data used in LRT modeling generally results in better LRT model verification statistics. Therefore, in theory, the NOOBS approach in CALMET could offer the opportunity to take advantage of higher temporally and spatially resolved initial guess wind fields from NWP data than could otherwise be achieved through the exclusive use of twice-daily RAOB soundings. However, it is important to note that CALMET does not merely pass through the majority of the information from the NWP model to CALPUFF. Much of the original NWP data (e.g., planetary boundary layer (PBL) heights and scaling parameters) is recomputed within CALMET. Therefore, careful consideration must be given to how these re-diagnostic procedures are implemented within CALMET. As also noted in the IWAQM reassessment report (USEPA, 2009), CALMET does not fully utilize the 3-dimensional temperature fields when applying diagnostic adjustments to the wind fields under the regulatory default option, although the full temperature field is passed to CALPUFF (along with the vertical velocities) if the LCALGRD option is selected. Aside from the documented limitations of the modeling system to properly utilize the full benefits of current state-of-the-practice prognostic modeling capabilities, there are few, if any, objective evaluations of model performance on which to base acceptance of these NOOBS options.

Model Clearinghouse Recommendation for Non-default CALMET Settings

While the *Otter Tail Protocol* only proposes the use of the NOOBS=1 option of CALMET, our experiences from the assessment of the VISTA's version (USEPA, 2008) and the 2001 Philadelphia study (Anderson, 2006) suggest that careful consideration of the underlying science and its implementation must be taken when using the more advanced features of CALMET. A literature search conducted by the Model Clearinghouse on subsequent evaluations of the CALMET model used in both the traditional "hybrid" approach and the newer "NOOBS" approach yielded no significant information regarding the performance of the "NOOBS" approach as compared to the traditional "hybrid" approach, other than the references listed in Appendix A-4 of the description of the CALPUFF modeling system delineated in the *GAQM*. Given the documented limitations of the modeling system described above, and lacking any relevant evaluations of the NOOBS=1 approach, we would not be able to endorse its use at this time without a thorough inspection of its implementation and evaluation of model performance.

The Model Clearinghouse also concurs with Region 8's view based on existing EPA guidance that "blending" of NWP data with observations is the most technically-sound approach to developing meteorological fields for application of the CALPUFF model. This approach should be used absent information showing that an alternative approach has equal technical merit. Section 8.3.1.2(d) of the *GAQM* states that these mesoscale meteorological fields should be used in conjunction with available standard NWS or comparable meteorological observations within and near the modeling domain. While the traditional method for this approach has been accomplished through the use of CALMET in its "hybrid" mode, Section 8.3.1.2(d) does not preclude the use of other methods to "blend" observational data into NWP data. It is EPA's view that the use of prognostic data from an NWP model using four-dimensional data assimilation (FDDA) is consistent with this recommendation for "blending". A more complete discussion of this issue is provided in the draft IWAQM reassessment report (USEPA, 2009), including proposed revisions to the IWAQM Phase 2 recommendations that are responsive to the issues and concerns raised in this memorandum. We also anticipate that new guidance and additional regulatory clarifications on the use of NWP and observational data in LRT modeling will be developed in the future as the modeling community expands its use of NWP data in dispersion modeling.

CONCENTRATION POST-PROCESSING ISSUES

The *Otter Tail Protocol* proposes the use of the Ammonia Limiting Method (ALM) which utilizes time-varying background values of sulfate, nitrate, and total ammonia. Monthly background averages are derived from 2002 CMAQ modeling results from the WRAP for each of the Class I areas under review. The *Otter Tail Protocol* contends that the full ALM approach is consistent with the MNITRATE=1 approach that the FLMs have previously accepted in Class I visibility analyses. Both Region 8 and the FLMs object to the use of the full ALM, and would prefer a constant ammonia background and the application of MNITRATE=1.

Under Section 6.2.1(e) of the *GAQM*, CALPUFF may be applied for haze attribution assessments when larger domains are involved than can normally be handled by the VISCREEN model. No specific guidelines exist within the *GAQM*, which covers the application of CALPUFF for the post-processing of chemical species. General guidance on the application of CALPUFF for such analyses can be found in the IWAQM Phase 2 report (USEPA, 1998) and Federal Land Managers FLAG 2000 guidance (NPS, 2000). According to Section 6.2.1(e) of the *GAQM*, specific procedures and analyses for CALPUFF should be determined in consultation with the appropriate reviewing authority and the affected FLMs. Since EPA Region 8 is the reviewing authority of record for this analysis, the Model Clearinghouse defers to the Region's judgment as to the best analytical procedures for post-processing of concentrations for visibility calculations.

ADDITIONAL OBSERVATIONS FOR CONSIDERATION

The Model Clearinghouse would also like to highlight several other observations that the Region should consider in its evaluation of the *Otter Tail Protocol* as it pertains to grid resolution. As noted above, the proposed use of a 1 km grid resolution in CALMET/CALPUFF is linked in the *Otter Tail Protocol* with the specification of three separate modeling domains of limited extent, ostensibly to balance the computational demands of the high resolution grid. The emission unit under review is located at the extreme eastern edge of the proposed modeling domains for both the southwestern and northwestern domains. Since during significant periods of the year the synoptic scale winds will flow zonally from west to east over the high plains of the north central United States, it is reasonable to expect that the emissions from the unit being modeled will rapidly flow off of the computational domain. If recirculation of the emissions is possible, the proposed grid configuration creates the potential for artificial elimination of emissions from the computational domain. Therefore, we recommend that the Region consider expanding the domains both east and south to prevent the possibility of artificial elimination of emissions from the computational grid. Also, given our response to the issue regarding grid resolution, there does not appear to be any technical or practical issues that would necessitate the use of multiple domains for this application.

The stack parameter information listed in Table 2-1 of the *Otter Tail Protocol* appears inconsistent with stack data reported on the WRAP website and utilized in the 2007 CAMx PSAT analysis previously cited. Region 8 should verify that the information contained in the *Otter Tail Protocol* is correct.

SUMMARY

The Model Clearinghouse has reviewed the BART modeling protocol for the Otter Tail Power Big Stone Unit I in South Dakota and Region 8's positions regarding the proposed CALMET/CALPUFF grid resolution, non-default CALMET settings, and concentration post-processing options. Based upon our review of the supporting information contained within the *Otter Tail Protocol* and available literature regarding the use of NWP data in DWM's, the Model Clearinghouse concurs with Region 8's position on grid resolution and the use of non-default options. We defer the final issue regarding post-processing to the Region and the FLMs for appropriate resolution. If you have any further questions or comments, please contact me at (919) 541-5562.

cc: Roger Brode, C439-01
Richard Wayland, C304-02
Bill Harnett, C504-01
Raj Rao, C504-01
Tim Allen, USFWS
John Notar, NPS
John Vimont, NPS
Rick Graw, USFS
EPA Regional Modeling Contacts, Regions I-VII, IX-X

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Appendix E

August 10, 2009

Mr. Kent P. Connaughton
Regional Forester
U.S. Department of Agriculture. Forest Service
626 E. Wisconsin, Suite 800
Milwaukee, WI 53202

Dear Mr. Connaughton:

This is in response to your letter dated July 31, 2009, regarding the Forest Service's review of the Preliminary Final Environmental Impact Statement (EIS) for the Mesaba Energy Project. The Department of Energy (DOE) values your agency's input as a cooperating agency for the EIS in providing technical expertise in the review of air quality impacts.

As I discussed with Trent Wickman, on August 7, 2009, there are important points of clarification regarding certain statements in your letter. As with all projects in the Clean Coal Power Initiative Program, the industrial participant (Excelsior Energy in this case) is responsible for satisfying all permitting requirements, including negotiation of Best Available Control Technology (BACT) requirements with the regulatory authority, the Minnesota Pollution Control Agency (MPCA). DOE understands that MPCA has deferred a decision on BACT for this project until later in the permitting process, sometime after completion of the Final EIS. The statement that "DOE proposes installing these controls..." when referring to Excelsior Energy's proposed level of control is incorrect. Further, the characterization of the controls proposed by Excelsior as representative of an "uncontrolled plant" is inaccurate.

The Department of Energy will give appropriate consideration to your technical comments in finalizing the EIS and in preparing DOE's Record of Decision (ROD). As stated in the Draft EIS which you reviewed earlier and in the Preliminary Final EIS, which is the subject of your current review, DOE would consider mitigation of air quality impacts, if necessary, beyond those required in the permitting process. It should however be noted that DOE's involvement is with Phase I only and therefore any mitigation specified in the ROD would be limited to the first of the two planned nominal 600 MWe Integrated Gasification Combined Cycle plants.

We will reference your letter in the text of the Final EIS and include a copy of your letter in the Appendix, as requested. We look forward to your continued involvement and working with your agency as this project goes forward.

Sincerely,

Richard A. Hargis, Jr.

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
hargis@netl.doe.gov@netl.doe.gov • Voice (412) 386-6065 • Fax (412) 386-4604 • www.netl.doe.gov

MINNESOTA DEPARTMENT OF COMMERCE

Energy Facility Permitting
85 7th Place East, Ste 500
Saint Paul, MN 55155-2198
Minnesota Department of Commerce

June 8, 2007

Richard Hargis
U.S. Department of Energy
National Energy Technology Laboratory
PO Box 10940
Pittsburgh, PA 15236-0940

RE: Release of the Draft Environmental Impact Statement
Minnesota Department of Commerce Energy Facility Permitting Staff
PUC Docket No. E6472/GS-06-668

Dear Mr. Hargis,

I am in receipt of your request concerning the Minnesota Department of Commerce, Energy Facility Permitting staff's concurrence with the release of the DEIS for the Mesaba Energy Project (MPUC Docket No. E6472/GS-06-668)

The MDOC EFP staff concurs with the DOE decision to release the DEIS.

If you have any question or need further information, please do not hesitate to contact me.

As always, MDOC appreciates the assistance and cooperation of the DOE with these issues.

Thank you.

Sincerely,

William Cole Storm,
State Planning Director
Department of Commerce
Energy Planning & Advocacy
Routing & Siting Unit
85 7th Place East
Suite 500
St. Paul, MN 55101-2198

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DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL MN 55101-1638

June 5, 2007

REPLY TO
ATTENTION
Operations
Regulatory (2005-5527-WAB)

Mr. Richard Hargis
NEPA Document Manager
U.S. Department of Energy
National Energy Technical Laboratory
PO Box 10940
Pittsburgh, PA 15236

Dear Mr. Hargis:

On December 27, 2006, the St. Paul District Corps of Engineers (Corps) provided comments on a preliminary version of the draft Environmental Impact Statement (DEIS) for Excelsior Energy's IGCC power plant proposal. In that letter, we raised concerns that the DEIS did not adequately document the consideration of a range of alternatives as required under both NEPA and the Clean Water Act Section 404(b)(1) guidelines.

As requested by the Department of Energy (DOE), we have worked with Excelsior Energy to develop a purpose and need statement that is acceptable to the Corps. Excelsior Energy has also responded to our request and provided us with a narrative of the process and criteria they used to identify and analyze the practicability of various power plant sites. We have reviewed the project purpose and need and the alternatives analysis with Excelsior Energy on several occasions. We understand this information has been forwarded to DOE for inclusion in the DEIS. While we believe the latest version of this narrative describes the process and rationale used by Excelsior Energy to select their preferred alternative, we have not endorsed its conclusions and have some question as to whether Excelsior Energy's preferred alternative is the least damaging practicable alternative as required under the 404(b)(1) guidelines.

However, we believe the purpose and need statement is satisfactory for our purposes; and the alternatives analysis in the DEIS, as supplemented by Excelsior Energy's latest input, provides sufficient documentation for review and comment. Although we have not resolved all of our concerns with the analysis necessary for the CWA Section 404 review process, the Corps is in agreement with DOE's release of the draft EIS for public comment. If you have any questions contact Kelly Urbanek at 218-444-6381.

Sincerely,

Robert J. Whiting
Chief, Regulatory Branch

Copy furnished:
Minnesota Department of Commerce
Minnesota Public Utilities Commission

United States Department of Agriculture
Forest Service
Superior National Forest
8901 Grand Ave. Place
Duluth, MN 55808-1122
Phone: (218) 626-4300
Fax: (218) 626-4398

File Code: 2580-3
Date: June 13, 2007

Mr. Richard Hargis
NEPA Document Manager, Office of Major
Demonstration Projects
National Energy Technology Laboratory, US
Department of Energy
3610 Collins Ferry Road
PO Box 880
Morgantown, WV 26507-0880

Dear Mr. Hargis:

Thank you for providing responses to our concerns. For the purposes of the EIS we feel you have addressed our concerns for most of the issues we raised. As you state, most of these issues will be resolved through the Federal Prevention of Significant Deterioration (PSD) air permitting process. We have a couple of responses to information we read in the document you sent that we'd like to share with you.

We do not agree with the following statement by the project proposer:

The MPCA has stated publicly that the reasonable progress improvements they have charted to date do not reflect such CAIR-related reductions. Further, the MPCA does not appear to have allowed for any benefit that would be derived from the CAIR-related provision requiring new EGUs (of which Mesaba One and Mesaba Two would be considered) to purchase sulfur dioxide allowances each year in an amount equal to the annual sulfur dioxide emissions that they release. Excelsior believes that the purchase of such allowances provides an unparalleled offset compared to new non-EGU sources that are not directly required to do so.

The modeling projections done to determine progress in 2018 for regional haze have always included the affect of CAIR as one of the programs that are "on-the-books." The timing and distribution of emission reductions under CAIR are unknown so a model (IPM) has been used to predict that information.

Purchasing of CAIR-related allowances in an amount equal to the emissions of the Excelsior facility would likely not offset the air quality impacts from the facility at the BWCAW. The location and timing of the emissions reductions that may eventually be caused by the purchase of the allowances by Excelsior on the open market are unknown. They may take place at sources hundreds of miles away from northern Minnesota, at some undetermined time in the future, while Excelsior will be emitting every year at a location near the BWCAW.

Lastly we would like to convey that in previous PSD projects we have not accepted the BART modeling approach used by Excelsior. We will need to discuss this issue (along with the emission inventories used) further with Excelsior and the MPCA during the PSD permitting process.

If you have any questions, please contact Trent Wickman at (218) 626-4372.

Sincerely,

/s/ James W. Sanders
JAMES W. SANDERS
Forest Supervisor

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APPENDIX E2
Endangered Species Act Consultation

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U.S. Department of Energy

NETL

National Energy Technology Laboratory

December 18, 2006

Mr. Paul Burke
U.S. Fish & Wildlife Service
4101 East 80th Street
Bloomington, MN 55425

Re: Section 7 Consultation – Mesaba Energy Project

Dear Mr. Burke:

This letter is to initiate formal consultation under Section 7 of the Endangered Species Act for a proposed action by the U.S. Department of Energy (DOE). As you know, DOE has entered into a cooperative agreement with Excelsior Energy to provide a total of $36 million in cost-shared funding for the Mesaba Energy Project. A description of the proposed project, the specific area affected by the proposed action, the listed species or critical habitat that may be affected and other relevant information is enclosed. Additional information is available in the Joint Permit Application and Environmental Supplement submitted by Excelsior Energy to the Minnesota Department of Commerce. The URL for this documentation is as follows:
http://energyfacilities.puc.state.mn.us/Docket.html?Id=16573
Note that the Minnesota Department of Commerce is a joint lead agency for the preparation of the Environmental Impact Statement for this project.

During the informal consultation process which began in September 2005, you and other representatives of your office indicated that the three species of concern were the bald eagle, grey wolf and Canada lynx. A summary of the record of communications between DOE and the U.S. Fish & Wildlife Service (FWS) was provided to you in an e-mail on September 7, 2006, as well as a report prepared by one of the contractors to Excelsior Energy regarding ecological habitat surrounding the preferred and alternative sites being considered by Excelsior Energy for the project. Based on the informal consultation process, DOE has made a determination that the proposed action may affect, but is not likely to adversely affect, the bald eagle and that the proposed action may affect the grey wolf and Canada lynx. Therefore, DOE is requesting a biological opinion from FWS regarding the potential effects on these two species.

Please let me know if I can provide any additional information. Thank you.

Sincerely,

Richard A. Hargis, Jr.
NEPA Document Manager

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
HARGIS@NETL.DOE.GOV@netl.doe.gov • Voice (412) 386-6065 • Fax (412) 386-4778 • www.netl.doe.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
4101 East 80th Street
Bloomington, Minnesota 55425-1665

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
FWS/AFWE-TCFO

MAR - 6 2007

Richard A. Hargis, Jr.
NEPA Document Manager
U.S. Department of Energy
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, Pennsylvania 15236

Dear Mr. Hargis:

This responds to your December 18, 2006, letter regarding consultation under section 7 of the Endangered Species Act of 1973, as amended, for the proposed construction of the Mesaba Energy Project (applicant), in Itasca and St. Louis Counties, Minnesota. There are two sites under consideration for plant construction. The West Site is located in Itasca County, near the Town of Taconite, and the East Site is located about 60 miles to the northeast, in St. Louis County, near the Town of Hoyt Lakes, Minnesota. The West Site has been identified as the preferred alternative. The final project site will be selected at the close of the planning process.

By your letter, the U.S. Department of Energy (DOE) is requesting concurrence with the determination that the proposed action may affect but is not likely to adversely affect the federally-listed species the bald eagle (*Haliaeetus leucocephalus*). Further, the DOE has requested the initiation of formal consultation for the gray wolf (*Canis* lupus) and the Canada lynx (*Lynx canadensis*). The Service will consult with the DOE on the project as proposed for the preferred alternative, the West Site. The U.S. Fish and Wildlife Service (Service) has reviewed the information included with your letter and provides the following comments for your consideration

Since 2005, the DOE and the applicant staff have provided comprehensive coordination with the Service on this project, including direct communication through telephone and electronic mail contacts throughout the planning phases for this project. Both the DOE and the applicant are to be commended for this consultation effort.

The Service, in working closely with project staff, has assessed the proposed project's impact on the bald eagle. The bald eagle is broadly distributed across the greater project area, and eagle sightings in the immediate vicinity of the project action area (West Site) are common. The forest canopy provides diurnal roosts, and the neighboring streams and lakes provide forage habitat for the bald eagle. However, the nature of the proposed project is such that roost and forage habitats are not likely to be reduced or diminished for eagles in the action area because only a small proportion of the project site has not already been substantially altered by historic mining activities. Further, there are no known eagle nests within the project site, or within 1,320 feet of the project site boundary. Thus, we concur the DOE determination that the proposed project is not likely to adversely affect the bald eagle.

The Service also concurs with the DOE determination that the proposed action may affect the Canada lynx and the gray wolf. The gray wolf and the Canada lynx are now found in the vicinity of the West Site. The greater challenge is in the apparent vulnerability of lynx and wolf to vehicle collisions when crossing roads. Specifically, any project that results in new roads, new road alignments, widened rights-of-way, or increased vehicle speeds, in habitat occupied by the Canada lynx and the gray wolf may affect these species.

By initiating formal consultation under section 7 of the Act, the Service will be required to prepare a biological opinion, which documents the specific elements of the proposed action and their impact on the listed species. Along with a determination as to whether the project would jeopardize the continued existence of the listed species, the biological opinion may also provide conservation recommendations, an incidental take statement, with reasonable and prudent measures and the terms and conditions of that statement.

The Service is limited to a time period of 135 days in which to provide your office with a final biological opinion for the project. This time period works to ensure a prompt response and a more predictable consultation environment for the project managers. This time period is supposed to begin upon the date of the letter requesting the initiation of formal consultation. However, the Service understands that the DOE and the applicant need to adhere to a project time line that requires a final biological opinion within 60 days. Due primarily to the efforts of the DOE and the applicant in project coordination to date, the Service believes that we can meet this deadline. Therefore, we will make every effort to provide a biological opinion dated on or before April 30, 2007, to be provided to the DOE, with copies to the applicant and other appropriate agencies.

We appreciate this opportunity to work with the DOE and the applicant in the conservation and recovery of federally-listed species. If you have any questions, or if we can be of further assistance, please contact Mr. Paul Burke, of this office, by calling (612) 725-3548, and at extension 205.

Sincerely,

Tony Sullins
Field Supervisor

CC:

David Holmbeck

Mn/DNR – Grand Rapids

February 25, 2009

Mr. Tony Sullins
Field Supervisor
U.S. Fish & Wildlife Service
Twin Cities Field Office
4101 East 80th Street
Bloomington, MN 55425

Re: Section 7 Consultation – Mesaba Energy Project

Dear Mr. Sullins:

My last letter to your office dated August 15, 2008, transmitted a Biological Assessment (BA) for the Mesaba Energy Project, addressing potential impacts to the Canada lynx. In a subsequent telephone conversation on November 5, 2008, you indicated that, due to recent court decisions, the BA would need to also address potential impacts to the gray wolf. The BA has been revised as requested and DOE has made a determination that the proposed action may affect, but is not likely to adversely affect, Canada lynx or gray wolf or their critical habitat under either site alternative for the project. However, as you explained in our telephone conversation in November, the U.S. Fish and Wildlife Service would only consult on one site (in this case, Excelsior's preferred West Range site near Taconite, MN). Therefore, this letter is to request concurrence with DOE's determination for the West Range site. I understand that consultation would have to be re-initiated if the state site permit were to be issued for the alternate East Range site by the Minnesota Public Utilities Commission

Enclosed is a hard copy of the BA for your review. Please note that a separate copy has also been sent to Ms. Susan Oetker, at your New Mexico Field Office. I would appreciate a response from your office by April 3, 2009.

Please let me know if you have any questions or if I can provide any additional information.

Thank you.

Sincerely,

Richard A. Hargis, Jr.
Office of Major Demonstration Projects

Enclosure

c w/ Enclosure
Susan Oetker, USFWS

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
hargis@netl.doe.gov • Voice (412) 386-6065 • Fax (412) 386-4778 • www.netl.doe.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
4101 American Blvd E.
Bloomington, Minnesota 55425-1665

May 1, 2009

Richard A. Hargis, Jr.
Office of Major Demonstration Projects
U.S. Department of Energy
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, Pennsylvania 15236

Dear Mr. Hargis:

We have received your biological assessment (BA) dated February 25, 2009 for the West Range Site of the Mesaba Energy Project. This letter corrects a minor error (reference to Corps of Engineers) in my letter of April 22, 2009, and therefore supplants that earlier correspondence. This project consists of constructing a large, coal-based electric generating facility on 1,708 acres in the Iron Range of northern Minnesota in the City of Taconite, Itasca County. The project would include two power plants, as well as 6 miles of rail line, 13 miles of natural gas pipeline, 8.5 miles of high voltage transmission lines, road access, and wastewater treatment areas. The Department of Energy (DOE) has requested concurrence with a "may affect but not likely to adversely affect" determination for Canada lynx and gray wolf and has also determined the project is not likely to adversely modify proposed critical habitat for Canada lynx in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C., 1531 et seq.). A complete administrative record of this consultation is on file in this office.

Under section 7 of the Endangered Species Act, the DOE began consulting with the U.S. Fish and Wildlife Service in 2006 regarding federally-listed threatened species that may occur on or near the Mesaba Energy Project's action area. Both the Canada lynx (*Lynx canadensis*) and gray wolf (*Canis lupus*) may use this habitat. At the time work on this BA began, the gray wolf was a delisted species and so was not included in the original BA submitted to this office in July 2008. The delisting rule was vacated in December 2008 and regulatory protections once again applied to the wolf. As such, the DOE has analyzed both lynx and wolf in the final BA. No critical habitat for either species occurs on the West Range Site.

Canada lynx

Northeastern Minnesota lies at the southern edge of the lynx range in North America, and the action area is located near the southeastern edge of the lynx range (historical and present day) in Minnesota. Male and female Canada lynx home ranges in Minnesota are approximately 34 and 8 square miles, respectively (Moen et al. 2006). The common causes of lynx mortality are starvation, inter-specific strife, hunting, trapping (including snaring), and vehicle collisions.

Long distance movements are characteristic of lynx (Mowat 2000). These movements may consist of a series of relatively short distance movements between patches of high snowshoe hare *(Lepus americanus)* abundance (Ward and Krebs 1985) or, if prey are not abundant, a search for such patches of more suitable habitat. Long distance movement may lessen in areas with good prey densities. Sub-adult lynx are also known to range widely even when prey are abundant (Quinn and Thompson 1987), presumably as an innate attempt to establish home ranges away from their natal areas. Lynx also make exploratory movements outside their home ranges (Squires et al. 2001) and are capable of moving extremely long distances (Mech 1977, Poole 1997, Squires et al. 2001). These movements may be necessary for lynx to persist in landscapes where potential habitat is not homogeneously distributed (Hoving et al. 2004).

Because of the proximity of the West Range Site to an area recently surveyed for lynx for a separate consultation with U.S. Army Corps of Engineers (Minnesota Steel project), the results of that survey may be indicative of lynx use of this project's West Range Site. The Minnesota Steel Mine site is approximately 5 miles east of the West Range Site, and it was surveyed January-March 2007. There were 614 miles of transects surveyed in 7 townships, including the West Range Site. During the winter of 2006, the contractor designed the survey, investigated historical records, canvassed local authorities regarding lynx activity, and scouted for potential lynx habitat and survey corridors in preparation for the track survey. During the winter of 2007, the winter lynx track survey was conducted on approximately 541 miles of transect within the 252 square mile survey area and on an additional 73 miles of transects in townships adjacent to the survey area (ENSR 2007). See ENSR (2007) for additional details regarding survey methods. The survey detected no Canada lynx tracks, but intercepted 56 bobcat *(Lynx rufus)* tracks.

The failure to detect any lynx tracks with a survey as intensive as that conducted by ENSR (2007) strongly indicates that lynx were not present in the survey area. In Maine, surveyors detected 100% of radio-collared lynx present in townships when at least 0.9 mile of transect were surveyed per square mile; at least one lynx was detected in townships that were known to be occupied by lynx when 0.6 mile of transect was surveyed per square mile (Vashon et a1. 2003). ENSR (2007) surveyed 2.1 miles of transect per square mile and should have detected lynx if they were present. The prevalence of bobcat track intercepts in the survey area reflects the general predominance of this species in the vicinity of the proposed project (Fig. 3). Bobcats may compete with lynx where they overlap and this competition may result in segregation of the species geographically and at the scale of individual home ranges (Robinson 2006). The northwest corner of the township (T 56 N, R 24 W) was described as having the greatest potential for lynx use, and this includes the West Range Site.

Although lynx are unlikely to be resident species in the action area or nearby, individuals may move into the action area while making the types of long-range movements described above. In these cases, the project impacts may reduce the ability of these lynx to move through the action area and may increase movements parallel to the SE-NW orientation of the Mesabi Iron Range in the vicinity of the action area. This type of effect on lynx movement is a potential outcome of the proposed action. It is unlikely, however, that this would result in any detectable adverse impacts on the survival or reproduction of any Canada lynx due primarily to the evidently marginal importance of the action area for lynx.

Collision with vehicles is also recognized as a documented cause of lynx mortality in Minnesota. Vehicle traffic to and from the project site would include the following:

- Road access to the project site
- Rail access to the project site
- Road traffic within the project site

In previous actions, the Service has anticipated incidental take of lynx as a result of increased vehicular traffic in close proximity to areas containing or likely to contain lynx home ranges. Approximately 0.5 miles of road would be constructed to connect County Road 7 to the West Range Site, and increased vehicular traffic would result from the approximately 185 full time workers employed by the plant. This increased traffic will occur in areas where lynx are not likely resident and away from areas identified as suitable or potentially suitable for lynx (ENSR 2007). Therefore, the likelihood of the proposed action resulting in the death or injury of any Canada lynx due to a vehicle collision is discountable.

A review of the scientific literature found no references to the impact of air quality on Canada lynx. Since the existing regulatory program for air quality sets standards for human health and safety, we will assume that the project-related air quality impacts will not adversely affect Canada lynx.

In conclusion, the action area is located near the edge of lynx range, does not contain extensive areas of suitable lynx habitat, and a comprehensive survey using established methods (e.g., see Squires et al. 2004) and qualified observers failed to record a single lynx in and around the action area in 2007 and during a preliminary investigation in 2006. Increased vehicular traffic will not occur near any area where lynx have been recently verified or near any areas identified as suitable or potentially suitable for lynx (ENSR 2007). Although project activities may affect lynx potentially moving through the action area due to the destruction of forested habitat, it is unlikely that these effects to movement will result in reduced survival or reproduction of any lynx. In summary, although the proposed action is likely to result in some effects to lynx, the Service finds that those effects are likely to be insignificant or discountable and, thus, are not likely to adversely affect any Canada lynx. Insignificant effects relate to the size of the impact and should never reach the scale where take[1] occurs. Discountable effects are those

[1] Under the Endangered Species Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. Therefore, we concur with the DOE determination that the proposed action may affect, but is not likely to adversely affect Canada lynx.

Gray wolf

The gray wolf population in Minnesota has hovered around 3,000 over the last decade (Erb 2008), exceeding the recovery goal of 1,400. Wolves occur throughout northern Minnesota, and the Chippewa National Forest has some of the highest numbers of wolf observations (Erb 2008). The West Range Site is approximately 6 miles from the Chippewa National Forest.

Wolf density is heavily dependent on prey availability (Fuller 1989). Conservation of primary wolf prey, such as white-tailed deer, is clearly a high priority for the Minnesota DNR, which typically manages ungulates to ensure a harvestable surplus for hunters, nonconsumptive users, and to minimize conflicts with humans. To ensure a harvestable surplus for hunters, the agency must account for all sources of natural mortality, including loss to wolves, and adjust hunter harvest levels when necessary.

The primary effects of the project on wolves would result from habitat loss and increased vehicle traffic. Approximately 618 acres of habitat would be lost at the West Range Site. Deer, moose, and beaver, the primary prey species for wolf, are closely associated with forage from young upland forest less than 10 years old. Currently, the Chippewa and Superior National Forests provide ample habitat for prey species, and densities of these species (particularly deer) have been high; therefore, prey availability is not likely to threaten wolves in the western Great Lakes population.

Human settlement and roads are considered to be major determinants in wolf distribution. These activities have multiple effects, including increased human presence causing an increase in illegal poaching and legal predator control, increased chance of introduced diseases and parasites via pets (e.g., canine parvovirus), and potential deterrence to colonization of otherwise suitable habitat (Mech 1995, Gogan et al. 1997). The Recovery Plan recommends that density of higher standard roads remain below one mile/mile^2 to limit the extent of associated effects to wolves.

The density of roads in the vicinity of the West Range Site is 1.1 miles/mile^2, and after project construction, the density would be 1.2 miles/mile^2. The increased traffic associated with these roads will occur in areas where wolf are not likely resident (i.e., close to human habitation and activity). Therefore, the likelihood of the proposed action resulting in the death or injury of any wolf due to a vehicle collision is discountable. The activities associated with the Mesaba Energy Project are not likely to lead to additional poaching or introduced disease.

This precludes further action as required under section 7 of the Endangered Species Act of 1973, as amended. If new information becomes available that indicates federally listed species may be affected in a manner or to an extent not previously considered, such as if evidence of lynx activity increases significantly in the action area, consultation must be reinitiated.

If you have any questions or if we can be of further assistance please contact me directly at (612)725-3548, extension 201.

Sincerely,

Tony Sullins
Field Supervisor

Prepared for:
Excelsior Energy, Inc.
Minnetonka, Minnesota

Biological Assessment for the Proposed Mesaba Energy Project
Final

ENSR Corporation
February 2009
Document No.: 12341-001-0300

ENSR | AECOM

Appendix E

Prepared for:
Excelsior Energy, Inc.
Minnetonka, Minnesota

Biological Assessment for the Proposed Mesaba Energy Project
Final

Prepared By: Stuart L. Paulus, Ph.D.
Tyler Creech
Bryan Chevillet

ENSR Corporation
February 2009
Document No.: 12341-002-0300

ENSR | AECOM

Executive Summary

Excelsior Energy Inc. (Excelsior) has proposed to construct a large, coal-based electric generating facility in the Iron Range of northeastern Minnesota as part of its Mesaba Energy Project. The U.S. Department of Energy (DOE), through its Clean Coal Power Initiative program, is providing $36 million in funding for the Project as part of a national energy strategy to improve the environment while providing low-cost electricity from domestic coal sources. The DOE is also serving as the lead federal agency for the preparation of an Environmental Impact Statement (EIS) for the proposed Project; the U.S. Army Corps of Engineers and U.S. Forest Service are cooperating federal agencies. The EIS is being jointly sponsored by DOE and the Minnesota Department of Commerce.

The first two phases of the Mesaba Energy Project ("Mesaba One" and "Mesaba Two," respectively; collectively, the "Project") would entail the construction and operation of two nominal 600-megawatt$_{(net)}$ Integrated Gasification Combined Cycle (IGCC) generating units (hereafter, the "IGCC Power Station") at one of two alternative Project sites. The two sites – one designated as Excelsior's preferred site, the other as its alternate – were proposed in accordance with State rules implementing the Power Plant Siting Act (*see* Minnesota Rule § 7849). The preferred West Range Site is in Itasca County within the city of Taconite, and the alternate East Range Site is in St. Louis County within the city of Hoyt Lakes, Minnesota. In each case, corridors extending beyond city limits have been established to connect the IGCC Power Station to important regional infrastructure elements.

Both sites are dominated by second-growth forest habitats – deciduous and mixed (deciduous and coniferous) forest at the West Range Site, and mixed forest at the East Range Site. Shrub swamp, wooded swamp, shallow marsh, and bog wetlands also can be found within the sites. Current and historic mining and other industrial operations are common in the area, and mine pits and tailings basins can be found near both sites.

The land upon which the IGCC Power Station equipment, raw material and by-product storage areas, administrative offices, electric switchyards, parking lots, and connecting roadways would be constructed is referred to as the "IGCC Power Station Footprint" or simply, the "Footprint." The large buffer area within which the Footprint would be located is referred to as the "Buffer Land." Project-related infrastructure constructed outside the Footprint and Buffer Land would include access roads, rail lines, high voltage transmission lines, natural gas pipelines, process water and potable water supply lines, and domestic wastewater disposal lines.

Section 7 of the federal Endangered Species Act (ESA) requires that federal agencies "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species." This Biological Assessment (BA) is prepared in accordance with the ESA and analyzes potential effects to federally listed threatened and endangered species, and species proposed for listing, and their designated critical habitats, as a result of the proposed project. Although the final site would be selected by the Minnesota Public Utility Commission, both sites are considered in this BA.

The Canada lynx (lynx) and gray wolf (wolf), federally threatened species, are listed species that may use the proposed Project sites. In the Great Lakes region, the lynx is found primarily in mixed forest habitats where snowshoe hare are common. The Project sites are located near the western edge of the lynx's range in the region, and lynx density is believed to be higher near the East Range Site, which lies closer to core lynx range than the West Range Site. Lynx were sighted within 2 miles of both Project sites in 2003.

On March 24, 2000, the lynx was federally listed as a threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies. On November 9, 2006, the USFWS designated 317 square miles (mi^2) as critical habitat in Voyageurs National Park. Voyageurs National Park is approximately 50 miles northwest of the proposed project sites. On February 29, 2008, the U.S. Fish and Wildlife Service (USFWS) published in the Federal Register (2008a) a proposed rule that included a proposed revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. The proposed rule is still under review by the USFWS as of January 31, 2009.

Gray wolves are the largest wild members of the dog family (Canidae). Wolves are carnivorous predators that prefer a diet of medium and large mammals. Wolf prey species in Minnesota include white-tailed deer, moose, beaver, and snowshoe hare. Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species.

In response to their vastly declining numbers range wide, the gray wolf was determined to be endangered in 1967 under the Endangered Species Preservation Act of 1966. In 1974, the species was formally listed as endangered through the authority of the ESA, and the Minnesota population was reclassified to threatened in 1977. In April 2003, gray wolf populations in the United States were separated into three Distinct Population Segments (DPS) to more effectively manage the species. The Minnesota population is a designated portion of the Eastern DPS. In 1978, critical habitat was designated for the Eastern DPS of gray wolf. That rule identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3. Wolf management zones 1, 2, and 3 comprise approximately 9,800 $miles^2$ in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest. The East Range Site is within Zone 2, while the West Range site is outside the designated critical habitat area.

Impacts associated with Project habitat loss and disturbance, and collisions with vehicles and trains, could impact lynx and gray wolf. Using worst case assumptions, approximately 618 acres of wildlife habitat would be lost within the West Range Site and associated utility and transportation corridors; approximately 929 acres of habitat would be lost within the East Range Site and its associated corridors. Noise, light, and glare from the generating facility could cause lynx and wolves to avoid either area. Lynx and gray wolf could be hit by vehicles or trains. Other potential impacts include human encroachment in the backcountry, and increased interspecific competition facilitated by snow compaction.

The Project would contribute to cumulative impacts to lynx and gray wolf through habitat loss, and fragmentation and disruption of wildlife travel corridors across the Iron Range. Other proposed and existing projects that would contribute to cumulative impacts include Minnesota Steel Industries, LLC (Minnesota Steel) mining and steelmaking activities, Nashwauk Public Utilities Commission Gas Pipeline, Itasca County Road 7 realignment, Itasca County short-line railroad near the West Range Site, and NorthMet Mine and Mesabi Nugget Plant near the East Range Site. Future actions are predicted to impact approximately 5,509 acres of habitat and two wildlife travel corridors in the vicinity of West Range Site, and approximately 4,846 acres of habitat and two corridors in the vicinity of the East Range Site.

Given the large amount of similar habitat in the region, the existence of alternate wildlife travel corridors, the potential for conservation and mitigation measures, and the low predicted density of lynx and gray wolf near the Project sites, the Project **may affect, but is unlikely to adversely affect** Canada lynx or gray wolf or their critical habitat under either alternative.

ENSR | AECOM

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1.0 Introduction

Excelsior Energy Inc. (Excelsior) proposes to construct a large, coal-based electric generating facility in the Iron Range of northeastern Minnesota as part of its Mesaba Energy Project. The first two phases of the Mesaba Energy Project ("Mesaba One" and "Mesaba Two," respectively; collectively, the "Project") would entail the construction and operation of two nominal 600-megawatt$_{(net)}$ Integrated Gasification Combined Cycle (IGCC) generating units (hereafter, the "IGCC Power Station"). Two potential sites for the facility have been identified: a preferred West Range Site in southeastern Itasca County within the city limits of Taconite, and an alternate East Range Site in central-eastern St. Louis County within the city limits of Hoyt Lakes (Figure 1.1). In each case, corridors extending beyond city limits have been established to connect the IGCC Power Station to important regional infrastructure elements.

These sites were proposed in accordance with State rules implementing the Power Plant Siting Act (*see* Minnesota Rule § 7849). Construction of the generating facility and associated utility and transportation infrastructure would require the clearing of forest, grassland, and wetland habitats, and would impact wildlife in the vicinity of the Project area.

The U.S. Department of Energy (DOE), through its Clean Coal Power Initiative program, is providing $36 million in funding for the Project as part of a national energy strategy to improve the environment while providing low-cost electricity from domestic coal sources. The DOE is also serving as the lead federal agency for the preparation of an Environmental Impact Statement (EIS) for the proposed Project; the U.S. Army Corps of Engineers and U.S. Forest Service are cooperating federal agencies. The EIS is being jointly sponsored by DOE and the Minnesota Department of Commerce.

Section 7 of the federal Endangered Species Act (ESA; Act) requires that federal agencies "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species." The purpose of this Biological Assessment (BA) is to evaluate the effects of the proposed Project on federally listed threatened and endangered species, species proposed for listing, and their critical habitats, as a result of the proposed Project. This BA is prepared in accordance with Section 7 of the federal ESA of 1973, as amended (19 United States Code [U.S.C.] 1536[c], 50 Code of Federal Regulations [CFR] 402.14[c]). The purpose of the Act is to provide a means for conserving the ecosystems upon which threatened and endangered species depend, and to provide a program for protecting these species. The ESA defines an endangered species as a species that is in danger of extinction throughout all or a major portion of its range. A threatened species is defined as any species that is likely to become an endangered species within the foreseeable future throughout all or a major portion of its range. A species proposed for listing is a species for which the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) has sufficient information on its biological status and threats to propose it as endangered or threatened. Critical habitat is a specific area or type of area that is considered to be essential for the survival of a species, as designated by the USFWS or NMFS under the ESA.

The consultation process is designed to assist federal agencies in complying with the ESA. Consultation can either be informal or formal, depending on the determination of effects in the BA. If the BA concludes that the Project "is not likely to adversely affect" listed species or critical habitat, the lead federal agency (DOE for the Project) has the discretion to choose either informal or formal consultation. If informal consultation is chosen, the agency asks for written concurrence by the USFWS and/or NMFS for the BA's conclusion. Informal consultation is complete if a concurrence letter is obtained from both agencies. If the BA concludes that the Project is "likely to adversely affect" listed species or critical habitat, the agency must request formal consultation. When formal consultation is requested by the agency, the USFWS and/or NMFS prepare and issue a Biological Opinion (BO) which completes the consultation.

Using information obtained in the BA, the USFWS and/or NMFS provide an opinion in the BO on whether the Project is: 1) "likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat" (a "jeopardy" biological opinion), or 2) "not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat" (a "no jeopardy" biological opinion). If the USFWS or NMFS issue a "jeopardy" opinion, it must include any "reasonable and prudent alternatives" to the Project that would avoid jeopardy. If the USFWS or NMFS issues a "no jeopardy" opinion, it may include discretionary "conservation recommendations," which are steps the USFWS and NMFS believe could be taken to further minimize potential effects on listed species or critical habitat.

The Canada lynx (lynx; *Lynx canadensis*) and gray wolf (wolf; *Canis lupus*), federally threatened species, are listed species that may use the proposed Project sites. In the Great Lakes region, the lynx is found primarily in mixed deciduous-coniferous forest habitats where snowshoe hare (*Lepus canadensis*) are common. The Project sites are located near the western edge of the lynx's range in the region, and lynx density is believed to be higher near the East Range Site, which lies closer to core lynx range than the West Range Site. Lynx were sighted within 2 miles of both Project sites in 2003. Wolves are widespread across northern Minnesota and have been seen in the vicinity of both Project sites. Wolf prey species in Minnesota include white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), beaver (*Castor canadensis*), and snowshoe hare. Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species.

2.0 Description of the Proposed Action

A detailed description of the proposed Project is provided in Chapter 2 of the Mesaba Energy Project Draft Environmental Impact Statement (Draft EIS) dated November 2007 (U.S. Department of Energy and Minnesota Department of Commerce 2007). A summary of the Project is as follows.

2.1 Overview

Excelsior plans to construct and operate a coal-based IGCC electric generating facility as part of its Mesaba Energy Project. Using IGCC technology, the facility would convert coal, petroleum coke, or a mixture of these feedstocks into a fuel called syngas, which would then be burned to power a combustion turbine generator and a stream turbine generator working in tandem to produce electricity. Two sites within northeastern Minnesota's Taconite Tax Relief Area are being considered for the location of the IGCC Power Station. The preferred West Range Site is in Township 56 North, Range 24 West, and within the city limits of Taconite in Itasca County (Figure 2.1). The alternate East Range Site would be located in Townships 58 and 59 North, Range 14 West and within the city limits of Hoyt Lakes in St. Louis County (Figure 2.2). In each case, corridors extending beyond city limits have been established to connect the IGCC Power Station to important regional infrastructure elements.

The land upon which the IGCC Power Station equipment, raw material and by-product storage areas, administrative offices, electric switchyards, parking lots, and connecting roadways would be constructed is referred to as the "IGCC Power Station Footprint" or simply, the "Footprint." The large buffer area within which the Footprint would be located is referred to as the "Buffer Land." Buildings constructed on the selected site would include a combustion turbine generator building, steam turbine generator building, air separation unit building, heat recovery steam generator, rod mill feed bins, control room, administration room, warehouse/maintenance shop, water treatment buildings, weather enclosures for equipment, power distribution centers, and visitor's center (Figure 2.3). Project-related infrastructure constructed outside the Footprint and Buffer Land would include access roads, rail lines, high voltage transmission lines, natural gas pipelines, process water and potable water supply lines, and domestic wastewater disposal lines.

The IGCC Power Station would be constructed in two phases. In the first phase, a nominal net 600-megawatt (MWe_{net}) IGCC-based large electric generating facility would be designed and constructed with $36 million of DOE co-funding and operated for a 1-year demonstration testing period. In phase two, a second identical electric generating facility would be constructed on the same site but would be financed privately. The two electric generating facilities would be known as Mesaba One and Mesaba Two. Each facility is expected to be operational for more than 30 years.

Key Project features and capacities include:

- Two nominal 600-$MWe_{(net)}$ IGCC-based electric generating facilities utilizing ConocoPhillips E-gas™ technology and requiring up to 17,100 tons of coal feedstock per day.

- An enhanced Zero Liquid Discharge (ZLD) wastewater treatment system to eliminate discharge of all industrial wastewaters.

- 6 miles of rail line at the West Range Site or 3.4 miles at the East Range Site to connect the site to existing rail lines and provide sufficient track for the unobstructed unloading of coal and petroleum coke feedstocks.

- 13.2 miles of natural gas pipeline to connect the West Range Site to an existing Great Lakes Gas Transmission Company line, or approximately 29 miles of pipeline to connect the East Range Site to an existing Northern Natural Gas Company pipeline.

- High voltage transmission lines (HVTLs) connecting the West Range Site to the Blackberry Substation (located approximately 8.5 miles south-southeast) or connecting the East Range Site to the Forbes Substation (located approximately 30 miles west-southwest).

- Potable water and domestic wastewater lines connecting the West Range Site to the City of Taconite's drinking water and wastewater treatment systems, or connecting the East Range Site to the City's of Hoyt Lakes' drinking water and wastewater treatment systems.

2.2 Feedstock Requirements

The IGCC Power Station would require coal and/or petroleum coke as feedstock for electricity generation. Excelsior estimates that the facility would use a maximum of 17,100 tons of coal feedstock per day, and intends to import these feedstocks by rail in dedicated unit trains. The primary feedstock is expected to be sub-bituminous coal imported from the Powder River Basin in Wyoming, although Illinois No. 6 bituminous coal may also be used.

2.3 Power Generation

Excelsior has chosen to use ConocoPhillips E-gas™ technology for the Project because it is a fuel-flexible technology that allows the use of bituminous coal, sub-bituminous coal, petroleum coke, or blends of these substances as feedstock. In the E-gas™ process, feedstock is crushed and slurried with water, then combined with 95 percent pure oxygen in a pressurized vessel called a gasifier to create a fuel called synthesis gas (syngas). After the syngas is cooled and contaminants are removed, it is burned in a combustion turbine connected to an electric generator, creating electricity. The heated exhaust gases from the combustion turbine are then forced through a heat recovery steam generator to produce steam. The steam is routed to a steam turbine connected to a second electric generator, producing additional electricity.

The primary by-products from the gasification process are elemental sulfur and an inert, glass-like slag, both of which are marketable products. Sulfur could be sold worldwide as a raw material for fertilizer or as a feedstock for the production of sulfuric acid. Slag could be sold for use as an asphalt aggregate, construction backfill, or landfill cover, and would likely be marketed locally. Slag produced by petroleum coke gasification may also be sold for metals recovery. Depending on the feedstock being used, the facility would produce up to 160 tons of elemental sulfur and up to 800 tons of slag per day. Sulfur would be sold and transported offsite via rail, while slag would likely be transported via trucks to local markets.

2.4 Process Water Management

The IGCC Power Station would require water for use in the steam cycle, for production of coal slurry to use as feed for the gasifier, and for various cooling processes. Predicted water demands for the West Range and East Range Sites would be expected to be similar due to their similar configuration. Average annual water demand is predicted to be approximately 7,000 gallons per minute (gpm), with peak water demand of 10,000 gpm. Primary water sources for the Project at the West Range Site would be the Canisteo Mine Pit, approximately 0.8 miles southwest of the proposed IGCC Power Station Footprint; Lind Mine Pit, approximately 6.6 miles southwest; Arcturus Mine Pit, approximately 2 miles east-southeast; Gross-Marble Mine Pit, approximately 2.9 miles east-southeast; Hill-Annex/Hill-Trumble Mine Pit, approximately 3.6 miles east; and Prairie River, approximately 6.9 miles southwest (Figure 2.4). Currently, the Arcturus, Gross-Marble, and Hill-Annex/Hill-Trumble mine pits are interconnected and referred to as the Hill-Annex Mine Pit Complex. Alternate West Range Site water sources include the Mississippi River and groundwater wells.

Primary water sources for the IGCC Power Station at the East Range Site would be the 2WX Mine Pit, approximately 0.8 miles northwest of the IGCC Power Station; 2E Mine Pit, approximately 2 miles north-northeast; 2W Mine Pit, approximately 1.6 miles north; 6 Mine Pit, approximately 3 miles west; 9S Mine Pit, approximately 4.2 miles west; Donora Mine Pit, approximately 4.2 miles west-northwest; Stevens Mine Pit, approximately 2.6 miles northwest; Knox Mine Pit, approximately 1.8 miles northwest; 5N Mine Pit, approximately 5 miles northeast; and Colby Lake, approximately 0.9 miles south-southwest (Figure 2.5).

Wastewaters at the IGCC Power Station that would be eliminated with the use of the enhanced ZLD system include the following:

- Cooling tower blowdown (water discharged from cooling towers and steam generators to control buildup of dissolved and suspended solids),
- Reject water from the boiler feed water demineralizers,
- Stormwater associated with industrial activity, and
- Contact cooling/scrubbing waters generated by the gasification process.

In the enhanced ZLD system, the wastewaters would be heated using steam or vapor compression, creating nearly-pure water vapor and leaving a concentrated brine to be further processed in a rotary drum dryer/crystallizer. The end products of the ZLD system would be high quality water distillate, which would be recycled for other water uses in the plant, and solid filter cake material, which would be collected for proper disposal. The Project would not discharge any industrial wastewaters to surface waters or ground water.

2.5 Air Emissions

The primary air emission point at the IGCC Power Station would be the Combustion Turbine Generator/Heat Recovery Steam Generator stack. Other air emission sources include flares, tank vent boilers, fugitive emission leaks, material handling systems, auxiliary boilers, cooling towers, emergency generators, and emergency fire water pump engines.

Predicted annual emissions of air pollutants at either site include 1,390 tons of sulfur dioxide (SO_2), 2,872 tons of nitrogen oxides (NO_x), 2,539 tons of carbon monoxide (CO), 0.03 tons of lead, and 197 tons of volatile organic compounds (VOCs). Additionally, the West Range and East Range Sites would emit 493 and 709 tons of particulate matter less than 10 microns in diameter (PM_{10}), respectively. Under Prevention of Significant Deterioration (PSD) regulations, both sites would be a major source of SO_2, NO_x, CO, PM_{10}, and VOCs. Class I area impacts analysis, which considers whether proposed major emitting facilities would have a significant adverse impact on air quality in national parks and wilderness areas, indicates that Project impacts would be below allowable increments for all pollutants. The Class II PSD increment analysis which considers impacts to most other areas that meet National Ambient Air Quality Standards indicates that the Project would be in compliance with all state increment limits.

Because the Project falls under PSD regulations, an analysis of Best Available Control Technologies (BACT) was conducted. Control technologies proposed as BACT include:

- Good combustion practice for NO_x, SO_2, CO, VOCs, and PM_{10} (tank vent boiler, emergency diesel generators, fire pumps, and auxiliary boiler)
- Use of natural gas as backup/start-up fuel (gasifiers and combustion turbines)
- Routing Claus system exhaust gas to gasifiers
- Diluent injection of nitrogen to reduce NO_x formation (combustion turbines)
- High efficiency drift eliminators for particulate matter emissions from cooling towers
- Good flare design for NO_x, SO_2, CO, VOCs, and PM_{10}
- Pre-combustion gas cleanup/use of scrubbed syngas for NO_x, SO_2, CO, VOCs, PM_{10}, sulfuric acid (H_2SO_4), and lead (combustion turbines)
- Limited hours of operation for NO_x, SO_2, CO, VOCs, and PM_{10} (emergency diesel generators, fire pumps, and auxiliary boiler).
- Use of low-sulfur diesel for NO_x, SO_2, CO, VOCs, and PM_{10} (emergency diesel generators and fire pumps)
- Use of natural gas as fuel (auxiliary boiler)
- Activated carbon bed(s) for mercury.

2.6 Connected Actions

2.6.1 Railroad

Railroad access to the facility would be necessary to import feedstock for the generating station and to export marketable sulfur. Currently, Burlington Northern Santa Fe Railway (BNSF) and Canadian National Railway (CNR) operate rail lines near the proposed facility sites. Construction of 2 miles of new track would be necessary to connect the West Range Site to an existing rail line shared by BNSF and CNR. Approximately 1.2 miles of this new alignment would overlap with track planned for the Minnesota Steel project. An additional 4 miles of loop track would be constructed within the site (Figure 2.6). The East Range Site would require less than 0.25 mile of new track to connect to an existing CNR rail line, plus an additional 3.2 miles of loop track within the site (Figure 2.7).

Addressing comments provided by the U.S. Army Corps of Engineers' in response to concerns related to avoiding and minimizing wetland impacts, Excelsior identified one option for the rail loop on the West Range Site, The optional rail loop would involve encircling the hill immediately to the northeast of Mesaba One. Given the reduced wetland impacts of this option, it is likely to emerge as the preferred approach for serving the IGCC Power Station.

2.6.2 Roads

Construction of a new section of road connecting the IGCC Power Station to existing roads would be necessary to allow vehicle access to the facility. The distance between the West Range Site and Itasca County Road (CR) 7, a two-lane highway paralleling the south and west sides of the West Range Site, varies between 0.25 and 0.5 miles . At one time, Itasca County officials had indicated a desire to reroute CR 7 to provide safer access to the West Range Site and Minnesota Steel property. Addressing comments provided by the U.S. Army Corps of Engineers' in response to concerns related to avoiding and minimizing wetland impacts, Excelsior identified a reduced-wetland-impact option for accessing the West Range Site. The optional access can be gained via a road approximately 3,200 feet in length and exiting CR 7 in a perpendicular direction to the north about 3,400 feet west of the access road.

The original access for the East Range Site was a looped roadway built off CR 666 to provide two access points to the facility. The length of the looped roadway was approximately 1.8 miles. However, as with the West Range Site, an optional access to the East Range Site was identified in order to avoid and minimize wetland impacts. For the East Range Site, optional access can be gained through use of only one road approximately 4,400 feet in length exiting CR 666 in a perpendicular direction to the west at about the same point as the southern arm of the loop road originally proposed.

Given the reduced wetland impacts of the two options, they are likely to emerge as the preferred approach for accessing the IGCC Power Station.

2.6.3 Natural Gas Supply Line

Although the IGCC Power Station is designed to use coal-derived syngas for electricity generation, the facility would also use natural gas during facility startup and as a backup fuel. This would require the construction and operation of a new natural gas pipeline connecting the facility to an existing pipeline system. At the West Range Site, Excelsior would construct one new 16-inch or 24-inch outside diameter (OD) gas line along 12.3 miles of new rights-of-way (ROW) (13.2 miles of total ROW are required) to connect to an existing 36-inch OD Great Lakes Gas (GLG) pipeline south of the site (Figure 2.8).

On April 3, 2008, the City of Nashwauk received a natural gas pipeline route permit for a pipeline that parallels the Project's natural gas pipeline ROW for virtually the entire distance from the GLG pipeline to the proposed IGCC Power Station Footprint. If Excelsior purchases its natural gas from the City of Nashwauk via the City's pipeline, Excelsior would not construct its own pipeline and thus could avoid pipeline construction-related impacts (i.e., the total habitat impacts discussed in Section 6.0 would decrease by approximately 143 acres).

The East Range Site has a 10-inch OD Northern Natural Gas (NNG) pipeline along its eastern boundary serving the nearby Cliffs Erie, Limited Liability Corporation (LLC; Cliffs Erie) plant, but this line has inadequate capacity to provide natural gas to the IGCC Power Station. Approximately 29 miles of new 16-inch OD pipeline would be looped within the existing NNG pipeline ROW to supply the East Range Site with natural gas (Figure 2.9). No new habitat impacts would be expected to occur outside the existing ROW.

2.6.4 Electrical Power Transmission Lines

Construction of new high voltage transmission line (HVTL) corridors would be required to connect the IGCC Power Station to existing substations of the power grid. The Blackberry substation, approximately 8.5 miles south-southeast of the West Range Site, would be the point of intersection with the power grid for the West Range Site (Figure 2.8). The Forbes substation, approximately 29 miles west-southwest of the East Range Site, would be the point of interconnection for the East Range Site (Figure 2.9). Several alternative ROWs for HVTL corridors at both sites have also been proposed.

2.6.5 Potable Water and Domestic Wastewater Lines

Personnel at the Project site would require potable water. Excelsior estimates that water demand would be approximately 30,000 gallons per day (gpd) during construction of the facility and 7,500 gpd once the facility is operational. At the West Range Site, Excelsior plans to construct a pipeline and receive water from the city of Taconite's water treatment system. Taconite's system currently lacks the capacity to provide water to the Project site at peak demand during construction, but the city has plans to improve the system to meet Project site needs. If these improvements were not made in time, Excelsior would construct an on-site water treatment system to provide the remaining water needed during the construction phase. A proposed alternative is to obtain all potable water via an on-site water treatment system. At the East Range Site, Excelsior plans to construct a pipeline and receive water from the city of Hoyt Lakes water treatment facility, which has the capacity to meet Mesaba Energy Project needs even at peak demand. A proposed alternative is to construct an on-site water treatment system.

Disposal of domestic wastewater would also be required at the facility. At the West Range Site, Excelsior plans to construct 10,000 feet of 12-inch OD gravity sewer, a pump station, and 2,400 feet of force main to connect the site to the main pump station of the Coleraine-Bovey-Taconite Wastewater Treatment Facility in the city of Taconite. A proposed alternative is to construct an on-site wastewater treatment facility that would discharge treated effluent to Little Diamond Lake, approximately 1.1 miles south of the generating facility, or Holman Lake, approximately 1.7 miles south of the generating facility. At the East Range Site, Excelsior plans to construct 9,500 feet of 12-inch OD gravity sewer, a pump station, and about 2,500 feet of 4-inch OD force main to connect the site to the city of Hoyt Lakes wastewater treatment facility. A proposed alternative is to construct an on-site wastewater treatment facility that would discharge treated effluent to Colby Lake, approximately 0.7 miles south of the generating facility.

3.0 Description of the Area that May Be Affected by the Project

A detailed description of the affected environment in the proposed Project area is provided in Chapter 3 of the Draft EIS. A summary of the Project area environment is as follows:

3.1 West Range Site and Corridors

The West Range Site comprises approximately 1,708 acres in the city of Taconite in Itasca County. The site is located on granite bedrock of the Giants Range batholith, covered by sand and gravel deposits from the most recent glaciation. In some areas of the site, organic soils have developed. The gasification facility would be constructed on the glacial till of the Nashwauk Moraine Association. Elevation within the proposed IGCC Power Station Footprint and Buffer Land ranges from approximately 1,340 to 1,480 feet above mean sea level. Outside of two high voltage transmission lines traversing the length of the site from north to south and another line from east to west in the northern areas of the site, the site is currently undisturbed by residential, commercial, or industrial development. Timber has been harvested historically and in recent years on the site (Figure 3.1), but the site may serve as a refuge for lynx and gray wolf.

The most common upland habitat within the West Range IGCC Power Station footprint is northern mesic hardwood forest (Tables 3-1 and 3-2). The canopy is dominated by 8- to 18-inch diameter at breast height (dbh) yellow birch (*Betula alleghaniensis*) and sugar maple (*Acer saccharum*), with a subcanopy comprised of small oaks (*Quercus* spp.) and maples (*Acer* spp.), honeysuckle (*Lonicera* spp.), ironwood (*Ostrya virginiana*), hazel (*Corylus* spp.), and serviceberry (*Amelanchier* spp.). Northern wet-mesic boreal hardwood-conifer forest is the second most common habitat within the site, and is dominated by paper birch (*Betula papyrifera*) with interspersed balsam fir (*Abies balsamea*) and occasional white pine (*Pinus strobus*), green ash (*Fraxinus pennsylvanica*), and sugar maple. The subcanopy includes immature red maple (*Acer rubrum*), basswood (*Tilia americana*), and aspen (*Populus* spp.). Other less common habitats within the site include monotypic, even-aged aspen stands and old fields in existing ROW. Collectively, these habitats include 1,368 acres within the West Range Site, of which 171 acres would be directly impacted by facility construction (Table 3.1). The majority of terrestrial habitat impacted within the site would be northern mesic hardwood forest.

Proposed utility/transportation corridors associated with the West Range Site pass through a variety of land cover types including several types of forests and grasslands. Approximately 270 acres of forest and grassland habitat exist within the preferred alternative utility/transportation corridors and would be impacted by the Project (Table 3.3). Deciduous forest is the most common land cover in these corridors, followed by mixed wood forest. The intensity and duration of these impacts would vary; some impacted acres would be within temporary ROW and regrowth of vegetation would begin immediately after construction activities cease, while other impacted would be in permanent ROW and vegetation clearing would be permanent.

Approximately 386 acres of wetlands have been delineated within the site and its associated utility and transportation corridors (Table 3.4; Figure 3.2). Wetlands were classified according to USFWS Circular 39 *Wetlands of the United States* (Shaw and Fredine 1956), *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979), and *Wetland Plants and Communities of Minnesota and Wisconsin* (Eggers and Reed 1997).

Table 3.5 describes the types of wetlands found in Minnesota. The most common wetland type in the West Range Site is wooded swamp (Type 7), which is vegetated with conifer trees such as tamarack (*Larix laricina*), black spruce (*Picea mariana*) and balsam fir, and deciduous trees such as red maple and black ash (*Fraxinus nigra*). Shrub swamp (Type 6) wetlands are also common in the Project area. The Project would directly impact approximately 57 acres of wetlands within the West Range Site (Table 3.6). Impacts would include wetland filling, temporary impacts, and type conversion (usually from shrub-covered or forested wetlands to emergent wetlands). Shrub swamp, wooded swamp, and bog wetlands (Type 8) would experience the greatest impacts.

3.2 Areas Surrounding the West Range Site

Land use surrounding the West Range Site includes residences, farms, mining, and other industrial operations (Figure 3.3). There are approximately 50 residences located within 1 mile of the proposed IGCC Power Station Footprint, including year-round residences, seasonal residences, and farmsteads. The residential neighborhoods of the City of Taconite are 1.5 miles south of the proposed Project site. Industries surrounding the West Range Site include a solid waste transfer station along the southern boundary of the site, mineral extraction operations approximately 2 miles to the south and 4.5 miles to the southeast, and the proposed Minnesota Steel Mine approximately 4 to 5 miles to the east. Abandoned mine pits are to the south and southeast of the site, including the Canisteo Mine Pit and Gross-Marble Mine Pit. Mine tailings piles and basins occur to the south, east, and west of the site.

With the exception of mine lands and residences, second-growth forest dominates the land around the site. Much of the forest land is actively managed for timber harvest but may serve as a refuge for lynx and gray wolf. State and national forests near the site include: Chippewa National Forest, approximately 6 miles northwest of the proposed Project site; Remer State Forest, approximately 22 miles southwest; George

Washington State Forest, approximately 11 miles north; Hill River State Forest, approximately 25 miles south-southwest; Savanna State Forest, approximately 25 miles south-southeast; and Golden Anniversary State Forest, approximately 12 miles south-southwest.

3.3 East Range Site and Corridors

The proposed East Range Site IGCC Power Station Footprint and Buffer Land comprises approximately 1,322 acres of property within the city limits of Hoyt Lakes in St. Louis County, on which Excelsior currently holds an option. Construction and operation activities would be confined within a smaller, 810-acre portion of this area (the boundaries of the 810-acre parcel are shown in Figure 2.2). The gasification facility would be located primarily on the bedrock of the Virginia formation, which is composed of argillite, siltstone, and greywacke. Glacial till of the Culver Moraine Association overlies bedrock within the site. Average elevation within the site is approximately 1,500 feet above mean sea level, with a north/south grade of 20 to 40 feet. As previously noted, with the exception of high voltage transmission line corridors traversing the site in east-west and north-south directions, the site currently is undisturbed by residential, commercial, or industrial development. Timber harvesting has occurred historically and in recent years on the site (Figure 3.4), but the site may serve as a refuge for lynx and gray wolf.

Northern mesic mixed forest habitat comprises most of the forest habitat within East Range Site. The canopy includes deciduous trees such as paper birch and quaking aspen (*Populus tremuloides*), and conifer trees such as balsam fir, white pine, red pine, and white spruce. Beaked hazel (*Corylus cornuta*), honeysuckle, mountain maple (*Acer spicatum*), and young balsam fir are common in the sub-canopy. The East Range Site encompasses approximately 416 acres of northern wet-mesic mixed forest habitat, of which 133 acres would be directly impacted by facility construction (Table 3.7).

Proposed utility/transportation corridors associated with the East Range Site pass through a variety of land cover types including several types of forests and grasslands. Approximately 360 acres of forest and grassland habitat currently exist within the preferred alternative utility/transportation corridors and would be impacted by the proposed Project (Table 3-8). Mixed wood forest is the most common land cover in these corridors, followed by shrubby grassland. The intensity and duration of these impacts would vary; some impacted areas would be within temporary ROW and regrowth of vegetation would begin immediately after construction activities cease, while other impacted areas would be in permanent ROW and vegetation clearing would be permanent.

Approximately 717 acres of wetlands have been delineated within the site and its associated utility and transportation corridors (Table 3.9; Figure 3.5). Shrub swamp, wooded swamp, and bog wetlands are the dominant wetland types in the Project area. The Project would directly impact approximately 61 acres of wetlands within the East Range Site and its utility/transportation corridors (Table 3.10). Impacts would include wetland filling, temporary impacts, and vegetation type conversion. Shrub swamp, wooded swamp, and bog wetlands would experience the greatest impacts.

3.4 Areas Surrounding the East Range Site

Land use surrounding the proposed East Range Site includes residences, mining, and other industrial operations (Figure 3.6). The nearest residences are located over 1 mile south of the proposed IGCC Power Station Footprint. Land to the north and west of the site is part of a mining complex that was owned by LTV Steel Mining Co. and shut down in February 2001 after many years of active mining. At the time, the complex was made up of three active and eight inactive mining areas. Cleveland Cliffs Inc. (CCI) acquired the mine and related mining assets in the fourth quarter of 2001 as part of a bankruptcy transaction. With the acquisition, Cliffs Erie LLC (a subsidiary of CCI) inherited the responsibility for reclaiming the complex. At present, some of the existing mine dumps - piles of ore, tailings (waste rock) or overburden – have been seeded with grasses and oats and have established good growth. Cliffs Erie has recently sold or optioned most of the property originally acquired. Current owners of land associated with the mining complex that hold property nearby the East Range Site include Cliffs Erie, PolyMet Mining, Inc., and Steel Dynamics, Inc. (SDI). Industries near the site include: the Mesabi Nugget iron nugget manufacturing plant (located approximately 3 miles northwest of the Footprint); the Syl Laskin Energy Center, a coal-fired power plant owned by Minnesota Power and located approximately 1.3 miles to the southwest in the Laskin Energy Park; and a proposed PolyMet mining operation on Cliffs Erie property, approximately 3 miles to the north and northeast. Mine pits are found to the west, northwest, north, and northeast of the site, and waste rock piles are located along the western site boundary and 0.25 miles to the northeast of the site. SDI, one of the two parent companies of Mesabi Nugget, is known to be assembling a permit application to re-open mining areas immediately north of the large waste rock pile adjacent to the western boundary. Operations to conduct surface mining of iron deposits, and to construct and operate a facility for the concentrating of iron ore could begin in late 2009 or early 2010, assuming the timely issuance of permits.

With the exception of mine lands and residences, second-growth forest dominates the land in the proposed IGCC Power Plant Footprint and Buffer Land. Much of the forest land is actively managed for timber harvest but may serve as a refuge for lynx and gray wolf. State and national forests near the site include: Bear Island State Forest, approximately 9 miles north of the proposed Project; Finland State Forest, approximately 15 miles east; Cloquet Valley State Forest, approximately 16 miles south; Sturgeon River State Forest, approximately 20 miles northwest; and Superior National Forest, within which the proposed IGCC Power Plant Footprint and Buffer Land is located. The boundary of Superior National Forest lies immediately north of the site, less than 2 miles from the western site boundary, and includes much of the land to the east and south.

4.0 Listed Species or Critical Habitat that May Be Affected and their Status

Section 7 of the ESA requires the responsible federal agency (the DOE) to consult with the USFWS regarding federally-designated threatened or endangered species. The Canada lynx and gray wolf are the only federally listed species that may use the proposed Project sites. The bald eagle (*Haliaeetus leucocephalus*) has recently been delisted in Minnesota and no longer requires consultation with the USFWS. There are no federally listed plants or fish species in the Project areas.

On March 24, 2000, the lynx was federally listed as a threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies. The proposed Project sites do not lie within or near any currently designated critical habitat for the lynx (the nearest critical habitat is in Voyageurs National Park approximately 75 miles north-northeast of the West Range Site and 55 miles north-northwest of the East Range Site (Federal Register 2006a). On February 29, 2008, the USFWS published in the Federal Register (Federal Register 2008a) a proposed rule that included a proposed revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. As of January 31, 2009, the proposed rule was still under review by the USFWS.

In response to their vastly declining numbers range wide, the gray wolf was determined to be endangered in 1967 under the Endangered Species Preservation Act of 1966. In 1974, the species was formally listed as endangered through the authority of the Endangered Species Act (Federal Register 1974), and the Minnesota population was reclassified to threatened in 1977 (Federal Register 1977). In April 2003, gray wolf populations in the United States were separated into three Distinct Population Segments (DPS; Federal Register 2003a) to more effectively manage the species; the Minnesota population is a designated portion of the Eastern DPS. In March 2006, the USFWS proposed to designate gray wolves in the Western Great Lakes region as a distinct population segment (DPS) under the ESA and to remove wolves from Minnesota, Wisconsin, and Michigan from listing under the ESA. The Western Great Lakes DPS included Minnesota, Wisconsin, and Michigan as well as parts of North Dakota, South Dakota, Iowa, Illinois, Indiana, and Ohio (Federal Register 2006b). In March 2007, the USFWS removed the gray wolf from the endangered species list (Federal Register 2007). In

September 2008, the U.S. District Court for the District of Columbia overturned the Department of Interior's decision to remove the Great Lakes DPS of the gray wolf from federal ESA protection; the USFWS issued a rule in December 2008 to comply with court orders reinstating regulatory protections for the gray wolf in the western Great Lakes and northern Rocky Mountains (Federal Register 2008b).

In 1978, critical habitat was designated for the Eastern DPS of gray wolf (Federal Register 1978). That rule identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3. Wolf management zones 1, 2, and 3 comprise approximately 9,800 miles^2 in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest.

5.0 Biological Assessment Methodology

5.1 Literature Review

This section is based on information (and references cited therein) in the *Recovery Plan for the Eastern Timber Wolf* (USFWS 1992); *Canada Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000); *Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000a), *Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule; Final Rule* (Federal Register 2000); *Biological Opinion on the Effects of National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on Canada Lynx (Lynx canadensis) in the Contiguous United States* (USFWS 2000); *Winter 2000 Wildlife Survey for the Proposed NorthMet Mine Site, St. Louis County, Minnesota* (ENSR 2000); *Minnesota Wolf Management Plan* (MnDNR 2001); *Endangered and Threatened Wildlife and Plants: Notice of Remanded Determination of Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx; Clarification of Findings; Final Rule* (Federal Register 2003b); *Biological Opinion for the Revised Land and Resource Management Plans (Forest Plans) for the Chippewa and Superior National* Forests (USFWS 2004); *NorthMet Mine Summer Fish and Wildlife Study* (ENSR 2005); Endangered *and Threatened Wildlife and Plants: Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx* (Federal Register 2006a); *Canada Lynx Assessment* for the proposed NorthMet Mine Project (ENSR 2006); *Final Rule Designating the Western Great Lakes Populations of Gray Wolves as a Distinct Population Segment; Removing the Western Great Lakes Distinct Population Segment of the Gray Wolf From the List of Endangered and Threatened Wildlife* (Federal Register 2007); and *Canada Lynx Assessment* for the proposed Minnesota Steel Mine Project (ENSR 2007).

5.2 Database Inquiries

ENSR reviewed the Canada Lynx Sightings in Minnesota 2000-2007 Database (MnDNR 2007) for lynx sightings near the study areas. ENSR also reviewed the Wolf Telemetry Database (International Wolf Center 2007) for wolf sightings near the study areas.

5.3 Consultation with Biologists with Local Knowledge of the Species

ENSR conducted telephone and in-person interviews with agency staff, (MnDNR regional biologist and lynx biologist, U.S. Fish and Wildlife Service regional biologist, U.S. Forest Service Superior National Forest biologist (Aurora and Ely, Minnesota offices), and International Wolf Center wildlife biologist. The information received from these contacts was used to gain information on Canada lynx and gray wolves likely to be found in the study areas and species of interest to state and federal agencies.

5.4 Field Studies

Two recent Canada lynx winter tracking surveys have been conducted in the vicinity of the proposed Project sites: 1) a 2006 survey at PolyMet Mining Company's NorthMet Mine, approximately 9 miles northeast of the East Range Site (ENSR 2006); and 2) a 2007 survey at the Minnesota Steel Mine site, approximately 5 miles east of the West Range Site (ENSR 2007). Because of the proximity and similarity in habitat types between the PolyMet and Minnesota Steel sites and the proposed Project sites, information on lynx distribution and habitat use from these ENSR surveys is used in this BA.

The NorthMet Mine lynx survey was conducted during January through March of 2006. Six hundred sixteen miles of transect were surveyed in seven townships, including Township 59 North, Range 14 West, which encompasses the majority of the East Range Site. The East Range Site is located in the southwest corner of the NorthMet Mine lynx survey area. Tracks and scat of four female lynx were identified during the survey, concentrated in areas approximately 10 miles west and 18 miles northwest of the East Range Site. Lynx sign was most common in dense conifer forests of balsam fir and jack pine (*Pinus banksiana*). ENSR concluded that at least three lynx reside in the survey area. No evidence of lynx was found in Township 59 North, Range 14 West, and ENSR found this township to have the least amount of suitable lynx habitat of all townships surveyed, due to extensive mining operations and recent logging. However, in the relatively undisturbed southeast portion of the township, near the East Range Site, lynx use was considered likely.

The Minnesota Steel Mine site survey was conducted by ENSR during January through March of 2007 (ENSR 2007). Six hundred fourteen miles of transect were surveyed in seven townships, including Township 56 North, Range 24 West, which encompasses all of the West Range Site. The West Range Site is located in the southwest corner of the Minnesota Steel Mine survey area. No evidence of lynx was found during the survey, but evidence of bobcat (*Lynx rufus*) was common. Survey routes intercepted bobcat tracks at 56 locations, and 4 bobcat scat samples were collected. DNA analysis of the scat samples indicated that they were from four unique bobcats, none of which was an F1 lynx-bobcat hybrid. ENSR concluded that it is unlikely that any lynx reside in the survey area, but that lynx may travel through the area. Most of the habitat in Township 56 North, Range 24 West was found to be marginal or unsuitable lynx habitat because of mining operations in the area. The northeast corner of the township, which includes the West Range Site, was identified as having the greatest potential for lynx use.

Wildlife surveys were conducted in 2000, 2004, and 2008 for Canada lynx, gray wolf, and other wildlife for the NorthMet Mine Project located about 10 miles east of the East Range site (ENSR 2000, 2005, 2009). These surveys included howling surveys for wolves and track surveys for Canada lynx and gray wolves.

6.0 Analysis and Determination of Effects

Section 6 includes background information and an analysis of the effects of the proposed Project on the species covered by this BA. In the first part of each section, background information on species abundance and distribution, habitat requirements, reproductive biology and life history, and current status and presence/absence of designated critical habitat is provided. Potential beneficial, direct, indirect, interdependent, and interrelated threats to the species that are unrelated to the proposed action, and that may result in cumulative effect as a result of the proposed action, are presented in Section 6.3, Analysis of Cumulative Effects (for a more detailed discussion of types of effects, see USFWS and NMFS 1998). These effects are defined as follows:

- Beneficial – Effects of an action that are wholly positive, without any adverse effects, on a listed species or designated critical habitat. Determination that an action will have beneficial effects is a "may effect" situation.

- Direct – The direct or immediate effects of the project on the species or its habitat. Direct effects result from the proposed action including the effects of interrelated actions and interdependent actions.

- Indirect – Effects caused by or resulting from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action.

- Interdependent – Effects that result from an activity that has no independent utility apart from the action under consideration.

- Interrelated – Effects that result from an activity that is part of the proposed action and depends on the proposed action for its justification.

- Cumulative – Include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

The effects assessment is based on the following factors:

- the dependency of the species on specific habitat components;

- habitat abundance;

- population levels of the species;

- the degree of habitat impact; and

- the potential to mitigate for an adverse effect.

For the purposes of this assessment, the action area includes those areas within 6 miles of proposed Project disturbance, or approximately 250 square miles (mi^2). This area was identified by the USFWS as the minimum area that needed to be assessed to identify lynx that could be impacted by the proposed Project (Burke 2006). The USFWS felt that lynx having territories further than 6 miles from the mine project would likely not be directly affected by the Project. This same area was also used to assess potential impacts to wolves from the Project.

The area of analysis for the cumulative effects assessments is the Arrowhead Region of Minnesota. This area includes seven ecological subsections totaling approximately 9.1 million acres in the northeast corner of Minnesota.

6.1 Canada Lynx

6.1.1 Environmental Baseline

6.1.1.1 Species Description and Status and Critical Habitat Status

The lynx is a medium-sized cat with long legs. Adult males average 22 pounds in weight and 33.5 inches in length (head to tail), and females average 19 pounds and 32 inches (Quinn and Parker 1987). The lynx's long legs and large feet make it highly adapted for hunting in deep snow.

The bobcat is a North American relative of the lynx. Compared to the lynx, the bobcat has smaller paws, shorter ear tufts, and a more spotted pelage (coat), and only the top of the tip of the tail is black. The paws of the lynx have twice the surface area as those of the bobcat. The lynx also differs from the bobcat in its body proportions; lynx have longer legs, with hind legs that are longer than the front legs, giving the lynx a ''stooped'' appearance (Quinn and Parker 1987). Bobcats are largely restricted to habitats where deep snows do not accumulate (Koehler and Hornocker 1991). Hybridization (breeding) between lynx and bobcat was first documented in 2002 in Minnesota (Schwartz et al. 2004).

Classification of the lynx (also called the North American lynx) has been subject to revision. In accordance with Wilson and Reeder (1993), the USFWS currently recognizes the lynx in North America as *Lynx canadensis.* The USFWS previously used the scientific name *L. lynx canadensis* for the lynx (Jones et al. 1992). Other scientific names still in use include *Felis lynx* or *F. lynx canadensis* (Jones et al. 1986; Tumlison 1987).

On March 24, 2000, the lynx was federally listed as a threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies (Federal Register 2000). On November 9, 2006, the USFWS designated 317 mi^2 as critical habitat in Voyageurs National Park (Federal Register 2006a). Voyageurs National Park is approximately 75 miles north-northeast of the West Range Site and 55 miles north-northwest of the East Range Site (Federal Register 2006a). The lynx is afforded no special status under Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895), which requires the MNDNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern. On February 29, 2008, the U.S. Fish and Wildlife Service (USFWS) published in the Federal Register (2008a) a proposed rule that included a proposed revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. The proposed rule is still under review by the USFWS as of December 31, 2008.

6.1.1.2 Distribution

The historical and present range of the lynx north of the contiguous United States includes Alaska and the portion of Canada extending from the Yukon and Northwest Territories south across the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, lynx historically occurred in the Cascades Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982, Quinn and Parker 1987).

In the contiguous United States, the distribution of the lynx is associated with the southern boreal forest, comprised primarily of subalpine coniferous forest in the West and mixed coniferous/deciduous forest in the East (Aubry et al. 2000). In Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; McKelvey et al. 2000a). Within these general forest types, lynx are most likely to persist in areas that receive deep snow, for which the lynx species is highly adapted (Ruggiero et al. 2000a).

Lynx in the contiguous United States are part of a larger metapopulation whose core is located in the northern boreal forest of central Canada; lynx populations emanate from this area (Buskirk et al. 2000; McKelvey et al. 2000a, b). The boreal forest extends south into the contiguous United States along the Cascade and Rocky Mountain Ranges in the West, the western Great Lakes Region, and the Appalachian Mountain Range of the northeastern United States. At its southern margins, the boreal forest becomes naturally fragmented into patches of varying size as it transitions into other vegetation types. These southern boreal forest habitat patches are small relative to the extensive northern boreal forest of Canada and Alaska, which constitutes the majority of the lynx range. Lynx are considered “not at risk” in Canada (Committee on the Status of Endangered Wildlife in Canada 2006).

Many of these southern boreal forest habitat patches within the contiguous United States are able to support resident populations of lynx and their primary prey species. It is likely that some of the habitat patches act as sources of lynx (recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey et al*.* 2000b). Other habitat patches act as ''sinks'' in which lynx mortality is greater than recruitment and lynx are lost from the overall population. The ability of naturally dynamic habitat to support lynx populations may change as the habitat undergoes natural succession following natural or manmade disturbances *(i.e.,* fire, clearcutting). In addition, fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa. The term ''resident population'' refers to a group of lynx that has exhibited long-term persistence in an area based on a variety of factors, such as evidence of reproduction, successful recruitment into the breeding cohort, and maintenance of home ranges. The word ''transient'' refers to a lynx moving from one place to another within suitable habitat. The word "dispersing'' refers to lynx that have left suitable habitat for various reasons, such as competition or lack of food. When dispersing lynx leave suitable habitat and enter habitats that are unlikely to sustain them, these individuals are considered lost from the metapopulations unless they return to boreal forest.

6.1.1.3 Population Dynamics

Density

Lynx numbers and snowshoe hare densities in the contiguous United States generally do not get as high as those in the center of their range in Canada, and there is no evidence they ever did so in the past (Hodges 2000a, b; McKelvey et al. 2000a). It appears that northern and southern hare populations have similar cyclic dynamics, but that in southern areas both peak and low densities are lower than in the north (Hodges 2000b). However, it is unclear whether hare populations cycle everywhere in the contiguous United States. Relatively low snowshoe hare densities at southern latitudes are likely a result of the naturally patchy, transitional boreal habitat at southern latitudes that prevents hare populations from achieving densities similar to those of the expansive northern boreal forest (Wolff 1980, Buehler and Keith 1982, Koehler 1990, Koehler and Aubry 1994). Additionally, the presence of more predators and competitors of hares at southern latitudes may inhibit the potential for high-density hare populations with extreme cyclic fluctuations (Wolff 1980). As a result of naturally lower snowshoe hare densities, lynx densities at the southern part of the range rarely achieve the high densities that occur in the northern boreal forest (Aubry et al*.* 2000).

Lynx and Snowshoe Hare Relationships

The association between lynx and snowshoe hare is considered a classic predator-prey relationship (Saunders 1963a, van Zyll de Jong 1966, Quinn and Parker 1987). In northern Canada and Alaska, lynx populations fluctuate on approximately 10-year cycles that follow the cycles of hare populations (Elton and Nicholson 1942; Hodges 2000a, b; McKelvey et al*.* 2000a). Generally, researchers believe that when hare populations are at their cyclic high, the interaction of predation and food supply causes the populations to decline drastically (Buehler and Keith 1982; Krebs et al. 1995; O'Donoghue et al. 1997). There is little evidence of regular snowshoe hare cycles in the Northeast and southern Quebec (Hoving 2001), but hare populations do fluctuate widely in this region. Hare fluctuations in this region may be more influenced by forest practices, weather, and other ecological factors. Snowshoe hare provide the quality prey necessary to support high-density lynx populations (Brand and Keith 1979). Lynx also prey opportunistically on other small mammals and birds, particularly when hare populations decline (Nellis et al. 1972; Brand et al. 1976; McCord and Cardoza 1982; O'Donoghue et al. 1997, 1998a). Red squirrels *(Tamiasciurus hudsonicus)* are an important alternate prey (O'Donoghue et al. 1997, 1998a; Apps 2000; Aubry et al. 2000). However, a shift to alternate food sources may not sufficiently compensate for the decrease in hares consumed to be adequate for lynx reproduction and kitten survival (Brand and Keith 1979, Koehler 1990, Koehler and Aubry 1994). When snowshoe hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, if any are born during this time; as a result, recruitment of young into the population nearly ceases during cyclic lows of snowshoe hare populations (Nellis et al. 1972;

Brand et al. 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Mowat et al. 2000).

Home Range and Dispersal

Lynx require very large areas containing boreal forest habitat. In the Northeast, lynx are most likely to occur in areas containing suitable habitat that were greater than 40 mi^2 (Hoving 2001). The requirement for large areas also is demonstrated by home ranges that encompass many square miles. The size of lynx home ranges varies by the animal's gender and age, abundance of prey, season, and the density of lynx populations (Hatler 1988; Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry et al. 2000; Mowat et al. 2000). Based on a limited number of studies in southern boreal forests, the average home range is 58 mi^2 for males, and 28 mi^2 for females (Aubry et al. 2000). Recent home range estimates from Maine are 27 mi^2 for males and 20 mi^2 for females. However, documented home ranges in both the southern and northern boreal forest vary widely from 3 to 300 mi^2 (Saunders 1963b; Brand et al. 1976; Mech 1980; Parker et al. 1983; Koehler and Aubry 1994; Apps 2000; Mowat et al. 2000; Squires and Laurion 2000). Generally, it is believed that larger home ranges, such as have been documented in some areas in the southern extent of the species' range in the West, are a response to lower-density snowshoe hare populations (Koehler and Aubry 1994, Apps 2000, Squires and Laurion 2000).

Lynx are highly mobile and have a propensity to disperse. Long-distance movements (greater than 60 miles) are characteristic (Mowat et al. 2000). Lynx disperse primarily when snowshoe hare populations decline (Ward and Krebs 1985; Koehler and Aubry 1994; O'Donoghue et al. 1997; Poole 1997). Subadult lynx also disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. Lynx also make exploratory movements outside their home ranges. Lynx are capable of moving extremely long distances (greater than 300 miles; Brainerd 1985; Washington Department of Wildlife 1993; Poole 1997; Mowat et al. 2000); for example, a male was documented traveling 380 miles (Brainerd 1985). While it is assumed lynx would prefer to travel where there is forested cover, the literature contains many examples of lynx crossing large, unforested openings. The ability of both male and female lynx to disperse long distances, crossing unsuitable habitats, indicates they are capable of colonizing suitable habitats and finding potential mates in areas that are isolated from source lynx populations.

Mortality

Common causes of mortality for lynx include starvation of kittens (Quinn and Parker 1987, Koehler 1990), and trapping (Ward and Krebs 1985; Bailey et al. 1986). Lynx mortality due to starvation has been shown in cyclic populations of the northern taiga, during the first 2 years of snowshoe hare scarcity (Pool 1994, Slough and Mowat 1996). During periods of low snowshoe hare numbers, starvation can account for up to two-thirds of all natural lynx deaths. Trapping mortality may be additive rather than compensatory during the low period of the snowshoe hare cycle (Brand and Keith 1979). Hunger-related stress, which induces dispersal, may increase exposure of lynx to other forms of mortality such as trapping and vehicle collisions (Brand and Keith 1979; Carbyn and Patriquin 1983; Ward and Krebs 1985; Bailey et al. 1986).

Predation on lynx by mountain lion (*Puma concolor*), coyote, wolverine (*Gulo gulo*), gray wolf, and other lynx has been observed (Berrie 1974; Koehler et al. 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Apps 2000; Squires and Laurion 2000). Squires and Laurion (2000) reported two of six mortalities of radio-collared lynx in Montana were due to mountain lion predation.

Interspecific Relationships with Other Carnivores

Buskirk et al. (2000b) described the two major competition impacts to lynx as exploitation (competition for food) and interference (avoidance). Of several predators examined (birds of prey, coyote, gray wolf, mountain lion, bobcat, and wolverine), it was deemed that coyotes were the most likely to pose local or regionally important exploitation impacts to lynx, and coyotes and bobcats were deemed to possibly impart important interference competition effects on lynx. Mountain lions were described as interference competitors, possibly impacting lynx during summer and in areas lacking deep snow in winter, or when high elevation snow packs develop crust in the spring.

In southern portions of snowshoe hare range, predators may limit hare populations to lower densities than in the taiga (Dolbeer and Clark 1975, Wolff 1980, Koehler and Aubry 1994). Exploitation competition may contribute to lynx starvation and reduced recruitment. During periods of low snowshoe hare numbers, starvation accounted for up to two-thirds of all natural lynx deaths in the Northwest Territories of Canada (Poole 1994).

Parker et al. (1983) discussed anecdotal evidence of competition between bobcats and lynx. On Cape Breton Island, Nova Scotia, lynx were found to be common over much of the island prior to bobcat colonization. Concurrent with the colonization of the island by bobcats, lynx densities declined and their presence on the island became restricted to the highlands, the one area where bobcats did not become established.

Predation on adult lynx has rarely been observed and recorded in the literature. Predators of lynx include mountain lion, coyote, wolverine, gray wolf, and other lynx. The magnitude or importance of predation on lynx is unknown.

Behavioral Response to Humans

Staples (1995) described lynx as being generally tolerant of humans. Other anecdotal reports also suggest that lynx are not displaced by human presence, including moderate levels of snowmobile traffic (Mowat et al. 2000) and ski area activities (Roe et al. 1999).

In a lightly roaded study area in north central Washington, logging roads did not appear to affect habitat use by lynx (McKelvey et al. 2000c). In contrast, six lynx in the southern Canadian Rocky Mountains crossed highways within their home ranges less than would be expected (Apps 2000). The latter study area contained industrial road networks, twin-tracked railway, and 2 to 4-lane highways with average daily traffic volumes of about 1,000 to 8,000 vehicles per day.

6.1.1.4 Habitat Requirements

To understand habitat relationships of lynx one must first understand the habitat relationships of snowshoe hares. Snowshoe hares use spruce and fir forests with dense understory vegetation that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe et al. 1982; Monthey 1986; Hodges 2000a, b). Generally, earlier succession (younger) forest stages have greater understory structure than do mature forests and, therefore, support higher hare densities (Fuller 1999; Hodges 2000a, b). Lynx generally concentrate their hunting activities in areas where hare populations are high (Koehler et al. 1979; Parker 1981; Ward and Krebs 1985; Major 1989; Murray et al. 1994; O'Donoghue et al. 1997, 1998a). In Maine, snowshoe hare abundance and lynx occurrence are positively associated with late regeneration forests (forest stands that are growing back 12 to 30 years after being clear-cut and have greater than 50 percent canopy closure), evidence that lynx are selecting habitat primarily on the abundance of primary prey (Hoving 2001).

Diet

Snowshoe hares are the primary prey to lynx, comprising 35 to 97 percent of the diet throughout the range of the lynx (Koehler and Aubry 1994). Other prey species include red squirrel, several species of grouse (*Bonasa umbellus*, *Dendragopus obscurus, Canachites canadensis*, *Lagopus* spp.), flying squirrel (*Glaucomys sabrinus*), ground squirrel (*Spermophilus parryii*, *Spermophilus richardsonii*), porcupine (*Erethrizon dorsatum*), beaver (*Castor canadensis*), mice (*Peromyscus* spp.), voles (*Microtus* spp.), shrews (*Sorex* spp.), fish, and ungulates as carrion or occasionally as prey (Saunders 1963a; van Zyll de Jong 1966; Nellis et al. 1972; Brand et al. 1976; Brand and Keith 1979; Koehler 1990; Staples 1995; O'Donoghue et al. 1998b).

The importance of other prey species, especially red squirrel, increases in the diet during periods when snowshoe hares become scarce (Brand et al. 1976; O'Donoghue et al. 1998b; Apps 2000; Mowat et al. 2000). However, Koehler (1990) suggested that a diet of red squirrels alone might not be adequate to ensure lynx reproduction and survival of kittens.

Most research has focused on the winter diet. Summer diets are poorly understood throughout the range of lynx. Mowat et al. (2000) reported that summer diets consist of less snowshoe hare and more alternate prey species than winter diets.

There has been limited research on the lynx diet in the southern portions of its range. Southern populations may prey on a wider diversity of species than northern populations because of lower snowshoe hare densities and differences in small mammal communities. In areas characterized by patchy distribution of lynx habitat, lynx may prey opportunistically on other species that occur in adjacent habitats, including white-tailed jackrabbit (*Lepus townsendii*), black-tailed jackrabbit (*Lepus californicus*), sage-grouse (*Centrocercus urophasianus*), and Columbian sharp-tailed grouse (*Tympanichus phasianellus*; Quinn and Parker 1987, Lewis and Wenger 1998).

Den Site Selection

Lynx den sites are found where coarse woody debris, such as downed logs and windfalls, provides denning sites with security and thermal cover for lynx kittens (McCord and Cardoza 1982, Koehler 1990, Koehler and Brittell 1990, Slough 1999, Squires and Laurion 2000). The integral component for all lynx den sites appears to be the amount of downed woody debris present rather than the age of the forest stand (Mowat et al. 2000). In Washington, lynx denned in lodgepole pine *(Pinus contorta),* spruce *(Picea* spp.), and subalpine fir *(Abies lasiocarpa)* forests older than 200 years with an abundance of downed woody debris (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/lodgepole pine forest with abundant downed logs and dense understory (Squires and Laurion 2000).

6.1.1.5 Range of Lynx within the Contiguous United States

Within the contiguous United States, the lynx's range coincides with that of the southern margins of the boreal forest along the Appalachian Mountains in the Northeast, the western Great Lakes, and the Rocky Mountains and Cascade Mountains in the West (Figure 6.1). In these areas, the boreal forest is at its southern limits, becoming naturally fragmented into patches of varying size as it transitions into subalpine forest in the West and deciduous temperate forest in the East (Agee 2000). Because the boreal forest transitions into other forest types to the south, scientists have difficulty mapping its exact boundaries (Elliot-Fisk 1988). Precisely identifying and describing the distribution of lynx habitat also is difficult because there are several vegetation and landform classifications and descriptions that have been published for various parts of North America (U.S. Forest Service and Bureau of Land Management 1999). However, the term ''boreal forest'' broadly encompasses most of the vegetative descriptions of this transitional forest type that makes up lynx habitat in the contiguous U.S. (Agee 2000).

In addition to appropriate vegetation type, delineation of the range of the lynx within the contiguous United States must consider snow conditions. Lynx are at a competitive advantage over other carnivores (e.g., bobcats or coyote) in areas that have cold winters with deep snow because of their morphological adaptations for hunting and surviving in such environments. Therefore, lynx populations may not be able to successfully compete and persist in areas with insufficient snow even if suitable forest conditions otherwise appear to be present (Ruediger et al. 2000; Ruggiero et al. 2000b; Hoving 2001). A consistent winter presence of bobcats indicates an area that is not of high quality for lynx.

Lynx in the contiguous United States are part of a larger metapopulation whose center is located in the northern boreal forest of central Canada; lynx populations emanate from this area (Buskirk et al. 2000;

McKelvey 2000a, b). When there is a high in the lynx population in central Canada, it acts like a wave radiating out to the margins of the lynx range. The magnitude of the lynx population high emanating from the central Canadian boreal forest varies for each cycle (McKelvey et al. 2000a, b). This wave can be produced by local populations reacting to environmental conditions, dispersers, or a combination of these (McKelvey et al. 2000a). Schwartz et al. (2002) concluded this wave is driven by dispersers, based on findings of a high level of gene flow between lynx in Alaska, Canada, and the western United States.

An example of the cyclic population ''wave'' occurred in the 1960s and 1970s, when numerous lynx were reported in the contiguous United States far from source populations. These records of dispersing lynx correlate to unprecedented cyclic lynx highs in Canada (Adams 1963; Harger 1965; Mech 1973; Gunderson 1978; Thiel 1987; McKelvey et al. 2000a; Mowat et al. 2000). These dispersers frequently were documented in areas, such as Wisconsin, that are close to source populations of lynx in Canada or possibly northeastern Minnesota and that contain some boreal forest. But there also have been a number of occurrences of dispersers in unsuitable habitats far from source populations, such as the North Dakota prairie (Adams 1963; Gunderson 1978; Thiel 1987; McKelvey et al. 2000a).

Lynx populations in the northeastern United States and southeastern Canada are separated from those in north central Canada by the St. Lawrence River. There is little evidence of regular hare or lynx population cycles in this area (Hoving 2001), but wide fluctuations in lynx and snowshoe hare populations do occur. On a smaller scale, fluctuating populations in the core of this area (Quebec's Gaspé Peninsula, western New Brunswick, and northern Maine) can potentially influence lynx distribution up to several hundred miles distant.

Lynx dispersing during periods of population highs will occupy many patches of boreal habitat at the periphery of their range. Some patches will be suitable to maintain a long-term population and some will not. Where the boreal forest habitat patches within the contiguous United States are large, with suitable habitat, prey, and snow conditions, resident populations of lynx are able to survive throughout the low period of the approximately 10-year cycle. Most likely the influx of lynx from populations in Canada at the high point of the cycle augments these resident populations. It is likely that some of these habitat patches within the contiguous United States are able to act as sources of lynx (where recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey et al. 2000b).

In other areas, the lynx that remain in an area after a cyclic population high may be so few or in naturally marginal habitat that they are not able to persist or establish local populations, although some reproduction may occur. Such areas naturally act as population sinks (McKelvey et al. 2000b). Sink habitats are most likely those places on the periphery of the southern boreal forest where habitat naturally becomes patchier and more distant from larger lynx populations. Lynx found in these sink habitats are considered dispersers, but are usually included within the species range. Changes in the habitat conditions or cyclic fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa. Through this natural process, local lynx populations in the contiguous United States may ''blink'' in and out as the metapopulation goes through the 10-year cycle. Where habitat is of high enough quality and quantity, resident lynx populations are able to become established or existing populations are augmented, aiding in their long-term persistence.

Some maps (e.g., Hall and Kelson 1959) incorrectly portray the range of the lynx by encompassing peripheral records from areas that are not within boreal forest or do not have cold winters with deep snow, such as prairie or deciduous forest. Such maps have led to a misperception that the historic range of the lynx in the contiguous United States was once much more extensive than ecologically possible. Records of lynx outside of southern boreal forest in peripheral habitats that are unable to support lynx represent long-distance dispersers that are lost from the metapopulation unless they return to boreal forest and contribute to the persistence of a population. These unpredictable and temporary occurrences are not included within either the historic or current range of lynx because they are well outside of lynx habitat. This includes records from Connecticut, Indiana, Iowa, Massachusetts, Nebraska, Nevada, North Dakota, Ohio, Pennsylvania, South

Dakota, and Virginia (Hall and Kelson 1959; Burt 1954 *as cited in* Brocke 1982; Gunderson 1978; McKelvey et al. 2000a). States that support some boreal forest and have frequent records of lynx are assumed to be the historic and current species range; these states include Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming.

6.1.1.6 Lynx Distribution within Great Lakes Region

The majority of lynx occurrence records in the Great Lakes Region are associated with the mixed deciduous-coniferous forest type (McKelvey et al. 2000a). Within this general forest type, the highest frequency of lynx occurrences have been in white spruce (*Picea glauca*), balsam fir, jack pine, white pine, red pine, black spruce, and mixed black spruce and tamarack forest types. These forest types are found primarily in northern Minnesota, northern Wisconsin, and Michigan's Upper Peninsula.

Although the mixed deciduous-coniferous forest covers an extensive area in the Great Lakes Region, much of this area may be marginal habitat for lynx because it is a transitional forest type at the edge of the snowshoe hare range. Habitat at the edge of hare range supports lower hare densities (Buehler and Keith 1982) that may not be sufficient to support lynx reproduction. Furthermore, appropriate habitat with snow depths that allow lynx a competitive advantage over other carnivores (e.g., coyotes) occur only in limited areas in northeastern Minnesota, extreme northern Wisconsin, and Michigan's Upper Peninsula.

The historic status of lynx in the Great Lakes Region is uncertain. Minnesota has a substantial number of lynx reports (McKelvey et al. 2000a), which is expected because of the connectivity of the boreal forest with that of Ontario, Canada, where lynx occur. Wisconsin and Michigan have substantially fewer records of lynx (McKelvey et al. 2000a). Researchers have debated whether lynx in this region are simply dispersing individuals emigrating from Canada, are members of a resident population, or are a combination of a resident population and dispersing individuals (McKelvey et al. 2000a). Recent research efforts in Minnesota have confirmed a resident population of lynx. Reproduction has been documented in all years since 2001. However, there are a few records of lynx occurrence in Michigan and Wisconsin during this same period.

6.1.1.7 Baseline Environment of the Great Lakes Geographic Area

Lynx are found within several geographic areas within the United States: the Cascade Mountains Geographic Area, Northern Rocky Mountains Geographic Area, Southern Rocky Mountains Geographic Area, Great Lakes Geographic Area, and Northeast Geographic Area. These geographic areas are separated from each other by expanses of unsuitable habitats that limit or preclude lynx movement, except the Northern Rockies and Cascades (Federal Register 2000).

Canada lynx in northern Minnesota are found within the Great Lakes Geographic Area. The Great Lakes Geographic Area encompasses northeastern and north-central Minnesota, northern Wisconsin, and the Upper Peninsula and northern portions of Michigan. The majority of lynx occurrence records in the Great Lakes Geographic Area are associated with the mixed deciduous-coniferous habitat type (McKelvey et al. 2000a). About 4.5 million of the 6 million acres of Forest Service-administered lands in the Great Lakes Geographic Area are mapped as primary lynx habitat. These lands comprise about 19 percent of all lynx habitat within the Great Lakes Geographic Area. About 2 million acres are included within non-developmental land allocations where natural processes are expected to predominate. Private lands account for about 81 percent of the lynx habitat within the Great Lakes Geographic Area.

6.1.1.8 Status of Canada Lynx within the Great Lakes Geographic Area

The proposed Project area is within the Great Lakes Geographic Area and is within the species range. Approximately 317 mi^2 in northern Minnesota (Voyageurs National Park) has been designated as critical habitat and is within this Geographic Area (Federal Register 2006). Voyageurs National Park is approximately

50 miles northwest of the proposed Project sites. Additionally, the USFWS has proposed to revise critical habitat to include all of Lake and Cook counties and the majority of St. Louis County in the Great Lakes Geographic Area (Federal Register 2008a).

6.1.1.9 Historical Records of Lynx in Northern Minnesota

The majority of lynx occurrence records are from the northeastern portion of Minnesota; however, dispersing lynx have been found throughout Minnesota outside of typical lynx habitat (Figure 6.2; Gunderson 1978; Mech 1980; McKelvey et al. 2000a). In northeastern Minnesota, where deep snow accumulates, suitable lynx and snowshoe hare habitat is present. Much of this area is protected as designated wilderness, including the Boundary Waters Canoe Area Wilderness. Furthermore, these habitats are contiguous with the boreal forest in southern Ontario. Until 1965, lynx had a bounty placed on them in Minnesota. In 1976, the lynx was classified as a game species, and harvest seasons were established (DonCarlos 1994). Harvest and bounty records for Minnesota are available since 1930. Approximate 10-year cycles are apparent in the data, with highs in the lynx cycle in 1940, 1952, 1962, and 1973 (Henderson 1978; McKelvey et al. 2000a). During a 47-year period (1930–1976), the Minnesota lynx harvest was substantial, up to 400 lynx in a year (Henderson 1978). These harvest returns for Minnesota are believed to be influenced by influxes of lynx from Canada, particularly in the 1960s and 1970s (Henderson 1978; Mech 1980; DonCarlos 1994; McKelvey et al. 2000a). When an anticipated lynx cyclic high for the early 1980s did not occur, the harvest season was closed in 1984 (DonCarlos 1994) and remains closed today.

Reproduction and maintenance of home ranges by lynx in Minnesota was documented in the early 1970s (Mech 1973, 1980), which may be evidence of a resident population. The early 1970s were a period when the second highest lynx harvest returns in the 20th century occurred throughout Canada. The high numbers of lynx trapped in Minnesota during this period likely included immigrants from Canada (McKelvey et al. 2000b). Lynx were consistently trapped over 40 years during cyclic lows, which may indicate that a small resident population occurred historically.

6.1.1.10 Observations of Lynx in the Vicinity of the West Range Site and East Range Site Since 2000

Approximately 115 lynx sightings have occurred in St. Louis County, and 16 lynx sightings have occurred in Itasca County, since 2000 (Figure 6.2; Minnesota Department of Natural Resources [MnDNR] 2008). The vast majorities of sightings are incidental encounters, and as such, tend to be clustered along roads and other places frequented by observant and interested people. Thus, while these reports tell us something (however incomplete) about where lynx are, they provide no information about where lynx do not occur. Similarly, we cannot know the relationship between the number of reports and the number of lynx in Minnesota at the time of the reports. The nearest sighting to the West Range Site occurred in September 2003 along Itasca County Road 7, within a half mile of the site's southern boundary. The nearest sighting to the East Range Site occurred in September 2003 along Highway 110 between Aurora and Hoyt Lakes, approximately 2.2 miles southwest of the site. Because the West Range Site is almost 60 miles further west, closer to the edge of the core area used by lynx in Minnesota, lynx are less likely to be found at the West Range Site than the East Range Site.

The NorthMet Mine lynx survey was conducted during January through March of 2006 (ENSR 2006). The East Range Site is located in the southwest corner of the NorthMet Mine survey area. Tracks and scat of four female lynx were identified during the survey, concentrated in areas approximately 10 miles west and 18 miles northwest of the East Range Site. Lynx sign was most common in dense conifer forests of balsam fir and jack pine. No evidence of lynx was found in Township 59 North, Range 14 West, and ENSR found this township to have the least amount of suitable lynx habitat of all townships surveyed, due to extensive mining operations and recent logging. However, in the relatively undisturbed southeast portion of the township, near the East Range Site, lynx use was considered likely.

The Minnesota Steel Mine site survey was conducted during January through March of 2007 (ENSR 2007). The West Range Site is located in the southwest corner of the Minnesota Steel Mine survey area. No evidence of lynx was found during the survey, but evidence of bobcat was common. ENSR concluded that it is unlikely that any lynx reside in the survey area, but that lynx may travel through the area. Most of the habitat in Township 56 North, Range 24 West was found to be marginal or unsuitable lynx habitat because of mining operations in the area. The northeast corner of the township, which includes the West Range Site, was identified as having the greatest potential for lynx use.

6.1.2 Factors Affecting Canada Lynx within the Action Area

6.1.2.1 Factors Identified in Final Rule

The USFWS concluded that the single biggest factor threatening the lynx in the contiguous United States is the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of the lynx in National Forest and other resource management plans (Federal Register 2000). In addition, the USFWS noted that timber harvest and fire suppression impact lynx in the Great Lakes Geographic Area.

Lands under federal management are necessary to lynx conservation regionally and nationally, as federal lands often provide large amounts of forested habitat needed by lynx and snowshoe hare. Large tracts of National Forest lands are found approximately 6 miles west (Chippewa National Forest) of the West Range Site. State forests near the site include: Remer State Forest, approximately 22 miles southwest of the Project; George Washington State Forest, approximately 11 miles north; Hill River State Forest, approximately 25 miles south-southwest; Savanna State Forest, approximately 25 miles south-southeast; and Golden Anniversary State Forest, approximately 12 miles south-southwest. Most of the lands not associated with Mesabi Iron Range mining and related activities are forests. These forestlands could provide important habitat for lynx that use the proposed West Range Site, and for movement of lynx between the West Range Site and areas with higher densities of lynx to the northeast. In addition, Voyageur National Park has been identified as critical habitat for lynx; the park is approximately 75 miles north of the proposed West Range Site (Federal Register 2006). In 2008, the USFWS proposed to designate an additional approximately 8,226 mi^2 in portions of Cook, Koochiching, Lake, and St. Louis counties in Minnesota (Federal Register 2008). This proposed critical habitat is about 30 miles east of the West Range Site.

The East Range Site is within the Superior National Forest. Proposed lynx critical habitat surrounds, but does not include, the East Range Site. These forestlands, as well as private forestlands, could provide important habitat for lynx that use the proposed East Range Site, and for movement of lynx between the East Range Site and areas with higher densities of lynx to the northeast.

6.1.2.2 Other Lynx Risk Factors

The *Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000) identified several other risk factors for lynx in the contiguous U.S., which could also apply to lynx in or near the Project sites. These factors are considered in the following section on the effects of the proposed action, and the cumulative effects of the Project and other projects within or near the study area, on lynx. These include (**bolded items** considered important in the West Range and East Range sites):

1. Factors Affecting Lynx Productivity
   - **a. Timber management**
   - b. Wildland fire management
   - **c. Recreation**
   - d. Forest/backcountry roads and trails
   - e. Livestock grazing
   - **f. Other human developments (mining, power generation, etc.)**

2. Factors Affecting Lynx Mortality
   a. **Trapping**
   b. Predator control
   c. **Incidental or illegal shooting**
   d. **Competition and predation as influenced by human activities**
   e. **Highways (vehicular collisions)**

3. Factors Affecting Lynx Movements
   a. **Highways, roads, and ROW**
   b. **Land ownership patterns**
   c. Ski areas and large resorts

4. Other Large-scale Risk Factors
   a. **Fragmentation and degradation of lynx refugia**
   b. Lynx movement and dispersal across shrub-steppe habitats
   c. Habitat degradation by non-native invasive plant species

6.1.3 Analysis of Direct and Indirect Effects

Environmental consequences to Canada lynx resulting from the Project are described in Section 3.8.3 of the Draft EIS. The primary direct impacts to lynx from the Project would result from habitat loss and disturbance. Approximately 618 acres of wetland, forest, and grassland habitat would be lost, at least temporarily, at the West Range Site, and 929 acres of these habitats would be lost at the East Range Site, including acreage in utility and transportation corridors (Tables 3.3 and 3.8).[1] Not all impacts would be expected to occur simultaneously, as construction of various corridors, facilities, and other Project components could take place at different times. Much of the habitat associated with these sites is suitable for lynx use, although the East Range Site is more likely to be used by lynx. Loss of this habitat would reduce the amount of prey items and cover available to lynx traveling through the Project area. Loss of habitat would also make it less likely that lynx would establish a territory within the Project area, especially areas directly impacted by the Project.

The Project would employ approximately 185 full-time workers during normal operations of Mesaba One and Mesaba Two, with a peak employment of approximately 1,500 people during the construction phase. Although some workers currently reside near the mine, other workers would move to the area. New housing and other infrastructure would be required to support these new workers and could indirectly affect lynx. Other industrial facilities proposed for development near the proposed and alternative sites (most notably the proposed Minnesota Steel Mine near the West Range Site, and the proposed SDI and PolyMet (NorthMet) mines near the East Range Site) would also increase the number of people living in or near the study area, and along with normal population growth, would result in conversion of wooded/forested habitats more suitable for lynx to developed uses that provide few habitat values for lynx. It is likely that ongoing and future development and disturbances within and near the study area would reduce the suitability of the area to provide habitat and travel corridors for lynx. State and federal forest lands near the study area would continue to provide a refuge for lynx, and it is likely the lynx would favor these areas over those within the study area.

Disturbance associated with the facility and associated transportation corridors would include lights, glare, and noise. The IGCC Power Station is expected to operate 24 hours a day, 365 days a year, for a minimum of 30

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[1] As noted in the tables, the West Range Site impact analysis assumes both Excelsior's natural gas pipeline and the pipeline that has been permitted to serve the City of Nashwauk and Minnesota Steel Industries would be constructed. If Excelsior chooses to purchase natural gas from the City of Nashwauk, the Project's impacts would be decreased.

years. Lights and glare would primarily be associated with plant buildings and structures. Lynx traveling through the study area would likely avoid areas that are active and well lit.

Sources of noise during the construction phase include trucks, bulldozers, rock drills, jack hammers, graders, backhoes, air compressors, and cranes. Studies conducted at the West Range and East Range Sites for the Draft EIS predicted that noise from construction equipment could be as loud as 98 decibels at a distance of 50 feet from the source. Noise sources during the operational phase of the facility include heat recovery steam generator and air separation unit stack exits, gas burners, cooling towers, water pumps, generator buildings, rod mill buildings, and slurry feed buildings. Predicted noise levels at receptors located between 800 and 11,000 feet from facility noise sources are in the 45 to 55 decibel range during normal plant operations, for both the West Range and East Range sites. However, current noise levels in the vicinity of the sites are in this same range due to existing noise sources, and the plant is not expected to increase noise at offsite receptors by more that 2 decibels during operation. Nonetheless, noise from the generating station could impact lynx residing in or traveling through the Project area. The impacts of noise on lynx and other wildlife are largely unknown and the assessment of impacts remains subjective. Wildlife are receptive to different sound frequency spectrums, many of which may be inaudible to humans. Wildlife are also known to habituate to noise, especially noises that are steady or continuous, such as noises that would occur at the IGCC Power Station. Wildlife are less likely to habituate to sudden, infrequent impulse noises.

Impacts to lynx in and surrounding the facility site may include mortality from vehicle collisions and trains. Construction of the facility and associated corridors, and the influx of workers to the area, would mean an increase in the number of roads and rail lines, as well as an increase in vehicular traffic volume along these transportation corridors. As many as 185 vehicle trips for full-time workers would occur during normal operations of Mesaba One and Mesaba Two, and about 1,500 vehicle trips during the construction phase. Also, additional supply and support vehicles would travel to the facility each day.

Impacts to Canada lynx and gray wolf in and surrounding the Project may include mortality from vehicle collisions and trains. Construction of the facility and associated corridors, and the influx of workers to the area, would mean an increase in the number of roads and rail lines, as well as an increase in vehicular traffic volume along these transportation corridors. Consequently, the threat of lynx and wolf mortality from vehicle collisions would increase in the vicinity of the Project. There are few records of lynx being killed on highways, but direct mortality from vehicular collisions may be detrimental to small lynx populations in the lower 48 states. Minnesota DNR lynx sighting records indicate that six lynx were killed by vehicle collisions in Minnesota between 2000 and 2006, and one lynx was killed by a train (MnDNR 2008). Of those killed by vehicles, two occurred on Interstate 35, two on Highway 61, one on a county road, and one on the Gunflint Trail. No lynx- or wolf-vehicle collisions have been reported on roads associated with mining projects, even though lynx and wolves have been observed using mine roads at the Northshore Mine and former Cliffs Erie mine site near the East Range Site (ENSR 2006, 2009). Risks of mortality from lynx-vehicle collisions would likely be greater in the vicinity of the East Range Site than the West Range Site because lynx density is predicted to be higher near the East Range Site. Still, it is unlikely that lynx and wolf would be killed by traffic associated with the Project because the Project Sites provide minimal habitat for lynx and wolf, no lynx were observed using the Sites during field surveys, and vehicle traffic associated with the Project would be light and limited to mostly rural roads, rather than highways and county roads, where lynx- and wolf-vehicle collisions are rare.

New roads and trails associated with Project activities and the influx of workers may facilitate snowmobile, cross-country skiing, and other human uses in the winter. Snow compaction on roads or trails may allow competing carnivores, such as coyotes and mountain lions, access into lynx habitat (Buskirk et al. 2000). In the absence of roads and trails, snow depths and snow conditions normally limit the mobility of these other predators during midwinter. It is likely that lynx near the Project site would compete with these competitors and predators for primary lynx prey (Buskirk et al. 2000).

The proposed Project sites do not lie within or near any currently designated critical habitat for the lynx (the nearest critical habitat is in Voyageurs National Park approximately 75 miles north-northeast of the West Range Site and 55 miles north-northwest of the East Range Site. The proposed revised critical habitat designation would surround, but would not include, the East Range Site and would exclude the West Range Site (Federal Register 2008a). Thus, the proposed Project would not impact lynx designated critical habitat.

6.1.4 Interrelated and Interdependent Effects

No known activities are interrelated or interdependent to the proposed Project that would have the potential to affect Canada lynx. It is possible that future specific programs or projects may have relevant interrelated and interdependent actions (e.g., construction and operation of additional power plants or substations on the site) and they will be considered in the context of consultations for those actions.

6.2 Gray Wolf

6.2.1 Environmental Baseline

6.2.1.1 Species Description and Status and Critical Habitat Status

Gray wolves are the largest wild members of the dog family (Canidae) with adults ranging from 40 to 175 pounds, depending on sex and subspecies (Mech 1974). Wolves have a gray fur coat that can vary from pure white to coal black (Federal Register 2003). Wolves may look similar to coyotes and some domestic dogs, such as the Siberian husky (*C. familiaris*; Federal Register 2003).

In response to their vastly declining numbers, the gray wolf was determined to be endangered in 1967 (Federal Register 1967) under the Endangered Species Preservation Act of 1966. In 1974, the species was formally listed as endangered through the authority of the ESA (Federal Register 1974), and the Minnesota population was reclassified to threatened in 1977 (Federal Register 1977). In April 2003, gray wolf populations in the United States were separated into three Distinct Population Segments (DPS; Federal Register 2003a) to more effectively manage the species; the Minnesota population is a designated portion of the Eastern DPS. In March 2006, the USFWS proposed to designate gray wolves in the Western Great Lakes region as a DPS under the ESA and to remove wolves from Minnesota, Wisconsin, and Michigan from listing under the ESA. The Western Great Lakes DPS included Minnesota, Wisconsin, and Michigan as well as parts of North Dakota, South Dakota, Iowa, Illinois, Indiana, and Ohio (Federal Register 2006b). In March 2007, the USFWS removed the gray wolf from the endangered species list (Federal Register 2007). In September 2008, the U.S. District Court for the District of Columbia overturned the Department of Interior's decision to remove the Great Lakes DPS of the gray wolf from federal ESA protection; the USFWS issued a rule in December 2008 to comply with court orders reinstating regulatory protections for the gray wolf in the western Great Lakes and northern Rocky Mountains (Federal Register 2008b).

In 1978, critical habitat was designated for the Eastern DPS of gray wolf (Federal Register 1978). That rule (50 CFR 17.95(a)) identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3, as delineated in 50 CFR 17.40(d)(1). Wolf management zones 1, 2, and 3 comprise approximately 9,800 miles^2 in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest. The East Range Site is within Zone 2, while the West Range site is outside the designated critical habitat area.

6.2.1.2 Distribution

The gray wolf historically occurred across most of North America, Europe, and Asia. The only areas of the conterminous United States that apparently lacked gray wolf populations since the last ice age are parts of California and portions of the eastern and southeastern United States (an area occupied by the red wolf; *Canis lupus rufus*). Widespread persecution of wolves began following European settlement of North America

(Boitani 1995). Poisons, trapping, and shooting spurred by federal, state, and local government bounties extirpated this once widespread species from more than 95 percent of its historic range. In the late 1960s, a diminished population (several hundred) of wolves was known to occur in northeastern Minnesota and on Isle Royale, Michigan; a few scattered wolves also may have occurred in Michigan's Upper Peninsula, Montana, and the southwest United States.

6.2.1.3 Life History

Wolves are carnivorous predators that prefer a diet of medium and large mammals. Wild prey species in Minnesota include white-tailed deer, moose, beaver, and snowshoe hare, with small mammals, birds, and large invertebrates sometimes being taken (Mech 1974, Wisconsin DNR 1999). Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species.

Wolves are social animals, normally living in packs of 2 to 12 wolves, although two packs in Yellowstone National Park had 22 and 27 members in 2000, and Yellowstone's Druid Peak pack increased to 37 members in 2001 (USFWS et al. 2001, 2002). Winter 2001–2002 pack size in Michigan's Upper Peninsula averaged 4.3 wolves. Packs are primarily family groups consisting of a breeding pair, their pups from the current year, offspring from the previous year, and occasionally an unrelated wolf. Packs typically occupy, and defend from other packs and individual wolves, a territory of 20 to 200 mi^2, with territories of 42 to 100 mi^2 in the Great Lakes region (Fuller 1989). In the northern Rocky Mountains of the United States, territories tend to be larger, usually from 200 to 400 mi^2. Normally, only the top-ranking (alpha) male and female in each pack breed and produce pups. Litters are born from early April to May and range from 1 to 11 pups, but generally include 4 to 6 pups (Michigan DNR 1997; USFWS 1992; USFWS et al. 2001). Normally a pack has a single litter annually, but the production of two or three litters in 1 year has been documented in Yellowstone National Park (USFWS et al. 2002). Yearling wolves frequently disperse from their natal packs, although some remain with their natal pack. Yearlings may range over large areas as lone animals after leaving their natal pack or they may locate suitable unoccupied habitat, pair with a member of the opposite sex, and begin their own pack. Dispersal distances of 500 miles have been documented (Fritts 1983); individual wolves have recently traveled from central Wisconsin to east-central Indiana (400 miles) and northern Illinois, from the Upper Peninsula of Michigan to northern Missouri (600 miles), and from the Minnesota-Wisconsin-Michigan population to east central Nebraska.

6.2.1.4 Population Numbers and Dynamics

Five comparable surveys of wolf numbers and range in Minnesota have been carried out since 1979. These surveys estimated that there were 1,235, 1,500 to 1,750, 2,440, 3,020, and 2,920 wolves in Minnesota in 1979, 1989, 1998, 2004, and 2008 respectively (Berg and Kuehn 1982; Fuller et al. 1992; Berg and Benson 1999; Erb 2008). Based on these surveys, wolf populations in Minnesota have increased at annual rates of about 3 percent between 1979 and 1989 and by about 4 percent between 1989 and 2008. The 1998 and later surveys revealed that the number of wolves in Minnesota was 2 times greater than the planning goal (1,400 wolves) as specified in the Recovery Plan for Minnesota.

In Minnesota, the Chippewa and Superior National Forests' wolf populations range from approximately 100 to 125 on the Chippewa National Forest (U.S. Forest Service 2004) to an estimated 300 to 400 on the Superior National Forest (Mech 2000, U.S. Forest Service 2004). Both Forests are operated and managed through current Forest Plans in conformance with standards and guidelines that follow the 1992 Recovery Plan's recommendations for the wolf.

Wolves were considered to have been extirpated from Wisconsin by 1960, and no formal attempts were made to monitor that state's wolf population from 1960 until 1979. During that time, individual wolves and an occasional wolf pair were reported. There is no documentation, however, of any wolf reproduction occurring in Wisconsin, and the wolves that were reported may have been animals dispersing from Minnesota. Wolf population monitoring by the Wisconsin Department of Natural Resources (DNR) began in 1979 and a statewide population of 25 wolves was estimated at that time. This population remained relatively stable for several years, and then declined to approximately 15 to 19 wolves in the mid-1980s. In the late 1980s, the Wisconsin wolf population began an increase that has continued to date. In 2002, wolf numbers in Wisconsin alone surpassed the planning goal as specified in the Recovery Plan for a second population near Minnesota (100 wolves for a minimum of 5 consecutive years; geographically isolated populations should have 200 wolves for a minimum of 5 years). Approximately 540 wolves were in Wisconsin in 2008 (Wydeven and Wiedenhoeft 2008).

Michigan wolves were extirpated as a reproducing population long before they were listed as endangered in 1974. Before 1991, and excluding Isle Royale, the last known breeding population of wild Michigan wolves occurred in the mid-1950s. As wolves began to reoccupy northern Wisconsin, the Michigan DNR began noting single wolves at various locations in the Upper Peninsula of Michigan. In the late 1980s, a wolf pair was verified in the central Upper Peninsula and was known to have produced pups in 1991. Since that time, wolf packs have spread throughout the Upper Peninsula, with immigration occurring from both Wisconsin to the west and Ontario to the east. They now are found in every county of the Upper Peninsula. When the wolf population estimates of Wisconsin and Michigan are combined, the total population has exceeded the second population recovery goal, as specified in the Recovery Plan, of 200 wolves for 5 consecutive years for a geographically isolated wolf population. The two state wolf population, excluding Isle Royale wolves, has exceeded 200 wolves since late winter 1995-1996. An estimated 510 wolves were in Michigan in 2007 (Michigan Department of Natural Resources 2008).

6.2.1.5 Observations of Gray Wolf in the Vicinity of the West Range Site and East Range Site

The MnDNR conducts surveys for wolves about every 5 years, including 2007-2008. The wolf population estimate for 2007-2008 was 2,920. Based on analysis of 32 radio-marked wolves, average territory size was about 40 mi^2. Wolf observations were greatest in the vicinity of the Chippewa National Forest, in the Superior National Forest near Virginia, Minnesota, and in Voyageurs National Park. (Erb 2008). The Chippewa National Forest is about 6 miles from the East Range Site.

Since 1968, the Biological Resources Division of the U. S. Geological Survey, formerly the Division of Wildlife Research of the U. S. Fish and Wildlife Service has been studying the wolf population trend in the central Superior National Forest around Ely, Minnesota since 1968.

The main method involves live-trapping, drugging, radio-collaring, aerially radio-tracking and counting members of several packs (families). Each pack usually occupies about 30-100 mi^2. The budget for the project is very low, so the biologists cannot afford to follow the wolves as often as usual. Thus, there will be large gaps in the data. Wolves that are farthest away will be followed the least. Another reason why entries may stop being added to the data list is because some wolves disperse, or leave the area and travel hundreds of miles away. They are seeking new areas and mates to form their own packs. It is too expensive to follow them, so USGS biologists must give up gathering data about these animals.

The International Wolf Center posts on their website a database summary of wolf observations from these studies (http://www.wolf.org/wolves/experience/telemsearch/vtelem/telem_main.asp). Of the over 9,300 records in the monitoring database, 32 records involving 10 wolves have been recorded within about 10 miles of the East Range Site. Except for a single record in December 2006 and two records in 2001, all other records of wolves near the East Range Site were recorded between 1994 and 1997. No radio collared wolves were recorded within 10 miles of the West Range Site, although this may be due to the limited amount of wolf tracking that occurs in the central portion of Minnesota.

6.2.2 Factors Affecting Gray Wolf within the Action Area

Land management practices potentially may affect wolves and wolf habitat. These activities include management of timber and other vegetation, wildland or prescribed fire, recreation, construction and operation of roads and trails, and other human developments (USFWS 1992, 2004; MnDNR 2001). Risks of direct wolf mortality may come from shooting, trapping, predator control, vehicle collisions, and competition or predation as influenced by human activities. Other large-scale risk factors are disease and fragmentation and degradation of wolf habitat.

6.2.2.1 Habitat Management

Gray wolf density is heavily dependent on prey availability (Fuller 1989). Conservation of primary wolf prey, such as white-tailed deer, is clearly a high priority for the MnDNR, which typically manages ungulates to ensure a harvestable surplus for hunters and nonconsumptive users, and to minimize conflicts with humans. To ensure a harvestable surplus for hunters, the agency must account for all sources of natural mortality, including loss to wolves, and adjust hunter harvest levels when necessary.

Deer, moose, and beaver, the primary prey species for wolf, are closely associated with forage from young upland forest less than 10 years old. Deer and moose rely on upland conifer more than 9 years old for thermal and hiding cover. Currently, federal, state, and local forests and private lands provide ample habitat for prey species, and densities of these species (particularly white-tailed deer) have been high; therefore, prey availability is not likely to threaten wolves in the Great Lakes DPS.

6.2.2.2 Human Access and Disturbance

Human settlement and roads are considered to be major determinants in gray wolf distribution. These activities have multiple effects, including increased human presence causing an increase in illegal poaching and legal predator control, increased chance of introduced diseases and parasites via pets (e.g., canine parvovirus), and potential deterrence to colonization of otherwise suitable habitat (Mech 1995; Gogan et al. 1997).

Studies of wolf populations in Minnesota, Michigan, and Wisconsin indicate that wolf populations usually fail to sustain themselves in areas where rural roads open to the public have densities exceeding 0.93 linear miles or road per mi^2. The Wolf Recovery Plan recommends that density of higher standard roads remain below 1 mile/mi^2 in critical habitat to limit the extent of associated effects to gray wolves (USFWS 1992). Roads lead to wolf-vehicle collisions and an increase in access by hunters and trappers, and can be barriers to movement (USFWS 1992). However, wolves may tolerate road densities as high as 1.2 miles per mi^2 if roaded areas are adjacent to large road less areas, such as the Superior National Forest.

The Wolf Recovery Plan addresses the impact of low standard roads, but does not recommend a density threshold for such roads. Low standard roads may have a greater potential for human impact on wolves than high standard roads due to the potential for human access for trapping and shooting. These roads typically are accessed by recreational motor vehicles or on foot. Illegal killing of wolves may result from a variety of reasons. Some of these killings are accidental (e.g., wolves are hit by vehicles, mistaken for coyotes and shot, or caught in traps set for other animals) and may be reported to state, tribal, and federal authorities. Most illegal killings, however, likely are intentional and are never reported to authorities (Mech 1995). The MnDNR receives approximately two to six reports of wolves killed by vehicle collision annually.

While human habitation and the associated network of roads and vehicle traffic increase, wolf mortality from vehicle collisions is expected to continue both in actual numbers and as a percent of total diagnosed mortality in Minnesota. A study conducted in between 1980 to1986 within north central Minnesota found human-caused mortality occurred at a rate of 29 percent, a figure which includes 2 percent mortality from legal depredation control actions (Fuller 1989). The MnDNR conducted a radio-telemetry study of wolves and white-tailed deer, and of 32 wolves fitted with radio collars between 1993 and 2001, 7 of 11 documented mortalities were attributed to humans (DelGuidice et al. 2001). Minnesota DNR (2001) and the Forest Service (2004) use a variety of methods to encourage and support education of the public about the history and ecology of wolves in the state and the effects wolves on livestock, wild ungulate populations, and human activities. Public outreach efforts have been in effect for years in Minnesota, and while these efforts may not further reduce illegal take of wolves from existing levels, these measures may be crucial in ensuring that illegal mortality does not increase. Illegal take of wolves is likely related to road and human population densities, but changing attitudes towards wolves may provide for their survival in areas where road and human densities were previously thought to be too high (Fuller et al. 2003). It is important to note that despite the difficulty in measuring the extent of illegal killing of wolves, all sources of wolf mortality, including legal (e.g., depredation control) and illegal human-caused mortality, have not been of sufficient magnitude to stop the continuing growth of the wolf population in Minnesota.

6.2.2.3 Other Factors

Den site disturbance may occur during timber harvest, site preparation, and prescribed burning. However, wolves at dens and rendezvous sites have been known to tolerate these activities. The proposed Project has the potential to disturb gray wolves, but impacts to wolves should be minimal due to the large home range size of wolves in Minnesota and large amount of disturbance that already occurs near the Project sites.

6.2.3 Analysis of Direct and Indirect Effects

The primary impacts to gray wolf from the Project would result from habitat loss and disturbance. Approximately 618 acres of wetland, forest, and grassland habitat would be lost, at least temporarily, at the West Range Site, and 929 acres of these habitats would be lost at the East Range Site, including acreage in utility and transportation corridors.[2] Not all impacts would be expected to occur simultaneously, as construction of various corridors, facilities, and other Project components could take place at different times. Much of the habitat associated with these sites is suitable for gray wolf and prey use. Loss of this habitat would reduce the amount of prey items and cover available to gray wolf traveling through the Project area. Loss of habitat would also make it less likely that a gray wolf pack would establish a territory within the Project area, especially areas directly impacted by the Project.

The Project would employ approximately 185 full-time workers during normal operations of Mesaba One and Mesaba Two, with a peak employment of approximately 1,500 people during the construction phase. Although some workers currently reside near the mine, other workers would move to the area. New housing and other infrastructure would be required to support these new workers. Other industrial facilities proposed for development near the proposed and alternative sites (most notably the proposed Minnesota Steel Mine near the West Range Site, and the NorthMet Mine near the East Range Site) would also increase the number of people living in or near the study area, and along with normal population growth, would result in conversion of wooded/forested habitats more suitable for gray wolf to developed uses that provide few habitat values for gray wolf. It is likely that ongoing and future development and disturbances within and near the proposed Project would reduce the suitability of the area to provide habitat and travel corridors for gray wolf. State and federal forest lands near the study area would continue to provide a refuge for gray wolf, and it is likely the gray wolf would favor these areas over those within the study area.

Disturbance associated with the facility and associated transportation corridors would include lights, glare, and noise. The IGCC Power Station is expected to operate 24 hours a day, 365 days a year, for a minimum of 30 years. Lights and glare would primarily be associated with plant buildings and structures. Gray wolf traveling through the study area would likely avoid areas that are active and well lit.

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[2] As noted in the tables, the West Range Site impact analysis assumes both Excelsior's natural gas pipeline and the pipeline that has been permitted to serve the City of Nashwauk and Minnesota Steel Industries will be constructed. If Excelsior chooses to purchase natural gas from the City of Nashwauk, the Project's impacts would be decreased. Also noted is that the East Range Site impact analysis does not include impacts that would occur along 11 miles of the existing NNG natural gas pipeline where NNG has only single line rights (therefore requiring new ROW to be obtained and construction to be undertaken thereon).

Sources of noise during the construction phase include trucks, bulldozers, rock drills, jack hammers, graders, backhoes, air compressors, and cranes. Studies conducted at the West Range and East Range Sites for the Draft EIS predicted that noise from construction equipment could be as loud as 98 decibels at a distance of 50 feet from the source. Predicted noise levels at receptors located between 800 and 11,000 feet from facility noise sources are in the 45 to 55 decibel range during normal plant operations, for both the West Range and East Range sites. However, current noise levels in the vicinity of the sites are in this same range due to existing noise sources, and the plant is not expected to increase noise at offsite receptors by more that 2 decibels during operation. Nonetheless, noise from the generating station could impact gray wolves residing in or traveling through the Project area. The impacts of noise on gray wolf and other wildlife are largely unknown and the assessment of impacts remains subjective.

The Wolf Recovery Plan recommends that density of higher standard roads remain below 1 mile/mi^2 in critical habitat to limit the extent of associated effects to gray wolves (USFWS 1992). However, wolves may tolerate road densities as high as 1.2 miles per mi^2 if roaded areas are adjacent to large road less areas, such as the Superior National Forest. Current road densities are 1.1 and 1.6 miles of road per mi^2 for the proposed West Range and East Range sites, respectively. Post construction, road densities would be 1.2 and 1.7 miles per mi^2 for the West Range and East Range sites, respectively. Thus, suitable habitat for wolves may currently be lacking, or would be lacking after construction of the proposed Project.

6.2.4 Effects of Interrelated and Interdependent Actions

No known activities are interrelated or interdependent to the proposed Project that would have the potential to affect gray wolf. It is possible that future specific programs or projects may have relevant interrelated and interdependent actions (e.g., construction and operation of additional power plants or substations on the site) and they will be considered in the context of consultations for those actions.

6.3 Analysis of Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. The area of analysis for the cumulative effects assessments is the Arrowhead Region of Minnesota. This area includes seven ecological subsections totaling approximately 9.1 million acres in the northeast corner of Minnesota (Figure 7.1). The period for analysis of cumulative effects in this BA was from pre-settlement (prior to 1900) through completion and operation of reasonably foreseeable projects identified below (approximately 30 years).

Cumulative effects to wildlife habitat and wildlife travel corridors are discussed in Section 5.2.6 of the Draft EIS. The impacts discussed in that section were based on an analysis conducted by the DOE and a 2006 MnDNR report titled *Cumulative Effects Analysis on Wildlife Habitat and Travel Corridors in the Mesabi Iron Range and Arrowhead Regions of Minnesota* (2006 Report; Emmons and Olivier Resources, Inc. 2006). Other cumulative effects considered in this BA include habitat loss and fragmentation, human access and disturbance, and mortality factors.

The Draft EIS identifies a number of proposed projects that should be considered reasonably foreseeable future actions and that may contribute to cumulative effects to Canada lynx, gray wolf, and other wildlife in the vicinity of the Project sites. Proposed projects near the West Range Site include: the Minnesota Steel Mine, approximately 7 miles northeast of the site; the Nashwauk gas pipeline, which would run north from the Blackberry Township, through the southeast corner of the Site, and continue northeast to the City of Nashwauk; the Itasca County Road 7 realignment, within a quarter mile of the southern boundary of the site; and the Itasca County rail alignment, which would run roughly from the City of Taconite to the Minnesota Steel Mine, passing within 1.25 miles of the southeast boundary of the site.

Proposed projects near the East Range Site include: the Mesabi Nugget plant, approximately 2 miles to the northeast; and the NorthMet Mine, comprising a tailings basin area approximately 3 miles to the north and a mine area approximately 10 miles to the northeast.

In addition to these projects, land management activities, such as timber harvest, prescribed fire, and road construction, that may be authorized or carried out on nearby national forests are likely to have both positive and negative effects to snowshoe hare, white-tailed deer, and moose habitat and therefore would have both positive and negative effects on the lynx and gray wolf. Projected acreage of forage and cover habitats for moose and deer over 100 years shows decreasing forage habitat (upland forest younger than 9 years) and greatly increasing cover habitat (upland conifer older than 10 years) on the Superior and Chippewa National Forests. Although the amount of available forage would decrease from current levels, the amount provided over the life of the Forest Plans should remain sufficient for healthy snowshoe hare and ungulate populations, based on the response of populations of these species on the Forests over the last 2 decades under current Forest management. Although the Forest Plans would provide significantly more young upland forage habitat and less upland conifer than would be found in the range of natural variability (U.S. Forest Service 2004), snowshoe hare, white-tailed deer, and moose populations should not be limiting factors for lynx or gray wolves under the Revised Forest Plans.

6.3.1 Habitat Loss and Fragmentation

The IGCC Power Station and other nearby proposed projects would increase the amount of habitat fragmentation in the area, changing wooded/forested and other vegetated habitats to disturbed/developed areas with limited habitat value. Development of iron mines along the Iron Range has made much of this area of limited value to lynx and wolf, especially areas with pits, tailings, and waste rock piles. Historic waste rock piles and tailings have begun to revegetate and provide some habitat for lynx, wolf, and their prey, but their value is greatly reduced compared to habitat that existed in the area prior to mining. At both sites, construction of the generating facility and much of the new corridors would occur on lands that are currently forested and potentially serve as lynx and wolf habitat. Although the amount of new habitat loss and fragmentation associated with the Project would be small in the context of available habitat within the region, the cumulative impacts would be greater. Impacts to lynx and wolf would be expected at the individual level, although not at the population or species level.

The 2006 Report estimates losses of wildlife habitat in seven ecological subsections of the Arrowhead region of Minnesota in the next 20 years due to mining, economic development, and forestry. The Arrowhead region is in the northeast corner of Minnesota and includes Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis counties (Figure 7.1). Because state timber harvest plans were only available through 2007 at the time of publication of the report, losses of wildlife habitat due to forestry are underestimated in the 2006 Report. The report considers all land cover types, including mine lands, croplands, and urban areas, to be potential wildlife habitat in its estimates of habitat loss. While lynx and wolf have been observed in these areas and use roads in mining areas as travel routes especially near the East Range site, the value to lynx and wolf as habitat may be minimal.

Chapter 5 of the Draft EIS estimates habitat losses at a smaller scale than in the 2006 Report. A study area for each of the proposed sites is defined according to local hydrology. For the West Range Site, the study area consists of the portion of the Swan River watershed above the point where Holman Lake discharges to the Swan River, plus the portion of the Prairie River watershed upstream of Prairie Lake. The East Range Site study area includes the portion of the Partridge River watershed upstream of its confluence with the St. Louis River. The Draft EIS estimates available habitat prior to European settlement, at the current time, and after the completion of reasonably foreseeable developments. Habitat loss is broken down by habitat type, and developed areas such as mine lands, croplands, and urban areas are not considered habitats.

The sections below summarize the data from the 2006 Report and Draft EIS on habitat loss in the Arrowhead region and in the ecological subsections and sub-watersheds in which the proposed Project sites lie.

6.3.1.1 Arrowhead Region

The Arrowhead Region includes seven ecological subsections totaling approximately 9.1 million acres in the northeast corner of Minnesota (Figure 7.1). The 2006 Report estimates that 8,727 acres (0.1 percent) of this area would be lost to economic development, mining, and forestry in the next 20 years (Table 7-1; Emmons and Olivier, Inc. 2006). Of the area lost, approximately 913 acres would be lost to mining, 498 acres would be lost to economic development, and 7,315 acres would be lost to forestry. While losses to forestry represent the bulk of habitat loss in the region, they are not as permanent or destructive as mining or economic development losses from the perspective of lynx and wolf. Forestry practices remove some or all trees from an area, reducing the value of that area as lynx and wolf habitat, but the natural process of succession ensures the regeneration of forest stands that can once again serve as high-quality habitat. Occasional timber harvest may actually promote the growth of dense conifer stands that are favored by snowshoe hare, the primary prey species of the lynx, and as bedding and thermal cover for white-tailed deer, an important prey species for gray wolf.

6.3.1.2 West Range Site

The West Range Site is situated in the Nashwauk Uplands ecological subsection, which is dominated by upland deciduous, upland shrub/woodland, and lowland conifer/shrubland habitats (Figure 7.2). The Nashwauk Uplands encompass an area of approximately 810,000 acres. The 2006 Report predicts losses of 158 acres (0.02 percent) to economic development and 718 acres (0.09 percent) to mining (Table 7.1; Emmons and Olivier, Inc. 2006). No habitat losses as a result of forestry are predicted in the 2006 Report. Mining is the largest threat to lynx and wolf habitat in this ecological subsection, although only a small fraction of the total available habitat is predicted to be lost.

The Draft EIS predicts a loss of 5,509 acres (1.4 percent of the currently existing wildlife habitat) in the West Range Site study area in the future due to reasonably foreseeable actions (Table 7.2). Within the study area, Mesaba One and Mesaba Two would account for 523 acres (9.5 percent) of this loss, while the largest contributor would be the Minnesota Steel Mine project at 3,324 acres (60 percent). Temporary impacts to habitat have been treated as though they were permanent habitat losses in the case of Mesaba One and Mesaba Two in order to ensure that a worst case estimate of the Project’s impact was calculated. Using such estimates, aspen/birch deciduous forest habitat would experience the greatest loss at 1,884 acres, or about 1.4 percent of the existing aspen/birch deciduous forest in the study area (Table 7.3). Within the Project’s site and corridors, aspen/birch deciduous forest and upland shrubland/woodland habitats would experience the greatest loss (Table 7.4).

6.3.1.3 East Range Site

The East Range Site is situated in the Laurentian Uplands ecological subsection, which is dominated by lowland conifer/shrubland, upland conifer, and upland deciduous habitats (Figure 7.3). The Laurentian Uplands encompass an area of approximately 567,000 acres. The 2006 Report predicts losses of 38 acres (0.01 percent) to economic development, 197 acres (0.03 percent) to mining, and 588 (0.10 percent) acres to forestry (Table 7.1; Emmons and Olivier, Inc. 2006). Forestry is the largest threat to lynx habitat in this ecological subsection, although only a small fraction of the total available habitat is predicted to be lost.

The Draft EIS predicts a loss of 4,846 acres (5.2 percent of the currently existing wildlife habitat) in the East Range Site study area in the future due to reasonably foreseeable actions (Table 7.5). Within the East Range study area, Mesaba One and Mesaba Two would account for 433 acres (9 percent) of this loss, but the NorthMet Mine and Mesabi Nugget projects would be much greater contributors to habitat loss at 2,957 acres

(61 percent) and 1,456 acres (30 percent), respectively. Aspen/birch deciduous forest habitat would experience the greatest loss at 1,558 acres, or 5.7 percent of the existing aspen/birch deciduous forest in the study area (Table 7.6). Within the Project site and corridors, upland aspen/birch deciduous forest and grassland habitats would experience the greatest loss (Table 7.7)

6.3.2 Impacts to Wildlife Travel Corridors

Much of the habitat for lynx, gray wolf, and other wildlife along the Iron Range has been eliminated by mining, other industrial activities, and residential development and remaining habitat is heavily fragmented. However, large patches of suitable lynx and wolf habitat exist on either side of the range, primarily within the Superior National Forest, Chippewa National Forest, and various state forests. To travel between habitat patches on either side of the Iron Range, lynx and wolf must find suitable corridors of habitat that traverse the range and allow safe movement. The 2006 Report identifies 13 wildlife travel corridors that facilitate movement of wildlife across the Iron Range (Figure 7.4). Corridors that could be affected by the Project and other existing and proposed projects in the area are discussed in the subsections below.

6.3.2.1 West Range Site

Two wildlife travel corridors exist in the vicinity of the West Range Site that could be impacted by the Project and other projects in the area. Corridor #2 from the 2006 Report is a roughly rectangular, 1.9-mile wide forested corridor connecting a large patch of wildlife habitat north of the Iron Range with several smaller patches south of the range (Figure 7.5). Existing mine features along the Iron Range on both sides of this corridor can hinder wildlife movement to the corridor for at least 1 mile in each direction. The proposed IGCC Power Station Footprint is located immediately northwest of the corridor, and lynx and wolf traveling to or from this corridor via the northwest could likely be forced to find an alternative route. The Itasca County Road 7 realignment, if it were to occur, could potentially run along the northeastern and eastern corridor boundaries, and while not an impenetrable barrier to lynx and wolf; it could discourage travel and increase wildlife-vehicle mortality. The Itasca County Railroad would cut across the southeast corner and along the southern boundary of the corridor, and could have a similar effect on lynx and wolf as the potential County Road 7 realignment. The Nashwauk gas pipeline and the existing transmission line corridor that traverses the entire proposed IGCC Power Station Footprint from north to south (which will remain in place) would run together along a north-south axis through the center of Corridor #2 and require vegetation clearing in the ROW. This would be a direct habitat loss and fragmentation in the corridor, but would not be an impenetrable barrier to movement. The 2006 Report predicts that this corridor would be isolated by future developments and would essentially be lost as a gateway between habitat blocks to the north and south. However, observations of lynx and wolves and their habitat use on the Northshore Mine Site during studies of the proposed NorthMet Mine (ENSR 2000, 2005, 2006, 2009) found that lynx and wolf used active mine areas as foraging habitat and for travel, and thus adverse impacts to lynx and wolf movements from mine development near corridors may be overstated in the 2006 Report.

Corridor #3 is an irregularly shaped corridor, varying in width between 1.4 and 2.3 miles, and located 2 miles east of Corridor #2 (Figure 7.6). Corridor #3 connects large habitat blocks the northwest and southeast, and is the only corridor for several miles in each direction, so it is considered a “high value” corridor. Current mining operations are immediately to the northeast and southwest of the corridor. The Project is not expected to directly impact this corridor, but other proposed projects could. The Itasca County rail alignment would run along the northern boundary of the corridor, and the Nashwauk gas pipeline would run along an east-west axis approximately 0.75 miles north of the corridor. These developments could discourage lynx and wolf movements and increase lynx and wolf mortality from vehicles. The Minnesota Steel Mine is expected to cause the loss of the majority of habitat in the eastern half of the corridor, and the 2006 Report suggested that other future developments may cause further habitat loss in the western half of the corridor.

6.3.2.2 East Range Site

Two wildlife travel corridors exist in the vicinity of the East Range Site that could be impacted by the IGCC Power Station and other projects in the area. Corridor #10 is approximately 1 mile wide and connects a large habitat patch to the north with several smaller patches to the south (Figure 7.7). Existing mine features on both sides of the corridor restrict access for several miles in each direction. The East Range Site lies approximately 1 mile to the southeast of the corridor, and would not be expected to significantly impact lynx or wolf access to or movement through the corridor. However, the Mesabi Nugget plant, which would be constructed along the entire northern boundary of the corridor, could eliminate the connection to the large habitat patch to the north of the corridor and cause the direct loss of the entire corridor. The plant would lessen the value of the corridor to lynx and wolf traveling across the Iron Range.

Corridor #11 is a small but important corridor, approximately 0.6 miles wide, that connects large habitat blocks to the east-southeast and north-northwest (Figure 7.8). The corridor could potentially be impacted by the NorthMet Mine tailings basin area, tentatively sited approximately 1 mile to the northwest, which could remove a large amount of habitat. The final site layout for the NorthMet Mine has not been finalized, however, and impacts to corridor #11 would be largely dependent on the final layout. The 2006 Report also noted that an area to the southwest has high potential for future growth, which could impact the corridor, but predicts that the corridor would continue to serve as an important connection for wildlife in the future.

6.3.3 Human Access and Disturbance

The IGCC Power Station and other nearby proposed projects would increase the amount of human access and disturbance in the area. Effects from loss of habitat and disturbance associated with human activities from the Project are discussed above. However, increased human populations in the Project area may also lead to increased risk to lynx and wolf from collisions with vehicles and trains, increased levels of recreation activities and use of backcountry roads and trails, increased mortality from illegal hunting and trapping, and increased risk from competition with other wildlife.

6.3.3.1 Collisions with Vehicles and Trains

Impacts to Canada lynx and gray wolf in and surrounding the Project may include mortality from vehicle collisions and trains. Construction of the facility and associated corridors, and the influx of workers to the area, would mean an increase in the number of roads and rail lines, as well as an increase in vehicular traffic volume along these transportation corridors. Consequently, the threat of lynx and wolf mortality from vehicle collisions would increase in the vicinity of the Project, as discussed in Sections 6.1.3, and 6.2.3 . There are few records of lynx being killed on highways, but direct mortality from vehicular collisions may be detrimental to small lynx populations in the lower 48 states. Risks of mortality from lynx-vehicle collisions would likely be greater in the vicinity of the East Range Site than the West Range Site because lynx density is predicted to be higher near the East Range Site. Still, it is unlikely that lynx and wolf would be killed by traffic associated with the Project because the Project Sites provide minimal habitat for lynx and wolf, no lynx were observed using the Sites during field surveys, and vehicle traffic associated with the Project would be light and limited to mostly rural roads, rather than highways and county roads, where lynx- and wolf-vehicle collisions are rare.

Studies of wolf populations in Minnesota, Michigan, and Wisconsin indicate that wolf populations usually fail to sustain themselves in areas where rural roads open to the public have densities exceeding 0.93 linear miles or road per mi^2. Post construction, road densities would be 1.2 and 1.7 miles per mi^2 in the vicinity of the West Range and East Range sites, respectively. Thus, suitable habitat for wolves may currently be lacking, or would be lacking after construction of the proposed Project.

6.3.3.2 Recreation

Recreational activities are becoming increasingly more widespread across the landscape, but their effects on lynx and wolf are little known. Very few studies have investigated the complex interactions between humans and wildlife. Some anecdotal information suggests that lynx are quite tolerant of humans, while wolves favor large tracts of land with low human densities, and that a wide variety of behavioral responses to human presence can be expected (USFWS 1992; Staples 1995; Roe et al. 1999; Mowat et al. 2000).

Nonconsumptive recreational activities are growing in popularity over the more traditional consumptive recreation uses of hunting and fishing (Duffus and Dearden 1990). Trends indicate that land-based activities occurring within developed recreation sites or near roads involve the greatest number of people. However, there have been vast improvements in bicycle and off-road vehicle technology, as well as a growing popularity in motorized off-road activities, including snowmobiling. Although the Project would not be used for recreational purposes, natural population growth, along with an influx of workers to support the Project, would further increase the growth of recreational activity in the study area and could possibly impact lynx and wolf movements within the area.

Recreational snowmobile use has expanded dramatically over the past 25 years, and is a common recreational activity in northern Minnesota. The growth of snowmobile use and an expanded trail system over the past 2 to 3 decades has increased human presence in lynx and wolf habitat in northern Minnesota and elsewhere in the United States. The impacts of this activity to lynx that may be found near the Project Sites would be minor given the limited number of lynx and wolf likely to use the Project area.

Lynx and carnivore biologists (Bider 1962; Ozoga and Harger 1966; Murray and Boutin 1991; Koehler and Aubry 1994; Murray et al. 1995; Lewis and Wenger 1998; Buskirk et al. 2000) have suggested that packed trails created by snowmobiles, cross-country skiers, snowshoe hares, and predators may serve as travel routes for potential competitors and predators of lynx, especially coyotes. Buskirk et al. (2000) hypothesized that the usual spatial segregation of lynx and coyotes may break down where human modifications to the environment increase access by coyotes to deep snow areas. Such modifications include expanded forest openings throughout the range of the lynx.

Fuller and Kittredge (1996) noted that the distribution and numbers of coyotes have dramatically expanded in recent decades. Geir (1975) and Nowak (1979) suggested that coyotes are thought to have originated in areas where snow cover was minimal, and it is only within the last century that they have colonized the boreal forests.

Buskirk et al. (2000) hypothesized that coyotes may be locally or regionally important competitors for lynx food resources, possibly exerting interference competition pressures on lynx as well. O'Donoghue et al. (1998b) also suggested coyotes exert potentially important exploitation competition pressures on lynx. Predation rates by coyotes on snowshoe hares exceeded those of lynx in the Yukon Territories during hare highs. Coyotes then shifted their prey preference from snowshoe hares to carrion because of intolerance to deep snow conditions (Todd et al. 1981). Coyotes have been shown to increase their use of open habitats between November and March due to the increase in packed snow conditions and the load-bearing strength of snow in openings. It is this strong prey- and habitat-switching ability of the coyote that may contribute to its success as a competitor with lynx (Buskirk et al. 2000).

Murray and Boutin (1991) reported that both lynx and coyotes used travel routes with shallow snow, but that coyotes traveled on harder snow more frequently. They also reported that the use of trails in the snow not only reduced the depth to which an animal sinks into the snow, but aided coyotes and lynx in obtaining additional food. Keith et al. (1977) suggested that during peak highs of hares, the density of trails in snow facilitates coyote movement. Murray and Boutin (1991) reported similar results with their study where hare densities were high.

Some studies suggest that wolves may exclude, and even kill coyotes in some areas of North America (Paquet 1992, Berger and Gese 2007), while others suggest that both species can coexist where food is abundant and varied (Arjo et al. 2002). Few coyotes have been seen near the West and East Range sites and likely would not influence wolf or lynx habitat use in these areas.

6.3.4 Forest/Backcountry Roads and Trails

A well-established road system is associated with mining activity along the Mesabi Iron Range, and to serve nearby towns, recreational areas, private residences, and pasturelands and forestlands. It is expected that the number of miles of roads within the study area would show little increase during the life of the Project, and some roads could be taken out of service or reclaimed during the life of the Project.

There is little information available on the effects of roads and trails on lynx or its prey (Apps 2000; McKelvey et al. 2000d), while road density appears to be an important factor in wolf habitat use (USFWS 1992). Construction of roads may reduce lynx and wolf habitat by removing forest cover and increasing the threat of illegal hunting and trapping. On the other hand, in some instances, along less-traveled roads where vegetation provides good snowshoe hare and white-tailed deer habitat, lynx and wolf may use the roadbed for travel and foraging (Koehler and Brittell 1990).

Roads and trails may facilitate snowmobile, cross-country skiing, and other human uses in the winter. As described previously in the recreation section, snow compaction on roads or trails may allow competing carnivores, such as coyotes and mountain lions, access into lynx and wolf habitat (Buskirk et al. 2000). In the absence of roads and trails, snow depths and snow conditions normally limit the mobility of these other predators during mid-winter.

Recreational, administrative, and commercial uses of roads are known to disturb many species of wildlife (Ruediger 1996). However, preliminary information suggests that lynx do not avoid roads (Ruggiero et al. 2000a), except at high traffic volumes (Apps 2000). Lynx were often seen crossing roads near the NorthMet Mine and Northshore Mine sites, near Babbitt, Minnesota, during winter lynx surveys in 2006 and 2008. Wolf tracks were common on snow-packed trails near these sites. It is possible that summer use of roads and trails through denning habitat may have negative effects if lynx are forced to move kittens because of associated human disturbance (Ruggiero et al. 2000b).

At this time, there is no compelling evidence to suggest management of road density is necessary to conserve lynx, and the increase in road density associated with the Project and future growth in the study area should have little effect on lynx movements in the area. Management of road density, however, was identified as a critical factor in maintaining wolf populations in North America (USFWS 1992).

6.4 Factors Affecting Mortality

6.4.1 Trapping and Incidental or Illegal Shooting

There is evidence that lynx and wolf may be accidentally trapped during furbearer, including fisher (*Martes plennanti*), marten (*Martes americana*), and bobcat, trapping seasons. Of the 435 records in the MNDNR (2007) lynx database for 2000 to 2006, 10 records list that the animal was caught in a trap, and of these, 3 were killed, 6 were released unharmed, and the status of 1 is unknown. It is likely that other lynx have been trapped, but not reported. The magnitude of accidental lynx trapping in the Project area and in northern Minnesota is unknown.

Illegal trapping of wolves has occurred in Minnesota, but has not limited wolf range expansion and population increases (MnDNR 2001). Illegal killing of all types appears related to road density and level of human access, and wolf packs rarely live in territories where road densities are greater than 1 per mi^2.

Lynx and wolf could be shot mistakenly or intentionally by hunters or by poachers. Lynx and wolves may be shot by hunters during deer and other hunting seasons for fun, or lynx may be mistakenly identified as bobcat and shot during the bobcat season. The actual magnitude of lynx shooting in northern Minnesota is unknown. Of the 435 records in the MNDNR (2007) lynx database for 2000 through 2006, only 1 record lists that the animal was intentionally shot, while another lynx was accidentally shot. However, it is likely that lynx shootings are generally not reported. It is unlikely that many lynx would be shot within the study area due to limited numbers of lynx in the general vicinity of the Project.

Wolves have been shot in protection of livestock and pets, and to improve ungulate populations in Minnesota. The U.S. Department of Agriculture Wildlife Services also kills wolves in verified depredation situations. Still, legal and illegal remove of wolves has not prevent wolf range expansion and population increases (MnDNR 2001).

Education of the public as to the importance of protecting lynx and other wildlife has helped to reduce the accidental or intentional loss of lynx and wolves in recent years (MnDNR 2001).

6.4.2 Competition and Predation as Influenced by Human Activities

Lynx and wolves interact with other carnivores throughout their range. Competition with or predation by coyotes, gray wolves, mountain lions, bobcats, and birds of prey have been inferred or documented throughout the range of the lynx. Some human activities, particularly those related to timber harvest and over-the-snow access routes, have the potential to alter natural relationships between lynx and other predators.

Gray wolves were extirpated from the continental United States, except Minnesota, by 1960 (Thiel and Ream 1995). Much of this effort was carried out through government control programs to protect ungulates and halt the spread of rabies (Paradiso and Nowak 1982). Recently, wolf populations have rebounded in Minnesota, Wisconsin, the Upper Peninsula of Michigan and Montana, and have been reintroduced into central Idaho and the Yellowstone ecosystem.

Coyotes have expanded their range in recent decades (Fuller and Kittredge 1996), and coyotes may have expanded their range and increased in numbers as wolves were reduced in range and number. Crabtree and Sheldon (1999) also reported that in some areas of the contiguous U.S., wolves are increasing in numbers and distribution, while coyotes are decreasing in response.

Certain timber harvest practices increase edges and openings within forest stands, which may improve foraging conditions for generalist predators such as coyotes, bobcats, and great horned owls (*Bulbus virginianus*). This in turn increases the potential for both exploitation and interference competition with lynx to occur.

As described previously (in the Recreation section), snow compaction due to resource management or recreation activities may facilitate movement of coyotes and other potential competitors and predators into lynx habitat, making it likely that lynx in the study area would compete with these competitors and predators for primary lynx prey (Buskirk et al. 2000).

7.0 Conservation Measures

Six measures are recommended to Excelsior as conservation measures for potential impacts to lynx and wolves from the proposed Project. These measures are based, in part, on conservation measures identified in the *Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000) that are applicable to lynx populations throughout the contiguous U.S. and could therefore apply to lynx in and around the proposed Project sites. The *Minnesota Wolf Management Plan* (MnDNR 2001) identifies measures that can benefit wolves in Minnesota.

Because limited research has been conducted on lynx in the contiguous United States, the first conservation measure would be to continue to follow studies of lynx conducted by the Forest Service, National Resources Research Institute, MnDNR, and other conservation agencies and groups to better understand lynx use of the study area during the Project's construction and operation, and to identify specific reclamation measures that could be implemented to restore lynx habitat to the area after facility closure. Numerous wolf studies have been conducted in northern Minnesota, but studies of wolves near the Project area could benefit wolf populations and habitat restoration near the Project. Additional conservation measures that are recommended if the Project is approved include: i) reclaiming the Project site to habitats favored by lynx, wolves, and other wildlife; ii) maintaining vegetated buffers around the Project site to reduce impacts to lynx and wolves from light and noise, where feasible; iii) restricting site access for recreation during development, operation, and reclamation; iv) minimizing the number of roads constructed and reclaiming roads upon facility closure; and v) educating workers on the need to observe speed limits and other facility regulations, and educating the public to take measures to protect lynx, wolves, and other wildlife. These measures are discussed in more detail below.

These conservation measures are written to support management of lynx, wolves, and their habitat. However, given the limited knowledge about lynx in the study area, many of the recommendations were drawn from knowledge about their primary prey (snowshoe hares) and important alternate prey (red squirrel, ruffed grouse [*Bonasa umbellus*]), other forest carnivores, and basic principles for maintaining or restoring native ecological processes and patterns. A benefit of this approach is that it should enhance compatibility with the needs of other species that inhabit the same ecosystem.

7.1 Reclaim Project Site

The IGCC Power Station and its associated infrastructure would modify wildlife habitat on a portion of the Project site. An important goal of reclamation would be to restore these portions of the site to productive uses for lynx, wolves, and other wildlife.

Upon site closure, much of the site could be reclaimed to wooded/forested habitat. Although it could take decades for reclaimed areas to provide suitable habitat for lynx, wolves, and their prey, timber management practices conducted on the site after closure that maintain or enhance habitat for snowshoe hare, white-tailed deer, moose, ruffed grouse, red squirrel, and other lynx and wolf prey would be beneficial. Reclaiming sites using deciduous and conifer tree species can also create good cover for snowshoe hare and white-tailed deer. Reclamation of the site would be enhanced if Excelsior evaluates historical and current conditions and landscape patterns to develop vegetation mosaics within the reclaimed area that are beneficial to lynx, wolf, and other wildlife and are conducive to promoting movement of wildlife throughout the study area and region. Given that past (and proposed) projects have led to fragmentation of habitat in the vicinity of the proposed Project sites, management activities that produce forest composition, structure, and patterns similar to those that would have occurred under historical disturbance regimes would benefit lynx, wolf, and their prey. Excelsior could also encourage nearby landowners to manage their forest stands to benefit lynx, wolf, and other wildlife, and to help maintain habitat connectivity between the study area and nearby national and state forests to provide future habitat for lynx and wolf and to allow for the movement of lynx between private and public lands.

Lynx and wolf exemplify the need for landscape-level ecosystem management. Contiguous tracts of land in public ownership (e.g., national and state forests) provide an opportunity for management that can maintain lynx habitat connectivity. Throughout most of the lynx range in the lower 48 states, connectivity with habitats and populations in Canada is critical for maintaining populations in the United States.

Efforts undertaken by Excelsior to minimize habitat disturbance during facility construction and operation, and to reclaim disturbed lands to wooded/forested habitat, would help ensure that habitat fragmentation is minimized and large blocks of lynx and wolf habitat remain in the region of the Project site. Although it is unlikely that the Project site would ever serve as a refuge for lynx and wolves, given the high level of human activity within the area, it can continue to serve as an important travel corridor for lynx and wolves moving between state and national forests.

7.2 Maintain Vegetated Buffers

The facility should be designed to minimize impacts to lynx and wolves by minimizing the disturbance area and new road construction, and reclaiming any areas where Project activities cease. Where feasible, a vegetative buffer should be retained around the perimeter of the facility to reduce light and noise effects on nearby lynx and wolves. In addition, existing and newly constructed roads (built to access the Project site) should be reclaimed or obliterated after facility closure, where feasible.

7.3 Limit Public Access to Project Site

Recreational activities on the Project site should be limited to the extent possible during development, operation, and reclamation. Users of any snowmobile or hiking trails within the site should be encouraged to stay on the trail and avoid travel into other areas. After closure and reclamation, activities that compact snow could be minimized. Excelsior could work with county officials and private and public landowners in the region of the Project site to encourage them to minimize or preclude snow compacting activities on little-used roads and other ROW, where feasible and appropriate.

Lynx have evolved a competitive advantage in environments with deep soft snow that tends to exclude other predators during the middle of winter, a time when prey is most limiting (Murray and Boutin 1991; Livaitis 1992; Buskirk et al. 2000). Widespread human activity (snowshoeing, cross-country skiing, snowmobiling, all-terrain vehicles) may lead to patterns of snow compaction that provide additional advantage to competing predators such as coyotes and bobcats to occupy lynx habitat through the winter, reducing its value to and even possibly excluding lynx (Bider 1962; Ozoga and Harger 1966; Murray et al. 1995; O'Donoghue et al. 1998b).

7.4 Minimize Road Construction and Reclaim Unused Roads

As discussed above, road density is an important factor in determining if an area is suitable for wolves. Thus, new road construction should be avoided or limited, where feasible. Where feasible and appropriate, dirt and gravel roads traversing lynx and wolf habitat within the Project site should not be paved or otherwise upgraded (e.g., straightening of curves, widening of roadway, etc.) in a manner that is likely to lead to significant increases in traffic speeds or increased width of the cleared ROW, or would foreseeably contribute to development or increases in human activity in lynx habitat within the Project area.

Plowed roads and groomed over-the-snow routes may allow competing carnivores such as coyotes to access lynx habitat in the winter, increasing competition for prey (Buskirk et al. 2000). However, plowed or created snow roads would be necessary to access the facility during construction and operation, and are necessary to access other lands within the vicinity of the Project sites.

Preliminary information suggests that lynx may not avoid roads, except at high traffic volumes. Therefore, at this time, there is no compelling evidence to recommend management of road density to conserve lynx. There is evidence, however, that road density can impact wolf use of an area. Thus, the number of new roads constructed in support of the Project should be minimized and roads reclaimed/obliterated where feasible and appropriate.

7.5 Educate Workers and Public

Direct mortality from vehicular collisions has been detrimental to lynx and wolves in northern Minnesota. It is unlikely that lynx or wolves would travel close to the IGCC Power Station due to disturbance and lack of habitat. Still, to benefit lynx and other wildlife, speed limits should be enforced along access roads to reduce the risk of wildlife-vehicle collisions. Workers should be given training to make them aware of the importance of the area to wildlife, to request that employees report sick or dying wildlife along roads or at facilities, to ensure that employees do not dump wastes or other harmful materials off the site, and to make employees aware of other actions that could be harmful to wildlife or their habitats.

Lynx and wolves may be mistakenly trapped or shot by legal predator hunters seeking bobcats or other furbearers, or illegally trapped or shot by poachers. Prey species, such as snowshoe hares, white-tailed deer, and ruffed grouse, may also be affected by legal and illegal trapping and shooting. To reduce or eliminate the incidence of illegal trapping and shooting of lynx and wolf, Excelsior could work with the MnDNR and local conservation groups to initiate information and education efforts to protect the lynx and wolf and to ensure that trappers check their traps at frequent intervals and release lynx and wolves that are still alive. Trailhead posters, magazine articles, and news releases could be used to inform the public of the possible presence of lynx and wolves within or near the Project area.

8.0 Determination of Effects

A recent survey for lynx conducted near the preferred West Range Site found no evidence of lynx residing in or traveling through the action area. A survey near the alternative East Range Site found evidence of lynx within 10 miles of the Project site. Lynx may be present in the vicinity of the proposed Project sites, but habitat in both areas is heavily fragmented by mining operations and is generally of marginal quality for lynx. Lynx density at the sites is expected to be low, particularly at the West Range Site, which lies at the western edge of the lynx's range in Minnesota. Surveys for wolves were not conducted within the action areas. Surveys conducted by the MnDNR have shown that wolves are most common in Minnesota in the Chippewa and Superior National Forests, and in Voyageur National Park. The Chippewa National Forest is about 6 miles from the West Range Site. In a study of radio-collared wolves by the Biological Resources Division of the U.S. Geological Survey, no radio-collared wolves were found near the West Range Site, but 10 wolves have been observed within 10 miles of the East Range site since 2004. However, except for a single record in December 2006 and two records in 2001, all other records of wolves near the East Range Site were recorded between 1994 and 1997. Habitat in the Project areas is of marginal quality for wolves and their primary prey, white-tailed deer, due to area disturbances, and road densities exceed levels (1 mile/mi^2) that are conducive for good wolf habitat (USFWS 1992).

Habitat loss and fragmentation would be unavoidable effects to lynx and wolves from the Project, and additional impacts from other proposed projects in the area are expected. However, the types of habitat that would be lost are common in northeastern Minnesota, and lands along the Iron Range are already highly fragmented. It is unlikely that habitat loss and fragmentation resulting from the Project would represent a significant impact to lynx and wolf from a regional perspective.

Although lynx and wolves are unlikely to be resident species in the action area or nearby, individuals may move into the action area while making the types of long-range movements described above. The IGCC Power Station and other regional projects have the potential to disrupt travel corridors that connect habitats on either side of the Iron Range. Two travel corridors could be negatively impacted by the Project at either of the proposed sites. There are 13 travel corridors across the Iron Range, however, and it is unlikely that the IGCC Power Station and other nearby projects would prevent lynx and wolves from traversing the Range, although lynx and wolves may be forced to travel further or through poorer habitat to do so. Both lynx and wolves have been observed using active mining areas to the northeast of the East Range Site, including lynx with kittens.

With implementation of conservation measures, other potential adverse effects to lynx and wolves could be mitigated. Noise and light disturbance could be minimized by designing and/or maintaining vegetated buffers around the generating station. Minimizing road construction and educating workers about wildlife could reduce or prevent lynx or wolf mortality resulting from harmful material releases and incidental shooting. Lynx and wolf habitat lost as a result of the Project could eventually be restored with proper site closure and reclamation measures.

Collision with vehicles is also recognized as a documented cause of lynx and wolf mortality in Minnesota. Vehicle traffic to and from the project site would include road access to the Project site, rail access to the Project site, and road traffic within the Project site. Increased traffic is expected in the vicinity of the Project. However, the increased traffic would occur in areas where lynx and wolves are not likely resident and away from areas identified as suitable or potentially suitable for lynx (ENSR 2006, 2007) and wolves. Therefore, the likelihood of the proposed action resulting in the death or injury of any Canada lynx or wolves due to a vehicle collision is discountable.

Critical habitat for the lynx has been designated in Minnesota, but is more than 60 miles away from the proposed Project sites, thus the IGCC Power Station would not adversely modify of otherwise affect lynx critical habitat. On February 29, 2008, the U.S. Fish and Wildlife Service (USFWS) published in the Federal Register (Federal Register 2008a) a proposed rule that included a proposed revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. The proposed rule is still under review by the USFWS as of January 31, 2009.

In 1978, critical habitat was designated for the Eastern DPS of gray wolf (Federal Register 1978). That rule (50 CFR 17.95(a)) identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3, as delineated in 50 CFR 17.40(d)(1). Wolf management zones 1, 2, and 3 comprise approximately 9,800 miles^2 in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest. The West Range Site is outside of these zones, while the East Range Site is in Zone 2.

Not all areas within the mapped boundaries of designated habitat are considered critical habitat. Only areas that contain the primary constituent elements required by the species are considered critical habitat. Primary constituent elements are the physical and biological features of a landscape that a species needs to survive and reproduce (USFWS and NMFS 1998). Habitat quality for wolves is marginal in the action areas, and road densities suggest that wolves would not establish territories near the Project; thus, the action areas likely also lack the primary constituent elements the wolf needs to survive and reproduce.

In conclusion, the action areas do not contain extensive areas of suitable lynx and wolf habitat in the vicinity of the Project. A comprehensive survey using established methods (e.g., see Squires et al. 2004) and qualified observers failed to record a single lynx in and around the Project sites in 2006 and 2007 (ENSR 2006, 2007). Increased vehicular traffic would not occur near any area where lynx have been recently verified, and road densities in the action areas, and noise and disturbance associated with the Project, suggest that wolves would avoid the Project sites. The West Range Site is located near the edge of lynx range, while wolves are widely distributed throughout northern Minnesota. Although project activities may affect lynx and wolves potentially moving through the action area due to the destruction of forested habitat, it is unlikely that these effects to movement would result in reduced survival or reproduction of any lynx or wolves. Habitat assessments indicate that the habitat is marginal and lacks the primary constituent elements the lynx and wolf need to survive and reproduce. In summary, although the Project could result in some effects to lynx and wolves, those effects are likely to be insignificant or discountable and, thus, **may affect, but are not likely to adversely affect** any Canada lynx or gray wolves or their critical habitat.

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Tables

Table 3.1 Existing and Impacted Wildlife Habitat in the West Range IGCC Power Station Footprint

Terrestrial Community	Areas within Mesaba IGCC Site (acres)	Areas Impacted by West Range IGCC Power Plant Footprint (acres)		
		Phase I	Phase II	Total Acres
Northern Mesic Hardwood Forest (Red oak, sugar maple, basswood, bluebead lily) forest (MNDNR Code MHn35b)	682.36	84.19	66.60	150.79
Northern Wet-Mesic Boreal Hardwood-Conifer Forest (Aspen, birch, red maple forest) (Mhn44a)	468.93	12.30	0.00	12.30
Aspen Forest[1]	185.35	0.51	7.12	7.62
Old Field[1]	31.16	0.00	0.00	0.00
Northern Mixed Cattail Marsh (MRn83)	12.55	0.01	0.45	0.45
Northern Wet Ash Swamp (WFn55)	209.68	6.08	17.24	23.32
Northern Wet Meadow/Carr (WMn82)	79.19	7.53	0.04	7.57
Northern Spruce Bog (Apn80)	3.95	0.00	0.00	0.00
Northern Open Bog (Apn90)	0.41	0.00	0.00	0.00
Northern Rich Alder Swamp (FPn82)	34.00	0.00	0.00	0.00
Northern Rich Tamarack Swamp (FPn82)	0.16	0.00	0.00	0.00
Inland Lake Clay/Mud Shore (Lki54)	0.56	0.00	0.00	0.00
Other Water Body (OW)	0.12	0.00	0.00	0.00
Total	**1,708.42**	**110.62**	**91.45**	**202.05**

[1] Codes were created for cover not included in ECS classification system.
Note: Numbers may not total due to rounding.
Source: Table 3 Technical Memo Supplement (Short Elliott Hendrickson, Inc. [SEH] 2008a).

Table 3.2 Land Cover Types in Minnesota

Ecological Classification System (ECS)	
Habitat Code and Name	**Definition**
APn80 - Northern Spruce Bog	Includes bogs dominated with black spruce trees (*Picea mariana*). Trees are usually stunted (< 30 feet tall) with 25-75% coverage. The understory is dominated by sphagnum mosses (*Sphagnum* spp.) and fine-leaved graminoids such as cottongrass (*Eriophorum vaginatum*) and sedge species (*Carex* spp.) Low-shrubs, such as cranberry species (*Vaccinium* sp.) and Labrador tea (*Ledum groenlandicum*) comprise approximately 25% of the canopy
APn81 - Northern Poor Conifer Swamp	Includes bogs dominated by black spruce and tamarack (*Larix laricina*). Trees are usually stunted (< 33 feet tall) with 25-50% coverage. The understory is dominated by sphagnum mosses, fine-leaved graminoids, and low-shrubs. The tall shrub layer is dominated by speckled alder (*Alnus incana*) and willow species (*Salix* spp.). The tall and low shrub layers comprise approximately 25% coverage of the canopy.
APn90 - Northern Open Bog	Includes bogs dominated by low-shrubs, sphagnum mosses, and fine-leaved graminoids. Graminoids species present include bog wiregrass sedge (*Carex oligosperma*), cottongrass, and miscellaneous other sedge species. Tree cover is sparse or absent (< 25%) and generally comprised of stunted black spruce and tamarack mix.
FPn73 - Northern Alder Swamp	Includes tall-shrub wetlands dominated by speckled alder, red-osier dogwood (*Cornus sericea*), and currant species (*Ribes* spp.). The herbaceous layer is comprised of Canada bluejoint (*Calamagrostis canadensis*), fowl mannagrass (*Glyceria striata*), sedge species, common marsh marigold (*Caltha palustris*), touch-me-nots (*Impatiens* spp.), and fern species (*Dryoptteris* spp.)
FPn82 - Northern Rich Tamarack Swamp (Western Basin)	Includes wetlands dominated by tamarack trees with black spruce, red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), and balsam fir (*Abies balsamea*) in the understory. Tree canopy is patchy to interrupted with 25-75% coverage. Speckle alder and willows dominate the tall-shrub layer. Sphagnum mosses, Canada bluejoint grass, and sedge species comprise the herbaceous layer.
LKi54 - Inland Lake Clay/Mud Shore	Includes inland lakes and ponds with plant communities growing in a clay, mud, or silt substrates. Vegetation cover and composition vary seasonally and from year to year dependent on water levels.
MHn35 - Northern Mesic Hardwood Forest	Includes hardwood forest on well-drained to moderately well-drained soils. Tree canopy is usually continuous (> 75% cover) and comprised of sugar maple (*Acer saccharum*), basswood (*Tilia americana*), northern red oak (*Quercus rubra*) with occasional area of paper birch and quacking aspen (*Populus tremuloides*) The shrub layer includes sapling of the tree canopy species with beaked hazelnut (*Corylus cornuta*), chokecherry (*Prunus virginiana*), and balsam fir. The herbaceous layer ranges from 5-75% coverage and dominated by Pennsylvania sedge (*Carex pennsylvanica*), large-leaved aster (*Aster macrophyllus*), and bedstraw species (*Galium* spp.)

Table 3.2 Terrestrial Land Cover Types in Minnesota (Cont.)

Ecological Classification System (ECS)	
Habitat Code and Name	**Definition**
MHn44 - Northern Wet-Mesic Boreal Hardwood-Conifer Forest	Includes forests on generally wet-mesic to mesic soils. Tree canopy is dominated by quacking aspen, paper birch, balsam fir with occasional red maple, white spruce (*Picea glauca*), and black ash (*Fraxinus nigra*). The shrub layer is comprised of beaked hazelnut, chokecherry, and juneberries (*Amelanchier* spp.). The ground layer is dominated by large-leaved aster, bedstraw species, and Canada mayflower (*Maianthemum canadense*).
MRn83 - Northern Mixed Cattail Marsh	Includes wetland complexes that are dominated by cattail species (*Typha* spp.). The cattails are often found is dense stands interspersed with pools of open water. Associated species are highly variable.
MRn93 - Northern Bulrush-Spikerush Marsh	Include emergent marsh communities typically dominated by bulrush species (*Scirpus* spp.) and spikerush species (*Eleocharis* spp.). Associated species include pondweeds (*Potamogeton* spp.), broad-leaved arrowhead (*Sagittaria latifolia*), and bur-reed (*Sparganium* spp.). Cattail species present but not dominant.
OW- Other Water Body	Includes open water body not associated with a natural body of water. An example is abandoned open pit mine filled with water.
WFn55 - Northern Wet Ash Swamp	Includes forested wetlands dominated (50-100% cover) with black ash primarily. Fine-bladed sedges and fern species dominate the herbaceous layer.
WMn82 - Northern Wet Meadow/Carr	Includes open wetlands dominated by dense cover of broad-leaved graminoids and/or tall shrubs. Tall shrubs include speckled alder, willow species (*Salix* spp.), and red-osier dogwood. Herbaceous layer dominated by Canada bluejoint, tussock sedge (*Carex stricta*), and lake sedge (*Carex lacustris*).
AFXXXX - Aspen Forest[1]	Includes forested areas dominated primarily by sapling quaking aspen. Generally these are areas that were logged using clear cutting methods.
XDXXOF - Old Field[1]	Includes native habitats that were disturbed by agricultural, development, or construction activities. The current vegetation likely dominated by non-native vegetation.
XDXXXX - Disturbed Land[1]	Includes primarily mine spoil areas that have not been vegetated.

[1] Codes were created for cover not included in ECS classification system.
Source: Table 19 Technical Memo Supplement (SEH 2008a).

Table 3.3 Existing and Impacted Wildlife Habitat in West Range IGCC Power Station Footprint and Utility/Transportation Corridors[1]

Land Use/Land Cover	Areas within Mesaba IGCC Site and Transportation/ Utility Corridors (acres)	Area Impacted (acres)				
		Phase I	Phase II	Transportation Corridors[2,3]	Utility Corridors[3]	Total[3]
Coniferous forest	67.21	0.34	3.94	3.47	13.72	21.47
Deciduous forest	788.17	46.48	45.77	60.28	69.35	221.88
Grassland	18.19	0.00	0.00	0.85	15.78	16.63
Gravel pits and open mines	50.52	0.00	0.00	0.01	50.50	50.51
Mixed wood forest	361.39	46.87	12.38	20.13	30.47	109.85
Open water	4.9	0.00	0.00	0.87	1.23	2.10
Other rural developments	42.54	0.00	0.00	1.13	20.86	21.99
Regeneration/young forests	253.99	0.48	9.11	10.14	36.68	57.31
Shrubby grassland	9.31	0.00	0.00	0.00	9.32	9.32
Urban/Industrial (cities & towns)	0.19	0.00	0.00	0.00	0.19	0.19
Wetlands	447.73	16.34	20.16	8.27	61.57	106.34
Totals	**2,044.14**	**110.51**	**91.36**	**106.05**	**309.67**	**617.59**

[1] Area calculations are based on the provided native file Universal Transverse Mercator (UTM) projection system. Minute differences will be noticed when comparing UTM calculation results to calculations based on the Minnesota County Lambert projection systems (ECS Terrestrial Communities).
[2] This summary excludes the area within the preferred Alternative 3B rail loop as impacted habitat.
[3] The totals include impacts over the entire area and along the full length of all project elements
Source: SEH email correspondence, January 19, 2009.

Table 3.4 Existing Wetlands in West Range Site and Utility/Transportation Corridors

Wetland Classification System			Area (acres)
Circular 39[1]	Eggers and Reed[2]	Cowardin[3]	
1	Seasonally Flooded Basin or Flat	PFO1A	0.49
2	Wet Meadow	PEMB	2.08
3	Shallow Marsh	PEMC	7.03
4	Deep Marsh	PUBF	0.42
5	Shallow Open Water	PEM1H/L1UBH	3.23
6	Shrub Carr	PSS1	80.14
6	Alder Thicket	PSS1A/C	46.83
7	Hardwood Swamp	PFO1A/B/C	208.88
7	Coniferous Swamp	PFO1C	12.73
8	Coniferous Bog	PFO7B	23.70
Total Wetland Area			**385.53**

[1] From: Shaw and Fredine (1971).
[2] From: Eggers and Reed (1997).
[3] From: Cowardin et al. (1979).
Source: Table 2 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.5 Wetland Types and Definitions in Minnesota

Circular 39[1]	Eggers & Reed[2]	Definition
Type 1 - Seasonally Flooded Basin or Flat	Floodplain forest Seasonally flooded basin Wet to Wet-mesic prairie Fresh (wet) meadow	Soil is covered with water or is waterlogged during variable seasonal periods, but usually is well drained during much of the growing season. Vegetation varies greatly according to season and duration of flooding from bottomland hardwoods (floodplain forests) to herbaceous plants.
Type 2 - Inland Fresh Meadow	Wet to Wet-mesic prairie Fresh (wet) meadow Sedge meadow Calcareous fen	Soil is usually without standing water during most of the growing season, but is waterlogged within at least a few inches of surface. Meadows may fill shallow basins, sloughs, or farmland sags, or these meadows may border shallow marshes on the landward side. Vegetation includes grasses, sedges, rushes, and various broad-leaved plants. Other wetland plant community types include low prairies, sedge meadows, and calcareous fens.
Type 3 - Inland Shallow Fresh Marsh	Shallow marsh	Soil is usually waterlogged early during the growing season and may often be covered with as much as 6 inches or more of water. These marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes on the landward side. These are common as seep areas on irrigated lands. Vegetation includes grass, bulrush, spikerush, and various other marsh plants such as cattail, arrowhead, pickerelweed, and smartweed.
Type 4 - Inland Deep Fresh Marsh	Deep marsh	Soil is usually covered with 6 inches to 3 feet or more of water during growing season. These deep marshes may completely fill shallow lake basins, potholes, limestone sinks, and sloughs, or the may border open water in such depressions. Vegetation includes cattail, reeds, bulrush, spikerush, and wild rice. In open areas, pondweed, naiad, coontail, Eurasian watermilfoil, waterweed, duckweed, waterlily, or spatterdock may occur.
Type 5 - Inland Open Fresh Water	Shallow open water	Shallow ponds and reservoirs are included in this type. Water is usually less than 10 feet deep and fringed by a border of emergent vegetation similar to areas of Type 4.
Type 6 - Shrub Swamp	Shrub-Carr Alder thicket	Soil is usually waterlogged during the growing season and is often covered with as much as 6 inches of water. These occur mostly along sluggish streams and occasionally of floodplains. Vegetation includes alder, willow, buttonbush, dogwood, and swamp-privet.
Type 7 - Wooded Swamp	Hardwood swamp Coniferous swamp	Soil is waterlogged at least within a few inches of the surface during the growing season and is often covered with as much as 1 foot of water. These occur mostly along sluggish streams, on old riverine oxbows, on flat uplands, and in ancient lake basins. Forest vegetation includes tamarack, arborvitae, black spruce, balsam fir, red maple, and black ash. Deciduous swamps frequently support beds of duckweed and smartweed. Other wetland plant community types include lowland hardwood swamps and coniferous swamps.
Type 8 - Bogs	Open bog Coniferous bog	Soil is usually waterlogged. These occur mostly in ancient basins, on flat uplands, and along sluggish streams. Vegetation is woody or herbaceous or both, usually on a spongy covering of mosses. Typical plants are heath shrub, sphagnum moss, and sedge. In the North, leatherleaf, Labrador tea, cranberry, and cottongrass are often present. Scattered, often stunted, black spruce and tamarack may occur.

[1] From: Shaw and Fredine (1971).
[2] From: Eggers and Reed (1997).
Source: Table 3.7-1 in Draft EIS and Table 3 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.6 Wetland Impacts in West Range IGCC Power Station Footprint and Utility/Transportation Corridors[1,2]

Project Element	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Wetland Filling									
IGCC Power Station, Phase I			0.04			7.31	6.27		13.62
IGCC Power Station, Phase II							17.74		17.74
Railroad						4.75	0.98		5.73
Plant Access Road (acres in Right of Way [ROW])			0.004			0.19			0.19
High Voltage Transmission Line (HVTL)						0.0032	0.0026	0.0039	0.01
Subtotal Wetland Filling									**37.29**
Temporary Disturbance									
Access Road			0.08			0.13			0.21
HVTL						2.33			2.33
Gas Pipeline (acres in ROW)	0.70	1.98	1.22			0.84			4.74
Process Water 1 – Lind Pit to Canisteo (acres in ROW)									0.00
Process Water 2 – Canisteo to IGCC site (acres in ROW)						0.18			0.18
Process Water 3 – Gross Marble to Canisteo (acres in ROW)				0.62	0.64	1.15			2.41
Potable Water and Sanitary Sewer									
Subtotal Temporary Disturbance									**7.54**
Permanent Type Conversion									
Access Road									0.00
HVTL						9.40	6.84	19.92	36.16
Gas Pipeline						4.5	9.16	2.72	16.38
Process Water 1- Lind Pit to Canisteo									0.00
Process Water 2 – Canisteo to IGCC Site						0.12	1.98		2.10
Process Water 3 – Gross Marble to Canisteo						1.23	0.51	0.63	2.37
Potable Water and Sanitary Sewer									0.00
Subtotal Permanent Type Conversion									**57.01**

[1] In instances where National Wetlands Inventory (NWI) and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.
[2] Accurate Eggers and Reed classifications are only available for wetlands that have been field delineated. Eggers and Reed classifications for NWI wetlands are assumed to be the most common wetland types for this area of Minnesota. In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type present.
Source: Table 15 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.7 Existing and Impacted Wildlife Habitat in the East Range IGCC Power Station Footprint

Terrestrial Community	Areas within Mesaba IGCC Site (acres)	Areas Impacted by East Range IGCC Power Plant Footprint (acres)		
		Phase I	Phase II	Total Acres
Northern Mesic Hardwood Forest (Red oak, sugar maple, basswood, bluebead lily) forest (MNDNR Code MHn35b)	304.34	2.76	11.10	13.86
Northern Wet-Mesic Boreal Hardwood-Conifer Forest (Aspen, birch, red maple forest) (Mhn44a)	416.38	63.74	69.43	133.17
Aspen Forest[1]	21.36	0.00	0.00	0.00
Old Field[1]	23.18	0.34	0.66	1.00
Northern Mixed Cattail Marsh (MRn83)	62.71	1.89	1.38	3.27
Northern Wet Ash Swamp (WFn55)	249.42	21.78	0.31	22.09
Northern Wet Meadow/Carr (WMn82)	12.14	1.79	0.01	1.80
Northern Spruce Bog (Apn80)	12.90	4.75	0.00	4.75
Northern Poor Conifer Swamp (Apn81)	37.12	0.66	1.42	2.08
Northern Rich Alder Swamp (FPn82)	181.22	0.19	0.90	1.09
Disturbed Land[1]	0.89	0.00	0.00	0.00
Total	**1,321.66**	**97.90**	**85.21**	**183.11**

[1] Habitats not included in ECS.
Source: Table 26 Technical Memo Supplement (SEH 2008a).

Table 3.8 Existing and Impacted Wildlife Habitat in East Range IGCC Power Station Site and Utility/Transportation Corridors[1]

Land Use/Land Cover	Areas within Mesaba IGCC Site and Transportation/ Utility Corridors (acres)	Area Impacted (acres)				
		Phase I	Phase II	Transportation Corridors[2]	Utility Corridors[3]	Total[4]
Coniferous forest	102.53	0.00	0.00	1.13	4.38	5.51
Deciduous forest	64.53	2.07	22.33	0.00	4.76	29.16
Grassland	305.35	0.00	0.00	0.00	9.74	9.74
Gravel pits and open mines	71.88	0.00	0.00	0.00	71.88	71.88
Mixed wood forest	489.29	67.45	57.27	38.76	37.72	201.2
Open water	7.93	0.00	0.00	0.17	7.44	7.61
Other rural developments	87.18	0.82	1.24	1.24	76.04	79.34
Regeneration/young forests	204.13	0.00	0.00	0.00	116.59	116.59
Shrubby grassland	201.73	13.91	0.00	12.73	133.34	159.98
Urban/Industrial (cities & towns)	0.17	0.00	0.00	0.00	0.00	0.00
Wetlands	748.46	13.44	3.70	15.12	216.00	248.26
Totals	**2,283.18**	**97.69**	**84.54**	**69.15**	**677.89**	**929.27**

[1] Area calculations are based on the provided native file Universal Transverse Mercator (UTM) projection system. Minute differences will be noticed when comparing UTM calculation results to calculations based on the Minnesota County Lambert projection systems (ECS Terrestrial Communities).
[2] This summary does not consider the area within the rail loop to be impacted habitat.
[3] Land Use/Land Cover calculations are based on a data set with 30 meters spatial resolution. The resolution of the data causes inaccuracies in land cover calculations such that the existing utility corridors (i.e., the natural gas pipeline and HVTL routes) that have been cleared of trees and shrubs artificially show as other land cover types found adjacent. In actuality, there will be minimal habitat impacts to such existing, cleared corridors. To address such known inaccuracies when dealing with the existing ROW that will be used on the East Range Site (where all gas pipeline ROW is existing ROW), the data in this table has been revised by assuming that all coniferous, deciduous, and mixed wood forest cover identified in Geographical Information System (GIS) studies focused on the gas pipeline are actually grassland. In like manner, all coniferous, deciduous, and mixed wood forest types identified in sections of the East Range HVTLs that are known to use existing ROW are assumed to be grassland.
Land cover types within new HVTL ROW that are identified in GIS studies are assumed to be accurate.
[4] The totals include impacts of the entire area within the East Range Site and along the full length of all the IGCC Power Station's linear facilities.
Source: SEH email correspondence, January 21, 2009.

Table 3.9 Existing Wetlands in East Range IGCC Power Station Footprint and Utility/Transportation Corridors

Circular 39[1]	Eggers and Reed[2]	Cowardin[3]	Area (acres)
2	Wet Meadow	PEMB	10.17
2	Sedge Meadow	PEMC	0.08
3	Shallow Marsh	PEMC	6.38
4	Deep Marsh	PUBF	62.94
5	Shallow Open Water	PEM1H/L1UBH	5.05
6	Alder Thicket	PSS1A/C	276.04
6	Shrub Swamp	PSS1B	154.87
7	Hardwood Swamp	PFO1A/B/C	71.76
7	Coniferous Swamp	PFO2B/C	33.37
8	Coniferous Bog	PFO7B	96
R	Riverine		0.28
Total Wetland Area			**716.94**

[1] From: Shaw and Fredine (1971).
[2] From: Eggers and Reed (1997).
[3] From: Cowardin et al. (1979).
Source: Table D-1 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.10 Wetland Impacts in East Range IGCC Power Station Footprint and Utility/Transportation Corridors[1, 2, 3]

Project Element	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Wetland Filling									
IGCC Power Station, Phase I		1.79		1.89		0.19	9.57		13.44
IGCC Power Station, Phase II		0.007		1.38		0.90	1.42		3.71
Railroad		0.05		2.67		8.86	0.89	0.91	13.38
Plant Access Road (acres in ROW)						0.05	0.39		0.44
HVTL	0.0006	0.0025			0.0025	0.0334	0.0114	0.0383	0.09
Subtotal Wetland Filling									**31.06**
Temporary Disturbance									
HVTL						0.20			0.20
Gas Pipeline Alt. 1	0.09	14.12	0.003	0.68	0.00	0.33		9.10	24.32
Process Water 1 – Intake			0.38	0.41		0.19			0.98
Potable Water and Sanitary Sewer									0
Subtotal Wetland Filling									**25.50**
Permanent Type Conversion									
HVTL						19.21	10.99	29.42	59.62
Gas Pipeline							0.41	0.06	0.47
Process Water - Intake						0.26	0.75	0.32	1.33
Potable Water and Sanitary Sewer									
Subtotal Permanent Type Conversion									**61.42**

[1] In instances where National Wetland Inventory and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.
[2] Wetland impacts are first counted for the plant site, rail, road, HVTL, gas pipeline, process water lines, sanitary sewer, and process water, in that order.
[3] Accurate Eggers and Reed classifications are only available for wetlands that have been field delineated. Eggers and Reed classifications for NWI wetlands are assumed to be the most common wetland types for this area of Minnesota. In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type present.
Source: Table D-17 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.11 Minnesota Species of Greatest Need Wildlife Species Assemblages in the East and West Range

Species	Habitat Associations[1]
Mammals	
Canis lupus – Gray wolf	All habitats
Lynx canadensis – Canada lynx	AF, MHn44
Phenacomys intermedius– Heather vole	APn90, APn80, APn81
Snaptomys borealis – Northern bog lemming	APn90, APn80, APn81
Birds	
**Accipiter gentiles* – Northern goshawk	MHn35, MHn44
**Asio flammeus* – Short-eared owl	OF, XD
**Botaurus lentiginosus* – American bittern	FPn73, LKi54, MRn83, MRn93, OW
**Buteo lineatus* – Red-shouldered hawk	MHn35, MHn44
**Catharus fuscescens* – Veery	MHn35, MHn44
**Chodeiles minor* – Common nighthawk	All habitats
**Circus cyaneus* – Northern harrier	OF, XD
**Coccocyzus erythropthalmus* – Black-billed cuckoo	MHn35, MHn44
**Contopus cooperi* – Olive-sided flycatcher	APn80, APn81
**C. virens* – Eastern wood-pewee	MHn35, MHn44, WFn55, WFn64, APn80, APn81, AF, FPn82
**Coturnicops novaboracensis* – Yellow rail	WMn82
**Dendroica cearulescens* – Black-throated blue warbler	MHn44
**D. castanea* – Bay-breasted warbler	MHn35, MHn44
**D. tigrina* – Cape May warbler	MHn35, MHn44
**Empidonax* – Flycatchers	MHn35, MHn44, WFn55, WFn64, APn80, APn81, AF, FPn82
**Gavia immer* – Common loon	OW, LKi54
**Haliaeetus leucocephalus* – Bald eagle	OW, LKi54, MHn35, MHn44
**Hylocichlia mustelina* – Wood thrush	MHn35, MHn44
**Melospiza georgina* – Swamp sparrow	LKi54, APn80, APn81, APn90, FPN73, FPn82, MRn83, MRn93, WFn55, WFn64
**Opornis agilis* – Connecticut warbler	MHn35, MHn44, WFn55, WFn64, APn81
**Pheuticus ludovicianus* – Rose-breasted grosbeak	MHn35, MHn44
**Scolopax minor* – American woodcock	LKi54, APn80, APn81, APn90, FPN73, FPn82, MRn83, MRn93, WFn55, WFn64
**Seiurus aurocapillus* – Ovenbird	MHn35, MHn44
**Sphyrapicus varius* – Yellow-bellied flycatcher	MHn35, MHn44, WFn55, WFn64, APn81
**Wilsonia canadensis* – Canada warbler	MHn35, MHn44, WFn55, WFn64, APn81
**Zonotrichia albicollis* – White throated sparrow	APn90, OF, XD, WMn82
Reptiles	
Chelydra serpentina – Snapping turtle	LKi54, OW
Amphibians	
Hemidactylum scutatum – Four-toed salamander	MHn35, MHn44, WFn55, WFn64, APn81, APn80, APn83
Plethodon cinereus – Eastern red backed salamander	MHn44, APn80
Rana palustris – Pickerel frog	LKi54, OW

[1] See Table 3-2 for habitat association types.
Note: OF = Old Field (XDXXOF); XD = Disturbed Land (XDXXX); AF = Aspen Forest (AFXXXX).
* Migratory bird species.
Sources: Table 20 and Table 31 in Technical Memo Supplement (SEH 2008a).

Table 7.1 Cumulative Habitat Impacts in the Arrowhead Region and Ecological Subsections in the Next 20 Years

	Losses to Forestry (acres)	Losses to Economic Development (acres)	Losses to Mining (acres)	Total Losses (acres)
Arrowhead Region	7,315	498	913	8,727
Nashwauk Uplands	0	158	718	876
Laurentian Uplands	588	38	197	823

Source: Emmons and Olivier, Inc. (2006).

Table 7.2 Cumulative Habitat Impacts in the West Range Study Area by Project

	Total Habitat in Study Area (acres)	Total Habitat Impacts (acres)	Percent Loss of Total Habitat		Proportion of Cumulative Impact (percent)
			From Past	From Existing	
Past Natural Habitat	400,052				
Existing Natural Habitat	387,754		3.07		
Future Actions					
Mesaba Energy Project		523[1,2]		0.13	9.49
Minnesota Steel		3,324		0.86	60.34
Nashwauk Gas Pipeline		157		0.04	2.85
County Road 7 Realignment		59		0.02	1.07
Itasca County Railroad		122		0.03	2.21
Keetac Mine Expansion		1,324		0.34	24.03
Total of Future Actions		5,509[3]		1.42	100.00
Future	**382,245**				

[1] This table includes habitat impacts that would occur in the 13.2 mile corridor along which the natural gas pipeline serving the Project would traverse. The table also includes pipeline impacts that would occur from constructing the natural gas pipeline adjacent to the natural gas pipeline that the City of Nashwauk will use to serve Minnesota Steel Industries, LLC. If Excelsior purchases its natural gas from the City of Nashwauk via the City's pipeline, Excelsior would not construct its own pipeline and thus could avoid associated impacts (i.e., the total habitat impacts noted would decrease by approximately 103 acres).
[2] The 523 acres differs from the 618 acres shown in Table 3.3 because the West Range study area does not include the entire length of the gas pipeline.
[3] This number differs from the sum of the numbers above it due to rounding.
Sources: Tables 2, 3, 4, 5, 6, 7, and 8 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.3 Cumulative Habitat Impacts in the West Range Study Area by Habitat Type

Habitat Type	Existing Conditions (acres)	Impacts of Reasonably Foreseeable Future Actions (acres)	Percent Loss Resulting from Implementation of Reasonably Foreseeable Future Actions
Open Wetland	7,763	113	1.46
Lowland Deciduous	8,172	26	0.32
Lowland Deciduous Shrubland	46,527	946	2.03
Lowland Conifer	31,731	31	0.10
Lowland Conifer Shrubland	212	0	0.00
Upland Conifer	22,878	28	0.12
Upland Conifer/Deciduous Mix	100	0	0.00
Upland Deciduous (Aspen/Birch)	139,407	1,884	1.35
Upland Deciduous (Hardwoods)	12,234	351	2.87
Upland Shrub/Woodland	64,509	1,465	2.27
Water	34,281	527	1.54
Urban/Developed	11,555	453	3.92
Cropland	3,381	35	1.04
Grassland	16,559	104	0.63
Barren	743	11	1.48
Total Area	**400,052**	**5,973**	**1.49**
Total Natural Habitat (Not Included; Urban or Barren)	**387,754**	**5,509**	**1.42**
Source: Table 9 in Cumulative Wildlife Effect Assessment (SEH 2008c).			

Table 7.4 IGCC Power Station Cumulative Habitat Impacts in the West Range Study Area[1,2]

Habitat Type	Habitat Impact (acres)	Percent Loss as Compared to Total Habitat within Study Area for Existing Conditions	Proportion of Cumulative Impact (percent)
Open Wetland	1	0.01	0.88
Lowland Deciduous	9	0.11	34.62
Lowland Deciduous Shrubland	16	0.03	1.69
Lowland Conifer	11	0.03	35.48
Lowland Conifer Shrubland	0	0.00	0.00
Upland Conifer	5	0.02	17.86
Upland Conifer/Deciduous Mix	0	0.00	0.00
Upland Deciduous (Aspen/Birch)	291	0.21	15.45
Upland Deciduous (Hardwoods)	69	0.56	19.66
Upland Shrub/Woodland	114	0.18	7.78
Water	1	0.00	0.19
Urban/Developed	7	0.06	1.55
Cropland	0	0.00	0.00
Grassland	6	0.04	5.77
Barren	0	0.00	0.00
Total Area	**530**	**0.13**	**8.87**
Total Natural Habitat (Not Included; Urban or Barren)	**523**	**0.13**	**9.49**

[1] Includes only impacts within the defined West Range Site Cumulative Wildlife Assessment Study Area.
[2] Data excludes cover within the rail loop.
Sources: Table 3 and Table 9 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.5 Cumulative Habitat Impacts in the East Range Study Area by Project

	Total Habitat in Study Area (acres)	Total Habitat Impacts (acres)	Percent Loss of Total Habitat		Proportion of Cumulative Impact (percent)
			From Past	From Existing	
Past Natural Habitat	103,563				
Existing Natural Habitat	92,758		10.4		
Future Actions					
Mesaba Energy Project		433		0.47	8.94
PolyMet Mining NorthMet Project		2,957		3.19	61.02
Mesabi Nugget		1,456		1.57	30.05
Total of Future Actions		4,846		5.22	100.00
Future	**87,912**				

¹ This number differs from the sum of the numbers above it due to rounding.
Note: See the note in Table 7.7 for the explanation of why the total habitat impacts for the Mesaba Energy Project identified within the East Range study area differ from the 618 acres of impacts quantified in Table 3.8.
Sources: Tables 10, 11, 12, 13, and 14 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.6 Cumulative Habitat Impacts in the East Range Study Area by Habitat Type

Habitat Type	Existing Conditions (acres)	Impacts of Reasonably Foreseeable Future Actions (acres)	Percent Loss of Existing Habitat Resulting from Implementation of Reasonably Foreseeable Future Actions
Open Wetland	1,585	15	0.95
Lowland Deciduous	1,555	20	1.29
Lowland Deciduous Shrubland	14,868	244	1.64
Lowland Conifer	18,712	804	4.30
Lowland Conifer Shrubland	702	327	46.58
Upland Conifer	12,418	1,268	10.21
Upland Conifer/Deciduous Mix	269	3	1.12
Upland Deciduous (Aspen/Birch)	27,579	1,558	5.65
Upland Deciduous (Hardwoods)	1,278	214	16.74
Upland Shrub/Woodland	6,513	113	1.73
Water	5,431	199	3.66
Urban/Developed	8,721	1,138	13.05
Cropland	61	0	0.00
Grassland	1,787	81	4.53
Barren	2,084	0	0.00
Total Area	**103,563**	**5,984**	**5.78**
Total Natural Habitat (Not Included; Urban or Barren)	**92,758**	**4,846**	**5.22**

Source: Table 14 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.7 IGCC Power Station Cumulative Habitat Impacts in the East Range Study Area

Habitat Type	Habitat Impact (acres)	Percent Loss as Compared to Total Habitat within Study Area for Existing Conditions	Proportion of Cumulative Impact (percent)
Open Wetland	3	0.19	20.00
Lowland Deciduous	18	1.16	90.00
Lowland Deciduous Shrubland	34	0.23	13.93
Lowland Conifer	9	0.05	1.12
Lowland Conifer Shrubland	2	0.28	0.61
Upland Conifer	21	0.17	1.66
Upland Conifer/Deciduous Mix	1	0.37	33.33
Upland Deciduous (Aspen/Birch)	218	0.79	13.99
Upland Deciduous (Hardwoods)	1	0.08	0.47
Upland Shrub/Woodland	42	0.64	37.17
Water	7	0.13	3.52
Urban/Developed	46	0.53	4.04
Cropland	0	0.00	0.00
Grassland	77	4.31	95.06
Barren	0	0.00	0.00
Total Area	**479**	**0.46**	**8.00**
Total Natural Habitat (N.I. Urban or Barren)	**433**	**0.47**	**8.94**

Note: The East Range study area excludes i) most of a 35 mile transmission line corridor along which an additional 30 feet of ROW will be required and ii) a 2 mile segment of new ROW must be acquired.
Source: Table 11 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Figures

Appendix E

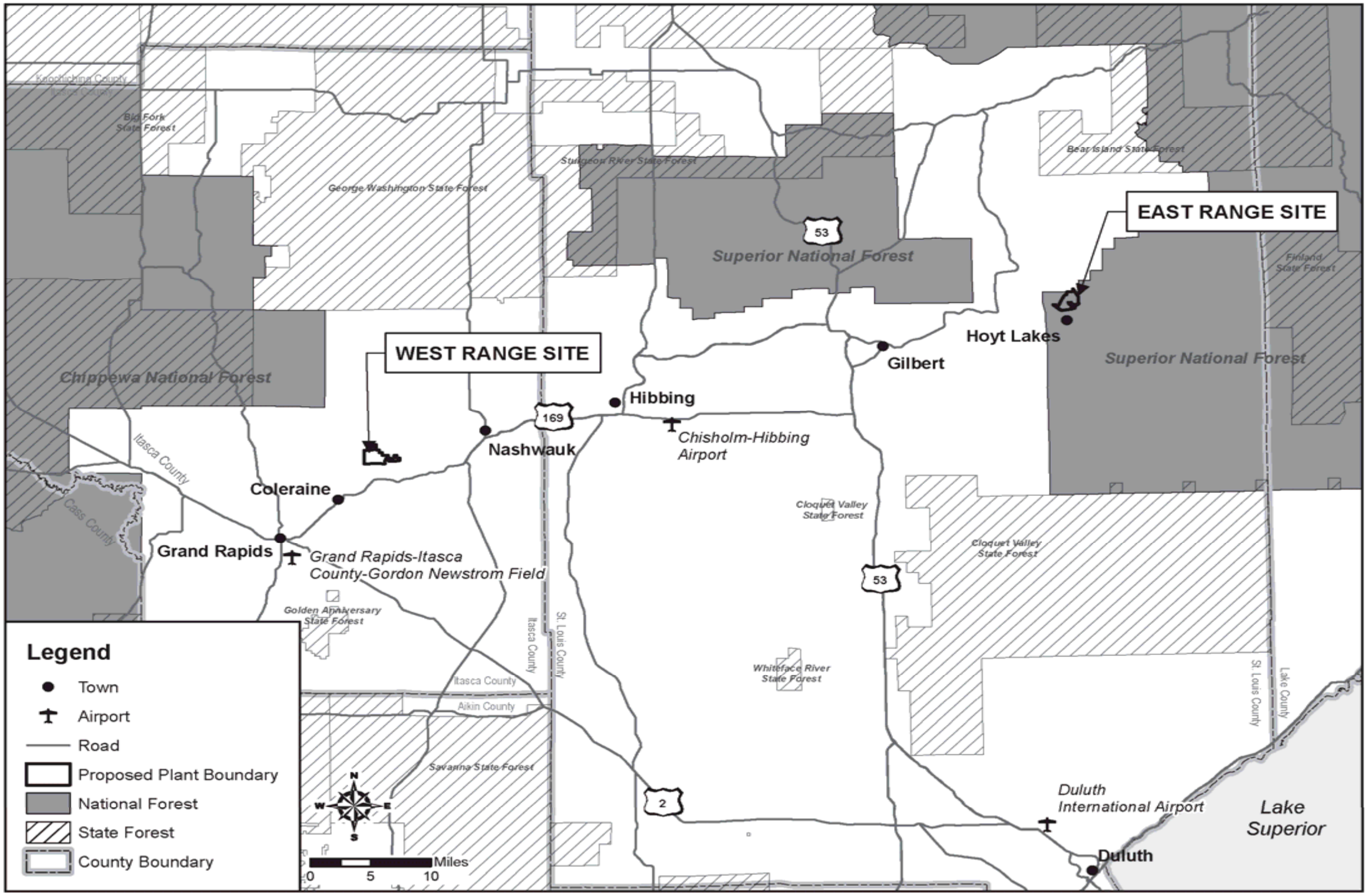

Figure 1.1 General Location Map

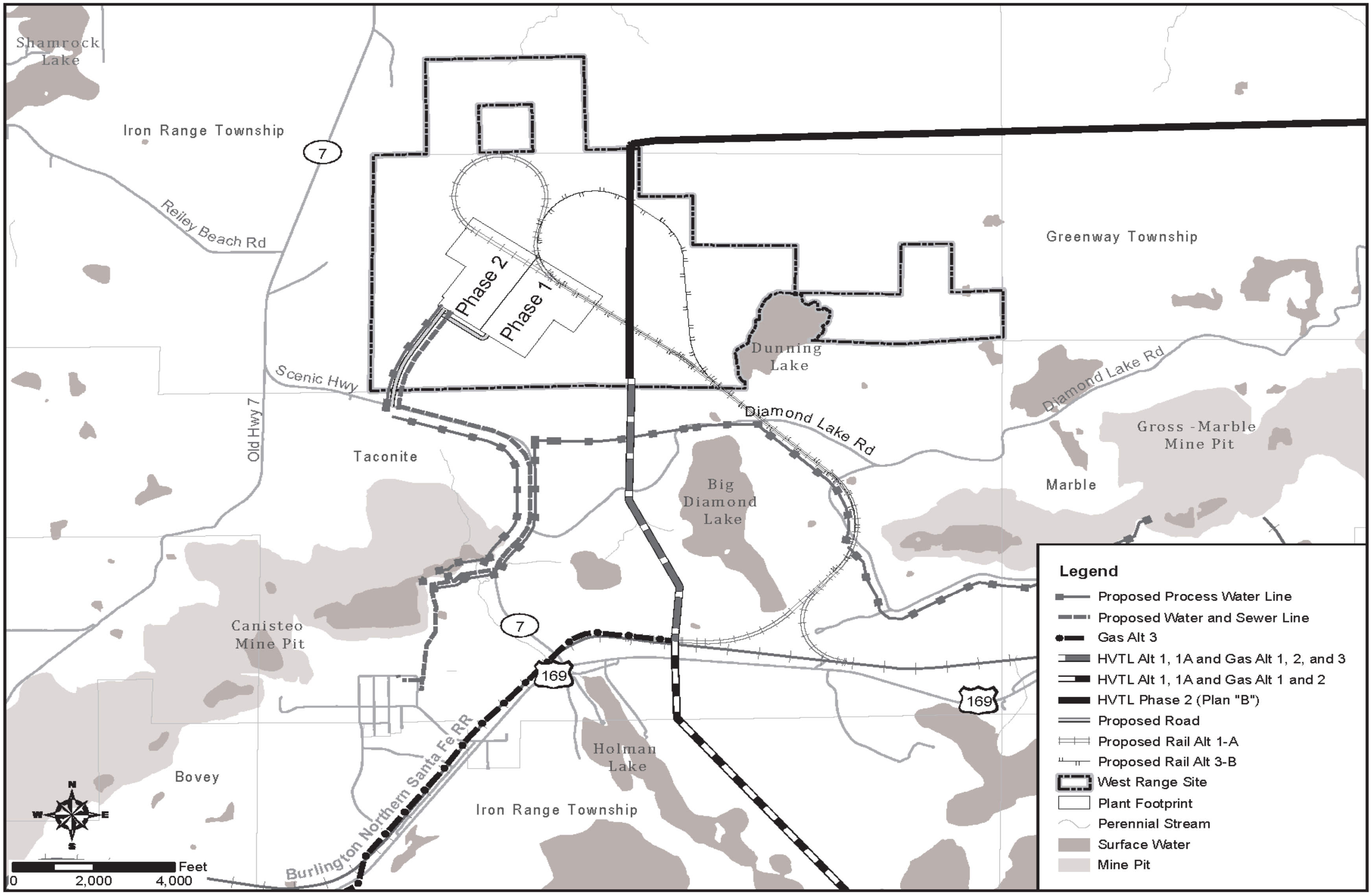

Figure 2.1 West Range Plant Site

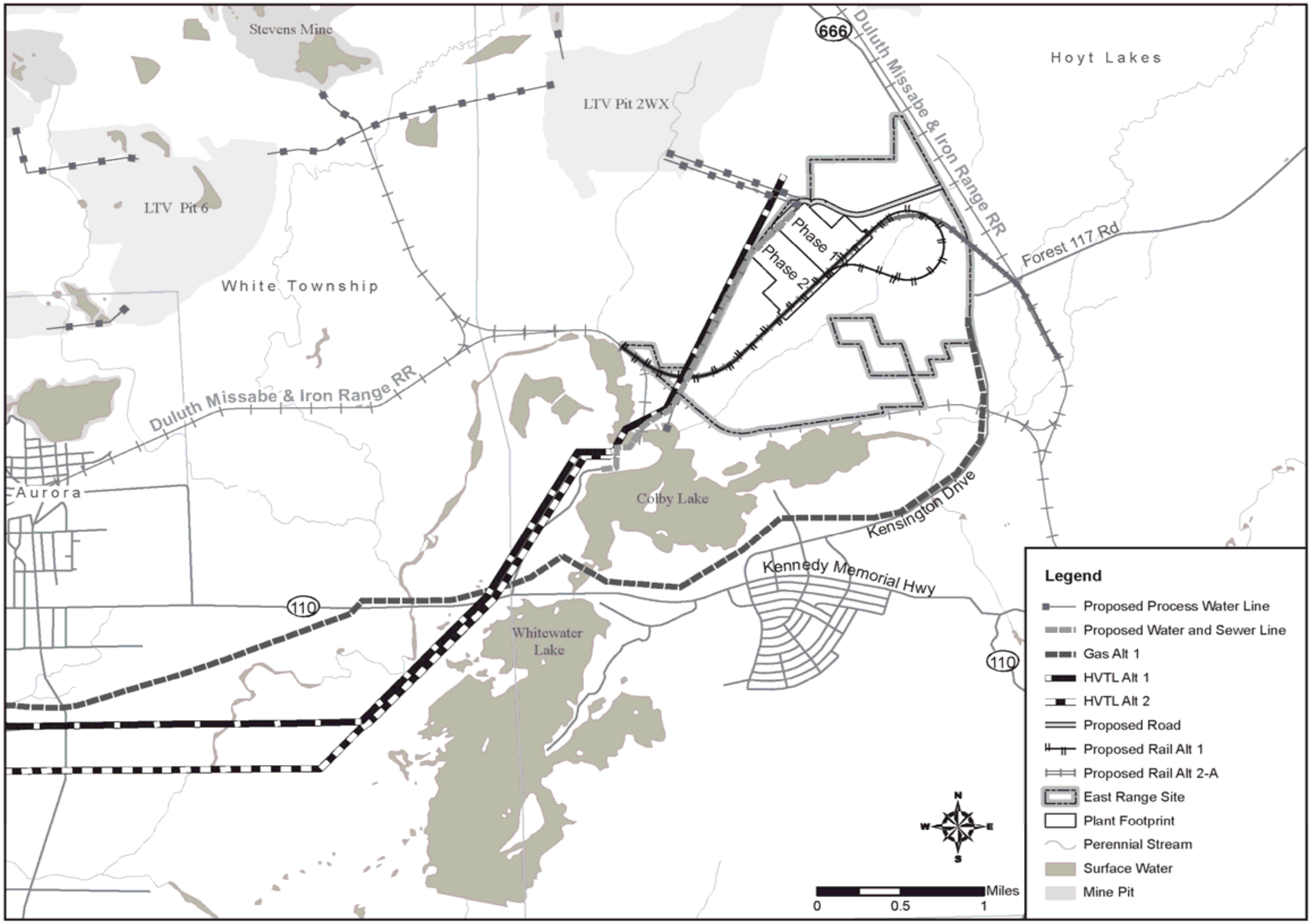

Figure 2.2 East Range Plant Site

Figure 2.3 Artist's Visualization of Integrated Gasification Combined Cycle (IGCC) Power Station

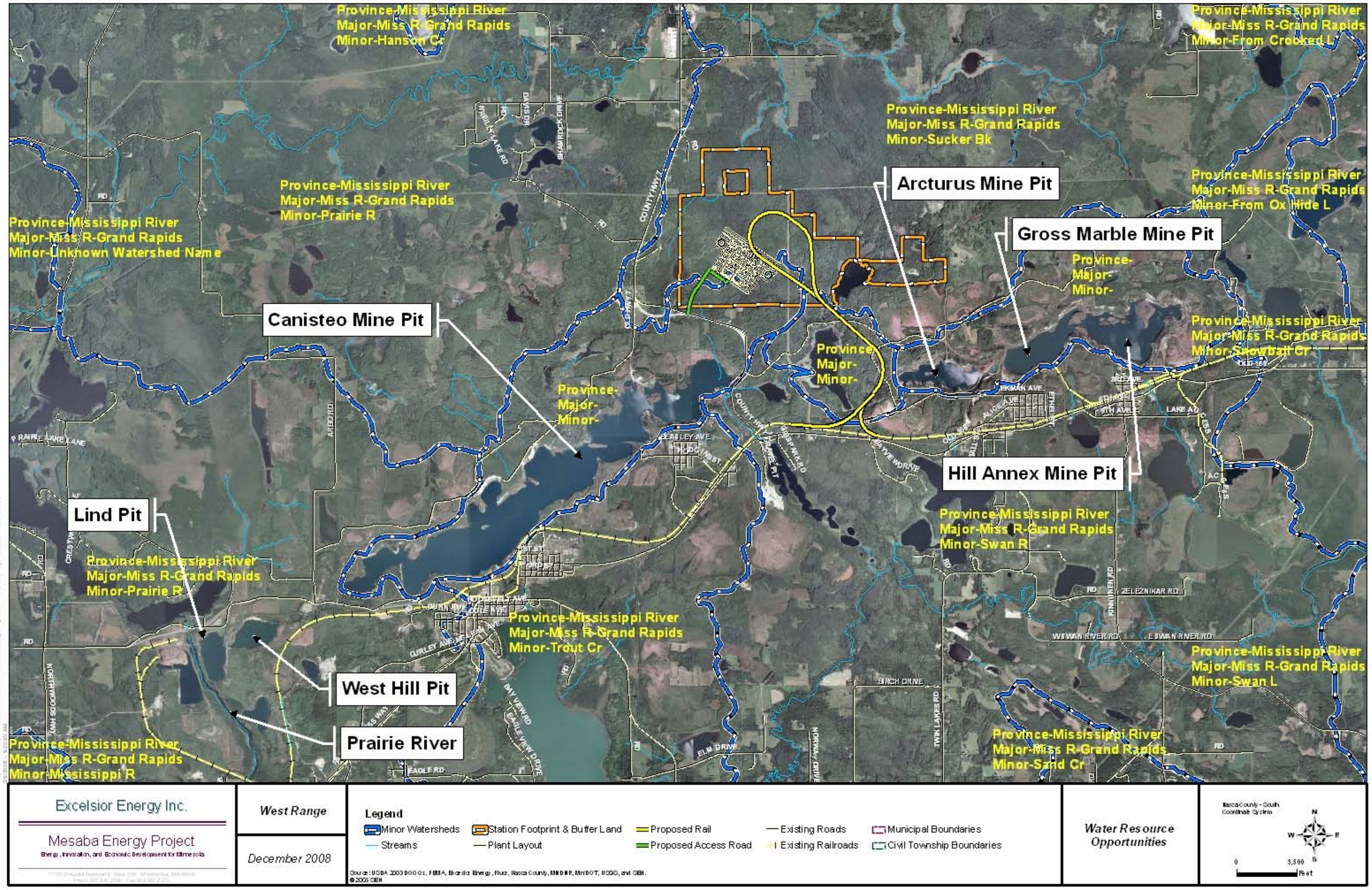

Figure 2.4 West Range Site Supply and Receiving Waters

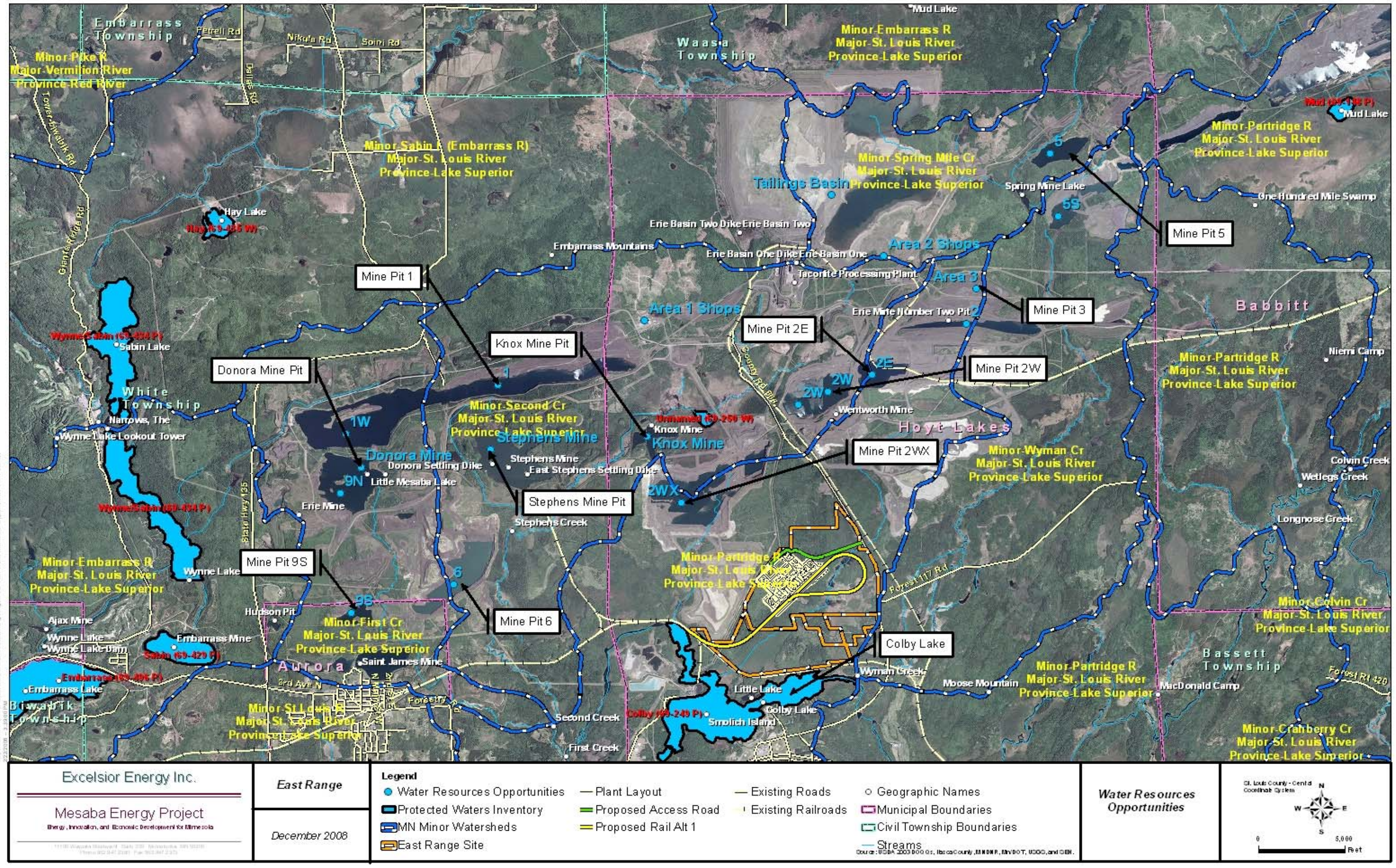

Figure 2.5 East Range Site Supply and Receiving Waters

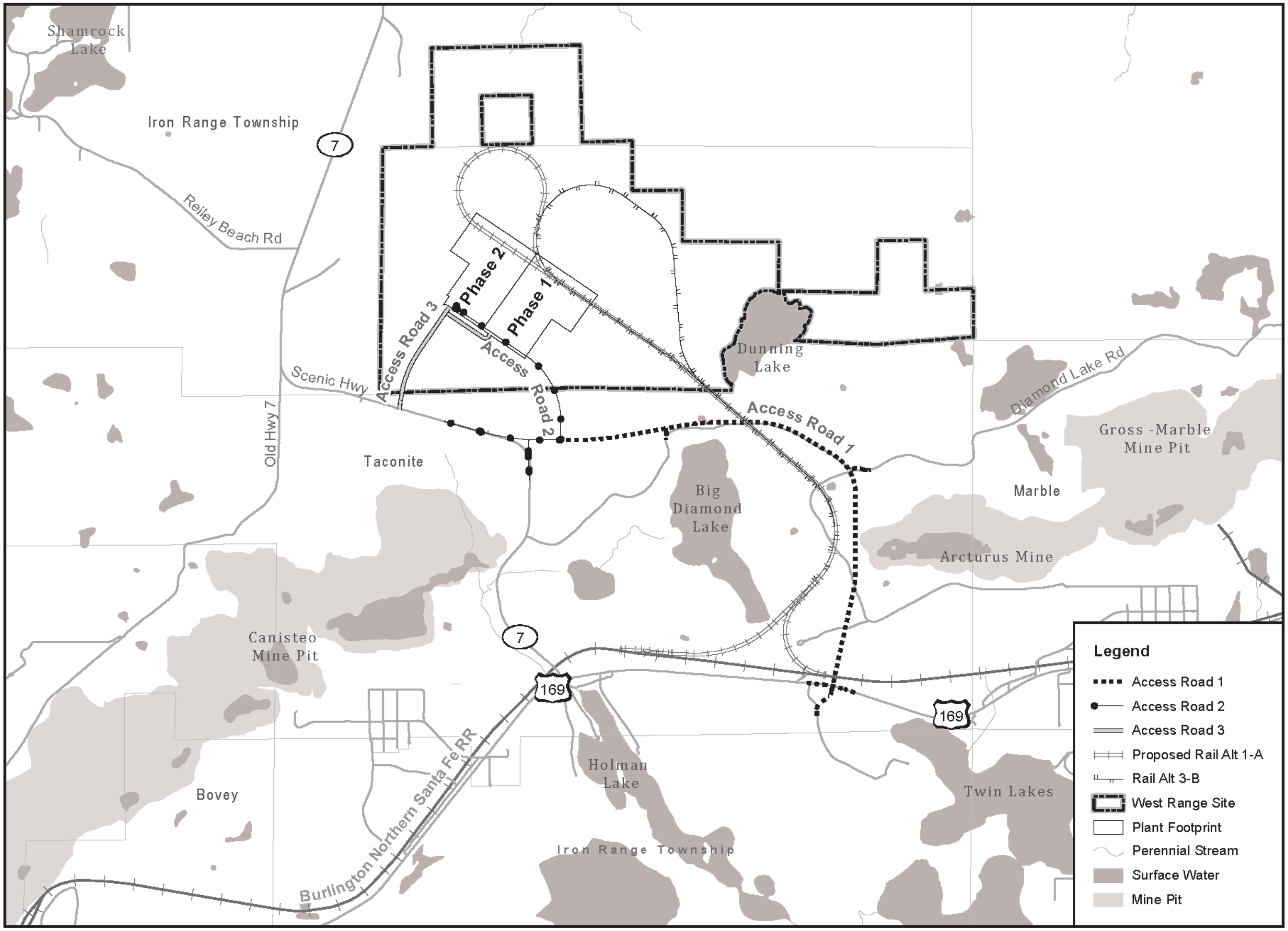

Figure 2.6 West Range Rail and Road Alternatives

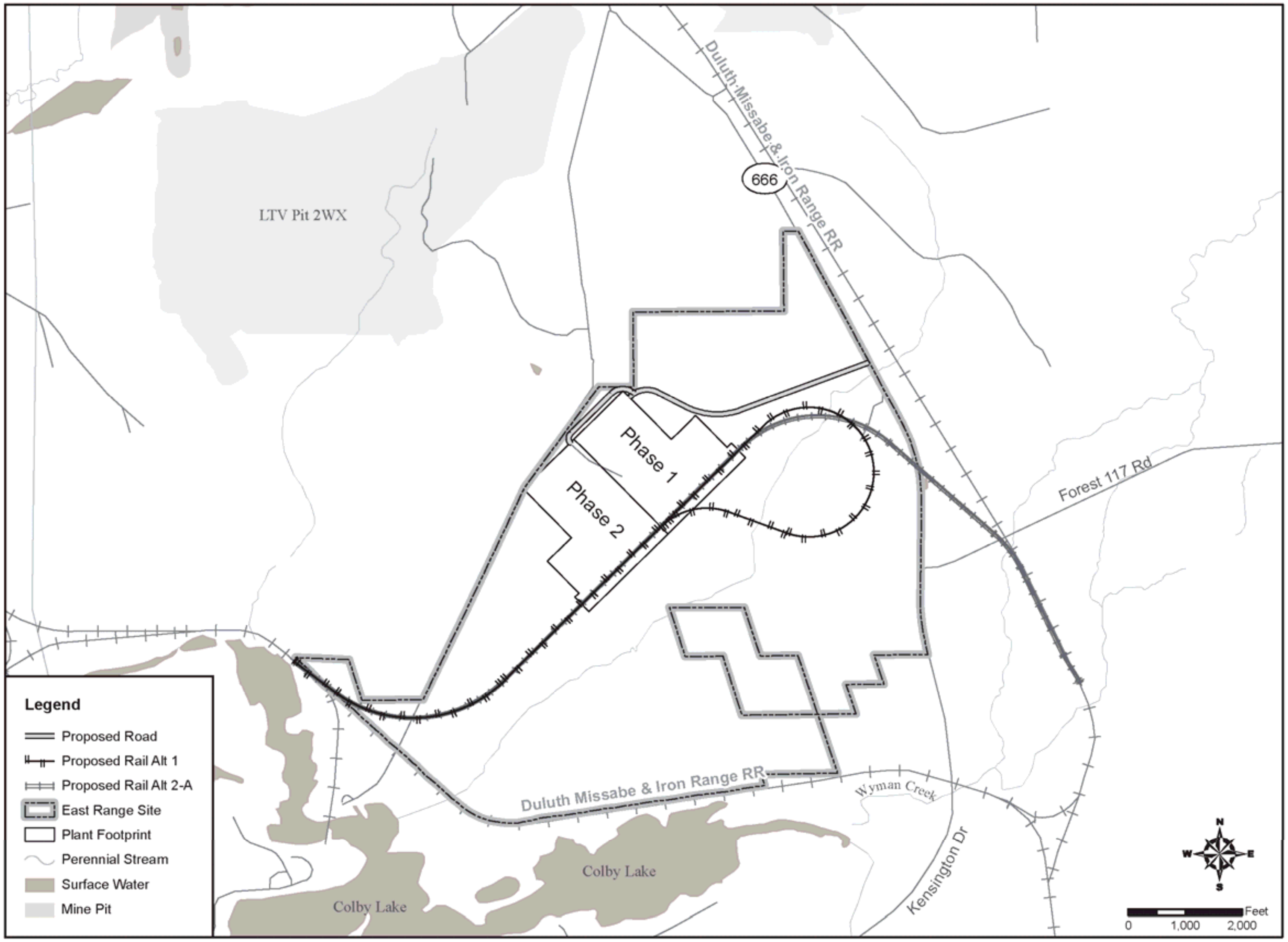

Figure 2.7 East Range Rail and Road Alternatives

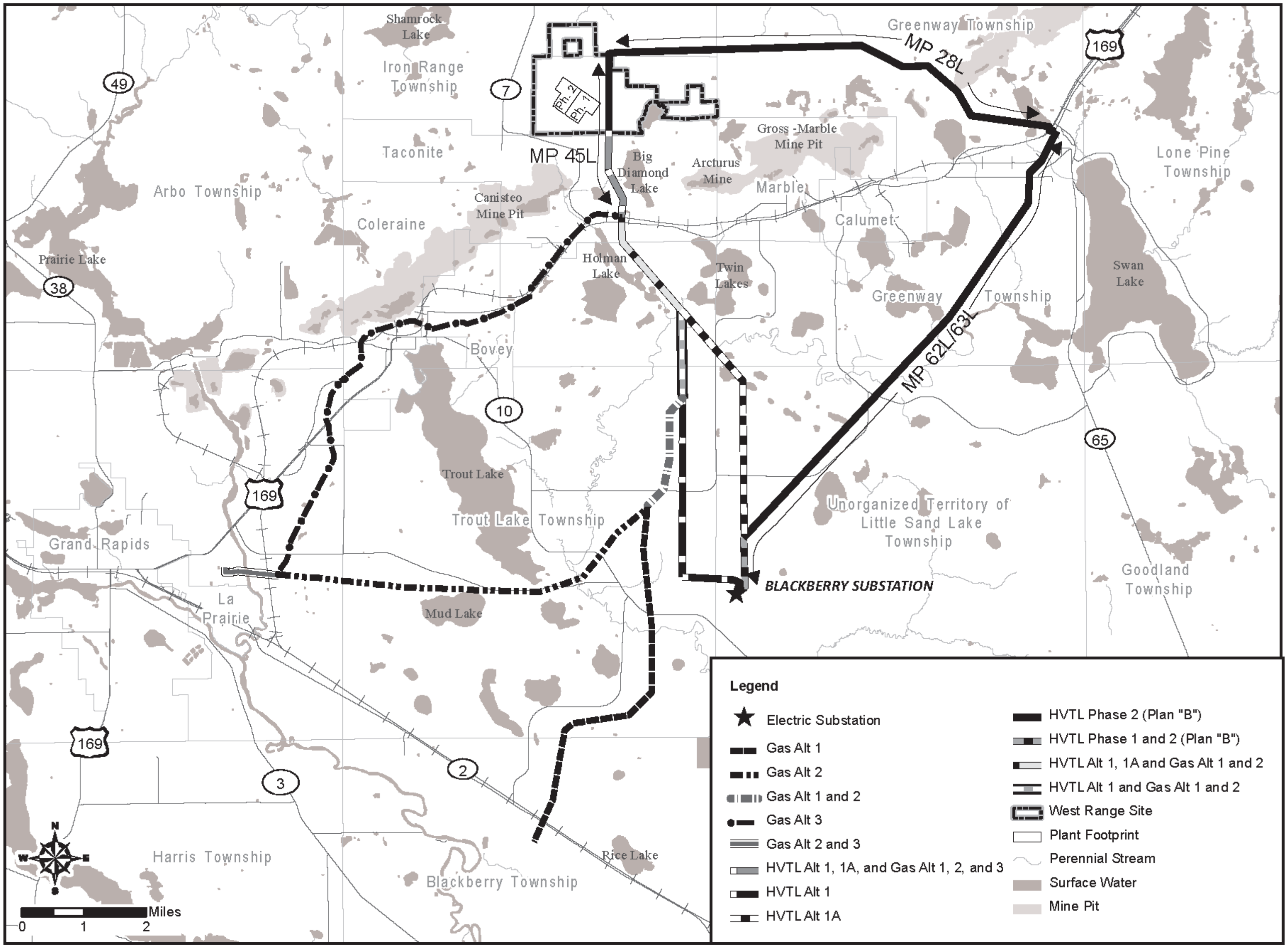

Figure 2.8 West Range Natural Gas Pipeline and HVTL Alternatives

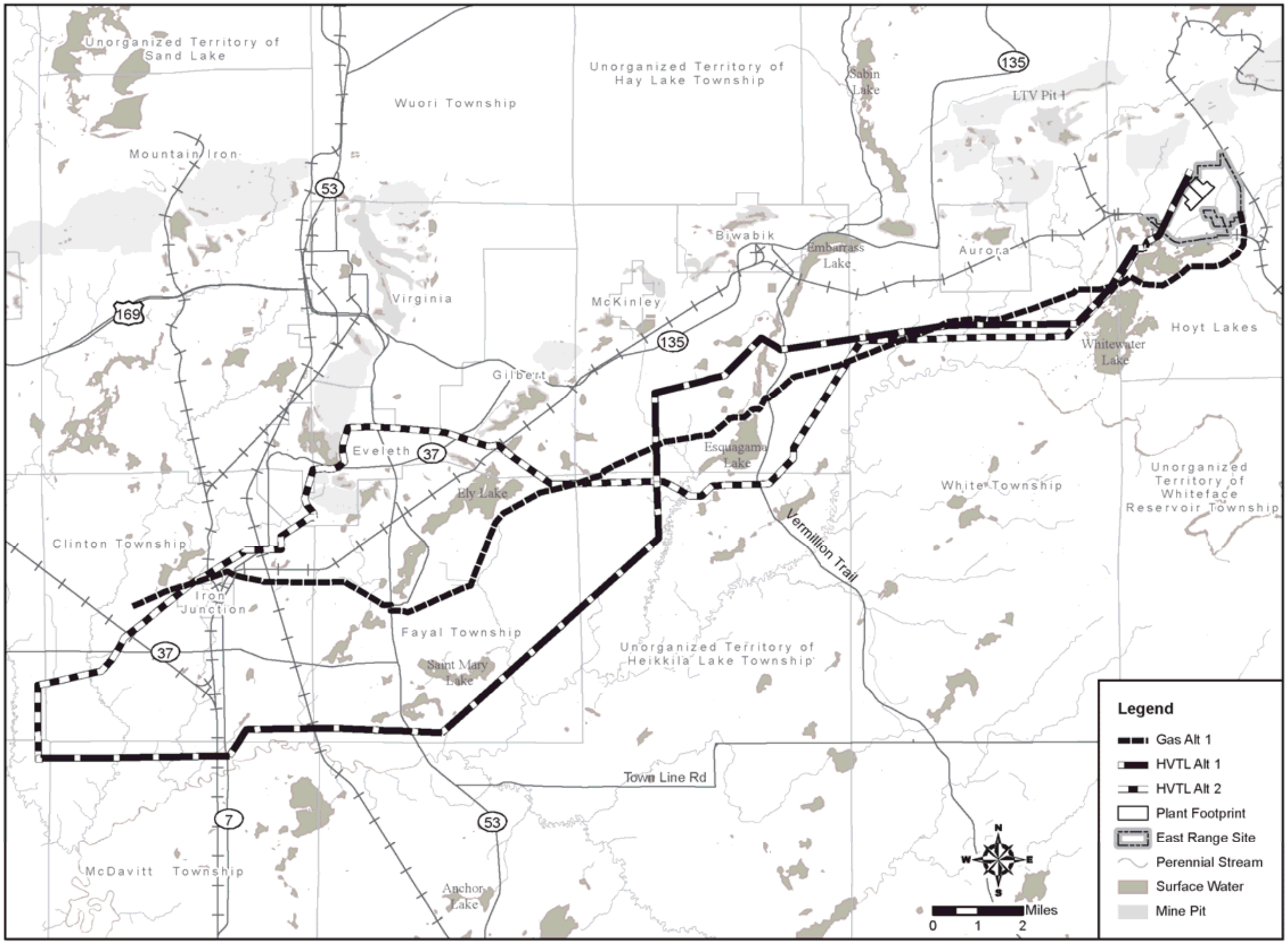

Figure 2.9 East Range Natural Gas Pipeline and HVTL Alternatives

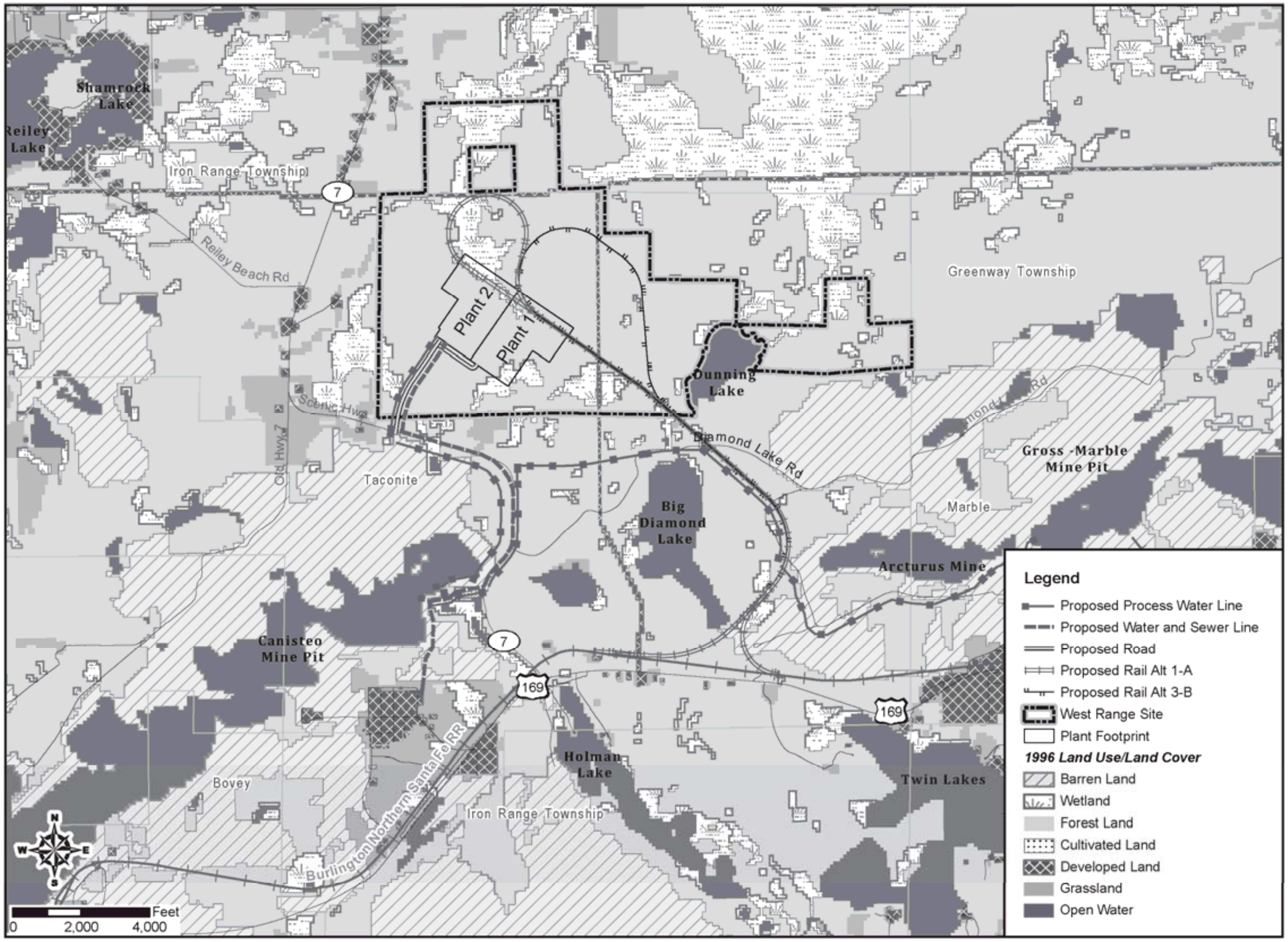

Figure 3.1 West Range Site Land Use and Land Cover

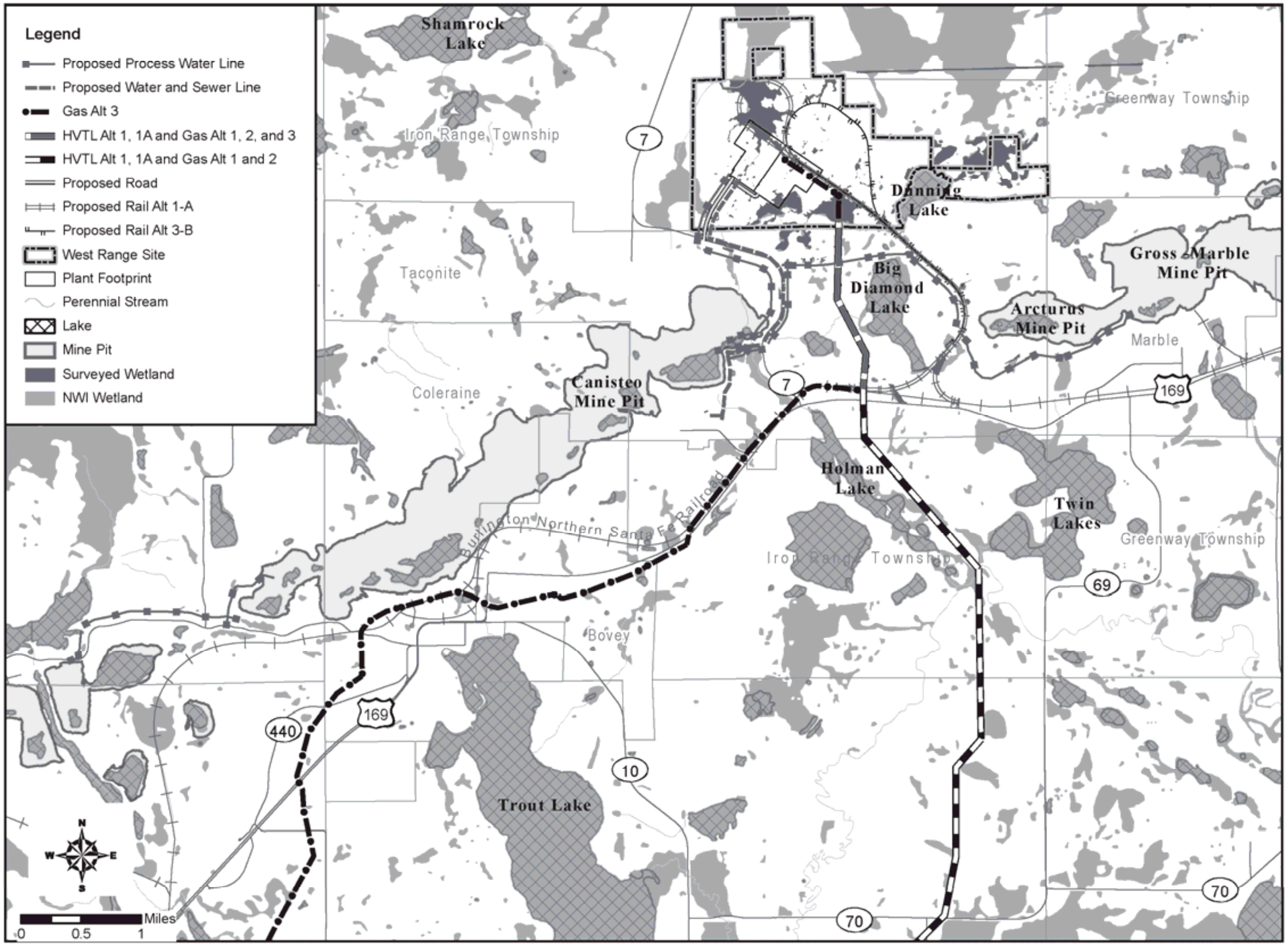

Figure 3.2 West Range Site Wetlands

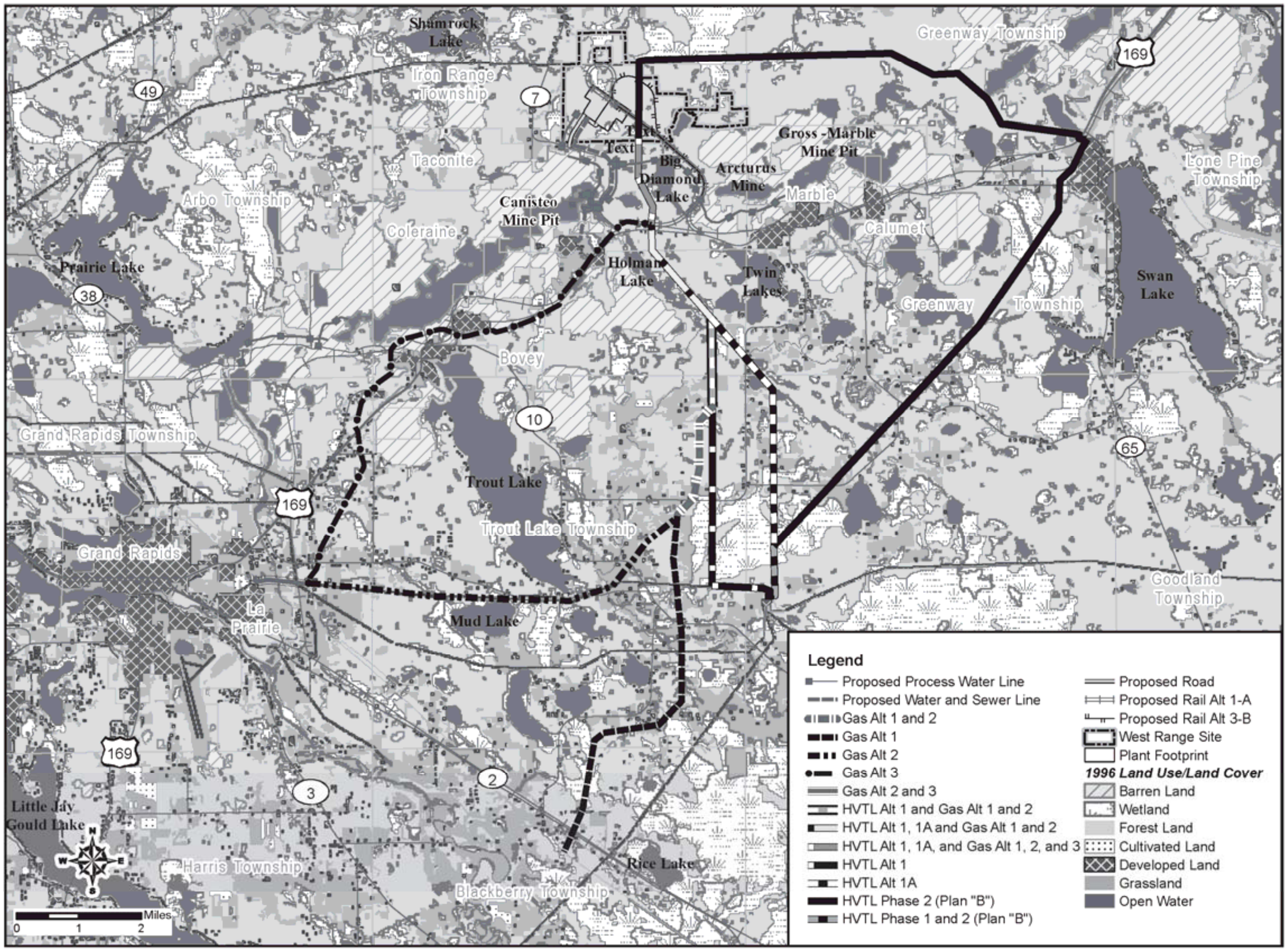

Figure 3.3 West Range Site Corridors and Surrounding Land Use and Land Cover

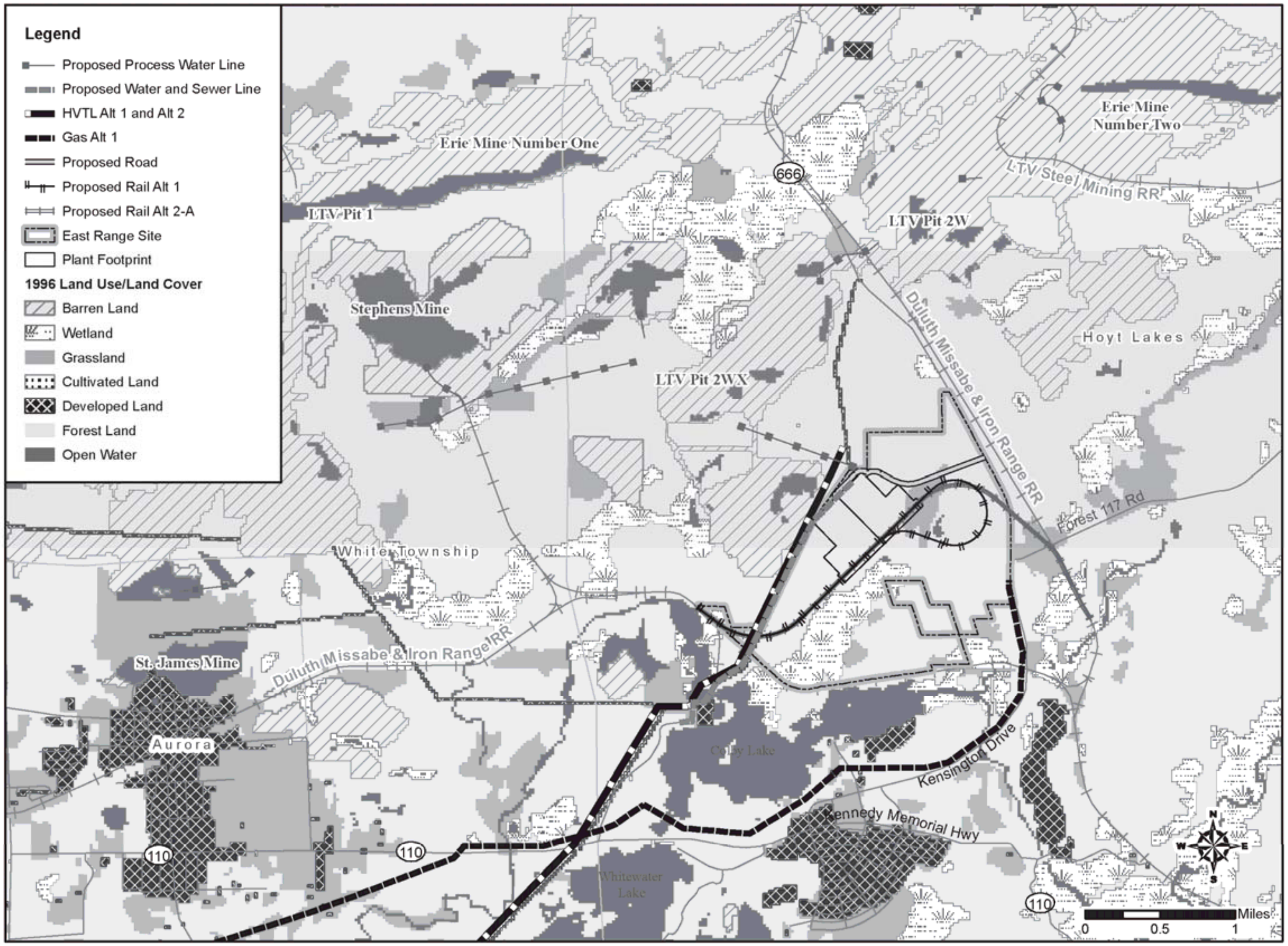

Figure 3.4 East Range Site Land Use and Land Cover

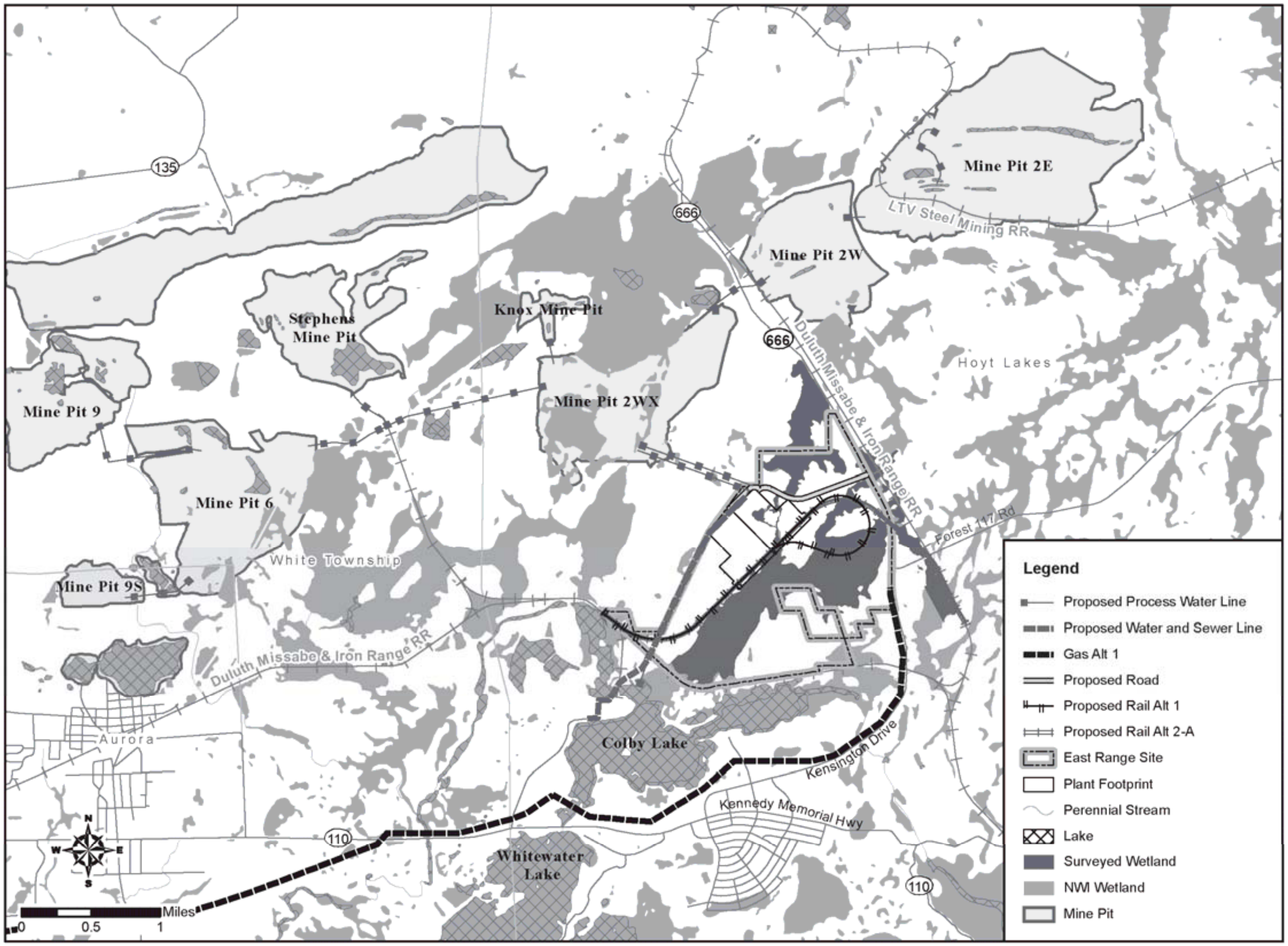

Figure 3.5 East Range Site Wetlands

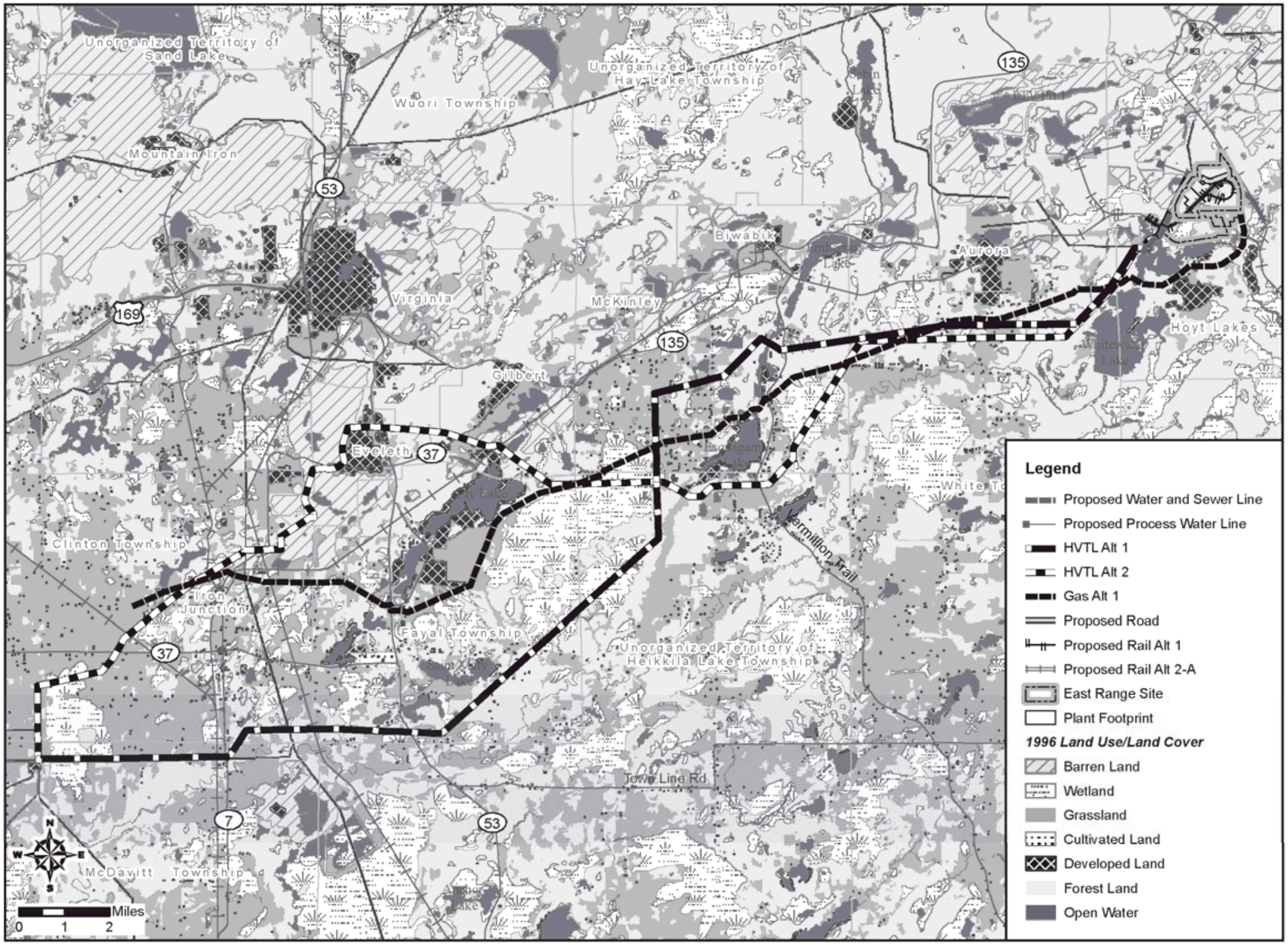

Figure 3.6 East Range Corridors and Surrounding Land Use and Land Cover

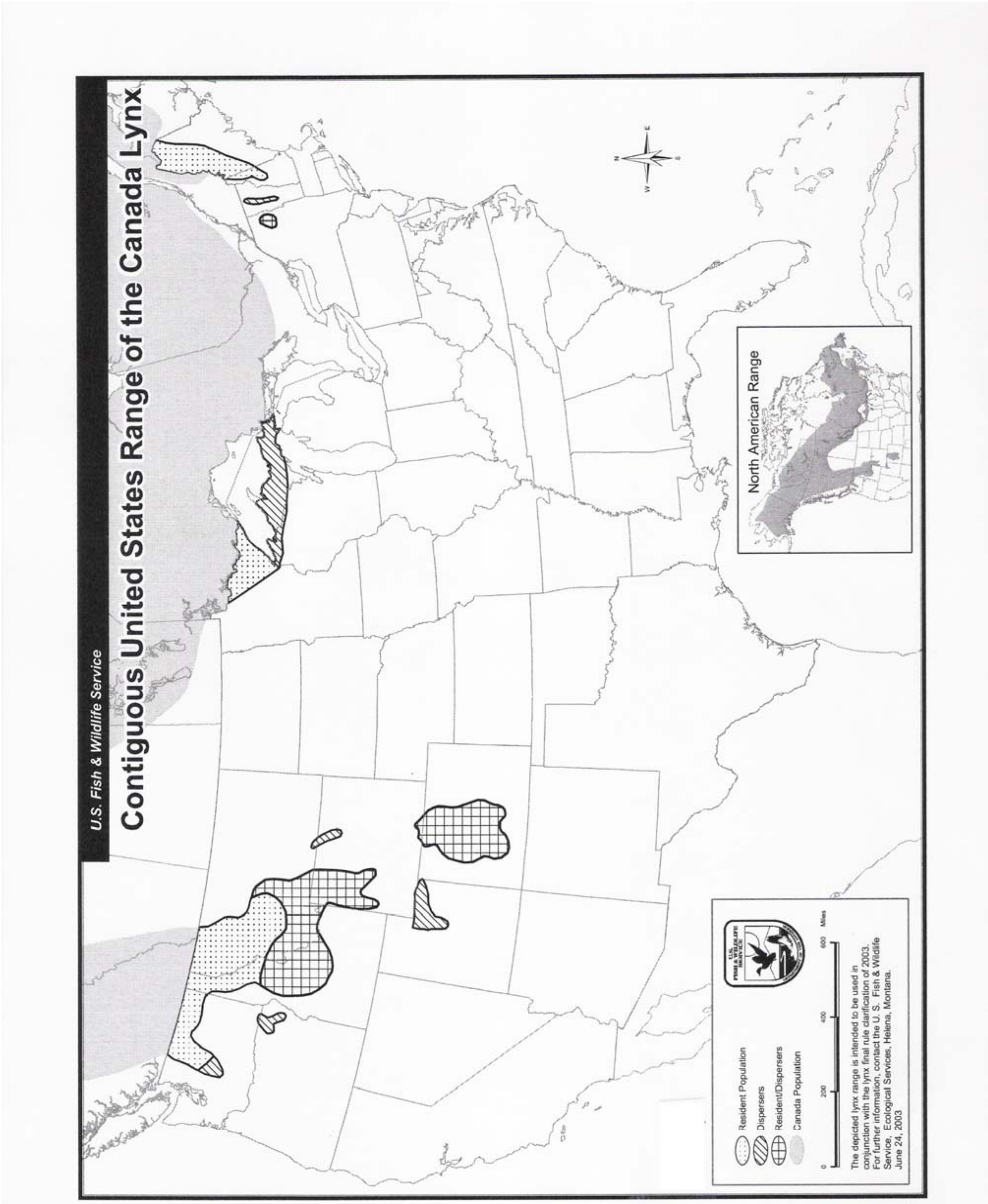

Figure 6.1 Contiguous United States Range of the Canada Lynx

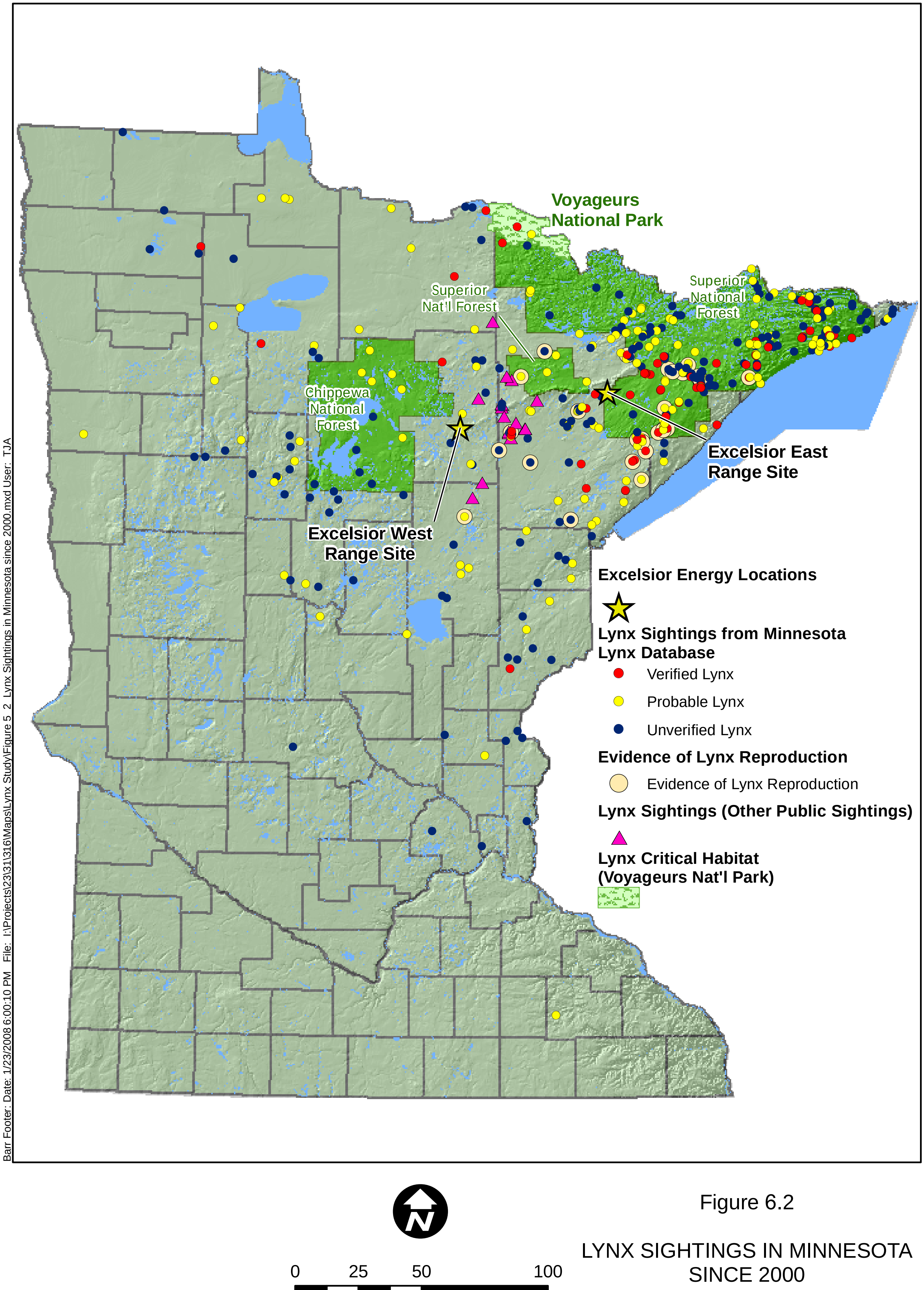

Figure 6.2

LYNX SIGHTINGS IN MINNESOTA
SINCE 2000
Excelsior Energy, Inc

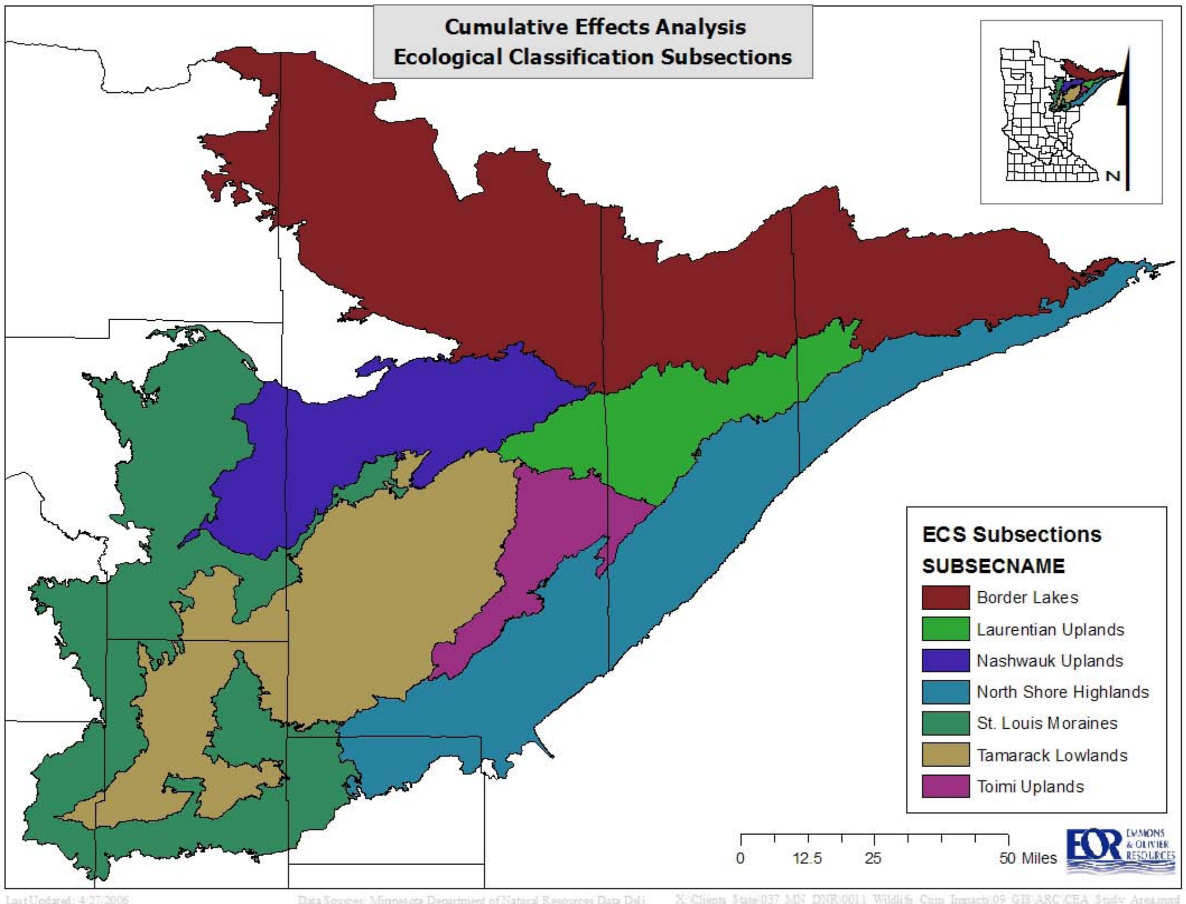

Figure 6.3 Arrowhead Region of Minnesota and its Ecological Subsections

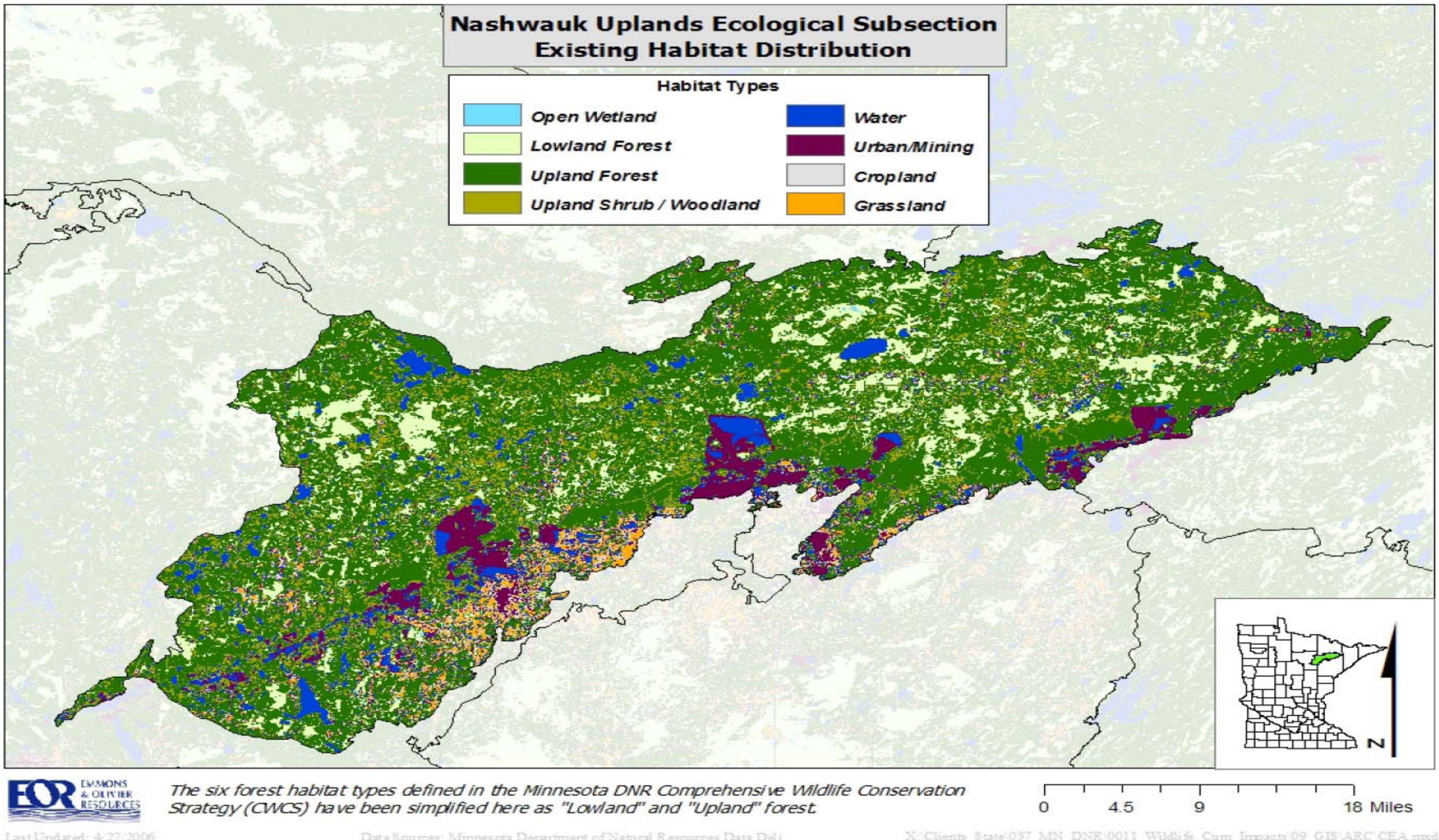

Figure 6.4. Nashwauk Uplands Ecological Subsection

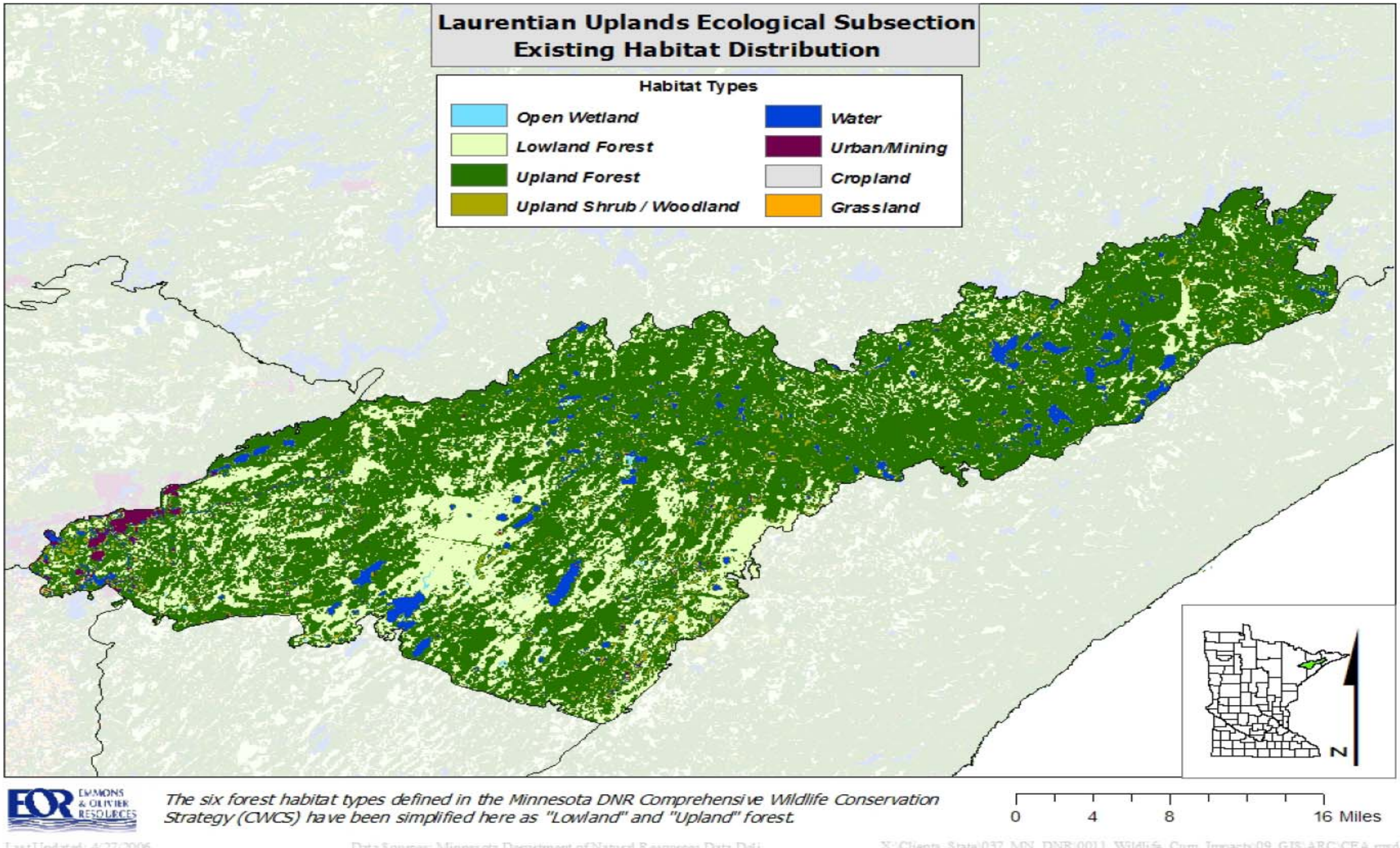

Figure 6.5 Laurentian Uplands Ecological Subsection

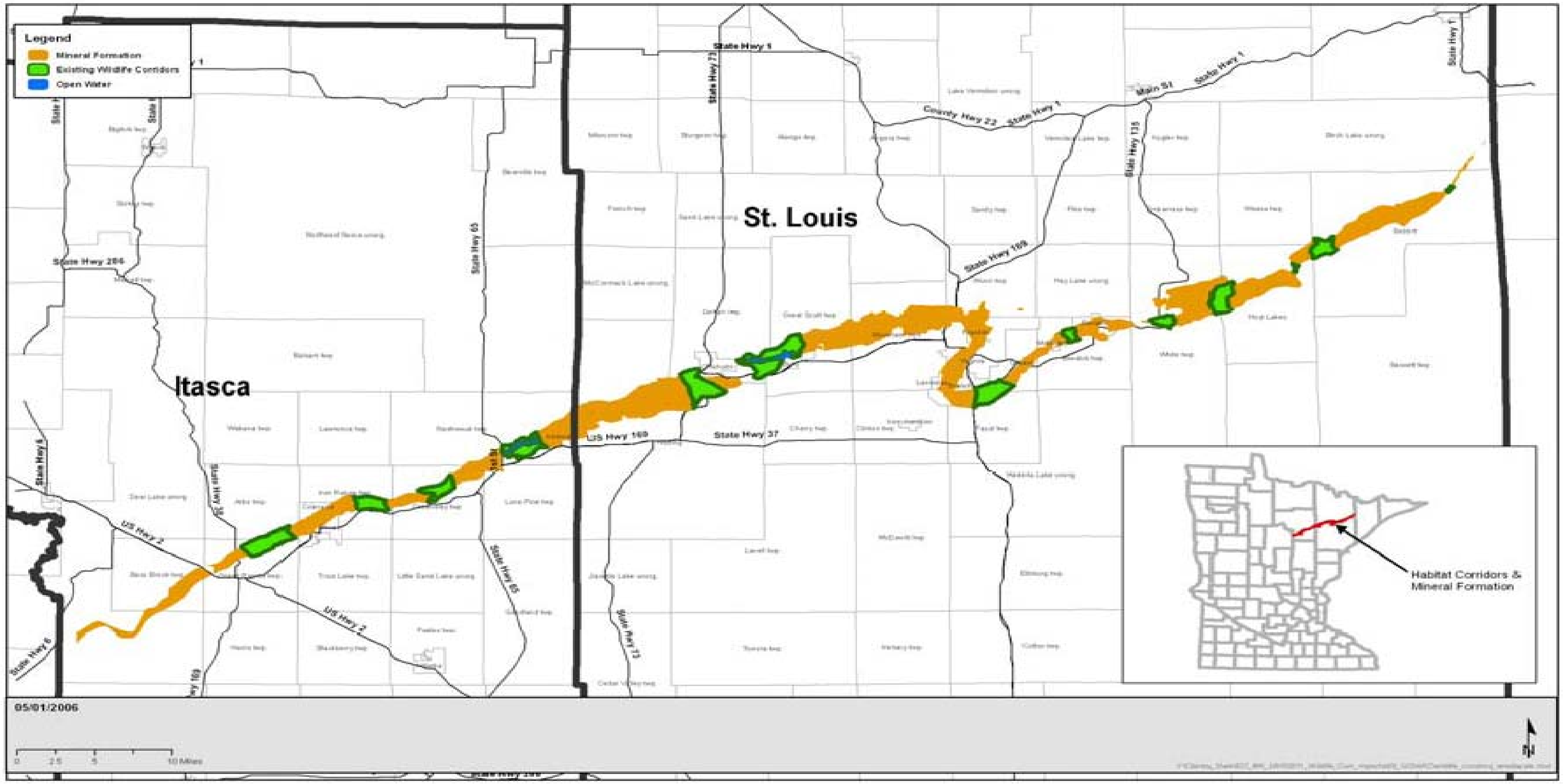

Figure 6.6 Wildlife Travel Corridors in the Iron Range

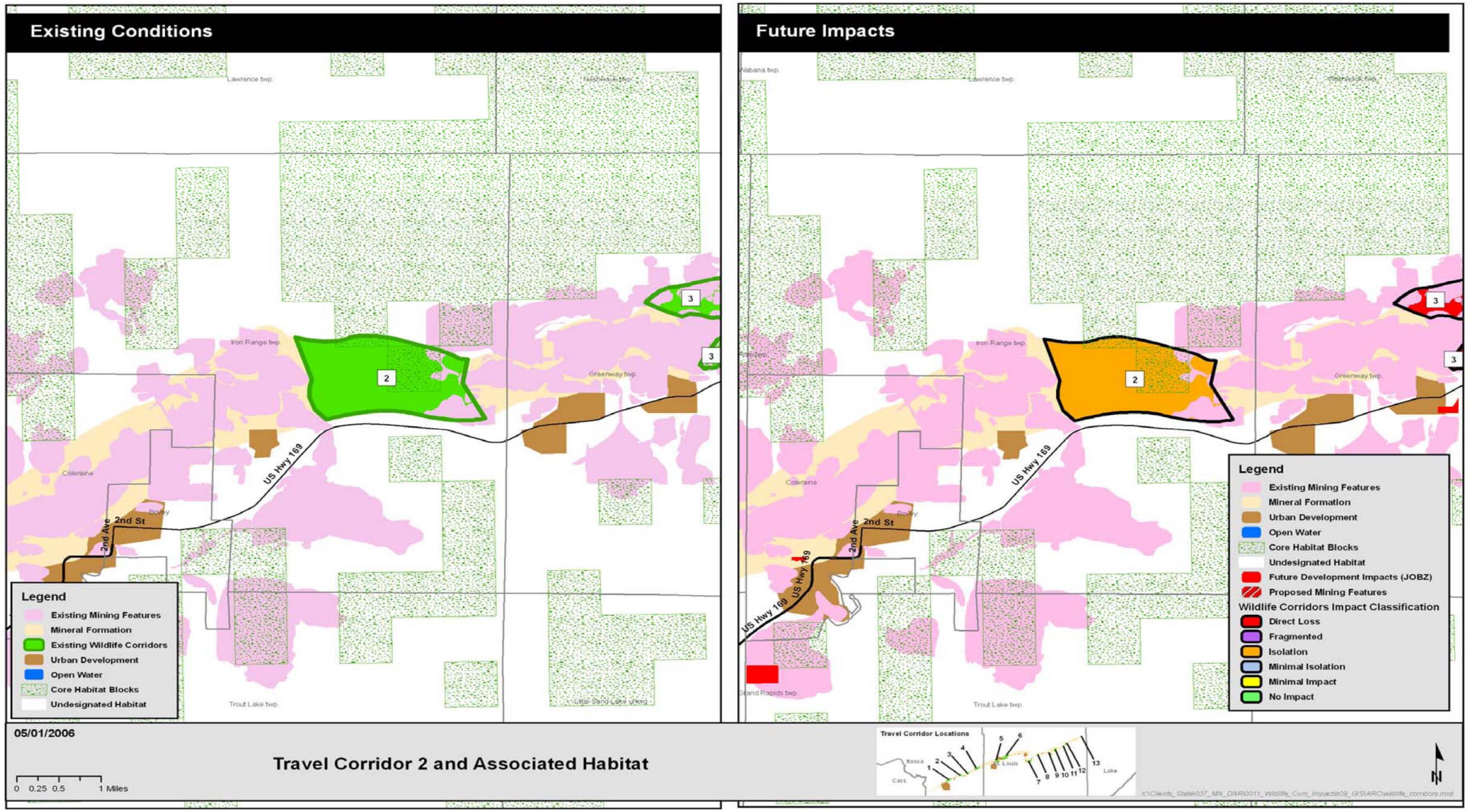

Figure 6.7 Wildlife Travel Corridor #2

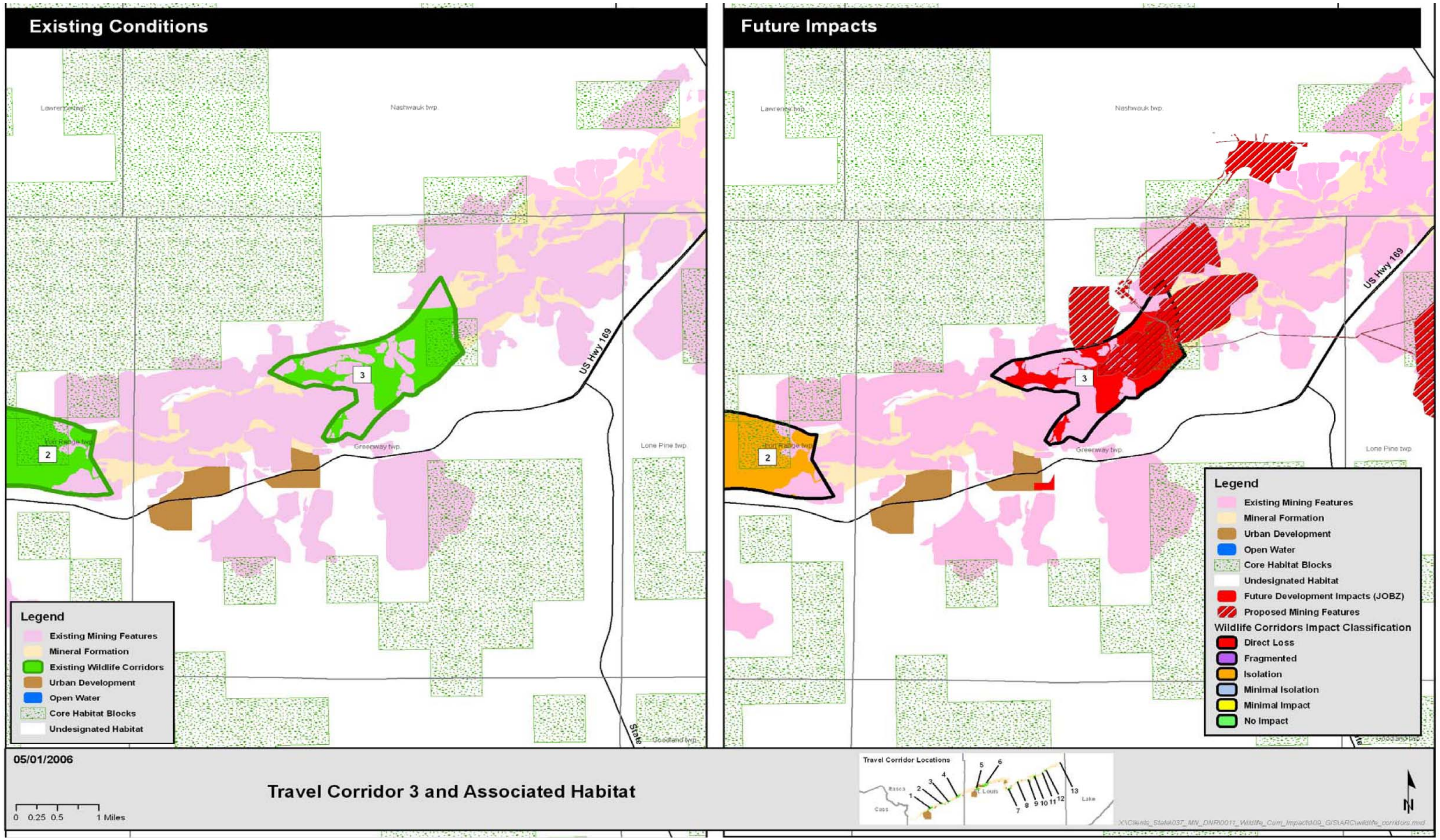

Figure 6.8 Wildlife Travel Corridor #3

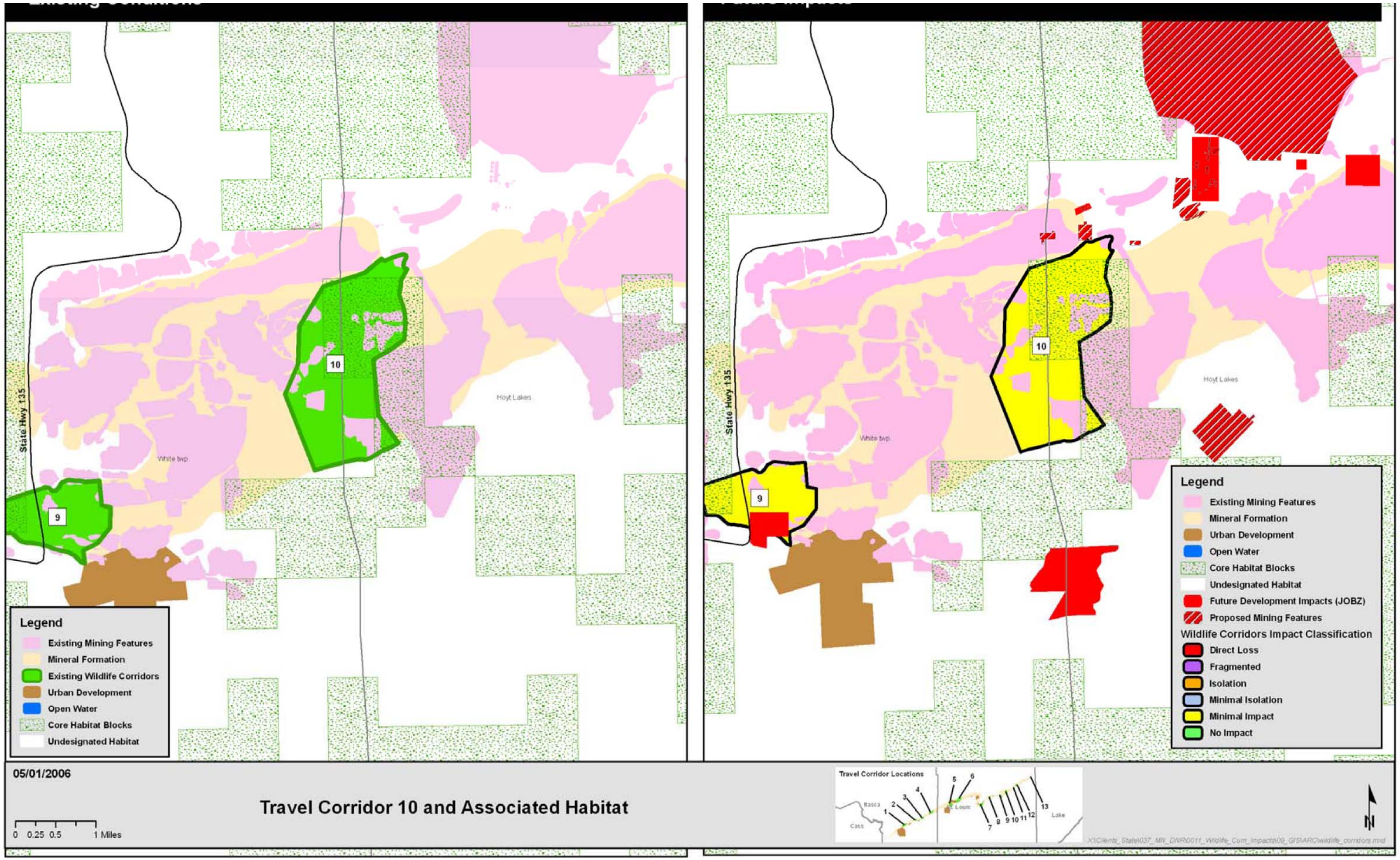

Figure 6.9 Wildlife Travel Corridor #10

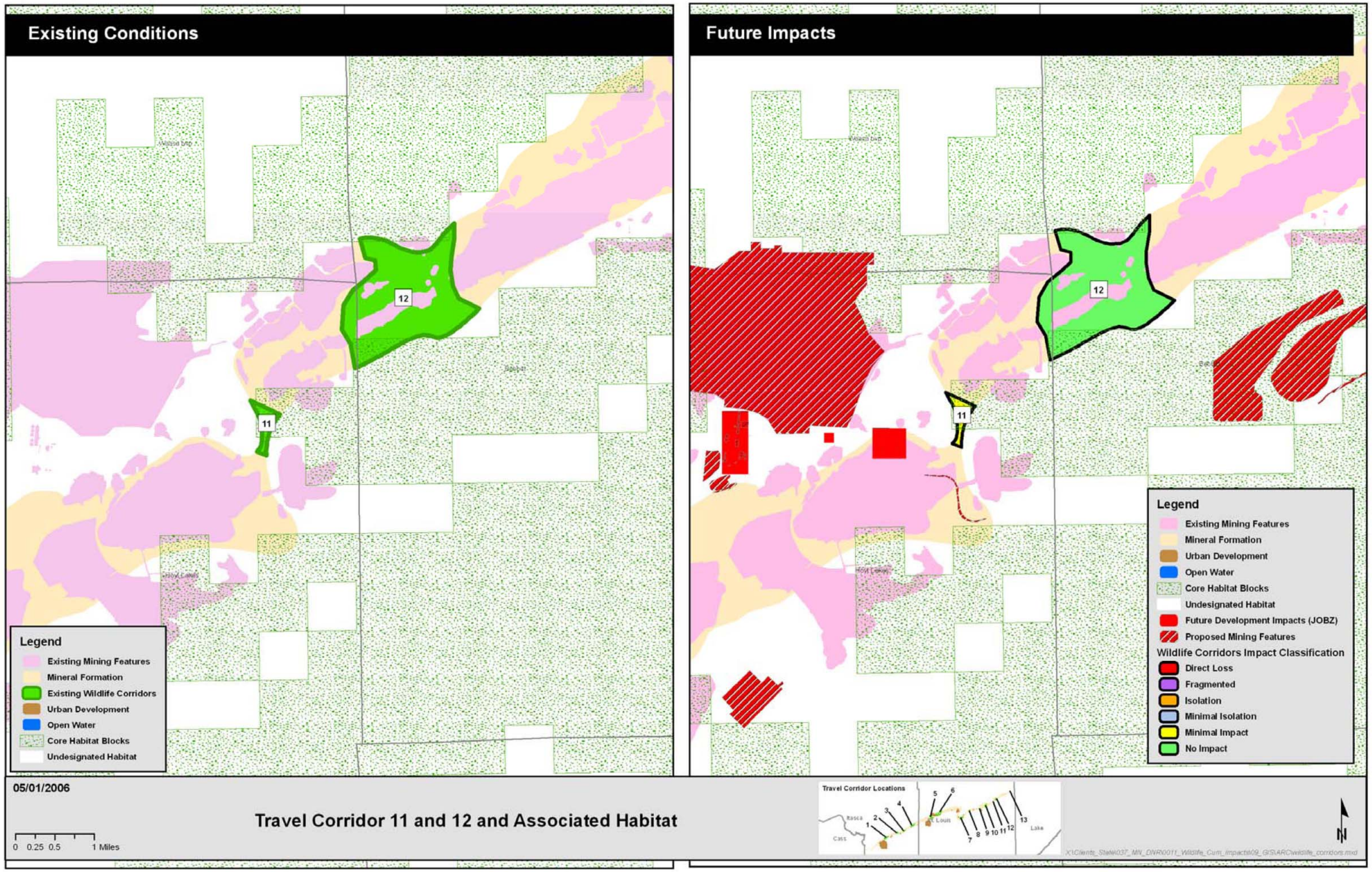

Figure 6.10 Travel Corridors 11 and 12 and Associated Habitat

APPENDIX E3
Cultural Resources Consultation

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MINNESOTA HISTORICAL SOCIETY

State Historic Preservation Office

January 10, 2006

Mr. Richard Hargis
NEPA Document Manager
U.S. Dept. of Energy
626 Cochrans Mill Road
PO Box 10940
Pittsburgh, PA 15236-0940

Re: Mesaba Energy Project
SHPO Number: 2005-3002

Dear Mr. Hargis:

Last August, your agency initiated Section 106 consultation with our office regarding the above referenced federal undertaking. You provided us with cultural resource reports on the two project sites, both of which included a strategy for completion of identification and evaluation surveys for each site. Later last fall, you also provided us with information about public scoping meetings for the project.

As you continue the NEPA process for the project, we would recommend that you include specific information about the Section 106 process in your documents and meetings. This will help to integrate NEPA and Section 106 and assure that the public participation requirements of Section 106 can be addressed in concert with other public involvement.

We look forward to working with you as this planning process proceeds. Contact me at 651-205-4205 with questions or concerns.

Sincerely,

Dennis A. Gimmestad
Government Programs & Compliance Officer

cc: Anne Ketz, The 106 Group

345 Kellogg Boulevard West / Saint Paul, Minnesota 55102-1906 / Telephone 651-296-6126

May 2, 2006

Dennis A. Gimmestad
Government Programs & Compliance Officer
State Historic Preservation Office
345 Kellogg Boulevard West
Saint Paul, Minnesota 55102-1906

Re: Mesaba Energy Project
SHPO Number: 2005-3002

Dear Mr. Gimmestad,

Last August, our agency initiated Section 106 consultation with your office regarding the above referenced federal undertaking. At that time, our agency provided you with two cultural resources reports, one for the east range project site and one for the west range project site. We also provided you with information about public scoping meetings for the project.

Enclosed please find two additional documents for your reivew, one for each of the two project sites. One report is titled, "Archaeological Sampling of the Mesaba Energy Project West Range Site, Itasca County, Minnesota." The other report is titled, "Cultural Resources Preliminary Report for Section 106 of the National Historic Preservation Act of 1966 (as revised) and Cultural Resources Requirements for the National Environmental Policy Act." Please treat these documents as draft and do not quote, cite, or distribute outside your office.

We would appreciate any comments that you may have and please let us know if there is any additional information needed to satisfy the Section 106 consultation requirements for this project. We look forward to working with you and we will be contacting you for your comments.

Sincerely,

George W. Pukanic
Project Engineer

2 Enclosures

cc: Richard Hargis

U.S. Department of Energy

National Energy Technology Laboratory

November 2, 2006

Dennis A. Gimmestad
Government Programs & Compliance Officer
State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Blvd. W.
ST. Paul, MN 55102-1903

Re: Mesaba Energy Project
SHPO Number: 2005-3002

Dear Mr. Gimmestaad:

Last year and early this year we sent you several cultural assessment reports for the east and west range potential plant sites for the Mesaba Energy Project. The reports presented an inventory of NHRP listed and eligible properties within the area of potential effect. A limited archaeological survey was conducted with a focus on areas considered to have the highest potential within the most likely areas of impact. As presented in the reports, no archaeological resources were encountered in either the high or moderate potential areas so identified that underwent testing.

On June 28, 2006, during a conference call with you, I indicated that DOE has made the determination that the proposed project at either the east or west range site would have no adverse effect on any historical or archaeological site. However, you expressed a concern for potential adverse impacts upon the Longyear historic site and the Longyear trail and its maintenance.

On September 5, 2006, you indicated through voice mail that you determined that the City of Hoyt Lakes is the responsible party for the historic Longyear site and trail. You mentioned that you spoke with Richard Bradford, the city administrator, who indicated that he was not aware of any adverse affects. On September 20, 2006, I emailed you a summary of the conversation I had with Richard Bradford. Mr. Bradford informed me that he did not see traffic impacts as a detriment, but on the contrary, he felt that an increase in traffic would bring more awareness to the site and contribute to the attractiveness of visiting the site. There has been a history of high volume traffic to the site when the LTV plant was in operation. However, when the plant closed, traffic was minimal and without word of mouth, visits to the site decreased considerably. He felt that more traffic in the area would bring more awareness to the site and hence would be a positive asset. Also, he did not believe that there would be any visual impacts to the site and certainly not on the maintenance of the site, which you were concerned with. Therefore, DOE has made the determination that there would be no adverse access or

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
George.Pukanic@netl.doe.gov • Voice (412) 386-6085 • Fax (412) 386-4775 • www.netl.doe.gov

visual impact to the historic Longyear site based on discussions with the city administrator of Hoyt Lakes.

We request your response to our determination of no adverse effect in accordance with Section 106 of the National Historic Preservation Act. Please let me know if you need any additional information. Thank you.

Sincerely,

George W. Pukanic
Project Engineer

cc: Richard A. Hargis
Jason T. Lewis

MINNESOTA HISTORICAL SOCIETY

November 22, 2006

Mr. George W. Pukanic
Project Engineer
National Energy Technology Laboratory
U.S. Department of Energy
626 Cochrans Mill Road
PO Box 10940
Pittsburgh, PA 15236

RE: Mesaba Energy Project
SHPO Number: 2005-3002

Thank you for your letter of 2 November 2006 regarding the above referenced undertaking.

We appreciate your efforts at considering any potential effects of the project on the E.J. Longyear First Diamond Drill Site, a property listed on the National Register of Historic Places. Based on your assessment and consultation with the City of Hoyt Lakes, it would not appear that the project will have any adverse effects on this property.

However, the status of the completion of the cultural resource surveys for the project areas is not clear to us. You have previously submitted to us several reports completed by The 106 Group, which outlined a strategy for the completion of surveys for both proposed project sites. However, it does not appear that we have yet reviewed the results of the surveys.

We look forward to working with you to complete this review. Contact us at 651-296-5462 with questions or concerns.

Sincerely,

Dennis A. Gimmestad
Compliance Officer

cc: Anne Ketz, The 106 Group

MINNESOTA HISTORICAL SOCIETY

State Historic Preservation Office

April 28, 2008

Mr. George W. Pukanic
Project Engineer
National Energy Technology Laboratory
U.S. Department of Energy
626 Cochrans Mill road
PO Box 10940
Pittsburgh, PA 15236

Re: Mesaba Energy Project
MNSHPO Number: 2005-3002

Dear Mr. Pukanic:

We have recently received two letters from you with regard to the above referenced undertaking. The first relates to a new draft of the Programmatic Agreement, incorporating changes you have made subsequent to tribal consultation, and the second relates to a history/architecture assessment for the West Range plant site.

1. Programmatic Agreement. We commented on an earlier draft of the Programmatic Agreement in our letter of 18 December 2007. We reiterate our recommendation that the provisions could be strengthened and simplified to facilitate use of the agreement by the project sponsor and consultants. We note that the sections of the WHEREAS clauses which describe survey efforts are not fully consistent with our understanding of the current status of identification efforts (as described in our 18 December 2007 letter). Further, we have a concern with the suggested resolution of adverse effects in Section II.ii and II.iii. It would appear that only mitigation of adverse effects would be considered, not avoidance and minimization. Avoidance and minimization need to be adequately considered and explored before mitigation is developed.

2. Historic Resources Assessment for the Mesaba Energy Project West Range Site. This report, completed by Summit Envirosolutions, addresses history/architecture resources at the West Range plant site. It identifies the Holman-Cliffs Mine Landscape District as a potentially National Register-eligible property. However, there is not an adequate description of this district in terms of its boundaries or character-defining features to permit us to concur with its eligibility, or to assess any project effects. This information is needed.

We look forward to working with you as this project review proceeds. Contact us at 651-259-3456 with questions or concerns.

Sincerely,

Dennis A. Gimmestad
Government Programs & Compliance Officer

cc: Andrew Schmidt, Summit Envirosolutions

July 29, 2009

Mr. Dennis A. Gimmestad
Government Programs & Compliance Officer
State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Blvd. W.
St. Paul, MN 55102-1903

Dear Mr. Gimmestad:

In a letter dated April 28, 2008 regarding the Mesaba Energy Project, you indicated that there was not an adequate description of the Holman-Cliffs Mine Landscape District in a Historic Resources Assessment Report for the West Range Site prepared by Summit Envirosolutions, Inc. regarding eligibility for listing in the NHRP and the assessment of any project effects.

Attached is a Historic Resources Survey Report of the Holman-Cliffs Iron Ore mining Landscape for the West Range Site dated June 2008 that you may not have received. In the report there is considerable description of the Holman-Cliffs Mine Landscape District. It is the Department of Energy determination that this site would be eligible for listing in the NHRP. As previously commented in correspondence to you in April 2008:

> DOE has made the determination of no adverse impact of the project on any historical structure at the West Range Plant Site. Mining and mining transportation properties are necessarily associated with industrial activity and the activities for the Mesaba project would be consistent with the historical character of the area. At distances grater than a mile, the proposed plant would not block or intrude into any views of historic resources, and it would be low enough on the horizon that it would not introduce an element that is out of scale or in considerable contrast to the surrounding area. Actually, from a distance, the plant may very well be in keeping with the industrial nature of the mining landscape, reminiscent of the large scale concentration/washing plants in the area.

Results of the additional research and field survey in the attached report should confirm the DOE determination. The Holman-Cliffs Iron-Ore Mining Landscape was an industrial operation first and foremost, and a new industrial plant located within a mile or more of the proposed historic district would be visually consistent with the historic character of the landscape. It appears that no part of the proposed historic district would fall within the APE. Hence, it is DOE's determination that the Mesaba Energy Project would have no adverse effect on the proposed Holman-Cliffs iron Ore Mining Landscape historic district.

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
George.Pukanic@netl.doe.gov • Voice (412) 386-6085 • Fax (412) 386-4775 • www.netl.doe.gov

We request your response to our determination of no adverse effect in accordance with Section 106 of the National Historic Preservation Act. Please let me know whether you need any additional information.

Sincerely,

George W. Pukanic

cc: Richard Hargis
Jason Lewis
Paul Detwiler

Attachment

APPENDIX E4
Native American Tribal Consultation

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1854 Authority

4428 HAINES ROAD • DULUTH, MN 55811-1524
218.722.8907 • 800.775.8799 • FAX 218.722.7003
www.1854authority.org

October 31, 2005

Richard Hargis
U.S. Department of Energy
National Energy Technology Laboratory
P.O. Box 10940
Pittsburgh, PA 15236-0940

RE: Mesabi Energy Project

Dear Mr. Hargis,

The purpose of this letter is to provide comment on the scoping for the Environmental Impact Statement (EIS) for the Mesabi Energy Project.

The 1854 Authority is an inter-tribal natural resource management organization governed by the Bois Forte Band and Grand Portage Band of Lake Superior Chippewa, both federally recognized tribes. The organization manages the off-reservation treaty rights of these bands in the 1854 Ceded Territory of northeastern Minnesota. The 1854 Ceded Territory encompasses all of Lake and Cook counties, most of St. Louis and Carlton counties, and portions of Pine and Aitkin counties.

Band members continue to exercise rights to hunt, fish, and gather guaranteed under treaty with the United States. Resources must be available and safe to utilize for the exercise of these rights. While we are not opposed to pursuing energy and economic development opportunities, we believe that such development should only proceed when all safeguards to protect the environment are ensured. Industrial operations should avoid or minimize negative impacts to the natural resources and utilization of these resources.

The 1854 Authority supports the environmental issues identified for analysis in the EIS. We are particularly concerned with the following issues:

- Atmospheric resources: Potential air emissions should be identified, including the effects on human health and the environment from releases of mercury and other air pollutants. Fish continue to be an important component of the diet of many band members, and mercury contamination is of high concern. Consumption advisories are not the appropriate solution to address mercury in fish. Fish must be made safe to eat through reductions of mercury in the environment. The 1854 Authority questions how additional mercury emissions will be handled with goal of reducing mercury releases in Minnesota.

A consortium of the Grand Portage and Bois Forte Bands of the Lake Superior Chippewa

- Water resources: Impacts to adjacent and downstream water resources should be identified and properly addressed. Issues include effects to water quality, fisheries, and wild rice.

  Cultural resources: Any effects on the exercise of Treaty rights (hunting, fishing, gathering) and the quality of associated resources should be addressed. Appropriate consultation and surveys should be completed to properly identify cultural resources. Impact to any historic or archaeological resources should be avoided.
- Ecological resources: The effects on wildlife populations and associated habitat should be addressed. Game species such as moose, deer, and grouse should be specifically discussed.
- Floodplains and wetlands: Discussion of impacts to wetlands should be included.
- Cumulative effects: Cumulative impacts from this project and other current or proposed industrial activities in the region should be a consideration. Specifically in regards to the East Range Site, other projects (Mesabi Nugget, Polymet) are currently proposed near Hoyt Lakes.

Finally, the federal government has the responsibility to work with Indian bands on a government-to-government basis. Notification and consultation activities must be completed directly with all tribes potentially affected by the proposed project. The planning process and project implementation must recognize the sovereign status of bands and the rights retained by treaty with the United States.

The 1854 Authority would like to remain informed on this project as the process moves forward. Thank you.

Sincerely,

Darren Vogt
Environmental Biologist

cc: Corey Strong, Bois Forte Department of Natural Resources
Curtis Gagnon, Grand Portage Trust Lands and Resources

Leech Lake Band of Ojibwe

George Goggleye, Chairman
Arthur "Archie" LaRose, Secretary/Treasurer

District I Representative
Robbie Howe

District II Representative
Lyman L. Losh

District III Representative
Donald "Mick" Finn

October 10, 2006

U. S. Department of Energy
National Energy Technology Laboratory
Attn: Richard Hargis, NEPA Document Manager
626 Cochrans Mill Road
P. O. Box 10940
Pittsburgh, PA 15236

RE: **Proposed Integrated Coal Gasification Combined Cycle electric generating facility on one of two sites**
Taconite, Itasca County, Minnesota
Hoyt Lakes, St. Louis County, Minnesota
LLBO Land Claim Area
LL-THPO Number: 06-223-NCRI

Dear Mr. Hargis:

Thank you for the opportunity to comment on the above-referenced project. It has been reviewed pursuant to the responsibilities given the Tribal Historic Preservation Officer (THPO) by the National Historic Preservation Act of 1966, as amended in 1992 and the Procedures of the Advisory Council on Historic Preservation (38CFR800).

I have reviewed the documentation; after careful consideration of our records, I have determined that the Leech Lake Band of Ojibwe does not have any concerns regarding sites of religious or cultural importance in this area. We are not interested in being a part of an agreement at this time.

Should any human remains or suspected human remains be encountered, all work shall cease and the following personnel should be notified immediately in this order: County Sheriff's Office and Office of the State Archaeologist. If any human remains or culturally affiliated objects be inadvertently discovered this will prompt the process to which the Band will become informed.

You may contact me at (218) 335-2940 if you have questions regarding our review of this project. Please refer to the LL-THPO Number as stated above in all correspondence with this project.

Respectfully submitted,

Gina M. Papasodora
Tribal Historic Preservation Officer

Leech Lake Tribal Historic Preservation Office * *Established in 1996*
115 Sixth Street NW, Suite E * Cass Lake, Minnesota 56633
(218) 335-2940 * FAX (218) 335-2974
llthpo@hotmail.com

THE MILLE LACS BAND OF

OJIBWE INDIANS

Executive Branch of Tribal Government

October 25, 2005

Richard A Hargis, NEPA Document Manager
U.S. Department of Energy, National Energy Technology Laboratory
3610 Collins Ferry Road, P.O. Box 880
Morgan Town, WV 26507-0880

Re: Section 106 Consultation and Tribal Review NHPA: Proposed Intergated Coal GasificationCombined Cycle electric generating facility, MN Iron Range, Itasca and St. Louis Counties

Dear Mr. Hargis,

Thank you for the opportunity to review and comment on the above project. It has been reviewed pursuant to the responsibilities given the Tribal Historic Preservation Office by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council of Historic Preservation (36CFR800).

Based on available information we conclude there is no cultural significance to the Mille Lacs Band of Ojibwe within the area described.

Please contact Natalie Weyaus at 320-532-4181 extension 7450 if you have any questions regarding our review of this project.

Respectfully,

Natalie C Weyaus

Natalie Weyaus
Tribal Historic Preservation Officer

Cc: Dennis Gimmestad, MN SHPO Review and Compliance

DISTRICT I
43408 Oodena Drive • Onamia, MN 56359
(320) 532-4181 • Fax (320) 532-4209

DISTRICT II
36666 State Highway 65 • McGregor, MN 55760
(218) 768-3311 • Fax (218) 768-3903

DISTRICT III
Route 2 • Box 233-N • Sandstone, MN 55072
(320) 384-6240 • Fax (320) 384-6190

Flandreau Santee Sioux Tribe

P.O. Box 283 Flandreau, SD 57028 *Ph. 605-997-3891*
Fax 605-997-3878

Date: September 7, 2005

To: U.S. Department of Energy-NETL

From: Cultural Preservation Officers-Flandreau Santee Sioux Tribe

RE: DOE and NETL notification dated September 1, 2005
Attachment - Your correspondence

No objections, however, if human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, please stop immediately and notify the appropriate persons from our Tribe. Sam Allen and Ray Redwing of our staff are our Cultural Preservation Officers, and NAGPRA Representatives. They can be contacted at the above address and phone number. Thank you.

Cultural Preservation Officers – Flandreau Santee Sioux Tribe
Flandreau, SD 57028

U.S. Department of Energy

National Energy Technology Laboratory

NETL

May 3, 2006

RECEIVED
MAY 11 2006
K.B.I.C.
CHAIRMAN'S OFFICE

Ms. Susan J. LaFernier, President
Keweenaw Bay Indian Community
107 Beartown Road
Barage, MI 49908

Copy to
Todd W & Summer

Dear Ms. LaFernier:

In September of 2005, the Department of Energy (DOE) sent correspondence (see copy enclosed) indicating that the National Energy Technology Laboratory is in the process of preparing an environmental impact statement (EIS) under the National Environmental Policy Act (NEPA) for our participation in the Mesaba Energy project under the Clean Coal Power Initiative Program. Excelsior Energy, Inc., an independent energy development company based in Minnetonka, MN, would build, own, and oversee operation of the Project, which would be an Integrated Coal Gasification Combined Cycle electric generating facility to be located on one of two sites in Minnesota's Iron Range. The western site is located just north of the city of Taconite in Itasca County; the eastern site is located about one and one-half miles north of the city of Hoyt Lakes in St. Louis County.

Should you have any concerns that you have not yet submitted, we would be interested in hearing those concerns. In addition, you will have another opportunity to comment once DOE issues the draft EIS to the public for comment. DOE intends to use the decision making process, which is ongoing under NEPA, in order to satisfy requirements it may have to provide for notification and consultation to tribes in order to insure that all of their concerns are addressed in the draft and that any comments they have on the draft EIS are addressed in the final EIS.

If at any point you have questions, and at your convenience, I would be pleased to discuss the Project and the EIS process with you. Please call me at 412-386-6065 or email me at richard.hargis@netl.doe.gov with any questions you have, as your active participation in this ongoing NEPA process is important to the Department.

Thank you for your assistance and I look forward to hearing from you.

THE KEWEENAW BAY INDIAN COMMUNITY
HAS NO INTEREST IN:
PROJECT #: Mesaba Project E.I.S.
Summer Cohen
SUMMER COHEN/THPO/NAGPRA
May 19, 2006
DATE

Sincerely,

Richard Hargis

Richard Hargis
NEPA Document Manager

Enclosure

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
Richard.Hargis@netl.doe.gov • Voice (412) 386-6065 • Fax (412) 386-4775 • www.netl.doe.gov

September 1, 2005

Mr. James Williams , Jr., Chairperson
Lac Vieux Desert Band of Lake Superior
Chippewa Indians
P.O. Box 249, Choate Road
Watersmeet, MI 49969

Dear Mr. Williams:

The U. S. Department of Energy (DOE), National Energy Technology Laboratory (NETL) is beginning the process of preparing an environmental impact statement (EIS) under the National Environmental Policy Act (NEPA) for our participation in the Mesaba Energy Project (the "Project") under the Clean Coal Power Initiative (CCPI) Program. NETL intends to publish a Notice of Intent in September to prepare the EIS. Excelsior Energy, Inc., an independent energy development company based in Minnetonka, MN, will build, own, and oversee operation of the Project, which is an Integrated Coal Gasification Combined Cycle (IGCC) electric generating facility to be located on one of two sites in Minnesota's Iron Range (please see attachment). Excelsior plans to construct the Project in two phases nominally generating up to 600 megawatts (net) each. The commercial in-service date of the first phase is scheduled for 2011; the second phase is scheduled for 2013.

As the lead Federal Agency, NETL is required to comply with Sections 106 and 110 of the National Historic Preservation Act (NHPA) for this undertaking as well as with NEPA. Therefore, this letter is intended to initiate consultation with your tribal government.

In compliance with the requirements of Minnesota Statutes 116C (Sections 116C.51 to 116C.69, known as the Minnesota Power Plant Siting Act) and Minnesota Rules Chapter 4400, Excelsior is considering two sites for the proposed facility. The western site is located just north of the city of Taconite in Itasca County; the eastern site is located about one and one-half miles north of the city of Hoyt Lakes in St. Louis County (please see attachment). In the case of the western site, the Project's generating facilities would connect to the power grid via new and existing high voltage transmission line (HVTL) corridors to a substation near the unincorporated community of Blackberry; in the case of the eastern site, the generating facilities would connect to the grid via existing HVTL corridors that lead to a substation near the unincorporated community of Forbes. Excelsior would reconstruct and/or reinforce the HVTL infrastructure within the final corridor(s) selected. In conjunction with both phases of the Project, Excelsior anticipates that network reinforcements would be required in other existing HVTL corridors and/or at substations down-network of the existing substations identified. In addition, the project would include intakes from and discharges to surface waters, connections to natural gas pipelines, and connections to various existing transit corridors (rail and road) in the region.

I would like to request any comments from your tribal government regarding the potential significance of, and potential effects to, any traditional cultural properties, cultural landscapes, or archaeological sites within the two alternative sites for the facility. In addition, I respectfully invite your tribal government to participate in any agreement that may be entered between the NETL, the State Historic Preservation Office (SHPO), and Excelsior.

After you have had the opportunity to review this information, and at your convenience, I would be pleased to discuss the Project and the EIS with you. Please do not hesitate to call me at 412-386-6065 or email me at richard.hargis@netl.doe.gov if you have further questions. Your active participation in this ongoing consultation process will be facilitated if we receive a written response on behalf of your tribal government.

Thank you for your assistance and I look forward to hearing from you.

Sincerely,

Richard A. Hargis
NEPA Document Manager

Enclosures: General Location Map

The Lac Vieux Desert Band of Lake Superior Chippewa Indians have no interest in

Project #: Clean Coal Power NETL

[illegible]wa Martin/THPO/NAGPRA

9/18/2005

D[illegible]

Mesaba Energy Project – Comment Sheet

DOE EIS Public Scoping Meeting

Please Check: ✓ 10/25/05 Taconite, MN *or* ___10/26/05 Hoyt Lakes, MN

Name: James Merhar, Chairman

Representing: Iron Range Area Council for Native Americans

Address: P.O.. Box 373, Bovey, Mn. 55709

Email:

Comment:

The Council in meeting has made the following comments regarding the Mesaba Energy Project projected construction.

The Council demands that an archeological study be made of the area before any construction commences, due to the fact that this area was once in the path of the migrations of our ancestors.

The Council demands a written guARANtee that our rights under the Treaty of 1855 will be protected as to water purity, fishing, hunting and gathering rights. This Treaty is still in effect and we want a written guarantee that your project will not interfere with any rights of ours.

Since our Tribal land is across the road from the proposed site of your plant, the Council wants a written guarantee that there will be no pollution from coal dust or from heavy metals with a ten mile radius. Our Tribal land will be the site for a senior housing in the near future aand we want our residents to be free from polutants - not only our residents but we are concerned for our neighbors.

The Council wants a writtenguarantee that water used in your plant will not be recycled and dumped or fed back into our rivers and lakes to pollute them.

The Council believes that a green site should NOT have been selected for this construction but that an already used site, such as an abandoned mine, should be used so as not to further desecrate the land. Has there been a feasibility study done on other sites such as mentioned.

The Council has grave concerns that this plant will not employ local labor to any great extent so as to improve the economy of the area, but that the employees will be high tech personnel imported from other areas. We would like some assurance that such is not the case and local labor will be the majority hired.

Please submit comments to meeting moderator or send to:

Mr. Richard A. Hargis
National Energy Technology Laboratory
U.S. Department of Energy
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940

Email: Richard.Hargis@NETL.DOE.GOV
Voice: 412-386-6065
Fax: 412-386-4775
Toll-free: 888-322-7436, ext. 6065

APPENDIX F
Wetlands Documents –

Documentation for USACE (F1), Floodplain and Wetlands Assessment (F2), MnRAM 3.1 Functions and Values Assessment Summary (F3)

(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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APPENDIX F1
Documentation for USACE

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APPENDIX F1: ADDITIONAL DOCUMENTATION SUBMITTED IN SUPPORT OF EXCELSIOR'S APPLICATION FOR A SECTION 404 PERMIT

I. INTRODUCTION: PURPOSE OF THIS APPENDIX

Pursuant to regulations promulgated under the Clean Water Act, Section 404(b), the United States Army Corps of Engineers ("Corps") is required to determine that there is no alternative to a proposed activity that is practicable, is less damaging to the aquatic ecosystem, and has no other significant, adverse environmental effects before discharge of dredged or fill material can be permitted.[1] In addition, the Corps is required under rules governing its implementation of the National Environmental Policy Act ("NEPA") to "consider and express that activity's underlying purpose and need from a public interest perspective."[2] The factors the Corps is required to use in assessing whether a proposed activity is contrary to the public interest are established by rule.[3] The documentation presented in this Appendix F1 is intended to support the Corps' above decision-making efforts by providing the following information:

- Evidence supporting the purpose and need for Excelsior Energy Inc.'s ("Excelsior") Mesaba Energy Project, a nominal 1,200MW_{net} integrated gasification combined cycle ("IGCC") electric power generating station comprised of two 600MWnet units (individually "Mesaba One" and "Mesaba Two"; collectively, the "Project" or the "IGCC Power Station");
- Incentives provided by the State and Federal government in support of the Project; and
- The screening process used to identify two sites to be evaluated as part of Minnesota's Power Plant Siting Act, one site of which is to be designated the preferred site, the other, the alternate site (with respect to the Project, the "West Range Site" and "East Range Site," respectively).

The two sites identified as part of the screening process described herein will be analyzed from a NEPA perspective and presented in the Final EIS, the information included therein providing the basis for a detailed comparison of the two sites' wetland impacts to be presented in Appendix F2.

II. OVERALL PROJECT PURPOSE AND NEED

The EIS includes a statement of the purpose and need for the project from the standpoint of Excelsior, the U.S. Department of Energy ("DOE"), and the State of Minnesota.[4] The Project's purpose and need is summarized in the following two elements:

1. 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; and
2. Help satisfy Minnesota's need for new and diverse sources of baseload electric power.

The considerations specified in Section III of this document provide support for the Project's purpose and need statement.

[1] *See* 40 C.F.R. § 230.10(a).
[2] *See* 33 C.F.R. pt. 325, App. B, § 9(b)(4).
[3] *See* 33 C.F.R. § 320.4(a).
[4] *See* U.S. Department of Energy and Minnesota Department of Commerce, Mesaba Energy Project Draft Environmental Impact Statement §§ 1.4.1-.2 (Nov. 2007).

III. CONSIDERATIONS SUPPORTING THE PROJECT'S PURPOSE AND NEED

A. Purpose and Need of Demonstrating the Commercial Viability of IGCC Technology

The need to confirm the commercial viability of IGCC technology in a utility-scale application has been determined by the DOE in furtherance of the Clean Coal Power Initiative ("CCPI"). Congress provided funding and guidelines for this program pursuant to Public Law 107-63, enacted in November 2001. Coal accounts for over 94% of the proven fossil energy reserves in the U.S. and supplies over 50% of the nation's electricity.[5] Priorities covered by the President's National Energy Policy "include increasing the domestic energy supply, protecting the environment, ensuring a comprehensive energy delivery system, and enhancing national energy security."[6] Promoting IGCC technology through the CCPI "provides an important platform responding to these priorities."[7] Specifically, "the National Energy Policy seeks to lessen the impact on Americans of energy price volatility and supply uncertainty. Such uncertainty increases as we reduce America's dependence on foreign sources of energy."[8] Because coal is the nation's most abundant domestic fuel resource, the "government's investment in CCPI recognizes the crucial benefits to our nation's economic stability and security that can be achieved through clean coal research."[9] U.S. Senator Norm Coleman also explained one of the important purposes of the Mesaba Energy Project:

> As concerns about natural gas prices and supply grow, this project is a step in the right direction…By increasing efficiency and reducing emissions, this project will continue energy production without forsaking the resources that sustain us. I'm proud [of] the vision for future energy this project sets before Minnesota and the rest of the country as it means greater diversification of energy and reduction of our dependence on foreign sources of oil.[10]

Published in February 2006, the President's *Advanced Energy Initiative* proposes significant new investments and policies in three promising areas: (1) clean coal technology; (2) nuclear power; and (3) renewable solar and wind energy.[11] The *Initiative* states, "To enhance our future energy security, we can and must do more to reduce our future demand for natural gas and foster alternatives for power production."[12] The basis for seeking to reduce the demand for natural gas and the role of the electric power sector in accomplishing it is explained in the *Initiative* as follows:

---

[5] Include citation.
[6] U.S. DEPARTMENT OF ENERGY, OFFICE OF FOSSIL ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY, CLEAN COAL POWER INITIATIVE 1 (Dec. 2006), http://www.fossil.energy.gov/programs/powersystems/cleancoal/ccpi/Prog052.pdf.
[7] *Id*.
[8] NATIONAL ENERGY POLICY DEVELOPMENT GROUP, NATIONAL ENERGY POLICY xv (2001), http://www.whitehouse.gov/energy/2001/National-Energy-Policy.pdf
[9] U.S. DEPARTMENT OF ENERGY, *supra* note 6, at 2.
[10] Press Release, U.S. Senator Norm Coleman, Coleman Announces $36 Million DOE Grant for Excelsior Energy's Mesaba Energy Project (Oct. 26, 2004), http://coleman.senate.gov/public/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=187daa08-f220-4765-a174-77958e4ef4d2&Month=10&Year=2004.
[11] NATIONAL ECONOMIC COUNCIL, ADVANCED ENERGY INITIATIVE 10 (2006), http://www.whitehouse.gov/stateoftheunion/2006/energy/energy_booklet.pdf.
[12] *Id.*

> At present, natural gas prices track high crude oil prices because natural gas is often used as a substitute for oil in power production and heating. Furthermore, the tight balance between supply and demand has led to a more volatile market, which can respond dramatically to weather events and geopolitical developments.
>
> This substantial increase in natural gas prices and volatility has had a negative impact on the U.S. industrial sector. High prices for natural gas translate to increased production costs for U.S. companies, which places them at a disadvantage to their foreign competitors. As a result, many firms have either shut down U.S. production facilities altogether or relocated them to another country where energy costs are more competitive with the global market. According to the National Association of Manufacturers, the chemicals and plastics industries, which rely on natural gas both for energy and as a raw material, have lost 250,000 jobs and $65 billion in business because of rising natural gas prices. High natural gas prices similarly harm the competitiveness of U.S. farm products in global markets, as natural gas is a primary input for fertilizer.
>
> Diversification of our electric power sector will ensure the availability of affordable electricity and ample natural gas supplies. At the same time, increased efficiency will help reduce demand for natural gas. By easing the demand pressure on natural gas, prices will drop and U.S. firms will be more competitive in the global market, keeping jobs here at home.[13]

On April 28, 2008, the DOE issued a white paper (Report No. DOE/NETL-2008/1320) entitled "Natural Gas and Electricity Costs and Impacts on Industry, A White Paper on Expected Near-Term Cost Increases" that concluded:

> Natural gas prices continue their recent upward trend. High natural gas prices hurt all natural gas consumers, especially households and natural gas-intensive industry, with recent prices three to four times higher than a decade ago. Trade-exposed industry has been hurt the most. Regions of the country dependent on natural gas fired generation have experienced large increases in the cost of power. Coal-fired generation has restrained the price of electricity and has constrained the price of natural gas from matching the rise in the price of oil. Currently, opposition to coal plants and uncertainty over nuclear power has stymied the construction of new baseload generation. This threatens a capacity shortage in many areas of the country, in the near term. Additionally, should climate change legislation pass, the "dash to gas" will be exacerbated, doubling natural gas consumption for power generation, increasing dependence on foreign energy sources, and sending natural gas and power prices skyward across the country.[14]

The DOE has sought to keep the nation from becoming too reliant on natural gas by sponsoring its Clean Coal Power Initiative Program, one element of which is demonstrating the commercial viability of IGCC. The Project's role in fulfilling DOE's objectives in this regard is, among other things, to i) "make it among the cleanest coal-based power generating plants in the world" and ii) "demonstrate, from a broad perspective, the commercial development, engineering and design necessary to construct a large feedstock-flexible reference plant for IGCC, thus establishing a

[13] *Id.* at 8.
[14] *See* http://www.netl.doe.gov/energy-analyses/pubs/NatGasPowerIndWhitepaper.pdf.

standard replicable design configuration with a sound basis for providing firm installed cost information for future commercialization."[15] Therefore, the Project represents an important step in ensuring that the U.S. can continue to use its most abundant domestic fuel resource to meet growing domestic energy needs in an environmentally sensitive manner.

B. Purpose and Need of Providing New and Maintaining Diverse Baseload Electric Power for Minnesota

The need for new and diverse sources of baseload power to serve Minnesota is documented in recent utility integrated resource plans ("IRPs") filed with the Minnesota Public Utilities Commission ("MPUC") and in other regulatory and commercial filings. Minnesota Statutes Section 216B.2422 and Minnesota Rules Chapter 7843 require many, but not all, of Minnesota's electric utilities to submit IRPs. In the IRPs, the utilities estimate the needs of their customers over the forecast period.[16] Other regulatory filings (such as certificate of need applications pursuant to Minnesota Statutes Section 216B.243) and commercial documents (such as requests for proposals) help produce a more comprehensive view of the need for baseload generation resources in Minnesota.

Table 1 identifies relevant historical utility IRPs and one RFP which Excelsior has used to document Minnesota's current need for more than 2,000 MW of new baseload electric generating capacity by the year 2020.

In a certificate of need docket currently pending before the MPUC, proponents of the Big Stone II conventional coal project have confirmed this view of the need for significant coal baseload additions in the region.[17] Xcel Energy has observed, "Over the past decade, there have been virtually no baseload additions anywhere in the Midwest. As load grows in the Midwest, coupled with the lack of baseload additions, there is less excess baseload generation available in the market."[18]

Other than Mesaba One and Mesaba Two, Big Stone Unit II is the only other planned coal facility with a substantial amount of future output slated to meet Minnesota's baseload power needs. In fact, the coal baseload resources available to serve Minnesota will decline from current levels as evidenced by the conversion of coal units in the Twin Cities to combined cycle natural gas, and Minnesota Power's May 13, 2008 announcement that its share of the Young Unit 2 coal plant is phasing out over the next several years.[19]

[15] U.S. Department of Energy, 2006, Notice Of Financial Assistance Award Under The Authority Of Public Law 95-91 DOE Organization Act. As Amended By PL 102-486 Energy Policy Act, Attachment A.

[16] *See* Minn. Stat. § 216B.2422, subd. 2.

[17] Uggerud, Ward. Supplemental prefiled testimony. Applicants' Exhibit 114 in MPUC Docket No. CN-05-619.

[18] Direct Testimony and Schedules of Camille A. Abboud, Director of Generation Risk Services at Xcel Energy at 11, In the Matter of the Application of Northern States Power Company d/b/a Xcel Energy for Authority to Increase Rates for Electric Utility Service in Minnesota, Docket No. E002/GR-05-1428 (Minnesota Public Utilities Commission, Nov. 2, 2005).

[19] Press Release, Minnesota Power, Minnesota Power Announces Long Term Project to Accelerate Wind Energy and Cut Back Carbon (May 13, 2008), *available at* http://www.mnpower.com/news/articles/2008/05-12-08_accelerate_wind.pdf.

Table 1. Baseload Electric Power Needs Identified in Completed IRPs/RFP

Utility	Baseload Power Needed (MW)	Data Source
Northern States Power d/b/a Xcel Energy	334	Xcel 2007 IRP, p. 4-14, (Dec. 14, 2007) MPUC Docket RP-07-1572
Minnkota Power Cooperative and Northern Municipal Power Agency	221	Minnkota and NMPA 2006 IRP, pp. 4-2, 9-3, (Jun. 29, 2006); DOC Comments, pp. 2-3 (Feb. 22, 2007), MPUC Docket RP-06-977
Great River Energy	273	GRE 2008 IRP, pp. 58, 70, (Jul. 1, 2008), MPUC Docket RP 08-784
Dairyland Power Cooperative	295	Dairyland 2008 IRP, pp. 14–15, (Jan. 25, 2008), MPUC Docket RP-08-113
Interstate Power and Light	60	IPL 2005 IRP, Appendix 9C (Jan. 3, 2006); Staff Briefing Paper, p. 19, (Mar. 8, 2007), MPUC Docket RP-05-2029
Missouri River Energy Services	135	Big Stone II CON, Addendum to the Testimony of J.P. Schumacher, p. 3, (Dec. 17, 2007), MPUC Docket CN-05-619
Otter Tail Power Company	170	Big Stone II CON, Direct Testimony of Brian Morlock, Exhibit 116-B, (Nov. 13, 2007), MPUC Docket CN-05-619
Minnesota Municipal Power Agency	50	MMPA 2008 IRP, pp. 31, 35, (Aug. 1, 2008), MPUC Docket RP- 08-927
Nashwauk Public Utilities Commission	300	Nashwauk PUC RFP, pp. 2–3, (Oct. 8, 2008)
Southern Minnesota Municipal Power Agency	149	SMMPA 2006 IRP, Initial Filing, p. IV-39 (Jun. 30, 2006), MPUC Docket RP-06-605
Central Minnesota Municipal Power Agency	40	Big Stone II CON, Supplemental Testimony of Robert L. Davis, Exhibit 117-G, (Nov. 13, 2007), MPUC Docket CN-05-619
Total	**2,027**	

Some utilities have proposed new wind generation backed up with natural gas combustion turbines as an alternative to coal generation. However, there are serious questions about the feasibility of achieving all the transmission upgrades and the procurement of a large number of wind turbines in a production-constrained market, both being necessary to support the rapid pace of wind penetration assumed in the utilities' plans. Importantly, the "wind plus gas" strategy does nothing to alleviate serious concerns regarding the reliance on a volatile commodity, natural gas, exposing Minnesota and the nation to further economic distress.

In summary, recent utility IRPs and other regulatory filings show that no plans are underway on the part of utilities to meet significant portions of their growing baseload electric power needs with traditional baseload generating capacity. Mesaba One and Mesaba Two are proposed, in part, to address this significant concern.

IV. ADHERENCE TO EXISTING STATE LAWS, POLICIES AND GOALS

The Project must comply with existing State laws, policies and goals, one of which specifically relates to how and where the Project is sited. Minnesota Rules Chapter 7849 ("Power Plants and Transmission Lines") require the applicant to provide an engineering analysis addressing how each site could accommodate expansion of generating capacity in the future.[20] Because the MPUC found that Excelsior's site application was complete and a state-appointed Citizen's Advisory Committee chose not to propose any additional sites, the Project has adequately addressed this application requirement.

A more recent requirement, codified in Minnesota Statutes Chapter 216H, establishes statewide reduction goals for greenhouse gases across all sectors of the economy and imposes a moratorium on the construction of new large energy facilities on or after August 1, 2009 unless a state or federal law or rule is in effect that directly limits and substantially reduces statewide power sector carbon dioxide emissions.[21] An exemption from the construction moratorium is provided in the law for new large energy facilities which had filed an application with the MPUC prior to April 1, 2007.[22] Because the applications for Site and Route Permits for Mesaba One and Mesaba Two were filed on June 16, 2006 and were deemed complete on July 28, 2006,[23] they are therefore exempt from, and compliant with, the moratorium mandated by Minnesota Statutes Section 216H.03, Subdivision 3.

V. STATE AND FEDERAL INCENTIVES AVAILABLE TO AN INNOVATIVE ENERGY PROJECT AND CLEAN ENERGY TECHNOLOGY

A. State Incentives

1. Introduction

In its 2003 Special Session, the Minnesota Legislature enacted broad-reaching energy policy legislation that, in addition to addressing the storage of spent nuclear fuel, recognized the need to provide for the development of new and alternative sources of energy.[24] Among the options addressed, the Legislature placed special emphasis upon the development of a project "that makes use of an innovative generation technology utilizing coal as a primary fuel in a highly efficient combined-cycle configuration with significantly reduced sulfur dioxide, nitrogen oxide, particulate, and mercury emissions from those of traditional technologies."[25] The Innovative Energy Project ("IEP") and the Clean Energy Technology ("CET") Statutes (collectively, the "Enabling Statutes") emerged from the 2003 Session with the aim of providing the State with a path forward to resolve critical energy issues. Market conditions that prompted the Legislature to seek to proactively foster the construction of IEPs in northeastern Minnesota included:[26]

- Rising natural gas prices and proposals to significantly increase reliance on gas-based generation. In 2002 through 2003, natural gas prices had begun what proved to be a steady upward climb. In 2002 and 2003, the average price for natural gas had risen to the level of \$4.54 to \$5.25 per thousand cubic feet and the State had experienced a few winters where

[20] *See* Minn. R. § 7849.5522, subp. 1.I. Expansion of generating capacity in this context implies that adequate resources are available to support a second generating unit of similar size and type to the first.
[21] *See* Minn. Stat. 216H.03, subd. 3.
[22] *See* Minn. Stat. 216H.03, subd. 7.
[23] Minnesota Public Utilities Commission, Order Accepting Joint Application for Filing and Authorizing Public Advisor, Advisory Task Force, and Electronic Dissemination of Proposal, as Modified, Docket No. E-6472/GS-06-668, July 28, 2006.
[24] *See* 2003 Minn. Laws, 1st. Spec. Sess., ch. 11.
[25] *See* 2003 Minn. Laws, 1st. Spec. Sess., ch. 11, art. 4, § 1, *codified as* Minn. Stat. § 216B.1694, subd. 1(1).
[26] *See* EXCELSIOR ENERGY INC., MESABA ENERGY REPORT TO THE MINNESOTA PUBLIC UTILITIES COMMISSION 1–4, MPUC Docket No. E-6472-/M-05-1993 (Dec. 23, 2005).

gas prices peaked above those levels. This early warning sign that market fundamentals were changing prompted concern on the part of policymakers about Xcel's proposed transition from its historically coal-based portfolio to a portfolio that would rely extensively on natural gas-fired generation.

- No plans for baseload. No new baseload facilities were on the drawing board in the State, and it was recognized that baseload resources require significant lead times for development and construction. Xcel forecasted needing an additional 4,100 MW to 5,800 MW of new generating resources by 2017 in its 2002 Resource Plan. The plan called for 1,804 MW of new baseload capacity by 2015.
- Concerns over out-of-state plants. Minnesota's environmental leadership record made it advantageous to site traditional coal-based resources to meet Minnesota's growing needs in neighboring states, resulting in the forfeiture by Minnesota of more than a billion dollars of direct investment for each plant, and the export of jobs and import of the pollution from high emission, conventional coal technologies.
- Transmission constraints. Transmission infrastructure was severely constrained and the region was experiencing a record number of transmission curtailments. Xcel's 2002 Resource Plan stated that "[W]ith few exceptions, major new transmission infrastructure improvements will be necessary for any of the generation options discussed," and concluded that significant lead-time was necessary to complete the transmission planning, permitting and construction process.[27]
- Tightening emission limits. Air emission limits, including mercury, appeared likely to tighten, but the precise form the limits would take was unclear. Pressure had begun to build on the U.S. to adopt some form of limits on greenhouse gases, which could force older, less efficient power plants to shut down.
- Oil price forecasts. Forecasts were emerging that oil production was about to peak, with accompanying rising world oil prices.
- Deteriorating economic conditions in Northeastern Minnesota. The Iron Range had lost an additional 2,000 jobs with the closure of the LTV Mining Company, bringing the total job loss to more than 10,000 in the past decade. Given these concerns, the benefits of locating IGCC generation facilities on the Iron Range were clear.

Since passage of the legislation, the market conditions that were the foundation for the enactment of the Enabling Statutes have become significantly more pronounced, underscoring the importance of the Project to a balanced, hedged energy portfolio for Minnesota. The MPUC has also subsequently confirmed that the project is an Innovative Energy Project under the Enabling Statutes, and is thus entitled to all the regulatory benefits provided therein.[28]

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[27] XCEL ENERGY, 2002 INTEGRATED RESOURCE PLAN 171–79, Dec. 2, 2002, MPUC Docket No. E002/RP-02-2065.

[28] Minnesota Public Utilities Commission, Order Resolving Procedural Issues, Disapproving Power Purchase Agreement, Requiring Further Negotiations, and Resolving to Explore the Potential for a Statewide Market for Project Power Under Minn. Stat. § 216B.1694, Subd. 5, Docket No. E-6472/M-05-1993, Aug. 30, 2007.

2. *Specific Incentives Provided by the Enabling Statutes*

The Minnesota Legislature recognized that special forms of assistance would be necessary to encourage the development of IGCC technology within the state. Thus, the IEP Statute provides important regulatory incentives, including:[29]

- Exemption from the requirements for obtaining a certificate of need;
- Eligibility to increase transmission capacity without additional state review;
- The power of eminent domain for sites and routes approved by the MPUC;
- Status as a "clean energy technology" for the supply of electric energy to a utility that owns a nuclear generating facility;
- The right to enter into a contract with a public utility that owns a nuclear generation facility to provide 450 megawatts of baseload capacity; and
- Eligibility for a $10 million grant from the renewable development account for development and engineering costs.

Without such incentives, it was deemed unlikely that an IGCC power station could be developed within the state. In order to take advantage of these important and unique incentives for an IEP, the Enabling Statutes specify that the project must be located on a site within the Taconite Tax Relief Area ("TTRA") of northeastern Minnesota. A project located elsewhere in the state does not qualify for the incentives.

B. Federal Incentives

1. *Loan Guarantees in General*

Federal loan guarantees are important to the development of innovative and emerging technologies because the lower cost of capital associated with federally guaranteed loans reduces the typically higher financing costs of such projects, making the cost of electricity more competitive.

2. *Loan Guarantees Specific to Mesaba Energy Project*

The United States Congress recognized the importance of the incentives provided by the Enabling Statutes in supporting the widespread commercialization of IGCC technology. The Energy Policy Act of 2005[30] ("EPAct2005") authorized the Secretary of Energy to make eligible for loan guarantees "a project located in a taconite-producing region of the United States that is entitled under the law of the State in which the plant is located to enter into a long-term contract approved by a State public utility commission to sell at least 450 megawatts of output to a utility."[31] Therefore, the Project's location in the TTRA under Minnesota law is a necessary condition for the federal loan guarantee provided in EPAct2005.

3. *Excelsior Is Successfully Pursuing Federal Loan Guarantees*

In August 2006, DOE issued a solicitation inviting pre-applications for loan guarantees. By the December 31, 2006 deadline for this solicitation, DOE had received 143 pre-applications

[29] Minn. Stat. § 216B.1694.
[30] *See* Public Law 109–58, Aug. 8, 2005.
[31] *See* 42 U.S.C. § 16513(c)(1)(C). *See also* 42 U.S.C. § 16514(b)

requesting more than $27 billion in loan guarantee protection (for project costs estimated at more than $51 billion). On October 4, 2007, Excelsior was notified by DOE that it was one of 16 project sponsors who submitted pre-applications for loan guarantees to be invited to submit full applications (the 16 were selected from the 143 applicants submitting pre-application loan guarantee requests). In the announcement, DOE Secretary Samuel Bodman stated:

> Loan guarantees aim to stimulate investment and commercialization of clean energy technologies to reduce our Nation's reliance on foreign sources of energy. Finalizing this regulation for the Department's Loan Guarantee program puts Americans one step closer to being able to use new and novel sources of energy on a mass scale to reduce emissions and allow for vigorous economic growth and increased energy security.[32]

As a result of lower cost debt financing associated with loans guaranteed by the federal government, the Project is expected to achieve cost parity with a conventional, utility-owned supercritical pulverized coal plant that would not have access to such loan guarantees.

On November 19, 2008, Excelsior submitted its application for a loan guarantee under DOE's first Energy Efficiency, Renewable Energy ("EERE") solicitation (DE-PS01-06LG00001).[33] On December 19, 2008, Excelsior was notified by DOE that the information submitted in the application had been judged sufficiently complete for the Loan Guarantee Program Office to move to the due diligence stage in its evaluation of the proposed Mesaba One project.[34]

VI. LIMITATION OF ALTERNATIVES TO SITES WITHIN THE TTRA

A. Demonstrating the Commercial Viability of the EGas™ Process Could Not Be Done Elsewhere in a Timely Manner

The commercial viability of IGCC technology on a utility-scale could, in theory, be demonstrated elsewhere in the United States. However, as outlined in Section 2.1.1.2 of the EIS, the Project was selected for DOE funding as part of a nationwide competitive solicitation process that attracted only two proposed IGCC projects, both of which were ultimately funded.

Despite the limited number of applicants, it is now generally acknowledged that the Mesaba Energy Project, with its local, state, and national cooperation and incentives, is uniquely positioned to demonstrate the commercial viability of an IGCC project on an expedited basis.[35] The important national goals of energy independence, improved environmental performance, and

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[32] Press Release, U.S. Department of Energy, DOE Announces Final Rule for Loan Guarantee Program (Oct. 4, 2007), http://www.doe.gov/5568.htm.

[33] November 19, 2008 letter from Thomas Osteraas to David Schmitzer submitting Mesaba One Loan Guarantee Application.

[34] December 19, 2008 letter from David Schmitzer, Director, Loan Origination, Loan Guarantee Program, U.S. DOE to Thomas Osteraas, Sr. V.P. and General Counsel, Excelsior Energy Inc.

[35] *See* Press Release, Electric Power Research Institute (EPRI), EPRI Announces Completion of First Pre-Design Specification for an IGCC Plant (March 13, 2007), http://www.gasification.org/Docs/News/2007/EPRI%20Predesign%20IGCC.pdf.

deployment of technology capable of dealing with greenhouse gases, place a premium on developing this important energy source as soon as possible.

B. Baseload Electric Power Could Not Be Provided by Sources Outside Minnesota and Still Achieve the Legislature's Long-Term Goals

The provision of additional sources of baseload electric power could theoretically be provided from outside Minnesota. However, the State's goal of maintaining its diverse portfolio of baseload electric power sources and diversifying the long term economy of the Iron Range would remain unfulfilled. Minnesota's 2003 energy act underscores the importance of developing an IEP within the state to provide for the state's long term energy security and, in turn, help protect it from the volatility of rapidly escalating natural gas prices. Baseload coal-fired power generating plants located both within and outside of Minnesota are also now subject to the moratorium established in the state greenhouse gas legislation enacted in 2007.

C. The Project Must Be Located Within the State *and* Within the TTRA

By state statute, to qualify for the essential incentives that the Legislature established for the construction and operation of an IEP, the facility must be built within the TTRA.[36] Without strong regional and state support, as evidenced by the special incentives the 2003 legislation provided to locate within the TTRA, the Project would not likely have been selected in the CCPI Round 2 funding. Further, the United States Congress, by virtue of its specific references to the TTRA in EPAct 2005, recognized the importance of the state incentives to the Project's success and specifically confirmed the importance of locating the Project in the TTRA.[37] Alternatives outside of the TTRA would not be eligible for the state and federal incentives described in the previous section, which would render those alternatives not practicable due to both cost and logistical reasons.

D. DOE and Corps Finding Concerning the Area of Consideration for the Alternatives Analysis

In a July 2008 meeting between the U.S. Army Corps of Engineers and the Department of Energy, the two agencies concurred that, from the standpoint of the Clean Water Act Section 404 analyses, the alternatives analysis would be limited to the TTRA.

VII. ANALYSIS OF ALTERNATIVES WITHIN THE TTRA

A. Site Selection Process

Although numerous studies involving the selection of coal-fired power plant sites have been published, a recent presentation by the U.S. Department of Energy's National Energy Technology Laboratory ("NETL") has briefly described the most critical elements as follows[38]:

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[36] *See* Minn. Stat. § 216B.1694, subd. 1(3).
[37] *See* 42 U.S.C. § 16513(c)(1)(C).
[38] Hoffmann, Feeley, and Carney, "DOE/NETL's Power Plant Water Management R&D Program –Responding to Emerging Issues," 8th Electric Utilities Environmental Conference, Tucson, AZ, January 24-26, 2005. *See* http://www.netl.doe.gov/technologies/coalpower/ewr/pubs/05_EUEC_Hoffmann_1.pdf.

- Access to transmission lines,
- Available fuel, and
- Water.

The state of Wisconsin has published a host of additional power plant siting criteria that are commonly used in the site selection process.[39] Excelsior's site selection efforts addressed these same fundamental concerns and included the following four steps:

- Developing site selection criteria;
- Identifying potential sites;
- Establishing a short list of sites having the greatest likelihood of licensing success; and
- Specifying at least two licensable sites for consideration under rules implementing the State of Minnesota's Power Plant Siting Act, one site of which must be designated as preferred.

Each of these four site selection steps is discussed in further detail below.

1. Step One: Development of Site Selection Criteria

Site selection criteria represent specific elements of concern that are collectively used to characterize the likelihood of a potential site to accommodate the footprint and infrastructure required for Phase I and Phase II of the Mesaba Energy Project (hereafter, "Mesaba One and Mesaba Two," "IGCC Power Station" or the "Station") while minimizing environmental and societal impacts. Excelsior divided its site selection criteria into three categories: permitting, technical, and site control. Permitting criteria focused on issues related to the relative feasibility of obtaining preconstruction permits necessary to construct and operate the IGCC Power Station. Technical criteria focused on the feasibility of constructing and operating the Station, and site control criteria considered the likelihood of obtaining site ownership and control in a timely manner with landowner cooperation. Table 2 lists the specific elements considered under each of these three categories.

[39] Public Service Commission of Wisconsin, "Common Power Plant Siting Criteria." September 1999. *See* http://psc.wi.gov/thelibrary/publications/electric/electric05.pdf.

Table 2. Excelsior's Site Selection Criteria

Code	Permitting Criteria	Description
P1	Air	What is the potential impact on Class I areas, including cumulative impacts of current and proposed projects?
P2	Wetlands	What is the potential for wetland impacts and mitigation if required?
P3	Groundwater	Will there be any solid waste disposal landfills on the site or other structures or operational features that could affect groundwater? If so, what is the depth to groundwater and how might groundwater be impacted?
P4	Floodplains	How will the proposed Project impact floodplains on the site?
P5	Water Supply	Are potential sources of water supply available, in what quantity/quality, and from what source or sources?
P6	Wastewater Discharges	Are publically owned treatment works ("POTW") located in relative proximity to the site, and can such POTWs accommodate plant-derived wastewaters? Are there bodies of water nearby that can accommodate the wastewater after appropriate treatment?
P7	Great Lakes Initiative ("GLI")	Is the proposed site located within the Lake Superior Basin watershed? If so, can wastewater discharges meet the low GLI mercury discharge criteria as such limits can be below the background mercury levels found in some Northeastern Minnesota surface waters?
P8	Natural/Cultural Resources	Does the site present any special concerns with respect to areas of archaeological/architectural importance or with respect to threatened and endangered species?
P9	Land Use	Is the current zoning designation compatible with industrial activities? What are the future land use plans for the proposed site and areas surrounding it?
Code	**Technical Criteria**	**Description**
T1	Plant Expansion	Is there sufficient contiguous acreage, water and related infrastructure available to accommodate the Phase I and Phase II Developments, including rail loop? Is the area sufficiently isolated for safety, security, dissipation of noise, and other considerations?
T2	Physical Characteristics	What are the size, shape, topography, and underlying soil conditions of the site? What are the subsurface characteristics? Are there any geohazards that would preclude use of the proposed site or confine the proposed facilities to specific areas?
T3	Rail Access	Is there adequate rail access for delivery of key pieces of equipment during construction, and for delivery of coal and pet coke for operation? Is it possible to develop more than one rail transportation option? Can Great Lakes ports be utilized to help meet fuel transportation needs?
T4	Transmission	How and where does the generator interconnection to the transmission system occur? What transmission system network reinforcements, beyond the POI, may be required to accommodate planned generating facilities?
T5	Natural Gas	How and where does the interconnection to the natural gas pipeline system occur and what is its available capacity?
T6	Industrial Processing	How close is the nearest large industrial processing facility? Do potential synergies exist with such facilities, including use of warmed water for industrial process uses, syngas as a substitute for natural gas, common use of facilities, etc.?
Code	**Control Criteria**	**Description**
C1	Site Control	Is it likely that site control can be obtained in a timely manner?

2. *Step Two: Identifying Initial Sites*

a) Existing Facilities

Industrial Facilities with Synergistic Processes

Excelsior initiated its siting efforts by identifying within the TTRA numerous sites in separate industrial complexes where the IGCC Power Station might share potential synergies with existing industrial operations. Such industrial sites could represent a desirable option for developing the Station based on the infrastructure that has been constructed to serve existing industrial operations.

However, any IGCC Power Station or other industrial facility cannot be indiscriminately placed in existing industrial locations. For example, many sites on the Iron Range, but off the "iron formation," have been used as auxiliary mining lands and include areas where large quantities of rocks and soil (stripped to expose natural mineral resources) have been placed. These areas, commonly referred to as "mine dumps" are generally not suitable locations upon which to place the IGCC Power Station. In general, the same is true for large areas where tailings[40] have been sluiced and left to settle[41].

The owners of two existing industrial operations, Minntac and United Taconite (owned by United States Steel Corporation and Cleveland-Cliffs Inc/Laiwu Steel Group, respectively,, showed an initial willingness to consider co-locating the IGCC Power Station on their sites. However, after extended negotiations, the owners were unwilling to commit to terms to allow Excelsior to develop the IGCC Power Station on their sites. Their inability and unwillingness to execute agreements for use of their industrial sites for the IGCC Power Station required Excelsior to look at other siting options. Although the two sites are designated as Site Nos. 16 and 17 in this document, efforts to locate the Station at either site were exhausted prior to further expanding Excelsior's site selection process. The general locations for Sites 16 and 17 are identified in Figures 8, 12, 26 and 30. Detailed information that Excelsior developed about these two sites is not disclosed because it is proprietary and/or confidential.

Repowering Existing Electric Utility Steam Generating Units

Excelsior did not consider repowering existing electric utility steam generating units. The basis for this decision was related to one of the Project's original purposes as stated in its June 15, 2004 response to DOE's Phase II CCPI solicitation:

> "The Mesaba Energy Project creates a standard configuration that can be deployed at multiple sites. The Project will demonstrate a technically superior configuration for IGCC projects in a readily replicable design that will offer a sound basis for providing firm installed cost information for future projects. In addition, the Mesaba Energy Project will remove the largest barrier to wide scale market penetration by establishing a competitive commercial and regulatory framework for IGCC projects. The Mesaba Energy Project will demonstrate lump sum turnkey engineering, procurement and construction (EPC) arrangements and limited

[40] Waste or refuse left in various processes of milling, mining, etc. From: Webster's New World College Dictionary, 4th Edition, Michael Agnes, Editor, Wiley Publishing, Inc.

[41] Loose, water-saturated sands and silts of low plasticity may have adequate shear strength under static loading conditions; however, if such materials are subjected to vibratory loading, they may lose strength to the point where they flow like a fluid. The process in which susceptible soils become unstable and flow when shocked by vibratory loading is called liquefaction, and it can be produced by vibration from blasting operations, earthquakes, or reciprocating machinery. In very loose and unstable deposits, liquefaction can occur as the result of disturbances so small that they are unidentifiable. *See* www.usace.army.mil/publications/eng-manuals/em1110-2-1911/c-3.pdf page 7.

> recourse project financing, removing significant market penetration barriers for IGCC."

Repowering an existing generating unit would represent a design uniquely tailored to one application and preclude its utilization as a standard design for use at multiple sites based on commercially available power generation technology. Finally, all potential sites within the TTRA that might be used for a repowering demonstration project were either owned or controlled by a utility that consistently opposed the Project, which eliminated repowering or co-siting as an option.

Use of Existing Large Electric Power Generating Facility Sites

Excelsior considered the use of existing LEPGF sites within the TTRA but after discussion with the owners found such sites to be unavailable for the Project's development.

b) Screening Process

Excelsior used geographical information system ("GIS") mapping software to identify areas within the TTRA potentially capable of supporting development of the IGCC Power Station. In general, the areas within the TTRA where Excelsior focused its search depended upon access to existing rail lines (i.e., the means by which coal will be delivered to the Station) and the presence of the following attributes:

- Availability of water for cooling and other Station purposes;
- Proximity to existing high voltage transmission line corridors that can be used to minimize environmental impacts associated with interconnecting the Station to the regional electric grid;
- Feasibility of acquiring large blocks of land in a timely manner;
- Reasonable distance from nearby landowners;
- Reasonable proximity to a major natural gas pipeline; and
- High proportion of upland to wetland areas.

Rail Access

Figure 1 shows the location of major rail trackage within the TTRA. Excelsior has used a six-mile buffer centered on each major rail line (that is, three miles on each side) to provide a general indication of the characteristic area within which Excelsior believes it feasible to construct and operate the IGCC Power Station. The costs and logistical challenges of securing rights of way and constructing rail to a site beyond this buffer, in addition to the likelihood of greater wetland impacts for longer rail alignments, generally renders such sites unworthy of consideration.

Dual rail service via two major rail suppliers using their own track has been identified as a key attribute in Excelsior's siting evaluation. The optionality created by such fuel supply and transportation diversity allows for fuel supply contracting options that will minimize the Project's fuel costs and allow for a fuel and fuel transportation contracting strategy that can incorporate supply contracts of varying terms and supply quantities and spot market access. At a minimum, the Project should have a fuel supply cost that is equal to the fuel supply costs of other regional fossil fueled power plants operated by NSP and Minnesota Power.[42] The dual rail optionality

[42] Excerpt from October 10, 2006 rebuttal testimony of Ralph Olson before the Minnesota Public Utilities Commission. *See* http://www.excelsiorenergy.com/public/index.html to obtain complete testimony of Mr. Olson regarding Excelsior's fuel procurement strategy.

available to the Project should allow for fuel mixes that are lower in overall cost than these regional suppliers over the long term[43].

Water Availability

The Joint Application ("JA") Excelsior submitted in support of the Power Plant Siting Act process identified the IGCC Power Station's water requirements, as shown in Table 3.

Table 3. IGCC Power Station Water Appropriation Requirements

Phase	**Average Annual Appropriation (GPM)**	**Peak Appropriation (GPM)**
I	3,500[a]	5,000
I & II	7,000[a]	10,000

[a]Based on 8 COC in the gasification island and the power block cooling towers

New facilities (as defined at 40 CFR 125.83) locating on waters of the United States and i) withdrawing more than 2 million gallons per day, ii) using more than 25% of that volume for cooling purposes, and iii) using a cooling water intake structure ("CWIS") to divert such volumes of water to the source are restricted as to the amount of water that can be withdrawn from such waters. Since the Mesaba Energy Project would be a new facility and would meet these criteria it is subject to rules governing cooling water intake structures (see 66 FR 65256). Such rules restrict the amount of water that can be withdrawn from freshwater rivers, streams, lakes and reservoirs. Withdrawals from freshwater rivers or streams must be no greater than 5 percent of the source waterbody mean annual flow; withdrawals from a lake or reservoir must not disrupt the natural thermal stratification or turnover pattern (except where such disruptions are determined to be beneficial to the management of fisheries). At 40 CFR 125.84(e), the final rule governing CWISs recognized that a State may include more stringent requirements to the location, design, construction and capacity of a CWIS at a new facility[44].

In evaluating flows in freshwater rivers or streams, Excelsior used daily flow information obtained from United States Geological Survey gauging stations. Impacts associated with withdrawals from lakes or reservoirs were estimated using information about the area of the specific resource, its maximum depth, and the area of the littoral zone obtained from the Minnesota Department of Natural Resources' ("MDNR") Lake Finder web site[45]. Excelsior assumed no inflow to such resources (approximating conditions that would be present during times of drought) and calculated the time it would take to lower the level of the lake or reservoir to the point where water in the littoral zone was completely depleted.

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43 Ibid, page 2, line 9.

44 In the proposed rules, the maximum amount of water that could be withdrawn from a river was 25 percent of the 7Q10 or 5 percent of the mean annual flow, whichever was lower. Although the language including the 7Q10 was dropped from the final rules, the state could deem it appropriate if it appeared that 5% of the mean annual flow did not sufficiently protect aquatic resources.

45 See http://www.dnr.state.mn.us/lakefind/index.html. The littoral zone is defined as that portion of the lake that is less than 15 feet in depth. The littoral zone is where the majority of the aquatic plants are found and is a primary area used by young fish. This part of the lake also provides the essential spawning habitat for most warmwater fish (e.g. bass, walleye, and panfish).

The use of groundwater in quantities suitable to meet the cooling requirements for the IGCC Power Station are generally discouraged by Minn. R. 4400.3450 ("Prohibited Sites") Subpart 5 ("Sufficient water supply required"). This subpart of Minnesota rules states:

> "No site may be designated that does not have reasonable access to a proven water supply sufficient for plant operation. No use of groundwater may be permitted where removal of groundwater results in material adverse effects on groundwater, groundwater dependent natural resources, or higher priority users in and adjacent to the area, as determined in each case.
>
> The use of groundwater for high consumption purposes, such as cooling, must be avoided if a feasible and prudent alternative exists."

High Voltage Transmission Lines/Natural Gas Pipelines

Excelsior's strategy for interconnecting the Station to a major electrical substation was to use existing HVTL corridors to the extent feasible and to minimize distances to the point of interconnection. The further the Station is located from such substations the higher interconnection costs become. In addition, the lower the HVTL voltage within an existing corridor, the narrower the existing right of way ("ROW") for that corridor is likely to be. The voltage for the preferred generator outlet facilities serving Mesaba One and Two appeared to be 345 kV. The required ROW for the 345 kV tower configuration to be used for these facilities is generally found to be less than or equal to the current ROW serving many of Minnesota Power's 115 kV HVTLs. This would not be the case for the smaller distribution HVTLs found in the TTRA north and east of Virginia, Minnesota.[46] Although there is rail track found north of Virginia, there are no suitable sized HVTL corridors within which Mesaba One and Two transmission outlet facilities could be placed absent the acquisition of additional ROW.

Even though existing rail corridors are present south of and east of Hoyt Lakes, there are no HVTLs corridors of suitable size to accommodate the right of way required for HVTLs sized to carry the output of Mesaba One and Two. A 115 kV HVTL runs along the North Shore of Lake Superior at the extreme southern end of this region, but water could not be feasibly obtained in the quantity required to support Mesaba One and Two.[47]

The only natural gas pipelines capable of providing the capacity required by Mesaba One and Two are the two 36" diameter Great Lakes Gas Transmission Company pipelines that parallel the southeastern boundary of the TTRA. The further the distance between the Station and this pipeline, the more costly it becomes to interconnect them.

Wetlands

Wetlands and open water cover large areas of the TTRA and represent an important factor in Excelsior's siting decision processes. National Wetland Inventory maps obtained from the U.S. Fish and Wildlife Service were used to screen areas where development of the Project would have

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[46]HVTLs found north and east of Virginia, Minnesota mostly belong to Great River Energy (GRE). See http://www.greatriverenergy.com/about/brochure1.html for a general comparison of right of way widths found in the Great River Energy transmission line portfolio. Also see http://www.tva.gov/power/rightofway/faq.htm,

[47] The only appropriate source of water in the area just north of Lake Superior is the lake itself. Excelsior does not believe it is reasonable to assume that a large electric power generating plant would be permitted on the shore of Lake Superior. Further, pumping water from the lake in the quantity necessary to meet MEP-I and MEP-II would not be feasible given the distance and head needed for a plant located a sufficient distance away from the lake.

significant impacts. Areas where wetlands represent a primary factor lie in the southern portion of the TTRA within the buffer area of the existing rail lines near the confluence of the St. Louis and Cloquet Rivers. In this proximity, areas that would appear to be capable of supplying sufficient water to Mesaba One and Two were excluded due to their relatively high impact on wetland resources and difficulties associated with obtaining control of the site (see Figures 18, 19 and 20).

Property Size and Ownership

Adequate site size is necessary to support the development of the Mesaba Energy Project. While the IGCC Power Station Footprint occupies approximately 200 acres and represents an absolute minimum, a large amount of additional land is desirable, and in some cases necessary for the associated facilities, particularly the rail loop. Buffer land is also desirable to isolate the IGCC Power Station Footprint from residences and other potentially affected land uses. Site specific variables, such as the orientation of available rail access, introduce variability to the site size required at each site. At a screening level, 400-500 acres is a reasonable range below which the development of the Project is unlikely to be practicable at that site.

The rights of existing homeowners were provided substantial deference to minimize impacts upon individuals, families, and local communities. Obtaining sites that consist primarily of many small landowners was also deemed to present a serious potential logistical problem as compared to acquiring a site from a small number of major landowners who were willing to reach necessary acquisition agreements. Therefore, in its site screening process, deference was given to locations where the number of landowners is low and where no relocation of residents would be dictated. Additionally, sites owned and used by other industrial entities as part of their mineral extraction activities within the iron formation were not obtainable through purchase, making the avoidance of such sites appropriate.

Exclusion Zones

Iron Formation

Although abandoned mine pits in the iron formation represent an area where there is generally an abundance of water, the iron formation itself represents an exclusion zone within which non-mining operations are unlikely to be allowed to locate.[48]

Native American Reservations

The Fond du Lac Indian Reservation located in the south-central-most part of the TTRA is considered an exclusion zone.

c) Search Area

Text boxes included on Figure 1 identify the relatively large areas of the TTRA that were excluded from consideration as IGCC Power Station sites due to a lack of existing rail service, distance from existing track, lack of sufficient transmission line corridors, the ubiquitous presence of wetlands, and/or their lack of sufficient water resources. These exclusions were discussed and justified in the preceding narrative of power plant siting considerations. The cross hatched area in the TTRA shown in Figure 1 (hereafter, the "Search Area") indicates where Excelsior thereafter focused its search for potential sites. Figure 1A is a mapping key that divides the Search Area into twenty-two parcels, each of which is identified by the figure number subsequently used to display the area in greater detail via GIS mapping.

[48] Excelsior's use of water obtained from mining pits will most always be outside the boundaries of the iron formation.

Figures 2 through 23 zoom into various locations within the Search Area to show the sites Excelsior identified as part of its initial screening efforts. In addition, these figures show areas within the Search Area that are located within the six-mile rail buffer area, but were excluded from consideration as practicable alternatives for the IGCC Power Station. Exhibit 1 provides a narrative description for each figure that outlines the general location the figure occupies within the Search Area and provides a general indication of why areas within each figure were not deemed suitable for consideration as potential sites for the Station.

d) Initial Sites Selected

As part of its expanded site selection screening process, Excelsior ultimately identified fifteen sites within the Search Area that appeared to have adequate access to required infrastructure and sufficient space to accommodate a LEGPF, and which appeared to minimize potential land-owner conflicts. Resources used in this process included the most recent plat maps and zoning ordinances for St. Louis and Itasca Counties. Excelsior conducted "windshield" surveys of most sites and, where access could be obtained while maintaining some anonymity, walked the sites to gauge their potential feasibility for the Project's use. Table 4 cross-references the fifteen sites selected with the figure numbers within which each site appears. In addition to the fifteen sites identified during Excelsior's expanded site selection process, Table 4 identifies the two industrial sites (Sites 16 and 17) that were eliminated prior to expanding the search.

Table 4. Excelsior Site/Figure Cross Reference List

Site No.	Site Name	Figure No.
1	Clinton Township South	12,24
2	Clinton Township East	11,25
3	Clinton Township West	11,25
4	Clinton Township North	11,26
5	Manganika Lake	11,26
6	West Aurora	10,27
7	Hoyt Lakes West	10,27
8	West Two Rivers Res.	8,26
9	East Range Site	10,27
10	Mountain Iron	8,26
11	Leonidas	11,26
12	Buhl	7,28
13	West Chisholm	7,28
14	Hibbing Industrial Park	7,28
15	West Range Site	3,29
16	Minntac Industrial Site	8, 30
17	United Taconite Industrial Site	12, 26

3. Step Three: Narrowing the Number of Potential Sites to Practicable Alternatives

In screening the sites for potential wetland impacts, Excelsior used National Wetland Inventory ("NWI") database information prepared by the U.S. Fish and Wildlife Service from USGS 1:24,000 quadrangle maps.[49] To quantify relative wetland impacts on an equivalent basis, Excelsior used the footprint of the IGCC Power Station prepared by Fluor (this same footprint appears throughout the EIS) and rearranged it in one of four orthogonal directions (that is, at 0º, 90º, 180º, and 270º angles) thought to best accommodate the expected rail configuration. Figures

[49] *See* U.S. Fish & Wildlife Service web site at http://wetlandsfws.er.usgs.gov/NWI/download.html.

24 through 29 show the final configurations analyzed (the power station footprint was moved outside the property boundary Excelsior originally specified where it appeared that some siting impediment within the original boundary might be avoided). This screening analysis considered only the area required to accommodate the Station footprint (approximately 180 acres in area for the two phase development). Further wetland evaluations were precluded at this stage due to the detailed, case-by-case analysis required to correctly establish the grade and orient the rail spur required for each potential IGCC power station layout and correctly align other infrastructure requirements.[50] The results of the wetland screening analysis are presented in Table 5. For the reasons noted in Section VI.A.2.a, detailed information about the two industrial sites is not disclosed.

Excelsior worked with city officials and owners of large blocks of land to gain additional insight into the feasibility of using a site for a LEPGF. Such discussions were very informative and, in the case of Sites No. 7 and 10, led to their ultimate dismissal as a feasible alternative. In addition, Excelsior worked with consultants and city engineers to investigate potential constructability issues on sites deemed to have local government's strong support.

In some instances numerous considerations combined to make a location infeasible as an LEPGF site. For example, in the case of Site No. 3, residential proximity/density, existing land uses (i.e., a county recreation site and numerous farms are located in immediate proximity and/or within the site footprint and likely rights of way for road/rail access), natural features restricting site development (i.e., a small river to the west, lakes to the south and northeast, and wetlands to the east across which access to the site would likely be required) and water supplies that, at best, can be considered marginal.

The distinguishing factors for the fifteen sites are summarized in Table 6, which is based on detailed information about each site as presented in their respective site evaluation sheets provided in Exhibit 2. If a factor either necessitated the dismissal of a site or weighed very heavily against a site, it is shaded and marked in bold in Table 6. Only Site Nos. 9 and 15 had no such factors. Table 7 provides additional narrative that reinforces the rationale for site dismissal, which is further supported by the detailed information in Exhibit 2.

The two practicable sites ultimately selected for use in the Power Plant Siting process are represented by the Preferred (Site No. 15) and Alternate (Site No. 9) sites, otherwise known as the West and East Range Sites, respectively. A third site, the Hibbing Industrial Park, would have been considered a practicable alternative, but an agreement between Iron Range Resources and a private developer seeking to develop the property for other uses precluded its consideration. A more detailed discussion of the impracticability of the Hibbing Industrial Park Site is provided in Section VI.A.4.

[50] Each site must accommodate a rail spur and loop, access roads for employees and construction vehicles, transmission line and natural gas pipeline interconnections, process water pipelines, and other utility connections.

Table 5. NWI Wetland Screening Analysis of Preliminary Sites Selected Under Excelsior's Screening Process*

Alt. Site No.	Site Name	NWI Wetland Parcel No. 1 (Acres)	NWI Wetland Parcel No. 2 (Acres)	NWI Wetland Parcel No. 3 (Acres)	NWI Wetland Parcel No. 4 (Acres)	NWI Wetland Parcel No. 5 (Acres)	NWI Wetland Parcel No. 6 (Acres)	NWI Wetland Parcel No. 7 (Acres)	NWI Wetland Parcel No. 8 (Acres)	NWI Wetland Parcel No. 9 (Acres)	NWI Wetland Total Impacts (Acres)
1	Clinton Township S.	28.1	2.3	2.4							32.8
2	Clinton Township E.	0.7	10.9	7.4	5.4	8.9	5.0				38.4
3	Clinton Township W.	1.2	1.6								2.8
4	Clinton Township N.	30.6	9.9	52.0	0.8						93.3
5	Manganika L.	28.7	16.8								45.5
6	W. Aurora	18.4	3.3	1.1	3.7	0.6					27.1
7	Hoyt Lakes W.	10.1	5.1	1.5	2.6						19.3
8	W. Two Rivers Res.	35.0	6.4	6.1	1.4						48.8
9	Hoyt Lakes E. (East Range Site)	10.5	1.7	2.4							14.6
10	Mountain Iron	16.5	1.7	1.9	2.7						22.8
11	Leonidas	9.0	3. 6	2.7	2.7	8.6	1.0				27.6
12	Buhl	40.7	2.5	5.7	19.2						68.1
13	W. Chisholm	25.0	5.0	1.3	1.5						32.8
14	Hibbing Ind. Park	8.6	18.6	2.3	1.9	1.4	0.9	0.7	0.4	0.5	35.4
15	West Range Site	10.3	0.4								10.7

* Sites 16 and 17 were not screened for NWI wetlands as they were eliminated from consideration prior to expanding Excelsior's site selection process (*see* Section I.A.2.a).

Table 6. Site Selection Screening Summary

Site ID	General Description				Site Attributes					Water Supply			HVTL POI	Proximity to Class I Areas (miles)	
	Size (Acres)	Site Control	Planned/Existing Land Use	Residential Proximity	Physical Features	Site Access: Road	Site Access: Rail	NWI Wetlands	Construct-ability	Potential Source(s)	Adequacy	Water-shed		VNP	BWCA
1	**~380**	Potentially obtainable	**Residential**	**High**	Flat, cleared, wetlands	Good	CN: Good BN: None	**32.8**	Feasible	St. Louis River, Long Lake	**Inadequate**	Lake Superior	Forbes	64	38
2	~620	**Not obtainable; within Environ-mental Setting Boundary of mining company**	**Residential and planned mining/ ancillary use**	**High**	Flat, wetlands	Good	CN: Good BN: None	**38.4**	Feasible	Elbow Lake, Thunderbird Mine Pit	Marginal	Lake Superior	Forbes	60	35
3	**~410**	Potentially obtainable	**Recreation, residential**	**High**	Wooded, lake	Good	CN: Good BN: None	2.8	Feasible	Elbow Lake, Thunderbird Mine Pit	Marginal	Lake Superior	Forbes	61	36
4	**~420**	**Not obtainable, within Environ-mental Setting Boundary of mining company**	**Planned mining/ ancillary use**	Moderate	Wetlands	Good	CN: Good BN: None	**93.3**	Feasible	Various mine dewatering, Virginia WWTP	Marginal	Lake Superior	Forbes	58	33
5	~1,375	Potentially obtainable	**Residential development**	**High**	Lakes	Good	CN: Good BN: None	**45.5**	Feasible	Various mine dewatering, WWTPs	Marginal	Lake Superior	Forbes	58	33
6	~2,500	Potentially obtainable	Zoned forest/ag. management and industrial	**High**	Waste rock, wetlands	Good	CN: Good BN: None	**27.1**	Some areas feasible	Embarrass Lake, mine pits	**Likely inadequate**	Lake Superior	Forbes	55	26
7	~1,630	**Not obtainable, owner unwilling to sell**	**Planned future mining, State Mineral Trust**	Low	Wetland and some former mining	**Poor**	CN: Good BN: None	19.3	Feasible	Abandoned Cliffs Erie mine pits, Colby Lake	Adequate	Lake Superior	Forbes	54	25
8	>2,000	**Not obtainable, within Environ-mental Setting Boundary of mining company**	**Current ancillary mining use (water reservoir)**	Moderate	Wetland	Good	CN: Good BN: None	**48.8**	Feasible	Various mine dewatering, WWTPs	**Likely inadequate**	Lake Superior	Forbes	57	33
9	1,433	Obtainable	Zoned mining; no current or planned land use	Low	Wooded, wetlands	Good	CN: Good BN: None	14.6	Feasible	Abandoned Cliffs Erie mine pits, Colby Lake	Adequate	Lake Superior	Forbes	49	25
10	~1,520	**Likely not obtainable**	**Residential and planned future mining**	**High**	Wooded	Good	CN: Good BN: None	22.8	Feasible	Abandoned mine pits, dewatering, Silver Lake	Marginal	Lake Superior	Forbes	57	32

Table 6 (continued). Site Selection Screening Summary

Site ID	General Description				Site Attributes					Water Supply			HVTL POI	Proximity to Class I Areas (miles)	
	Size (Acres)	Site Control	Planned/Existing Land Use	Residential Proximity	Physical Features	Site Access		NWI Wetlands	Construct-ability	Potential Source(s)	Adequacy	Water-shed		VNP	BWCA
						Road	Rail								
11	<704	**Not obtainable, within Environmental Setting Boundary of mining company and boundary of iron formation.**	**Residential and planned future mining**	**High**	Waste rock	Good	CN: Good BN: None	**27.6**	**Likely infeasible**	Various mine dewatering, WWTPs	Marginal	Lake Superior	Forbes	58	33
12	850	**Portion is not obtainable**	Previous ancillary mining use	Moderate	Waste rock	Good	**CN: Poor BN: None**	**68.1**	**Likely infeasible**	Sherman and Frasier mine pits, Iron World	Uncertain	Lake Superior	Forbes	58	39
13	785	Potentially obtainable	Previous ancillary mining use	Moderate	Waste rock	Good	**CN: None BN: None Inacces-sible by unit coal trains**	**32.8**	**Potentially infeasible**	N/A	N/A	Lake Superior	Forbes	59	42
14	860	**Likely not obtainable**	**Site of planned race track**	Moderate	Wetland	Good	CN: Good BN: Poor	**35.4**	Feasible, but close to Iron Formation	Abandoned mine pits	Adequate	Lake Superior	Forbes	61	43
15	1,727	Obtainable	Zoned industrial; no current or planned land use	Low to Moderate	Wooded	Good	CN: Good BN: Good	10.7	Feasible	Canisteo, Hill Annex, Lind pits and Prairie River	Abundant	Upper Missis-sippi	Black-berry	75	61
16	N/A	**Not obtainable, industrial owner not willing to commit to terms to allow Excelsior to co-locate an IGCC facility.**	Details of site are proprietary and/or confidential.												
17	N/A	**Not obtainable, industrial owner not willing to commit to terms to allow Excelsior to co-locate an IGCC facility.**	Details of site are proprietary and/or confidential.												

Table 7. Initial Dismissal of Sites During the Screening Process

Site No.	Site Name	Rationale for Dismissal
1	Clinton Township South	Water unavailable in required quantities; development constrained because of inadequate site size, existing land owners, forcing expansion into areas where relatively high wetland impacts would occur.
2	Clinton Township East	Residential development has occurred on the western part of the site; the eastern part of the site is completely within the environmental setting boundary*for Eveleth Taconite making it unlikely that the Project could be obtained and developed there; potential for high wetland impacts and marginal water availability.
3	Clinton Township West	Plant footprint and associated facilities would require displacement of numerous residences and closure of a County recreation area; the site would not readily accommodate the size and shape of the footprint and associated facilities; marginal water availability.
4	Clinton Township North	High proportion of wetland areas; site is small and mostly located within the environmental setting boundary* for Eveleth Taconite making it unlikely that the Project could be obtained and developed there; marginal water availability.
5	Manganika Lake	Western part of the site is being developed for lake homes; wetland impacts would be significant for both the plant footprint and rail loop, which would encircle Manganika Lake; marginal water availability; and too close to residential developments in Mountain Iron.
6	West Aurora	Water unlikely to be available in required quantities; site cannot accommodate plant footprint and associated facilities while also avoiding large wetlands, waste rock piles, and close proximity to dense residential development.
7	Hoyt Lakes West	Site is partly located within the Mesabi Iron Range iron formation and may conflict with expanded mining operations; State school trust mineral rights cannot be encumbered. Present property owner has refused to consider sale of land to Excelsior.
8	West Two Rivers Res.	Property considered unobtainable because of its location in environmental setting boundary* of U.S. Steel Co.; reservoir and all its surrounding land owned by one industrial entity unwilling to provide access; water availability inadequate without appropriation from that reservoir.
10	Mountain Iron	Site is partly located within the Mesabi Iron Range iron formation and planned for expanded mining operations and also within environmental setting boundary* making it unlikely that the Project could be obtained and developed there; nearby residential development is relatively dense; marginal water availability.
11	Leonidas	Constructability concerns[51]; wetland impacts; marginal water availability; site is within the environmental setting boundary* for Eveleth Taconite making it unlikely that the Project could be obtained and developed there.
12	Buhl	Constructability concerns; pervasive wetland impacts; poor rail access.
13	West Chisholm	Grade required to reach site is not suitable for rail access by unit coal trains.
14	Hibbing Industrial Park	Site was committed by its owner, Iron Range Resources, to the development of a race track at the time of Excelsior's site selection process, therefore unobtainable; site is constrained by Iron Formation to north, residential developments to south, and U.S. 169 to west. Expansion of area to east would impact wetlands and mineral extraction.
16	Minntac Industrial Site	The industrial owner of the site was ultimately unwilling to commit to terms to allow Excelsior to co-locate the IGCC Power Station.
17	United Taconite Industrial Site	The industrial owner of the site was ultimately unwilling to commit to terms to allow Excelsior to co-locate the IGCC Power Station.

[51] Significant portions of property are devoted to "mine dumps," that is, large piles of rocks of mixed size. Construction is difficult due to the inability to ascertain whether or not one has reached bedrock upon which to build foundations. See "Existing Industrial Facilities" under the section entitled "Step Two."

* Detailed investigations of site No. 10 indicated that serious ownership issues were associated with being located in the environmental setting boundary (formerly known as the mine permit boundary) of a company conducting active iron mining operations. Environmental setting boundaries established for such companies were seen thereafter as areas that should be avoided given the ultimate difficulty of obtaining site control. The East Range site was an exception as it was within Cliffs Erie's environmental setting boundary. However, there was no active mining or mining-related land use plans for that site, as evidenced by Excelsior's ability to secure an option. agreement. Excelsior's experience indicated that this was not typical, and that those areas are generally very difficult to obtain.

4. Step Four: Final Evaluation of Practicable Alternatives & Hibbing Industrial Park

In identifying its preferred site for purposes of satisfying the obligation under Minnesota Rule 7849.5220, subpart 1.C, Excelsior analyzed the two practicable alternatives identified above and the Hibbing Industrial Park, even though the Industrial Park site was not available for development.[52] Excelsior quantitatively ranked the three sites using its site selection criteria and the personal knowledge, judgment, and experience of Excelsior's staff who had significant experience in siting large power plants and transmission facilities. The results of these evaluations and rankings were as follows:

1. West Range (Preferred Site)
2. Hibbing Industrial Park
3. East Range (Alternate Site)

The methodology consisted of aggregating the site evaluation criteria into the following eight categories:

- Licensability (whether and under what circumstances a site could be expected to be permitted considering all regulatory requirements, including such key permits as air, NPDES, water appropriation, etc.)
- Water Supply (quantity of water available and ease with which it could be obtained)
- Local community support (general support within the nearby community)
- Industrial Synergies (proximity to nearby industrial facilities with the potential capability of creating some synergy with MEP-I and MEP-II), and
- Transmission/Gas Supply (proximity of site to potential points of interconnection with the regional grid/gas supply lines)
- Local community support (general support within the nearby community)
- Dual Rail (capability to accommodate two rail suppliers providing service from their own track)
- Site Attributes (physical characteristics of site including topographical relief, wetland areas).
- Plant Expansion (capability of accommodating two phases of development)

To assist its siting analysis through use of a "quantifiable" (versus experience/judgmental) mechanism, Excelsior employees with various backgrounds and experience (environment, engineering, development, law, marketing, senior management, and operations) produced a pairwise comparison of the above eight categories. Each person compared each category to each of the other categories to establish the relative weights that each category would be given in the final site ranking analysis. The number of times a specific criterion was identified as being the

[52] Excelsior also included three currently impracticable alternatives in its analysis (the two industrial sites and the Mountain Iron site [Site No. 10]). The results of the six-site analysis are provided in Excelsior's Environmental Supplement at Section 1.13.1.3.

most important in any pairwise comparison was totaled and divided by the total number of possibilities to establish such relative weights. Table 8 shows the weights assigned to each of the criterion.

Table 8. Weights Assigned to Site Evaluation Criteria By Excelsior Employees

Criterion	Relative Weight (%)
Licensability	20
Water Supply	19
Industrial Synergies	13
Transmission/Gas Supply	11
Local community support	10
Site Attributes	10
Dual Rail	9
Plant Expansion	8
Total	100

Each of the three sites identified in Table 9 was assigned (by each employee participating in the ranking process) a score on a scale of 1 to 100 for each criterion. The resulting scores were weighted by the factors provided in Table 8 and are provided in Table 9.

Table 9. Final Site Ranking by Excelsior Employees: Weighted Totals

Criterion	Site No. 15 (West Range Site)	Site No. 14 (Hibbing Ind. Park)	Site No. 9 (East Range Site)
Licensability	118	105	99
Water Supply	106	95	89
Industrial Synergies	12	38	49
Transmission/Gas Supply	57	54	43
Local community support	54	49	57
Site Attributes	55	52	52
Dual Rail	54	45	37
Plant Expansion	46	38	39
Total	**502**	**476**	**465**

Following the site ranking and evaluation, Excelsior proceeded to make its final selection of preferred and alternate sites. Two critical factors considered at this stage were site selection rank and the ability to obtain timely site control. The West Range Site ranked highest for these two factors and was selected as Excelsior’s preferred large electric power generating plant site for the following principal reasons:

- It received the highest ranking score in Excelsior's quantitative analysis.
- It lies outside the Lake Superior Basin watershed, thereby facilitating permitting and licensing.
- Plant make-up water is readily available from the Canisteo Mine Pit ("CMP") and Hill-Annex Mine Pit Complex. Continually rising water levels in these abandoned pits posed a significant concern for local communities and the MDNR, respectively, and use of water from such pits provided a solution to such concerns. Alternative sources of water were also available to the site and in likely quantities to supply any shortfall that could be encountered in supplying the Mesaba One and Mesaba Two developments via mine pit waters alone.
- The site is fairly remote, with only a small number of residential property owners potentially impacted, most of whom use the property on only a seasonal basis.
- The site and much of the land surrounding it had been zoned for industrial development by regional governmental bodies.
- The site is located in close proximity to adequately sized natural gas pipelines, existing HVTL corridors, and has the capability of being serviced by two rail providers.
- Excelsior was able to obtain an option to purchase the site, thereby providing immediate site control.
- Preliminary contacts with Itasca County, city officials from nearby communities, and the Itasca Development Council indicated broad support for the site and the project.

The Hibbing Industrial Park site was originally considered as the alternative site because of the following advantages:

- The location is in an area that local communities had identified and set aside for industrial development. IRR and St. Louis County both played important roles in assembling a land package of some 850 acres, with additional acreage appearing to be available. Impacts on local residences were deemed manageable and local communities appeared supportive. Additionally, a new Central Range water treatment facility has been proposed for the area.
- Adequate make up water appeared to exist in local mine pits.
- Although the site is located within the Lake Superior Basin watershed, it appeared that the City of Hibbing's POTW may be of sufficient size to handle discharges and potentially qualify for a variance from the rigid standards imposed on discharges of mercury by regulations implementing the Great Lakes Initiative.
- The site is located in relatively close proximity to two rail service providers, existing transmission line corridors, and a large industrial facility.

The Hibbing Industrial Park site was under the control of the IRR, but at the time that Excelsior finalized its site selection process in August of 2005, it was not reasonably obtainable by Excelsior for development of the Project due to conflicting development plans and commitments for a race track at the site. These were formalized in a Memorandum of Understanding ("MOU") between the Office of the Commissioner of the Iron Range Resources and Rehabilitation (i.e., the IRR), the County of St. Louis, the Cities of Hibbing and Chisholm, and the Town of Balkan that established their intention to support, through both pro-rata financial assistance and subsidized property lease or transfer, the development of a multi-venue motor sports complex at the Hibbing Industrial Park. The document provided for the execution of a Development Agreement and Financing Plan at any time through September 4, 2006, a date that was subsequently extended by an additional year. The language of the MOU suggested the great importance that numerous governmental entities attached to this site and development, several of which possess important oversight capacities relevant to site development as noted in the following commitment:

> "Each Party by executing this Agreement agrees and commits to work diligently and in good faith with the other Parties subscribed below to affect the Project and its associated documentation in an efficient and expeditious manner."

While Excelsior was allowed to conduct some preliminary site investigatory work, it was unable to obtain any rights to utilize the site within the timeframe in which Excelsior conducted its site selection process. The extended MOU expired more than two years after Excelsior made its final selection. Over the two intervening years, project development considerations and regulatory processes, including moving through the Minnesota Power Plant Siting Act process, have rendered this selection irrevocable. Requiring Excelsior to completely restart its project development process after two years to consider a previously unavailable site would cause logistical problems that would completely frustrate the Project's purposes and would establish an untenable precedent[53]. Therefore, a site would have to have been reasonably obtainable in August 2005 in order to be considered available to accomplish the Project's purpose and need.

Therefore, the East Range Site was viewed as the best alternate site to evaluate under the Minnesota Power Plant Siting Act process. The rationale for utilizing the East Range Site as the alternate to the West Range Site included the following:

- IRR has secured through negotiation in the LTV bankruptcy proceeding (LTV was the original landowner of property now occupied by Cliffs-Erie ("CE")) an option to acquire land on LTV property near East Range. In a June 15, 2004 letter to U.S. Secretary of Energy Spencer Abraham, the Commissioner of IRR indicated that the agency would convey its option to Excelsior in support of the Mesaba Energy Project.
- Adequate make-up water appeared to exist in local mine pits and other surface waters (Colby Lake and Whitewater Reservoir) in amounts sufficient to support Phase I and Phase II facilities.
- The closest residential neighbors were more than 0.5 miles from the site.
- The site provided ready access to infrastructure needed to support plant operations.

The East Range Site was considered to be less suitable than the West Range Site for the following reasons:

- The generator outlet HVTL facilities required are longer, the n-1 contingency dictating the use of two separate corridors, and more line losses occur over the increased distance.
- The site is within the Lake Superior Basin watershed and subject to regulations implementing the Great Lakes Initiative.
- The Hoyt Lakes POTW would require an expansion to accommodate discharges of cooling tower blowdown.
- Only one rail service provider appeared to be feasible, and the potential use of a rail-connected Lake Superior port appeared costly and uncertain from an engineering perspective.
- The site was closer to Class I areas, thereby creating the potential for increased adverse impacts on air quality related values, including a potential increase in visibility impacts.

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[53] If a project proponent was required to revisit sites that had become available after it had concluded its environmental review process, the site consideration process would never be completed.

Figures 1-29

See accompanying narrative in Exhibit I

Exhibit 1: Narrative for Figures

Narrative for Figures 1-23

Figure 1: An overview of the TTRA showing the area within which Excelsior's search for practicable alternatives for siting Mesaba One and Mesaba Two was focused. The cross hatched region generally represented areas within the TTRA where access to sufficient water supplies were available, where access to existing rail tracks and HVTL corridors were feasible, and where impacts to wetlands could be minimized.

Figure 1A: An overview map of the TTRA showing the general location of the area shown in Figures 2 through 23. This figure also identifies areas within the TTRA that have been designated "environmental setting boundaries" for various mining operations.

Figure 2: The western-most portion of the TTRA, in the vicinity of La Prairie and Coleraine, MN, is highly residential and generally unsuitable for siting a large power plant. Only one location appeared to have some potential for low wetland impacts, but the plat map revealed that no large blocks of land were available there, and the close proximity to resort homes on Trout Lake pose insurmountable issues precluding further consideration of the site.

Figure 3: To the east, the next portion of the TTRA, between Coleraine and Pengilly, MN, contains a number of promising-looking sites, but only the preferred West Range site is worthy of further consideration. To the west of that site, the unfavorable topography and the difficulty of routing rail access around the Canisteo Mine Pit eliminates that area from consideration. The area to the east of the preferred West Range site is owned and proposed for use by another industrial entity. The region south of US-169 is covered with lakes and wetlands, and the three areas identified are of insufficient size to site a power plant without having significant wetland impacts.

Figure 4: The portion of the TTRA between Pengilly, MN and Keewatin, MN is much like the previous region. The area north of US-169 is owned and proposed for use by another industrial entity. The region south of US-169 is covered with lakes and wetlands, and is also owned and used by other industrial entities.

Figure 5: The portion of the TTRA between Keewatin, MN and Hibbing, MN is much like the previous region. Nearly the entire area is owned and used by other industrial entities.

Figure 6: The portion of the TTRA just south of Hibbing, MN is dominated by wetlands. The only area that appears to have less wetland is residential and lacks large blocks of available land, making it unsuitable for siting a power plant.

Figure 7: The portion of the TTRA in the vicinity of Chisholm, MN and Buhl, MN contains three of the alternative sites identified in the site selection process. Aside from those areas, the Iron Formation precludes development in much of the region. The area northeast of Chisholm

appears promising, but GIS software does not reflect that the nearby rail line has since been removed, rendering that location beyond all the three mile rail line buffers.

Figure 8: The portion of the TTRA between Kinney, MN and Virginia, MN contains two of the alternative sites identified in the site selection process. Aside from those areas, the Iron Formation precludes development in much of the region. Otherwise, the region north of Virginia is largely controlled and used by industrial entities, but the availability of water is unlikely to be sufficient anyway. The plat map reveals that the area southeast of Kinney contains no large blocks of land suitable for siting a power plant.

Figure 9: The portion of the TTRA between Virginia, MN and Biwabik, MN is dominated by the Iron Formation. Otherwise, the area just west of Gilbert is controlled and used by an industrial entity. East of Gilbert, water availability to the north of the Iron Formation is insufficient for siting a power plant, and the region south of the Iron Formation is dominated by wetlands and residential developments, leaving no areas suitable for power plant siting.

Figure 10: The portion of the TTRA between Biwabik, MN and Hoyt Lakes, MN contains three of the alternative sites identified in the site selection process, including the alternative East Range site. Aside from these sites, the region is dominated by the Iron Formation, residential development, and wetlands that preclude any other sites from being considered. East of Hoyt Lakes, water availability is insufficient for siting a power plant.

Figure 11: The portion of the TTRA in the vicinity of Eveleth and Leonidas, MN contains five of the alternative sites identified in the site selection process. Outside of these locations, the region is dominated by the Iron Formation, residential development and wetlands, which preclude any other sites from being considered for siting a power plant.

Figure 12: The portion of the TTRA in the vicinity of Forbes, MN contains one of the alternative sites identified in the site selection process. Aside from this location, the region is dominated by wetlands and residential development, which preclude other sites from being considered for siting a power plant. The plat map revealed that the area southwest of Forbes and southeast of the St. Louis River contained no large blocks of available land.

Figures 13-18: The large southern portion of the TTRA along the DMIR and DWP rail lines contains vast amounts of wetlands, while generally lacking sufficient water availability for siting a power plant. The few areas with less wetland area lack large blocks of available land.

Figure 19: The southern-most portion of the TTRA in the vicinity of Brookston, MN is dominated by wetlands and residential development. South of the St. Louis River, the Fon du Lac Reservation would complicate power plant siting beyond the issues cited above. The area north of the confluence of the St. Louis and Cloquet rivers would result in significant wetland impacts, due to rail access and because aesthetic considerations would force some setback from the river.

Figure 20: The southwestern-most portion of the TTRA to the west of Brookston, MN contains significant residential development and no large blocks of available land suitable for siting a power plant.

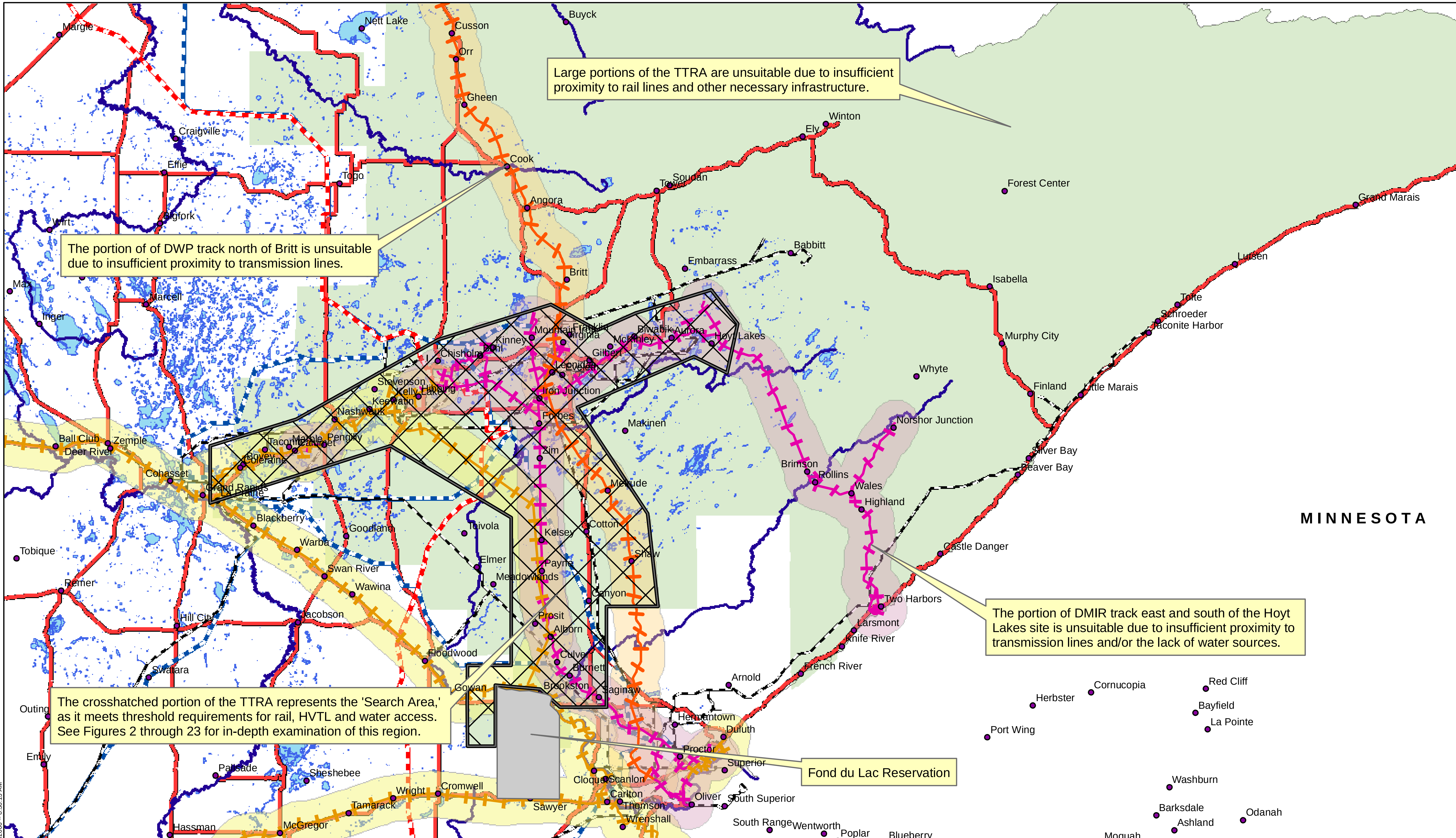
Figure 21: The small portion of the TTRA near Swan River, MN contains significant wetlands, residential development and no large blocks of available land suitable for siting a power plant.

Figure 22: The portion of the TTRA along the BNSF rail near Casco, MN is dominated by wetlands. The two areas with less wetland are either controlled by another industrial entity or lack large blocks of available land.

Figure 23: The portion of the TTRA east of Hibbing and south of Buhl, MN contains two of the alternative sites identified in the site selection process. Aside from these locations, the region is dominated by residential development and wetlands, and sufficient water availability is unlikely.

Narrative for Figures 24-29

Figures 24 through 29 illustrate how Excelsior screened alternative site locations for wetland impacts using the IGCC Power Station footprint and National Wetland Inventory maps. The results of this screening analysis are presented in Table 5. The methodology used in the screening analysis is presented in the text immediately following that table.



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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Lakes

Appendix F

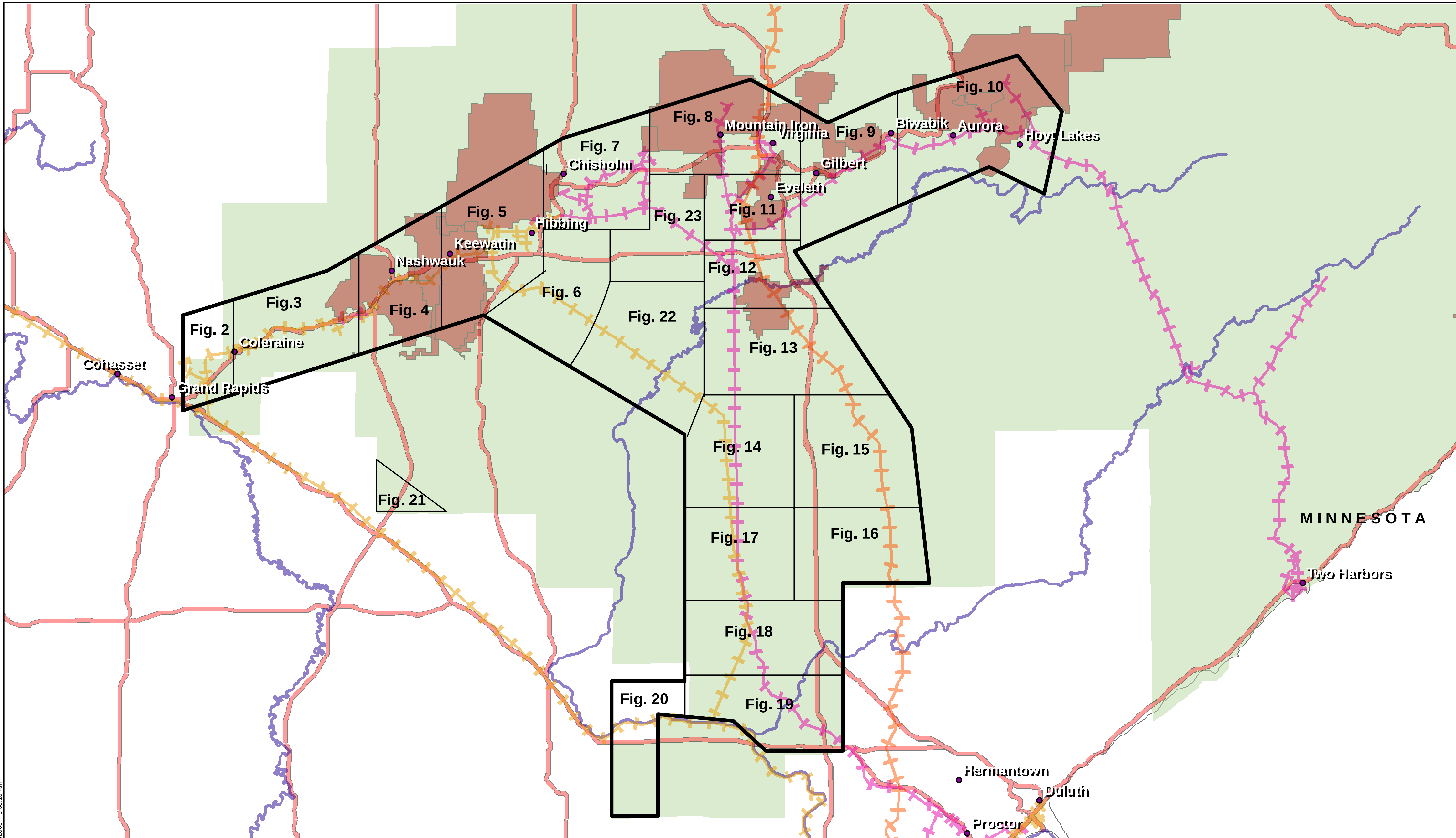
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 1: Overview of TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 9 Miles



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Taconite Tax Relief Area

May 2008

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- Mine Environmental Setting Boundaries

Appendix F

Source: ESRI, Excelsior Energy, and SEH.
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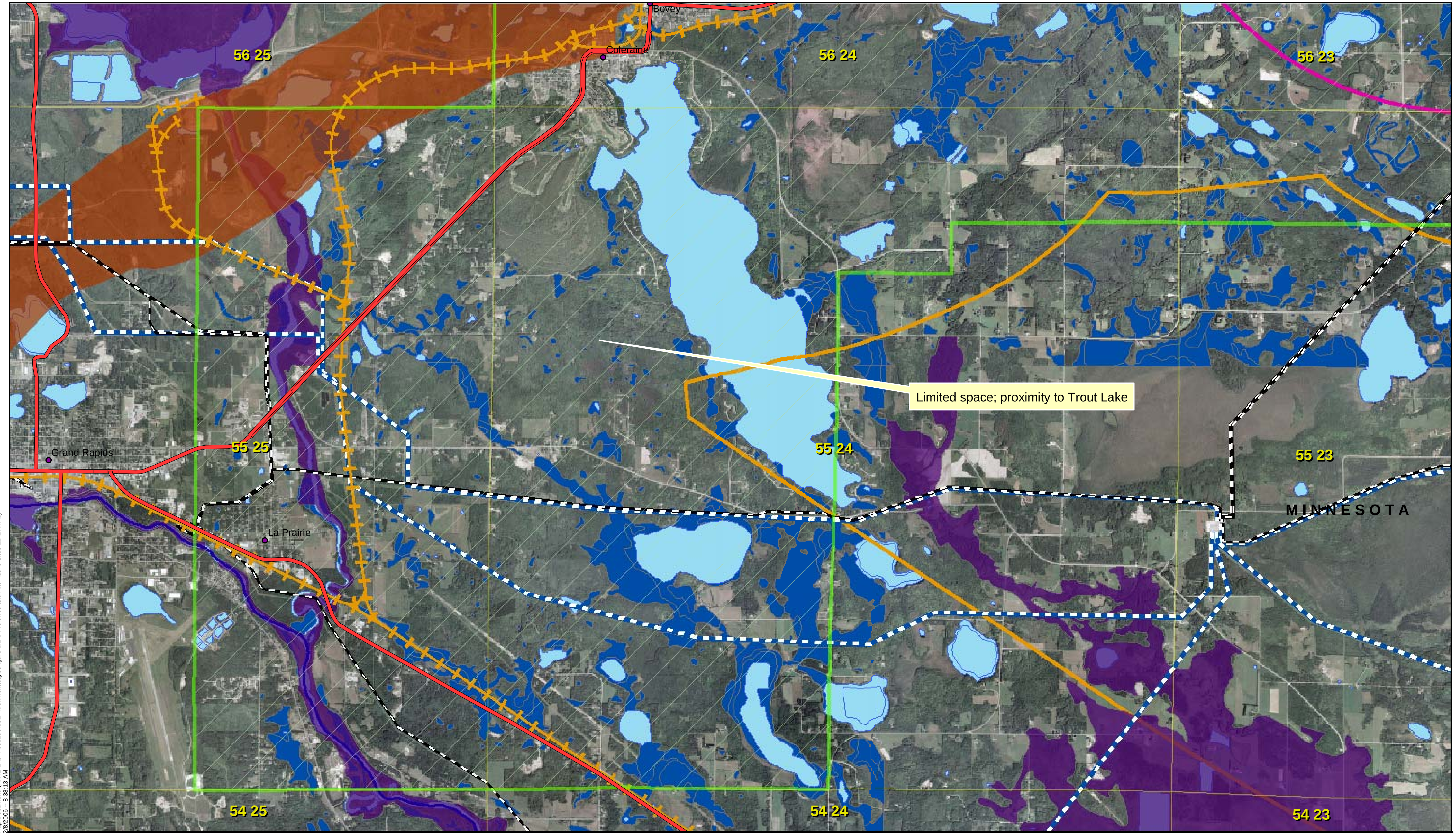
Figure 1A: Figure Key for Site Selection Process

UTM Zone 15 Meters
NAD83

N W E S

0 9 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

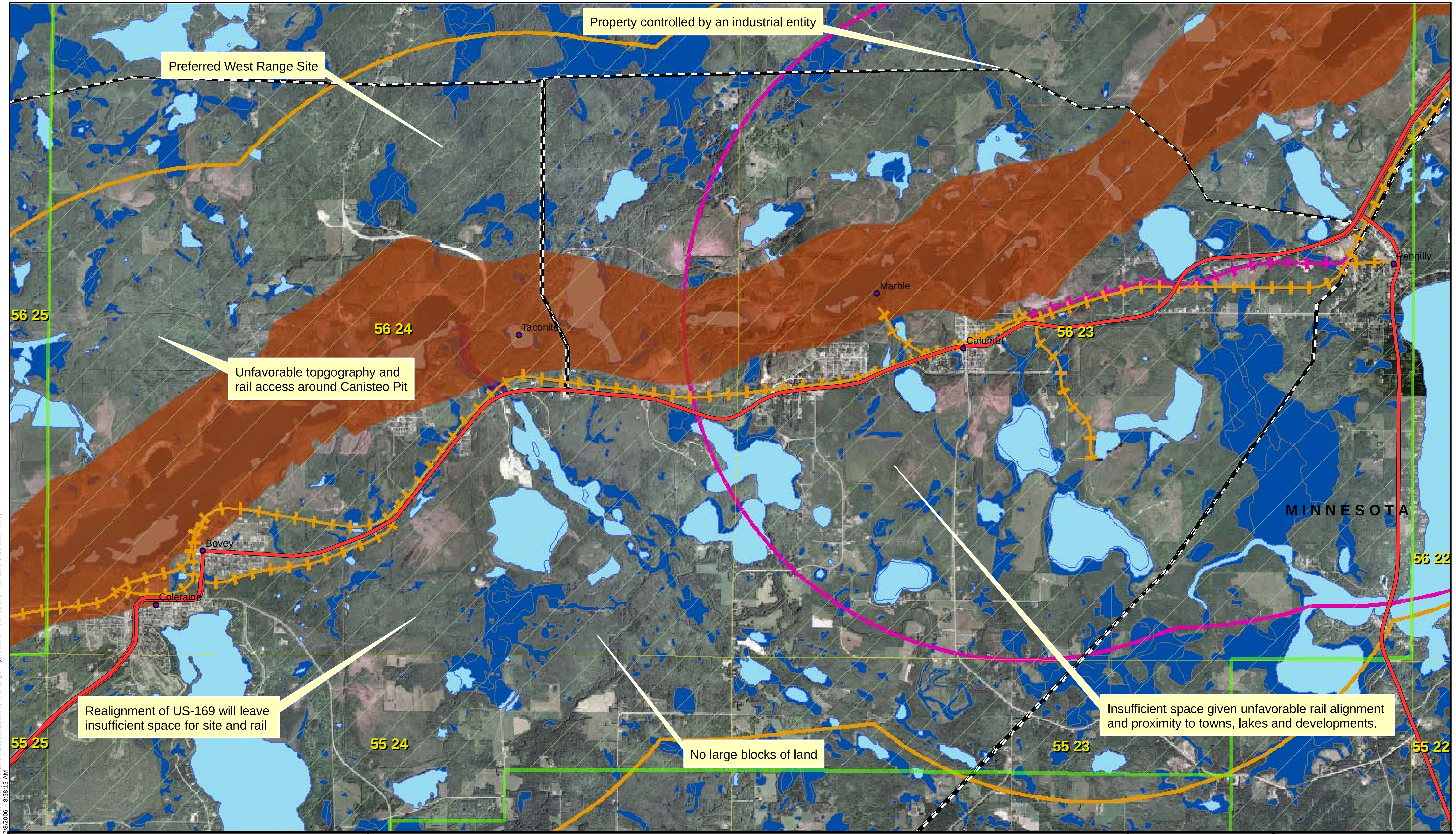
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 2: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

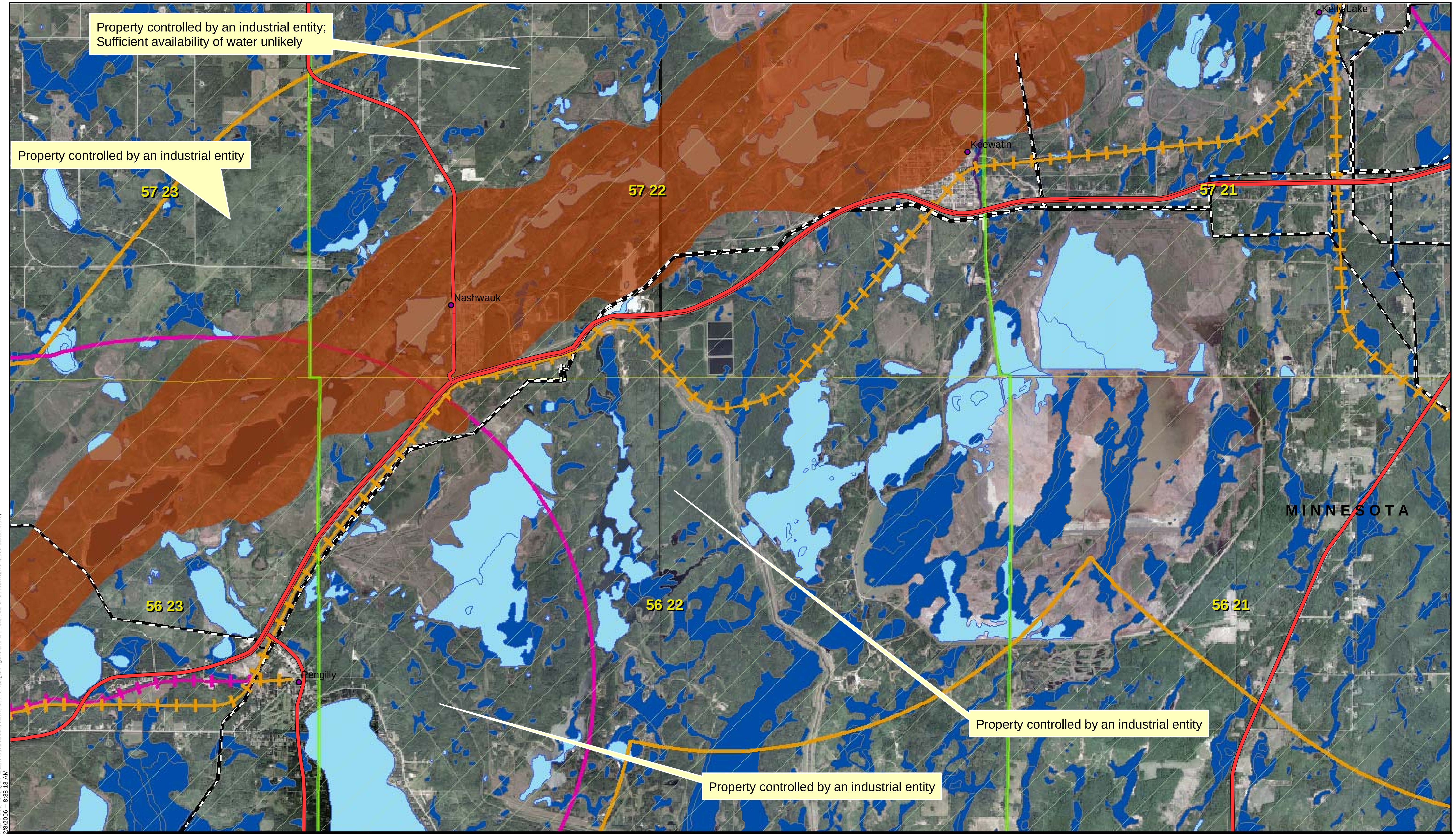
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 3: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

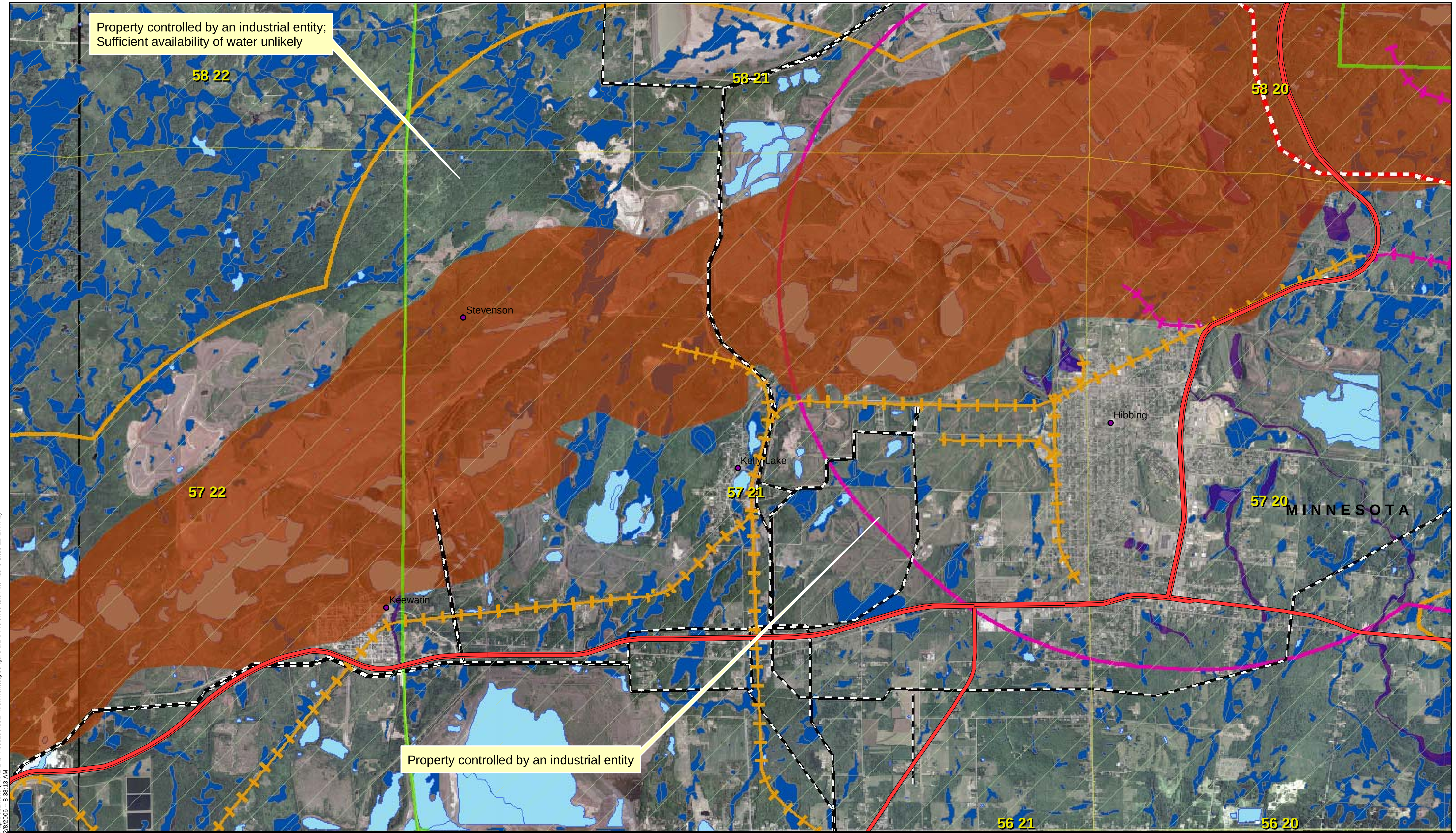
Source: ESRI, Excelsior Energy, and SEH.

Figure 4:
TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

Cities	BNSF Rail	HVTL_230_kV	Buffer of BNSF	Floodplains
Highways	DMIR Rail	HVTL_115_kV	Buffer of DMIR	Iron Formation
Rivers	DWP Rail	HVTL_345_kV	Buffer of DWP	Lakes
TTRA		HVTL_500_kV		Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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Figure 5: TTRA Site Selection

UTM Zone 15 Meters NAD83

N W E S

0 1 Miles

Appendix F

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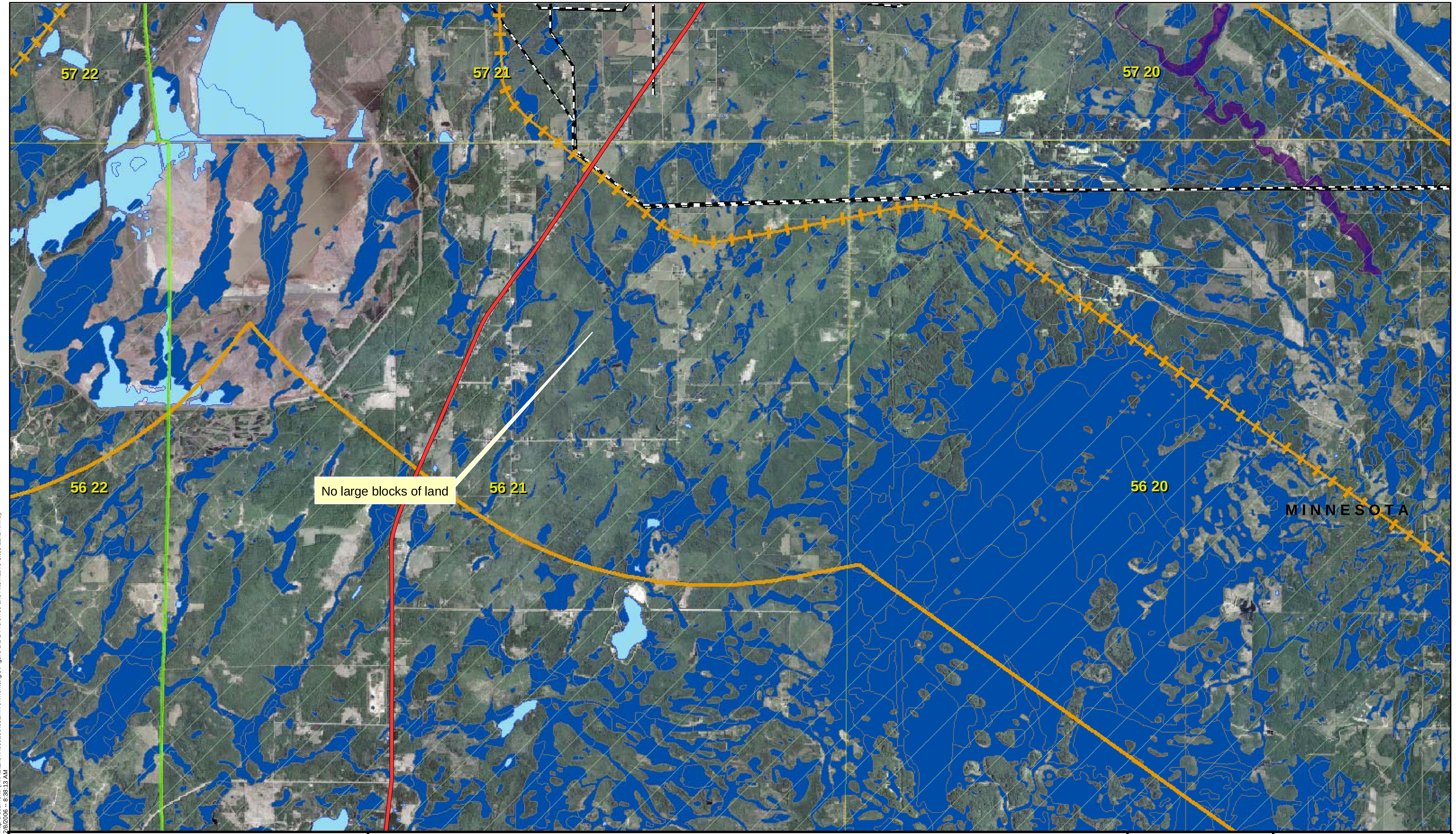

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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

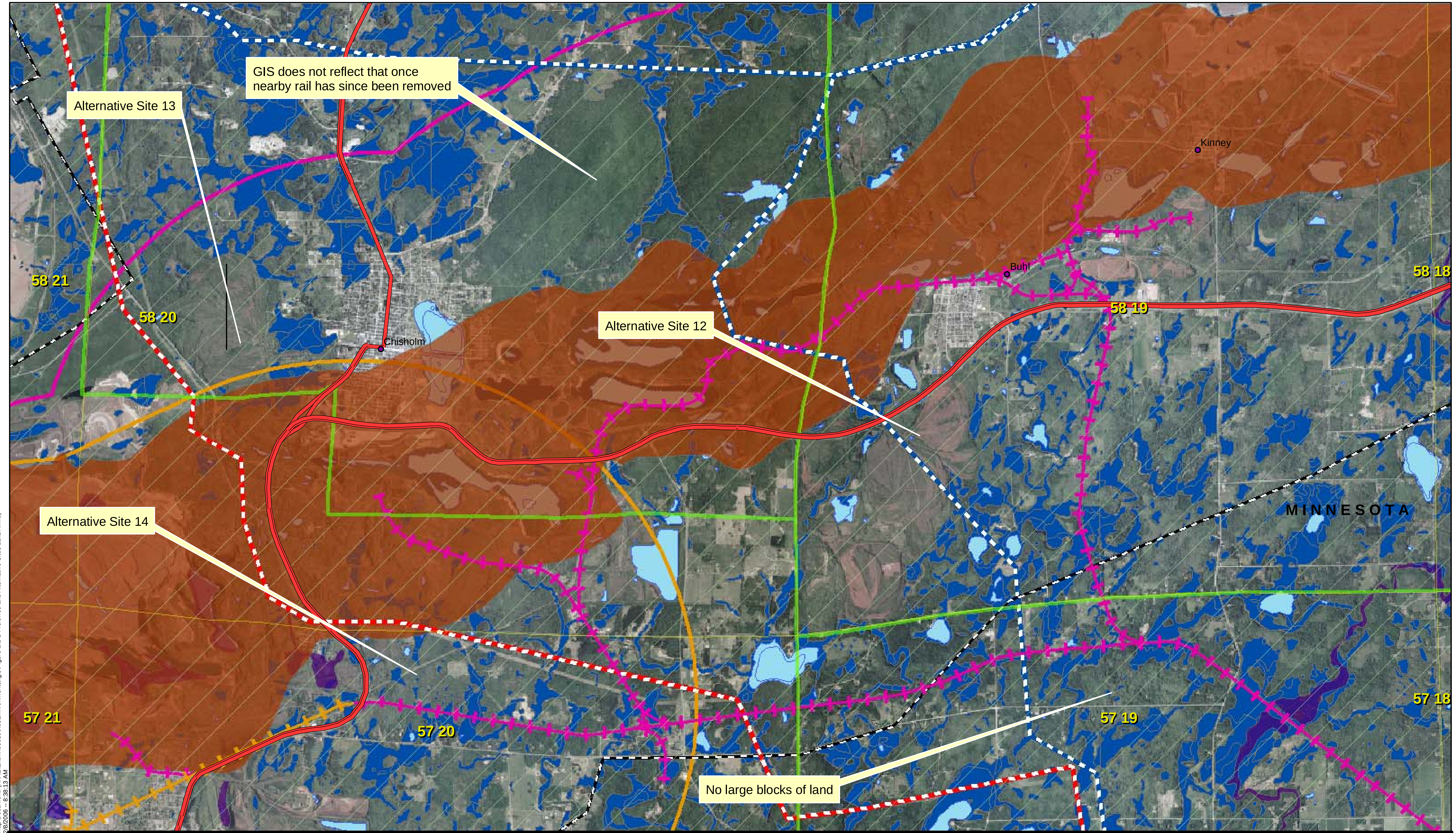
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 6: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N E S W

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

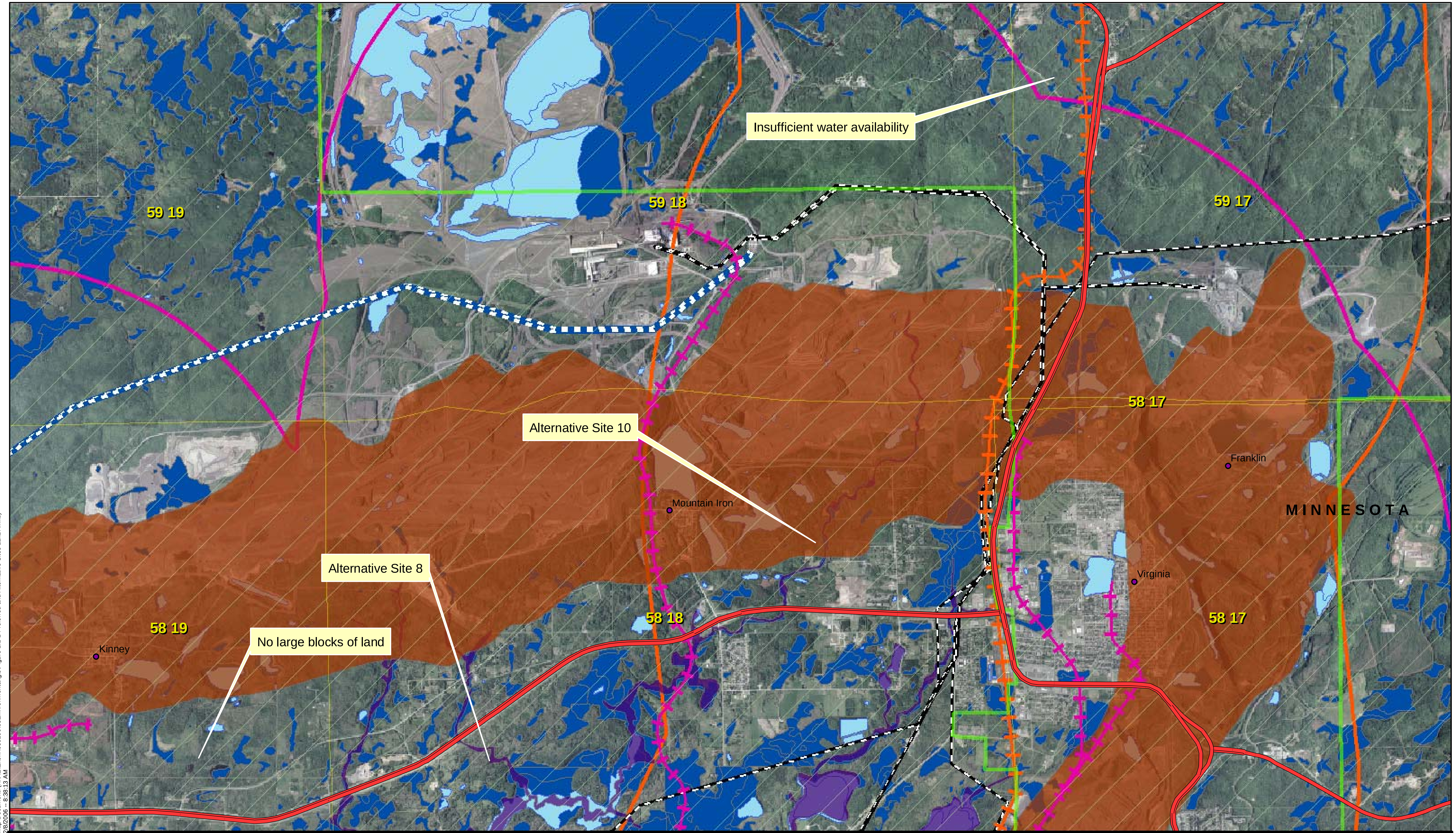
Source: ESRI, Excelsior Energy, and SEH.

Figure 7: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

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- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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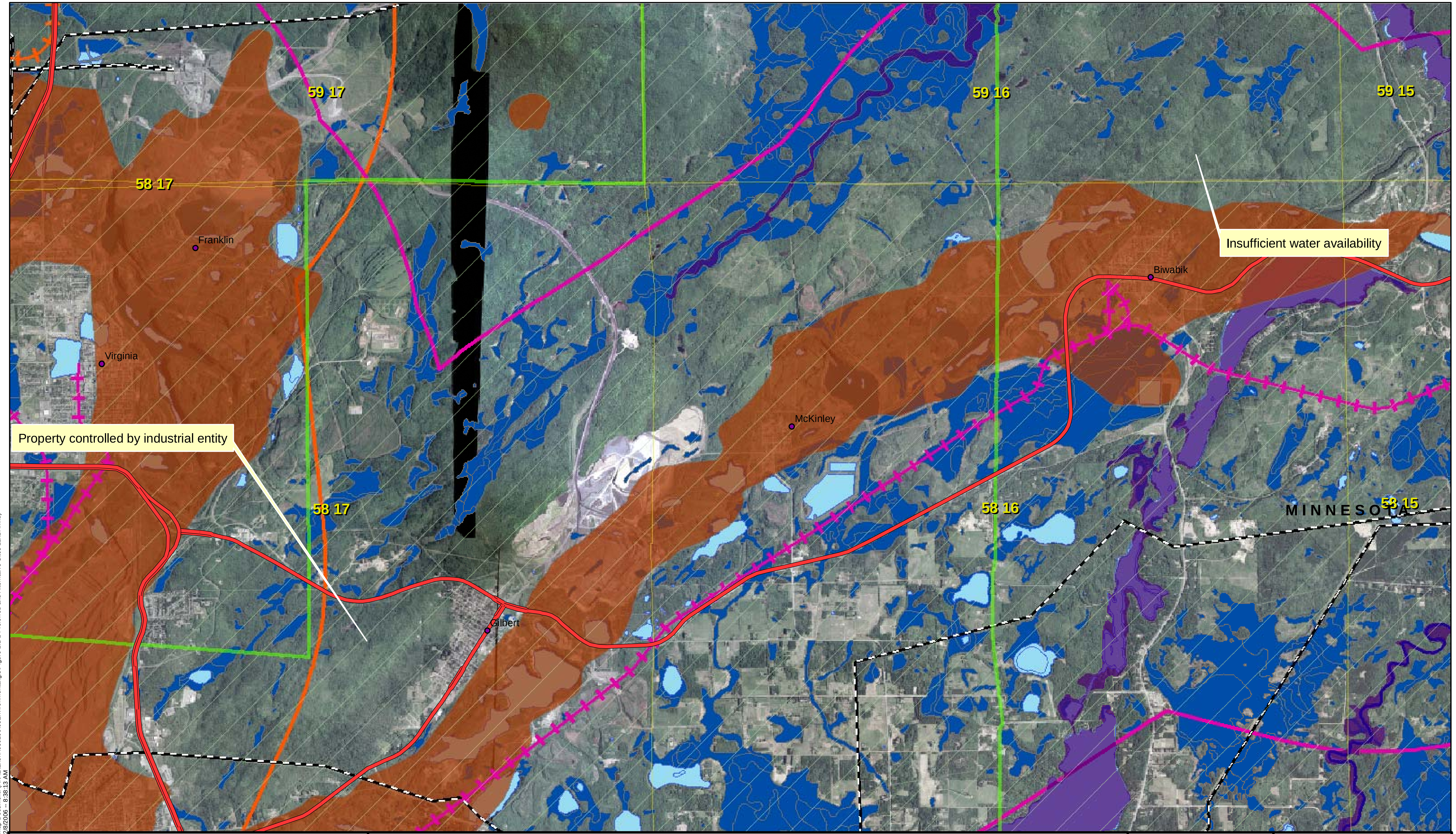
Figure 8:
TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

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- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

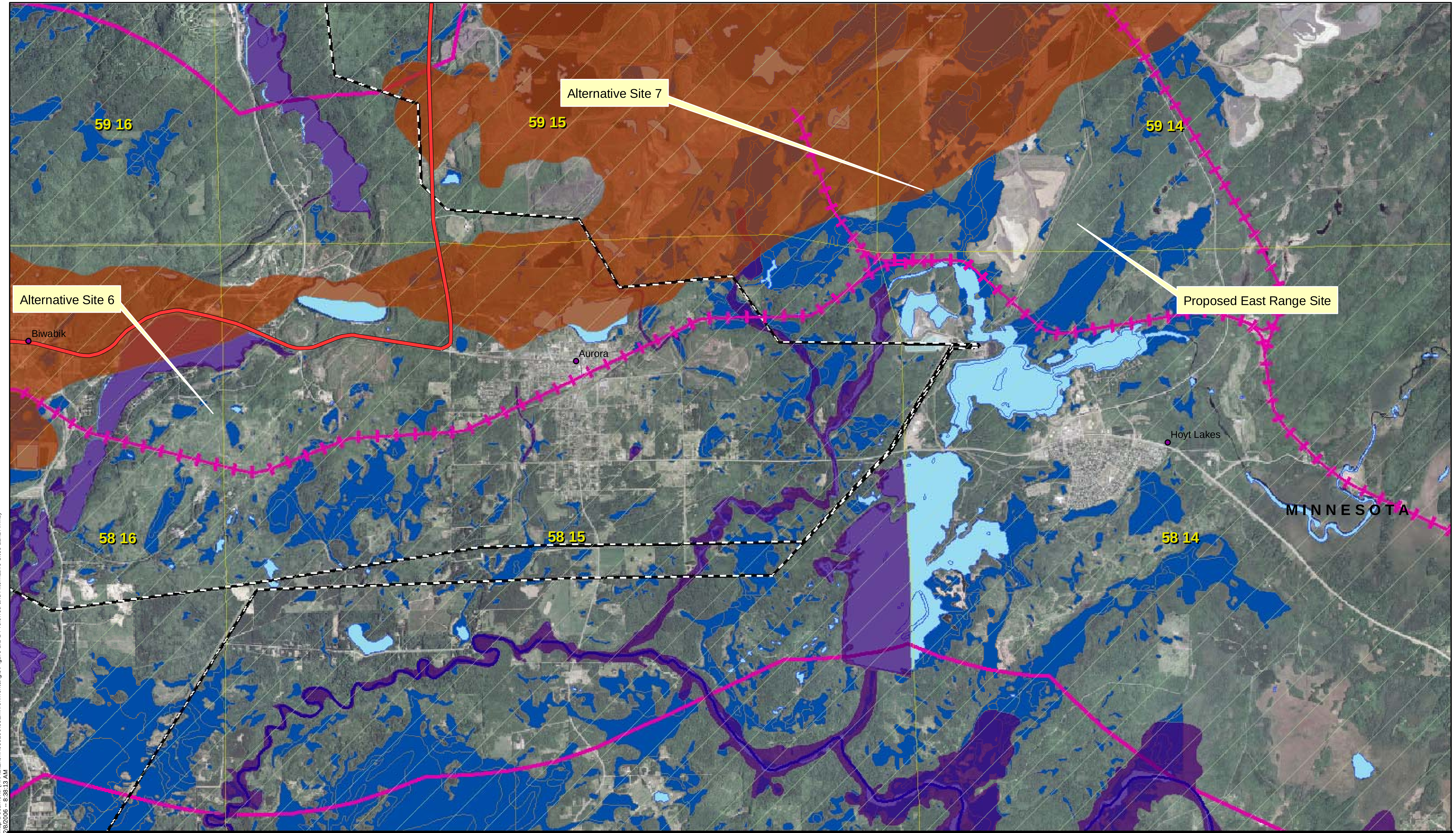
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 9: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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- HVTL_230_kV
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- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Appendix F

Source: ESRI, Excelsior Energy, and SEH.

Figure 10: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N
W E
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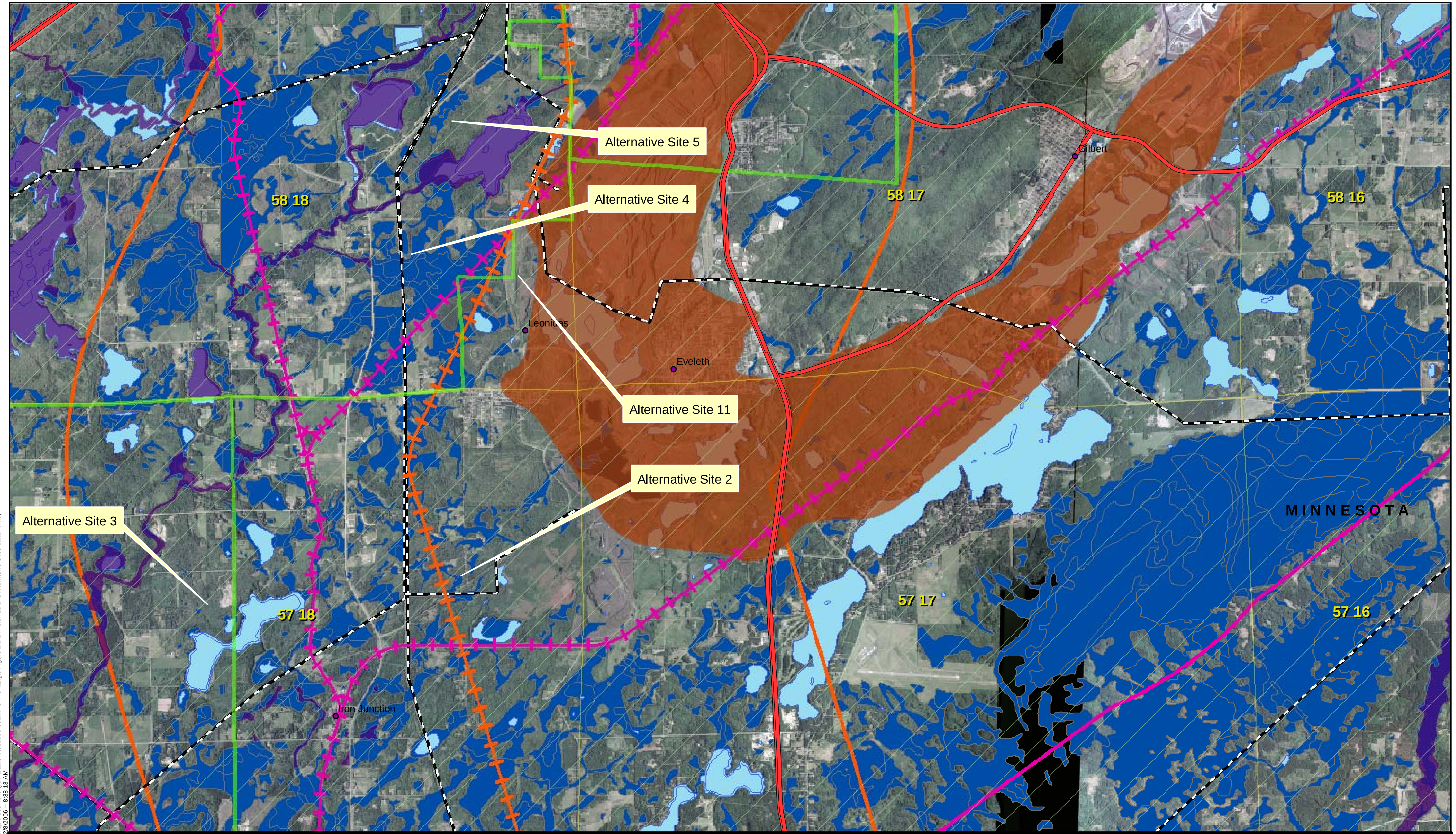
0 1
Miles



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Taconite Tax Relief Area

January 2007

Legend

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- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.

Figure 11: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles

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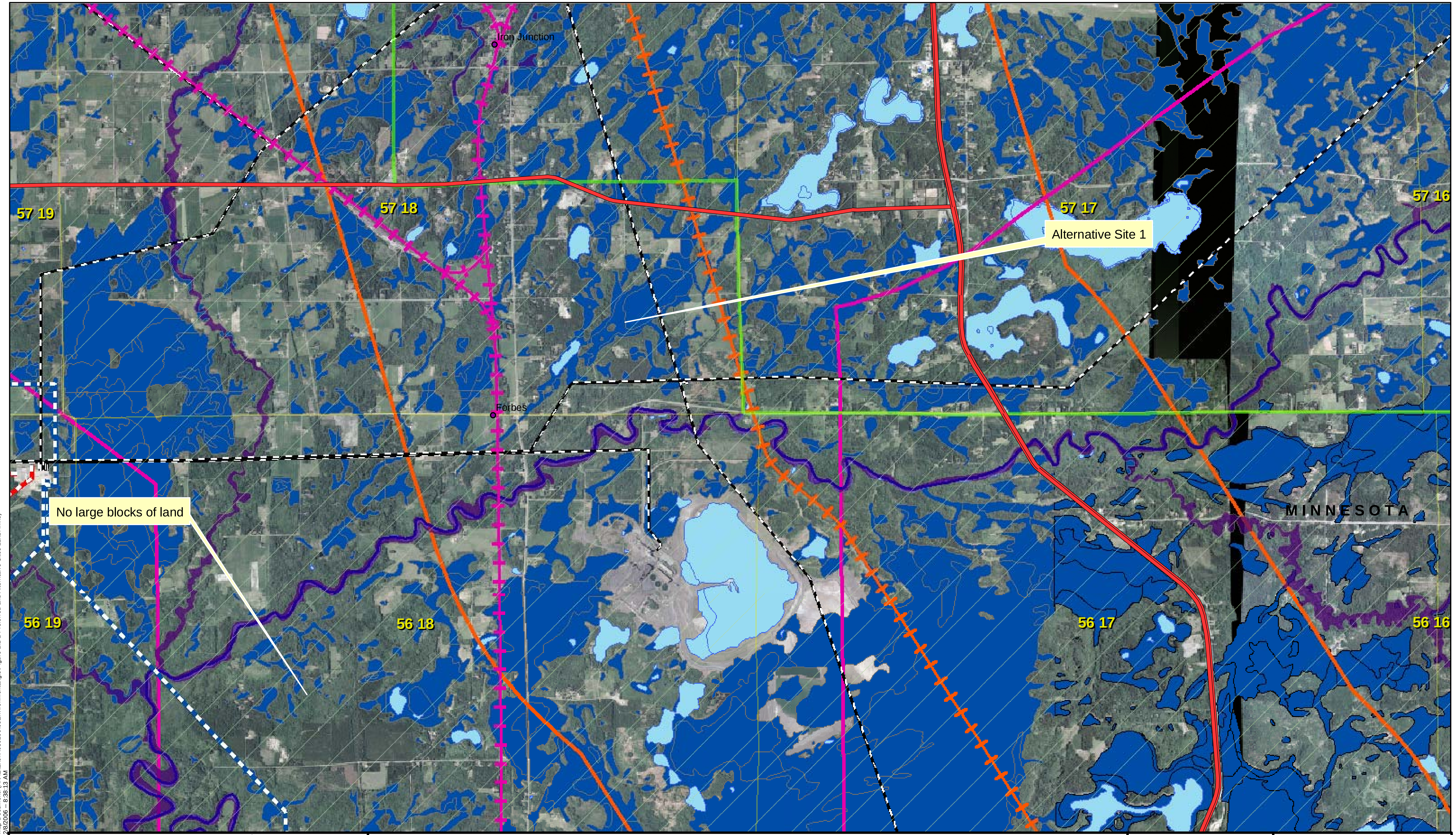

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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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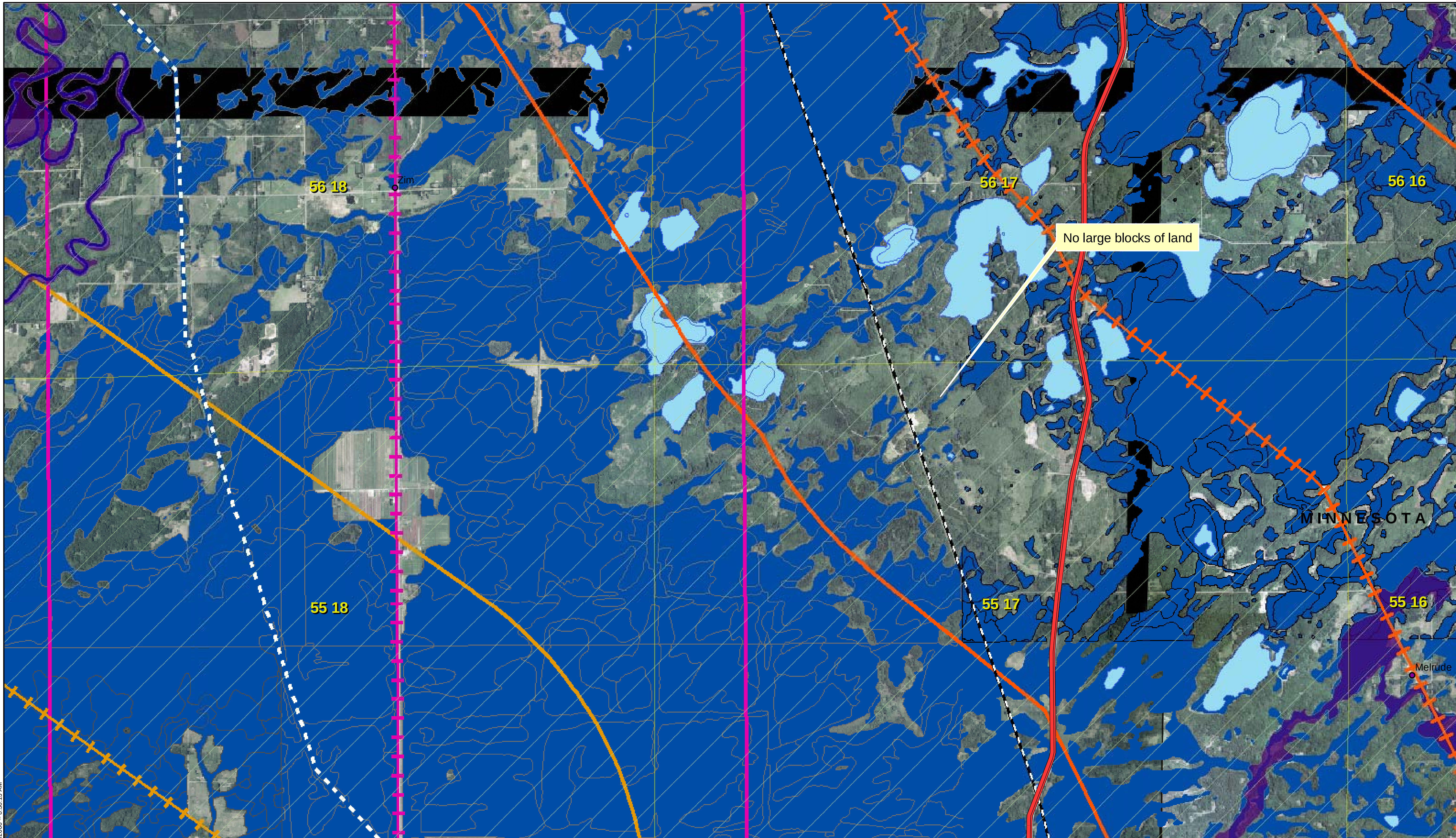
Figure 12: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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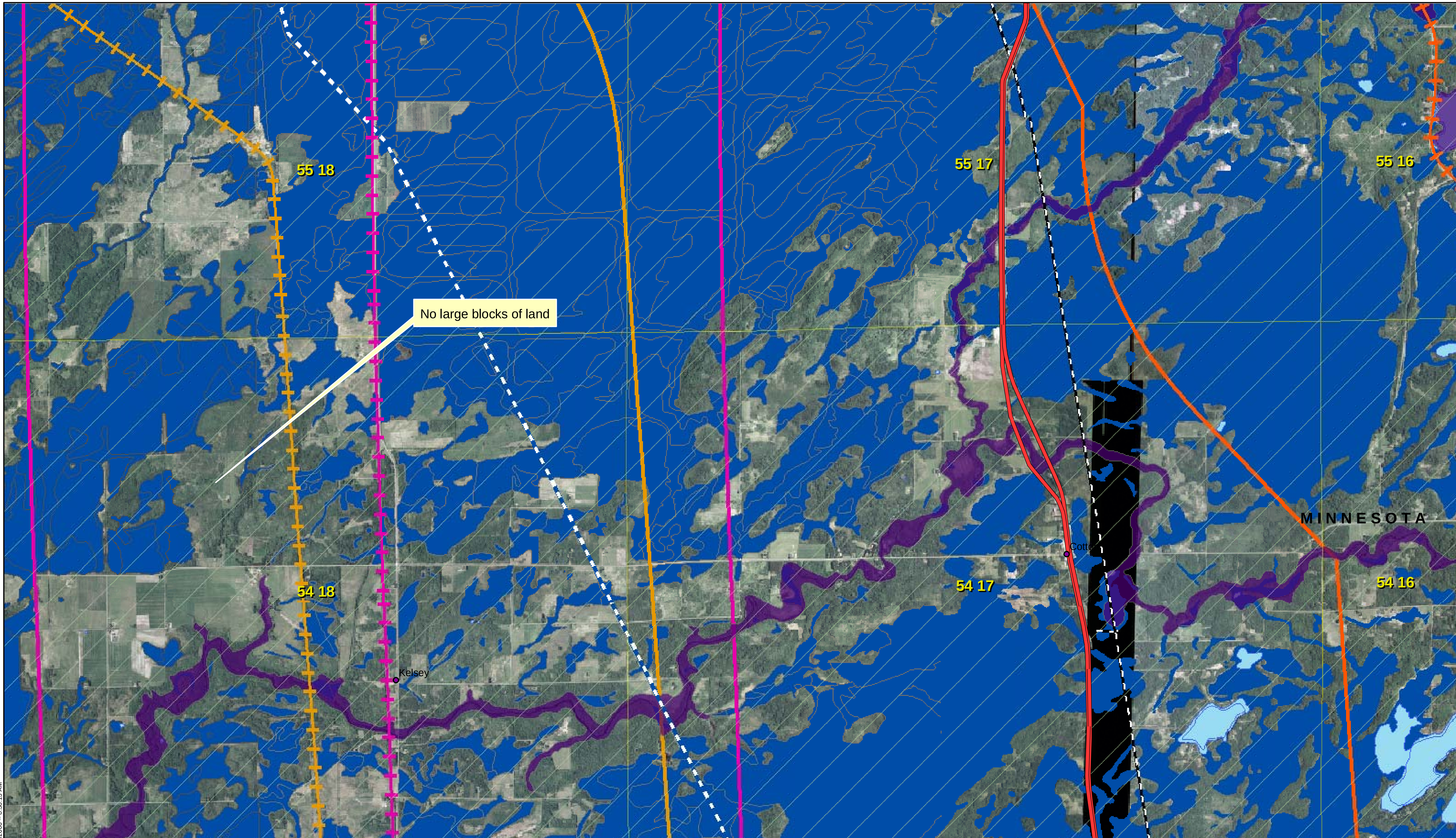
Figure 13: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N E S W

0 1 Miles



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- BNSF Rail
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- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Appendix F

Source: ESRI, Excelsior Energy, and SEH.
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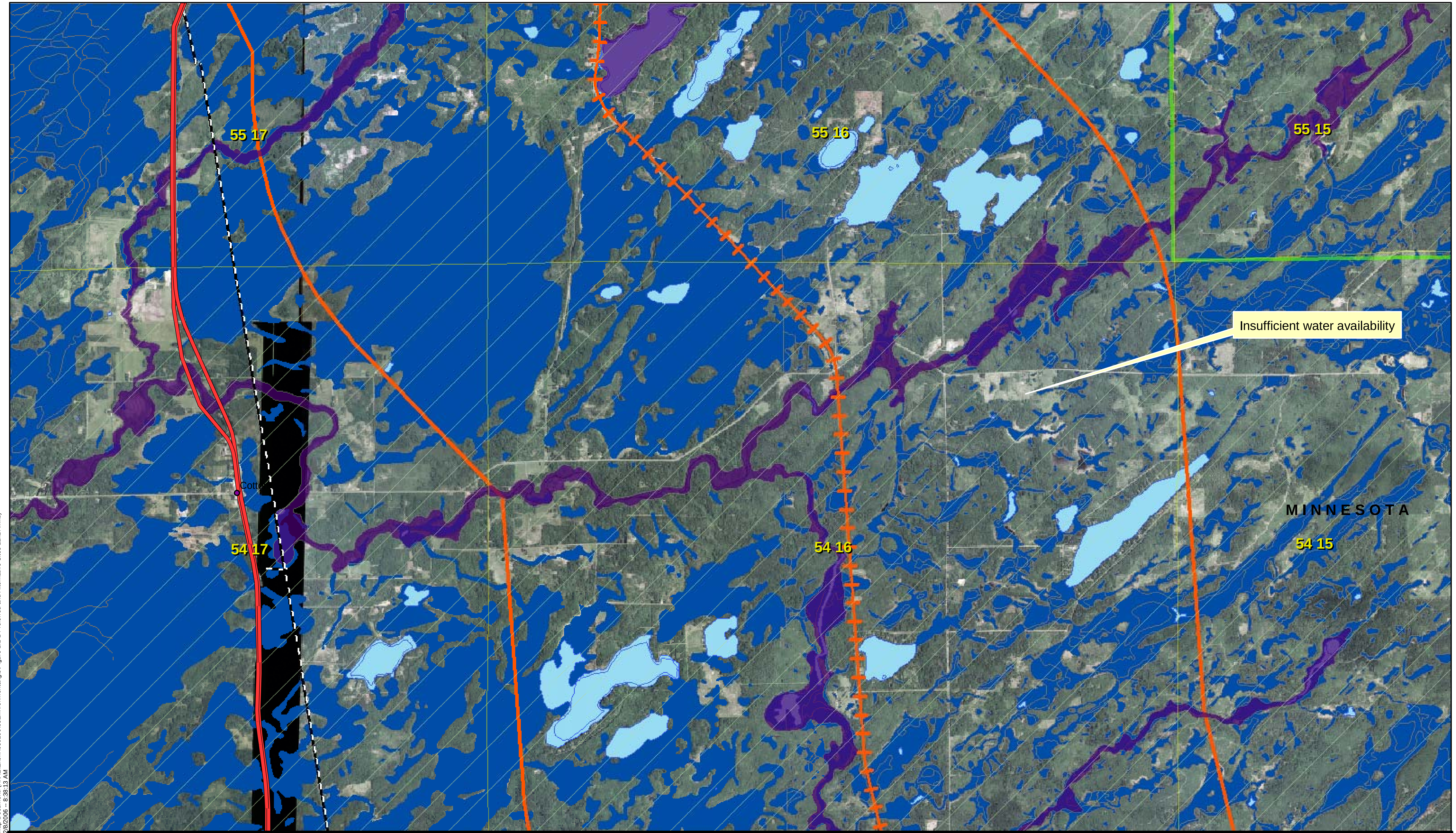
Figure 14: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Phone 952.847.2360 Fax 952.847.2373

Taconite Tax Relief Area

January 2007

Legend

Cities	BNSF Rail	HVTL_230_kV	Buffer of BNSF	Floodplains
Highways	DMIR Rail	HVTL_115_kV	Buffer of DMIR	Iron Formation
Rivers	DWP Rail	HVTL_345_kV	Buffer of DWP	Lakes
TTRA		HVTL_500_kV		Wetlands

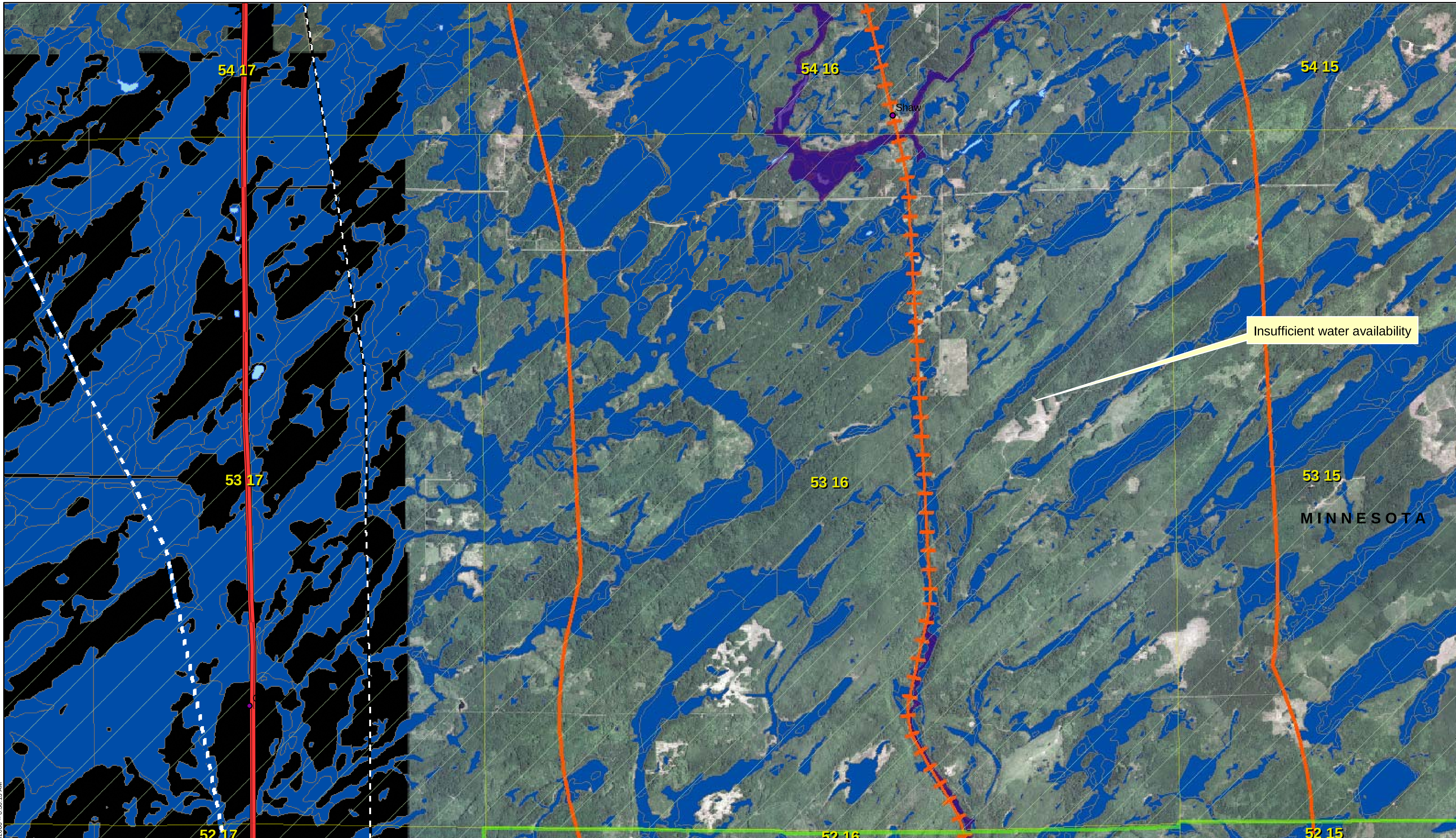
Source: ESRI, Excelsior Energy, and SEH.

Figure 15: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N
W E
S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

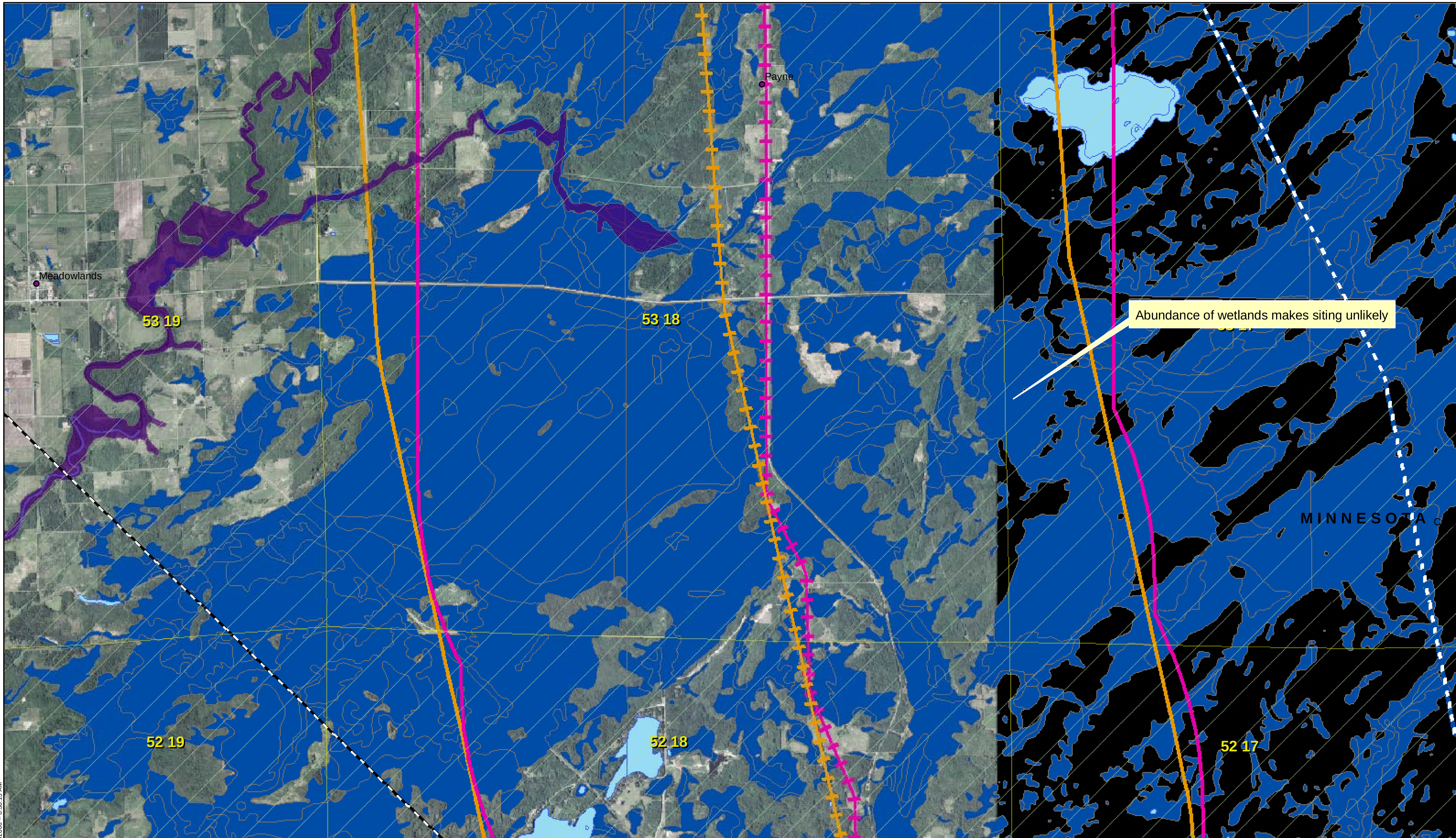
Source: ESRI, Excelsior Energy, and SEH.

Figure 16: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

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- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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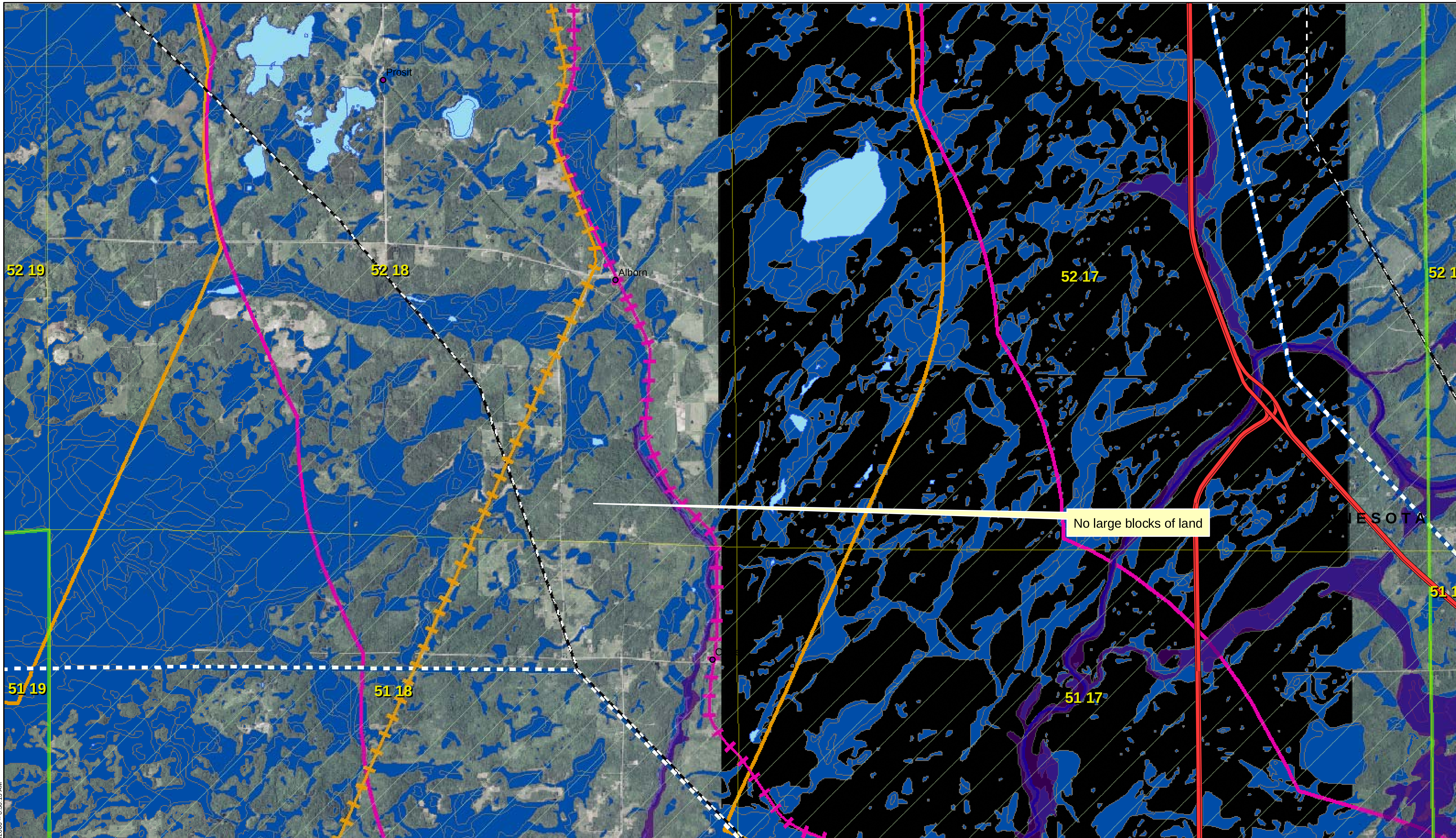
Figure 17: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Source: ESRI, Excelsior Energy, and SEH.
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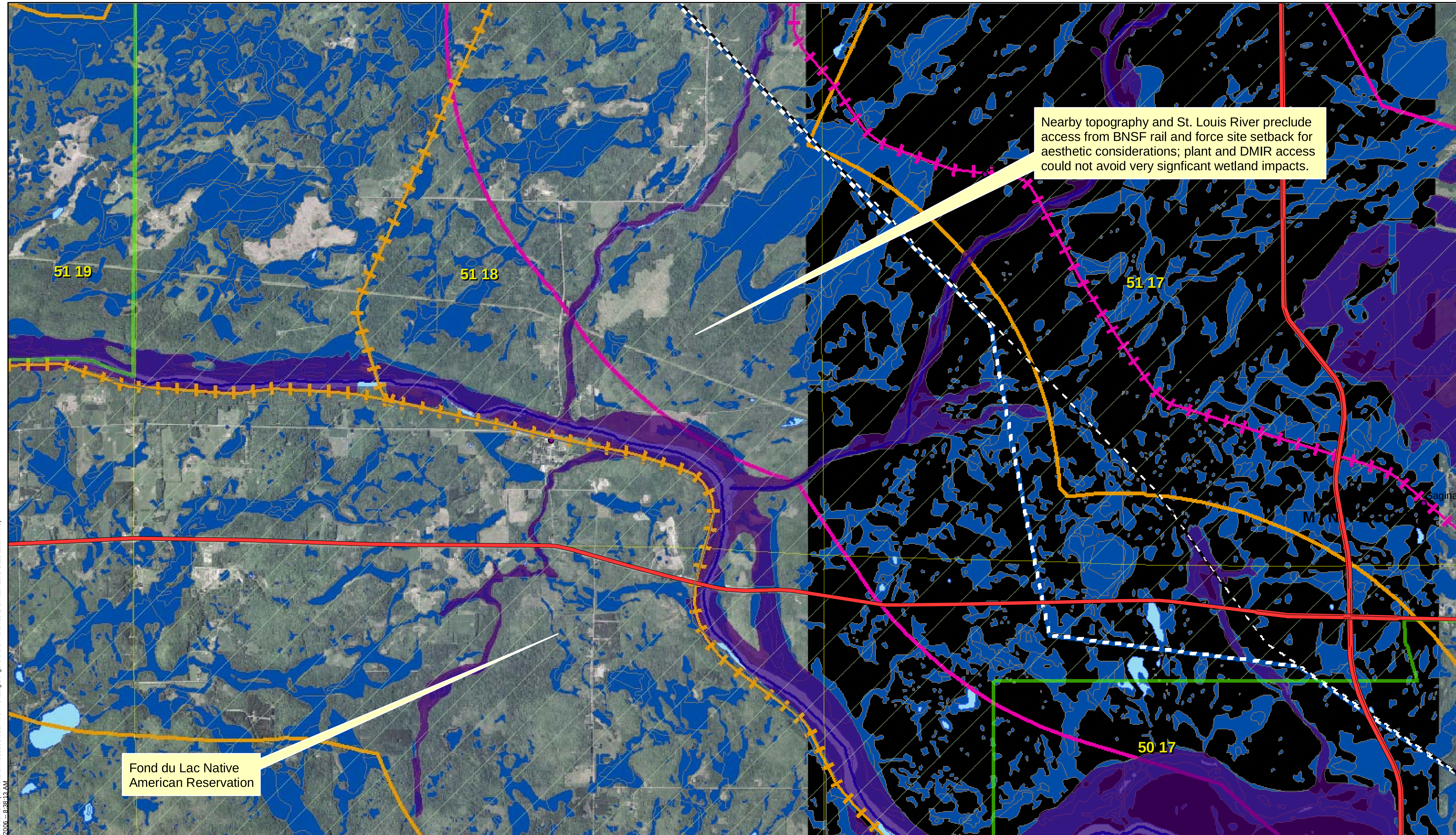
Figure 18: TTRA Site Selection



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Taconite Tax Relief Area

January 2007

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- BNSF Rail
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- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

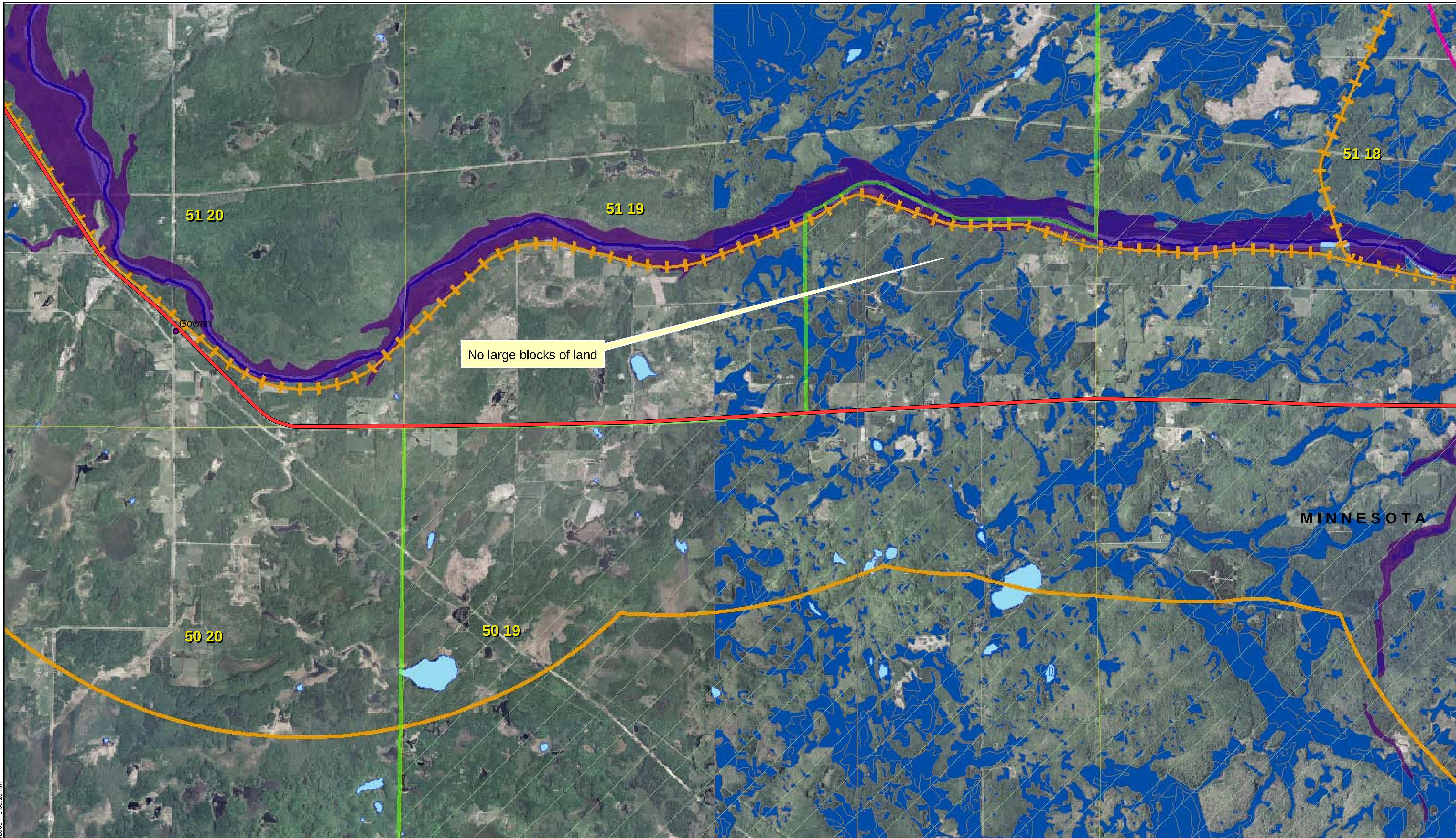
Source: ESRI, Excelsior Energy, and SEH.

Figure 19: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N
W E
S

0 1 Miles



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Legend

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- Highways
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- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.

Figure 20: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles

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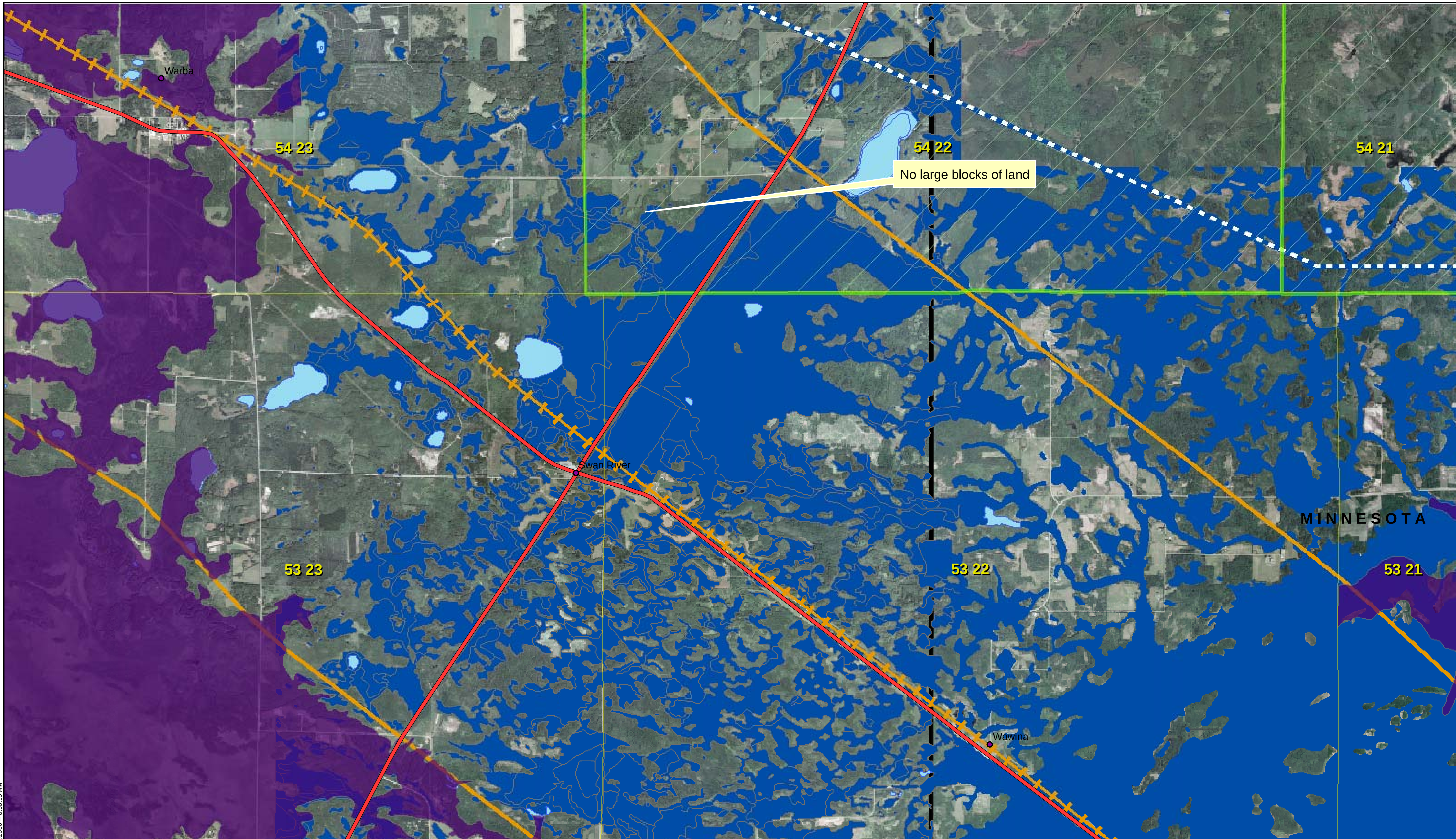

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Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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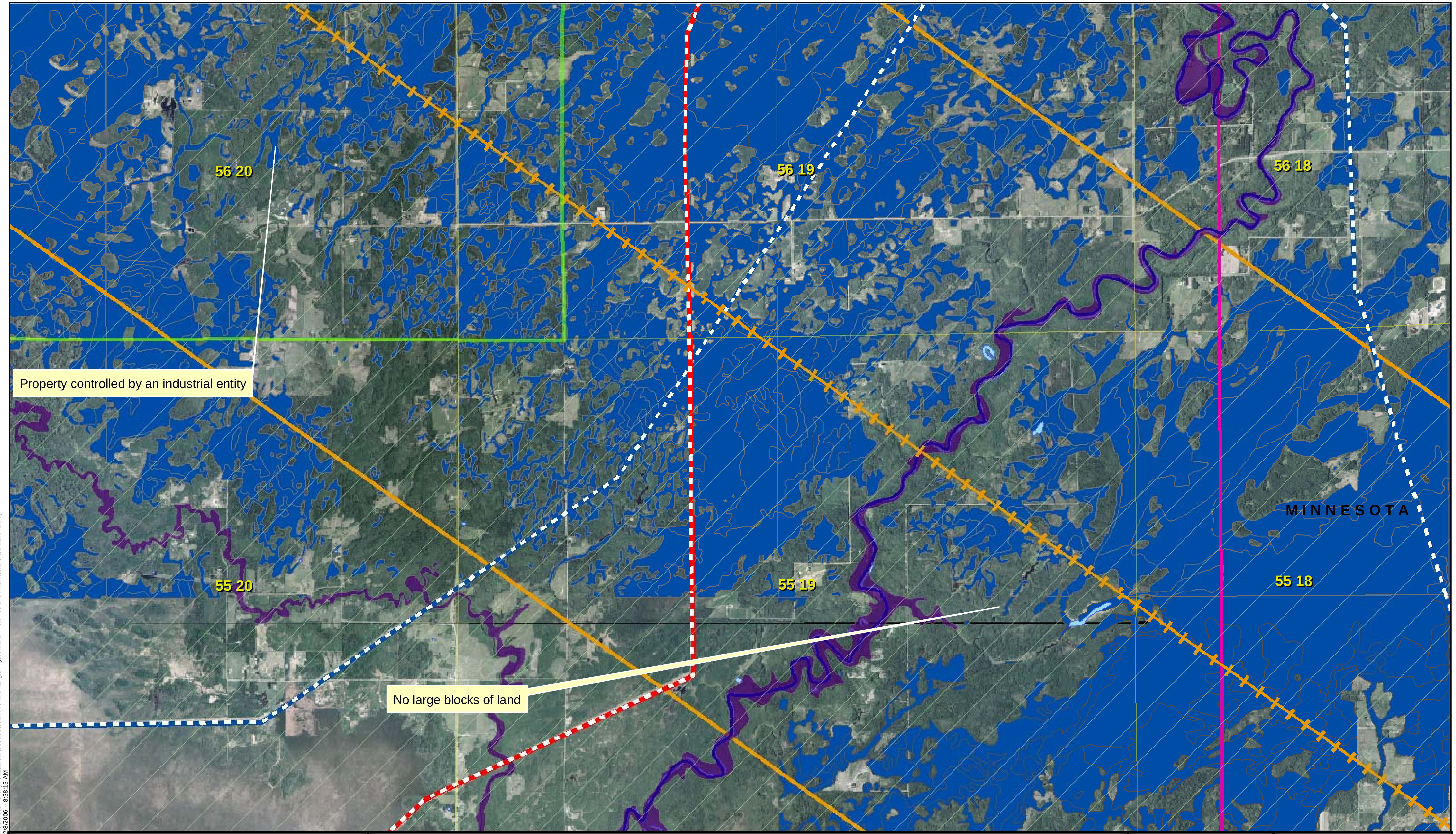
Appendix F

Figure 21: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



Map Document: (X:\AE\Exenr\050200\03Environmental\gis\Figure 1.1-1 Preferred and Alternative Sites 11x17.mxd)
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- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

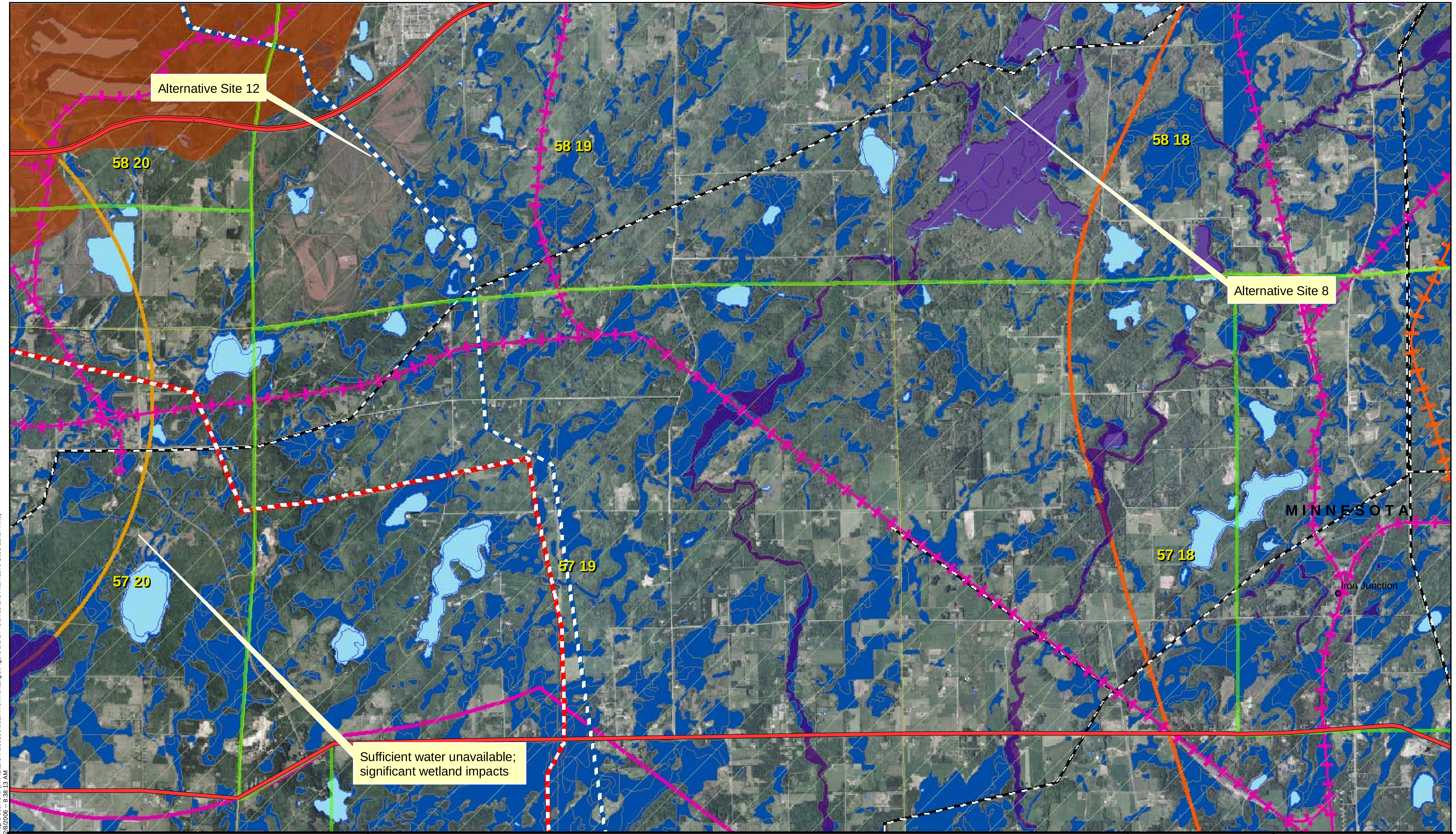
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 22:
TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Appendix F

Source: ESRI, Excelsior Energy, and SEH.
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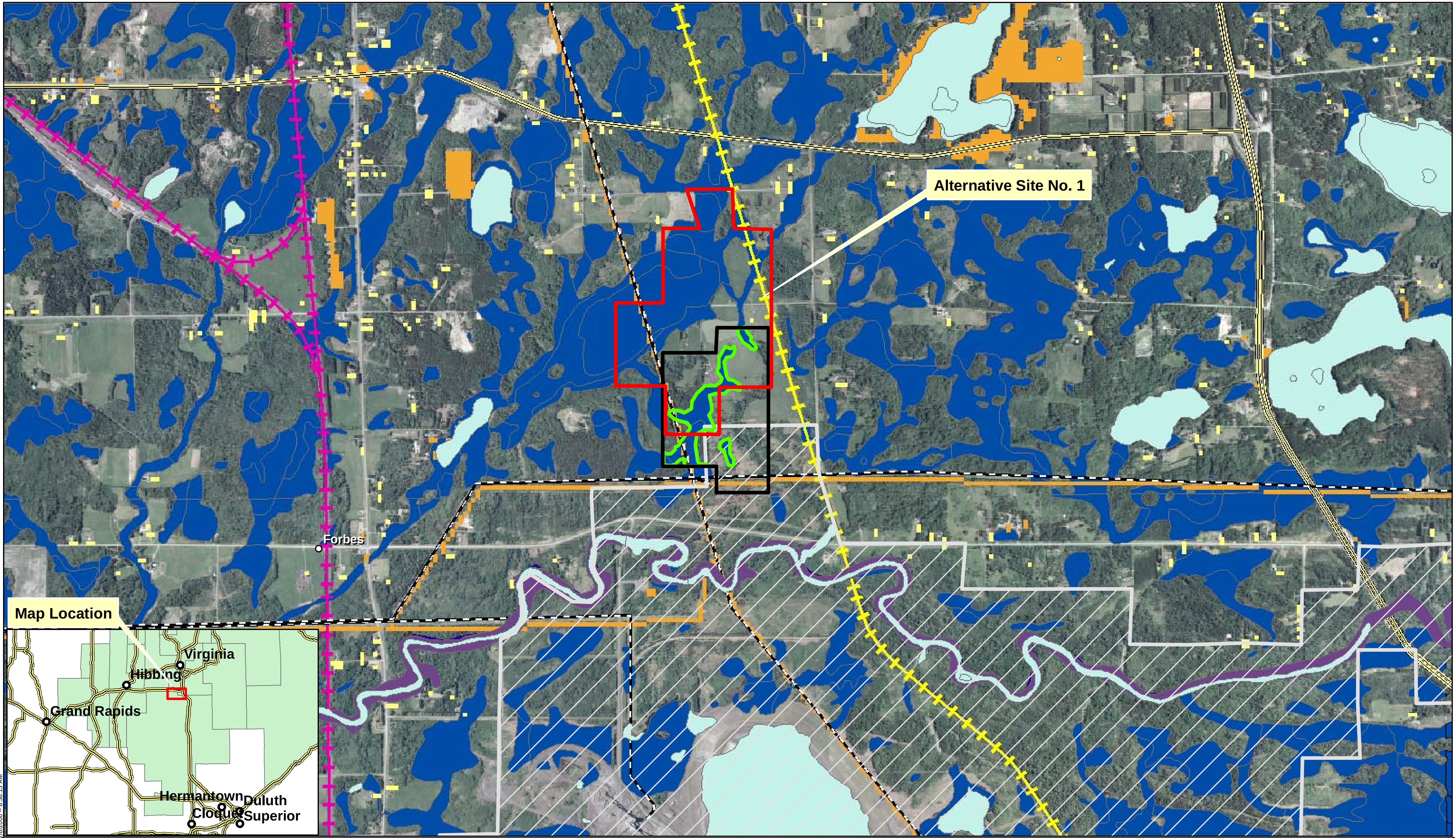
Figure 23: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



Map Document: (X:\AE\Exenr\050200\03Environmental\gis\Figure 1.1-1 Preferred and Alternative Sites 11x17.mxd)
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Figure 24

May 2008

Legend

- **Wetlands**
- **Floodplains**
- Lakes
- **Rivers**
- **HVTL_500_kV**
- **HVTL_345_kV**
- **HVTL_115_kV**
- **HVTL_230_kV**
- **DMIR Rail**
- **DWP Rail**
- **BNSF Rail**
- **Highways**
- Iron Formation
- Cities
- Mine Env Setting Bndry
- Rural Residence
- Rural Development
- Urban/Industrial

Appendix F

Source: ESRI, Excelsior Energy, and SEH.
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Site 1 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 1,500 Feet

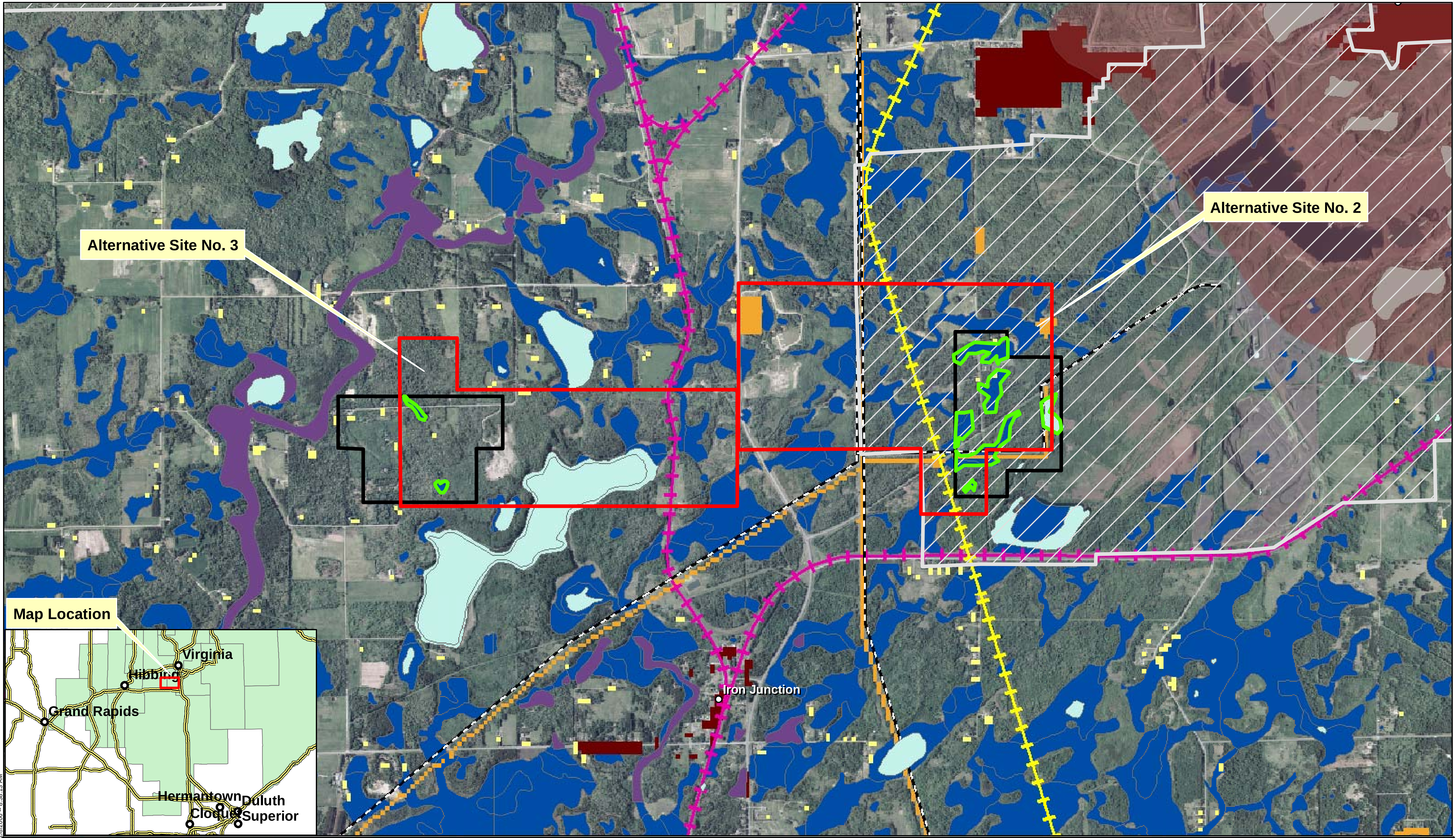

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Figure 25

May 2008

Legend

Wetlands	HVTL_500_kV	DMIR Rail	Highways
Floodplains	HVTL_345_kV	DWP Rail	Iron Formation
Lakes	HVTL_115_kV	BNSF Rail	Cities
Rivers	HVTL_230_kV		Mine Env Setting Bndry

Rural Residence
Rural Development
Urban/Industrial

Appendix F

Source: ESRI, Excelsior Energy, and SEH.

Sites 2 & 3 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 1,500 Feet

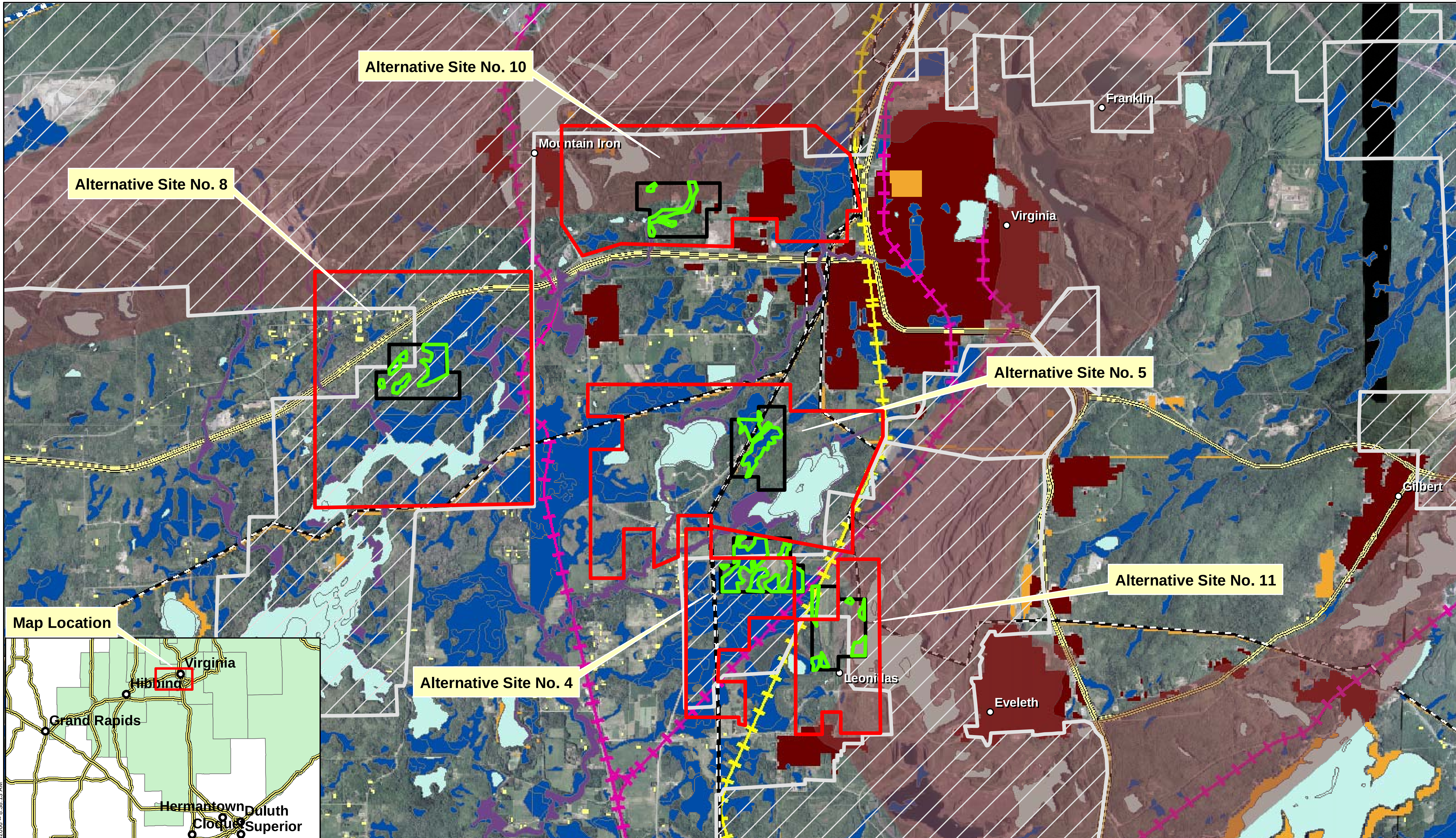

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Figure 26

May 2008

Legend

Wetlands	HVTL_500_kV	DMIR Rail	Highways
Floodplains	HVTL_345_kV	DWP Rail	Iron Formation
Rivers	HVTL_115_kV	BNSF Rail	Cities
Lakes	HVTL_230_kV		Mine Env Setting Bndry
Rural Residences	Rural Development	Urban/Industrial	

Appendix F

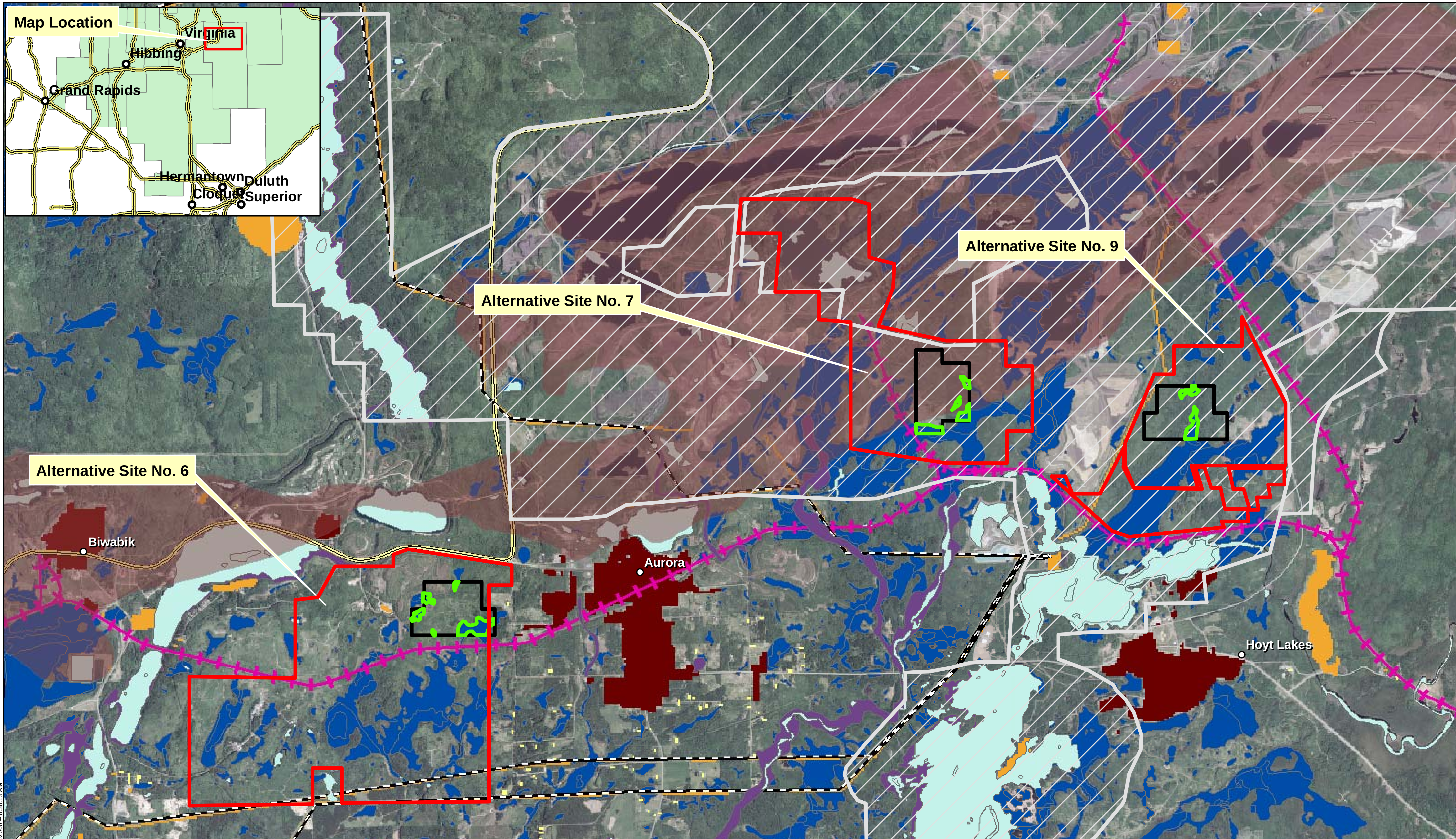
Sites 4, 5, 8, 10, & 11 Wetland Impacts

Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

UTM Zone 15 Meters
NAD83

N W E S

0 3,000 Feet



Map Document: (X:\AE\Exenr\050200\03Environmental\gis\Figure 1.1-1 Preferred and Alternative Sites 11x17.mxd)
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Figure 27

May 2008

Legend

Wetlands
Floodplains
Lakes
Rivers
HVTL_500_kV
HVTL_345_kV
HVTL_115_kV
HVTL_230_kV
DMIR Rail
DWP Rail
BNSF Rail
Highways
Iron Formation
Cities
Mine Env Setting Bndry
Rural Residences
Rural Development
Urban/Industrial

Appendix F

Source: ESRI, Excelsior Energy, and SEH.
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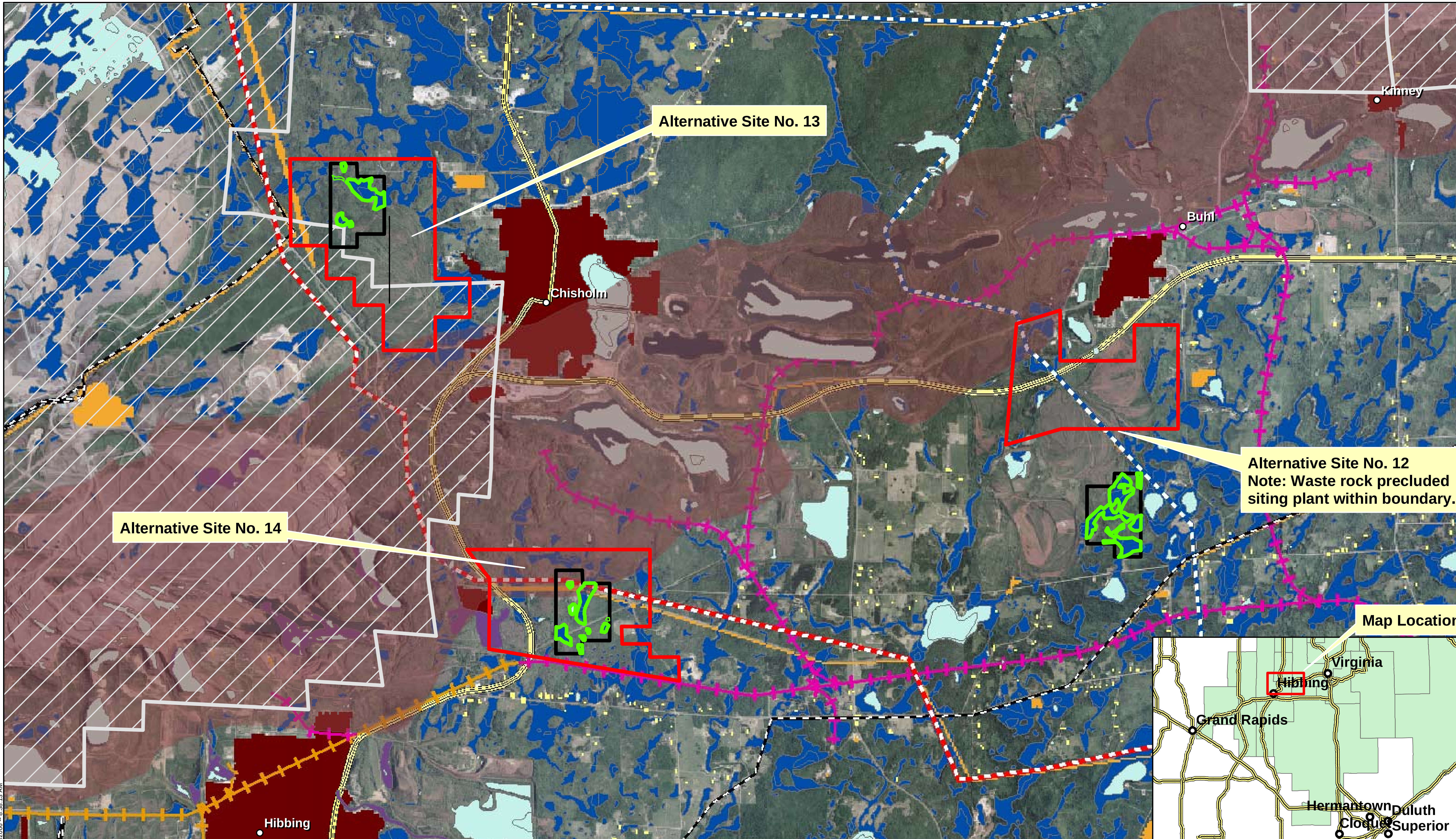
Sites 6, 7, & 9 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 3,000 Feet



Map Document: (X:\AE\Exenr\050200\03Environmental\gis\Figure 1.1-1 Preferred and Alternative Sites 11x17.mxd)
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Figure 28

May 2008

Legend

- **Wetlands**
- **Floodplains**
- Lakes
- **Rivers**
- **HVTL_500_kV**
- **HVTL_345_kV**
- **HVTL_115_kV**
- **HVTL_230_kV**
- **DMIR Rail**
- **DWP Rail**
- **BNSF Rail**
- **Highways**
- Iron Formation
- Cities
- Mine Env Setting Bndry
- Rural Residences
- Rural Development
- Urban/Industrial

Appendix F

Source: ESRI, Excelsior Energy, and SEH.

Sites 12, 13, & 14 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 3,000 Feet

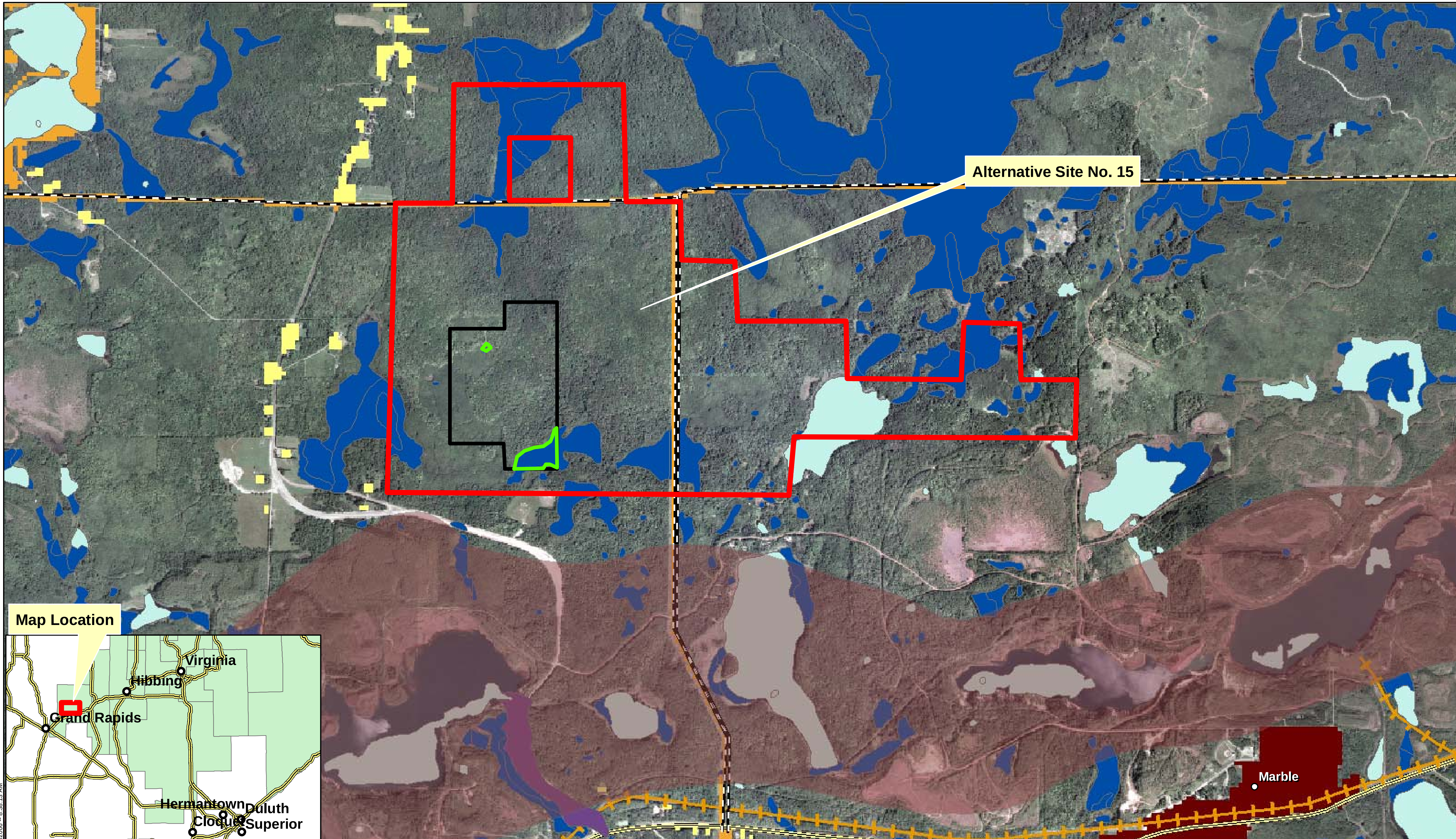

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Figure 29

May 2008

Legend

- Wetlands
- Floodplains
- Lakes
- Rivers
- HVTL_500_kV
- HVTL_345_kV
- HVTL_115_kV
- HVTL_230_kV
- DMIR Rail
- DWP Rail
- BNSF Rail
- Highways
- Iron Formation
- Cities
- Rural Residences
- Rural Development
- Urban/Industrial

Appendix F

Source: ESRI, Excelsior Energy, and SEH.

Site 15 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 1,500 Feet

Exhibit 2: Site Evaluation Sheets

NOTE: Site Evaluation Sheets are included for only those sites that were considered to be obtainable (Sites 2, 4, 7, 8, 10, 11, 16 and 17 were considered unobtainable) and of sufficient size (Sites 1 and 3 were considered to be too small) to allow for development of the Project. The Site Evaluation Sheet for Site 14 is included as it was originally considered to be available; this decision was reviewed and reversed at the time of Excelsior's submission of its application for a Joint Permit to the Minnesota Public Utilities Commission.

MESABA ENERGY PROJECT: IGCC POWER STATION SITE EVALUATION SHEET

Site Identification

Site No.: 5 Site Name: Manganika Lake T: 58N R: 18W Section: 23, 24, 25, 26 Acres: ~1375

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +16 CN OS Other:

Rail Discussion: No opportunity for two rail suppliers.

Other Transportation: Good access via CR 102, CR 7, US Highway 169, and Maxwell Road.

Water Supply: Virginia WWTP effluent, Thunderbird Mine Pit dewatering, East/West Pit dewatering, West Two Rivers Reservoir, Mountain Iron WWTP effluent, and other surface water runoff.

Water Supply Discussion: It is doubtful that the necessary water supplies for peak two-phase operation can be assembled into a dependable portfolio.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 16L, 37L on site; MP 38L contiguous with eastern property boundary.

HVTL Discussion: Good access to Forbes Substation.

General Description

Site is completely within city limits of Mountain Iron and is split in half by CR 7. The western half is being developed into lake lots (around Mashkenode Lake) and would preclude development there; significant cultural resources found nearby this lake. Rail loop would encircle Manganika Lake, cause significant wetland impacts and require reconfiguration of roads and other infrastructure. City appeared interested in working with Excelsior to acquire land.

Exclusions

Site Selection Criteria

☒ Permitting — P2, P5, P9

☒ Technical — T1, T2

☐ Site Control

Practicability

☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Water supply for two phase operation is logistical concern. West Two Rivers Reservoir use is unlikely as reservoir was created by US Steel for its own use. Close proximity to residential properties likely to create insurmountable concerns. Wetland impacts deemed problematic.
Technical	Site development would create significant disruptions of roadway infrastructure and impact new residential development.
Site Control	

Other Discussion

Approximately 45 acres of wetlands impacted inside IGCC Power Station footprint; ~ 38% of surrounding area considered to have potential for development is covered by wetlands. Site located 31 miles from BWCA and 56 miles from VNP. See Figure 26 for configuration of site in general area.

Further Analysis

Water for two phase operation would be required to come from numerous sources, many of which are not predictable (that is , the East and West Pit dewatering from Minntac, surface runoff, wastewater treatment effluent, the Wacootah and Iroquois Mine Pits, Thunderbird Mine Pit, the Ispat Inland Mine Pit, and other abandoned mine pits). West Two Rivers Reservoir cannot be used as it is owned by U.S. Steel.

The biggest problem with this site is due to development constraints that would place the IGCC Power Station footprint too close to existing residential areas within the Mountain Iron city limits. Wetland impacts associated with site development would be significant.

Conclusions

Unworkable due to site constraints and feasibility of establishing predictable water supplies for two phase operation.

MESABA ENERGY PROJECT: IGCC POWER STATION SITE EVALUATION SHEET

Site Identification

Site No.: 6 Site Name: West Aurora T: 58N R: 15, 16W Section: 13 (R16W), 7,8, 17, 18 Acres: ~2,500

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +30 CN OS Other:

Rail Discussion: Two rail supplier option not available. Rail access to site will require significant cut and fill.

Other Transportation: Good access to State Highway 135.

Water Supply: Embarrass Lake, Mine Pit No. 6 and others from Cliffs Erie

Water Supply Discussion: Poor water availability at this site. Wide fluctuations of lake not acceptable. Logistics associated with obtaining water from Cliffs Erie are problematic.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 38L on-site; 39L contiguous with south boundary.

HVTL Discussion: Lengthy, but fair access to Forbes Substation.

General Description

High ground in northeast corner of property most suitable for development. However, large waste rock dump and residential developments in city of Aurora constrain site development. Site is ~26 miles to BWCA; 55 miles to VNP. See Figure 27 for illustration of Station footprint within region assumed for site development..

Exclusions

Site Selection Criteria: ☒ Permitting (P2, P5) ☐ Technical (T1, T2) ☐ Site Control

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Water supply is likely to be insufficient for two phases and Embarrass Lake would undergo wide variation in water levels. Distance is considered too far to be pumped from abandoned mine pits on Cliffs-Erie property. St. James Mine Pit source of Aurora's water supply. The only feasible part of the site on which to build would encroach upon nearby residential developments.
Technical	Waste rock presents constructability issues in the best part of the site on which to build; wetlands would preclude construction in areas south of the rail track.
Site Control	

Other Discussion

Approximately 27 acres of wetlands would be affected by IGCC Power Station footprint; ~23% of surrounding area considered to have potential for development is covered by wetlands. See Figure 26 for an illustration of how the site would be configured within the area.

Further Analysis

DNR Lakefinder indicates Embarrass Lake is 442 acres in size with a littoral zone of 408 acres, a maximum depth of 19 ft. and a median depth of 11 ft. Assuming that the volume of water in the littoral zone is 4,488 acre-feet (i.e., 408 acres x 11 ft.) or 1.462 billion gallons and that there is no flow into the lake from other another source; at the annual average rate of appropriation for the IGCC Power Station of 7,400 gpm the Station would consume all the water in the littoral zone in about 137 days. This makes Embarrass Lake a poor prospect for this site from a permitting perspective.

The biggest issue with respect to this site is its site development constraints. The site is bounded by a mine dump to the West (mine dumps pose a constructability issue because of the uncertainty associated in knowing whether or not bedrock has been encountered), residential areas to the East, the highway to the north, and the rail line and wetlands to the South.

Conclusions

Deemed unworkable from a site development perspective.

MESABA ENERGY PROJECT: IGCC POWER STATION SITE EVALUATION SHEET

Site Identification

Site No.: 9 Site Name: East Range Site T: 59N R: 14W Section: 28, 32, 33 Acres: ~810

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN ~44 CN ~3/4 Other:

Rail Discussion: CN is only rail supplier at this location. Lake Superior access would require upgrade of existing track to accommodate unit coal trains.

Other Transportation: Good access via CR 666 and CR 110.

Water Supply: Abandoned mine pits (2WX, 6, Denora, Stephens, Knox, 2, & 3) and Colby Lake; wastewater effluent from nearby industrial developments.

Water Supply Discussion: Widely fluctuating levels of mine pits are of minor concern as pits are on private land and have no current recreational use, but water quality is relatively poor

HVTL: ☒ 115 kV ☐ 230 kV ☒ Other Line Nos.: MP 43L, 38L, 39L, 34L

HVTL Discussion: MP 43L is 138 kV HVTL leading to Syl Laskin Substation where 38L, 39L, and 34L HVTLs originate. Distance to Forbes Substation is significant with the 38L and 39/37L routes being ~ 35 miles each.

General Description

This site is the alternate site described in the Joint Application and Environmental Supplement. The site is located almost completely within the city limits of Hoyt Lakes and is mostly undisturbed with the exception of being periodically logged. The site is the closest of any to the BWCA and VNP being 25 and 54 miles distant, respectively.

Exclusions

Site Selection Criteria: ☐ Permitting ☐ Technical ☐ Site Control

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting

Technical

Site Control

Other Discussion

Approximately 15 acres of NWI wetlands affected by IGCC Power Station footprint; ~ 35% of surrounding area considered to have potential for development is occupied by wetlands. See Figure 27 for illustration of Station footprint within area assumed for site development.

§ 404 (b)(1) Compliance Summary Matrix

Section No.	ACOE	Description of Compliance Criteria	Complies	Does Not Comply
§230.10(a)	1	Overcome presumption that practicable, less environmentally damaging alternative site, outside special aquatic sites, exists	X	
	2	No alternative that is practicable, is less damaging to the aquatic ecosystem, and has no other significant environmental effects		
§230.10(b)	3	Discharge must not violate state water quality standards or CWA Section 307 toxic effluent standards or bans		
	4	Project not jeopardize the continued existence of an endangered species		
§230.10(c)	5	Must not cause significant adverse effects ("MNCSAE") on municipal water supplies, plankton, fish, shellfish, wildlife, special aquatic sites or other aspects of human health or welfare		
	6	MNCSAE on life stages of aquatic life and other wildlife dependent on aquatic ecosystems		
	7	MNCSAE on ecosystem diversity, productivity, or stability		
	8	MNCSAE on recreational, aesthetic or economic values		
§230.10(d)	9	All appropriate and practicable steps taken to minimize adverse impacts		

Conclusions

MESABA ENERGY PROJECT: IGCC POWER STATION SITE EVALUATION SHEET

MESABA ENERGY PROJECT: IGCC POWER STATION SITE EVALUATION SHEET

Site Identification

Site No.: 12 Site Name: Buhl T: 58N R: 20W Section: 17-20 Acres: 850

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +5 CN <1 Other:

Rail Discussion: No existing rail presently serves this site, but at one time CN track served the area.

Other Transportation: Good access via US Highway 169 and CR 453

Water Supply: Sherman Mine Pit, Fraser Mine Pit, Iron Word

Water Supply Discussion: Water availability is uncertain at this site (other factors eliminated consideration of this site).

HVTL: ☐ 115 kV ☒ 230 kV ☐ Other Line Nos.: MP 80L to Forbes

HVTL Discussion: Forbes Substation about 10 miles

General Description

This present owner of the site has refused to sell the part of the site that is north of US 169. Most of the site south of US 169 is a mine dump (which causes constructability issues). Coal delivery issues may exist due to terrain obstacles for the rail track. Constructability concerns regarding the mine dumps on the site south of US 169 preclude serious consideration of the site. See Figure 28 for illustration of Station footprint within area assumed for site development..

Exclusions

Site Selection Criteria			Practicability		
☒ Permitting P2	☒ Technical T1, T2	☐ Site Control	☐ Cost	☐ Technology	☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Wetlands to the south of the mine dumps would preclude siting of IGCC Power Station footprint.
Technical	Constructability issues due to the presence of mine dumps and problems with rail grade are expected. Availability of adequate water supply is concern.
Site Control	

Other Discussion

IGCC Power Station footprint must be located away from mine dumps and the only location on site is where wetlands are more prevalent; IGCC Power Station foot print alone would impact approximately 68 acres of wetlands. See Figure 28.

Further Analysis

Constructability issues (see footnote 16 on page 14 for a discussion of the general concern associated with building on a mine dump) would force development of the site footprint into an area having a high proportion of wetlands.

Conclusions

Site development precluded due to constructability issues and constraints posed by wetland areas.

Site Identification

Site No.: 13 Site Name: West Chisholm T: 58N R: 20W Section: 17-20 Acres: 785

Rail Provider: ☐ BN ☐ CN ☐ Other Distance (mi): BN CN Other:

Rail Discussion: No rail supplier presently can provide service to this site because of grade differences.

Other Transportation:

Water Supply:

Water Supply Discussion:

HVTL: ☐ 115 kV ☐ 230 kV ☐ Other Line Nos.:

HVTL Discussion:

General Description

This site is on a mine dump and provides some constructability issues. Originally, the site was thought to be capable of being served by the rail system delivering taconite pellets produced by Hibbing Taconite to Lake Superior. This however, was not possible as trains could make it up the hill to Hibtac only because they were empty. The grade is too steep to provide access to unit coal trains.

Exclusions

Site Selection Criteria

☐ Permitting ☒ Technical T2 ☐ Site Control

Practicability

☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting

Technical: The site is not accessible via loaded unit train coal trains due to grade change between site and main track.

Site Control

Other Discussion

Infeasible to consider this site.

Further Discussion

None required, rail access is not feasible.

Conclusion

Rail access is not feasible.

MESABA ENERGY PROJECT: IGCC POWER STATION SITE EVALUATION SHEET

Site Identification

Site No.: 14 | Site Name: Hibbing Industrial Park | T: 57N, 58N | R: 20W | Section: 3,4 (57N), 33,34 (58N) | Acres: 860

Rail Provider: ☒ BN ☒ CN ☐ Other | Distance (mi): BN OS | CN OS | Other:

Rail Discussion: Possibility of two suppliers at this site. However, BN has expressed concerns about unit coal train traffic through Hibbing.

Other Transportation: Good access via US Highway 169.

Water Supply: Abandoned Mine Pits (Hull-Rust dewatering, Iron World)

Water Supply Discussion: Uncertain about how much water is available from Iron World and dewatering from Hull-Rust Mine Pit.

HVTL: ☐ 115 kV ☐ 230 kV ☒ Other | Line Nos.: Xcel has 500 kV HVTL that traverses the Site on Route to Forbes Substation

HVTL Discussion: Alternate path to Blackberry Substation is available.

General Description

This site is located in a planned industrial park that has been incorporated into a comprehensive plan for the communities of Hibbing, Chisholm and Buhl. The site is currently owned by IRR and committed to other development.

Exclusions

Site Selection Criteria			Practicability		
☐ Permitting	☒ Technical	☒ Site Control	☐ Cost	☐ Technology	☐ Logistics
	T1	C1			

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	
Technical	The site is constrained to the north by the Iron Formation, to the south by residential developments, and to the east by mineral mining operations. In order to accommodate the IGCC power station dual rail potential, additional land must be acquired within the Iron Formation or from other landowners outside the boundary of the current owner's property making acquisition more difficult.
Site Control	The IRR has committed the site to another developer's project.

Other Discussion

The IGCC Power Station footprint will impact about 35 acres of wetlands. The potential for dual rail access will be difficult given the proximity of the site to the iron formation (to the north) and residential properties to the south and east. See Figure 28 for illustration of Station footprint within area assumed for site development.

Further Analysis

See Figures 7 and 28 to see the difficulty of positioning the site footprint within the site boundary and off the Iron Formation.

Conclusions

The site is currently committed to another developer's project and unavailable for development at this time by Excelsior.

MESABA ENERGY PROJECT: IGCC POWER STATION SITE EVALUATION SHEET

Site Identification

Site No.: 15 Site Name: West Range Site T: 56N R: 24W Section: 2,3,10-12 Acres: ~1,730

Rail Provider: ☒ BN ☒ CN ☐ Other Distance (mi): BN ~2 CN ~2 Other:

Rail Discussion: Both suppliers have access to the site.

Other Transportation: Good access by US 169 and CR 7.

Water Supply: Canisteo Mine Pit, Hill-Annex Mine Pit Complex, Lind Pit, West Hill Mine Pit, and Prairie River.

Water Supply Discussion: One of the best places in the TTRA where adequate water supplies are assured for two phase operation.

HVTL: ☐ 115 kV ☐ 230 kV ☒ Other Line Nos.: New 345 kV outlet facilities planned ~9 miles in length

HVTL Discussion: Blackberry Substation is point of interconnection.

General Description

A large block of land has been optioned from RGGS; option provides for Excelsior to purchase mineral rights to 550 acres of property and to obtain easements across RGGS land in accordance with commercially reasonable terms. See Figure 29 for illustration of Station footprint within area assumed for site development.

Exclusions

Site Selection Criteria: ☐ Permitting ☐ Technical ☐ Site Control

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting

Technical

Site Control

Other Discussion

IGCC Power Station footprint would impact only 11 acres of NWI wetlands.

Further Analysis

Section No.	ACOE	Description of Compliance Criteria	Complies	DNC
§230.10(a)	1	Overcome presumption that practicable, less environmentally damaging alternative site, outside special aquatic sites, exists	X	
	2	No alternative that is practicable, is less damaging to the aquatic ecosystem, and has no other significant environmental effects		
§230.10(b)	3	Discharge must not violate state water quality standards or CWA Section 307 toxic effluent standards or bans		
	4	Project not jeopardize the continued existence of an endangered species		
§230.10(c)	5	Must not cause significant adverse effects ("MNCSAE") on municipal water supplies, plankton, fish, shellfish, wildlife, special aquatic sites or other aspects of human health or welfare		
	6	MNCSAE on life stages of aquatic life and other wildlife dependent on aquatic ecosystems		
	7	MNCSAE on ecosystem diversity, productivity, or stability		
	8	MNCSAE on recreational, aesthetic or economic values		
§230.10(d)	9	All appropriate and practicable steps taken to minimize adverse impacts		

Conclusions

Conclusions on ACOE Compliance Summary Items Nos. 2-9 will be provided as part of future documentation.

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APPENDIX F2
Floodplain and Wetlands Assessment

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F2.1 REGULATORY BACKGROUND

Executive Order 11988 Floodplain Management directs each Federal agency to evaluate the potential effects of its actions on floodplains and to ensure that flood hazards and floodplain management are considered in its planning programs. Executive Order 11990 Protection of Wetlands directs all Federal agencies to consider wetlands protection in decision making and to evaluate the potential impacts of any new construction proposed in a wetland. As stated in these Executive Orders, Federal agencies shall avoid direct or indirect support of development in a floodplain or new construction in a wetland wherever there is a practicable alternative. Department of Energy (DOE) requirements with respect to Executive Orders 11988 and 11990 are found in Title 10, Code of Federal Regulations (CFR) Part 1022, Compliance with Floodplain and Wetland Environmental Review Requirements.

Pursuant to 10 CFR 1022.11, DOE shall determine whether the Proposed Action would be located within a base floodplain (100-year) or critical action floodplain (500-year) and/or a wetland. In order to determine whether a Proposed Action would be located within a base or critical action floodplain, information available relative to site conditions from the following sources, as appropriate, would be reviewed: Flood Insurance Rate Maps (FIRM) or Flood Hazard Boundary Maps prepared by the Federal Emergency Management Agency (FEMA), information from a land-administering agency (e.g., Bureau of Land Management) or from other government agencies with floodplain-determination expertise [e.g., U.S. Army Corps of Engineers (USACE), Natural Resources Conservation Service (NRCS)], information contained in safety basis documents as defined at 10 CFR Part 830, and DOE environmental documents [e.g., National Environmental Policy Act (NEPA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documents]. To determine whether a Proposed Action would be located within a wetland, information available relative to site conditions from the following sources, as appropriate, would be reviewed: USACE "Wetland Delineation Manual" Wetlands Research Program Technical Report Y-87-1 (January 1987) or successor document, U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) or other government-sponsored wetland or land use inventories, NRCS Local Identification Maps, U.S. Geological Survey Topographic Maps, and DOE environmental documents (e.g., NEPA and CERCLA documents). If there is no floodplain/wetland impact identified, the action may proceed without further consideration of the remaining procedures set forth below.

If a Proposed Action is located in or affects floodplains or wetlands, a floodplain/wetlands assessment shall be undertaken. DOE shall prepare the floodplain or wetland assessment concurrent with and included in the appropriate NEPA document to be used as a basis for determining floodplain and/or wetland impacts which may result from the implementation of a Proposed Action. In accordance with 10 CFR 1022.13, assessments shall consist of a description of the Proposed Action including a map showing its location with respect to the floodplain and/or wetland as well as a discussion of its positive and negative, direct and indirect, and long- and short-term impacts on the floodplain/wetland. In addition, the assessment shall consider alternatives to the Proposed Action that avoid adverse impacts (including alternate sites, alternate actions, and no action) and evaluate measures that mitigate the adverse effects of actions in a floodplain or wetland.

Per DOE NEPA regulations, this Floodplain and Wetlands Assessment was written in support of an EIS for the Mesaba Energy Project. If DOE determines that there is no practicable alternative to implementing the Proposed Action in a floodplain, then a statement of findings must be prepared and can be included in the Final EIS (FEIS). The statement of findings (10 CFR 1022.14) shall include a brief description of the Proposed Action including a location map, an explanation indicating why the action is proposed to be located in the floodplain, a list of alternatives considered, a statement indicating whether the Proposed Action conforms to applicable floodplain protection standards, and a brief description of steps to be taken to minimize potential harm to or within the floodplain.

F2.2 PROJECT DESCRIPTION

As described in Section 1.3 of the EIS, DOE's Proposed Agency Action is to provide a total of $36 million in co-funding through a cooperative agreement with Excelsior Energy, Inc. to demonstrate technologies under the Clean Coal Power Initiative (CCPI) Program. Excelsior proposes to design, construct, and operate the Mesaba Energy Project, which is a two-phased nominal 606 $MWe_{[net]}$ (1,212 $MWe_{[net]}$ total) Integrated Gasification Combined Cycle (IGCC) power plant to be located in northeastern Minnesota.

The DOE purpose and need for Agency Action (EIS Sections 1.4.1.2 and 1.4.2.2) are to commercially demonstrate IGCC technology, which includes advanced gasification and air separation systems, feedstock flexibility, improved environmental performance characteristics, and improved thermal efficiency. Excelsior's purpose and need for the proposed project are described in EIS Section 1.4.1.1 and 1.4.2.1 and Appendix F1. The proposed IGCC power plant would be designed for long-term commercial operation following a 12-month minimum demonstration period. The project would represent Phase I of a proposed two-phased Mesaba Generating Station; however, the EIS considers both phases of the proposed power plant as connected actions. DOE may also provide a loan guarantee pursuant to the Energy Policy Act of 2005 for a portion of the private sector financing of the project. As described in EIS Section 2.1.1.2, DOE's decision in the EIS relates to the co-funding of a project selected competitively in accordance with the objectives of the CCPI Program, and DOE has not participated in the identification or selection of alternative sites or corridors for the Mesaba Energy Project.

In conformance with Minnesota Rules described in EIS Section 1.5.2, Excelsior has proposed two alternative locations, the West and East Range Sites, for construction of the Mesaba Energy Project in the Taconite Tax Relief Area. Excelsior's process for screening candidate sites and selecting the potential alternative sites is described in EIS Appendix F1. Both of the sites are currently undeveloped, unoccupied, wooded lands located in the immediate vicinity of former iron ore mining operations. The West Range Site is located on approximately 1,708 acres of land, the majority of which is owned by RGGS Land & Minerals Ltd. within the city limits of Taconite in Itasca County, Minnesota (see Figure 2.3-1 of the EIS). The East Range Site is located on approximately 1,322 acres of land owned by Cliffs-Erie, LLC within the western boundary of Superior National Forest and the city limits of Hoyt Lakes in St. Louis County, Minnesota (see Figure 2.3-5 of the EIS). The features of Excelsior's proposed project at the West Range Site are described and illustrated in EIS Section 2.3.1. The features at the East Range Site are described and illustrated in EIS Section 2.3.2.

F2.3 BASIS FOR ASSESSING FLOODPLAIN AND WETLAND IMPACTS

A floodplain or wetlands assessment is required to discuss the positive and negative; direct and indirect; and long- and short-term effects of the Proposed Action on the floodplain and/or wetlands (10 CFR 1022.13(a)(2)). In addition, the effects on lives and property and on natural and beneficial values of floodplains must be evaluated. For actions taken in wetlands, the assessment should evaluate the effects of the Proposed Action on the survival, quality, and function of the wetlands. If DOE finds no practicable alternative to locating activities in floodplains or wetlands, DOE must design or modify its actions to minimize potential harm to these resources (10 CFR 1022.14(a)).

For the purposes of this Floodplain and Wetlands Assessment, the region of influence for direct impacts to floodplains and wetlands includes the areas of land disturbance. The region of influence for indirect impacts includes those floodplain and wetland areas adjacent to locations that would experience direct impacts. For the Mesaba Energy Project, indirect impacts are expected to be of lesser consequence than direct impacts, because all land disturbing activities would be performed in accordance with appropriate regulatory requirements and BMPs for sediment and erosion control and pollution prevention. Of most importance for avoiding or minimizing impacts on floodplains and wetlands is the careful pre-planning of activities and investigations that aim to identify and assess potential impacts before they occur.

The potential for a Proposed Action to have an adverse impact on floodplains and wetlands has been evaluated by DOE based on whether the Proposed Action located at either alternative site would cause any of the conditions listed in Table F2-1.

Table F2-1. Approach to Impact Assessment

Resource	Basis for Assessing Adverse Impact
Floodplains	Cause construction of aboveground facilities in or otherwise impede or redirect flows in the 100-year floodplain or other flood hazard areas that would adversely affect the qualities or functions of jurisdictional floodplains. Substantially alter flood water discharges and adversely affect drainage patterns, flooding, and/or erosion and sedimentation causing risk to human lives and property.
Wetlands	Cause construction in (dredging or filling of) wetlands or otherwise alter drainage patterns that would adversely affect the qualities or functions of jurisdictional wetlands.

F2.4 FLOODPLAINS

For the purposes of this assessment, the DOE No Action Alternative is assumed to be equivalent to a "No Build" Alternative (see EIS Section 2.1.1.2). Under the No Action Alternative, there would be no changes to water resources in the project area and floodplains would continue to function in their current form.

Although for its Proposed Action, DOE has not participated in the identification or selection of alternative sites or corridors for the Mesaba Energy Project, DOE evaluated the comparative impacts of Excelsior's proposed project at two alternative sites in the EIS and in this floodplain assessment. The following subsections provide descriptions of potential impacts to floodplains associated with both of Excelsior's site alternatives under consideration for the Proposed Action. The locations of floodplain areas were determined with the use of FEMA Flood Insurance Rate Maps (see EIS Sections 3.6.2.1 and 3.6.2.2 for information on the specific FEMA Flood Insurance Rate Maps that were consulted). Maps showing the locations of floodplains in relation to the West and East Range Sites are provided in Section 3.6 (Floodplains) of this EIS (Figures 3.6-1 and 3.6-2). Potential impacts of the Mesaba Energy Project are described in EIS Section 4.6.

F2.4.1 West Range Site Floodplain Impacts

There would be no anticipated impacts to floodplains for the West Range Site with respect to the placement of the Mesaba IGCC Power Plant, the HVTL Alternatives, the Cooling Tower Blowdown Pipelines, Segments 2 and 3 of the Process Water Supply Pipelines, potable water and sewer pipelines, or the transportation corridors because these structures would be situated outside of the boundaries of any 100-year floodplain areas. No 500-year floodplains have been identified that could be impacted by the implementation of the Proposed Action at the West Range Site. No impacts would be expected to result in any locations considered high-hazard areas (portions of riverine floodplains nearest the source of flooding that are frequently flooded and where the likelihood of flood losses and adverse impacts on the natural and beneficial values served by floodplains is greatest).

Proposed utilities that could potentially affect floodplains due to their siting within or near 100-year floodplains include: Natural Gas Pipeline Alternatives 1, 2, and 3, and the Process Water Supply Pipeline – Segment 1 (Lind Pit to Canisteo Pit). These linear corridors are described and illustrated in EIS Section 2.3.1.

F2.4.1.1 West Range Natural Gas Pipeline Alternatives 1, 2, and 3

The Natural Gas Pipeline Alternatives 1, 2, and 3 would each cross at least one 100-year floodplain area. Alternative 1 would cross the Swan River and an adjacent 100-year floodplain. Alternative 2 would cross both the Swan River and the Prairie River and adjacent 100-year floodplains. Alternative 3 would cross the Prairie River and adjacent 100-year floodplains.

During the construction phase of the Mesaba Energy Project there may be some temporary impacts to the floodplain areas caused by the installation of necessary pipelines. These temporary impacts may result from the presence of construction equipment, materials stockpiles, etc. being temporarily situated within the boundaries of the 100-year floodplain areas, which could redirect flood flows during a major storm event. However, these impacts would be minimized through the use of appropriate engineering procedures and BMPs, which would ensure that river and stream flows be maintained during construction. For example, the natural gas pipelines would be directionally drilled beneath these and all other water body crossings at approximately 100 feet from the edge of each water body. This method would ensure that no permanent impacts would occur to floodplains from the placement of structures within water bodies that could divert or otherwise impede stream flows. Upon completion of construction activities within the floodway, the construction equipment and stockpiles would be removed, and contours would be restored to their original grade and seeded, stabilized, or planted with plants native to the region.

F2.4.1.2 West Range Process Water Supply Pipeline – Segment 1 (Lind Pit to Canisteo Pit)

Segment 1 of the Process Water Supply Pipeline would be located in relatively close proximity to a 100-year floodplain area adjacent to the Prairie River. There would be no anticipated impacts associated with this pipeline due to it being placed outside of the floodplain as well as it not crossing any rivers or streams associated with the neighboring floodplain area. All construction equipment and materials would be kept out of the floodplain area.

F2.4.2 East Range Site Floodplain Impacts

There would be no anticipated impacts to floodplains for the East Range Site with respect to the placement of the Mesaba IGCC Power Plant, the Process Water Supply Pipelines, potable water and sewer pipelines, or the transportation corridors, because these structures would be situated outside of the boundaries of any 100-year floodplain areas. No 500-year floodplains have been identified that could be impacted by the implementation of the Proposed Action at the East Range Site. No impacts would be expected to result in any locations considered high-hazard areas (portions of riverine floodplains nearest the source of flooding that are frequently flooded and where the likelihood of flood losses and adverse impacts on the natural and beneficial values served by floodplains is greatest).

Proposed utilities that could potentially affect floodplains due to their potential placement within or near 100-year floodplains include HVTL Alternatives 1 and 2 and the Natural Gas Pipeline Alternative 1. These linear corridors are described and illustrated in EIS Section 2.3.2.

F2.4.2.1 East Range HVTL Alternatives 1 and 2

Excelsior proposes to use three existing 115 kV HVTL corridors - the combined 39L/37L corridor and the 38L corridor - as routes for the two 345-kV HVTLs required to interconnect the Project to the regional electric grid. To avoid long and costly interruptions of power and dangerous conditions associated with “hot line” construction methods, Excelsior proposes to acquire an additional 30 feet of ROW along one of these two routes between the Laskin and Forbes Substations. The HVTL Alternative 1 would involve adding the 30 feet of ROW to the 39L/37L corridor (which crosses the Partridge River, Cedar Island Lake, the East Two River, and 100-year floodplains adjacent to each of these surface waters). The HVTL Alternative 2 would involve adding the 30 feet of ROW to the 38L corridor (which crosses the Partridge River, the Embarrass River, the East Two River, and 100-year floodplains adjacent to each of these surface waters).

No permanent impact on flood elevations would occur, because permanent structures would be limited to HVTL towers that have small footprints and these structures would be located outside of floodplains to the extent practicable.

F2.4.2.2 East Range Natural Gas Pipeline Alternative 1

The Natural Gas Pipeline Alternative 1 would cross 100-year floodplains along the Partridge River and an area between Fourth Lake and Esquagama Lake. As previously described for the West Range Site (Section F2.3.2.1), the construction of pipelines may cause some temporary impacts to floodplains, however these impacts would be minimized through the use of appropriate engineering procedures and BMPs to maintain existing river and stream flows. Following construction activities, efforts would be taken to restore floodway contours as closely as possible to their original condition as well as the right of ways (ROWs). Therefore, no permanent impacts to floodplains would be anticipated.

F2.4.3 Conclusions

DOE finds that, for both the East Range and West Range alternative sites, that Excelsior has proposed all permanent structures to be located outside the 100 year and 500 year floodplains to the extent practicable. The only temporary impacts and, in one instance, small permanent impact (for the placement of an HVTL tower) would be as a result of utility connections.

F2.5 WETLANDS

F2.5.1 Introduction

For the purposes of this assessment, the DOE No Action Alternative is assumed to be equivalent to a “No Build” Alternative (see EIS Section 2.1.1.2). Under the No Action Alternative, there would be no changes to water resources in the project area and wetlands would continue to function in their current form.

Although for its Proposed Action, DOE has not participated in the identification or selection of alternative sites or corridors for the Mesaba Energy Project, DOE evaluated the comparative impacts of Excelsior’s proposed project at two alternative sites in the EIS and in this wetlands assessment. The following subsections provide descriptions of potential impacts to wetlands associated with both of Excelsior’s site alternatives under consideration for the Proposed Action. This section summarizes these potential impacts on wetlands due to construction and operation activities, including how such impacts would be minimized or avoided due to construction practices, or where temporary impacts may be restored.

Wetland areas were determined through the use of USFWS NWI mapping, soils survey, and aerial photographs. Also, detailed wetland delineations were performed by Excelsior's contractors in the areas of the potential power plant site footprints and the immediate vicinity. The area within which wetlands were delineated for the West Range is depicted in Figure F2-1, which may be found at the back of this appendix. The East Range delineated wetlands are depicted in Figure F2-2. Land access restrictions have not allowed for field delineations to be performed along the utility and transportation corridors. DOE evaluated the methods, results, and conclusions of the wetland delineations performed by the contractors.

There are three methods of classifying wetlands that have relevance to this project. They will be discussed in the chronplogic order of their development.

First, USFWS Circular 39 *Wetlands of the United States* (Shaw and Fredine, 1956) is a wetland classification inventory developed by the USFWS, which was initiated due to the steady decline of wetland habitats available to wildlife. The purpose of the Circular 39 wetland inventory is to identify the correlation between wetlands and wildlife, and identify areas susceptible to habitat loss from activities such as draining, filling or otherwise human-related alteration of water resource habitats. Aerial photographs, USGS topographic maps, charts of the U.S. Coast and Geodetic Survey, Federal and state agency mapping, soil maps, and county highway maps were used to provide information identifying the locations of wetlands for the inventory (Shaw and Fredine, 1956).

The USFWS inventory identified 20 types of wetland habitats used by wildlife, which primarily focused on waterfowl habitat. Wetland habitats identified by Circular 39 were grouped into four categories: 1) Inland Fresh Areas (Types 1-8); 2) Inland Saline Areas (Types 9-11); 3) Coastal Fresh Areas (Types 12-14); and, Coastal Saline Areas (Types 15-20). Inland Fresh Areas are the only wetland group occurring in Minnesota. There are eight wetland types associated with the Inland Fresh Area group

Second, *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979) has been used in the NWI maps prepared by the U.S. Fish and Wildlife Service. This approach has a hierarchial structure for five major systems -- Marine, Estuarine, Riverine, Lacustrine, and Palustrine.

Third, *Wetland Plants and Plant Communities of Minnesota and Wisconsin* (Eggers and Reed, 1997) was produced for the primary purpose of assisting the U.S. Army Corps of Engineers personnel working with the regulatory program under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. The guide specifically addresses wetland plants and plant communities of Minnesota and Wisconsin, and is organized by wetland plant community. In general, the wetland plant communities are organized according to water permanence and depth, and degree of soil saturation. Thus, the guide progresses from deepwater wetlands (I. Shallow, Open Water Communities) to temporary water-holding wetlands (VIII. Seasonally Flooded Basins). Photographs and descriptions are provided for each of the fifteen wetland plant communities, along with representative plant species of each. Interested readers may view the document online at http://www.npwrc.usgs.gov/resource/plants/mnplant/intro.htm.

A comparison of Eggers and Reed, 1997, Cowardin et al., 1979, and Shaw and Fredine, 1971 is presented in Table F2-2.

Table F2-2. Comparison of Wetland Classification Systems in Minnesota

Wetland Plant Community Types (Eggers and Reed, 1997)	Classification of Wetlands and Deep Water Habitats of the United States (Cowardin et al. 1979)	Fish and Wildlife Service Circular 39 (Shaw and Fredine 1971)
Shallow, Open Water	Palustrine or lacustrine, littoral; aquatic bed; submergent, floating, and floating-leaved	Type 5: Inland open fresh water
Deep Marsh	Palustrine or lacustrine, littoral; aquatic bed; submergent, floating, and floating-leaved; and emergent; persistent and nonpersistent	Type 4: Inland deep fresh marsh
Shallow Marsh	Palustrine; energent; persistent and nonpersistent	Type 3: Inland shallow fresh marsh
Sedge Meadow	Palustrine; emergent; narrow-leaved persistent	Type 2: Inland fresh meadow
Fresh (Wet) Meadow	Palustrine; emergent; broad- and narrow-leaved persistent	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Wet to Wet-Mesic Prairie	Palustrine; emergent; broad- and narrow-leaved persistent	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Calcareous Fen	Palustrine; emergent; narrow-leaved persistent; and scrub/shrub, broad leaved deciduous	Type 2: Inland fresh meadow
Open Bog	Palustrine; moss/lichen; and scrub/shrub; broad-leaved evergreen	Type 8: Bog
Coniferous Bog	Palustrine; forested: needle-leaved evergreen and deciduous	Type 8: Bog
Shrub - Carr	Palustrine; scrub/shrub; broad-leaved deciduous	Type 6: Shrub swamp
Alder Thicket	Palustrine; scrub/shrub; broad-leaved deciduous	Type 6: Shrub swamp
Hardwood Swamp	Palustrine; forested; broad-leaved deciduous	Type 7: Wooded swamp
Coniferous Swamp	Palustrine; forested; needle-leaved deciduous and evergreen	Type 7: Wooded swamp
Floodplain Forest	Palustrine; forested; broad-leaved deciduous	Type 1: Seasonally flooded basin or flat
Seasonally Flooded Basin	Palustrine; flat; emergent; persistent and nonpersistent	Type 1: Seasonally flooded basin or flat

Source: Eggers and Reed (1997)

Maps showing the locations of wetlands in relation to the West and East Range Sites are provided in Section 3.7 (Wetlands) of this EIS (Figures 3.7-1 and 3.7-2).

Potential indirect impacts would be common to any wetland area adjacent to a location that would experience direct impacts. The main potential indirect impacts that could occur would include increased sedimentation into undisturbed wetland areas that could result from construction activities in neighboring locations as well as changes in local hydrology, resulting in increased surface runoff in some areas, while decreasing surface runoff and subsurface flows in other areas. The utilization of standard engineering design measures and BMPs would reduce indirect impacts to adjacent wetlands.

The process followed to avoid and minimize potential wetland impacts to the maximum extent practicable based on preliminary engineering is described in Section F2.5.2. The details of that analysis is presented in Section F2.5.3 for the West Range and Section F2.5.4 for the East Range. Future efforts at minimizing and mitigating wetland impacts during permitting and final design are discussed in Section F2.5.5.

F2.5.2 Wetland Avoidance and Minimization

F2.5.2.1 Description of the Process

The avoidance and minimization of impacts to wetlands lies at the heart of the Section 1022 analysis. Section 1022 says that:

> *DOE shall exercise leadership and take action to:…Avoid to the extent possible the long- and short-term adverse impacts associated with the destruction of wetlands…and avoid direct and indirect support of…new construction in a wetland wherever there is a practicable alternative.*

The project elements described in Chapter 2 of the FEIS are the result of project planning efforts that included measures to avoid and minimize wetland impacts to the greatest extent possible. Based upon meetings and telephone conferences among DOE, USACE, and Excelsior some additional alternatives have been developed and evaluated in this attempt to avoid and minimize wetland impacts that had been identified in the DEIS. At the same time, the alternatives included in the DEIS were reexamined to attempt to further reduce potential wetland impacts. The following sections identify and analyze the alternative power station footprints, railroad alignments, access roads and utility lines that have been considered to avoid and minimize wetland impacts as a result of constructing Phase I and Phase II of the Mesaba Energy Project.

The avoidance and minimization analysis has proceeded in a hierarchical fashion. The most important factor is the location of the IGCC power station. There were four IGCC Power Station Footprint alternatives evaluated at both the West Range (Section F2.5.3.1) and at the East Range (Section F2.5.2.4.1) to attempt to avoid and minimize wetland impacts. Because the rail line and coal train operations greatly influence the location, orientation, and elevation of the IGCC Power Station Footprint, alternative rail alignments were evaluated for each of the Footprint alternatives. Differences in wetland impacts due to road access and utility lines were also noted as appropriate. Once the best overall location for the IGCC power station was identified, a finer look was taken of the road connections and utility alternatives (i.e. Sections F2.5.3.2 through F2.5.3.7 for the West Range and Sections F2.5.4.3 through F2.5.4.7 for the East Range.

The wetland avoidance and minimization analysis described in Sections F2.5.3 and F2.5.4 is based upon preliminary engineering As described in more detail in Section F2.5.5 whenever the Least Environmentally Damaging Practicable Alternative (LEDPA) is selected by the USACE, additional efforts to avoid and minimize wetland impacts would be considered during final design and future stages of the 404 permitting process.

F2.5.2.2 IGCC Power Station Facility

As described in subsequent sections, four alternative locations within both the West Range Site and the East Range Site were considered to identify the potential to avoid and minimize wetland impacts. However, as described in this section, the layout within the plant footprint is assumed to remain the same for all alternative sites. This is due to the fact that the layout within the IGCC Power Station Footprint is the result of substantial engineering efforts to develop the optimal layout to accommodate both Phase I and Phase II of the IGCC Power Station. This layout also reflects the balance between a large number of design considerations, many of which have been derived through over ten years of experience operating the Louisiana Gasification Technologies Inc. and Wabash River Coal Gasification Repower Project in Plaquemine, Louisiana and Terre Haute, Indiana, respectively. Such considerations include maximizing access for material handling and storage facilities to the rail yard, adjacent placement of related plant processes, minimizing the total footprint acreage to help reduce wetland impacts and site preparation costs, while maintaining sufficient distance between large process equipment to facilitate safe access for construction, operation, and maintenance of the facility. One example of optimization through adjacent placement is the air separation unit, which is near the combustion turbines (a source of air via air extraction and the nitrogen delivery point) and the gasifiers (the oxygen delivery point). Rearranging the plant layout is likely to disrupt this optimization, which may reduce the plant's ability to operate efficiently, and was therefore not considered for wetland avoidance and minimization. A visual rendering of the proposed IGCC layout is shown in Figure F2-3. A conceptual plot plan is shown in Figure F2-4 (Excelsior, 2009).

The IGCC plant will be constructed in two phases. Mesaba One is expected to be constructed between 2010 and 2014. Construction of Mesaba Two is expected to begin in 2012. The comparisons in Appendix F2 have been conducted on both phases. Section 4.7 discusses potential wetland impacts by phase.

The construction laydown areas used for stockpiling materials for Phase I will be placed within the footprint of Phase II in a manner that avoids wetland impacts. The construction laydown area for stockpiling materials for Phase II will be maintained offsite in nearby local areas. Excelsior would establish offsite construction staging and laydown areas for Phase II construction on lands selected from among potential sites as described in Chapter 2. All of the sites are located on lands that have been disturbed or cleared during prior uses by mineral extraction companies, and all have access to local roadways. Excelsior would select appropriate sites for the necessary acreage prior to construction of Phase II taking into consideration availability at that time. Sites used would be restored to prior existing conditions following completion of Phase II construction. Only areas of sites without wetlands would be utilized so there would be no additional impacts to wetlands.

These same procedures would be used for disposal of excess cut material.

F2.5.3 West Range Wetland Avoidance and Minimization

F2.5.3.1 West Range IGCC Power Station Footprint and Rail Alternatives

The following sections describe four IGCC Power Station Footprint alternatives considered to avoid and minimize wetland impacts. Because the rail line and coal train operations greatly influence the location, orientation, and elevation of the IGCC Power Station Footprint, alternative rail alignments were evaluated for each of the Footprint alternatives. The other linear project elements, including the site access road, HVTL, natural gas pipeline, process water lines, and water and sewer lines, were also considered for the Northeast and West alternatives when there were differences from the Central alternative.

The alternatives discussed are as follows:

- Central – DEIS (This is the alternative presented in the DEIS. The acreage of wetlands filled under this alternative has been corrected to account for the grading that would be necessary outside the power station footprint.);
- Central – FEIS (a modified Central alternative where the IGCC power station is slid approximately 280 feet to the northwest to minimize wetlands impacts);
- Northeast – (new alternative to move the IGCC power station to the uplands to the northeast to avoid wetland impacts); and
- West – (new alternative to move the IGCC power station to the uplands to the west to avoid wetland impacts).

The rail spur from the main CN/BNSF track would be shared by two entities, the IGCC Power Station and Essar Steel Minnesota, LLC ("ESM", previously refered to as "Minnesota Steel"). Originally, rail sidings that are to help manage incoming and outgoing material shipments for ESM were to be located within the wye where the spur for the IGCC Power Station diverged from the spur continuing on to ESM. The rail sidings at that original location required an elevation of 1390 ft msl be maintained at the IGCC Power Station's rail spur. Subsequent changes in the design (a longer siding was deemed necessary) and relocation of ESM's rail sidings to a point about three quarter's of a mile further beyond and outside the wye allowed the elevation of Excelsior's proposed rail loop to be raised from 1390 to 1405. This will reduce the cut required for construction of this alternative and minimize the resulting volume of excess material.

It should also be noted that numbers (e.g. wetlands acres filled, volume of cut and fill, length of rail line, etc. are discussed in the text of the following sections they are also summarized for comparison purposes in Section F2.5.3.1.5 in Table F2-3a. Text comparisons of noise, visibility, utility, and operational issues are summarized in Table F2-3b.

F2.5.3.1.1. *Central DEIS Alternative*

As depicted and analyzed in the DEIS, the IGCC Power Station Footprint is located in a topographic saddle between two substantial hills to minimize overall natural resource impacts. See Figure F2-5. The established elevation of the northeast portion of the footprint is principally determined by: i) the elevation of the main BNSF and CN rail line from which the spur serving the IGCC Power Station emanates; and ii) design limitations imposed by unit coal train operations. Grading disturbances within and around the IGCC Power Station Footprint are minimized by terracing the area such that the grade increases from northeast to southwest (Excelsior, 2009).

The IGCC Power Station Footprint is oriented to allow a straight-line approach to the power station's coal dumper from the rail alignment established as a result of locating the track between Dunning and Big Diamond Lake (in a manner to minimize residential impacts). The footprint is located between the two large wetland complexes in the southern and northern portions of the site (Excelsior, 2009). This placement of the Footprint would require filling of 34.58 acres of wetlands and would also bisect a wetland located in the southern-most corner of the Phase I Footprint (the northwestern area of A1), causing indirect impacts to 7.34 acres of wetlands that would be difficult to mitigate. It would require approximately 3,550,000 cubic yards of cut and 2,350,000 cubic yards of fill, for a net volume of material to be disposed of 1,200,000 cubic yards.

Rail Alternative 1-A (identified as preferred in the DEIS)

The originally proposed rail alignment (Alternative 1-A) would encircle the large wetland complex in the northern portion of the site (Wetland A4) as shown on Figure F2-5. This alignment would be 21,539 feet in total length with a rail loop of 9,838 feet at an elevation of 1390 feet. The rail alignment and loop would require 3,725,000 cubic yards cut and 610,000 cubic yards fill and would directly impact 17.93 acres of wetland Excelsior, 2009). An additional 58.3 acres of wetland would be enclosed within the rail loop and has to potential to have some of its wetland functions indirectly impacted from the construction and operation of the rail loop. The loop would restrict access of the 58.3 acres of wetlands to large fauna including mammals, could impede the movement of reptiles and amphibians, and could interfere with wetland hydrology.

One of the benefits of Alternative 1-A is the fact that the length of track along the plant boundary allows for continuous rail sidings to exiting the loop in the eastern portion of the site, extending the length of the northeasterly plant footprint and rejoining the loop track at the northwesterly plant corner. This allows an engine to traverse the rail loop to move from one end of a train to the other while using the siding and makes train operations and management more efficient.

Rail Alternative 1-B

Wetlands within the West Range Railroad Alternative 1B alignment totaled 18 wetland basins, as delineated during the 2005 field surveys. Permanent wetland losses caused by filling of wetlands would be 13.96 acres (Excelsior, 2009). In addition there would be potential indirect impacts to 43.37 acres of wetlands encircled by the rail loop. See Figure F2-6.

F2.5.3.1.2. Central FEIS Alternative

The IGCC Power Station Footprint is located near the center of the West Range site in a topographic saddle and between two large wetland complexes as shown on Figure F2-7 (Excelsior, 2009). The preferred IGCC Power Station Footprint has been shifted approximately 280 feet to the northeast from the original Station Footprint in order to reduce the raea of wetlands to be filled and to eliminate the potential indirect impacts to A1 by maintaining existing flow patterns.

Construction of the IGCC Power Station Footprint would impact 31.34 acres of wetland habitat. The impact footprint includes the Power Station footprint and grading of the adjacent area at a 3:1 slope to meet the natural grade of the surrounding area. The site has been designed in a tiered fashion to minimize grading on the sloping site topography. It would require approximately 3,100,000 cubic yards of cut and 2,350,000 cubic yards of fill and result in a total of 750,000 cubic yards of excess material (Excelsior, 2009). Wetland impacts from the IGCC Power Station Footprint, including areas of grading limits, are shown on Figure F2-7.

Road access to the IGCC Power Station would be from County Road (CR) 7 to the south and west as shown in Figure F2-7. This road alignment provides the shortest access to CR 7 and minimizes impacts to wetlands. Wetland impacts will include wetland fill for roadway construction and temporary impacts from ROW establishment.

Rail Alternative 3A

In an effort to avoid encircling the wetland complex Wetland A4, and in response to comments received on the DEIS, consideration was given to encircle the IGCC Power Station Footprint instead. Alternative 3A includes looping the rail around the IGCC Power Station Footprint (see Figure F2-8). This alternative avoids impacts to Wetland A4 to the north, but would result in additional impacts to wetlands in the southern portion of the site. This rail line would be 27,299 feet in total length (approx 5,760 feet longer than the preferred) with a rail loop of 21,500 feet at an elevation of 1,405 (compared to 1,390). It would require 4,668,000 cubic yards cut and 595,000 cubic yards fill and would result in filling of 12.00 acres of wetland (Excelsior, 2009).

The coal dumper and coal handling facilities would remain in the same location as Alternative 1-A, which would maintain maximum distance between the coal train and the adjacent residences during unloading. The coal dumper would be at an approximate elevation of 1405. However, once around the south side of the plant (where wetland elevation is between 1410 and 1420) construction of the rail line would require a cut of 10 to 20 feet in depth through the wetland areas. The cut through the wetland area could indirectly impact the adjacent wetland basin by altering the hydrology. These wetlands drain to the south and west, away from the rail line, which would minimize the potential hydraulic effect. Construction of an impermeable berm along the south side of the railroad cut would further protect wetland hydrology, but would result in a wider rail bed cross section and therefore more impacts to wetlands. Figure F2-9 shows the typical cross sections through both cut and fill areas.

Construction of the rail loop around the IGCC Power Station would constrain the rail sidings within the loop and limit the flexibility of internal rail operations for slag, sulfur, and other material transfers. The IGCC Power Station Footprint would be encircled by the rail loop at a significantly lower elevation, requiring bridge(s) for road access to the site. The process water lines and utilities would be routed along the access road, but would have to be constructed over 20 feet below existing grade beneath the rail cut. This would create a wide impact area for deep utility construction, as well as create issues with pumping water, sewer, and process water.

Rail Alternative 3B

The proposed rail line (Railroad Alternative 3B) preferred by Excelsior for the Final EIS will intersect the northeastern portion of the plant footprint and loop around the hill in the northeastern portion of the site as shown on Figure F2-7. This rail loop will be 22,070 feet in total length, with a rail loop of 15,303 feet at an elevation of 1,405. It will require 2,620,000 cubic yards cut and 620,000 cubic yards fill and will result in 5.73 acres of wetland fill (Excelsior, 2009).

Although rail yard operations will be less than optimal because the onsite rail sidings will be dead-end spurs instead of continuous sidings, this rail alternative reduces the area of wetland fill from 17.9 acres (DEIS rail alternative 1A) to 5.7 acres and avoids potential indirect impacts to 58.3 acres of encircled wetlands.

F2.5.3.1.3. Northeast IGCC Power Station Footprint

An IGCC Power Station Footprint in the northeast portion of the site (see Figure F2-10) would avoid the two large wetland complexes on the West Range Site (Wetlands A1 and A4) and reduce the wetland impacts from the plant footprint to 10.92 acres (Excelsior, 2009). The relocation would require rotation of the plant layout to ensure proper alignment with the rail line as it enters the site from the southeast. The relocated footprint and rotation would require reconfiguration of the access road, natural gas service, HVTL lines, process water supply and sewer and water utilities. The reconfiguration of these Project elements is also shown on Figure F2-10.

Although wetland impacts would be reduced by this alternative plant location, this area of the site is occupied by a large hill that currently represents a visual landmark in the general vicinity, has a maximum elevation of about 1,485 feet (a difference in elevation of approximately 75 feet from the center of the site), and approximately 135 feet from the low point on the site to the highest point on the site. Establishing a suitable construction site consisting of three tiers at elevations of approximately 1,405 (to accommodate the railroad), 1,425, and 1,440 feet mean sea level (msl) would require about 6,143,000 cubic yards of cut and 301,000 cubic yards of fill. This would result in an excess of 5,842,000 cubic yards of material that would require disposal (see Table F2-3a in Section F2.5.3.1.5). When combined with the excess material that would be result from construction of a rail line, the amount of excess material requiring disposal would be between 7.8 and 8.6 million cubic yards. Raising the elevation of the second and third tiers by 10 feet on the Northeast Footprint would reduce the amount of material cut and increase the amount of fill in certain areas, for a net decrease in cut of 2.4 million cubic yards. However, raising these two tiers would also aggravate the aesthetic impacts of noise and visibility given the lack of screening relative to the Central Footprint. See Tables F2-3a and 3b.

The power block and the switchyard of the original Northeast Footprint were tiered at the same height as the Central Footprint. At their respective elevations of 1,435 and 1,450 feet, the power block and switchyard associated with the reduced tiering would each be approximately 10 feet higher than the original location of the IGCC Power Station Footprint. As noted above, the increased elevation, combined with the loss of occlusion from a nearby forested hilltop, would increase the visibility of the IGCC Power Station in the surrounding area. For example, the base of the highest tier on the the Central Footprint is about 45 feet lower than the peak elevation of the hill upon which the Northeast Footprint is located. When one considers that the trees on the peak would be about 30 to 40 feet in height, the peak adds about 75 to 85 feet of screening, the loss of which would represent significant shielding.

A noise analysis of the Northeast alternative location showed that the closest sensitive receptor locations (those along the northern boundary of Big Diamond Lake) would fall within the same noise isobars as those for the Central location (between 45 and 50 dBA) representing no noticeable increase in noise. The isobar footprint was and is considered a "worst case" model allowing for no topographical or added attenuation.

The IGCC Power Station Footprint would extend across the alignment of the previously approved Naswhwauk Public Utilities Commission natural gas pipeline. This would require that the gas pipeline route be altered to avoid the Station Footprint, or that the Station Footprint be shifted further northwest. Relocation of the gas pipeline would result in construction nearer the western shore of Dunning Lake and nearer areas identified as having high potential for archaeological resources. Also, the Northeast Station Footprint itself is on an area identified as having moderate potential for encountering such resources. Shifting the Station Footprint slightly to the northwest could avoid the need to realign the gas pipeline, but would result in greater amounts of wetland fill.

Railroad Alternatives for the Northeast Site Footprint

Two rail alternatives were evaluated to serve the northeast site alternative and both are also shown on Figure F2-10 (Excelsior, 2009). Railroad Alternative 4A would loop south of the Northeast footprint. This rail line would be 20,643 feet in total length, with a 12,634-foot rail loop at an elevation of 1,405 feet. This alternative would require 2,871,000 cubic yards cut and 805,000 cubic yards fill with an excess balance of 2,066,000 cubic yards of material and would result in filling about 9.92 acres of wetland (compared to 5.73 for Alternative 3B). Railroad Alternative 4B would loop around the relocated IGCC Power Station Footprint. This rail loop would be 22,070 feet in total length, with a rail loop of 15,303 feet at an elevation of 1405 feet. It would require 2,620,000 cubic yards cut and 620,000 cubic yards fill with an excess balance of 2,000,000 cubic yards of material and would result in filling about 4.27 acres of wetland (compared to 5.73 for Alternative 3B).

For Alternative 4A, and a short segment of Alternative 4B where co-located with Alternative 4A, the southern portion of the rail loop would impact wetland area. At the point where the rail intersects the wetland along the southern portion of the loop, the elevation of the rail line would be 10 to 20 feet below the existing grade. These wetland basins flow to the southwest, so the cut through the wetland would be upgradient. However, protection from indirect impacts would be provided by constructing an impermeable berm along the south side of the rail line, thereby increasing the width of disturbance through the wetland area and, concomitantly, increasing wetland impacts relative to what would have occured from the railway track alone. The cut and fill calculations summarized above reflect such increased impacts.

Because Alternative 4B would encircle the Station Footprint, the design would need to accommodate space for the access road and HVTL. Water and sewer utilities and process water lines would be constructed beneath the rail grade, but road crossings would require a bridge.

For both rail Alternatives 4A and 4B the coal dumper would be located 2,000 feet southeast of the proposed dumper location for Alternative 1A and would result in the tail end of the coal train being visible for a longer period of time to residents near Big Diamond and Dunning Lakes during unloading. Trains would be within sight distance for approximately one additional hour during the unloading process (based on a 4-hour unloading process for an 8,000 foot unit coal train).

Associated Facilities for the Northeast Site Footprint

Rotation of the IGCC Power Station Footprint would reposition the Power Station's access road and administration offices along the northeastern margin of the site (Excelsior, 2009). This location would require that road access extend from CR 7 around the rear of the IGCC Power Station Footprint and would require a substantially longer access road. Road access could be provided around the east side of the footprint for either rail alternative. Road access could be provided around the west side of the plant, with the alignment dependent upon the location of the rail line. With the exception of the west access using rail Alternative 4A, any of the road alternatives would require one or more bridge crossings over the rail line.

Similarly, water and sewer service would be required at the administrative building at the rear of the IGCC Power Station Footprint. Water and sewer utilities would be routed along the entrance road out to CR 7 and then south to Taconite. These utilities could share the access road corridor for either a west or east access. However, the greater elevation of the plant would require additional pumping requirements for water supply for the 10 feet higher tiering to reduce excess cut material.

Process water lines would need to be routed to the center of the IGCC Power Station Footprint. This utility would likely be routed along with the sewer and water utilities and would follow the implemented roadway corridor. The IGCC Power Station's higher elevation would require that process water be pumped 10 feet higher than the preferred plan, resulting in slightly greater head and additional pumping requirements.

The HVTL lines transmitting electricity from the IGCC Power Station switchyard cannot be routed over buildings and power station equipment, but would have to be routed around the east side of the IGCC Power Station Footprint and further east to meet the existing HVTL corridor where it would turn south. If the eastern road alignment were established, the HVTL alignment could share the same corridor. If the western access were established, the HVTL would be established in a separate corridor or in association with the rail loop if Alternative 4B were constructed.

F2.5.3.1.4. West IGCC Power Station Footprint

An IGCC Power Station Footprint in the western portion of the site (see Figure F2-11) would avoid the two large wetland complexes on the West Range Site (Wetlands A1 and A4) and reduce wetland impacts to 18.26 acres (Excelsior, 2009). However the far westerly portion of the West Range Site has not been field delineated. Small, ephemeral wetlands such as those discovered in similar portions of the site that were field delineated are likely to be present in addition to those shown on the NWI.

Rotation of the IGCC Power Station Footprint would allow maximum wetland avoidance, but would not allow for proper alignment of the footprint with the rail line. The lack of a straight rail line along the front margin of the IGCC Power Station Footprint would restrict rail operations, including both the offloading of coal and the loading of ash, sulfur, and/or slag. The location of the coal dumper would require that coal and other materials be transferred to and from the IGCC Power Station by conveyor from an unloading area near the coal dumper as shown on Figure F2-11.

Although wetland impacts would be reduced by this alternative location for the Station Footprint, this area of the site is also occupied by a large hill, with a maximum elevation of about 1,480 feet and a total difference in elevation of about 130 feet from that point to the northeast corner of the site boundary. Establishment of a three tiered construction site (with elevations at approximately 1,405, 1,420, and 1,440 feet msl) would require 6,631,000 cubic yards of cut and 128,000 cubic yards of fill. This would result in an excess of 6,503,000 cubic yards of material that would require disposal. When combined with the excess material that would result from construction of a rail line the amount of excess material requiring disposal would be between 8.5 and 10 million cubic yards.

Raising the elevation of the second and third tiers on the West Footprint by 10 feet would reduce the amount of material cut and increase the amount of fill in certain areas. The net excess cut material could be reduced 2.6 million cubic yards. However, raising these two tiers would also aggravate the aesthetic impacts of noise and visibility given the lack of screening relative to the Central Footprint.

The location of the IGCC Power Station Footprint along the western boundary of the site would place the plant within 2,000 feet of one residence on CR 349 and within 3,000 feet of the residences along CR 7. In comparison, the preferred site would be approximately 3,300 feet from the same single residence on CR 349 and over 4,000 feet from the residences along CR 7. This proximity is compounded by the increased visibility and noise issues as described above for the Northeast alternative. This would be especially significant for these residents for this alternative. As noted above, without the shielding of the western-most hill within the IGCC Power Station's Buffer Land, the Power Station would likely be in plain view of these and other residences. The unmitigated noise contour for the West Footprint would be increased by about 5 dBA at the closest residences relative to the noise level from the Central Footprint. Therefore, complying with Minnesota noise standards would likely require equipment additions to mitigate such impacts.

Railroad Alternatives for the Western Site Footprint

Two rail alternatives were evaluated to serve the west site alternative. Alternative 5B would loop around the hill in the northeastern portion of the site (see Figure F2-11), similar to Alternative 4B. This rail loop would be 22,070 feet in total length, with a rail loop of 15,303 feet at an elevation of 1405. It would require 2,590,000 cubic yards cut and 775,000 cubic yards fill and would result in fill in 5.91 acres of wetland. Railroad Alternative 5C would loop around the center of the site (see Figure F2-11). This rail line would be 20,532 feet in total length, with a rail loop of 13,273 feet at an elevation of 1405. It would require 3,940,000 cubic yards cut and 1,412,000 cubic yards fill and would result in fill in 17.69 acres of wetland (Excelsior, 2009).

For both rail alternatives 5B and 5C the coal dumper would be located 2,000 feet southeast and, as described above for rail alternatives 4A and 4B, would result in the tail end of the coal train being visible to residents near Big Diamond and Dunning Lakes during unloading for a longer period of time. Trains would be within sight distance (approximately 854 feet) for approximately one additional hour during the unloading process (based on a 4-hour unloading process for an 8,000 foot unit coal train).

The location of the coal dumper in both rail alternatives 5B and 5C would require a conveyance system to transfer coal from the dumper location to the active and passive coal storage areas. Further, the lack of or poor intersection of the rail with the IGCC Power Station Footprint in these alternatives would require the plant tracks and loading areas for slag, sulfur, and other materials be located in the area between the coal dumper and the plant. This siding area would disturb an additional 25 to 40 acres. This layout of the plant tracks would complicate rail operations and material handling by requiring additional tracking or conveyors to transport material into this area.

Both rail loop alternatives would indirectly impact wetlands on south side of loop to some degree. Alternative 5C would result in the greatest wetland impact by bisecting two large wetland basins. The rail line would cross these wetlands at an elevation ten to 20 feet below the elevation of the wetland. Although the crossing would be upgradient of the southerly flow from these wetlands, excavation in the basin could result in indirect impacts to wetland hydrology. To avoid this potential effect, calculation of wetland impacts assumes that an impermeable berm would be constructed along the southern margin of the rail crossing.

Associated Facilities for the Western Site Footprint

Rotation of the IGCC Power Station Footprint would reposition the plant access and administration offices along the western margin of the site. This location would require that road access from CR 7 immediately north to the IGCC Power Station Footprint. The access road, and the sewer and water and process water utilities that would parallel the road, would impact wetland habitat. Shifting the IGCC Power Station Footprint further east to avoid wetland impacts at the rear of the plant would result in additional impacts to wetlands east of the Station Footprint and affect the rail and conveyor operations.

An isobar noise footprint was created for the West location. The sensitive receptors along the northern boundary of Big Diamond Lake were found to fall within the same noise isobars for the West plant location as to those of the Central location (between 45 and 50dBA) representing no noticeable increase in noise for the West alternative. However, additional receptors along CR 7 and to the immediate west show a slight increase in noise (1dBA) with the West alternative over the Central. Noise levels for the two closest residents located immediately southwest of the West Footprint are increased on the order of 5 dBA. The isobar footprint was and is considered a "worst case" model allowing for no topographical attenuation. An additional 1-3dBA due to the higher elevation of stacks and machinery and an elimination of topograpghic shielding would be expected at the closest sensitive receptors.

The HVTL lines transmitting electricity from the IGCC Power Station switchyard cannot be routed over the buildings and power station equipment, but would have to be routed eastward to the existing HVTL corridor where it would turn south. The infrastructure corridor along the western boundary of the buffer land is very crowded and would be plainly visible to residences along CR 7.

F2.5.3.1.5. Summary of West Range IGCC PowerStation Footprint and Rail Alternatives

The differences in wetlands acreage and cut and fill requirements for the four plant alternatives and their associated rail alternatives are summarized in Table F2-3a. As can be seen in the table the Central DEIS alternative has the greatest wetland impacts among all the plant locations no matter which of the two rail alternatives (1A or 1B) are combined with it. Since the Central DEIS location with Rail Alternative 1A was the preferred alternative in the DEIS it will be carried forward in the FEIS as one alternative that is completely analyzed. In comparing the remaining three alternative sites, the Northeast alternative (with enhanced tiering) with Rail 4B has the least wetland impact 15.2 acres. The wetland acres filled are summarized below.

Power Station Footprint and Rail Alternative	Wetlands Filled, acres	Figure Reference
Central DEIS – 1A	52.51	F2-5
Central FEIS – 3B	37.09	F2-7
Northeast (enhanced) – 4B	15.19	F2-10
West (enhanced) – 5B	24.17	F2-11

Table F2-3a. West Range IGCC Plant and Rail Alternatives Comparison (wetlands and grading)

Alternative	Wetlands Impacted, acres		Grading, cu yd		
	Filled	Indirect	Cut	Fill	Net for Disposal
DEIS Central					
IGCC DEIS	34.58	7.34	3,550,000	2,350,000	1,200,000
Rail 1A	17.93	58.3	3,725,000	610,000	3,115,000
Rail 1B	13.96	43.37			
Total -1A	**52.51**	**65.60**	**7,275,000**	**2,960,000**	**4,315,000**
Total -1B	48.54	50.67	8,500,000	2,000,000	6,500,000
FEIS Central					
IGCC FEIS	31.36		3,100,000	2,350,000	750,000
Rail 3A	12.00		4,668,000	595,000	4,073,000
Rail 3B	5.73		2,620,000	620,000	2,000,000
Total -3A	43.36		7,768,000	2,945,000	4,823,000
Total -3B	**37.09**		**5,720,000**	**2,970,000**	**2,750,000**
Northeast					
IGCC standard tiering	10.92		6,143,000	301,000	5,842,000
IGCC enhanced tiering	10.92		4,391,000	956,000	3,435,000
Rail 4A	9.92		2,871,000	805,000	2,066,000
Rail 4B	4.27		2,620,000	620,000	2,000,000
Total -4A enhanced	20.84		7,262,000	1,761,000	5,501,000
Total -4B enhanced	15.19		7,011,000	1,576,000	5,435,000
West					
IGCC standard tiering	18.26		6,631,000	128,000	6,503,000
IGCC enhanced tiering	18.26		4,357,000	489,000	3,868,000
Rail 5B	5.91		2,590,000	775,000	1,815,000
Rail 5C	17.69		3,940,000	1,412,000	2,528,000
Total -5B	24.17		6,947,000	1,264,000	5,683,000
Total -5C	35.95		8,297,000	1,901,000	6,396,000

Before selecting an alternative with reduced wetlands impacts to fully evaluate in the FEIS, one must consider other factors. One factor that is also summarized in Table F2-3a is the grading requirements of the alternatives. The Central FEIS alternative has the least amount of excess material to be disposed of as summarized below.

Power Station and Rail Alternative	Excess Material to be Disposed, cubic yards	Excess Material as % of Central FEIS
Central DEIS – 1A	4,300,000	157
Central FEIS – 3B	2,800,000	100
Northeast (enhanced) – 4B	5,400,000	198
West (enhanced) – 5B	5,700,000	207

The Central FEIS would have about ½ of the excess material for disposal as compared to the Northeast and West alternatives. The other distinguishing factors to consider (noise, aesthetics, utilities and operations) that were discussed in Sections F2.5.3.1.1 through F2.5.3.1.4 are summarized in Table F2-3b.

Table F2-3b. West Range IGCC Plant and Rail Alternatives Comparison (other factors)

Alternative	Noise	Visibility	Utilities	Operations/Other
DEIS Central				
IGCC DEIS	Baseline as described in FEIS	Baseline as described in FEIS	Baseline as described in FEIS	Baseline as described in FEIS
Rail 1A	Baseline as described in FEIS	Baseline as described in FEIS	Baseline as described in FEIS	Baseline as described in FEIS
Rail 1B				A longer ROW , with slightly steeper grades than 1A
FEIS Central				
IGCC FEIS	Essentially the same as DEIS alt	Essentially the same as DEIS alt	Essentially the same as DEIS alt	Essentially the same as DEIS alt
Rail 3A			Utility lines would be required to be placed deep underneath existing grade to go under rail line, resulting in maintenance issues and increased energy consumption for pumping water, sewer, and process water	Bridge over the rail track would be required to provide access to the Power Station Siding would limit the flexibility of internal rail operations for slag, sulfur, and other material transfers
Rail 3B				Rail yard operations would be less than optimal because the onsite rail sidings will be dead-end spurs instead of continuous sidings
Northeast				
IGCC enhanced tiering		Removal of the top of a large hill that is a visual landmark. Increased visibility of power station.	Would require City of Nashwauk to reposition its permitted natural gas pipeline to avoid it traversing beneath the coal pile storage area, rail sidings, and other project elements. New ROW through forested land would be 4,000 feet longer than Central.	Site would be on an area judged to have moderate potential for encountering archeological resources, and relocated Nashwauk pipeline in a high potential area.
Rail 4A		Tail end of the coal train would be visible for a longer period of time to residents near Big Diamond and Dunning Lakes during unloading		
Rail 4B		Tail end of the coal train would be visible for a longer period of time to residents near Big Diamond and Dunning Lakes during unloading	Utility lines would be required to be placed deep under rail line, resulting in increased maintenance issues and energy consumption for pumping water, sewer,	Bridge over the rail track would be required to provide access to the Power Station

Table F2-3b. West Range IGCC Plant and Rail Alternatives Comparison (other factors)

Alternative	Noise	Visibility	Utilities	Operations/Other
			and process water	
West				
IGCC enhanced tiering	The unmitigated noise contour for the West Footprint would be increased by about 5 dBA at the closest residences. Complying with Minnesota noise standards would likely require equipment additions to mitigate such impacts.	The plant would be closer to one residence on CR 349 and several residences along CR 7.		Lack of a straight rail line along the IGCC footprint would restrict rail operations, would require that coal and other materials be transferred to and from the IGCC Power Station by conveyor from an unloading area near the coal dumper
Rail 5B		Tail end of the coal train would be visible for a longer period of time to residents near Big Diamond and Dunning Lakes during unloading	New ROW through forested land would be 1,500 feet longer than Central	Located 1,800 feet from the Power Station Footprint, requiring that coal be actively conveyed over this distance to the inactive and active coal piles.
Rail 5C		Tail end of the coal train would be visible for a longer period of time to residents near Big Diamond and Dunning Lakes during unloading		

In comparing the Northeast and West alternatives, the Northeast has many advantages:

- Less wetlands to be filled – 15.19 vs 24.17 acres;
- Slightly less material to be disposed of – 5.4 vs 5.7 million cubic yards;
- Less noise impacts to residences to the west;
- Less asthetic impacts to the residences to the west; and,
- Would not require a long conveyor to transfer coal.

There are a few disadvantages regarding the Northeast as compared to the West:

- For the Northeast site the City of Nashwauk would have to reposition its permitted natural gas pipeline;
- Utility lines would have to be placed deep under the rail line, resulting in maintenance issues, additional pumping costs, and energy consumption; and
- A bridge over the railroad would be required to provide access to the Power Station.

In this comparison the Northeast location would be preferable to the West location.

In comparing the Central FEIS to the Northeast, the Central FEIS has many advantages:

- Signicantly less material to be disposed of – 2.8 vs 5.4 million cubic yards;
  - Lower cost;
  - Less land covered;
  - Less energy consumed; and

  - o Less impacts from truck traffic – noise, dust, internal combustion engine emissions, and damage to roads—due to shorter haul distances.
- Would not require the City of Nashwauk to reposition its permitted natural gas pipeline into an area of high archeological potential;
- Would not require removing the top of the tallest hill in the area;
- Would have less visibility both of the plant and the coal train;
- Would not require that utility lines would have to be placed deep under the rail line, resulting in lower pumping costs and energy consumption, and lessening maintenance issues;
- Would not require a bridge over the railroad to obtain access to the Power Station.

There are two disadvantages to the Central FEIS location as compared to the Northeast:
- More wetlands would be filed – 37.09 vs 15.19 acres;
- Rail yard operations would be less than optimal because the onsite rail sidings would be dead end spurs instead of continuous sidings.

DOE has concluded that because of the additional costs, energy consumption (in both construction and operation), maintenance issues, and environmental and socio-economic impacts associated with the Northeast and West sites, they are not practicable alternatives. Thus, the Central FEIS alternative with Rail 3B will be analyzed further in Appendix F2 (both the road and utility connections and more detailed discussions of the wetlands proposed to be impacted) and the FEIS.

F2.5.3.2 Access Road for the Central Alternative

The original proposed road corridor (see Access Road 2 Figure F2-6) was designed with the intention of intersecting a new CR 7 alignment proposed by Itasca County that would extend eastward off the existing CR 7 just south of West Range Site, run east between Dunning Lake and Big Diamond Lake, and then turn south between Arcturus Mine and Big Diamond Lake to intersect with U.S. 169 (shown as Access Road 1 in Figure F2-6). The realignment was proposed to improve truck traffic access to the IGCC Power Station and the Essar Steel Minnesota, LLC (ESM) mining and steelmaking plant site and to reduce conflicts between slow, heavy trucks and passenger vehicles. Due to the lack of sufficient of state bonding money for the project and the reluctance of Excelsior and/or ESM to cover construction costs, Itasca County dropped its plans to construct the new roadway. Additional options for road access to the West Range Site were subsequently investigated.

The proposed road alignment (see Figure F2-7**)** would reduce the length of the road and would reduce wetland impacts from 5.67 acres to 0.194 acres. Wetland hydrology will be maintained via culvert(s) under the roadway to avoid indirect impacts to wetland habitat (Excelsior, 2009).

F2.5.3.3 Power Transmission Alternatives for the Central Alternative

F2.5.3.3.1. HVTL Alternatives 1 and 1A

Alternatives 1 and 1A are shown in Figure F2-12**.** These alternate routes shares about 3.3 miles of ROW. Alternative 1A parallels about 2 miles of the secondary road known as Twin Lakes Road. It crosses or abuts the Swan River in several locations and crosses numerous areas that have been cleared but are unoccupied (Excelsior, 2009).

Wetland Fill

Wetland fill would be limited to those areas where power poles will be placed within wetlands. Each pole is assumed to require an estimated 28 square feet of fill. It is assumed that power poles will be placed evenly, every 800 feet along the alignment. Using this assumption, 16 power poles would be placed within wetland habitat and would result in approximately 0.01 acres of wetland fill for Alternative 1 (either WRA-1 or WRB-1) or Alternative 1A (either WRA-1A or WRB-1A).

Wetland Type Conversion (Tree and Shrub Clearing)

Construction across greenfield and establishment of new ROW will require clearing of vegetation in upland and wetland areas. Impacts to wetland vegetation would be of two types, temporary impacts to scrub-shrub habitat in temporary work spaces outside the permanent ROW and permanent conversion of scrub-shrub habitat within the permanent ROW and forested habitat within the permanent ROW. Temporary conversion would include removal of scrub-shrub vegetation in the temporary construction ROW but outside the permanent ROW. These areas would be allowed to revegetate following construction. Permanent conversion would include removal of scrub-shrub vegetation within the permanent ROW and removal of forest vegetation within the construction ROW. The permanent ROW would be maintained free of woody vegetation, resulting in conversion of scrub-shrub and forested wetland to emergent wetland habitat. Although forested wetland cleared outside of the permanent ROW but within the construction ROW would still be allowed to revegetate, it is considered a permanent type conversion because of the length of time that regeneration would require. There would be 2.3 acres of temporary scrub-shrub wetland impacts and 36.2 acres of permanent wetland type conversions for Alternative 1. There would be 3.9 acres of temporary scrub-shrub wetland impacts and 25.3 acres of permanent wetland type conversions for Alternative 1A.

Water Crossings

Since a portion of HVTL Alternative 1A follows the same alignment as HVTL Alternative 1, there are two similar water crossings: a perennial stream between Big and Little Diamond Lakes and the Swan River, a protected water listed by the MDNR Protected Waters Inventory. There are four additional water crossings over the Swan River along the southern portion of the HVTL Alternative 1A alignment. Wetland impacts within the bed of any portions of these water bodies will be avoided. The total length of water crossings for HVTL Alternative 1 is estimated at 123 linear feet and Alternative 1A is estimated at 533 linear feet.

Alternative 1 is preferred to Alternative 1A because of fewer crossings of the Swan River, avoidance of county recreatrional lands, and greater distances from residences.

F2.5.3.3.2. Plan B HVTL Alternative

Excelsior Energy considered a range of alternate HVTL configurations, including staggered and unstaggered 230kV and 345kV transmission concepts, each of which offered varying levels of cost and reliability.

Phase 1

The preferred Route WRB-1 is identical to the preferred Route WRA-1 but involves the use of a double circuit 230kV HVTL instead of a 345kV double circuit. The Plan B preferred route would also require the same additional new six miles of ROW and, therefore, the Proponent must propose at least one alternative HVTL route.

The alternate Route WRB-1A is identical to the preferred Route WRA-1A with the exception that Route WRB-1A will involve use of a double circuit 230kV HVTL.

Phase 2

The difference between the proposed HVTL plan and Plan B is in the provision of service for Phase II. The preferred route WRB-2 for Phase II under Plan B would be the route not selected in Phase I of Plan B. In other words, the wetland impacts accompanying the preferred HVTL alignments under Plan B would approximate the sum of the wetland impacts associated with the Plan A preferred *and* alternate routes. Again, this is because three 230 kV circuits are required under Plan B; two of the three circuits can traverse the same route, but the third must travel in a separate route to avoid crowding within one ROW.

The alternate route for Plan B Phase II, namely WRB-2A, would involve use of the existing 28L and 62L corridors as shown in Figure F2-13. Wetland impacts associated with this route would result in little (0.03 acre) potential for additional direct or indirect wetland impact because it would use an existing HVTL system in existing maintained ROW.

Water Crossings

There are five water crossings associated with Plan B Phase II Alternate Route WRB-2A, all of which are protected waters listed in the MDNR Protected Water Inventory. These crossings include the Swan River and one of its tributaries, Snowball Creek, Oxhide Creek, and Oxhide Lake. Wetland impacts within the bed of any portions of these water bodies will be avoided. The total length of water crossings for Plan B Phase II Alternate Route WRB-2A is estimated at 283 linear feet.

F2.5.3.4 Natural Gas Pipeline Alternatives for the Central Alternative

F2.5.3.4.1. West Range Natural Gas Pipeline Alternative 1

The Nashwauk Public Utilities Commission has recently received (April 2008) a Route Permit from the MPUC and plans to construct a 24-inch diameter natural gas pipeline past the IGCC Power Station Footprint to serve the Minnesota Steel Industries steel plant. If this pipeline is constructed as proposed, Excelsior would likely tap into it at the point where it turns eastward from the West Range site and would not construct a parallel pipeline (Alternative 1) as proposed in the Joint Application (Excelsior, 2009). If the Nashwauk gas pipeline was not constructed, and Excelsior were to construct Alternative 1 it would result in the following impacts:

- Temporary impacts to 3.9 acres of emergent wetlands;
- Temporary impacts to 0.8 acres of shrub-scrub wetlands; and
- Permamant type conversion of 16.4 acres of forested and shrub-scrub wetlands to emergent wetlands.

F2.5.3.4.2. West Range Natural Gas Pipeline Alternative 2

Alternative 2 would follow the same route as the Proposed Alternative, running south from the IGCC Power Station, for approximately 7.5 miles. The route for Alternative 2 would then turn to the west to La Prairie. The route of Natural Gas Pipeline Alternative 2 is shown in Figure F2-14.

Impacts to wetland vegetation would be of three types, temporary impacts to emergent wetlands, temporary impacts to scrub-shrub habitat in temporary work spaces outside the permanent ROW and permanent conversion of scrub-shrub habitat within the permanent ROW and forested habitat within the permanent ROW. Temporary impacts to emergent wetlands would be restored following construction. Temporary conversion would include removal of scrub-shrub vegetation in the temporary construction ROW but outside the permanent ROW. These areas would be allowed to revegetate following construction. Permanent conversion would include removal of scrub-shrub vegetation within the permanent ROW and removal of forest vegetation within the construction ROW. The permanent ROW would be maintained free of woody vegetation, resulting in conversion of scrub-shrub and forested wetland to emergent wetland habitat. Although forested wetland cleared outside of the permanent ROW but within the construction ROW would still be allowed to revegetate, it is considered a permanent type conversion because of the length of time that regeneration would require. There would be 1.5 acres of temporary impacts to emergent wetlands, 0.02 acres of temporary impacts to scrib-shrub wetlands, and 11.0 acres of permanent type conversion.

There are four water crossings associated with Natural Gas Pipeline Alternative 2. The Swan River will be crossed twice by Natural Gas Pipeline Alternative 2 at approximate Mileposts 5+4330 (feet) and 10+4180, as shown in Figure F2-10. Other water crossings include the Prairie River at Milepost 0+1980 and a perennial stream between Big Diamond and Little Diamond Lakes at Milepost 13+1690. Construction methods for Natural Gas Pipeline Alternative 2 will be the same as those for the Proposed Natural Gas Pipeline. The combined length of the water crossing for natural gas Pipeline Alternative 2 is estimated at 313 linear feet.

F2.5.3.4.3. West Range Natural Gas Pipeline Alternative 3

Alternative 3 would follow the same route from the IGCC Power Station Footprint as the Proposed Alternative, running south from the IGCC Power Station along existing ROW to TH 169. The route for Alternative 3 would then turn west and run adjacent to TH 169 through Coleraine and Bovey and then turn south to La Prairie. The route of Natural Gas Pipeline Alternative 3 is shown in Figure F2-14.

Alternative 2 would follow the same route as the Proposed Alternative, running south from the IGCC Power Station, for approximately 7.5 miles. The route for Alternative 2 would then turn to the west to La Prairie. The route of Natural Gas Pipeline Alternative 2 is shown in Figure F2-14.

Impacts to wetland vegetation would be of three types, temporary impacts to emergent wetlands, temporary impacts to scrub-shrub habitat in temporary work spaces outside the permanent ROW and permanent conversion of scrub-shrub habitat within the permanent ROW and forested habitat within the permanent ROW. Temporary impacts to emergent wetlands would be restored following construction. Temporary conversion would include removal of scrub-shrub vegetation in the temporary construction ROW but outside the permanent ROW. These areas would be allowed to revegetate following construction. Permanent conversion would include removal of scrub-shrub vegetation within the permanent ROW and removal of forest vegetation within the construction ROW. The permanent ROW would be maintained free of woody vegetation, resulting in conversion of scrub-shrub and forested wetland to emergent wetland habitat. Although forested wetland cleared outside of the permanent ROW but within the construction ROW would still be allowed to revegetate, it is considered a permanent type conversion because of the length of time that regeneration would require. There would be 7.9 acres of temporary impacts to emergent wetlands, 0.3 acres of temporary impacts to scrib-shrub wetlands, and 4.3 acres of permanent type conversion

While the wetland impacts associated with Alternative 3 are less than the preferred alternative, the route for Alternative 3 travels through portions of the towns of Coleraine and Bovey, and the route's close proximity to a high number of residences makes it unlikely that the MPUC would grant a permit for this route rather than Alternative 1, as evidenced by the MPUC's decision for the Nashwauk pipeline. There are 935 residences within a half mile of Alternative 3 (compared to 153 for Alternative 1), including 7 residences within 100 feet (compared to zero for Alternative 1).

There are four water crossings associated with Natural Gas Pipeline Alternative 3. The Prairie River will be crossed by Natural Gas Pipeline Alternative 3 at approximate Milepost 0+2300 (feet), as shown in Figure F2-14. Other water crossings include a tributary of the Prairie River at Milepost 2+880, a perennial stream that drains to Holman Lake at Milepost 9+3200, and a perennial stream between Big Diamond and Little Diamond Lakes at Milepost 11. Construction methods for Natural Gas Pipeline Alternative 3 will be the same as those for the Proposed Natural Gas Pipeline. The combined length of the water crossing for Natural Gas Pipeline Alternative 3 is estimated at 236 linear feet.

F2.5.3.5 Process Water Pipelines for the Central Alternative

F2.5.3.5.1. Process Water Alternatives

The Mississippi River was considered as a potential water source for the supply of water to the Phase I & II IGCC Power Station. However, the process water pipeline would be approximately 10 miles long and require several pump stations, electrical facilities, support structures, and land acquisitions in order to provide adequate flow for the plant. Such an alternative would also not help resolve the flooding issues in the Canisteo Mine Pit and the Hill-Annex Mine Pit Complex. For these reasons, this alternative was determined to be unnecessary and removed from further consideration.

Consideration was also given to supplying process water by drilling a number of ground water wells and developing those wells. This alternative was rejected after review of available information that showed most wells in the area will likely produce between 200 and 300 gallons per minute. This alternative would require the development, operation and maintenance of up to 50 ground water wells, pump stations, force mains, electric services, and support structures to provide adequate flow for the IGCC Power Station. The geographical size of this well field, the effects of the well field on other nearby wells, and the supporting infrastructure that would have to be maintained would present insurmountable logistical problems. For these reasons, and the fact that it also does not address the serious flooding issues presented by the Canisteo and Hill Annex Mine pits, this alternative was determined to be impracticable and removed from further consideration (Excelsior, 2009).

F2.5.3.5.2. Pipeline Corridor Location Alternatives

Large wetlands were avoided when initially establishing the ROW for the Proposed Process Water Pipelines. When wetland delineations occur and the wetland boundaries are known, further sequencing measures will be taken to avoid and minimize temporary wetland impacts. Exact pipeline routes will be established during the design phase and these routes will be sited in such a way as to avoid wetlandswhere possible. Construction activities will be planned during the winter months to further minimize impacts to wetlands as a result of pipeline installation.

The Proposed Process Water Pipelines will be located so they share permanently maintained ROW with other utilities as much as possible. For example, Segment 3 of the Proposed Process Water Pipeline will parallel the Proposed Railroad, Site Access Road, CR 7, and a portion of Segment 2. Segment 2 of the Proposed Process Water Pipeline will parallel the Site Access Road, Sanitary Sewer Pipeline, Potable Water Pipeline, and a portion of Segment 3, as shown in Figure F2-15.

F2.5.3.6 Process Water Blowdown for the Central Alternative

The proposed IGCC Power Station was originally designed to treat all contact wastewaters with a zero liquid discharge (ZLD) system in order to protect local receiving waters. Non-contact wastewaters were to be discharged into Holman Lake. In order to further minimize environmental impacts and eliminate permitting issues associated with discharging such wasterwaters, Excelsior announced in a January 21, 2008 press release that all non-contact wastewaters would be treated by a separate ZLD system, thereby eliminating all direct wastewater discharges. This ZLD treatment also allows the elimination of blowdown pipelines, which further reduces wetland impacts. The use of a ZLD system has eliminated 3.04 acres of permanent type conversion wetland impacts and 1.57 acres of temporary impacts to wetlands that would have resulted from the construction of the discharge water blowdown lines as described in the DEIS.

F2.5.3.7 Potable Water and Sanitary Sewer Alternatives for the Central Alternative

Excellsior evaluated two alternatives for potable water and sanitary sewer: (1) construction of on-site water and wastewater and treatment facilities; and (2) connection to the municipal facilities of the City of Taconite. See Figure F2-16.

On site water treatment considered was construction of a facility with the capacity to treat 7,500 gallons per day of raw water from the Canisteo Mine Pit and Hill-Trumbull/Hill-Annex Mine Pit Complex to provide potable water to the IGCC Power Station. Construction of a building to house the filtration system, a 5,000 gallon underground reservoir, and pump would be required as part of this alternative.

On-site treatment of domestic wastewater generated at the site would consist of constructing a stabilization pond and wastewater treatment facility (WWTF) on the project site. The facility would be constructed with the capacity to treat 45,000 gallons of domestic wastewater per day (the maximum projected flow from Mesaba One and Two). Once treated, effluent from the WWTF would be routed off-site, most likely to Little Diamond Lake via an 8-inch diameter gravity sewer pipeline.

The alternative of connecting to the City of Taconite's systems was selected for the following reasons (Excelsior, 2009):

- it is advantageous to the community in expanding their service area and upgrading their facilities;
- avoids issues surrounding new and expanded discharges to impaired waters;
- the onsite alternatives do not adequately address water and wastewater requirements during construction that are higher by a factor of seven than the requirements during operation;
- does not result in any additional wetland impacts, since water and sewer lines can be entirely routed in ROWs of roads and other utilities; and
- given the prevalence of wetland habitat surrounding the IGCC Power Station Footprint, additional development in the area would very likely create additional wetland impacts.

F2.5.3.8 Summary of West Range Road and Utility Alternatives

The temporary and permanent impacts to wetlands associated with the road and utility alternatives are summarized in Table F2-4.

Table F2-4. Summary of West Range Road and Utility Alternatives Wetland Impacts

	Permanent Impacts, acres					Temporary Impacts, acres		
	Type Conversion			Fill	Total Fill + Type Conversion	Emergent Wetlands	Shrub-scrub	Total
	Shrub-scrub to Emergent	Forested to Emergent	Total					
Road Access								
DEIS Preferred		1.07	1.07	5.67	6.74	0.17	2.81	2.98
FEIS Preferred			0.00	0.19	0.19		0.13	0.13
HVTL								
DEIS/FEIS Preferred								
Alternative 1		36.16	36.16	0.01	36.17		2.33	2.33
Alternative 1A		25.34	25.34	0.01	25.35		3.90	3.90
Plan B (WRB-1/1A)		61.50	61.50	0.02	61.52		6.23	6.23
Plan B (WRB-1/2)		36.16	36.16	0.04	36.17		2.33	2.33
Plan B (WRB-1A/2)		25.34	25.34	0.04	25.35		3.90	3.90

Table F2-4. Summary of West Range Road and Utility Alternatives Wetland Impacts

	Permanent Impacts, acres					Temporary Impacts, acres		
	Type Conversion			Fill	Total Fill + Type Conversion	Emergent Wetlands	Shrub-scrub	Total
	Shrub-scrub to Emergent	Forested to Emergent	Total					
Natural Gas Pipeline								
DEIS/FEIS Preferred								
Alternative 1	4.50	11.88	16.38		16.38	3.90	0.84	4.74
Alternative 2	7.59	3.39	10.98		10.98	1.46	0.02	1.48
Alternative 3	2.47	1.79	4.26		4.26	7.93	0.33	8.26
Process Water Pipeline								
DEIS/FEIS Preferred								
Water Line 1	0.00	0.00	0.00		0.00	0.00	0.00	0.00
Water Line 2	0.12	1.98	2.10		2.10	0.00	0.18	0.18
Water Line 3	1.23	1.14	2.37		2.37	1.26	1.15	2.41
Process Water Blowdown								
Pipeline								
DEIS Preferred								
Line 1 to Holman Lake	2.86	0.00	2.86		2.86		1.40	1.40
Line 2 to Canisteo Pit	0.09	0.09	0.18		0.18		0.17	0.17
FEIS								
Line 1 to Holman Lake			0.00		0.00			0.00
Line 2 to Canisteo Pit			0.00		0.00			0.00
Potable Water & Sanitary								
Sewer Pipeline								
DEIS/FEIS Preferred			0.00		0.00		0.00	0.00

F2.5.4 East Range Wetland Avoidance and Minimization

F2.5.4.1 East Range IGCC Power Station Footprint Alternatives

The following sections describe four IGCC Power Station Footprint alternatives considered to avoid and minimize wetland impacts. The alternatives discussed are as follows:

- Prefered (Figure F2-17 - This is the alternative presented in the DEIS. The acreage of wetlands filled under this alternative has been corrected to account for the grading that would be necessary outside the power station footprint.);
- Northeast Shift of 50 feet (Figure F2-18);
- Southeast Shift (Figure F2-21); and
- Southern Shift (Figure F2-19).

F2.5.4.1.1. <u>Preferred East Range IGCC Power Station Footprint</u>

As shown on Figure F2-17**,** the IGCC Power Station Footprint is located on the west side of the East Range site property boundary, situated between an existing 138kV HVTL corridor leading to MP's Syl Laskin Substation and a large wetland complex to the south and east (Wetland C). The Station Footprint is oriented to accommodate an acceptable i) curvature angle of the rail spur at the point where it splits from the existing CN track at the southwestern-most portion of the site and ii) approach to the railcar dumper.

As positioned in Figure F2-17, the IGCC Power Station Footprint would impact 17.15 acres of wetland habitat. The impact area includes the Station Footprint and the 3:1 grading at its boundaries required to achieve the natural grade of the surrounding area. The Station Footprint is located on a hill that drops about 40 feet in elevation from northwest to southeast; therefore, site has been designed in a tiered fashion to minimize grading on the sloping topography. Such grading would require approximately 3,349,900 cubic yards of cut and 1,146,400 cubic yards of fill and result in a total of 2,203,500 cubic yards of excess material (Excelsior, 2009).

The IGCC Power Station would be constructed in two phases. Mesaba One is expected to be constructed between 2010 and 2014; construction of Mesaba Two is expected to begin in 2012. Mesaba One would be constructed in the northern portion of the Station Footprint because of the desire to provide the longest straight line approach to the railcar dumper and to minimize the length of conveyors needed for stockpiling feedstocks in this unit's active and passive storage areas.

F2.5.4.1.2. Alternative Placement of the IGCC Power Station Footprint: Avoiding & Minimizing Wetland Impacts

The IGCC Power Station Footprint was moved around within the site boundaries to evaluate the potential for avoiding and minimizing wetland impacts. Looking at Figure F2-17 confirms that the Station Footprint cannot be moved any further northwest to minimize impacts to Wetland C given its placement directly adjacent to the western site boundary, the existing HVTL corridor, and the adjacent waste rock stockpiles and berm around the tailings basin. Any significant shift of the Station Footprint to the north would require concomitant movement to the east to keep from encroaching on others' property. Figure F2-18 shows a shift of approximately 50 feet to the northeast. This shift would slightly reduce impacts to the large complex (Wetland C) in the southwest corner of the Station Footprint, but would slightly increase Wetland C impacts to the northeast, and would increase total impacts from 17.15 acres to 17.30 acres.

Any shift of the Station Footprint to the west would also require a shift to the south, which would clearly increase impacts to the Wetland C complex located in the southern portion of the site. Alternative locations for the Station Footprint within the East Range site boundaries are limited by the large Wetland C complex that extends from the northeastern corner to the southwestern corner of the site. The southeastern portion of the site contains upland area, but insufficient area to accommodate the IGCC Power Station Footprint without filling wetlands. An attempt to position the Station Footprint in the southern-most portion of the East Range site, shown on Figure F2-19, would result in 62.67 acres of wetland fill. This alternative would also require alternative rail and road access. The rail loop would require an additional 5.34 acres of wetland fill and the road an additional 1.23 acres. In total, positioning the Station Footprint in this location would result in 69.24 acres of wetland impact. More importantly, repositioning the Station Footprint in the southernmost portion of the East Range site would bring the IGCC Power Station to within 2,000 feet of the closest residences and eliminate any screening of the Station's ongoing industrial operations. The increased noise and aesthetic impacts associated with repositioning the Station Footprint in this location would be expected to be opposed by Hoyt Lakes residents.

In testimony presented by the MDNR's James M. Sellner on January 30, 2008 before Administrative Law Judge Steve M. Mihalchick,[1] Mr. Sellner indicated that the State currently had under lease to Steel Dynamics

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[1] State Of Minnesota, Office Of Administrative Hearings, For The Public Utilities Commission, *In the Matter of the Joint Application by Excelsior Energy for the following Pre-Construction Permits: Large Electric Generating Plant*

for future mining a large portion of the 2WX Mine Pit. Further, Mr. Sellner doubted that blasting, vibration and fly rock could co-exist next to a power plant of this size. Mr. Sellner concluded by stating:

> *"Our recommendation is that the footprint of the Hoyt Lakes power plant be located so that those mineral taconite resources and nonferrous mineral resources from those areas be protected. We're not opposed to the power plant, just trying to protect those underlying resources in that area."*

On February 29th, 2008, the MDNR's Matthew Langan submitted a letter to the Administrative Law Judge Steve M. Mihalchick underscoring Mr. Sellner's comments. Mr. Langan stated that there is potential that Mesabi Nugget may reopen the Area 2WX mining site and that the existing placement of the East Range IGCC Power Station in close proximity to future mining in 2WX "could encumber state taconite reserves resulting in millions of dollars of lost revenue for the state's school and tax-forfeit trusts." Mr. Langan noted that typical blast perimeters around taconite mining operations range from 3,000 to 5,000 feet. To avoid such encumbrance, Mr. Langan stated that the final location of the facilities on the East Range Project Site should be reviewed in conjunction with mining and operating plans being developed for Mesabi Nugget's expansions.

The MDNR's testimony strongly recommends that the IGCC Power Station Footprint should be moved further from the Iron Formation and Mine Pit 2WX to avoid dangers associated with blasting debris being carried into the IGCC Power Station Footprint and/or to avoid increased mining costs. The East Range site is capable of accommodating the IGCC Power Station Footprint while maintaining the recommended blast radius. However, referring to Figure F2-17, any movement of the Station Footprint to increase the distance between it and Mine Pit 2WX would increase wetland impacts.

F2.5.4.2 East Range Rail Access

F2.5.4.2.1. Preferred East Range Rail Access

The proposed rail spur to the East Range IGCC Power Station (Railroad Alternative 1) would intersect the southeastern margin of the Station Footprint and loop as shown on Figure F2-17. This rail loop would provide optimal rail yard operations because it allows the onsite rail sidings to be continuous and reconnect with the track without dead-end spurs. The spur would be 17,878 feet in total length with a rail loop of 9,836 feet at an elevation of 1,465 feet msl. The preferred rail alignment and loop would require 2.39 million cubic yards cut and 0.12 million cubic yards fill and would impact 13.38 acres of wetland (Excelsior, 2009). An additional 51.26 acres of two remnant wetlands would be enclosed within the rail loop. This wetland complex is supported by surface flow via a tributary to Colby Lake from offsite to the north. The preferred railroad alternative would cross this tributary in two locations. Culverts would be installed in these locations in order to maintain current volumes of flow. Culverts would be installed in other locations throughout the rail loop as well in order to ensure maintenance of hydrologic connectivity throughout the wetland.

The Railroad Alternative 1 corridor would require crossing approximately six linear feet of streams and bodies of water. The tributary to Colby Lake that flows through Wetland C is crossed twice by the center loop.

Site Permit, High Voltage Transmission Line Route Permit and Natural Gas Pipeline Routing Permit related to the Mesaba Energy Project in Itasca and St. Louis Counties, OAH Docket No. 12-2500-17512-2; MPUC Docket No. E-6472/GS-06-668, Public Hearing Volume IV - Pages 525 – 632, Evening Session January 30, 2008 Hoyt Lakes Arena, Hoyt Lakes, Minnesota. Mr. Sellner's testimony appears on pages 550-553.

F2.5.4.2.2. East Range Railroad Alternative 2

Railroad Alternative 2 (*see* Figure F2-20) would extend from existing CN track southwest of the East Range Site, unload coal at the IGCC Power Station, and exit the site and join existing CN track east of the site. This alternative would not include a rail loop. The track for Alternative 2 would be 18,430 feet in total length with an elevation of 1,465 feet msl. It would require 2,180,000 cubic yards cut and 123,000 cubic yards fill and would require filling 18.34 acres of wetland (Excelsior, 2009).

Alternative 2 is less than optimal because it would not include a rail loop. Coal train loops have become the standard for most coal fired power plants because the system is a very efficient method for handling coal. The disadvantage is that is takes more land to construct a rail loop.

The track profile grade for Alternative 2 is acceptable but not ideal. The unloading areas would be located on a minor incline to the east. Train unloading operations would extend across CR 666 which would require reconstruction of a segment of the roadway to provide a highway bridge over the tracks. Forest Road 117 would need to be relocated or closed during coal unloading operations. Extension of the train unloading area outside of the plant area would also cause issues with security, visual impacts, coal dust and adjacency to the active CN RR line.

Railroad Alternative 2 would cross approximately 6 linear feet of streams and bodies of water, the tributary to Colby Lake and Wyman Creek.

F2.5.4.2.3. East Range Railroad Alternative 3

The option of routing the rail loop around the plant site was investigated to determine the potential to reduce wetland impacts. Railroad Alternative 3 (*see* Figure F2-21) would have a rail loop surrounding the plant site. While it appears a loop surrounding the plant site would reduce the need for wetland impacts through Wetland C (as incurred for Rail Alternatives 1 and 2), further investigation showed that it was impossible to encircle the plant site and avoid Wetland C while maintaining required railroad curvature. Furthermore, encircling the plant site required additional area between the plant site and the existing HVTL and tailings basin and required the plant site to be shifted to the southeast, therefore incurring more wetland impacts. In order to provide enough width for the rail bed to surround the IGCC Power Station, the Station Footprint was shifted to the southeast approximately 500 feet. The shifted plant layout would result in 41.90 acres of impact (24.75 acres more than preferred) to the Wetland C complex traversing the center of the East Range Site.

The track for Alternative 3 would be 24,860 feet in total length with an elevation of 1,465 feet msl. It would require 5,257,000 cubic yards cut and 354,000 cubic yards fill and would result in filling 27.01 acres of wetland (Excelsior, 2009). Note that this estimate of wetland impact represents only that additional wetland fill that would result from construction of the rail line and loop; it does not include wetland fill that would result from construction of the Station Footprint.

- Alternative 3 would result in increased wetland impacts relative to the preferred alternative.
- Would require bridge crossing for site access road.
- This alternative requires the greatest track length by approximately 7,000 feet.
- Would require more than double the excavation efforts than the preferred (Alternative 1).
- The track in the southwest corner of the site may impact the adjacent tailings basin dike. Special geotechnical techniques may be required during design and construction of this alternative.
- Because the Station Footprint is shifted to the southeast, a greater distance is maintained between it and blasting associated with future mining activities in Mine Pit 2WX.

F2.5.4.2.4. Summary of East Range Railroad Alternatives

Rail track length, wetland impacts, and cut and fill quantities are summarized for each East Range IGCC Power Station railroad alternative in Table F2-5. Alternative 1 was chosen as the preferred alternative because it had the shortest track length, the least wetland impacts, and it minimized grading necessary for construction.

Table F2-5. Wetland Impacts Associated With Alternative East Range Railroad Alignments

Alternative	Rail Loop Length	Track length	Wetland Fill[1]	Cut Quantity	Fill Quantity	Net Cut
	FT	FT	Acres	CYD	CYD	CYD
Alternative 1	9,836	17,878	13.38	2,390,000	123,000	2,267,000
Alternative 2	Not Applicable	18,430	18.34	2,180,000	116,000	2,064,000
Alternative 3	24,448	24,860	27.01	5,257,000	354,000	4,903,000

[1] From Rail Loop only

The combined wetland impacts of the alternative IGCC Power Station locations and the rail Aletrnative 1 are shown in Table F2-6. The Preferred Site was selected in order ito minimize wetland impacts.

Table F2-6. Wetland Impacts Associated With Alternative East Range IGCC Power Station Footprint Alignments

Site	Plant Site Wetland Impact (acres)	Associated Railroad Wetland Impacts[1] (acres)	Total Wetland Impact (acres)
Preferred Site	17.15	13.38	30.53
Northeast Shift	17.30	13.38	30.68
Southeast Shift[2]	41.90	27.01	68.91
Southern Site	62.67	5.34	69.24[3]

[1] Railroad alternatives are described in a separate section.
[2] *See* description of Southeastern Shift with East Range Railroad Alterative 3.
[3] Includes 1.23 acres of additional wetland impacts to accommodate a new access road.

F2.5.4.3 East Range Plant Access Road

F2.5.4.3.1. Preferred East Range Road Access

An access road would be constructed to provide access to the IGCC Power Station from the existing CR 666, as shown in Figure F2-22. CR 666 passes just to the east of the proposed site and is the only feasible option to serve the site via the public road system. The proposed road access is located to cross wetland areas at the intersection with CR 666 and near the Station Footprint at their narrowest point to minimize wetland fill to just 0.44 acres (Excelsior, 2009).

Proper placement of culverts throughout the road alignment would mitigate potential indirect wetland impacts to nearby wetlands by maintaining existing hydrologic connectivity.

F2.5.4.3.2. East Range Road Access Alternatives

The originally designed access road, as shown in the DEIS, consisted of a loop roadway with two access points onto CR 666 (see Figure F2-22**)** and was designed allow separation of ingress and egress, and/or separation of heavy truck traffic. The revised access road alignment minimizes wetland impacts by eliminating the upper portion of the looped access. The remaining roadway is essentially the same as the southern portion of the originally proposed loop and would have only a single access point to CR 666. The revised southern roadway alignment further minimizes wetland impacts by crossing the wetlands in the area at their narrowest point. The combination of the two minimization efforts reduces wetland impacts from 5.53 acres (0.49 acres of temporary impact, 1.81 acres of permanent type conversion, and 3.23 acres of fill) to approximately 0.44 acres of fill. Wetland hydrology would be maintained via culvert(s) under the roadway to avoid indirect impacts to wetland habitat.

F2.5.4.4 East Range Power Transmission

F2.5.4.4.1. East Range Preferred HVTL Alternatives

The preferred transmission plan for the East Range IGCC Power Station consists of constructing two new 345kV HVTLs within three existing ROWs to link the IGCC Power Station to the Forbes Substation POI as shown on Figure F2-23. Even though one 345kV HVTL would be sufficient to accommodate the combined full load output of Mesaba One and Mesaba Two, both new lines must be constructed concurrently with installation of Mesaba One to address the single failure criterion (see Section 1.2.4). Each line would follow existing routes now occupied by 115kV HVTLs owned by Minnesota Power and that interconnect the Syl Laskin Energy Center with the Forbes and Virginia Substations (the 37L and 38L HVTL connect to the Forbes Substation; the 39L HVTL connects to the Virginia Substation). One of the new 345 kV HVTLs – the preferred 39L/37L option – would traverse sections of two ROWs. Both new 345 kV HVTLs would require approximately two miles of additional HVTL ROW to connect the IGCC Power Station with the Syl Laskin Substation. An additional 30 feet of ROW would be acquired parallel to the applicable sections of the 39L and 37L routes.

Wetland impacts along the HVTL alignment would include wetland fill for power pole placement, temporary impacts to scrub-shrub habitat in temporary work spaces (areas within the construction ROW but outside the permanent ROW), and conversion of scrub-shrub and forested habitat within the permanent ROW.

F2.5.4.4.2. East Range HVTL Alternatives

Instead of applying the new 30-feet of ROW to the 39L/37L route, the possibility of adding the new ROW to the 38L route was investigated. This alternative was rejected because of the increased impacts to existing nearby landowners.

F2.5.4.4.3. Wetland Fill

Permanent wetland impacts would be limited to those areas where power poles are placed within wetlands. Each pole would require an estimated 28 square feet of fill. Wetland impacts are calculated for the HVTL alignment assuming that power poles would be placed every 800 feet along the alignment. Using this assumption, a total of 139 power poles (73 for Line 38 and 66 for Line 37/39) would be placed in wetland areas, resulting in 3,892 square feet (0.09) acres of permanent wetland impacts along the 68.42 mile alignment (33.58 miles for Line 38 and 34.84 for Line 37/39).

The location of power poles would be more accurately specified during project design. Placement of the poles would consider avoidance of wetland habitat to the greatest extent feasible. In addition to avoiding wetland impact, location of the poles outside wetland habitat improves construction access and stability of the poles. However, the maximum distance between poles of approximately 1,000 feet would limit avoidance of long expanses of wetland habitat.

Temporary wetland disturbance during construction would be minimized by performing construction during winter months or through use of construction mats to minimize rutting by equipment and disturbance of wetland vegetation. Where construction within wetland habitat could not be avoided, best management practices would be employed to minimize disturbance. Extra workspace areas, access roads, and contractor staging areas would be located outside of wetland areas to the greatest extent possible. Where wetland disturbances cannot be avoided, temporary roads and work areas would be removed and the affected wetlands restored following completion of construction.

F2.5.4.4.4. Wetland Type Conversion (Tree and Shrub Clearing)

The majority of the East Range HVTL is proposed within an existing 100-foot power utility ROW which would avoid clearing of trees and shrubs. Tree clearing would be required on the additional 30-feet of new ROW and on the new approximately two-mile section of ROW to the Syl Laskin Substation. The proposed new 30-foot ROW would parallel the existing 100-foot ROW for the 37/39 Line and would alter wooded or shrub wetland habitat. Construction of the new 100-foot ROW between the East Range IGCC Power Station and the Syl Laskin Substation would require clearing of shrub swamp.

Impacts to wetland vegetation would be of two types, temporary impacts to scrub-shrub habitat in temporary work spaces outside the permanent ROW (0.2 acres) and permanent conversion of scrub-shrub habitat within the permanent ROW and forested habitat within the permanent ROW (59.62 acres). Temporary conversion would include removal of scrub-shrub vegetation in the temporary construction ROW but outside the permanent ROW. These areas would be allowed to revegetate following construction. Permanent conversion would include removal of scrub-shrub vegetation within the permanent ROW and removal of forest vegetation within the construction ROW. The permanent ROW would be maintained free of woody vegetation, resulting in conversion of scrub-shrub and forested wetland to emergent wetland habitat. Although forested wetland cleared outside of the permanent ROW but within the construction ROW would still be allowed to revegetate, it is considered a permanent type conversion because of the length of time that regeneration would require.

F2.5.4.4.5. Water Crossings

There are 21 crossings of streams or water bodies associated with HVTL Alternative 1.The total length of water crossings for HVTL Alternative 1 is estimated at 1,194 linear feet.

F2.5.4.5 East Range Natural Gas Pipeline

F2.5.4.5.1. East Range Preferred Gas Pipeline

For the East Range Site, the proposed natural gas pipeline would be constructed, owned and operated by Northern Natural Gas (“NNG”), and would be an extension of NNG’s interstate pipeline system shown on Figure F2-24. NNG represents the only feasible option for supplying Mesaba One and Two with natural gas because it is the only pipeline company within the immediate vicinity of the East Range Site. NNG’s existing pipeline serves Cliffs-Erie (and the former LTV mining operation) and abuts the IGCC Power Station Footprint on its eastern boundary. In order to provide natural gas in the quantity and at the pressure required to supply the Project’s two phases, installation of approximately 28.8 miles of new, 16- to 24-inch pipe would be constructed adjacent to NNG’s existing 32.5-mile pipeline. A new pipeline can be laid within the same ROW (i.e., without having to expand the ROW’s width).

The natural gas pipeline would be constructed below grade within the existing ROW. Construction of the natural gas pipeline would result in temporary impacts to wetlands existing within the ROW from excavation and installation of the pipe. Permanent impacts to wetlands would be avoided by restoring wetland habitat after installation of the pipe. Material excavated from the trench would be sidecast to one side of the trench or the other. Preference would be given to sidecasting outside of wetland areas. Following pipe installation, soil would be returned to the trench in reverse of the removal (i.e. topsoil would be replaced on the surface). Disturbed wetland (and upland areas) would be reseeded with a native seed mix appropriate to the adjacent vegetative community. Indirect drainage effects to wetlands from groundwater conducted along the backfilled pipeline trench would be avoided by installing anti-seepage collars on the pipe in strategic locations.

Wetland impacts along the pipeline alignment would not include temporary disturbance of scrub-shrub habitat in temporary work spaces or permanent conversion of scrub-shrub and forested habitat within the permanent ROW because the existing ROW is maintained free of woody vegetation.

The location of the pipeline alignment would be determined during project design and would consider adjustments to avoid and minimize wetland habitat. Extra workspace areas, access roads, pipe storage yards, and contractor staging areas would be located outside of wetland areas to the greatest extent possible. Where avoidance of wetland disturbance is not possible, temporary roads and work areas would be removed and wetland restored in a manner similar to the pipeline trench following completion of construction.

Temporary Emergent Wetland Impacts

Only the portion of the proposed gas pipeline where the alignment enters the East Range Site has been field delineated. The potential wetland impacts resulting from the construction of the gas pipeline have been estimated from NWI wetland boundaries. In an effort to improve the accuracy of estimation of wetland habitat along the inaccessible linear utility corridors, an exercise comparing aerial photography, hydric soils, and the NWI was performed along 15 miles of the gas pipeline corridor. This revised wetland information is used where available to calculate wetland impacts. The NWI classifies a majority of the wetlands within the existing ROW for the gas pipeline as scrub shrub, forested, or coniferous bog. However, because the existing ROW is maintained to be free of trees and shrubs, these wetland types are no longer accurate. For wetland impact calculations, scrub shrub and forested wetlands within the ROW are considered wet meadows and coniferous bogs are considered open bogs.

Construction and installation of the proposed natural gas pipeline would disturb an estimated total of 24.79 acres of wetland along the entire 28.8 miles of existing ROW. This area assumes that open cut trenching is employed for construction, which would require use of the entire width of the ROW.

Water Crossings

The East Range Natural Gas Pipeline Alternative 1 would require crossing approximately 792 linear feet of streams and bodies of water, not including adjacent wetland habitat. Colby Lake (249P) and 12 streams and rivers impacted by Natural Gas Pipeline Alternative 1 are protected by the MDNR.

F2.5.4.6 East Range Process Water

The water supply system for the East Range site would consist of eight pipeline segments that would connect existing mine pits and provide process water to the IGCC plant as shown on Figure F2-25. As noted in Sections 1.1.1.3 and 3.1.2, plans are underway to resume mining in Mine Pit Nos. 6 and 2WX. In order to accomplish such activities, the pits and the immediate area surrounding them must be dewatered. Excelsior will work with the entities mining these pits to allow the IGCC Power Station to collect water resulting from such dewatering activities and ultimately use it as make up water to the cooling system. Given the status of the mining project's impending environmental review process (*see* Section 1.1.1.3), it is too early to project where and how such collection devices would be linked and subsequently piped to the IGCC Power Station. Until a mine permit application is submitted, Excelsior will continue to show the pipeline configurations between Mine Pits No. 6, 2WX, and the East Range Station Footprint as shown in Figures F2-17 and F2-25 as being conceptually indicative of its plans to use water directly obtained from the abandoned mine pits or derived from their dewatering. The wetland impacts associated with these process water pipelines are small, (0.98 acres of temporary impacts and 1.33 acres of type conversion from forested wetland to emergent wetland) as the pipelines would be primarily routed across lands previously disturbed by mining or other developments.

It is unlikely that the increased number of smaller pipelines required to collect water from numerous dewatering wells, route it to a common collection header, and then convey it via a larger pipeline to the IGCC Power Station would cause a significant increase in wetland impacts relative to those calculated using the assumptions provided in the three following paragraphs. Such collection pipelines would likely be installed assuming they would be moved as mining progresses and/or as their productivity decreased, i.e., they would be temporarily placed and cause minimal wetland impact. In any case, the land over which they would traverse would ultimately be excavated.

The impacts are calculated assuming the pipelines would be constructed below grade within a 150-foot construction ROW. Wetland impacts would be avoided by restoring wetland habitat after construction. Wetland impacts along the pipeline alignments would include temporary impacts to emergent wetlands within the construction corridor, temporary disturbance of scrub-shrub habitat in temporary work spaces (areas within the construction ROW but outside the permanent ROW) and permanent conversion of scrub-shrub and forested habitat within the permanent ROW where prior disturbance has not removed woody vegetation. Although vegetation outside of the permanent ROW would be allowed to revegetate, impacts to forested wetlands even outside the permanent ROW are considered permanent because of the length of time required for restoration of forested habitat. Only the Process Water Pipeline segments constructed from Area 2WX to the IGCC Station Footprint and Area 6 and Stephens Mine to Area 2WX contain shrub scrub or forested wetland habitat.

The location of each pipeline alignment would be determined during project design and would consider adjustments to avoid and minimize wetland habitat. The construction ROW would be located to minimize sidecasting in wetland habitat. Extra workspace areas, access roads, pipe storage yards, and contractor staging areas would be located outside of wetland areas to the greatest extent possible. Where avoidance of wetland disturbance is not possible, temporary roads and work areas would be removed and wetland restored in a manner similar to the pipeline trench following completion of construction.

Only a small portion of the proposed process water supply pipeline segments have been field delineated during the 2004 and 2005 field surveys. The potential wetland impacts resulting from the construction of the pipelines in the remainder of the proposed alignments have been estimated from NWI wetland boundaries.

Several segments of the East Range Process Water Supply Pipeline system would cross 39 linear feet of streams.

F2.5.4.7 East Range Potable Water and Sanitary Sewer

Excelsior evaluated two alternatives for potable water and sanitary sewer: (1) construction of on-site water and wastewater and treatment facilities; and (2) connection to the municipal facilities of the City of Hoyt Lakes.

A micro-filtration system would be used to treat process water that would be pumped to the site from local mine pits. The filtration unit would treat water at a rate of 10gallons per minute to potable drinking water standards. Construction of a building to house the filtration system, a 5,000 gallon underground reservoir, and supply pump would be required. The reservoir is required because wide fluctuations of water use will occur during the course of the day in excess of the treatment rate of the filtration unit. The reservoir would provide storage of water to cover the high use times. The pump would supply the water from the reservoir to the facility at the required flow rate and pressure.

The on-site waste water treatment alternative would consist of constructing a stabilization pond facility with the capacity to treat 45,000 gpd at a location near the IGCC facility. Also, a 12-inch effluent gravity sewer would be constructed to convey treated effluent to the mine drainage stream running northeast to southwest through the IGCC facility site. The stream discharges into Colby Lake. The length of this sewer pipe would be approximately 1,200 feet to reach the stream. One disadvantage of this alternative is the treatment facility would be required to have a capacity of 45,000 gpd but would receive only about 17% of this design flow after the construction of the IGCC plant is complete. Thus part of the facility would have to be abandoned and other modifications made to the facility at the completion of the IGCC facility construction.

The alternative of connecting to the City of Hoyt Lakes' systems was selected for the following reasons:

- avoids effluent from the system would discharge into Colby Lake, which is the source for the Hoyt Lakes drinking water treatment plant;
- the onsite alternatives do not adequately address water and wastewater requirements during construction that are higher by a factor of 10 than the requirements during operation;
- the water supply to the water treatment facility would dependant on the process water supply and would not provide treated water until process water is available on site; thus, potable water would not be available during the construction phase and would need to be supplied to the site by other means;
- does not result in any additional wetland impacts, since water and sewer lines can be entirely routed in ROWs of roads and other utilities; and
- given the prevalence of wetland habitat surrounding the IGCC Power Station Footprint, additional development in the area would very likely create additional wetland impacts.

Potable water would be provided by constructing a 6-inch pipeline approximately 11,000 feet from the East Range IGCC Power Station to the 12-inch water main that serves Minnesota Power, as shown on Figure F2-26. The proposed 6-inch pipeline would provide the required flow and pressure to Mesaba One and Two without the need for a booster station. The City of Hoyt Lakes treatment plant has the capacity to provide the potable water needs of the facility.

Sanitary sewer would be provided through connection to the City of Hoyt Lakes' wastewater collection and treatment system. This would consist of constructing approximately 9,500 feet of 12-inch gravity sewer pipeline, a pump station, and about 2,500 feet of 4-inch force main as shown on Figure F2-26. The wastewater piping would parallel the existing high voltage power line easement along the west side of the proposed property boundary south to Colby Lake. A pump station would be located on the north side of Colby Lake. The force main would be directionally drilled beneath Colby Lake and then connected to the existing city gravity sewer near Minnesota Power on the north end of Colby Lake Road. The 12-inch sewer pipe would have ample capacity to convey the estimated wastewater flow of 45,000 gallons per day during construction. The existing Hoyt Lakes wastewater treatment facility has capacity available to treat the estimated flow from the proposed project.

The pipelines would be constructed below grade within a 100-foot construction ROW. Only a portion of the proposed corridor for the East Range Potable Water and Sewer Pipeline has been field delineated. The potential wetland impacts resulting from the construction of the pipelines in the remainder of the proposed alignments have been estimated from NWI wetland boundaries. According to the NWI, up to 1.12 acres of Colby Lake lie within the construction limit and would be impacted during construction. This segment of the pipelines would be directionally drilled to avoid impacts to the lake and lakeshore. No other NWI wetlands are identified within the 100-foot wide construction limit; however, field verification would be required for confirmation.

Construction of the Potable Water and Sewer Pipelines would require crossing approximately 460 linear feet of Colby Lake.

F2.5.4.8 Summary of East Range Road and Utility Alternatives

A summary of permanent wetland impacts, temporary wetland impacts, and permanent type conversions for the East Range Power Station, Buffer Land, and Associated Utilities Facilities is provided in **Table F2-7** below.

Table F2-7. Summary of East Range Road and Utility Alternatives Wetland Impacts

	Permanent Impacts, acres					Temporary Impacts, acres		
	Type Conversion			Fill	Total Fill + Type Conve r-sion	Emer-gent Wetlands	Shrub-scrub	Total
	Shrub-scrub to Emergent	Forested to Emergent	Total					
Road Access								
DEIS Preferred	0.00	1.81	1.81	3.23	5.04	0.00	0.49	0.49
FEIS Preferred	0.00	0.00	0.00	0.44	0.44	0.00	0.00	0.00
HVTL								
DEIS/FEIS Preferred								
Alternative 1 - 30 feet on 37/39 Line plus use of existing 38 Line ROW	19.21	40.41	59.62	0.04	59.66	0.00	0.20	0.20
Natural Gas Pipeline								
DEIS/FEIS Preferred								
Alternative 1	0.00	0.47	0.47	0.00	0.47	23.99	0.33	24.32
Process Water Pipeline								
DEIS/FEIS Preferred								
All Lines	0.26	1.07	1.33	0.00	1.33	0.79	0.19	0.98
Potable Water & Sanitary								
Sewer Pipeline								
DEIS/FEIS Preferred	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL								
DEIS Preferred	19.47	43.76	63.23	3.27	66.50	24.78	1.21	25.99
FEIS Preferred	19.47	41.95	61.42	0.48	61.90	24.78	0.72	25.5

F2.5.5 Future Wetland Impact Minimization and Mitigation

The wetland acreages impacted by the project as summarized in Sections F2.3.3.1, F2.3.3.2 (these could be changing) and in Section 4.7 represent the maximum potential impacts, as determined based on preliminary engineering designs. DOE expects that during the wetland permitting process and final design of the project additional efforts to avoid and minimize wetland impacts would be considered as described in the following sections. Once the USACE designates the Least Environmentally Damaging Practicable Alternative (LEDPA), Excelsior would initiate additional engineering investigations and proceed with final design. During final design additional refinements could result in a reduction in the wetland impacts from those described in the FEIS. However, such opportunities may be not be equally available at the two sites. As noted in Section F2.5.4.1.2, the MDNR has indicated that placement of the IGCC Power Station on the East Range site should be reviewed in conjunction with mining and operating plans being developed for nearby mining expansions. Such joint review processes could affect the degree to which design refinements could be expected to reduce wetland impacts, Once final design is complete, Excelsior would mitigate all identified wetland impacts at a size, type, and location acceptable to the USACE and state agencies. In addition, DOE may also include language with respect to minimization and/or mitigation of impacts as a condition of the Record of Decision, if necessary to fulfill DOE's obligations under 10 CFR 1022.

Pursuant to 10 CFR 1022.13(a)(3) "DOE shall evaluate measures that mitigate the adverse effects of actions in a...wetland including but not limited to minimum grading requirements, runoff controls, design and construction constraints, and protection of ecologically sensitive areas." DOE, working with the USACE and Excelsior, has evaluated a variety of new alternatives in Appendix F2 in order to avoid and minimize wetland impacts to the extent possible based on current information and preliminary engineering work on the alternatives. As noted previously, there are methods and procedures that can be used in the final design, permitting and construction of the project that are described below.

F2.5.5.1 Minimize Area of Filling

There are a variety of design options to be exercised and evaluated during the design and permitting of the project that could reduce the area of wetlands to be filled. Some of the options available to the project proponent include:

- When placing fill, instead of employing grass embankments on a 3:1 slope down to the adjacent wetlands, design options could include 2:1 embankments, gabion walls or retaining walls to minimize the footprint of disturbance. The deeper the fill (and therefore the longer the side slope) the more important this is. This approach is effective for all areas of filling whether for the power plant, the access roads, or the new rail lines. These design alternatives can only be evaluated during final design, when additional soil boring information is collected.
- The final tiering of the plant site has the potential to affect wetlands filled. For example, the tiering alternatives presented for the Northeast and West locations at the West Range demonstrated that the elevation of different areas of the site could dramatically affect the volume of excess cut. In the same way, if the elevations of those perimeter portions of the site that result in the filling of wetlands could be lowered, the area of wetlands impacted could be reduced. For example, if 3:1 side slopes need to be employed, for every foot that the elevation could be reduced the toe of slope into the wetland could be pulled back three feet.
- If, because of grade issues, roads or especially railways need to be placed on high embankment areas with a corresponding wide footprint, consideration would be given to placing some of the rail line or roadway on elevated structures to minimize the wetlands impacted.
- In Section 4.7, both the permanent and temporary ROWs for the railroads and the entire permanent ROWs of the roads are assumed to be totally impacted, with all wetlands filled. During the design process, every attempt would be made to minimize the footprint of the actual permanent fill, thus reducing, potentially by a large amount, the actual wetlands to be filled.

F2.5.5.2 Maximize Hydrologic Connections

In order to maintain many of the wetland functions such as flood control, sediment trapping and wildlife habitat, adequate drainage across and through the road and rail ROWs must be maintained. Some of the options available include:

- Frequent spacing of culverts under roadways and railroads;

- Installing several larger culverts that are frequently flowing or inundated with open bottoms that allow the natural substrate of the stream to remain; and
- Grade for wide grass swales wherever practicable.

F2.5.5.3 Limit the Number of Wetland Functions Impacted

During the design and construction process, efforts would be taken to minimize the temporary impacts to wetlands and to minimize the permanently filled wetlands. Some of the options available include:

- The entire temporary and permanent utility ROWs have been assumed to be impacted in the calculations presented in Appendix F2 and Section 4.7. Once the USACE selects the LEDPA, Excelsior would delineate the wetlands in all of the utility corridors to be constructed. Once the exact location is determined, the following design and construction measures would be employed to the extent possible:
    - Locate above ground features (e.g. HVTL poles) outside wetlands;
    - Avoid temporary impacts by not placing construction materials, backfill material, or excavated soil in wetlands;
    - Limit the compression of temporarily disturbed wetland soils by minimizing heavy vehicular traffic across the compressible soils.
- In wetlands to be temporarily disturbed, stockpile the organic topsoil so that the existing substrate can be replaced after construction has been completed. Design roads and railroads to be as close to existing grade as possible, since the smaller the depth of fill, the smaller corresponding width of filling that would be required.

F2.5.5.4 Best Management Practices (BMPs)

The final selection and inclusion of appropriate BMPs would be made during the permitting and design of the project. They would be specified in the construction documents. There are a multitude of BMPs related to stormwater and other indirect impacts to wetlands, which are discussed at numerous websites, including:

USEPA: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

The Minnesota Pollution Control Agency: http://www.pca.state.mn.us/water/stormwater/stormwater-manual.html *and* http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html

University of Minnesota Water Resources Center:
http://wrc.umn.edu/outreach/stormwater/bmpassessment/

Some additional information may be available for and included in the ROD. More detailed discussions concerning USACE permitting may be found in EIS Section 4.7.7. Discussions pertaining to stormwater permitting may be found in EIS Section 4.5.2.5.

F2.5.5.5 Ensure Implementation of Mitigation Measures and BMPs

- Ensure that suitable language is included in the contract documents for the contractor;
- Require the con*tractor to provide environmental awareness and safety t*raining for all employees;
- Specify, in the contract, procedures and timing for regular inspection of all mitigation measures and BMPs to be employed during construction.

F2.5.5.6 Wetland Replacement Plan

F2.5.5.6.1. Wetland Replacement Siting – On Site Replacement

The wetland replacement plan would be developed in an amount, type, and location as agreed to by the agencies in the permitting process. An example discussion relating to the West Range is provided below.

On site or project specific mitigation opportunities within the West Range Site were evaluated as a first priority. There are no effectively drained wetlands nor any partially drained basins with restoration potential within the West Range Site, or in the surrounding area.

On site wetland replacement through wetland creation was evaluated as a second priority. Conceptually, wetland creation would involve the expansion of existing wetlands to create new wetland habitat. Several site characteristics make wetland creation on the site unfeasible.

- The West Range Site is located at the headwaters of two subwatersheds. This limits the contributing watershed area and the available surface hydrology for created wetland basins.
- With an inability to provide adequate surface hydrology, the ability to intersect the groundwater table to provide hydrology was assessed. Much of the topography and upland conditions adjacent to the West Range Site wetlands is rugged, steep hills. Excavation around existing wetlands to a depth to intersect groundwater would require large amounts of excavation, often as much as 50 to 90 feet.
- Areas of the site that are not wetland are typically upland forested habitat. It is understood that USACE policy discourages the use of undisturbed, forested uplands for the purposes of wetland mitigation.
- Creating wetland extensions would introduce a disturbance element within the adjacent existing wetlands and serve as a potential vector for invasive species into areas where there are currently no invasive species.

Although the on site mitigation opportunities are severely limited by the abovementioned factors, the potential to provide at least of portion of mitigation on site was evaluated. The corridors where the railroad and access roadway will be constructed into the project site will be cleared and otherwise disturbed during construction. The construction of these facilities will also result in wetland filling (as described above) and could provide opportunities for creation of wetland habitat by expanding wetland areas within those construction corridors. However, the same limiting factors described above apply to the linear transportation corridors. The topography limits the feasibility of creating wetland habitat adjacent to the new roadway or railroad. Although the feasibility appears to be minimal, the potential for mitigation within these corridors will continue to be assessed and evaluated as the roadway and railroad are designed.

F2.5.5.6.2. Off Site Wetland Replacement – Wetland Bank Credits

After exhaustion of effort to identify onsite mitigation opportunities, the availability of existing wetland banking credits was assessed. The State Wetland Bank Account Listing link on the Minnesota Board of Water and Soil Resources web site was reviewed to identify and contact potential existing wetland banks for wetland credit availability. All of the wetland banks located within the major watershed, Itasca County, and for that matter in all of northern Minnesota were contacted to identify available wetland credits. The following paragraphs summarize the findings regarding available mitigation credits in the State Wetland Bank Account Listing:

- There are no wetland banks in Itasca County and no available wetland credits shown on the List.

- There are no wetland banks in the two major watersheds or in adjacent major watersheds shown on the List.
- Four wetland bank sites are listed in neighboring counties in northern Minnesota; two in St. Louis County and two in Roseau County. The account managers for each site were contacted and informed us that credits were no longer available. All of the credits were sold by November 2006.

After review of the State Wetland Bank Account List, LGUs and agency staff in the project area were contacted to discuss and identify potential wetland mitigation opportunities that are not represented on the List. These include sites proposed for development, suitable for further investigations as a potential mitigation site, or developed sites not yet enrolled in the State Wetland Bank. Communication records with each respective agency are summarized below.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) Regulatory Branch Project Manager was contacted regarding suggestions on available and potential wetland mitigation opportunities for the project. No specific sites were known or recommended by the USACE. It was recommended that the U.S. Forest Service (USFS) be contacted to see if there were any opportunities to restore wetlands on decommissioned roads in the Chippewa National Forest (CNF). The USFS did not have available funding earmarked for the decommissionings but is offering the wetland credits to any entity willing to fund decommissionings. Complete funding to decommission a forest road is too cost prohibitive for the purpose of wetland mitigation. No other wetland replacement options or suggestions were recommended by the USACE.

U.S. Fish and Wildlife Service

The Ecological Services division in the Twin Cities Field Office of the U.S. Fish and Wildlife Service (USFWS) was contacted to identify any existing or potential wetland mitigation opportunities. Wildlife Biologists at the Field Office are involved in wetland permitting and planning actions in support of their regulatory program requirements and have a good knowledge of wetland mitigation in northern Minnesota. Similar to their federal counterparts at the USACE, the USFWS did not know of any existing or potential opportunities for wetland mitigation in the region.

Itasca Soil and Water Conservation District

The Itasca Soil and Water Conservation District (SWCD) is the WCA LGU for Itasca County and also has in depth knowledge of the land resources in the county, including potential wetland mitigation sites. The Itasca SWCD mentioned two potential mitigation sites; a confidential site in development, no additional information could be provided; and a 10 acre site in development that will be enrolled in the State Wetland Bank. No other existing or potential wetland replacement opportunities were provided by the Itasca SWCD.

Koochiching Soil and Water Conservation District

The Koochiching SWCD was contacted to identify available and potential wetland mitigation opportunities in the county. The county currently has approximately 20 acres of available wetland credit, but they are reserving these for future county projects and anticipates using them all by 2008 due to the extensive wetland base in the county.

F2.5.5.6.3. Off Site Wetland Replacement – Project Specific Replacement

After identification of existing wetland bank credits was unsuccessful, efforts were initiated to identify opportunities for off-site, project specific mitigation. These efforts consist of using GIS and available data to screen the surrounding area to identify suitable sites for development of wetland mitigation.

This screening effort is not yet complete. The following paragraphs describe the steps to be taken.

Search Area

The search area is within Wetland Bank Service Area #5 and in adjacent watersheds located in adjacent Wetland Bank Service areas including Service Areas #2 and #3. The West Range Site is located at the top of a watershed, just inside Service Area #5 along its border with Service Area #2.

- Major Watershed #9 – Mississippi River (Grand Rapids).
    - Adjacent Major Watersheds within the USACE Bank Service Area #4 including #7 Mississippi River (Headwaters, Lake Winnibigoshish), #8 Leech Lake River, #10 Mississippi River (Brainerd), and # 11 Pine River.
    - Adjacent Major Watersheds bordering Major Watershed #9 that are not Mississippi River tributaries but are within USACE Bank Service Area #4
- Itasca County where the West Range Site is located and adjacent counties within USACE Bank Service Area #5 including
- Counties adjacent to Itasca County including Aitken, Cass, and Crow Wing.
- Other counties adjacent to those in “e” that are also within the MNDNR defined Laurentian Mixed Forest Ecoregion including Lake of the Woods County, Beltrami County, Hubbard County, Crow Wing County, Carlton County, Pine County, and Lake County in adjacent Wetland Bank Service Areas.

Screening Process

The screening for potential mitigation sites will utilize the following data, either exclusively or concurrently. Numerical or other weighting of attributes will be used to identify characteristics suitable for mitigation (i.e., drainage, hydric properties, ownership, etc.)

The NWI database will be mapped in these areas using GIS to identify existing wetlands that may have been historically altered by ditching, partial drainage, or some other hydrological alteration or change in wetland type.

The MNDNR Protected Waters Inventory (PWI) digital maps will be reviewed to identify features suggesting hydrological alterations and or changes in wetland type. PWI maps also often show ditches and drainage signatures as well.

If available, county ditching and drainage maps and data will be mapped and/or reviewed to identify hydrologically altered wetlands. These may be coupled with or also determined by reviewing aerial photographs and USGS Quad maps as well to identify drainage features and ditches.

Subwatershed boundaries will be mapped and overlain on these resources and reviewed as stand alone maps to identify mitigation opportunities.

Tax forfeiture parcels and designated school trust lands that are mapped and available from the counties will be reviewed to identify tracts of land that are potentially available.

State and federally owned and/or managed parcels that are eligible for wetland mitigation projects will be reviewed if available. These are expected to be limited to state forest lands, some national forest holdings, or some other holding where policy allows for outside funded wetland mitigation.

Gravel pits and borrow pits will be mapped and reviewed.

Screening Criteria

Potential sites identified by screening will be mapped and subjected to additional, secondary screening criteria. The following are generalized and provided for example. Other criteria may be developed during the screening process.

1. Extent of altered wetland types (mostly vegetation) and hydrology will be ground truthed.
2. Existence of nuisance vegetation.
3. Restoration needs in terms of construction to restore hydrology will be estimated.
4. Number of parcels or ownerships that could be affected by the scope of a restoration on the subject wetland will be evaluated.
5. Roads, rail corridors, homes and utility lines potentially affected by or facilitating hydrological restoration of the subject wetland will be verified. Many of these will be shown on the above referenced maps and data sources and will be field verified.
6. Degree of degradation of ditching within the subject wetland will be determined by ground truthing.
7. Extent of beaver activity will be noted.
8. Proximity to towns and other developments.
9. Surrounding topography grades, slopes, and the configuration of the subject wetland basin will be noted.
10. Open water.
11. Dead wetland trees and snags.
12. Ditch and stream channel course configuration, flow direction, and general notes an rates and volumes will be determined when possible.
13. Proximity to lakes, rivers, and major waterbodies.

Depending on the number of sites evaluated and complexity of the above mentioned variables, a ranking matrix may be established were each variable is scored. Regardless, detailed written descriptions of each evaluated site will be prepared to prioritize potential sites and screen those from further consideration.

Priority sites will be further analyzed for their potential as viable wetland mitigation sites by developing conceptual mitigation plans. This will include identifying the methods, engineering structures and designs, and site acquisition approaches needed, as well as the extent of potential wetland replacement credit eligible for each potential site. Priority sites determined to be preferential by Excelsior the USACE, and the WCA TEP will be recommended for initiation of right-of-way acquisition accomplished through Excelsior designated land agents. Details of these sites, including restrictions and covenants, will be addressed in the wetland replacement plan if the land acquisition efforts are successful.

After identification of the preferred mitigation site, a wetland replacement plan will be developed. The plan will include a vegetation management plan and exotic species control plan as well as monitoring schedules, design details, applicable restrictions and covenants, and summaries of the anticipated wetland credits.

It is expected that the off site screening analysis will be completed early spring of 2008. The results will be summarized submitted as an addendum to this wetland permit application.

F2.5.6 West Range Wetland Impacts

The proposed project includes actions across the West Range Site, i.e., those within the IGCC Power Station Footprint and Buffer Land and the linear corridors along which the power transmission, gas pipeline, and other associated facilities traverse. Details about the project elements are described in Section 2.3. The following sections describe the wetland impacts that will result from the construction of each project element. Wetland impacts are described as wetland fill, temporary wetland disturbance, and wetland type conversion resulting from vegetation removal within each of the following sections. After all off the individual elements are discussed, a summary of wetland impacts across the West Range Site is presented in Table F2-22 in Section F2.5.6.9.

F2.5.6.1 IGCC Power Station Footprint

The IGCC Power Station Footprint is located near the center of the West Range site in a topographic saddle and between two large wetland complexes. There are two alternative locations: the preferred location as contained in the DEIS (the Central-DEIS, Figure F2-5) and a new location in which the plant would be slid 280 feet to the northwest (the Central-FEIS, Figure F2-7). Table F2-8 is a summary of wetland impacts for each phase of the DEIS and FEIS IGSS Power Station Footprint, including grading associated with each plant footprint.

Table F2-8. Comparison of Preferred and Original Plant Site Wetland Impacts

	Phase I[1] (acres)	Phase II (acres)	Total (acres)
Central - FEIS	13.62	17.74	31.36
Central - DEIS	20.96	13.62	34.58

[1] Impacts due to grading limits for the entire IGCC Power Station Footprint are included in the Phase 1 Impacts.
[2] Phase I and Phase II were reversed in the Original Site Plan.

The new site placement minimizes wetland fill within the plant footprint and maintains hydrologic connectivity and the existing flow pattern from northeast to southwest within Wetland A1. This would avoid potential indirect impacts to 7.34 acres of wetlands. Construction of the IGCC Power Station Footprint will impact 31.34 acres of wetland habitat. The impact footprint includes the Power Station footprint and grading of the adjacent area at a 3:1 slope to meet the natural grade of the surrounding area. Wetland impacts from the IGCC Power Station Footprint, including areas of grading limits, are summarized in Tables F2-9 (Central-DEIS) and F2-10 (Central-FEIS) and are shown on Figure F2-27, which also includes the Eggers & Reed classifications.

The IGCC plant will be constructed in two phases. Mesaba One is expected to be constructed between 2010 and 2014. Construction of Mesaba Two is expected to begin in 2012.

Table F2-9. Wetland Fill for West Range (Central DEIS) IGCC Power Station with Grading Limits

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions		Wetland Fill (acres)		
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	Phase I[2]	Phase II	Total
A1	PEMB/PSS1/PFO4	Type 3/6/8	Shallow Marsh/Shrub Carr/Coniferous Bog	High	Moderate	1.05	11.51	12.56
A4	PFO1C/F	Type 7	Hardwood Swamp	Moderate	High	18.08	1.51	19.59
A13	PFO1B	Type 7	Hardwood Swamp	High	High	0.40	0.00	0.40
A14	PFO1B	Type 7	Hardwood Swamp	High	High	0.45	0.00	0.45
A20	PFO1C	Type 7	Hardwood Swamp	High	High	0.19	0.00	0.19
A21	PEMC/PFO1C	Type 3/7	Shallow Marsh/ Hardwood Swamp	High	High	0.01	0.00	0.01
A23	PEMC/PFO1C	Type 3/7	Shallow Marsh/ Hardwood Swamp	High	High	0.24	0.00	0.24
A25	PFO1C	Type 7	Hardwood Swamp	High	High	0.18	0.00	0.18
A26	PFO1C	Type 7	Hardwood Swamp	High	High	0.03	0.00	0.03
A27	PFO1C	Type 7	Hardwood Swamp	High	High	0.07	0.00	0.07
A28	PEMC/PFO1C	Type 3/7	Sedge Meadow/ Hardwood Swamp	High	High	0.22	0.00	0.22
A29	PEMC/PFO1C	Type 3/7	Sedge Meadow/ Hardwood Swamp	High	High	0.00	0.08	0.08
A30	PEMC	Type 3	Shallow Marsh	High	High	0.00	0.04	0.04
A31	PFO1C	Type 7	Hardwood Swamp	High	High	0.00	0.48	0.48
B2	PFO1A	Type 7	Hardwood Swamp	High	High	0.04	0	0.04
					Total	**20.96 acres**	**13.62 acres**	**34.58 acres**
						Isolated by Power Station		
A1	PEMB/PSS1/PFO4	Type 3/6/8	Shallow Marsh/Shrub Carr/Coniferous Bog	High	Moderate	**7.34**		**7.34**

[1] Dominant wetland types for wetland complexes are shown in bold and represent the dominant type within the impact area as determined from field delineation data.
[2] Impacts due to grading limits for the entire plant site are included in the Phase 1 Impacts.

Table F2-10. Wetland Fill for West Range (Central FEIS) IGCC Power Station

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[2]		Wetland Fill (acres)		
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	Phase I[3]	Phase II	Total
A1	PEMB/PSS1/PFO4	Type 3/6/8	Shallow Marsh/Shrub Carr/Coniferous Bog	High	Moderate	7.31		7.31
A4	PFO1C/F	Type 7	Hardwood Swamp	Moderate	High	5.36	16.00	21.36
A13	PFO1B	Type 7	Hardwood Swamp	High	High	0.06	0.29	0.35
A14	PFO1B	Type 7	Hardwood Swamp	High	High	0	0.44	0.44
A15	PEMC/PFO1C	Type 3/7	Shallow Marsh/ Hardwood Swamp	High	High	0.01	0.21	0.22
A20	PFO1C	Type 7	Hardwood Swamp	High	High	0	0.19	0.19
A21	PEMC/PFO1C	Type 3/7	Shallow Marsh/ Hardwood Swamp	High	High	0	0.01	0.01
A22	PEMC/PFO1C	Type 3/7	Shallow Marsh/ Hardwood Swamp	High	High	0	0.04	0.04
A23	PEMC/PFO1C	Type 3/7	Shallow Marsh/ Hardwood Swamp	High	High	0	0.24	0.24
A25	PFO1C	Type 7	Hardwood Swamp	High	High	0	0.18	0.18
A26	PFO1C	Type 7	Hardwood Swamp	High	High	0	0.03	0.03
A27	PFO1C	Type 7	Hardwood Swamp	High	High	0	0.07	0.07
A28	PEMC/PFO1C	Type 3/7	Sedge Meadow/ Hardwood Swamp	High	High	0.18	0.04	0.22
A29	PEMC/PFO1C	Type 3/7	Sedge Meadow/ Hardwood Swamp	High	High	0.08	0	0.08
A30	PEMC	Type 3	Shallow Marsh	High	High	0.04	0	0.04
A31	PFO1C	Type 7	Hardwood Swamp	High	High	0.48	0	0.48
B2	PFO1A	Type 7	Hardwood Swamp	High	High	0.10	0	0.10
					Total	**13.62 acres**	**17.74 acres**	**31.36 acres**

[1] Dominant wetland types for wetland complexes are shown in bold and represent the dominant type within the impact area as determined from field delineation data.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.
Impacts due to grading limits for the entire IGCC Power Station Footprint are included in the Phase 1 Impacts.

F2.5.6.2 Rail Alignment

The rail line (Railroad Alternative 1A), which pairs with the Central DEIS plant location, will pass-by the plant footprint and loop around a wetland complex as shown on Figure F2-5. This rail loop will be 21,539 feet in total length, with a rail loop of 9,838 feet at an elevation of 1390. It will result in 17.93 acres of wetland fill. The wetland impacts summarized in Table F2-11 include all wetlands within the construction limits of the proposed rail line, including a 3:1 slope along the railroad embankments. It would also create the potential indirect impacts for wetlands within the loop (58.3 acres).

Table F2-11. Wetland Fill for West Range Railroad Alternative 1A

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[2]		Wetland Fill (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	
A1	PEMB/PSS1/PFO4	Type 3/6/8	Shallow Marsh/Shrub Carr/Coniferous Bog	High	Moderate	3.15
A3	PFO1C	Type 7	Hardwood Swamp	High	High	0.10
A4	PFO1C/F	Type 7	Hardwood Swamp	Moderate	High	12.65
C12	PSSC1	Type 6	Alder Thicket	High	Moderate	0.62
C13	PSS1C/PFOC1	Type 6/7	Alder Thicket/ Hardwood Swamp	High	Moderate	0.22
C15	PSS1C	Type 6	Alder Thicket	High	Moderate	0.07
D8	PEMC/PFO1C/ PFO4B	Type 3/7/8	Shallow Marsh/Hardwood Swamp/Coniferous Bog	High	Moderate	0.32
D10	PEMC/PSSA1C	Type 3/6	Sedge Meadow/ Shrub Carr	High	High	0.51
NWI	n/a	Type 6	Assumed Alder Thicket	n/a	n/a	0.30
					Total	**17.94 acres**
			Center Loop			**Isolated within Rail Loop**
A4	PFO1C/F	Type 7	Hardwood Swamp	Moderate	High	**58.30 acres**

n/a = not available

The proposed rail line (Railroad Alternative 3B), which pairs with the Central FEIS plant location, will intersect the northeastern portion of the plant footprint and loop around the hill in the northeastern portion of the site as shown on Figures F2-7 and F2-27. This rail loop will be 22,070 feet in total length, with a rail loop of 15,303 feet at an elevation of 1405. It will result in 5.73 acres of wetland fill. The wetland impacts summarized in Table F2-12 include all wetlands within the construction limits of the proposed rail line, including a 3:1 slope along the railroad embankments.

Although rail yard operations will be less than optimal because the onsite rail sidings will be dead-end spurs instead of continuous sidings, this rail alternative reduces the area of wetland fill from 17.9 acres to 5.7 acres and avoids potential indirect impacts to 58.3 acres of wetlands. Changes in the design of the nearby short line rail that will serve the Minnesota Steel Industries, LLC plant will allow the elevation of Excelsior's rail loop to be raised. This will reduce the cut required for construction of this alternative and minimize the resulting volume of excess material.

Table F2-12. Wetland Fill for Railroad Alternative 3B

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[2]		Wetland Fill (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	
A1	PEMB/PSS1/PFO4	Type 3/6/8	Shallow Marsh/Shrub Carr/Coniferous Bog	High	Moderate	2.05
A3	PFO1C	Type 7	Hardwood Swamp	High	High	0.10
A4	PFO1C/F	Type 7	Hardwood Swamp	Moderate	High	0.27
A40	PEMC/PSS1C	Type 3/6	Shallow Marsh/ Alder Thicket	High	High	0.06
B15	PEMB/PSS1C/PFO1A	Type 2/6/7	Wet Meadow/ Alder Thicket	High	High	0.14
C12	PSSC1	Type 6	Alder Thicket	High	Moderate	0.62
C13	PSS1C/PFOC1	Type 6/7	Alder Thicket/ Hardwood Swamp	High	Moderate	0.22
C15	PSS1C	Type 6	Alder Thicket	High	Moderate	0.08
D8	PEMC/PFO1C/PFO4B	Type 3/7/8	Shallow Marsh/Hardwood Swamp/Coniferous Bog	High	Moderate	0.56
D10	PEMC/PSSA1C	Type 3/6	Sedge Meadow/ Shrub Carr	High	High	0.38
D12	PEMC/PFO1C	Type 3/7	Sedge Meadow/ Hardwood Swamp	High	High	0.01
D13	PEMC/PFO1C	Type 3/7	Sedge Meadow/ Hardwood Swamp	High	High	0.04
D14	PSS1C/PFO1C	Type 6/7	Shrub Carr/ Hardwood Swamp	High	High	0.61
NWI[3]	PSSB	Type 6	Assumed Alder Thicket	N/A	N/A	0.29
NWI[3]	PSSB	Type 6	Assumed Alder Thicket	N/A	N/A	0.16
NWI[3]	PSSB	Type 6	Assumed Alder Thicket	N/A	N/A	0.14
					Total	**5.73 acres**

[1] Dominant wetland types for wetland complexes are shown in bold and represent the dominant type within the impact area as determined from field delineation data.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.
[3] NWI basins are those areas that have not been field investigated. Cowardin classifications are taken from the NWI. Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classification, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.

F2.5.6.3 Plant Access Road

The DEIS proposed road corridor (see Figure F2-6) was designed with the intention of intersecting a new CR 7 alignment proposed by Itasca County that would extend eastward off the existing CR 7 just south of West Range Site, run east between Dunning Lake and Big Diamond Lake, and then turn south between Arcturus

Mine and Big Diamond Lake to intersect with U.S. 169. The realignment was proposed to improve truck traffic access and reduce conflicts between slow, heavy trucks and passenger vehicles.

Due to the unavailability of state bonding money for the project, Itasca County does not intend to construct the new roadway in the foreseeable future. Because of this and to attempt to reduce wetland impacts additional options for road access to the West Range Site were investigated. Road access to the FEIS IGCC Power Station would be from CR 7 to the south and west as shown in Figures F2-7 and F2-27. This road alignment provides the shortest access to CR 7 and minimizes impacts to wetlands. Wetland impacts will include wetland fill for roadway construction and temporary impacts from ROW establishment.

F2.5.6.3.1. Wetland Fill

Wetland fill impacts for the access road construction were calculated assuming fill across the width of the 120-foot wide permanent ROW. Table F2-13 provides a summary of wetland within the construction limits of the proposed DEIS roadway (5.67 acres) and Table F2-14 for the FEIS roadway (0.19 acres).

Table F2-13. Wetland Fill for West Range DEIS Plant Access Road

Basin ID	Dominant Wetland Classification			Selected MnRAM Functions		Wetland Impact Area (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	
A1	PEMB/PSS1/ PFO4	Type 3/6/8	Shallow Marsh/**Shrub Carr**/Coniferous Bog	High	Moderate	3.44
A13	PFO1B	Type 7	Hardwood Swamp	High	High	0.24
A14	PFO1B	Type 7	Hardwood Swamp	High	High	0.14
A27	PFO1C	Type 7	Hardwood Swamp	High	High	0
C21	PSS1C	Type 6	Alder Thicket	High	Moderate	0.33
C22	PSS1C	Type 6	Alder Thicket	High	Moderate	0.09
C23	PSS1C/ PFO1C	Type 6/7	Alder Thicket/Hardwood Swamp	High	Moderate	0.36
C24	PFO2B	Type 8	Coniferous Bog	High	Moderate	0.34
C26	PFO1C	Type 7	Coniferous Swamp	High	High	0
C27	PFO1C	Type 7	Coniferous Swamp	High	Moderate	0.01
NWI Basin*	n/a	Type 4	Assumed Deep Marsh	n/a	n/a	0.43
NWI Basin*	n/a	Type 6	Assumed Alder Thicket	n/a	n/a	0
NWI Basin*	n/a	Type 7	Assumed Hardwood Swamp	n/a	n/a	0.19
NWI Basin*	n/a	Type 8	Assumed Coniferous Bog	n/a	n/a	0.10
					Total	**5.67 acres**

n/a = not available

Table F2-14. Wetland Fill for FEIS Plant Access Road

Basin ID	Dominant Wetland Classification			Selected MnRAM Functions[1]		Wetland Impact Area (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	
A11	PEMC	Type 3	Shallow Marsh	Moderate	High	0.004
F1	PSS1C	Type 6	Alder Thicket	High	High	0.19
					Total	**0.194 acres**

[1]Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.

F2.5.6.3.2. Temporary Wetland Impacts

Temporary wetland impacts associated with FEIS road construction assume a 200-foot wide construction ROW. This ROW will be shared with several process water pipelines and the potable water and sanitary sewer pipelines for a portion of its length. The total temporary wetland impacts are 0.21 acres (as compared to 2.98 acres for the DEIS alternative), which includes 0.08 acres of Type 3 shallow marsh and 0.13 acres of Type 6 alder thicket.

F2.5.6.4 Power Transmission Lines

Excelsior's proposed HVTL Route (a.k.a.WRA-1) for interconnecting Mesaba One and Two to the Blackberry Substation is shown on Figure F2-12. The only portion of the HVTL alignment that was accessible for wetland delineation is the segment north of Highway 169. Wetland impacts along the remainder of the alignment have been estimated from the NWI.

Figure F2-12 shows Excelsior's Preferred HVTL Route for interconnecting to the Blackberry Substation. The preferred 345kV double circuit HVTL route (Route WRA-1) extends east from the IGCC Power Station's high voltage switchyard to Minnesota Power's (MP) existing 45 Line ROW along new greenfield ROW. The route would then head south from the southern boundary of the Buffer Land about 1.6 miles to the retired Greenway Substation along existing ROW. The route continues south from the Greenway Substation approximately 6.2 miles over new ROW to intersect MP's 230kV 83 Line and 115kV 20Line. At that point, the route follows the existing MP ROW about one mile east to the Blackberry Substation. Route WRA-1 is shown in more detail in Figures 2-28a, b, c. Approximately 3.7 miles of the HVTL would be constructed in new greenfield ROW with the remainder co-located with existing HVTL ROW or the proposed natural gas pipeline (lengths of which will include greenfield areas). Where new ROW will be established in greenfield areas, a 150-foot ROW will be established for construction. A permanent 100-foot ROW will be maintained to be clear of trees and shrubs.

The HVTL would share ROW with the natural gas pipeline along approximately 4.7 miles of the proposed alignment, from Birch Drive to the West Range site property boundary, minimizing tree clearing and wetland impacts.

Temporary wetland disturbance during construction would be minimized by performing construction during winter months or through use of construction mats to minimize rutting by equipment and disturbance of wetland vegetation. Where construction within wetland habitat can not be avoided, best management practices will be employed to minimize disturbance. Extra workspace areas, access roads, and contractor staging areas will be located outside of wetland areas to the greatest extent possible. Where avoidance of wetland disturbance is not possible, temporary roads and work areas would be removed and wetland restored following completion of construction.

Wetland impacts along the HVTL alignment will include wetland fill for power pole placement, temporary impacts to scrub-shrub habitat in temporary work spaces (areas within the construction ROW but outside the permanent ROW), and conversion of scrub-shrub and forested habitat within the permanent ROW.

F2.5.6.4.1. Wetland Fill

Wetland fill would be limited to those areas where power poles will be placed within wetlands. Each pole is assumed to require an estimated 28 square feet of fill. It is assumed that power poles will be placed evenly, every 800 feet along the alignment. Using this assumption, 15 power poles would be placed within wetland habitat and would result in approximately 0.01 acres of wetland fill as summarized in Table F2-15.

The actual location of the power poles will be determined during project design, once the final HVTL alignment is approved and defined by the MPUC. Placement of the poles will consider avoidance of wetland habitat to the greatest extent feasible. In addition to avoiding wetland impact, location of the poles outside wetland habitat will improve construction access and stability of the poles. However, the maximum distance between poles is approximately 1,000 feet which could limit avoidance across long expanses of wetland habitat.

Table F2-15. Wetland Fill for HVTL Alignment WRA-1

Basin ID	Wetland Classification			Selected MnRAM Functions[2]		Wetland Fill	
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	# Poles	Area (acres)
A1	PEMB/PSS1/PFO4	Type 3/6/8	Shallow Marsh/Shrub Carr/Coniferous Bog	High	Moderate	1	0.0006
NWI Basin[1]	n/a	Type 6	Assumed Alder Thicket	Unknown	Unknown	4	0.0026
NWI Basin[1]	n/a	Type 7	Assumed Hardwood Swamp	Unknown	Unknown	4	0.0026
NWI Basin[1]	n/a	Type 8	Assumed Coniferous Bog	Unknown	Unknown	6	0.0039
					Total	**15**	**0.01**

[1] NWI basins are those areas that have not been field investigated. Cowardin classifications are taken from the NWI. Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classification, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2]Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.

F2.5.6.4.2. Wetland Type Conversion (Tree and Shrub Clearing)

Construction across greenfield areas and establishment of new ROWs will require clearing of vegetation in upland and wetland areas. Impacts to wetland vegetation would be of two types, temporary impacts to scrub-shrub habitat in temporary work spaces outside the permanent ROW and permanent conversion of scrub-shrub habitat within the permanent ROW and forested habitat within the permanent ROW. Temporary conversion would include removal of scrub-shrub vegetation in the temporary construction ROW but outside the permanent ROW. These areas would be allowed to revegetate following construction. Permanent conversion would include removal of scrub-shrub vegetation within the permanent ROW and removal of forest vegetation within the construction ROW. The permanent ROW would be maintained free of woody vegetation, resulting in conversion of scrub-shrub and forested wetland to emergent wetland habitat. Although forested wetland cleared outside of the permanent ROW but within the construction ROW would still be allowed to revegetate, it is considered a permanent type conversion because of the length of time that regeneration would require. Table F2-16 provides a summary of wetland type conversion that would result from construction of the HVTL Alternative WRA-1.

Table F2-16. Wetland Conversion for HVTL Alignment WRA-1

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[2]		Temporary Scrub-Shrub Wetland Impacts[3]	Permanent Wetland Type Conversion[4]
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality		
A1	PEMB/**PSS 1B**/PFO4	Type 3/**6**/8	Shallow Marsh, **Shrub Carr**, Coniferous Bog	High	Moderate	0.56 2.14 already clear	1.77
E5	PEMH	Type 8	Coniferous Bog	High	Moderate	0 (already clear)	0 (already clear)
NWI Basin[1]	n/a	Type 6	Assumed Alder Thicket	n/a	n/a	1.77	7.63
NWI Basin[1]	n/a	Type 7	Assumed Hardwood Swamp	n/a	n/a	0	6.84
NWI Basin[1]	n/a	Type 8	Assumed Coniferous Bog	n/a	n/a	0	19.92
					Total	**2.33 acres**	**36.16 acres**

[1] NWI basins are those areas that have not been field investigated. Cowardin classifications are taken from the NWI. Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classification, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.
[3]Temporary removal of scrub-shrub vegetation outside the 100-foot permanent ROW. Natural revegetation will be allowed following completion of construction.
[4]Permanent conversion of scrub-shrub vegetation within 100-foot permanent ROW and scrub-shrub and forested vegetation within the 150-foot construction ROW.

F2.5.6.4.3. Water Crossings

There are two water crossings associated with the HVTL alignments. (See Figure F2-28a,b,c). These crossings include a perennial stream between Big & Little Diamond Lakes and the Swan River. Wetland impacts within the bed of either water body will be avoided. The total length of water crossings for the HVTL WRA-1 alignment is estimated at 123 linear feet. A summary of the length of each water body crossing for the HVTL alignment is provided in Table F2-17.

Table F2-17. Water Crossings – HVTL WRA-1 Alignment

Water Crossing Location	Milepost (mile + linear feet)	MNDNR PWI?	Length of Crossing (linear feet)
Perennial stream between Big & Little Diamond Lakes (Basin E1)	0+3980	No	3
Swan River	3+1630	Yes	120
		Total	**123 linear feet**

F2.5.6.5 Natural Gas Pipeline

The Nashwauk Public Utilities Commission has recently received (April 2008) a Route Permit from the MPUC and plans to construct a 24-inch diameter natural gas pipeline past the IGCC Power Station Footprint to serve the Minnesota Steel Industries steel plant. If this pipeline is constructed as proposed, Excelsior would likely tap into it at the point where it turns eastward from the West Range site and would not construct a parallel pipeline as proposed in the Joint Application. However, because construction on the Nashwauk natural gas pipeline has not yet commenced, the Application assumes that Excelsior will construct its own natural gas pipeline.

The proposed alignment for the natural gas pipeline serving the West Range IGCC Power Station would require approximately 13.1 miles of utility right of way. The pipeline would essentially parallel the Nashwauk Public Utilities Commission's natural gas pipeline from the GLG natural gas pipeline near Blackberry to the West Range site as shown on Figure F2-14. The natural gas pipeline route is detailed in Figures F2-29a,b,c,d.

The natural gas pipeline will be constructed below grade within a 70-foot permanent ROW. Construction of the pipeline will result in temporary impacts to wetlands existing within the 100-foot construction ROW. Wetland fill impacts will be avoided by restoring wetland habitat after construction. Wetland impacts along the pipeline alignment will include temporary impacts to emergent wetlands within the construction corridor, temporary disturbance of scrub-shrub habitat in temporary work spaces (areas within the construction ROW but outside the permanent ROW) and permanent conversion of scrub-shrub and forested habitat within the permanent ROW where prior disturbance has not removed woody vegetation. Although vegetation outside of the permanent ROW will be allowed to revegetate, impacts to forested wetlands even outside the permanent ROW are considered permanent because of the length of time required for restoration of forested habitat.

As noted above, the exact location of the pipeline alignment will be determined during project design and will consider adjustments to avoid and minimize wetland habitat. The construction ROW will be located to minimize sidecasting in wetland habitat. Extra workspace areas, access roads, pipe storage yards, and contractor staging areas will be located outside of wetland areas to the greatest extent possible. Where avoidance of wetland disturbance is not possible, temporary roads and work areas will be removed and wetland restored following completion of construction.

Directional drilling will be employed where the gas pipeline crosses streams and protected watercourses. Although directional drilling is more expensive, where employed it will avoid temporary disturbance to streams and adjacent wetlands. The natural gas pipeline will cross four rivers and streams.

F2.5.6.5.1. Temporary Emergent Wetland Impacts

Permanent impacts to wetlands would be avoided by restoring wetland habitat after installation of the pipe. Material excavated from the trench would be sidecast to one side of the trench or the other. Preference would be given to sidecasting outside of wetland areas. Following pipe installation, soil would be returned to the trench in reverse of the removal (i.e. topsoil will be replaced on the surface). Disturbed wetland (and upland areas) would be reseeded with a native seed mix appropriate to the adjacent vegetative community. Indirect drainage effects to wetlands from groundwater collected and conveyed along the backfilled pipeline trench would be avoided by installation of anti-seepage collars on the pipe in strategic locations.

Table F2-18. Temporary Emergent Wetland Impacts for Natural Gas Pipeline

Basin ID	Dominant Wetland Classification			Selected MnRAM Functions[1]		Temporary Emergent Impact [2] (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	
E1	PEMC	Type 3	Shallow Marsh	High	Moderate	0.43
E2	PEMB	Type 2	Wet Meadow	High	Moderate	0.23
E4	PEMC	Type 3	Shallow Marsh	Moderate	Moderate	0.08
E6	PEMC	Type 3	Shallow Marsh	High	Moderate	0.17
E7	PEMC	Type 3	Shallow Marsh	High	High	0.33
NWI Basin[1]	n/a	Type 1	Assumed Floodplain Forest	Unknown	Unknown	0.70
NWI Basin[1]	n/a	Type 2	Assumed Wet Meadow	Unknown	Unknown	1.75
NWI Basin[1]	n/a	Type 3	Assumed Shallow Marsh	Unknown	Unknown	0.21
					Total	**3.90 acres**

[1] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.
[2] Temporary Emergent Impacts are wetland impacts to wetland Types 1-5 within the 150-foot temporary construction ROW.

F2.5.6.5.2. Wetland Type Conversion (Tree and Shrub Clearing)

If the Nashwauk Public Utilities Commission natural gas pipeline is not constructed and Excelsior's natural gas pipeline is constructed first, approximately 11.14 miles of the pipeline would be constructed in new greenfield ROW. Construction across greenfield areas and establishment of new ROW would require clearing of trees and shrubs in upland and wetland areas.

Impacts to wetland vegetation would be of two types, temporary impacts to scrub-shrub habitat in temporary work spaces outside the permanent ROW and permanent conversion of scrub-shrub habitat within the permanent ROW and forested habitat within the permanent ROW. Temporary conversion would include removal of scrub-shrub vegetation in the temporary construction ROW but outside the permanent ROW. These areas would be allowed to revegetate following construction. Permanent conversion would include removal of scrub-shrub vegetation within the permanent ROW and removal of forest vegetation within the construction ROW. The permanent ROW would be maintained free of woody vegetation, resulting in conversion of scrub-shrub and forested wetland to emergent wetland habitat. Although forested wetland cleared outside of the permanent ROW but within the construction ROW would still be allowed to revegetate, it is considered a permanent type conversion because of the length of time that regeneration would require. Table F2-19 provides a summary of wetland type conversion that would result from construction of the natural gas pipeline.

The location of the temporary construction and permanent rights-of-way will be determined during final design, once the final pipeline alignment is approved and defined by the MPUC. The pipeline design will consider adjustments to avoid and minimize wetland habitat.

Table F2-19. Wetland Conversion for Natural Gas Pipeline

Basin ID	Dominant Wetland Classification			Selected MnRAM Functions[2]		Temporary Scrub-Shrub Impacts[3] (acres)	Permanent Scrub-Shrub and Forested Conversion[4] (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality		
A1	PEMB/PS S1B/PFO4	Type 3/6/8	Shallow Marsh, Shrub Carr, Coniferous Bog	High	Moderate	0.01	1.50
E1	PEMC	Type 3	Shallow Marsh	High	Moderate	0	0
E2	PEMB	Type 2	Wet Meadow	High	Moderate	0	0
E4	PEMC	Type 3	Shallow Marsh	Moderate	Moderate	0	0
E5	PEMH	Type 8	Coniferous Bog	High	Moderate	0	0.13
E6	PEMC	Type 3	Shallow Marsh	High	Moderate	0	0
E7	PEMC	Type 3	Shallow Marsh	High	High	0	0
NWI Basin[1]	n/a	Type 1	Assumed Floodplain Forest	Unknown	Unknown	0	0
NWI Basin[1]	n/a	Type 2	Assumed Wet Meadow	Unknown	Unknown	0	0
NWI Basin[1]	n/a	Type 3	Assumed Shallow Marsh	Unknown	Unknown		0
NWI Basin[1]	n/a	Type 6	Assumed Alder Thicket	Unknown	Unknown	0.83	3.00
NWI Basin[1]	n/a	Type 7	Assumed Hardwood Swamp	Unknown	Unknown	0	9.16
NWI Basin[1]	n/a	Type 8	Assumed Coniferous Bog	Unknown	Unknown	0	2.59
					Total	**0.84 acres**	**16.38 acres**

[1] NWI basins are those areas that have not been field investigated. Cowardin classifications are taken from the NWI. Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classification, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands

[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.

[3]Temporary removal of scrub-shrub vegetation outside the 70-foot permanent ROW. Natural revegetation will be allowed following completion of construction.

[4]Permanent conversion of scrub-shrub vegetation within 70-foot permanent ROW and scrub-shrub and forested vegetation within the 100-foot construction ROW.

F2.5.6.5.3. Water Crossings

There are four water crossings associated with the proposed gas pipeline, as shown in Table F2-20. The Swan River will be crossed twice by the gas pipeline at approximate mileposts 4+2170 (feet) and 9+4560, as shown in Figures F2-29 a,b,c,d. Other water crossings include a tributary of the Swan River at Milepost 5+1460 and a perennial stream between Big Diamond and Little Diamond Lakes at Milepost 12+2000. The Natural Gas Pipeline will be directionally drilled under waterbodies starting approximately 100 feet from the edge of each waterbody. This will minimize impacts to wetlands associated with water crossings. Temporary wetland impacts are limited to those areas on either side of the waterbody where the pipeline emerges and open cut trenching begins.

The Swan River is listed as a protected water in the MNDNR Protected Waters Inventory. A License for Utility Crossings of Public Lands and Waters granted by the MNDNR Division of Lands and Minerals will be required to complete the water crossings of the Swan River.

Table F2-20. Water Crossings – Proposed Natural Gas Pipeline

Water Crossing Location	Milepost (mile + linear feet)	MNDNR PWI?	Length of Crossing (linear feet)
Swan River	4+2170	Yes	60
Tributary of Swan River	5+1460	No	10
Swan River	9+4560	Yes	60
Perennial stream between Big & Little Diamond Lakes	12+2000	No	3
		Total	**133 linear feet**

F2.5.6.6 Process Water Pipelines

The water supply system for the West Range site consists of three mine pits, three pumping stations, and an engineered orifice to draw water from the Prairie River as shown on Figure F2-15. The system would include three pipeline segments; one from Lind Mine Pit to the Canisteo Mine Pit (referred to as Segment 1), one from the Gross-Marble Mine Pit to the Canisteo Mine Pit (referred to as Segment 3), and one from the Canisteo Mine Pit to the West Range site (referred to as Segment 2).

Routing for the pipelines will be primarily on public property adjacent to existing transportation corridors. The pipelines will be constructed below grade within a 100-foot permanent ROW. Construction of the process water utilities will result in temporary impacts to wetlands existing within the 150-foot construction ROW. Wetland fill impacts will be avoided by restoring wetland habitat after construction. Wetland impacts along the pipeline alignments will include temporary impacts to emergent wetlands within the construction corridor, temporary disturbance of scrub-shrub habitat in temporary work spaces (areas within the construction ROW but outside the permanent ROW) and permanent conversion of scrub-shrub and forested habitat within the permanent ROW where prior disturbance has not removed woody vegetation. Although vegetation outside of the permanent ROW will be allowed to revegetate, impacts to forested wetlands even outside the permanent ROW are considered permanent because of the length of time required for restoration of forested habitat.

F2.5.6.6.1. Segment 1 - Lind Mine Pit to Canisteo Mine Pit

Process Water Pipeline Segment 1 will be constructed from the pump station on the northeast end of Lind Mine Pit, north to County Road 61 and then east to the Buckeye Mine pit, the southernmost portion of the Canisteo Mine Pit complex. The alignment traverses areas previously disturbed by mining and the existing County Road 61 corridor. The NWI does not identify any wetland habitat within the proposed ROW of Process Water Segment 1 as shown on Figure F2-30.

F2.5.6.6.2. Segment 2 - Canisteo Mine Pit to the West Range Site

Process Water Pipeline Segment 2 will be constructed from the pump station on the east side of the Canisteo Mine Pit, east to Highway 7 and then north along the west side of Highway 7 to the West Range Site via the proposed access road. The alignment traverses areas previously disturbed by mining and the existing Highway

7 corridor, but will cross wetland habitat immediately east of the Canisteo Pump Station and along the new and existing roadway corridors. Access was available to the full length of Process Water Pipelines Segment 2 and wetland delineation was conducted. Wetlands along the corridor are shown on Figure F2-31. Table F2-21 provides a summary of wetland impacts resulting from construction of Process Water Pipeline Segment 2.

F2.5.6.6.3. Segment 3 - Gross-Marble Mine Pit to Canisteo Mine Pit

Process Water Pipeline Segment 3 will be constructed from the pump station on the west side of the Gross Marble Mine Pit, west to the west end of the Arcturus Mine Pit and then north along the Excelsior railroad alignment. At a point just south of the West Range site, the alignment will continue east to Highway 7 and then south along the west side of Highway 7 to the Canisteo Pump Station. The alignment traverses areas previously disturbed by mining, the new rail corridor and the existing Highway 7 corridor, but will cross some greenfield in the area south of the West Range site. Access was available to some segments of the alignment and wetland delineation was conducted where possible. Wetlands identified on the NWI were used along segments where wetland delineation was not performed. Wetlands along the corridor, both results of delineation and NWI, are shown on **Figure F2-32**. **Table F2-21** provides a summary of wetland impacts resulting from construction of Process Water Pipeline Segment 3.

Table F2-21. Wetland Impacts for Process Water System

Basin ID	Dominant Wetland Classification			Selected MnRAM Functions[1]		Temporary Emergent Wetland Impacts[1]	Temporary Scrub-Shrub Wetland Impacts[2]	Permanent Wetland Type Conversion[3]
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality			
Lind Mine Pit to the Canisteo Mine Pit (Segment 1) Total Length: 2.18 miles Greenfield ROW: 0.17 miles								
--	--	--	--	--	--	0	0	0
Canisteo Mine Pit to the West Range Site (Segment 2) Total Length: 2.15 miles Greenfield ROW: 0.73 miles								
C10	PSS1A	Type 6	Alder Thicket	High	Moderate	0	0.12	0.04
C27	PFO1C	Type 7	Coniferous Swamp	High	Moderate	0	0	0.93
C28	PFO1C	Type 7	Coniferous Swamp	High	Moderate	0	0	1.05
F1	PSS1C	Type 6	Alder Thicket	High	High	0	0.06	0.08
					Segment 2 Subtotal	**0**	**0.18**	**2.10**
Gross-Marble Mine Pit to Canisteo Mine Pit (Segment 3) Total Length: 4.83 miles Greenfield ROW: 2.23 miles								
C10	C10	PSS1A	Type 6	Alder Thicket	High	0	0.84	0.76
C19	PEMH	Type 5	Shallow Open Water	High	Moderate	0.64	0	0
C21	PSS1C	Type 6	Alder Thicket	Moderate	Moderate	0	0.08	0.16
C22	PSS1C	Type 6	Alder Thicket	High	Moderate	0	0.02	0

Table F2-21. Wetland Impacts for Process Water System

Basin ID	Dominant Wetland Classification			Selected MnRAM Functions[1]		Temporary Emergent Wetland Impacts[1]	Temporary Scrub-Shrub Wetland Impacts[2]	Permanent Wetland Type Conversion[3]
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality			
C23	PSS1C	Type 6	Alder Thicket	Moderate	Moderate	0	0.08	0.18
C24	PFO2B	Type 8	Coniferous Bog	Moderate	Moderate	0	0	0.14
C28	PFO1C	Type 7	Coniferous Swamp	High	Moderate	0	0	0.05
NWI	PUBF	Type 4	N/A	N/A	N/A	0.62	0	0
NWI	PSS/EM5B	Type 6	N/A	N/A	N/A	0	0.13	0.13
NWI	PFO/SSB	Type 7	N/A	N/A	N/A	0	0	0.46
NWI	PFOB	Type 8	N/A	N/A	N/A	0	0	0.49
Segment 3 Subtotal						**1.26**	**1.15**	**2.37**
Grand Total						**1.26 acres**	**1.33 acres**	**4.47 acres**

[1]Temporary disturbance of emergent wetland habitat within the 150-foot construction ROW.
[2]Temporary removal of scrub-shrub vegetation outside the 100-foot permanent ROW. Natural revegetation will be allowed following completion of construction.
[3]Permanent conversion of scrub-shrub vegetation within 100-foot permanent ROW and scrub-shrub and forested vegetation within the 150-foot construction ROW.

Previously inaccessible areas will be investigated to identify and delineate wetland habitat when possible. The pipeline alignment will be altered to avoid wetland habitat to the greatest extent possible. Construction workspace will be located to minimize sidecasting in wetland habitat. Extra workspace areas, access roads, pipe storage yards, and contractor staging areas will be located outside of wetland areas to the greatest extent possible. Where avoidance of wetland disturbance is not feasible, temporary roads and work areas will be removed and wetland restored following completion of construction.

F2.5.6.7 Cooling Tower Blowdown Pipelines

In the DEIS there were process water blowdown lines that would have resulted in the following type conversion impacts:

- Permanent
  - 0.09 acres of forested wetlands to emergent wetlands;
  - 2.95 acres of shrub-scrub wetlands to emergent wetlands;
- Temporary
  - 1.57 acres of shrub-scrub wetlands.

In the FEIS alternative, with the provision of ZLD, all of these potential impacts are avoided.

F2.5.6.8 Potable Water and Sanitary Sewer Pipelines

Potable water and sanitary sewer treatment will be provided from the City of Taconite. The water and sewer utilities will extend from the IGCC plant, along the plant access road, across Hwy 7, and along the west side of Hwy 7 to the City of Taconite as shown on Figure F2-16.

The utilities will be constructed below grade within a 40-foot permanent ROW. However, this ROW and the 100-foot construction ROW is located within the same impact corridor as Process Water Pipeline Segment 2 and the IGCC Power Station access road. Construction of the potable water and sanitary sewer utilities will not result in any additional wetland impacts beyond those described for those project elements.

F2.5.6.9 Summary of West Range Wetland Impacts

A summary of both temporary and permanent wetland impacts for the West Range IGCC Power Station, Buffer Land, and Associated Facilities is provided in Table F2-22 below.

Table F2-22. Summary of Wetland Impacts for the West Range IGCC Power Station, Buffer Land, and Associated Facilities

Project Element	Wetland Types													Total Wetland Impacts
	Type 1	Type 2		Type 3	Type 4	Type 5	Type 6			Type 7		Type 8		
	Floodplain Forest	Wet Meadow	Sedge Meadow	Shallow Marsh	Deep Marsh	Shallow Open Water	Alder Thicket	Shrub Swamp	Shrub Carr	Hardwood Swamp	Coniferous Swmap	Coniferous Bog	Open Bog	
Permanent Wetland Impacts														
IGCC Power Station - FEIS				0.04					7.31	24.01				31.36
Phase 1				0.04					7.31	6.27				13.62
Phase 2										17.74				17.74
Railroad – 3B							1.71		3.04	0.98				5.73
Access Road - FEIS				0.004			0.19							0.194
HVTL							0.0026		0.0006	0.0026		0.0039		0.01
Subtotal	**0.00**	**0.00**	**0.00**	**0.08**	**0.00**	**0.00**	**1.90**	**0.00**	**10.35**	**24.99**	**0.00**	**0.00**	**0.00**	**37.29**
Temporary Emergent Wetland Impacts														
Access Road				0.08										0.08
Gas Pipe Alt. 1	0.70	1.98		1.22										3.90
Process Water 1 - Lind Pit to Canisteo														0.00
Process Water 2 - Canisteo to IGCC site														0.00
Process Water 3 - Gross Marble to Canisteo					0.62	0.64								1.26
Potable Water and Sanitary Sewer														0.00
Subtotal	**0.70**	**1.98**	**0.00**	**1.30**	**0.62**	**0.64**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.24**
Temporary Scrub-Shrub Wetland Impacts (TWS)														
Access Road							0.13							0.13
HVTL							2.33							2.33
Gas Pipe Alt. 1							0.83		0.01					0.84
Process Water 1 - Lind Pit to Canisteo														0.00
Process Water 2 - Canisteo to IGCC site							0.18							0.18
Process Water 3 - Gross Marble to Canisteo							1.15							1.15
Potable Water and Sanitary Sewer														0.00
Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.62**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**4.63**

Table F2-22. Summary of Wetland Impacts for the West Range IGCC Power Station, Buffer Land, and Associated Facilities

Project Element	Wetland Types													Total Wetland Impacts
	Type 1	Type 2		Type 3	Type 4	Type 5	Type 6			Type 7		Type 8		
	Floodplain Forest	Wet Meadow	Sedge Meadow	Shallow Marsh	Deep Marsh	Shallow Open Water	Alder Thicket	Shrub Swamp	Shrub Carr	Hardwood Swamp	Coniferous Swmap	Coniferous Bog	Open Bog	
Permanent Type Conversion (Scrub-Shrub and Forested)														
HVTL							9.40			6.84		19.92		36.16
Gas Pipe Alt. 1							3.00		1.50	9.16		2.72		16.38
Process Water 1 - Lind Pit to Canisteo														0.00
Process Water 2 - Canisteo to IGCC site							0.12			1.98				2.10
Process Water 3 - Gross Marble to Canisteo							1.23			0.46	0.05	0.63		2.37
Potable Water and Sanitary Sewer														0.00
Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**13.75**	**0.00**	**1.50**	**18.44**	**0.05**	**23.27**	**0.00**	**57.01**

F2.5.7 East Range Wetland Impacts

The following sections describe the wetland impacts that would result from the construction of each project element on the East Range Site. Wetland impacts are described as wetland fill, temporary wetland disturbance, and wetland type conversion resulting from vegetation removal. A summary of wetland impacts on the East Range Site is included on Table F2-35.

F2.5.7.1 IGCC Power Station Footprint

As positioned in Figures F2-17 and F2-33 the IGCC Power Station Footprint would impact 17.15 acres of wetland habitat. The impact area includes the Station Footprint and the 3:1 grading at its boundaries required to achieve the natural grade of the surrounding area. The Station Footprint is located on a hill that drops about 40 feet in elevation from northwest to southeast; therefore, site has been designed in a tiered fashion to minimize grading on the sloping topography. Such grading would require approximately 3,349,900 cubic yards of cut and 1,146,400 cubic yards of fill and result in a total of 2,203,500 cubic yards of excess material. Wetland impacts resulting from the placement, alignment, and grading of the Station Footprint, including areas within the grading limits, are summarized in Table F2-23. The mapping of the wetlands with the Eggerrs and Reed classifications is shown in Figure F2-33.

The IGCC Power Station would be constructed in two phases. Mesaba One is expected to be constructed between 2010 and 2014; construction of Mesaba Two is expected to begin in 2012. Mesaba One would be constructed in the northern portion of the Station Footprint because of the desire to provide the longest straight line approach to the railcar dumper and to minimize the length of conveyors needed for stockpiling feedstocks in this unit's active and passive storage areas.

Table F2-23. Wetland Fill for West Range IGCC Power Station

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[2]		Wetland Fill (acres)		
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	Phase I	Phase II	Total
A	PEMC	Type 2	Sedge Meadow	High	Moderate	0.05	0.003	0.05
B	PFOC	Type 7	Coniferous Swamp	High	Moderate	5.53	0	5.53
C3	PFO2B	Type 7	Coniferous Swamp	High	Moderate	0.66	1.42	2.08
C4	PEMH	Type 4	Deep Marsh	High	Moderate	1.89	1.38	3.27
C5	PEMB	Type 2	Fresh Wet Meadow	High	Moderate	1.74	0.004	1.74
C6	PFO1B	Type 7	Hardwood Swamp	High	Moderate	3.38	0	3.38
C9	PSS1B	Type 6	Shrub Swamp	High	Moderate	0.19	0.90	1.09
					Total	**13.44 acres**	**3.71 acres**	**17.15 acres**

[1] Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classifications, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.

F2.5.7.2 Rail Alignment

The proposed rail spur to the East Range IGCC Power Station (Railroad Alternative 1) would intersect the southeastern margin of the Station Footprint and loop as shown on Figures F2-17 and F2-33. This rail loop would provide optimal rail yard operations because it allows the onsite rail sidings to be continuous and reconnect with the track without dead-end spurs. The spur would be 17,878 feet in total length with a rail loop of 9,836 feet at an elevation of 1,465 feet msl. The preferred rail alignment and loop would require 2.39 million cubic yards cut and 0.12 million cubic yards fill and would impact 13.38 acres of wetland. An additional 51.26 acres of two remnant wetlands would be enclosed within the rail loop. This wetland complex is supported by surface flow via a tributary to Colby Lake from offsite to the north. The preferred railroad alternative would cross this tributary in two locations. Culverts would be installed in these locations in order to maintain current volumes of flow. Culverts would be installed in other locations throughout the rail loop as well in order to ensure maintenance of hydrologic connectivity throughout the wetland.

The wetland impacts of this railroad alternative are summarized in Table F2-24 and include all wetlands within the construction limits of the proposed rail line, including a 3:1 slope along the railroad embankments.

Table F2-24. Wetland Fill for East Range Railroad Alternative 1

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[2]		Permanent Impact Area (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	
C2	PFO2B	Type 8	Coniferous Bog	High	Moderate	0.91
C3	PFO2B	Type 7	Coniferous Swamp	High	Moderate	0.45
C4	PEMH	Type 4	Deep Marsh	High	Moderate	2.67
C6	PFO1B	Type 7	Hardwood Swamp	High	Moderate	0.44
C7	PSS1B	Type 6	Hardwood Swamp - Logged	High	Moderate	8.19
I	PSS1C	Type 6	Alder Thicket	Moderate	Moderate	0.67
J	PEMC	Type 2	Fresh Wet Meadow	Moderate	Moderate	0.05
					Total	**13.38 acres**

[1] Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classifications, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.

The Railroad Alternative 1 corridor would require crossing approximately six linear feet of streams and bodies of water. See Table F2-25. The tributary to Colby Lake that flows through Wetland C is crossed twice by the center loop.

Table F2-25. Stream Crossings for Railroad Alternative 1

Water Crossing Location	MDNR PWI?	Length of Crossing (linear feet)
Tributary to Colby Lake (North Crossing)	Yes	3
Tributary to Colby Lake (South Crossing)	Yes	3
Total		**6**

F2.5.7.3 Plant Access Road

An access road would be constructed to provide access to the IGCC Power Station from the existing CR 666, as shown in Figures F2-17 and F2-33. CR 666 passes just to the east of the proposed site and is the only feasible option to serve the site via the public road system. The proposed road access is located to cross wetland areas at the intersection with CR 666 and near the Station Footprint at their narrowest point to minimize wetland fill.

Side slopes for the road bed would be graded to the maximum possible slope allowed by St. Louis County and Mn/DOT road construction specifications in order to minimize the footprint of the road and impacts to the environment, specifically to wetland habitat. Proper placement of culverts throughout the road alignment would mitigate potential indirect wetland impacts to nearby wetlands by maintaining existing hydrologic connectivity. Wetland impacts associated with the preferred access road are identified in Table F2-26.

Table F2-26. Wetland Fill for East Range Access Road

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[2]		Permanent Impact Area (acres)
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	
C6	PFO1B	Type 7	Hardwood Swamp	High	Moderate	0.39
D	PSS1B	Type 6	Alder Thicket	High	Moderate	0.05
					Total	**0.44 acres**

[1] Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classifications, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3.

F2.5.7.4 Power Transmission Lines

Excelsior's preferred transmission plan for the East Range IGCC Power Station consists of constructing two new 345kV HVTLs within three existing ROWs to link the IGCC Power Station to the Forbes Substation POI as shown on Figure F2-23. Even though one 345kV HVTL would be sufficient to accommodate the combined full load output of Mesaba One and Mesaba Two, both new lines must be constructed concurrently with installation of Mesaba One to address the single failure criterion. Each line would follow existing routes now occupied by 115kV HVTLs owned by Minnesota Power that interconnect the Syl Laskin Energy Center with the Forbes and Virginia Substations (the 37L and 38L HVTL connect to the Forbes Substation; the 39L HVTL connects to the Virginia Substation).

As described in Final EIS Section 2.3.2.5 (Volume 1), to avoid the high cost and dangerous conditions associated with "hot" construction methods, Excelsior proposes to acquire an additional 30 feet of ROW along one of the routes between the Laskin and Forbes Substations. Based on a review of aerial photographs and video taken during overflights of the routes in September 2005, Excelsior identified the 39L/37L corridor as the preferred route along which to acquire the additional 30-foot ROW. For the alternative plan, Excelsior would acquire the additional ROW along the 38L corridor. In addition to the 30-foot ROW added to one corridor, either Excelsior's preferred or alternative plan would require the acquisition of two new segments of ROW. One of the two new ROW segments is about 2 miles in length and would extend alongside the existing MP 43L HVTL corridor connecting the Mesaba Generating Station with the initiation point of the 39L and 38L corridors. The second new ROW segment would be about 2 miles in length and would be required to link the 39L and 37L corridors near the City of Eveleth.

Wetland impacts along the HVTL alignment would include wetland fill for power pole placement, temporary impacts to scrub-shrub habitat in temporary work spaces (areas within the construction ROW but outside the permanent ROW), and conversion of scrub-shrub and forested habitat within the permanent ROW.

F2.5.7.4.1. Wetland Fill

Permanent wetland impacts would be limited to those areas where power poles are placed within wetlands. Each pole would require an estimated 28 square feet of fill. Wetland impacts are calculated for the HVTL alignment assuming that power poles would be placed every 800 feet along the alignment. Using this assumption, a total of 139 power poles (73 for Line 38 and 66 for Line 37/39) would be placed in wetland areas, resulting in 3,892 square feet (0.09) acres of permanent wetland impacts along the 68.42 mile alignment (33.58 miles for Line 38 and 34.84 for Line 37/39). Wetland impacts are summarized in Table F2-27, below.

The location of power poles would be more accurately specified during project design. Placement of the poles would consider avoidance of wetland habitat to the greatest extent feasible. In addition to avoiding wetland impact, location of the poles outside wetland habitat improves construction access and stability of the poles. However, the maximum distance between poles of approximately 1,000 feet would limit avoidance of long expanses of wetland habitat.

Temporary wetland disturbance during construction would be minimized by performing construction during winter months or through use of construction mats to minimize rutting by equipment and disturbance of wetland vegetation. Where construction within wetland habitat could not be avoided, best management practices would be employed to minimize disturbance. Extra workspace areas, access roads, and contractor staging areas would be located outside of wetland areas to the greatest extent possible. Where wetland disturbances cannot be avoided, temporary roads and work areas would be removed and the affected wetlands restored following completion of construction.

Table F2-27. Wetland Fill for East Range HVTL Alignments

Basin ID[1]	Wetland Classification[1]			Selected MnRAM Functions[2]		Wetland Fill	
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	# Poles	Area (acres)
38 Line							
NWI Basin	Various	Type 2	Assumed Wet Meadow	--	--	3	0.0019
NWI Basin	Various	Type 5	Assumed Shallow Open Water	--	--	1	0.0006
NWI Basin	Various	Type 6	Assumed Alder Thicket	--	--	33	0.0211
NWI Basin	Various	Type 7	Assumed Hardwood Swamp	--	--	5	0.0030
NWI Basin	Various	Type 8	Assumed Coniferous Bog	--	--	30	0.0189
NWI Basin	Riverine	Not Applicable	Not Applicable	--	--	1	0.0006
					Total	**73**	**0.0461**
37/39 Line							
NWI Basin	Various	Type 2	Assumed Wet Meadow	--	--	1	0.0006
NWI Basin	Various	Type 5	Assumed Shallow Open Water	--	--	3	0.0019
NWI Basin	Various	Type 6	Assumed Alder Thicket	--	--	19	0.0123
NWI Basin	Various	Type 7	Assumed Hardwood Swamp	--	--	13	0.0084
NWI Basin	Various	Type 8	Assumed Coniferous Bog	--	--	30	0.0194

Table F2-27. Wetland Fill for East Range HVTL Alignments

Basin ID[1]	Wetland Classification[1]			Selected MnRAM Functions[2]		Wetland Fill	
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality	# Poles	Area (acres)
					Total	**66**	**0.0426**

[1] NWI basins are those areas that have not been field investigated. Cowardin classifications are taken from the NWI. Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classifications, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3. MnRAM assessments were only completed for wetlands field delineated, and are not available for wetland impacts based off the NWI.

F2.5.7.4.2. Wetland Type Conversion (Tree and Shrub Clearing)

The majority of the East Range HVTL is proposed within an existing 100-foot power utility ROW which would avoid clearing of trees and shrubs. Tree clearing would be required on the additional 30-feet of new ROW and on the two new approximately two-mile sections of ROW to the Syl Laskin Substation and linking the 39L and 37L corridors. The proposed new 30-foot ROW would parallel the existing 100-foot ROW for the 37/39 Line (HVTL Alternative 2 – Excelsior's Preferred) and would alter wooded or shrub wetland habitat. Construction of the new 100-foot wide ROW between the East Range IGCC Power Station and the Syl Laskin Substation would require clearing of shrub swamp. HVTL Alternative 1 would add 30-feet of new ROW to the 38 Line.

Impacts to wetland vegetation would be of two types, temporary impacts and permanent conversion. Temporary impacts would include removal of scrub-shrub vegetation in the temporary construction ROW but outside the permanent ROW. These areas would be allowed to revegetate following construction. Permanent conversion would include removal of scrub-shrub vegetation within the permanent ROW and removal of forest vegetation within the construction ROW. The permanent ROW would be maintained free of woody vegetation, resulting in conversion of scrub-shrub and forested wetland to emergent wetland habitat. Although forested wetland cleared outside of the permanent ROW but within the construction ROW would still be allowed to revegetate, it is considered a permanent type conversion because of the length of time that regeneration would require. Table F2-28 provides a summary of wetland type conversion that would result from construction of the East Range HVTL.

Table F2-28. Wetland Conversion for East Range HVTL Alignments

Basin ID[1]	Dominant Wetland Classification[1]			Temporary Scrub-Shrub Impacts[3] (acres)	Permanent Scrub-Shrub and Forested Conversion[4] (acres)
	Cowardin	Circular 39	Eggers and Reed		
Alternative 1 – add 30' to the 38 Line					
NWI Basin	Various	Type 1	Assumed Floodplain Forest	0 (no shrubs)	0 (no trees/shrubs)
NWI Basin	Various	Type 2	Assumed Wet Meadow	0 (no shrubs)	0 (no trees/shrubs)
NWI Basin	Various	Type 5	Assumed Shallow Open Water	0 (no shrubs)	0 (no trees/shrubs)
NWI Basin	Various	Type 6	Assumed Alder Thicket	0 (no wetlands)	24.27
NWI Basin	Various	Type 7	Assumed Hardwood Swamp	0 (no shrubs)	9.15
NWI Basin	Various	Type 8	Assumed Coniferous Bog	0 (no shrubs)	29.03
NWI Basin	Riverine	Not	Not Applicable	0 (no shrubs)	0 (already cleared)

Table F2-28. Wetland Conversion for East Range HVTL Alignments

Basin ID[1]	Dominant Wetland Classification[1]			Temporary Scrub-Shrub Impacts[3] (acres)	Permanent Scrub-Shrub and Forested Conversion[4] (acres)
	Cowardin	Circular 39	Eggers and Reed		
		Applicable			
			Total	**0 acres**	**62.45 acres**
Alternative 2 (Preferred) - add 30' to 37/39 Line					
NWI Basin	Various	Type 1	Assumed Floodplain Forest	0 (no shrubs)	0 (no trees/shrubs)
NWI Basin	Various	Type 2	Assumed Wet Meadow	0 (no shrubs)	0 (no trees/shrubs)
NWI Basin	Various	Type 5	Assumed Shallow Open Water	0 (no shrubs)	0 (no trees/shrubs)
NWI Basin	Various	Type 6	Assumed Alder Thicket	0.20	19.21
NWI Basin	Various	Type 7	Assumed Hardwood Swamp	0 (no shrubs)	10.99
NWI Basin	Various	Type 8	Assumed Coniferous Bog	0 (no shrubs)	29.42
NWI Basin	Riverine	Not Applicable	Not Applicable	0 (no shrubs)	0 (no wetlands)
			Total	**0.20 acres**	**59.62 acres**

[1] NWI basins are those areas that have not been field investigated. Cowardin classifications are taken from the NWI. Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classifications, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2] Complete MnRAM 3.1 Functions and Values Assessment data can be found in Appendix F3. MnRAM assessments were only completed for wetlands field delineated, and are not available for wetland impacts based off the NWI.
[3]Temporary removal of scrub-shrub vegetation outside the 100-foot permanent ROW. Natural revegetation would be allowed following completion of construction.
[4]Permanent conversion of scrub-shrub vegetation within 100-foot permanent ROW and scrub-shrub and forested vegetation within the 150-foot construction ROW.

F2.5.7.4.3. Water Crossings

There would be 21 crossings of streams or water bodies associated with the 38L corridor (HVTL Alternative 1) for a total length of water crossings estimated at 1,194 linear feet. There would be 20 water crossings in the 37L/39L corridors (HVTL Alternative 2) for a total length estimated at 1,760 linear feet. A summary of the length of each water body crossing is provided in Table F2-29.

Table F2-29. Water Crossings for East Range HVTL Alignments

Water Crossing Location	Milepost	MNDNR PWI	Length of Crossing (linear ft)
MP 38 Line Corridor			
Colby Lake	1+4670	Yes—249P	540
Partridge River	5+1190	Yes	110
Perennial Tributary to St. Louis River	6+3680	No	3
Perennial Tributary to St. Louis River	6+4590	Yes	3
Perennial Tributary to St. Louis River	8+1215	No	3
Perennial Tributary to St. Louis River	8+2420	No	3
Unnamed Pond	9+0480	Yes—430W	180

Table F2-29. Water Crossings for East Range HVTL Alignments

Water Crossing Location	Milepost	MNDNR PWI	Length of Crossing (linear ft)
Perennial Stream between North and South Cedar Island Lake	11+1780	Yes	60
Perennial Stream South of Forge Lake	13+1850	No	95
Perennial Tributary to Esquagama Lake	15+0670	Yes	3
Perennial Ditch to Esquagama Lake	15+3590	No	3
Perennial Tributary to Embarrass River	16+3900	No	60
Intermittent Stream to Embarrass River	16+4900	No	3
Ely Creek	22+0090	Yes	3
Perennial Stream south of Half Moon Lake	23+4750	No	3
Intermittent Stream north of Long Lake Creek	26+4020	No	3
Long Lake Creek	27+0360	Yes	3
Perennial Stream north of St. Louis River	29+3250	Yes	3
Elbow Creek	30+1230	Yes	15
Perennial Stream north of Elbow Creek	30+4100	No	3
Two River (in 3 places due to meander)	31+2840	Yes	95
		Total MP 38 Line	**1194**
MP 37/39 Line Corridor			
Colby Lake	1+4670	Yes—249P	540
Partridge River	5+3020	Yes	250
Perennial Tributary to St. Louis River	7+1110	Yes	80
Perennial Tributary to St. Louis River	8+2300	Yes	3
Perennial Tributary to St. Louis River	8+2980	No	3
Perennial Drainage Ditch to wetland	12+1410	No	6
Embarrass River	15+1140	No	3
Embarrass River	15+1490	Yes	70
Deep Lake	19+2260	Yes—666P	690
Perennial Stream west of Deep Lake (2 crossings in meander)	19+4840	No	6
Perennial Stream west of Deep Lake	20+1540	No	3
Unnamed Intermittent Stream	22+4080	Yes	3
Perennial Ditch to Mine Dump	25+0960	No	3
Perennial Stream to Mine Dump	25+1960	No	3
Elbow Creek	28+5130	Yes	15
Perennial Ditch to East Two River	30+2190	No	3
Perennial Stream to East Two River	31+1910	No	3
East Two River	32+0810	Yes	70
Unnamed Perennial Stream	33+0340	No	3
Perennial Ditch to Two River	34+4960	No	3
		Total MP 37/39 Line	**1760**

F2.5.7.5 Natural Gas Pipeline

For the East Range Site, the proposed natural gas pipeline would be constructed, owned and operated by Northern Natural Gas ("NNG"), and would be an extension of NNG's interstate pipeline system shown on Figure F2-24. NNG represents the only feasible option for supplying Mesaba One and Two with natural gas because it is the only pipeline company within the immediate vicinity of the East Range Site. NNG's existing pipeline serves Cliffs-Erie (and the former LTV mining operation) and abuts the IGCC Power Station Footprint on its eastern boundary. In order to provide natural gas in the quantity and at the pressure required to supply the Project's two phases, installation of approximately 28.8 miles of new, 16- to 24-inch pipe would be constructed adjacent to NNG's existing 32.5-mile pipeline. A new pipeline can be laid within the same ROW (i.e., without having to expand the ROW's width).

The natural gas pipeline would be constructed below grade within the existing ROW. Construction of the natural gas pipeline would result in temporary impacts to wetlands existing within the ROW from excavation and installation of the pipe. Permanent impacts to wetlands would be avoided by restoring wetland habitat after installation of the pipe. Material excavated from the trench would be sidecast to one side of the trench or the other. Preference would be given to sidecasting outside of wetland areas. Following pipe installation, soil would be returned to the trench in reverse of the removal (i.e. topsoil would be replaced on the surface). Disturbed wetland (and upland areas) would be reseeded with a native seed mix appropriate to the adjacent vegetative community. Indirect drainage effects to wetlands from groundwater conducted along the backfilled pipeline trench would be avoided by installing anti-seepage collars on the pipe in strategic locations.

Wetland impacts along the pipeline alignment would not include temporary disturbance of scrub-shrub habitat in temporary work spaces or permanent conversion of scrub-shrub and forested habitat within the permanent ROW because the existing ROW is maintained free of woody vegetation.

The location of the pipeline alignment would be determined during project design and would consider adjustments to avoid and minimize wetland habitat. Extra workspace areas, access roads, pipe storage yards, and contractor staging areas would be located outside of wetland areas to the greatest extent possible. Where avoidance of wetland disturbance is not possible, temporary roads and work areas would be removed and wetland restored in a manner similar to the pipeline trench following completion of construction.

F2.5.7.5.1. Temporary Emergent Wetland Impacts

Only the portion of the proposed gas pipeline where the alignment enters the East Range Site has been field delineated. The potential wetland impacts resulting from the construction of the gas pipeline have been estimated from NWI wetland boundaries, also shown on Figure F2-24. In an effort to improve the accuracy of estimation of wetland habitat along the inaccessible linear utility corridors, an exercise comparing aerial photography, hydric soils, and the NWI was performed along 15 miles of the gas pipeline corridor (*see* Section 4.3 of the Wetland Permit Application). This revised wetland information is used where available to calculate wetland impacts. The NWI classifies a majority of the wetlands within the existing ROW for the gas pipeline as scrub shrub, forested, or coniferous bog. However, because the existing ROW is maintained to be free of trees and shrubs, these wetland types are no longer accurate. For wetland impact calculations, scrub shrub and forested wetlands within the ROW are considered wet meadows and coniferous bogs are considered open bogs.

Construction and installation of the proposed natural gas pipeline would disturb an estimated total of 24.79 acres of wetland along the entire 28.8 miles of existing ROW, as shown in Table F2-30, below. This area assumes that open cut trenching is employed for construction, which would require use of the entire width of the ROW.

Table F2-30. Wetland Impacts for East Range Natural Gas Pipeline

Basin ID	Dominant Wetland Classification			Selected MnRAM Functions[5]		Temporary Emergent Wetland Impacts[1]	Temporary Scrub-Shrub Wetland Impacts[2]	Permanent Wetland Type Conversion[3]
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality			
C2	PFO2B	Type 8	Coniferous Bog	High	Moderate	--	--	0.06
C4	PEMH	Type 4	Deep Marsh	High	Moderate	0.68	--	--
C6	PFO1B	Type 7	Hardwood Swamp	High	Moderate	--	--	0.41
C7	PSS1B	Type 6	Hardwood Swamp - Logged	High	Moderate	--	0.33	--
C8	PEMC	Type 3	Shallow Marsh	High	Moderate	0.003	--	--
NWI	Various	Type 2	Assumed Wet Meadow	--	--	1.81	--	--
NWI	Various	Type 5	Assumed Shallow Open Water	--	--	(0.34)[5]	--	--
NWI	Various	Type 6	Assumed Alder Thicket	--	--	8.71	Already clear	--
NWI	Various	Type 7	Assumed Hardwood Swamp	--	--	3.60	--	Already clear
NWI	Various	Type 8	Assumed Coniferous Bog	--	--	9.10	--	Already clear
NWI	Riverine	Not Applicable	Not Applicable	--	--	0.09	--	--
					Grand Total	**23.99 acres**	**0.33 acres**	**0.47 acres**

[1]Temporary disturbance of emergent wetland habitat within the 100-foot construction ROW. This includes impacts to previously cleared Type 6, 7, and 8 NWI wetlands.
[2]Temporary removal of scrub-shrub vegetation outside the 70-foot permanent ROW. Natural revegetation would be allowed following completion of construction.
[3]Permanent conversion of scrub-shrub vegetation within 70-foot permanent ROW and scrub-shrub and forested vegetation within the 100-foot construction ROW.
[4]MnRAM 3.1 Functional Assessments were completed only for wetlands field delineated.
[5] Impacts to open water would be avoided by directionally drilling pipeline under the water body.

F2.5.7.5.2. Water Crossings

The East Range Natural Gas Pipeline Alternative 1 would require crossing approximately 792 linear feet of streams and bodies of water, not including adjacent wetland habitat. Colby Lake (249P) and 12 streams and rivers impacted by Natural Gas Pipeline Alternative 1 are protected by the MDNR. Table F-31 below describes which impacted wetlands are protected.

Table F2-31. Water Crossings for East Range Natural Gas Pipeline Alternative 1

Water Crossing Location	Milepost	MDNR PWI?	Length of Crossing (linear feet)
Elbow Creek – West Side	1+3580	Yes	20
Elbow Creek – East Side			
Unnamed Perennial Stream- West Side	4+1010	No	3
Unnamed Perennial Stream – East Side			

Water	Milepost	MDNR	Length of
Perennial Stream from Mud to Horseshoe Lake – West Side	5+2840	Yes	3
Perennial Stream from Mud to Horseshoe Lake – East Side			
Perennial Ditch from Airport to Ely Creek – West Side	8+0550	No	3
Perennial Ditch from Airport to Ely Creek – East Side			
Perennial Ditch from Airport to Ely Creek – West Side	8+1030	No	3
Perennial Ditch from Airport to Ely Creek – East Side			
Ely Creek – West Side	9+3530	Yes	3
Ely Creek – East Side			
Perennial Ditch from Leaf Lake – West Side	12+2370	No	3
Perennial Ditch from Leaf Lake – East side			
Perennial Stream to Esquagama Lake – West Side	13+4720	Yes	15
Perennial Stream to Esquagama Lake – East Side			
Perennial Stream to Esquagama Lake – West Side	14+1790	Yes	15
Perennial Stream to Esquagama Lake – East Side			
Perennial Ditch to Esquagama Lake – West Side	15+0710	No	3
Perennial Ditch to Esquagama Lake – East Side			
Perennial Stream from Fourth Lake to Esquagama Lake – West Side	15+3620	Yes	90
Perennial Stream from Fourth Lake to Esquagama Lake – West Side			
Perennial Stream to St. Louis River – West Side	19+3500	No	3
Perennial Stream to St. Louis River – East Side			
Perennial Stream to St. Louis River – West Side	19+4350	Yes	3
Perennial Stream to St. Louis River – East Side			
Perennial Stream to St. Louis River – West Side	21+1880	Yes	15
Perennial Stream to St. Louis River – East Side			
Perennial Stream to St. Louis River – West Side	21+3380	No	15
Perennial Stream to St. Louis River – East Side			
Partridge River – West Side	24+0960	Yes	100
Partridge River – East Side			
Colby Lake – West Side	25+1490	Yes	430
Colby Lake – East Side			
Partridge River – West Side	27+3230	Yes	50
Partridge River – East Side			
Wyman Creek – West Side	28+0950	Yes	15
Wyman Creek – East Side			
		Total	**792 linear feet**

F2.5.7.6 Process Water Pipelines

The water supply system for the East Range site would consist of eight pipeline segments that would connect existing mine pits and provide process water to the IGCC plant as shown on Figure F2-25. As noted in Sections 1.1.1.3 and 3.1.2, plans are underway to resume mining in Mine Pit Nos. 6 and 2WX. In order to accomplish such activities, the pits and the immediate area surrounding them must be dewatered. Excelsior will work with the entities mining these pits to allow the IGCC Power Station to collect water resulting from such dewatering activities and ultimately use it as make up water to the cooling system. Given the status of the mining project's impending environmental review process (*see* Section 1.1.1.3), it is too early to project where and how such collection devices would be linked and subsequently piped to the IGCC Power Station. Until a mine permit application is submitted, Excelsior will continue to show the pipeline configurations between Mine Pits No. 6, 2WX, and the East Range Station Footprint as shown in Figures F2-17 and F2-25 as being conceptually indicative of its plans to use water directly obtained from the abandoned mine pits or derived from their dewatering. As shown in Table F2-32, the wetland impacts associated with these process water pipelines are small, as the pipelines would be primarily routed across lands previously disturbed by mining or other developments.

It is unlikely that the increased number of smaller pipelines required to collect water from numerous dewatering wells, route it to a common collection header, and then convey it via a larger pipeline to the IGCC Power Station would cause a significant increase in wetland impacts relative to those calculated using the assumptions provided in the three following paragraphs. Such collection pipelines would likely be installed assuming they would be moved as mining progresses and/or as their productivity decreased, i.e., they would be temporarily placed and cause minimal wetland impact. In any case, the land over which they would traverse would ultimately be excavated.

The impacts presented in Table F2-32 are calculated assuming the pipelines would be constructed below grade within a 150-foot construction ROW. Wetland impacts would be avoided by restoring wetland habitat after construction. Wetland impacts along the pipeline alignments would include temporary impacts to emergent wetlands within the construction corridor, temporary disturbance of scrub-shrub habitat in temporary work spaces (areas within the construction ROW but outside the permanent ROW) and permanent conversion of scrub-shrub and forested habitat within the permanent ROW where prior disturbance has not removed woody vegetation. Although vegetation outside of the permanent ROW would be allowed to revegetate, impacts to forested wetlands even outside the permanent ROW are considered permanent because of the length of time required for restoration of forested habitat. Only the Process Water Pipeline segments constructed from Area 2WX to the IGCC Station Footprint and Area 6 and Stephens Mine to Area 2WX contain shrub scrub or forested wetland habitat.

The location of each pipeline alignment would be determined during project design and would consider adjustments to avoid and minimize wetland habitat. The construction ROW would be located to minimize sidecasting in wetland habitat. Extra workspace areas, access roads, pipe storage yards, and contractor staging areas would be located outside of wetland areas to the greatest extent possible. Where avoidance of wetland disturbance is not possible, temporary roads and work areas would be removed and wetland restored in a manner similar to the pipeline trench following completion of construction.

Only a small portion of the proposed process water supply pipeline segments have been field delineated during the 2004 and 2005 field surveys. The potential wetland impacts resulting from the construction of the pipelines in the remainder of the proposed alignments have been estimated from NWI wetland boundaries.

Table F2-32. Wetland Impacts for Process Water System

Basin ID	Dominant Wetland Classification[1]			Selected MnRAM Functions[4]		Temporary Emergent Wetland Impacts[2]	Temporary Scrub-Shrub Wetland Impacts[3]	Permanent Wetland Type Conversion[4]
	Cowardin	Circular 39	Eggers and Reed	Vegetative Diversity	Wetland Water Quality			
Area 2WX to Station Footprint - Total Length: 2.18 miles								
NWI	Various	Type 3	Assumed Shallow Marsh	--	--	0.38	0	0
NWI	Various	Type 7	Assumed Hardwood Swamp	--	--	0	0	0.75
NWI	Various	Type 8	Assumed Coniferous Bog	--	--	0	0	0.32
					Segment Subtotal	**0.38**	**0**	**1.07**
Area 2WX to Area 2W - Total Length: 0.51 miles								
--	--	--	--	--	--	0	0	0
					Segment Subtotal	**0**	**0**	**0**
Area 2W to Area 2E - Total Length: 0.14 miles								
--	--	--	--	--	--	0	0	0
					Segment Subtotal	**0**	**0**	**0**
Area 3 to Area 2E - Total Length: 0.55 miles								
NWI	Various	Type 4	Assumed Deep Marsh	--	--	0.41	0	0
					Segment Subtotal	**0.41**	**0**	**0**
Knox Mine to Area 2WX - Total Length: 0.16 miles								
--	--	--	--	--	--	0	0	0
					Segment Subtotal	**0**	**0**	**0**
Area 6 and Stephens Mine to Area 2WX - Total Length: 2.15 miles								
NWI	Various	Type 6	Assumed Alder Thicket	--	--	0	0.19	0.26
					Segment Subtotal	**0**	**0.19**	**0.26**
Area 9 South to Area 6 - Total Length: 0.50 miles								
NWI	Various	Type 5	Assumed Shallow Open Water	--	--	(0.54)[6]	0	0
					Segment Subtotal	**0**	**0**	**0**
Area 9 North (Donora Mine) to Area 6 - Total Length: 0.95 miles								
--	--	--	--	--	--	0	0	0
					Segment Subtotal	**0**	**0**	**0**
					Grand Total	**0.79 acres**	**0.19 acres**	**1.33 acres**

[1] NWI basins are those areas that have not been field investigated. Cowardin classifications are taken from the NWI. Circular 39 and Eggers and Reed classifications are assumed from the Cowardin classification, aerial photograph interpretations, and assumptions based on known characteristics of delineated wetlands.
[2]Temporary disturbance of emergent wetland habitat within the 150-foot construction ROW.
[3]Temporary removal of scrub-shrub vegetation outside the 100-foot permanent ROW. Natural revegetation would be allowed following completion of construction.
[4]Permanent conversion of scrub-shrub vegetation within 100-foot permanent ROW and scrub-shrub and forested vegetation within the 150-foot construction ROW.
[5]MnRAM 3.1 Functional Assessments were completed only for wetlands field delineated.
[6] Impacts to open water would be avoided by directionally drilling pipeline under the water body.

Several segments of the East Range Process Water Supply Pipeline system would cross streams. A summary of these crossings is provided in Table F2-33.

Table F2-33. Stream Crossings for Process Water Supply Pipeline

Stream Crossing Location	MDNR PWI?	Length of Crossing (linear feet)
Area 6 and Stephens Mine to Area 2WX		
Stephens Creek	Yes	3
Second Creek	Yes	30
Area 9 South to Area 6		
First Creek	Yes	3
Area 9 North to Area 6		
First Creek	Yes	3
	Total	**39 linear feet**

F2.5.7.7 Potable Water and Sanitary Sewer Pipelines

Potable water would be provided by constructing a 6-inch pipeline approximately 11,000 feet from the East Range IGCC Power Station to the 12-inch water main that serves Minnesota Power, as shown on Figure F2-26. The proposed 6-inch pipeline would provide the required flow and pressure to Mesaba One and Two without the need for a booster station. The City of Hoyt Lakes treatment plant has the capacity to provide the potable water needs of the facility.

Sanitary sewer would be provided through connection to the City of Hoyt Lakes' wastewater collection and treatment system. This would consist of constructing approximately 9,500 feet of 12-inch gravity sewer pipeline, a pump station, and about 2,500 feet of 4-inch force main as shown on Figure F2-26. The wastewater piping would parallel the existing high voltage power line easement along the west side of the proposed property boundary south to Colby Lake. A pump station would be located on the north side of Colby Lake. The force main would be directionally drilled beneath Colby Lake and then connected to the existing city gravity sewer near Minnesota Power on the north end of Colby Lake Road. The 12-inch sewer pipe would have ample capacity to convey the estimated wastewater flow of 30,000 gallons per day during construction. The existing Hoyt Lakes wastewater treatment facility has capacity available to treat the estimated flow from the proposed project.

The pipelines would be constructed below grade within a 100-foot construction ROW. Only a portion of the proposed corridor for the East Range Potable Water and Sewer Pipeline has been field delineated. The potential wetland impacts resulting from the construction of the pipelines in the remainder of the proposed alignments have been estimated from NWI wetland boundaries. According to the NWI, up to 1.12 acres of Colby Lake lie within the construction limit and would be impacted during construction. This segment of the pipelines would be directionally drilled to avoid impacts to the lake and lakeshore. No other NWI wetlands are identified within the 100-foot wide construction limit; however, field verification would be required for confirmation.

Construction of the Potable Water and Sewer Pipelines would require crossing approximately 460 linear feet of Colby Lake. The impacts due to crossing are shown in Table F2-34.

Table F2-34. Stream Crossings for Potable Water and Sewer Pipelines

Stream Crossing Location	Milepost	MDNR PWI?	Length of Crossing (linear feet)
Colby Lake	1+3720	Yes, 249 P	460
	Total	**460 linear feet**	

F2.5.7.8 Summary of East Range Wetland Impacts

A summary of both temporary and permanent wetland impacts for the East Range IGCC Power Station, Buffer Land, and Associated Facilities is provided in Table F2-35 below.

Table F2-35. Summary of Wetland Impacts for the East Range IGCC Power Station, Buffer Land, and Associated Facilities

Project Element	Wetland Types													Total Wetland Impacts
	Type 1	Type 2		Type 3	Type 4	Type 5	Type 6			Type 7		Type 8		
	Floodplain Forest	Wet Meadow	Sedge Meadow	Shallow Marsh	Deep Marsh	Shallow Open Water	Alder Thicket	Shrub Swamp	Shrub Carr	Hardwood Swamp	Coniferous Swamp	Coniferous Bog	Open Bog	
Permanent Wetland Impacts														
IGCC Power Station		1.74	0.05		3.27			1.09		3.38	7.61			17.15
Phase 1		1.74	0.05		1.89			0.19		3.38	6.19			13.44
Phase 2		0.004	0.003		1.38			0.90			1.42			3.71
Railroad		0.05			2.67		0.67	8.19		0.44	0.45	0.91		13.38
Access Road							0.05			0.39				0.44
HVTL	0.0006	0.0025				0.0025	0.0334			0.0114		0.0383		0.09
Subtotal	**0.00**	**1.80**	**0.05**	**0.00**	**5.94**	**0.00**	**0.75**	**9.28**	**0.00**	**4.22**	**8.06**	**0.95**	**0.00**	**31.06**
Temporary Emergent Wetland Impacts														
Gas Pipe Alt. 1	0.09	14.12		0.003	0.68	0.00							9.10	23.99
Area 2WX to Station Footprint				0.38										0.38
Area 2WX to Area 2W														0.00
Area 2W to Area 2E														0.00
Area 3 to Area 2E					0.41									0.41
Knox Mine to Area 2WX														0.00
Area 6 and Stephens Mine to Area 2WX														0.00
Area 9 South to Area 6						0								0.00
Area 9 North (Donora Mine) to Area 6														0.00
Potable Water and Sanitary Sewer						0								0.00
Subtotal	**0.09**	**14.12**	**0.00**	**0.38**	**1.09**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**9.10**	**24.78**

Table F2-35. Summary of Wetland Impacts for the East Range IGCC Power Station, Buffer Land, and Associated Facilities

Project Element	Wetland Types: Type 1	Type 2		Type 3	Type 4	Type 5	Type 6			Type 7		Type 8		Total Wetland Impacts
	Floodplain Forest	Wet Meadow	Sedge Meadow	Shallow Marsh	Deep Marsh	Shallow Open Water	Alder Thicket	Shrub Swamp	Shrub Carr	Hardwood Swamp	Coniferous Swamp	Coniferous Bog	Open Bog	
Temporary Scrub-Shrub Wetland Impacts (TWS)														
HVTL							0.20							0.20
Gas Pipe Alt. 1							0.33							0.33
Area 2WX to Station Footprint														0.00
Area 2WX to Area 2W														0.00
Area 2W to Area 2E														0.00
Area 3 to Area 2E														0.00
Knox Mine to Area 2WX														0.00
Area 6 and Stephens Mine to Area 2WX							0.19							0.19
Area 9 South to Area 6														0.00
Area 9 North (Donora Mine) to Area 6														0.00
Potable Water and Sanitary Sewer														0.00
Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.72**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.72**
Permanent Type Conversion (Scrub-Shrub and Forested)														
HVTL							19.21			10.99		29.42		59.62
Gas Pipe Alt. 1										0.41		0.06		0.47
Area 2WX to Station Footprint										0.75		0.32		1.07
Area 2WX to Area 2W														0.00
Area 2W to Area 2E														0.00
Area 3 to Area 2E														0.00
Knox Mine to Area 2WX														0.00
Area 6 and Stephens Mine to							0.26							0.26

Table F2-35. Summary of Wetland Impacts for the East Range IGCC Power Station, Buffer Land, and Associated Facilities

Project Element	Wetland Types													Total Wetland Impacts
	Type 1	Type 2		Type 3	Type 4	Type 5	Type 6			Type 7		Type 8		
	Floodplain Forest	Wet Meadow	Sedge Meadow	Shallow Marsh	Deep Marsh	Shallow Open Water	Alder Thicket	Shrub Swamp	Shrub Carr	Hardwood Swamp	Coniferous Swamp	Coniferous Bog	Open Bog	
Area 2WX														
Area 9 South to Area 6														0.00
Area 9 North (Donora Mine) to Area 6														0.00
Potable Water and Sanitary Sewer														0.00
Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.74**	**0.00**	**0.00**	**12.15**	**0.00**	**29.80**	**0.00**	**61.42**

Wetland impacts are first counted for the plant site, rail, road, HVTL, gas pipeline, process water lines, sanitary sewer, in that order.
Accurate Eggers and Reed classifications are only available for wetlands that have been field delineated. Eggers and Reed classifications for NWI wetlands are assumed to be the most common wetland types for this area of Minnesota. In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type present.

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Note: PHE prepared Figures F2-6, 22, 27 and 33. All other figures were prepared by SEH on behalf of Excelsior (Excelsior, 2009). They were prepared as color graphics and are in color on CDs of the document. They are also accessible on the web in color. They are reproduced in paper copies in black and white.

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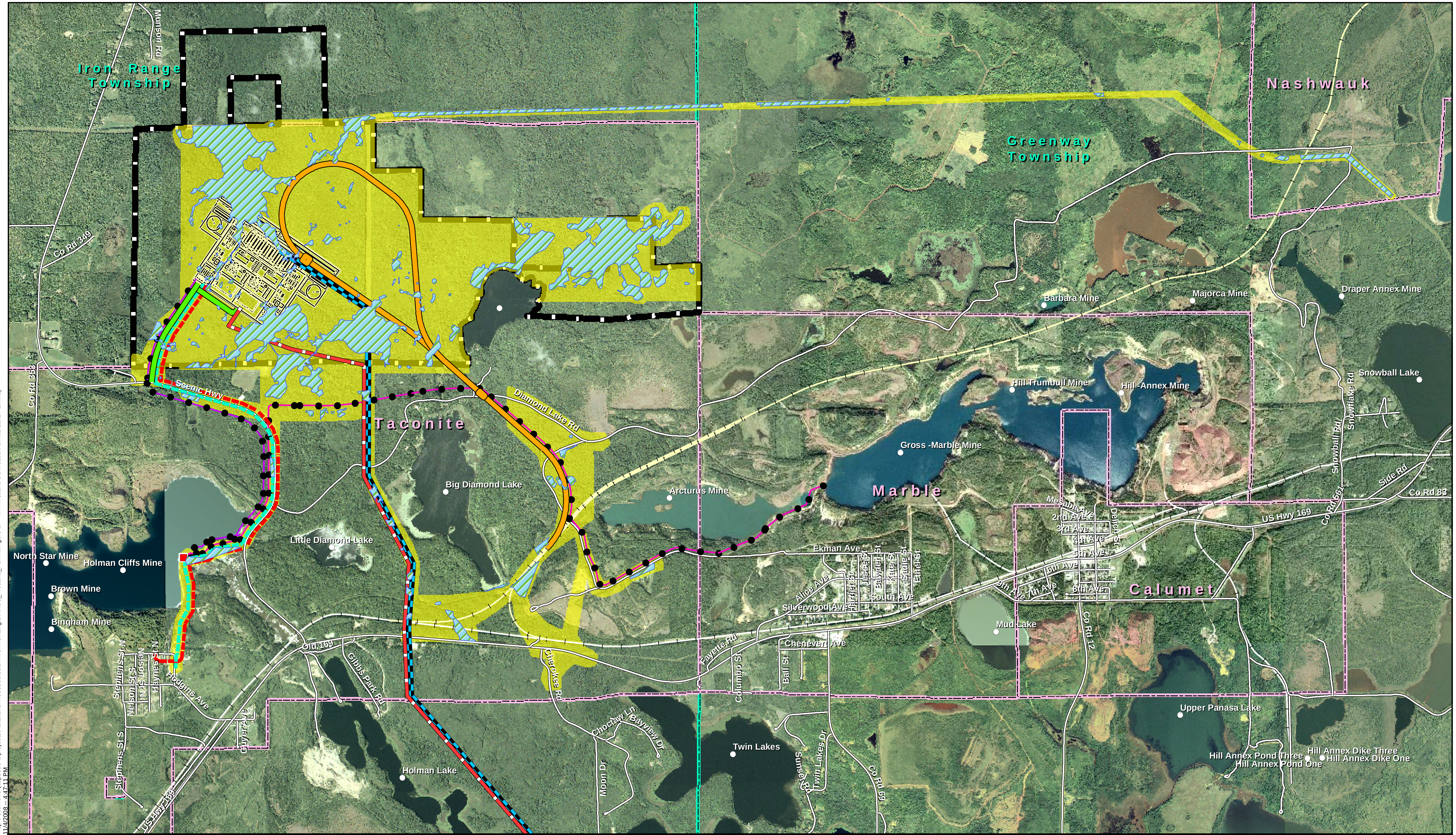

Map Document: (\\sp3020-1\projects\AEIE\Excel\0502003\Environmental\gis\MXDs_Wetland_Permit\Figure 17 - WR Wetland Delineation Limits 11x17 L.mxd)
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West Range

November 2008

Legend

- Surveyed Wetlands
- Wetland Survey Area
- Plant Layout
- Footprint and Buffer Land
- Proposed Rail
- Proposed Access Road
- HVTL
- Gas Pipeline
- Potable Water
- Gravity Sewer
- Sanitary Pump Station
- Process Water Pipeline 1
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- Municipal Boundaries
- Civil Township
- Existing Roads
- Existing Railroads
- Railroad in Development

Appendix F

Source: NAIP 2006, Itasca County, Mn/DNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

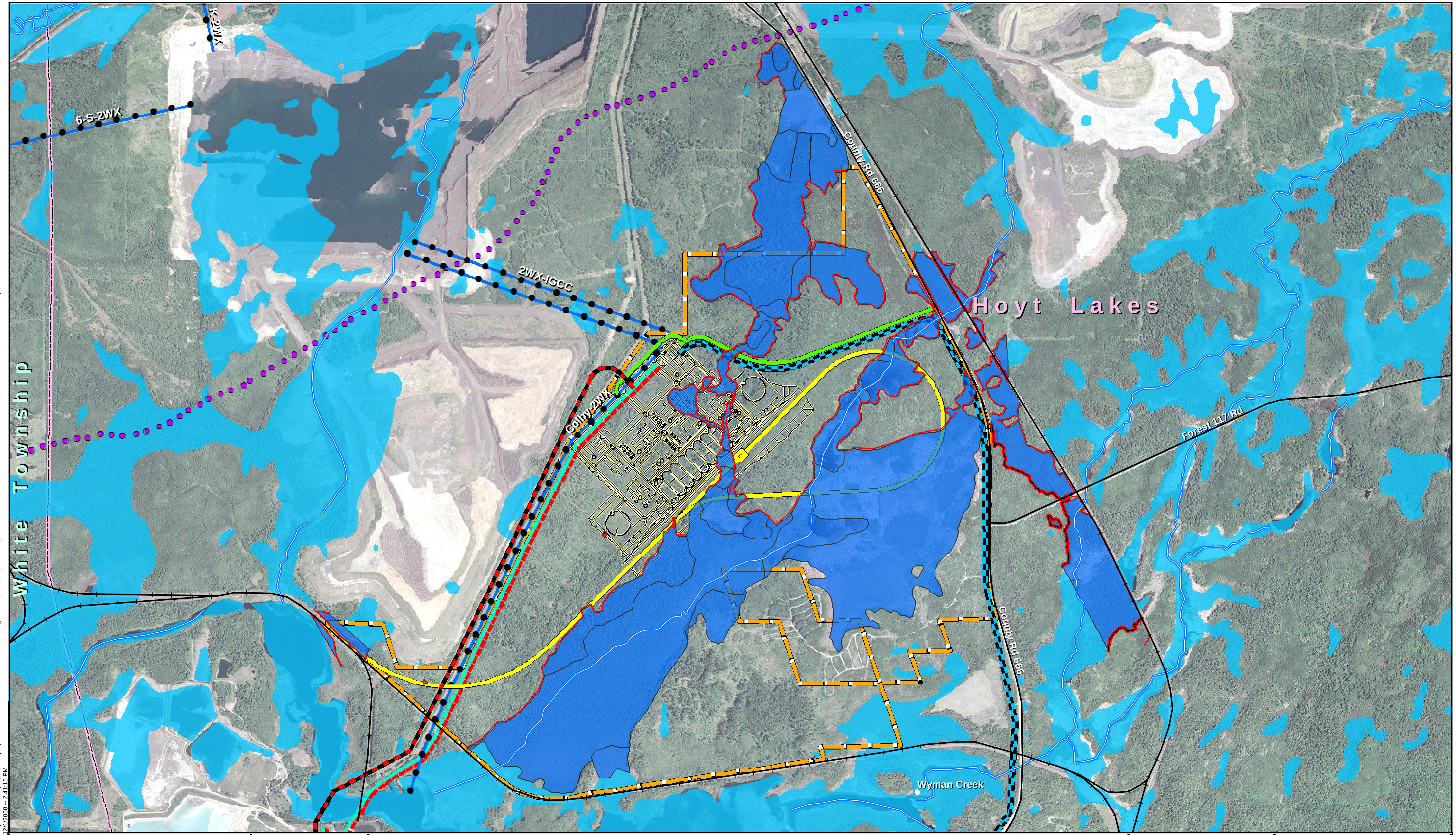
Figure F2-1

West Range Wetland Delineation Area

Itasca County - South Coordinate System

N W E S

0 2,500 Feet



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East Range

December 2008

Legend

- Footprint and Buffer Land
- Preferred Rail Alt 1
- Proposed Roads
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Surveyed Wetlands
- Wetland Delineations
- Wetland Delineation Refinements
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township
- Streams
- Iron Formation

Appendix F

Source: NAIP 2003, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, and SEH.

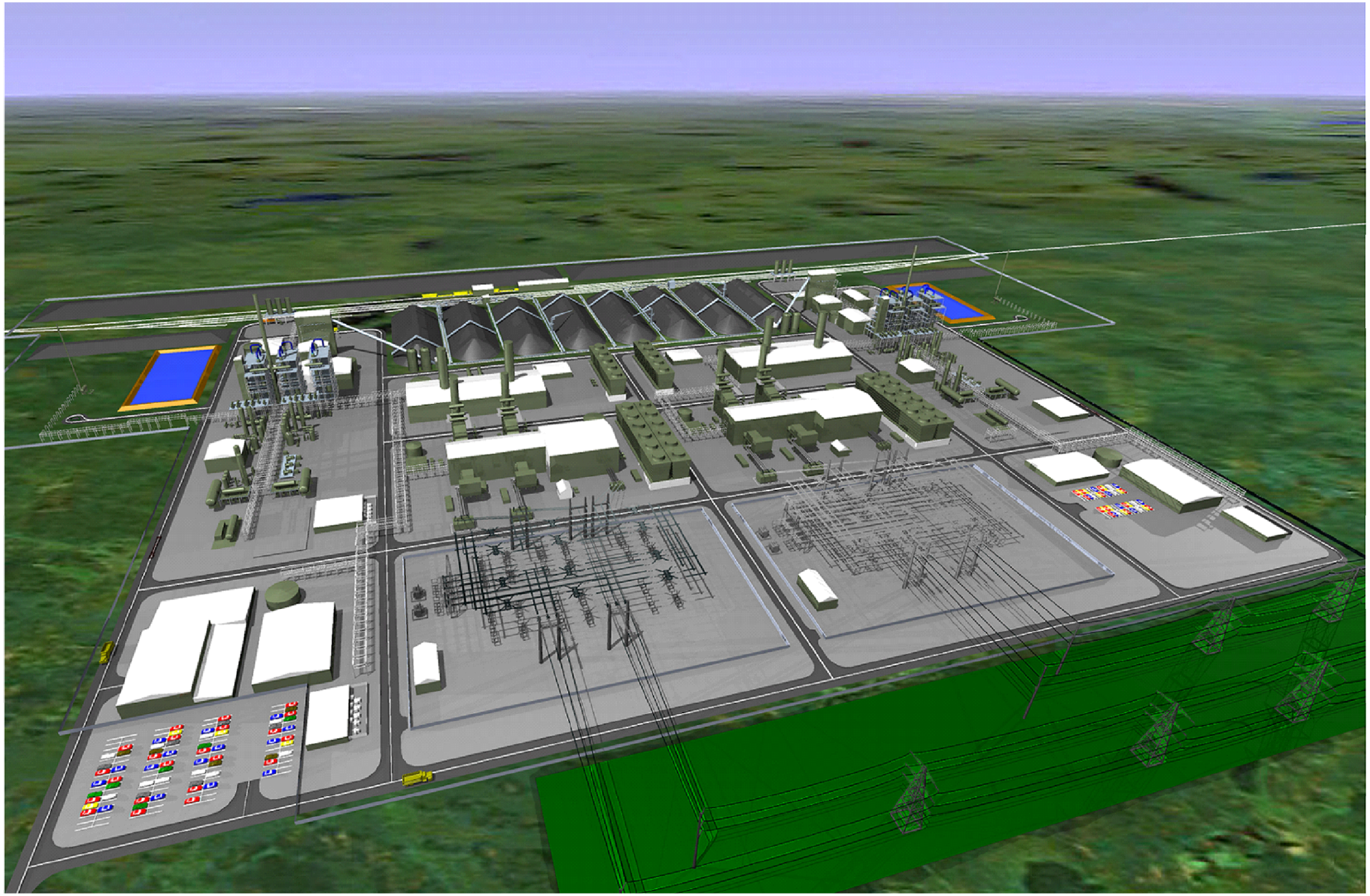
Figure F2-2

East Range Wetland Delineations

St. Louis County - Central Coordinate System

N W E S

0 1,500 Feet



FLUOR

PHASE 1 AND 2

ConocoPhillips

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West Range

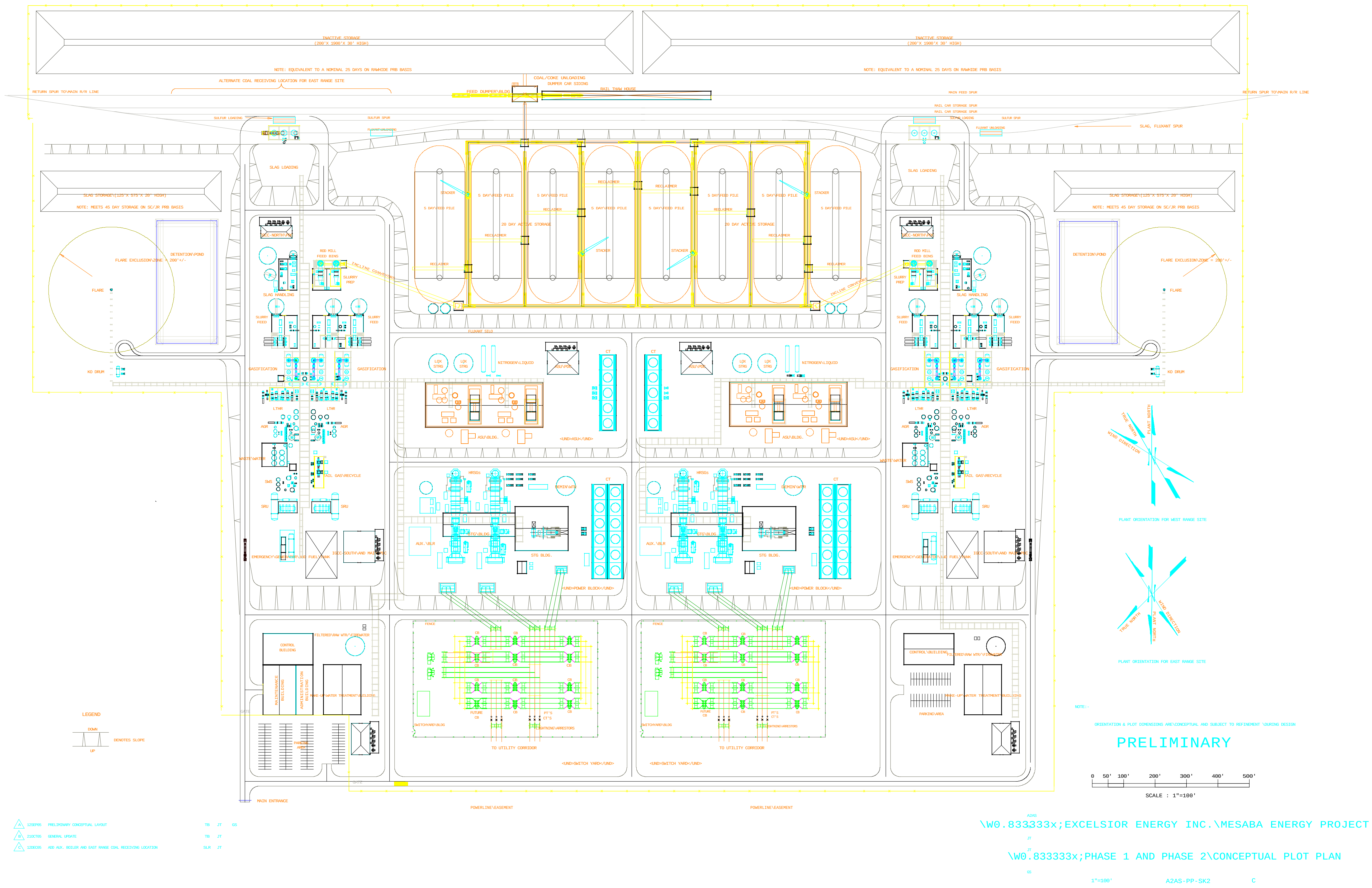
August 2006

Appendix F

Source: Fluor, ConocoPhillips, and Excelsior Energy.

Figure F2-3

Visual Rendering of Phase I and II



Map Document: (\\sjs3020-1\projects\AE\E\Exem\0502000\03Environmental\gis\MXDs_Wetland_Permit\Figure 06 - Surfacing Plan for Phase I & II Developments 11x17 L.mxd)
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West Range

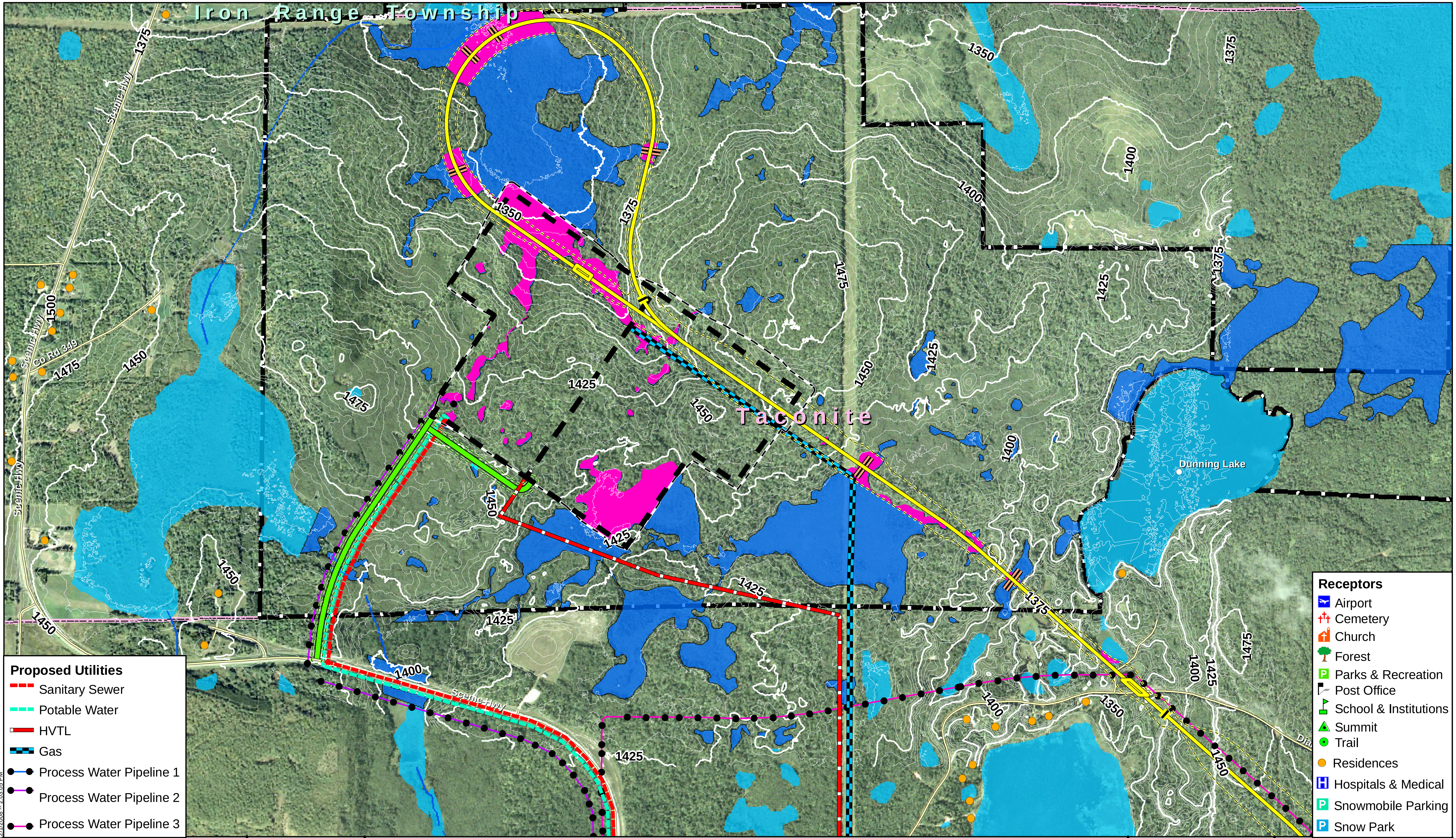
November 2008

Appendix F

Source: Fluor and Excelsior Energy.

Figure F2-4

Surfacing Plan for Phase I & II Developments



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West Range

December 2008

Legend

- Footprint and Buffer Land
- Central Plant Layout
- Plant Layout Grading Limits
- Rail Alternative 1-A
- Rail Alternative 1-A Construction Limits
- Coal Train Limits
- Proposed Culverts
- Proposed Roads
- Proposed Road Permanent ROW Limits
- Impacted Wetlands
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Streams
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2006, Horizon's, Itasca County, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.

Figure F2-5

Central Plant Layout Railroad Alternative 1-A

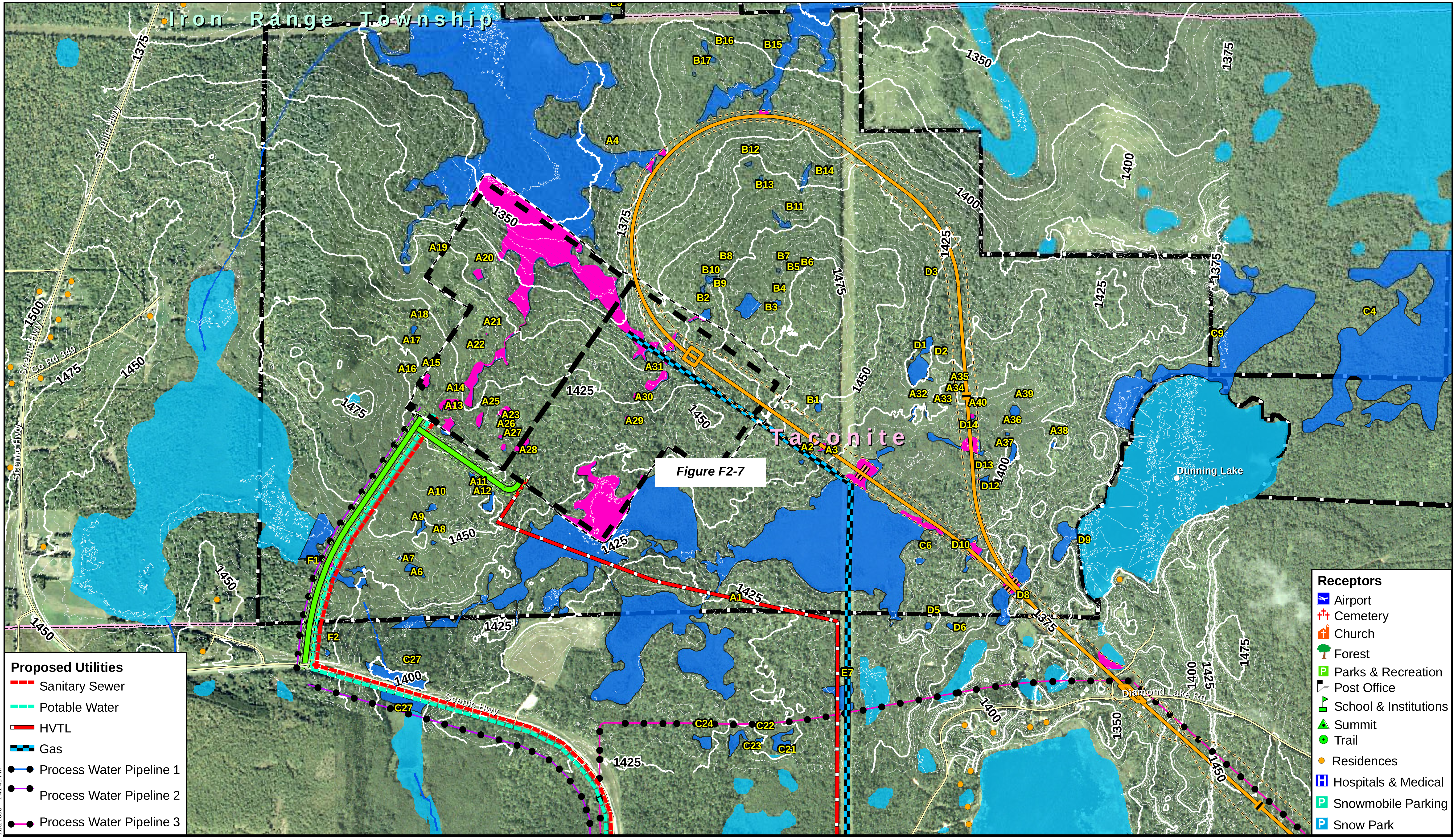
Itasca County - South Coordinate System

N S W E

0 1,000 Feet

Figure F2-6.. West Range Central DEIS Plant with Rail and Road Alternatives

Appendix F



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West Range

November 2008

Legend

- Footprint and Buffer Land
- Preferred Central Plant Layout
- Plant Layout Grading Limits
- Rail Alternative 3-B
- Rail Alternative 3-B Construction Limits
- Coal Train Limts
- Proposed Culverts
- Proposed Roads
- Proposed Road Permanent ROW Limits
- Impacted Wetlands
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Streams
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2006, Horizon's, Itasca County, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.

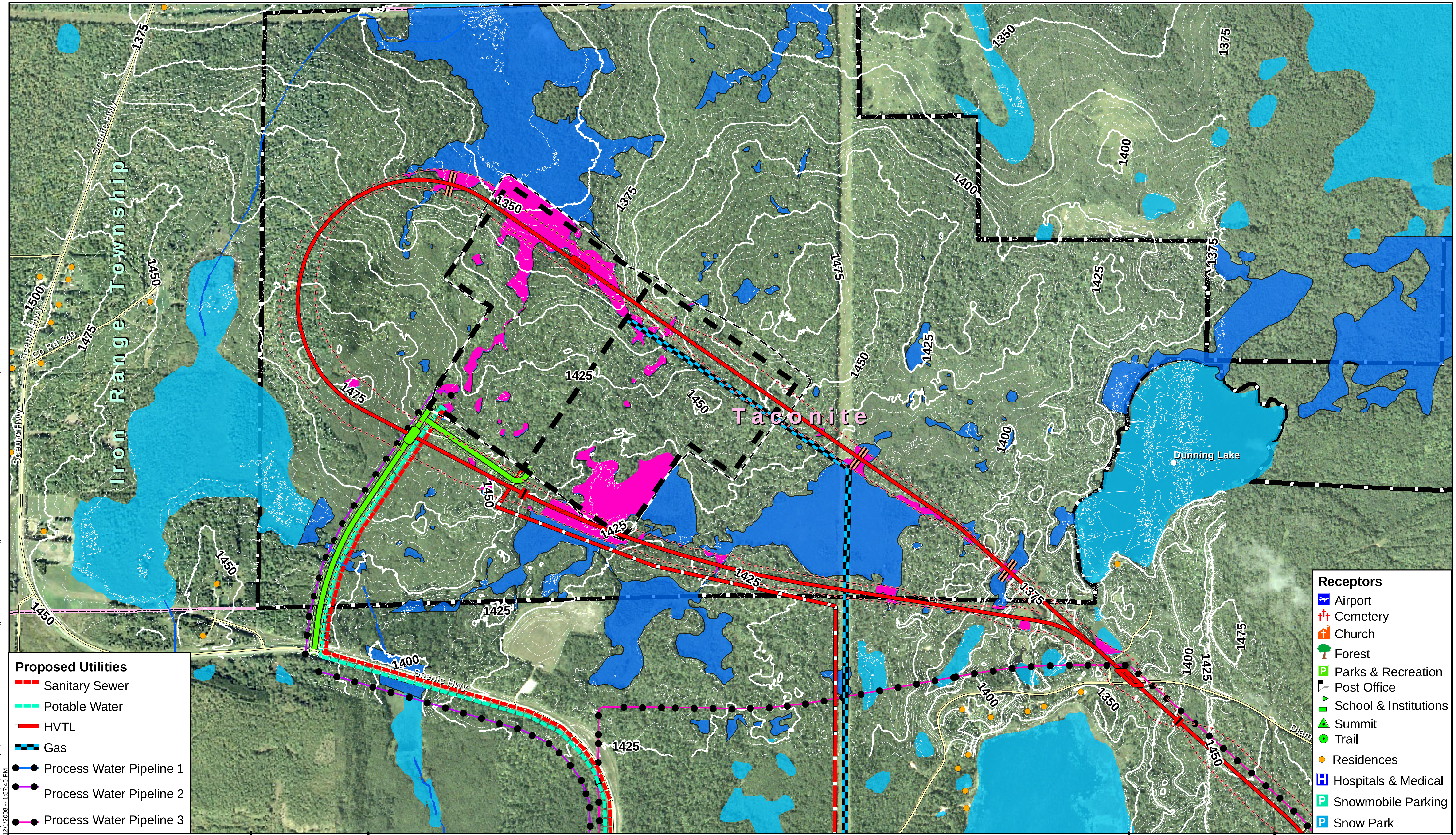
Figure F2-7

Preferred Central FEIS Plant Layout Railroad Alternative 3-B

Itasca County - South Coordinate System

N W E S

0 1,000 Feet



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West Range

December 2008

Legend

- Footprint and Buffer Land
- Central Plant Layout
- Plant Layout Grading Limits
- Rail Alternative 3-A
- Rail Alternative 3-A Construction Limits
- Coal Train Limits
- Proposed Culverts
- Proposed Roads
- Proposed Road Permanent ROW Limits
- Impacted Wetlands
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Streams
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2006, Horizon's, Itasca County, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.
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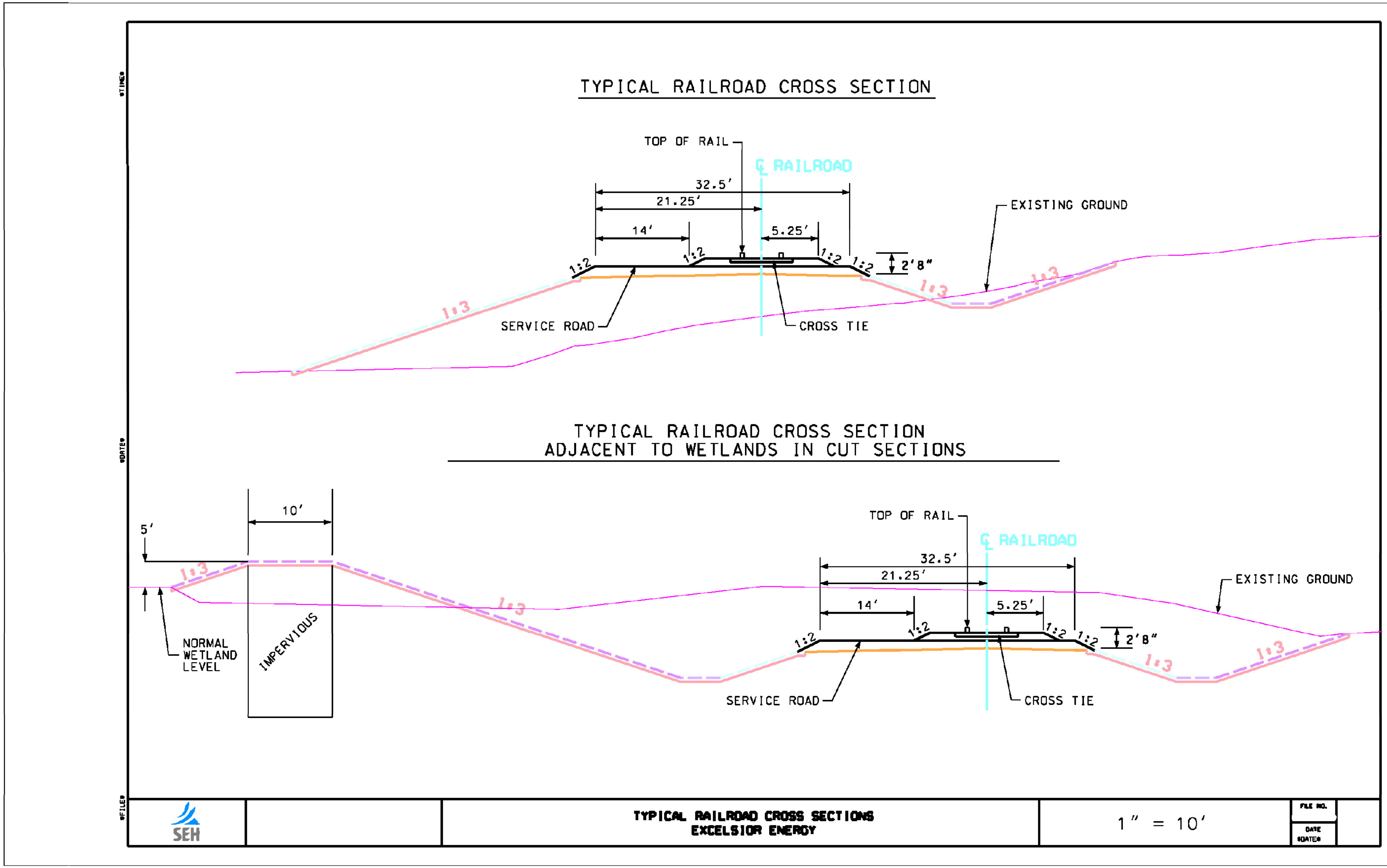
Figure F2-8

Central FEIS Plant Layout Railroad Alternative 3-A

Itasca County - South Coordinate System

N E S W

0 1,000 Feet



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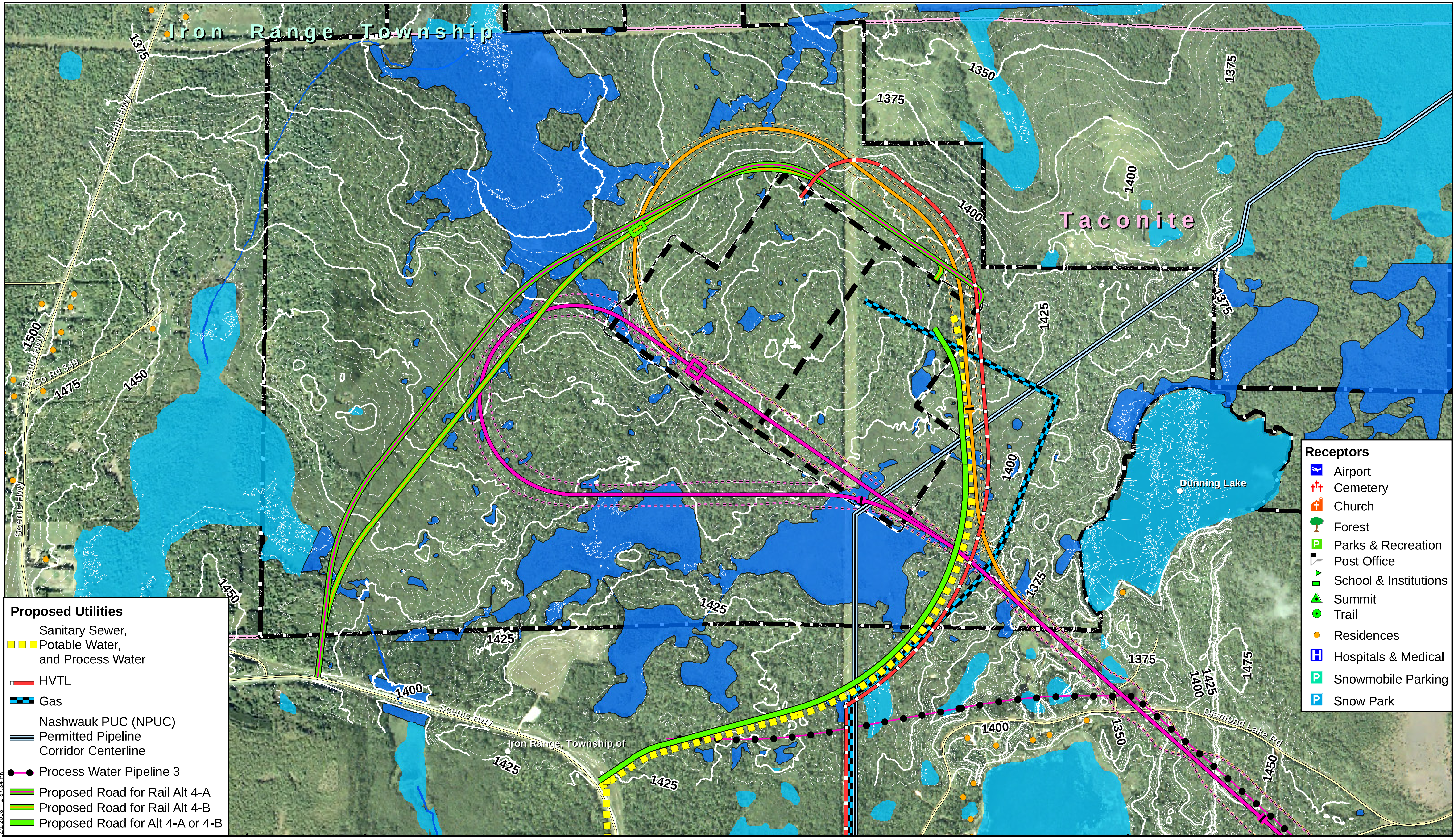
Map Document: (\\Sp3020-1\projects\AE\E\Exenr\050200\03Environmental\gis\MXDs_Wetland_Permit\Figure 29 - Typical Railroad Cross Sections 11x17 L.mxd) 12/1/2008 -- 1:54:21 PM

Excelsior Energy Inc. Mesaba Energy Project Energy, Innovation, and Economic Development for Minnesota 11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305 Phone 952.847.2360 Fax 952.847.2373	*West Range* *December 2008*	Appendix F Source: Excelsior Energy and SEH. © 2008 SEH	***Figure F2-9*** ***Typical Railroad Cross Sections***	



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West Range

December 2008

Legend

- Footprint and Buffer Land
- Northeast Plant Layout
- Plant Layout Grading Limits
- Rail Alternative 4-A
- Rail Alternative 4-B
- Rail Alternative 4-A Construction Limits
- Rail Alternative 4-B Construction Limits
- Coal Train Limits (4-A)
- Coal Train Limits (4-B)
- Existing Roads
- Existing Railroads
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Streams
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2006, Horizon's, Itasca County, MNDNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, and SEH.
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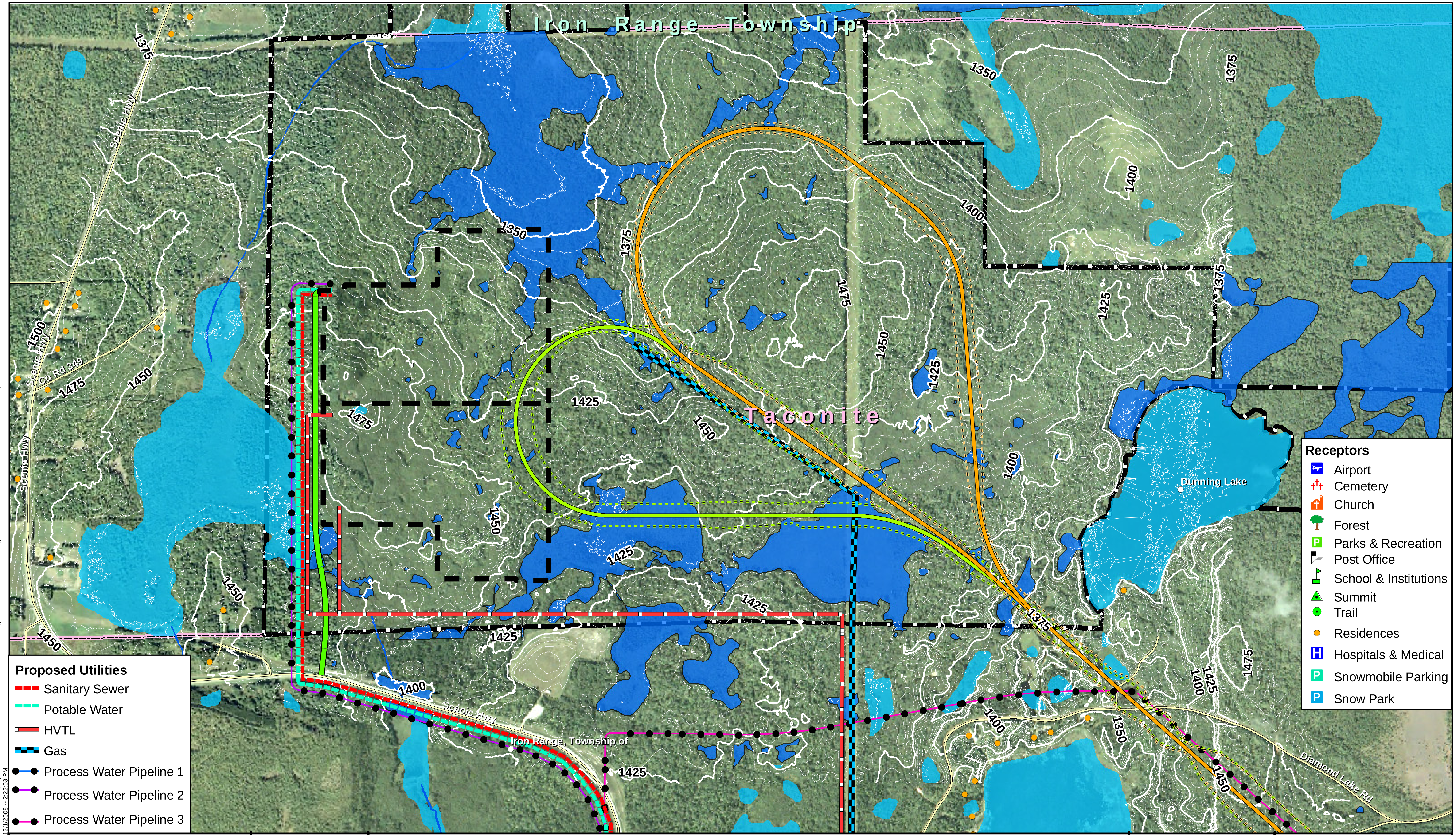
Figure F2-10

Northeast Plant Layout Railroad Alternatives 4-A & 4-B

Itasca County - South Coordinate System

N E S W

0 — 1,000 Feet



Map Document: (\\Sp3020-1\projects\AE\E\Exenr\050200\03Environmental\gis\MXDs_Wetland_Permit\Figure 26 - Plant West Railroad Alternatives 11x17 L.mxd)
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West Range

December 2008

Legend

- Footprint and Buffer Land
- Plant West
- Rail Alternative 5-B
- Rail Alternative 5-C
- Rail Alternative 5-B Construction Limits
- Rail Alternative 5-C Construction Limits
- Existing Roads
- Existing Railroads
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Streams
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2006, Horizon's, Itasca County, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, and SEH.

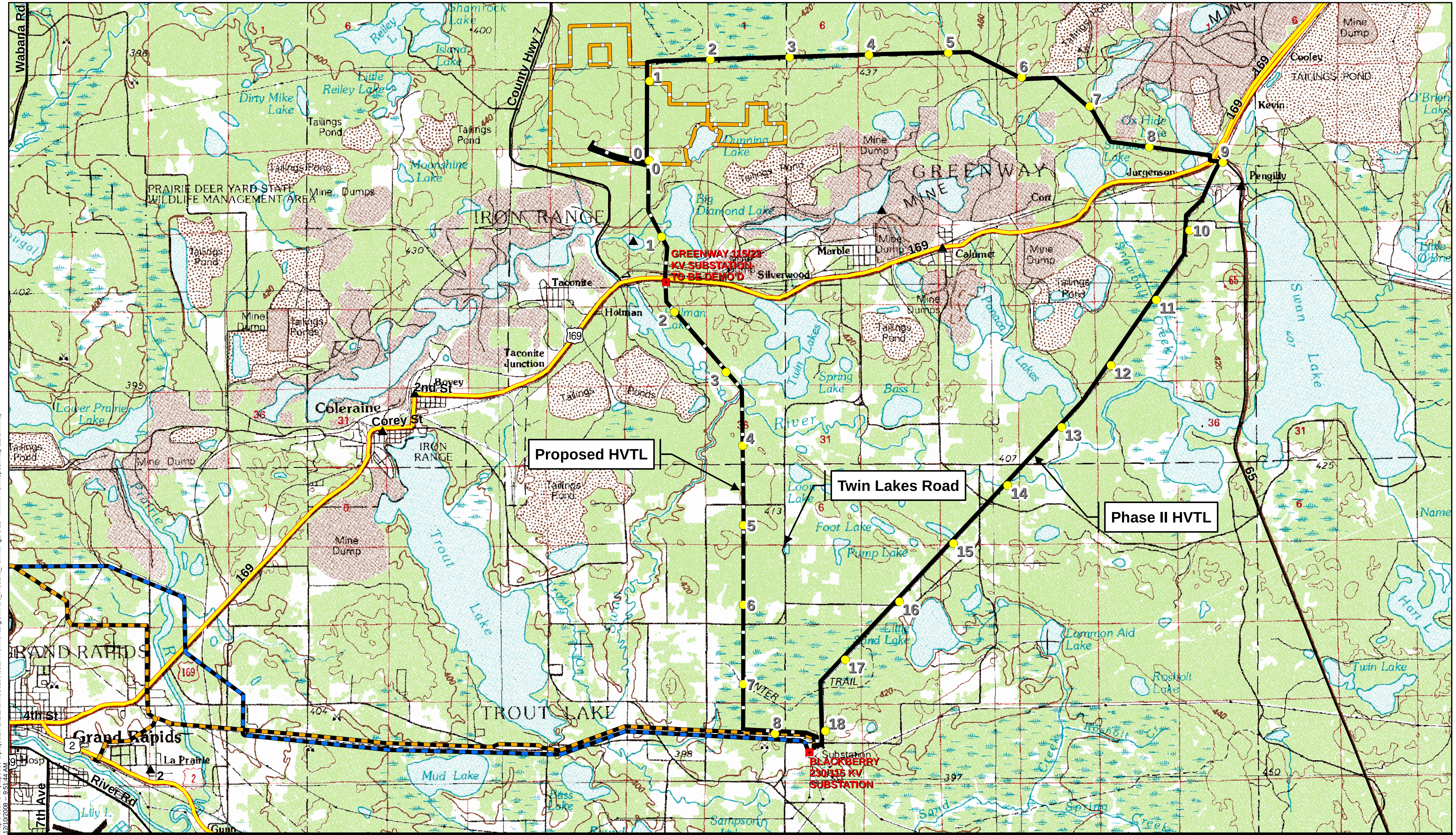
Figure F2-11

West Plant Layout Railroad Alternatives 5-B & 5-C

Itasca County - South Coordinate System

N
W E
S

0 1,000 Feet



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West Range

December 2008

Legend

- Footprint and Buffer Land
- Proposed HVTL
- HVTL Phase II
- HVTL Mileposts
- HVTL Substations
- **Existing HVTL (Company, Line)**
- MP, 20 LINE
- MP, 83 LINE
- Cities
- U.S. Highways
- Other Highways

Source: ESRI, USGS, Mn/EQB, LMIC, Excelsior Energy, and SEH.
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Figure F2-12

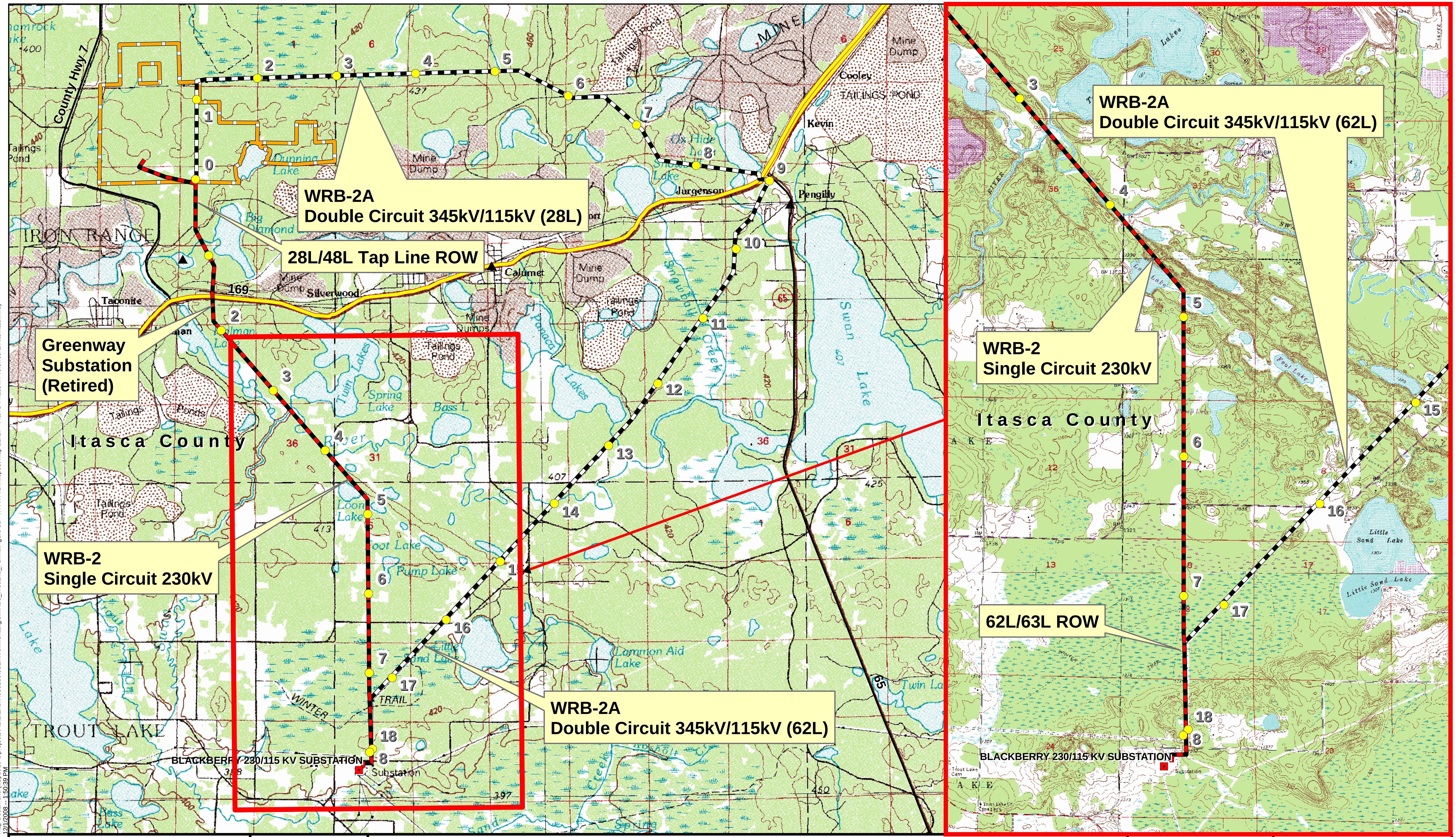
West Range HVTL

Itasca County - South Coordinate System

N E S W

0 6,000 Feet

Appendix F



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West Range

December 2008

Legend

- Footprint and Buffer Land
- HVTL Substations
- HVTL Mileposts
- HVTL Alternate
- HVTL Phase II
- Cities
- Counties
- U.S. Highways
- Other Highways

Source: ESRI, USGS, Mn/EQB, LMIC, Excelsior Energy, and SEH.
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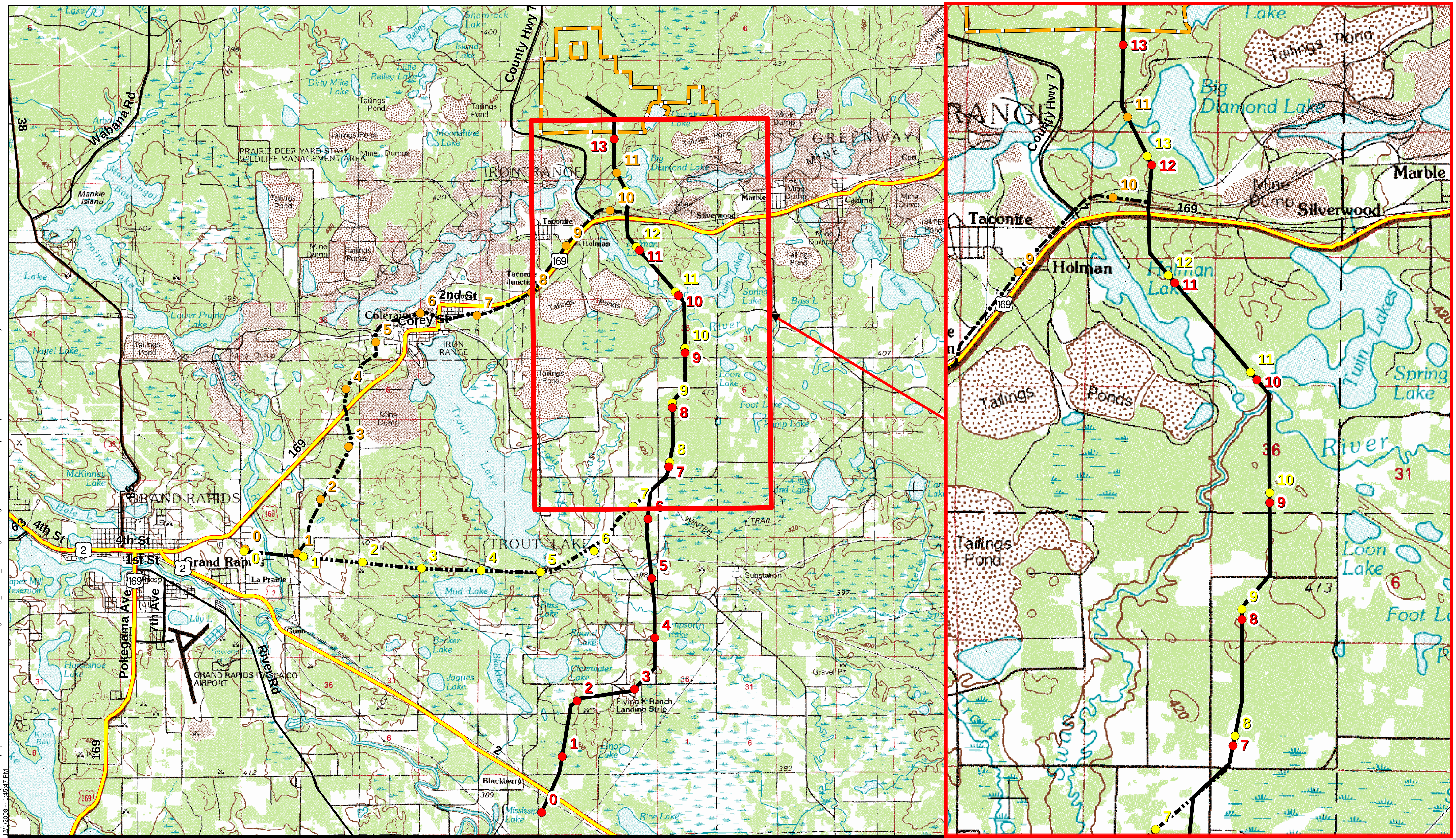
Figure F2-13

Contingent HVTL Plan B Phase KK Alternative Alignments Mileposts

UTM, Zone 15, Meters
NAD83

0 6,000 Feet



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12/1/2008 -- 1:45:47 PM

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West Range

December 2008

Legend

- Footprint and Buffer Land
- Gas Proposed (Alt 1)
- Gas Alt 2
- Gas Alt 3
- Gas Proposed (Alt 1) Mileposts
- Gas Alt 2 Mileposts
- Gas Alt 3 Mileposts
- U.S. Highways
- Other Highways

Appendix F

Source: ESRI, USGS, NNG, Excelsior Energy, and SEH.
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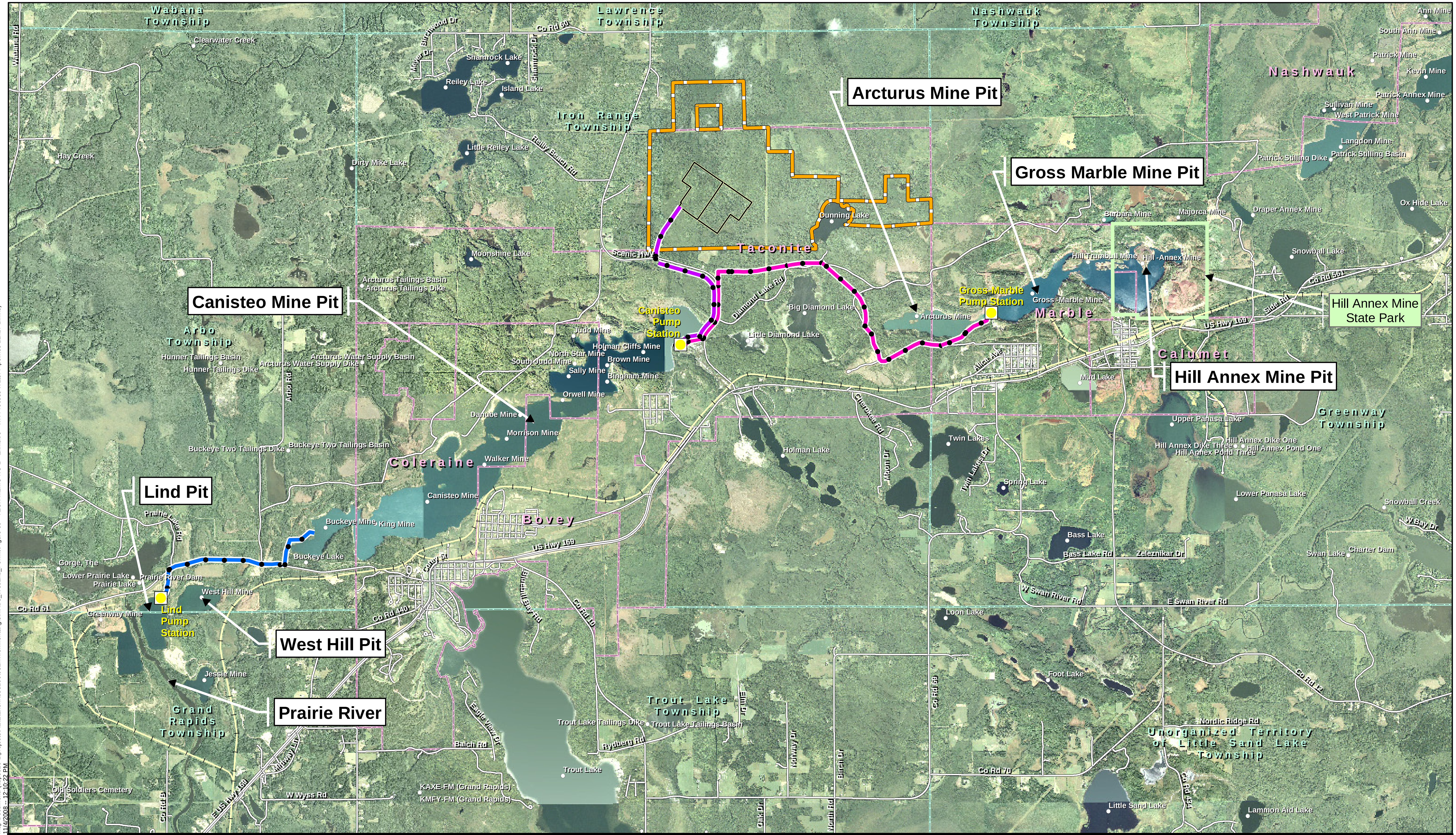
Figure F2-14

Natural Gas Pipeline Alternatives

Itasca County - South Coordinate System

N S E W

0 8,000 Feet



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West Range

November 2008

Legend

- Footprint and Buffer Land
- Plant Layout
- Source Water
- Proposed Pump Station
- Proposed Process Water Lines
  - Segment 1
  - Segment 2
  - Segment 3
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township
- State Park

Appendix F

Source: NAIP 2006, USGS, Mn/DNR, Mn/DOT, Itasca County, Fluor, Excelsior Energy, and SEH.
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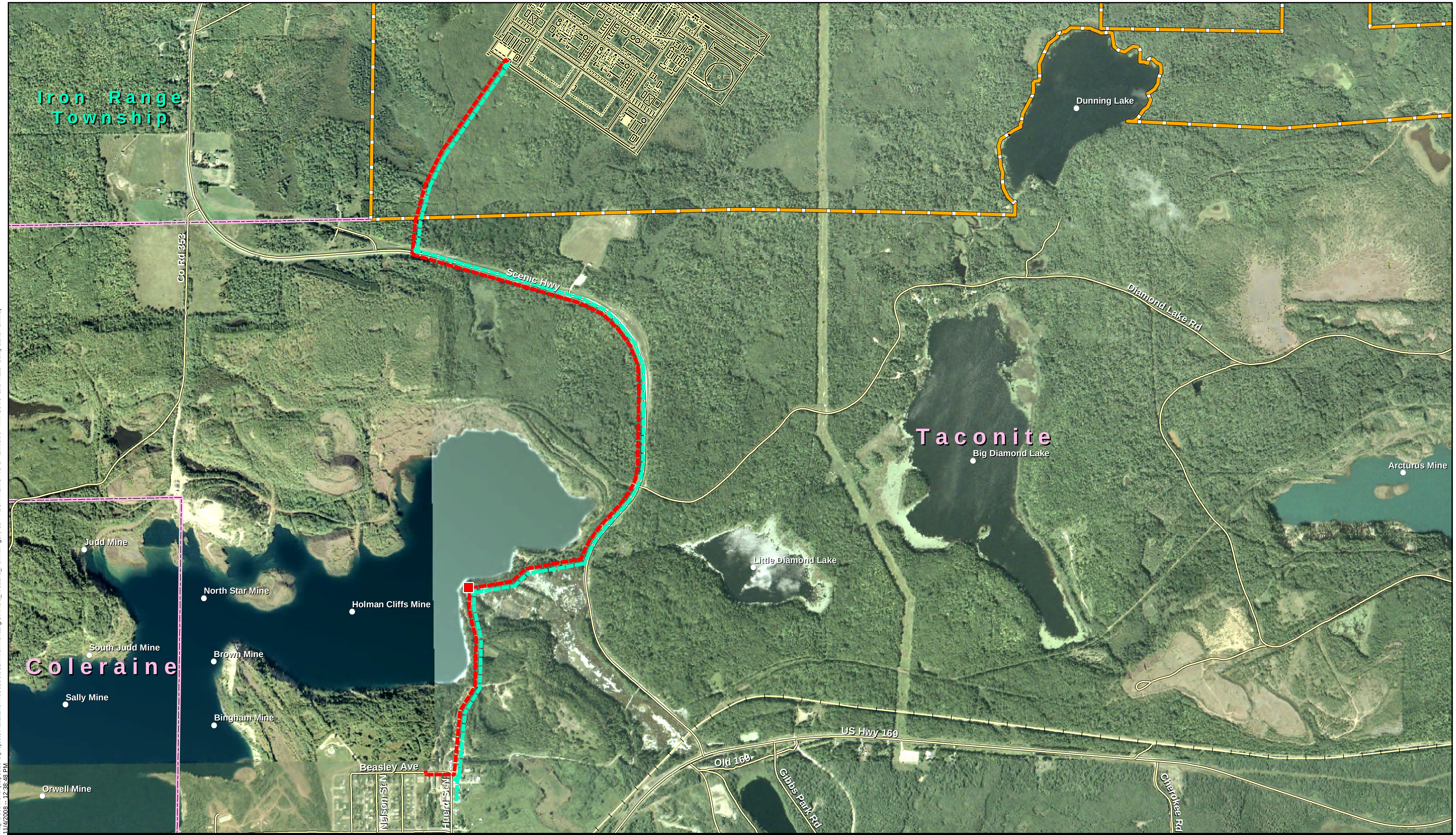
Figure F2-15

Process Water Routes

Itasca County - South Coordinate System

N E S W

0 5,000 Feet



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West Range

November 2008

Legend

Plant Layout

Footprint and Buffer Land

Proposed Utilities

Potable Water

Gravity Sewer

Proposed Sanitary Pump Station

Geographic Names

Municipal Boundaries

Civil Township

Existing Roads

Existing Railroads

Appendix F

Source: NAIP 2006, Itasca County, Mn/DOT, Mn/DNRUSGS, USFWS, Fluor, Excelsior Energy, and SEH.
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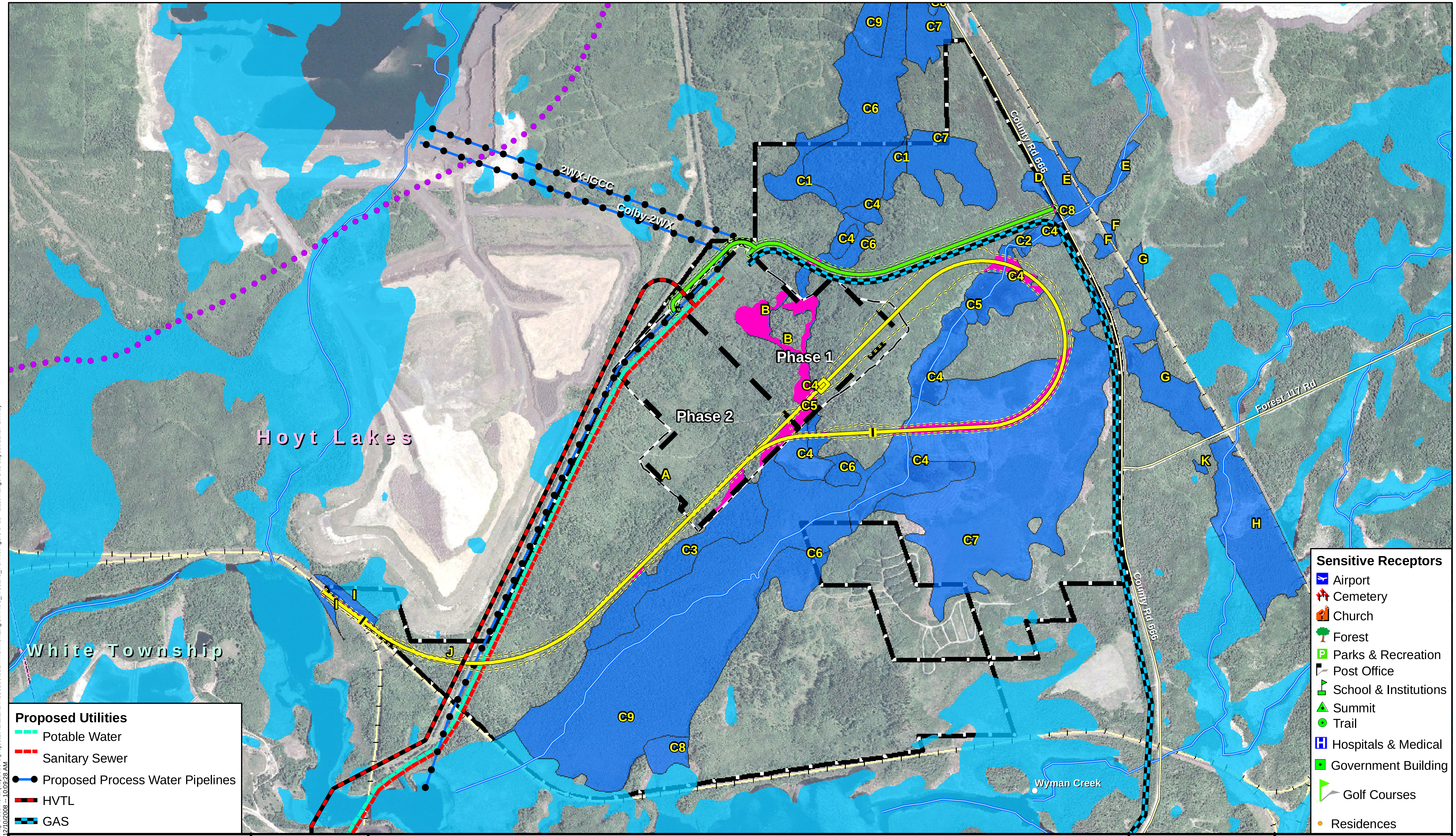
Figure F2-16

Proposed Sanitary & Potable Water

Itasca County - South Coordinate System

N W E S

0 1,300 Feet



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East Range

December 2008

Legend

- Footprint and Buffer Land
- Preferred Plant Layout
- Plant Layout Grading Limits
- Preferred Rail Alt 1
- Preferred Rail Alt 1 Construction Limits
- Coal Train Limits
- Proposed Access Road
- Proposed Access Road Permanent ROW Limits
- Impacted Wetlands
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Existing Roads
- Existing Railroads
- Streams
- Iron Formation
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2003, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.
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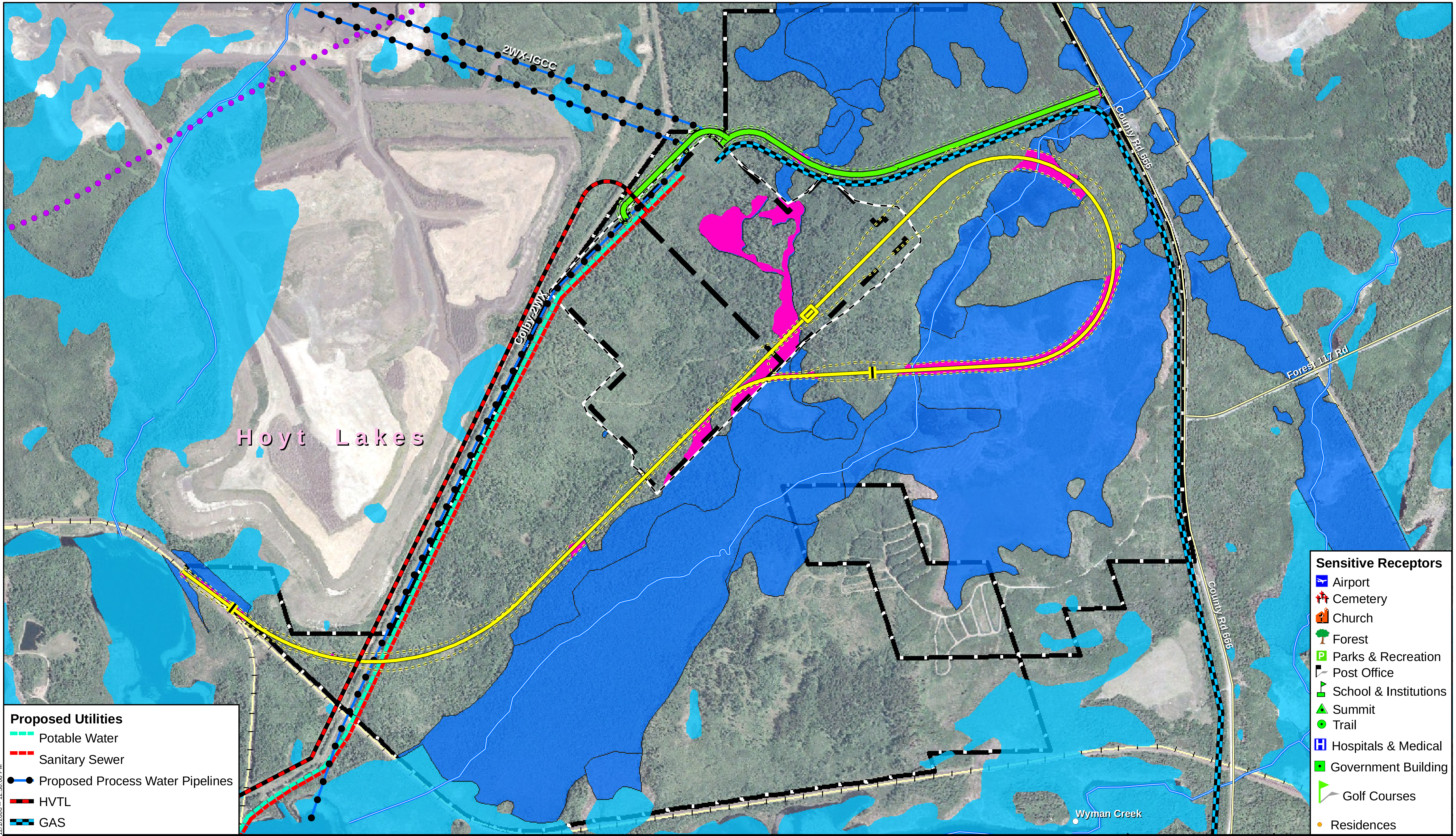
Figure F2-17

East Range Site Layout

St. Louis County - Central Coordinate System

N E S W

0 1,250 Feet



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East Range

December 2008

Legend

- Footprint and Buffer Land
- Plant Layout NE SHIFT (50')
- Plant Layout Grading Limits
- Preferred Rail Alt 1
- Preferred Rail Alt 1 Construction Limits
- Coal Train Limits
- Proposed Access Road
- Proposed Access Road Permanent ROW Limits
- Impacted Wetlands
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Existing Roads
- Existing Railroads
- Streams
- Iron Formation
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2003, MNDNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.
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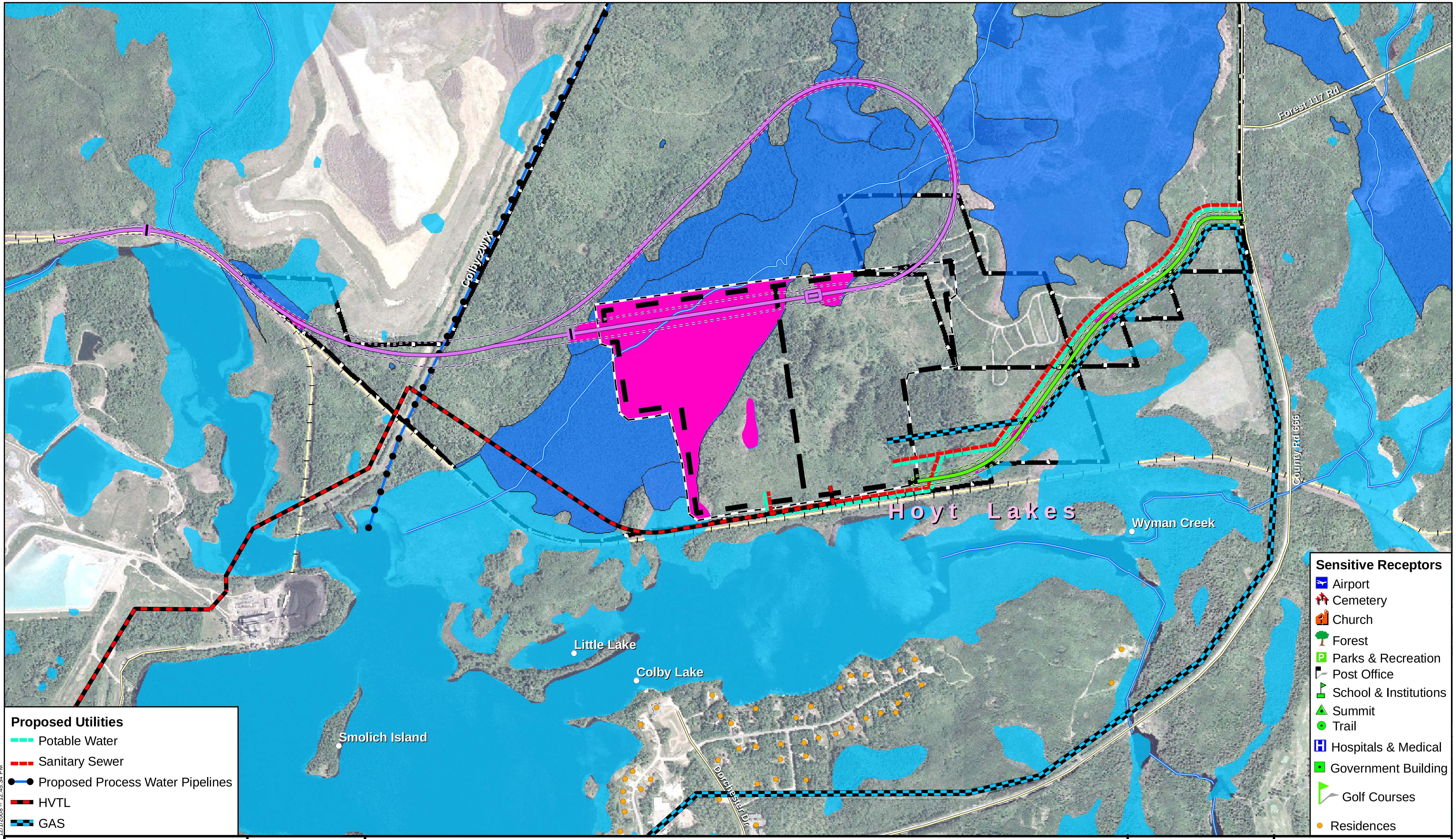
Figure F2-18

East Range NE Plant Shift (50')

St. Louis County - Central Coordinate System

N E S W

0 1,000 Feet



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East Range

December 2008

Legend

- Footprint and Buffer Land
- Plant Layout (South Plant Site)
- Plant Layout Grading Limits
- Preferred Rail Alt 4
- Preferred Rail Alt 4 Construction Limits
- Coal Train Limits
- Proposed Access Road
- Proposed Access Road Permanent ROW Limits
- Impacted Wetlands
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Existing Roads
- Existing Railroads
- Streams
- Iron Formation
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2003, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.
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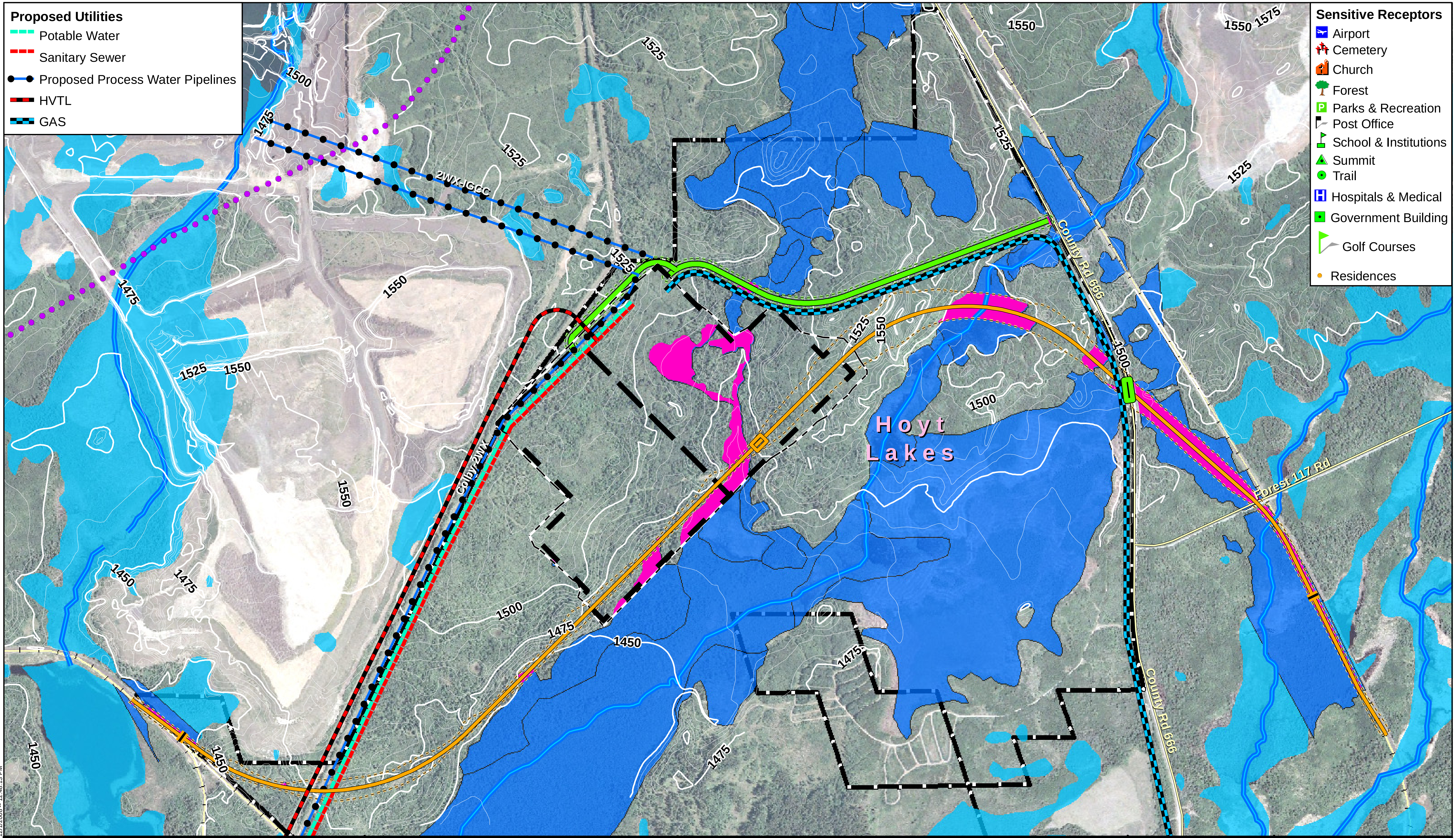
Figure F2-19

East Range (South Site) Rail Alternative 4

St. Louis County - Central Coordinate System

N E S W

0 1,000 Feet



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East Range

December 2008

Legend

Footprint and Buffer Land	Impacted Wetlands
Preferred Plant Layout	Surveyed Wetlands
Plant Layout Grading Limits	National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
Rail Alt 2	Existing Roads
Rail Alt 2 Construction Limits	Existing Railroads
Coal Train Limits	Streams
Proposed Access Road	Iron Formation
Proposed Access Road Permanent ROW Limits	Geographic Names
	Municipal Boundaries
	Civil Township

Appendix F

Source: NAIP 2003, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.
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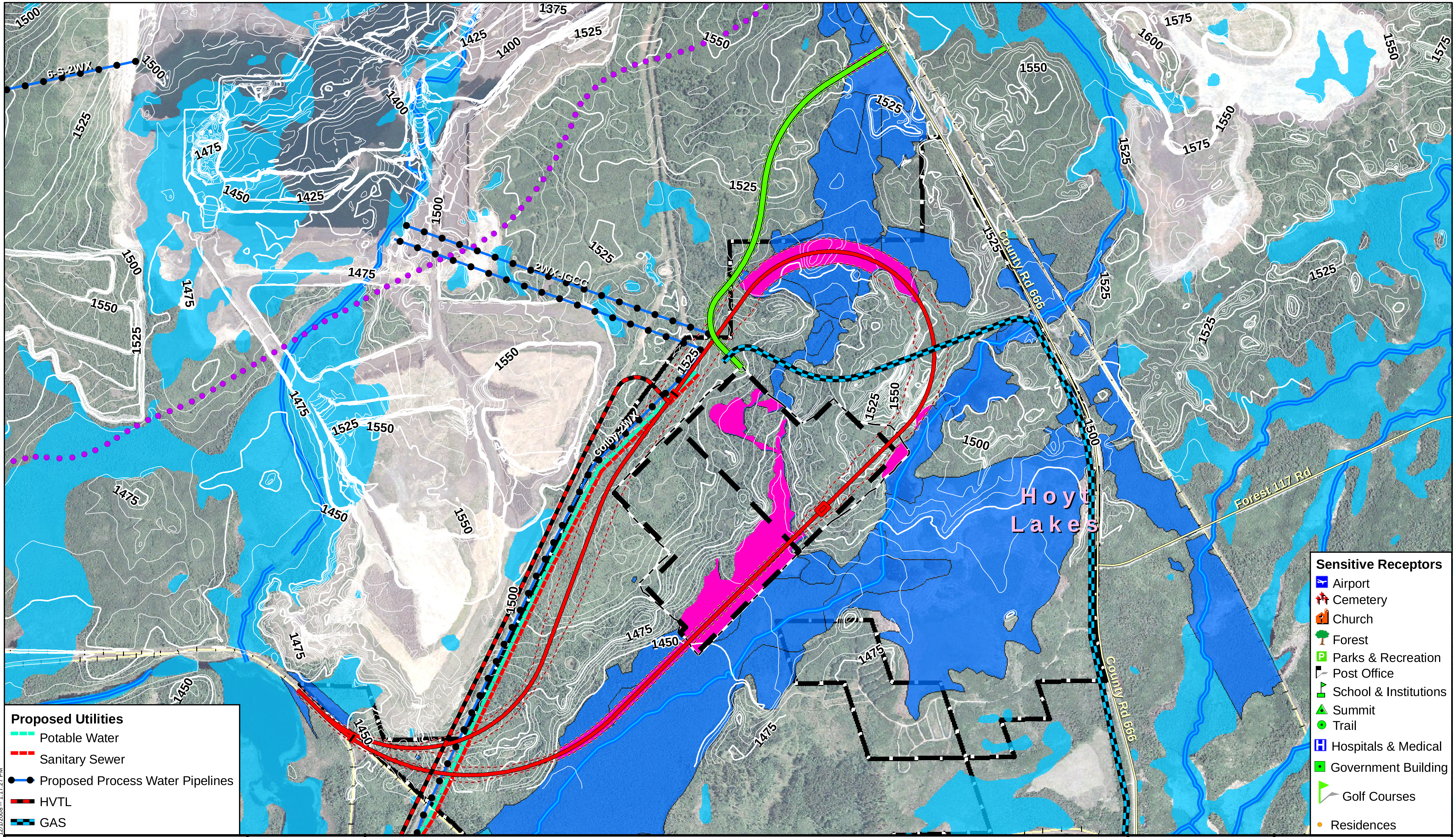
Figure F2-20

East Range Railroad Alternative 2

St. Louis County - Central Coordinate System

N
W E
S

0 1,000 Feet



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East Range

December 2008

Legend

- Footprint and Buffer Land
- Plant Layout (500' SE Shift)
- Plant Layout Grading Limits
- Rail Alt 3
- Rail Alt 3 Construction Limits
- Coal Train Limits
- Proposed Acces Road
- Proposed Access Road Permanent ROW Limits
- Impacted Wetlands
- Surveyed Wetlands
- National Wetlands Inventory (NWI) [Beyond Surveyed Wetlands Areas]
- Existing Roads
- Existing Railroads
- Streams
- Iron Formation
- Geographic Names
- Municipal Boundaries
- Civil Township

Appendix F

Source: NAIP 2003, Mn/DNR, Mn/DOT, USGS, USFWS, Fluor, Excelsior Energy, ESRI, and SEH.
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Figure F2-21

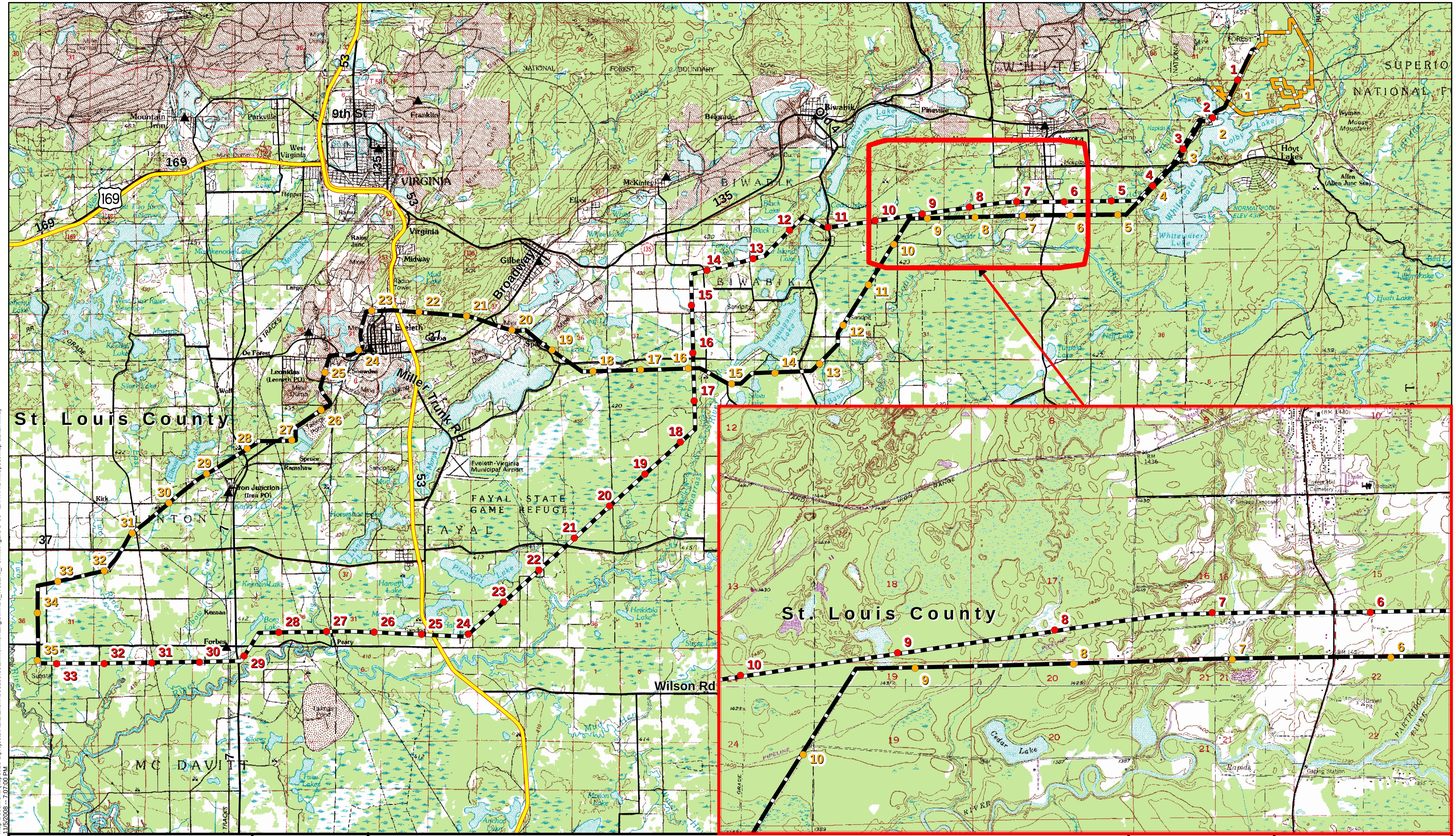
East Range Railroad Alternative 3

St. Louis County - Central Coordinate System

N W E S

0 1,250 Feet

Figure F2-22. East Range Road Alternatives



Excelsior Energy Inc.	*East Range*	**Legend**	*Figure F2-23*
Mesaba Energy Project	*November 2008*	Footprint and Buffer Land; HVTL Alt 1; HVTL Alt 2 (Preferred); HVTL Alt 1 Mileposts; HVTL Alt 2 Mileposts; Cities; Counties; U.S. Highways; Other Highways	*East Range HVTL Alignments Mileposts*

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Appendix F

Source: ESRI, USGS, Mn/DOT, Mn/EQB, LMIC, Excelsior Energy, and SEH.
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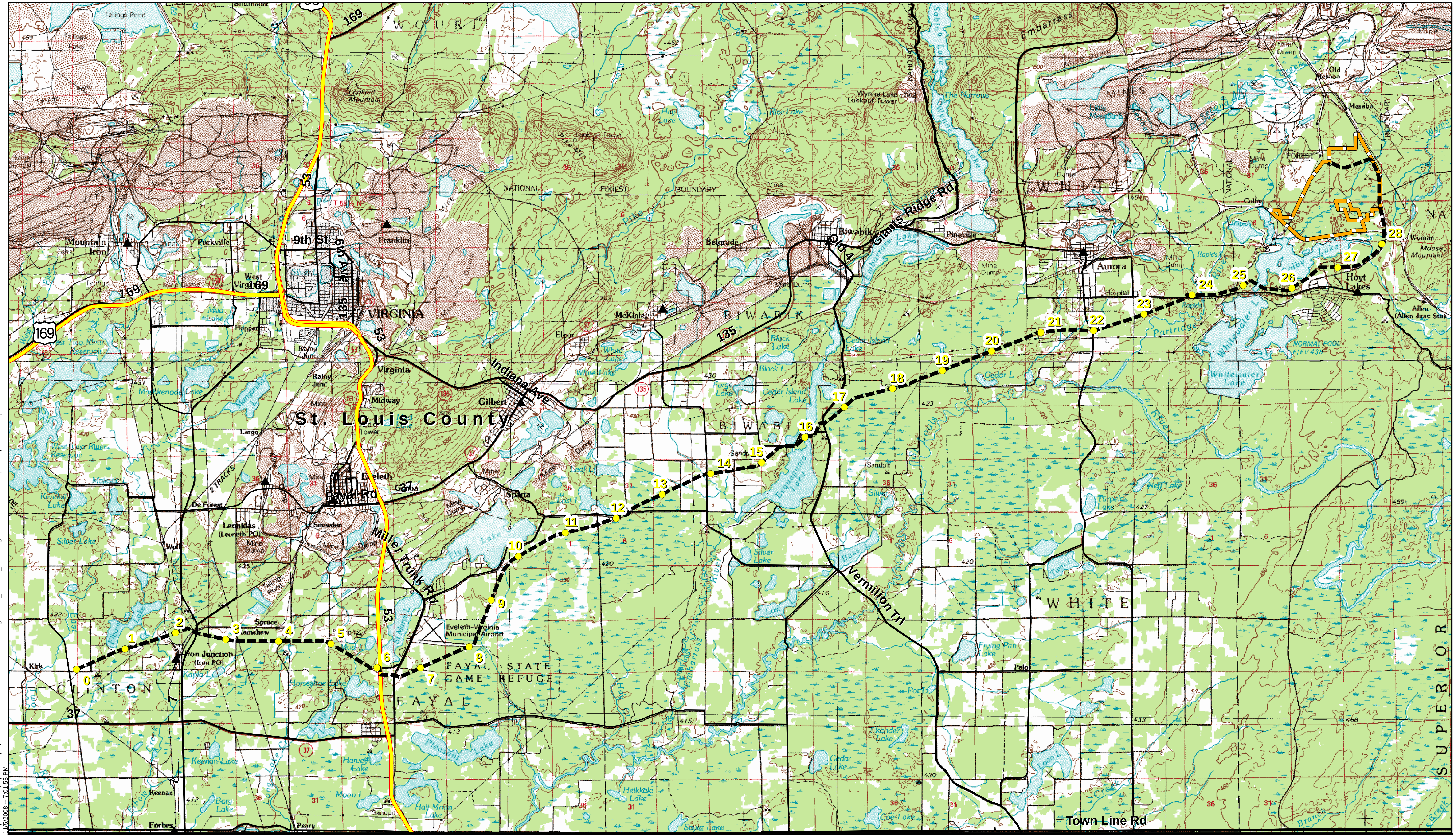
St. Louis County - Central Coordinate System

N E S W

0 10,000 Feet



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East Range

November 2008

Legend

- Footprint and Buffer Land
- Proposed Gas
- Gas Mileposts
- Cities
- Counties
- U.S. Highways
- Other Highways

Appendix F

Source: ESRI, USGS, Mn/DOT, Excelsior Energy, and SEH.
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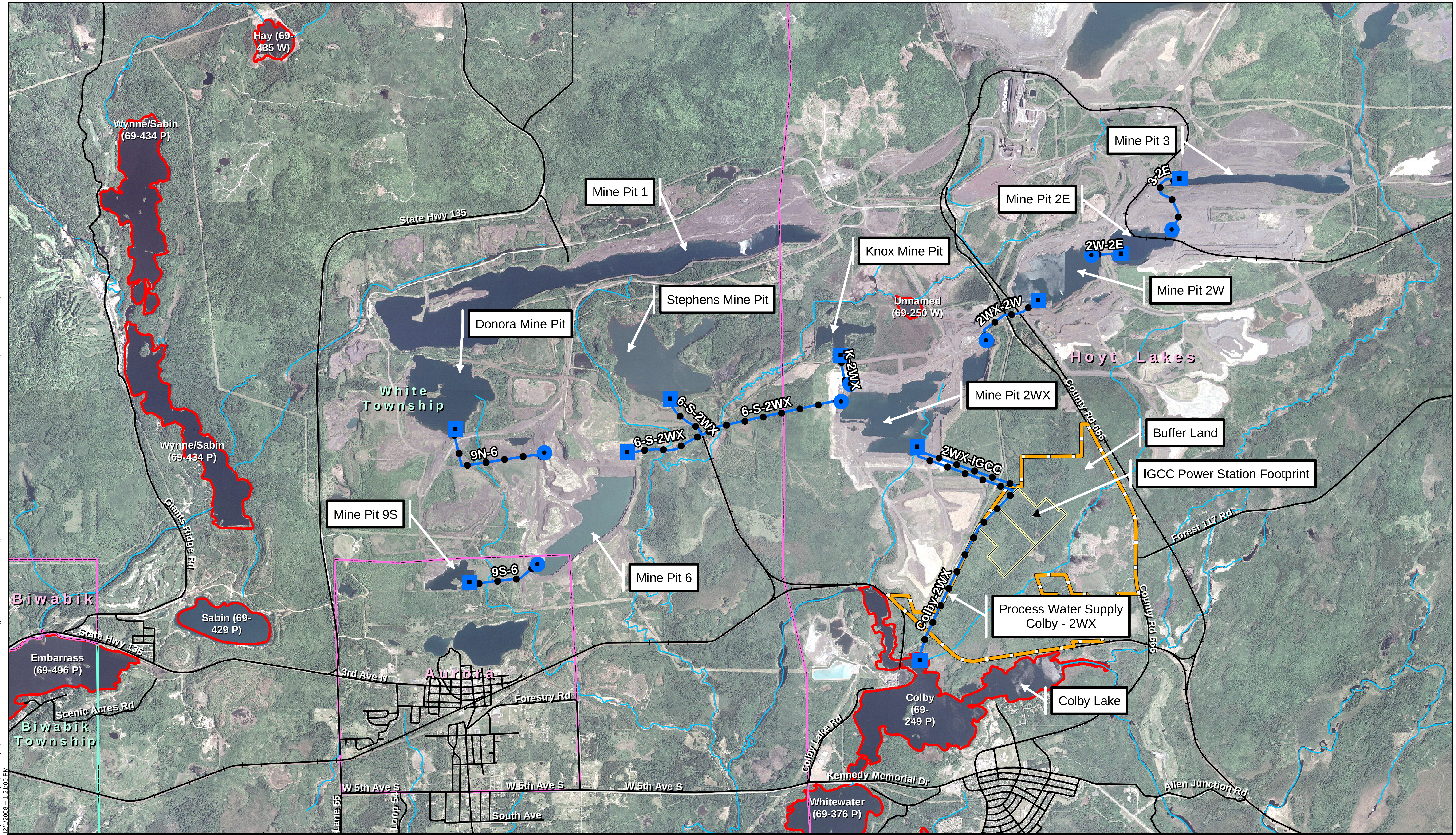
Figure F2-24

East Range Natural Gas Alignments Mileposts

St. Louis County - Central Coordinate System

N
W E
S

0 9,000
Feet



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East Range

December 2008

Legend

- Footprint and Buffer Land
- Plant Layout
- Process Water Pipelines
- Pumping Facility
- Outfall Facility
- Existing Roads
- Existing Railroads
- Municipal Boundaries
- Civil Township
- Streams
- PWI

Appendix F

Source: NAIP 2003, Mn/DNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

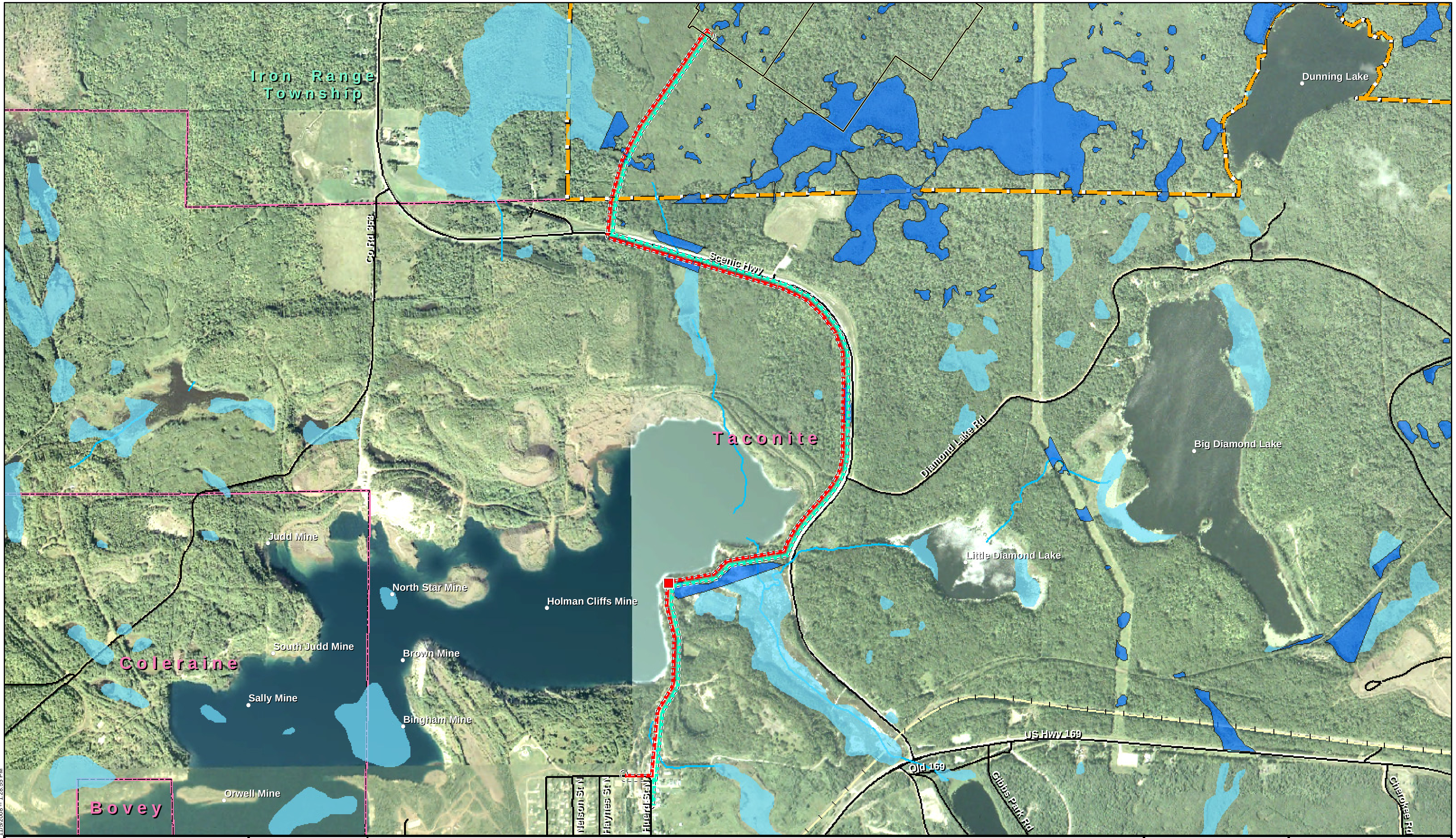
Figure F2-25

Process Water Lines & Pump Station Facilities

St. Louis County - Central Coordinate System

N E S W

0 4,000 Feet



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West Range

November 2008

Legend

- Footprint and Buffer Land
- Plant Layout
- **Proposed Utilities**
  - Potable Water
  - Gravity Sewer
  - Sewer and Water Construction Limits
- Surveyed Wetlands
- NWI
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township
- State Park
- Streams

Appendix F

Source: NAIP 2006, Itasca County, Mn/DOT, Mn/DNR, USGS, USFWS, Fluor, Excelsior Energy, and SEH.

Figure F2-26

Proposed Sanitary & Potable Water Wetlands

Itasca County - South Coordinate System

N E S W

0 1,250 Feet

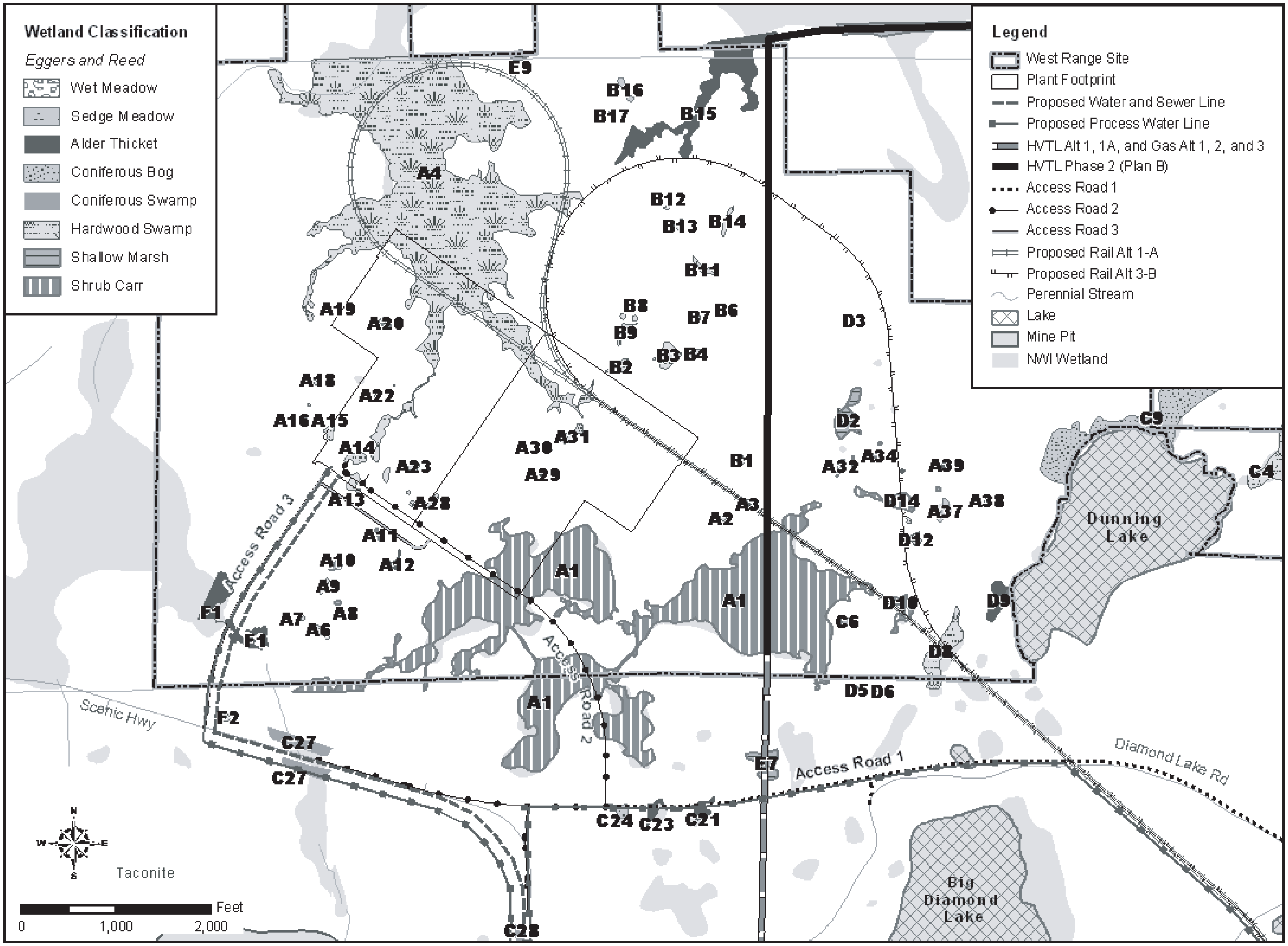

Figure F2-27. West Range Central EIS with Eggers and Reed Wetland Classifications

Map Document: (\\sls3020-1\projects\AE\E\Exen\050200\03Environmental\gis\MXDs_Wetland_Permit\Figure 13a-13c - Mapbook HVTL Alt 1 032506 11x17 L.mxd)
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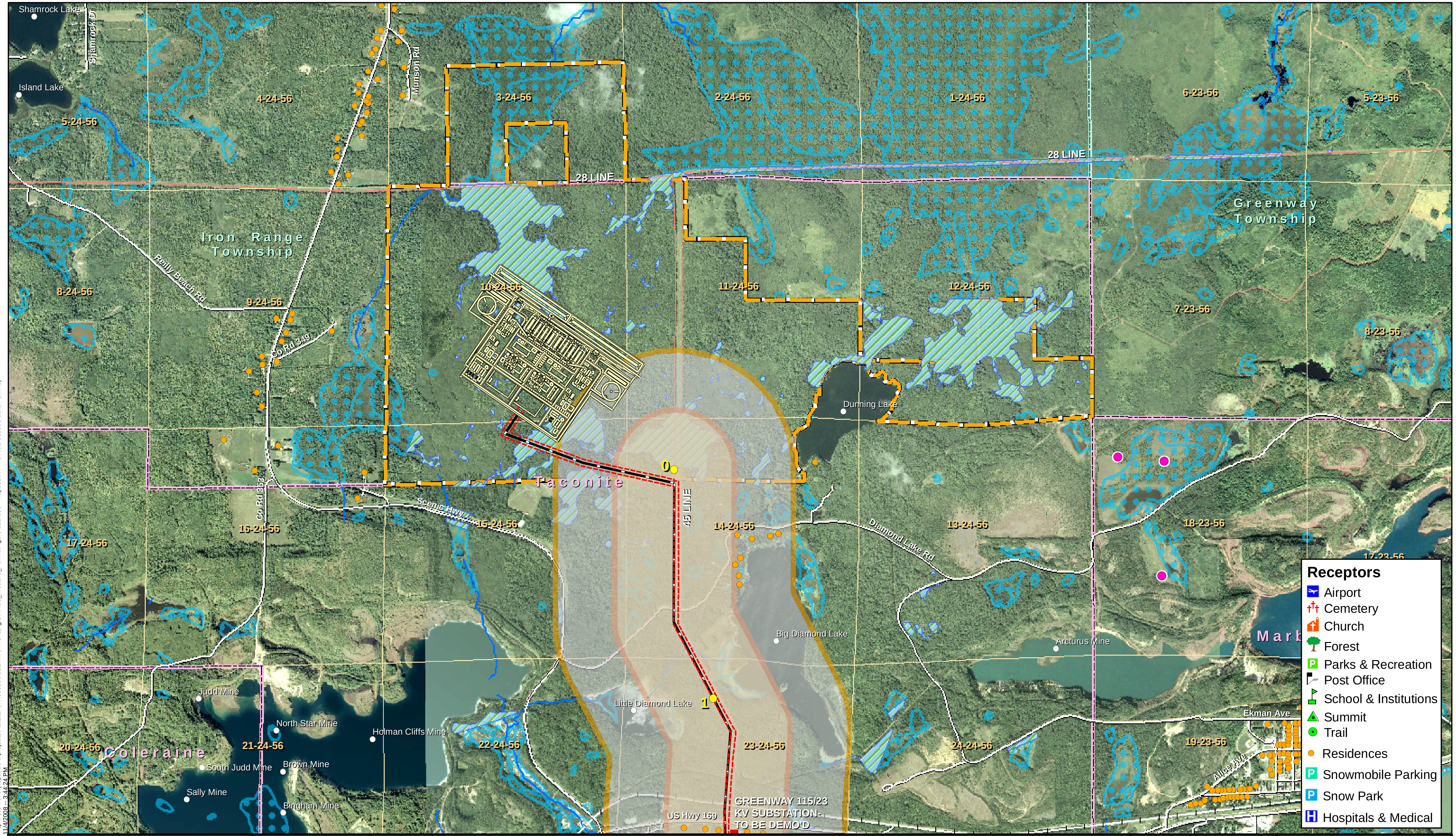

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West Range

November 2008

Legend

- Plant Layout
- Footprint and Buffer Land
- WRA-1 Route
- One-mile ROW
- HVTL Mileposts
- HVTL WRA-1
- HVTL Impacted ROW
- HVTL Substations
- Existing HVTL
- PLS Sections (S-T-R)
- Rare Natural Features
- WMA
- Streams
- Surveyed Wetlands
- NWI (w/Gas Line Refinements)

Source: NAIP 2006, LMIC, Mn/EQB, Mn/DNR, Mn/DOT, USGS, ESRI, Excelsior Energy, and SEH.
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Appendix F

Overview Map Tiles: 1, 2, 3

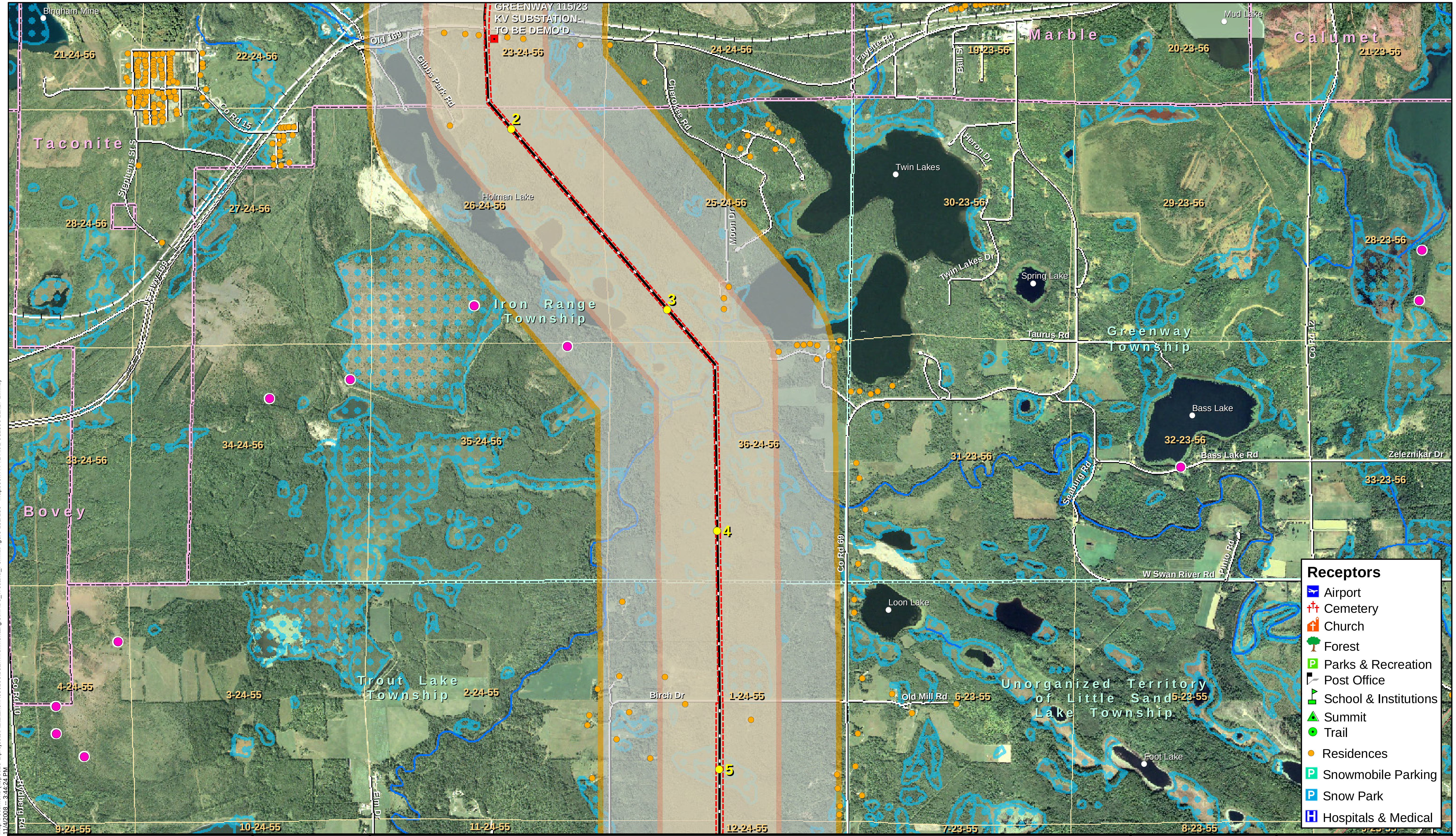
Figure F2-28a

Plan A: Phase I/II Preferred (WRA-1) HVTL Route

Itasca County - South Coordinate System

N, E, S, W

0 — 2,000 Feet



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West Range

November 2008

Legend

- Plant Layout
- Footprint and Buffer Land
- WRA-1 Route
- One-mile ROW
- HVTL Mileposts
- HVTL WRA-1
- HVTL Impacted ROW
- HVTL Substations
- Existing HVTL
- PLS Sections (S-T-R)
- Rare Natural Features
- WMA
- Streams
- Surveyed Wetlands
- NWI (w/Gas Line Refinements)

Source: NAIP 2006, LMIC, Mn/EQB, Mn/DNR, Mn/DOT, USGS, ESRI, Excelsior Energy, and SEH.
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Appendix F

Overview Map Tiles: 1, 2, 3

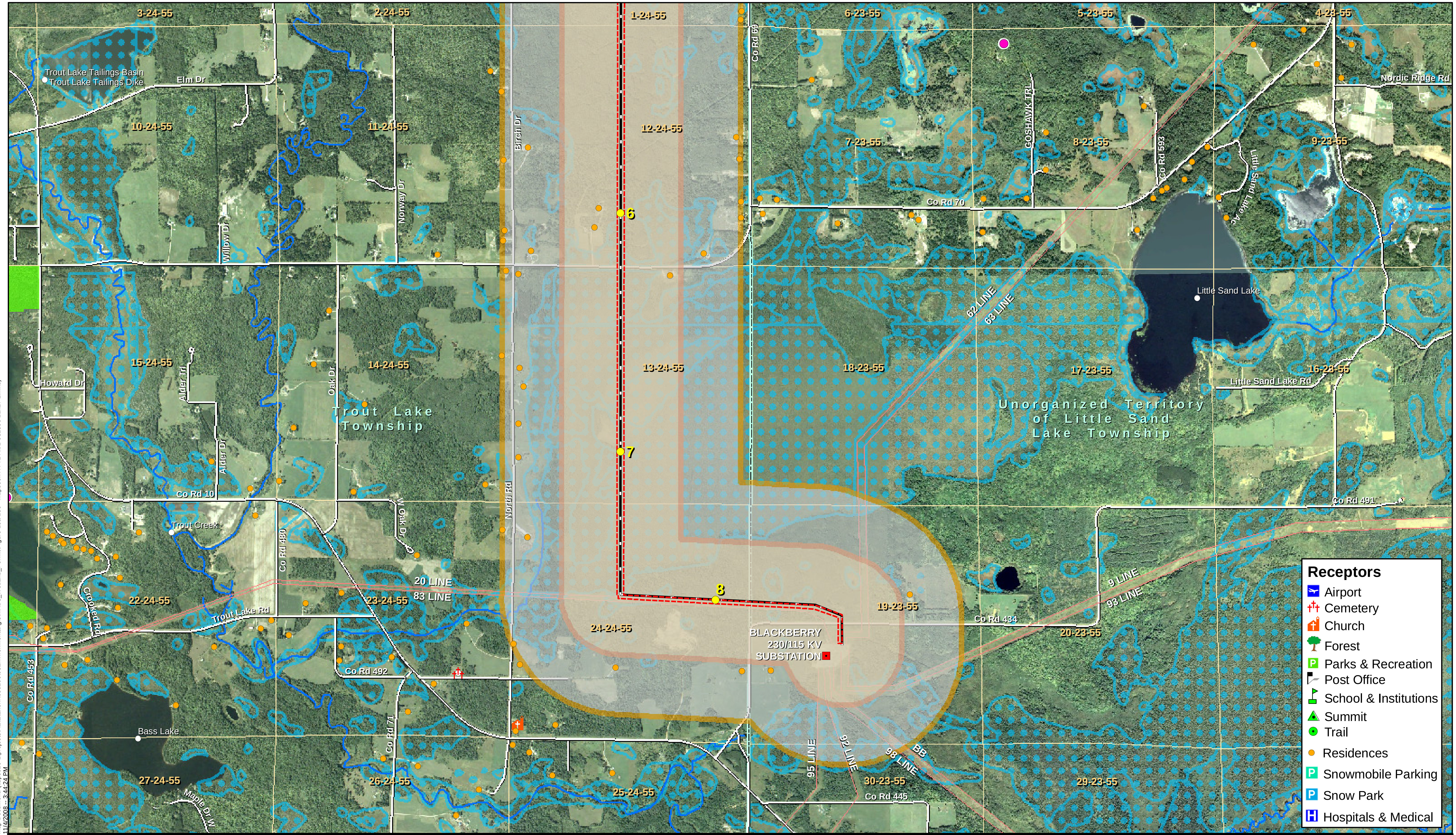
Figure F2-28b

Plan A: Phase I/II Preferred (WRA-1) HVTL Route

Itasca County - South Coordinate System

N, S, E, W

0 — 2,000 Feet



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West Range

November 2008

Legend

- Plant Layout
- Footprint and Buffer Land
- WRA-1 Route
- One-mile ROW
- HVTL Mileposts
- HVTL WRA-1
- HVTL Impacted ROW
- HVTL Substations
- Existing HVTL
- PLS Sections (S-T-R)
- Rare Natural Features
- WMA
- Streams
- Surveyed Wetlands
- NWI (w/Gas Line Refinements)

Overview Map Tiles: 1, 2, 3

Source: NAIP 2006, LMIC, Mn/EQB, Mn/DNR, Mn/DOT, USGS, ESRI, Excelsior Energy, and SEH.
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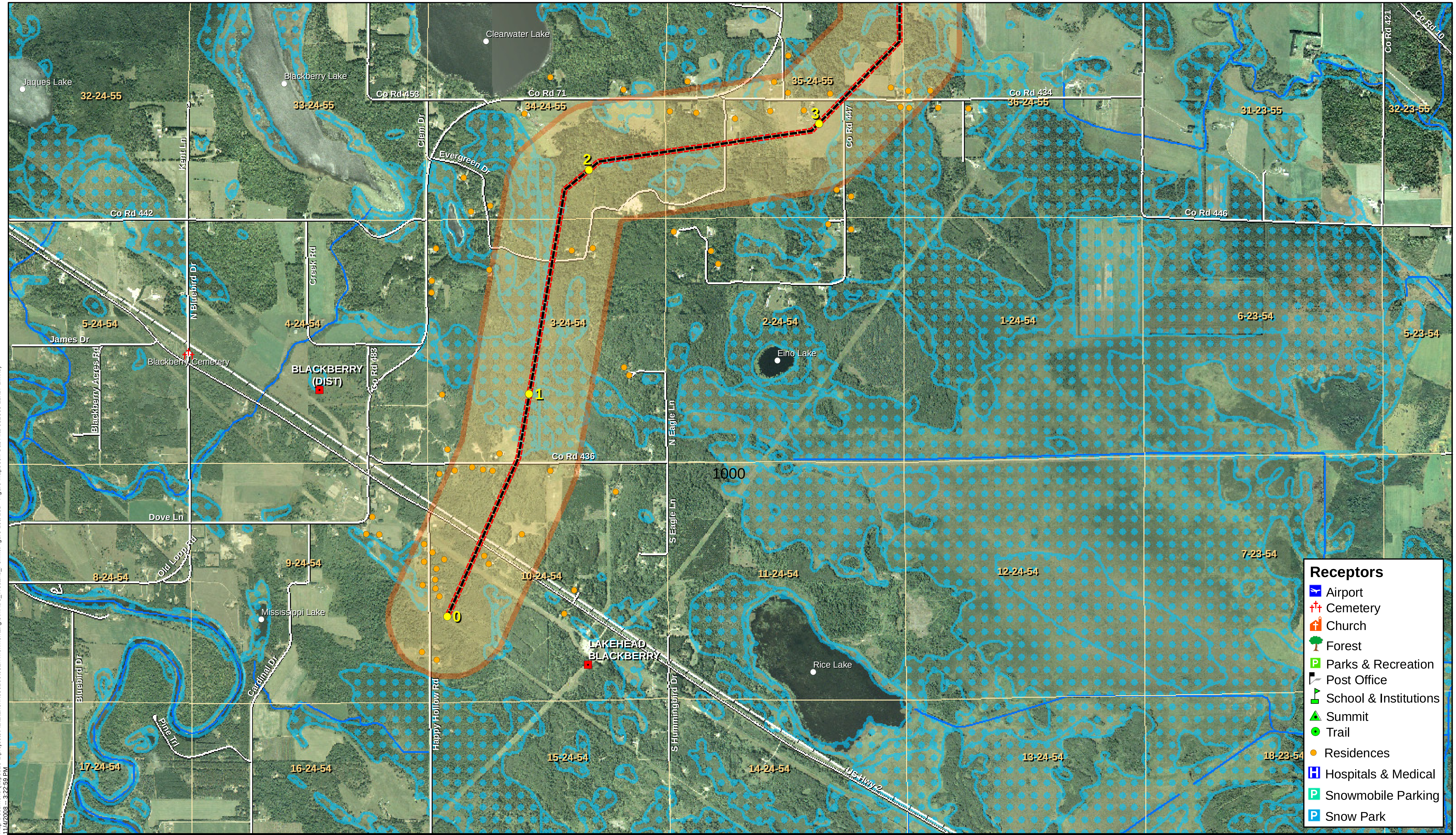
Figure F2-28c

Plan A: Phase I/II Preferred (WRA-1) HVTL Route

Itasca County - South Coordinate System

N, E, S, W

0 — 2,000 Feet



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West Range

November 2008

Legend

- Plant Layout
- Footprint and Buffer Land
- Natural Gas Route
- Gas Mileposts
- Gas Proposed
- Gas Impacted ROW
- HVTL Substations
- HVTL Preferred
- HVTL Alternate
- PLS Sections (S-T-R)
- WMA
- Streams
- Surveyed Wetlands
- NWI (w/Gas Line Refinements)

Source: NAIP 2006, LMIC, Mn/EQB, Mn/DNR, Mn/DOT, USGS, ESRI, Fluor, Excelsior Energy, and SEH.
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Appendix F

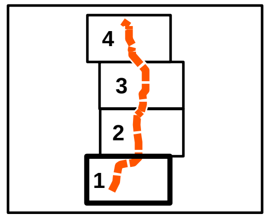
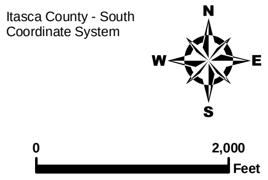
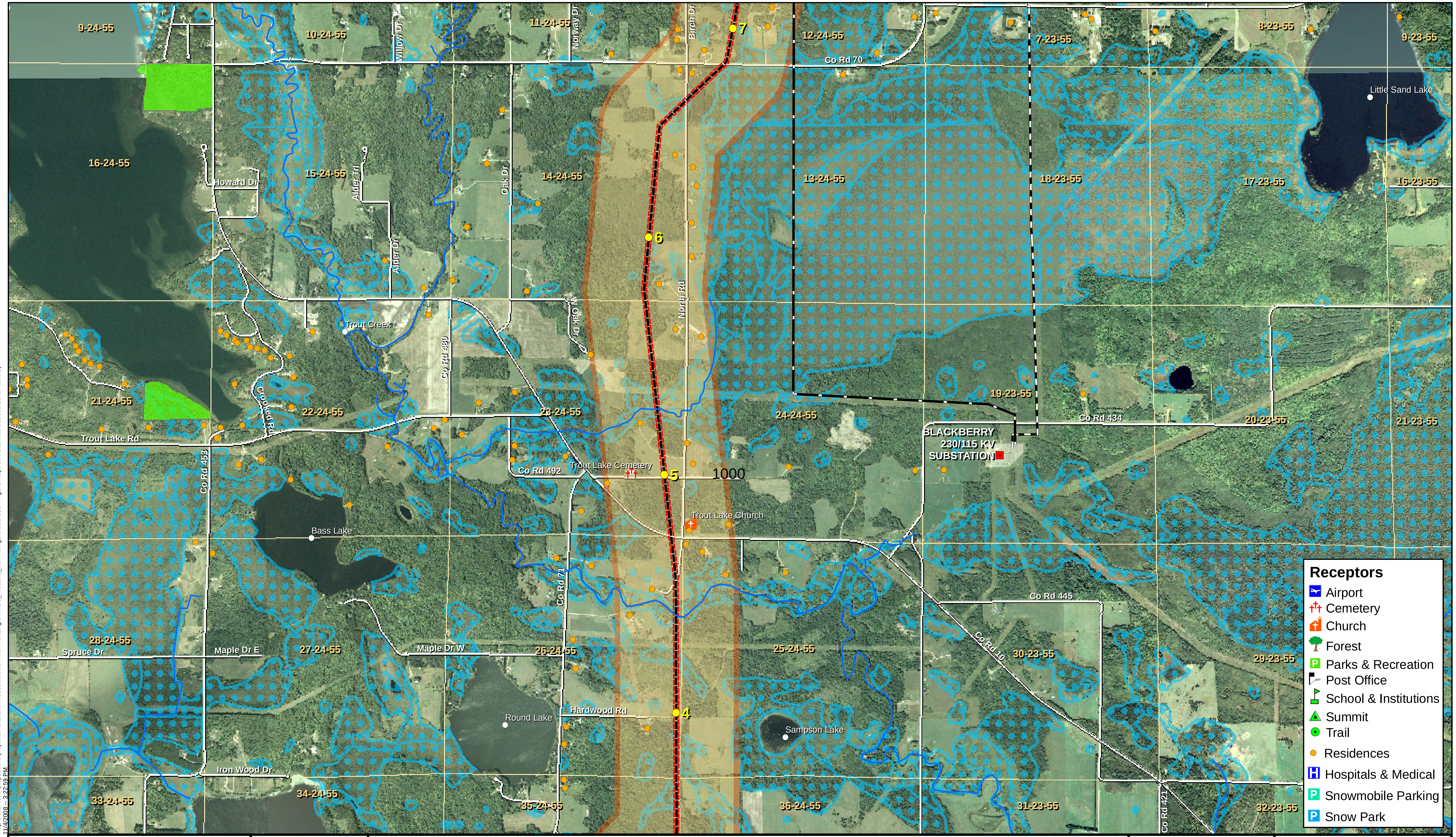


Figure F2-29a

Proposed Natural Gas Pipeline Route

Itasca County - South Coordinate System





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Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

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- Gas Impacted ROW
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- HVTL Preferred
- HVTL Alternate
- PLS Sections (S-T-R)
- WMA
- Streams
- Surveyed Wetlands
- NWI (w/Gas Line Refinements)

Source: NAIP 2006, LMIC, Mn/EQB, Mn/DNR, Mn/DOT, USGS, ESRI, Fluor, Excelsior Energy, and SEH.
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Appendix F

Overview Map Tiles: 4, 3, 2, 1

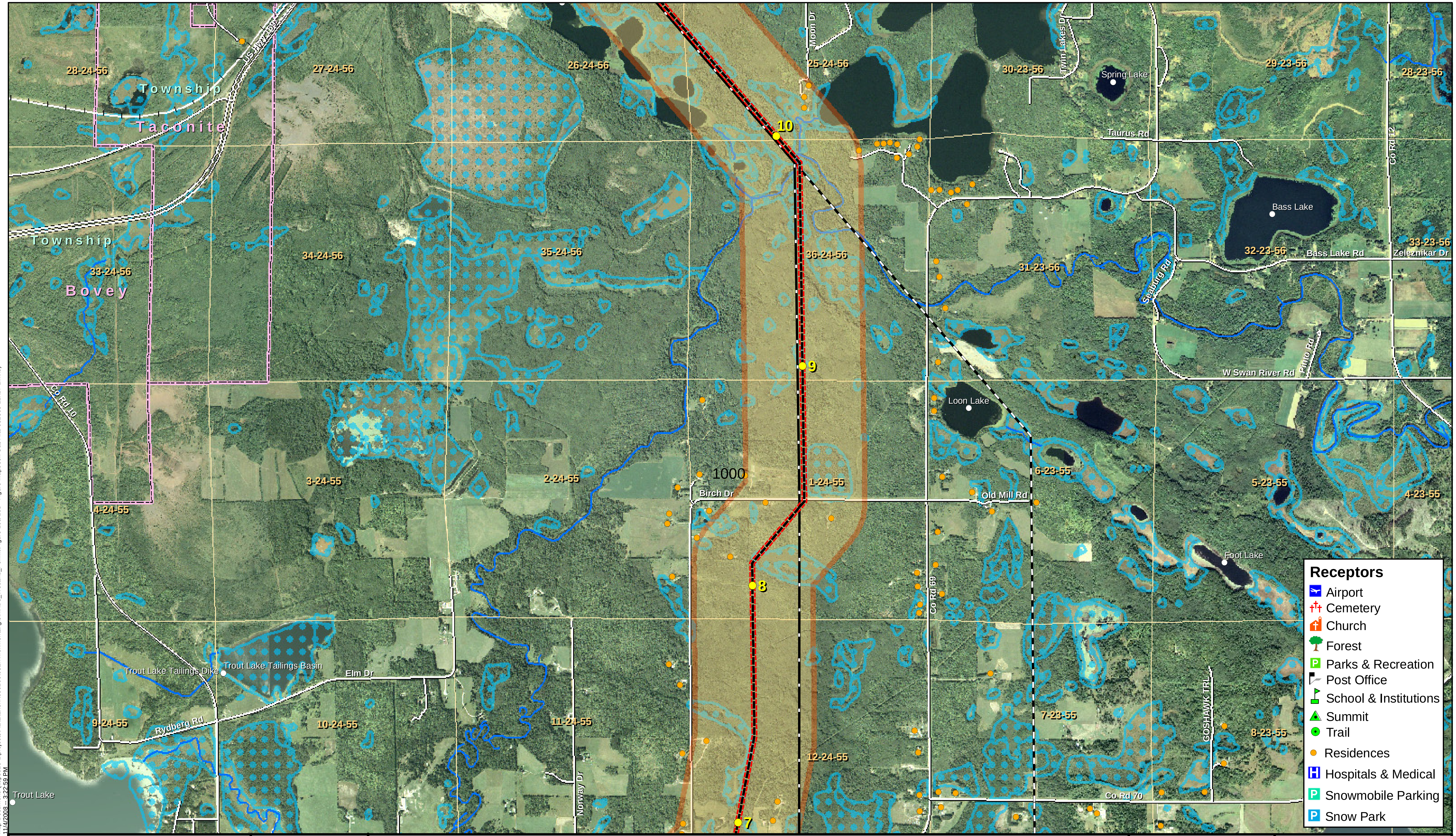
Figure F2-29b

Proposed Natural Gas Pipeline Route

Itasca County - South Coordinate System

N W E S

0 2,000 Feet



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Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

- Plant Layout
- Footprint and Buffer Land
- Natural Gas Route
- Gas Mileposts
- Gas Proposed
- Gas Impacted ROW
- HVTL Substations
- HVTL Preferred
- HVTL Alternate
- PLS Sections (S-T-R)
- WMA
- Streams
- Surveyed Wetlands
- NWI (w/Gas Line Refinements)

Source: NAIP 2006, LMIC, Mn/EQB, Mn/DNR, Mn/DOT, USGS, ESRI, Fluor, Excelsior Energy, and SEH.
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Appendix F

Overview Map Tiles: 4, 3, 2, 1

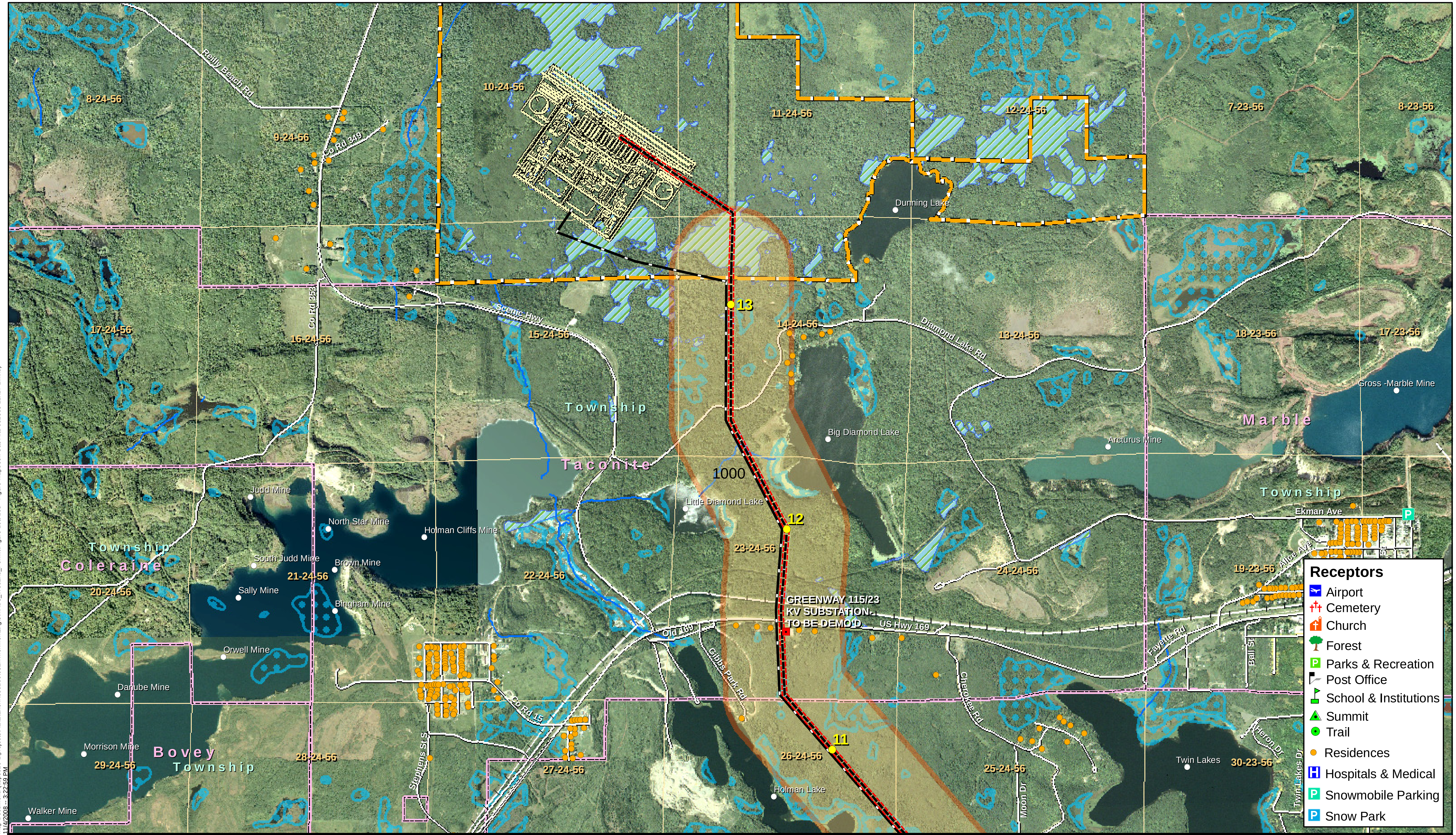
Figure F2-29c

Proposed Natural Gas Pipeline Route

Itasca County - South Coordinate System

N W E S

0 2,000 Feet



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Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

- Plant Layout
- Footprint and Buffer Land
- Natural Gas Route
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- Gas Proposed
- Gas Impacted ROW
- HVTL Substations
- HVTL Preferred
- HVTL Alternate
- PLS Sections (S-T-R)
- WMA
- Streams
- Surveyed Wetlands
- NWI (w/Gas Line Refinements)

Source: NAIP 2006, LMIC, Mn/EQB, Mn/DNR, Mn/DOT, USGS, ESRI, Fluor, Excelsior Energy, and SEH.
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Appendix F

Overview Map Tiles: 4, 3, 2, 1

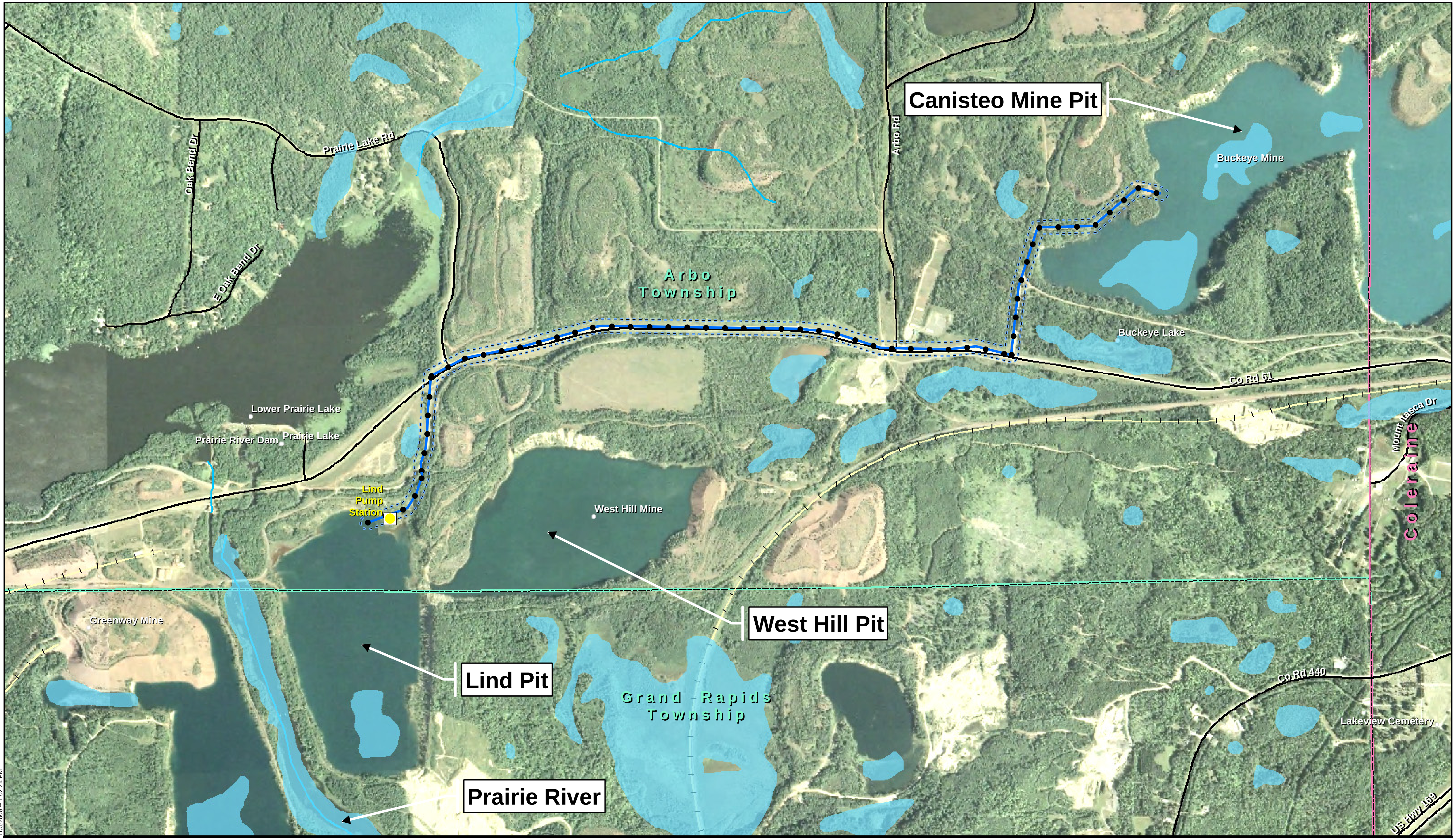
Figure F2-29d

Proposed Natural Gas Pipeline Route

Itasca County - South Coordinate System

N, E, S, W

0 2,000 Feet



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Phone 952.847.2360 Fax 952.847.2373

West Range

November 2008

Legend

- Footprint and Buffer Land
- Plant Layout
- Source Water
- Proposed Pump Station
- Process Water Pipeline 1
- Process Water Pipeline 1 Construction Limits
- Surveyed Wetlands
- NWI
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township
- State Park
- Streams

Appendix F

Source: NAIP 2006, USGS, Mn/DNR, Mn/DOT, Itasca County, Fluor, Excelsior Energy, and SEH.
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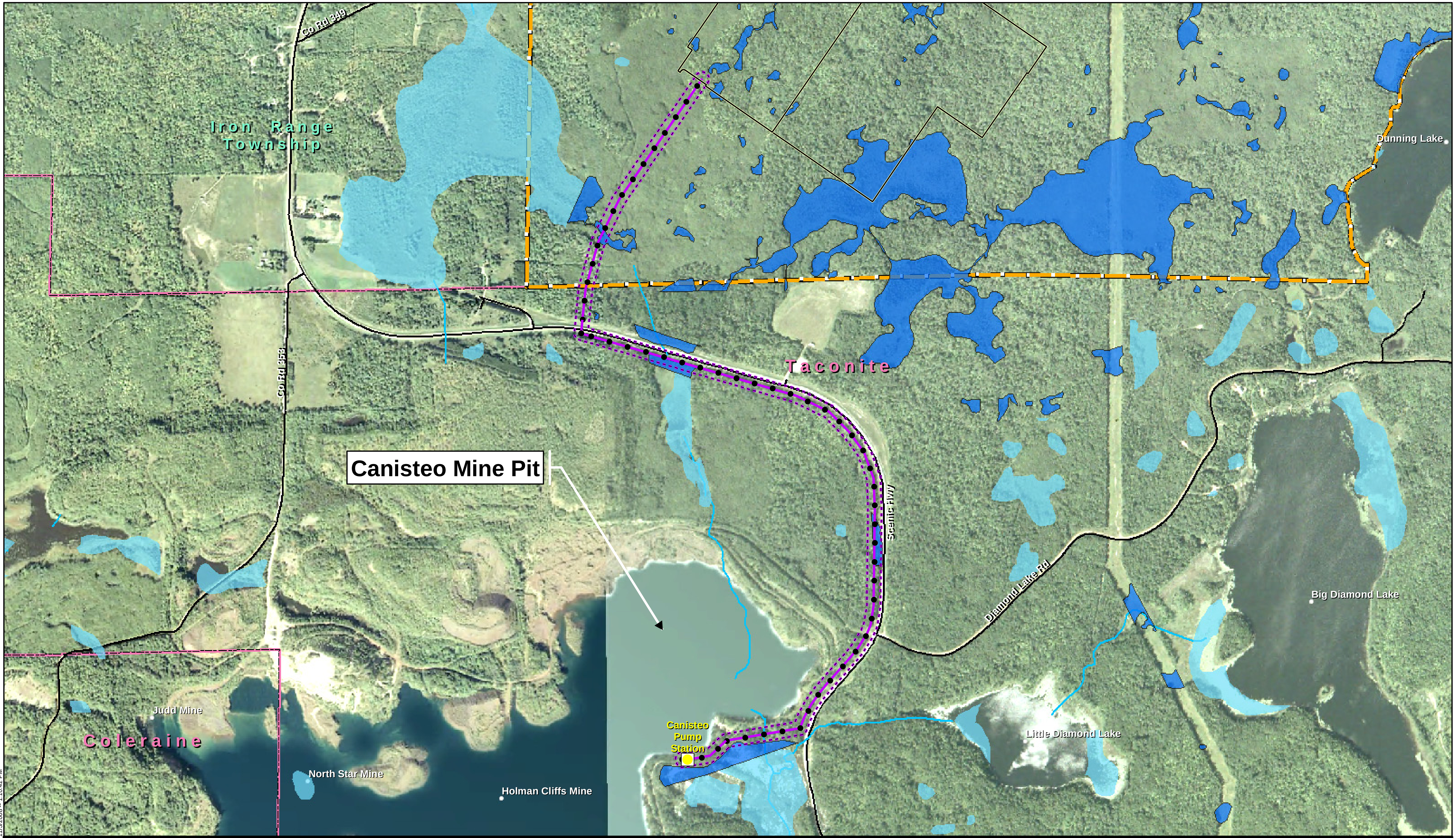
Figure F2-30

Process Water Pipeline 1 Wetlands

Itasca County - South Coordinate System

N
W E
S

0 1,000 Feet



Map Document: (\\us3020-1\projects\AE\E\Exem\050200\03Environmental\gis\MXDs_Wetland_Permit\Figure 22 - WR Process Water Pipeline - Segment 2 11x17 1.mxd) 11/5/2008 -- 1:10:42 PM

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West Range

November 2008

Legend

- Footprint and Buffer Land
- Plant Layout
- Source Water
- Proposed Pump Station
- Process Water Pipeline 2
- Process Water Pipeline 2 Construction Limits
- Surveyed Wetlands
- NWI
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township
- State Park
- Streams

Appendix F

Source: NAIP 2006, USGS, Mn/DNR, Mn/DOT, Itasca County, Fluor, Excelsior Energy, and SEH.

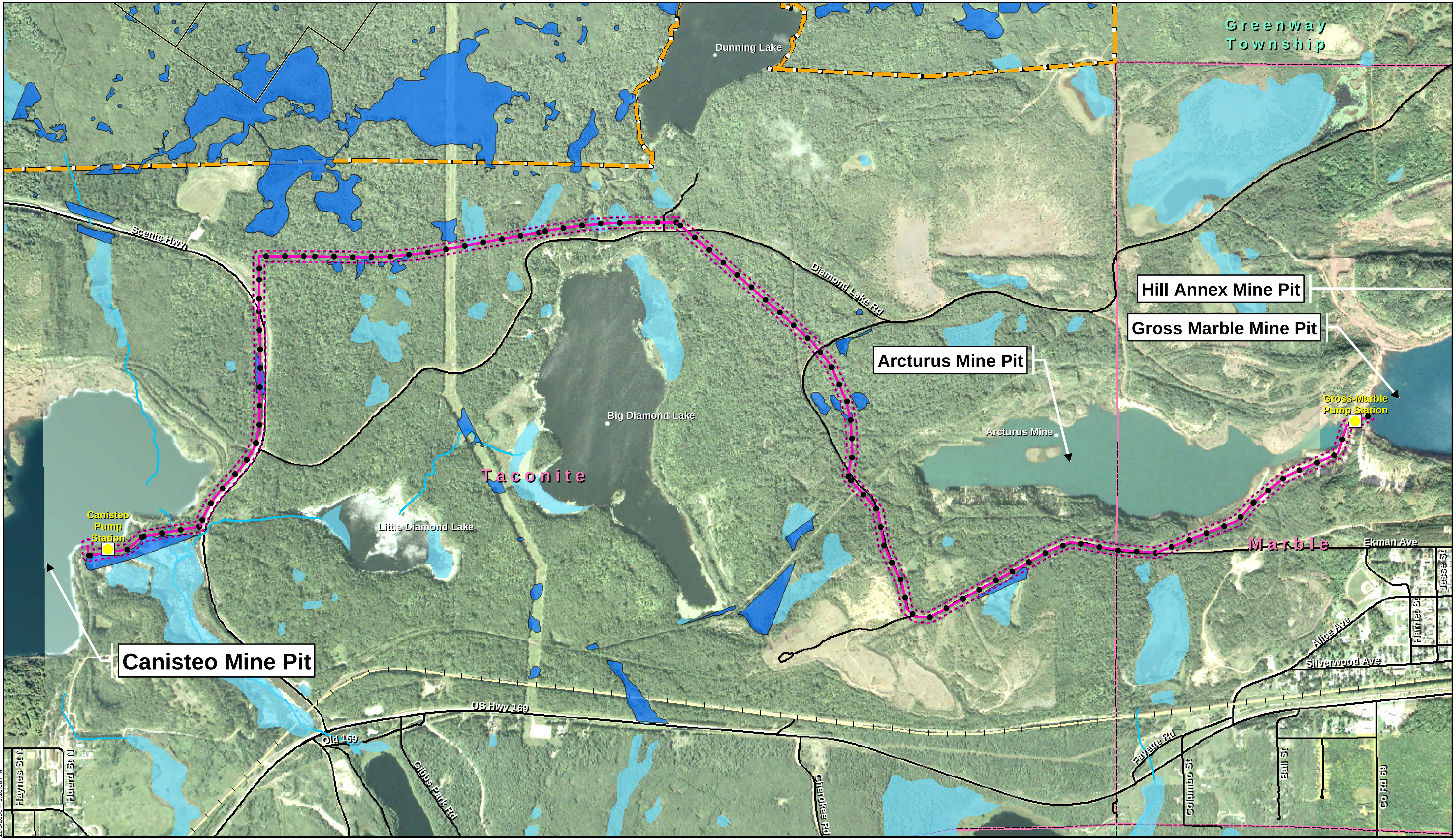
Figure F2-31

Process Water Pipeline 2 Wetlands

Itasca County - South Coordinate System

N W E S

0 1,000 Feet



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West Range

November 2008

Legend

- Footprint and Buffer Land
- Plant Layout
- Source Water
- Proposed Pump Station
- Process Water Pipeline 3
- Process Water Pipeline 3 Construction Limits
- Surveyed Wetlands
- NWI
- Existing Roads
- Existing Railroads
- Geographic Names
- Municipal Boundaries
- Civil Township
- State Park
- Streams

Appendix F

Source: NAIP 2006, USGS, Mn/DNR, Mn/DOT, Itasca County, Fluor, Excelsior Energy, and SEH.
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Figure F2-32

Process Water Pipeline 3 Wetlands

Itasca County - South Coordinate System

N S E W

0 1,250 Feet

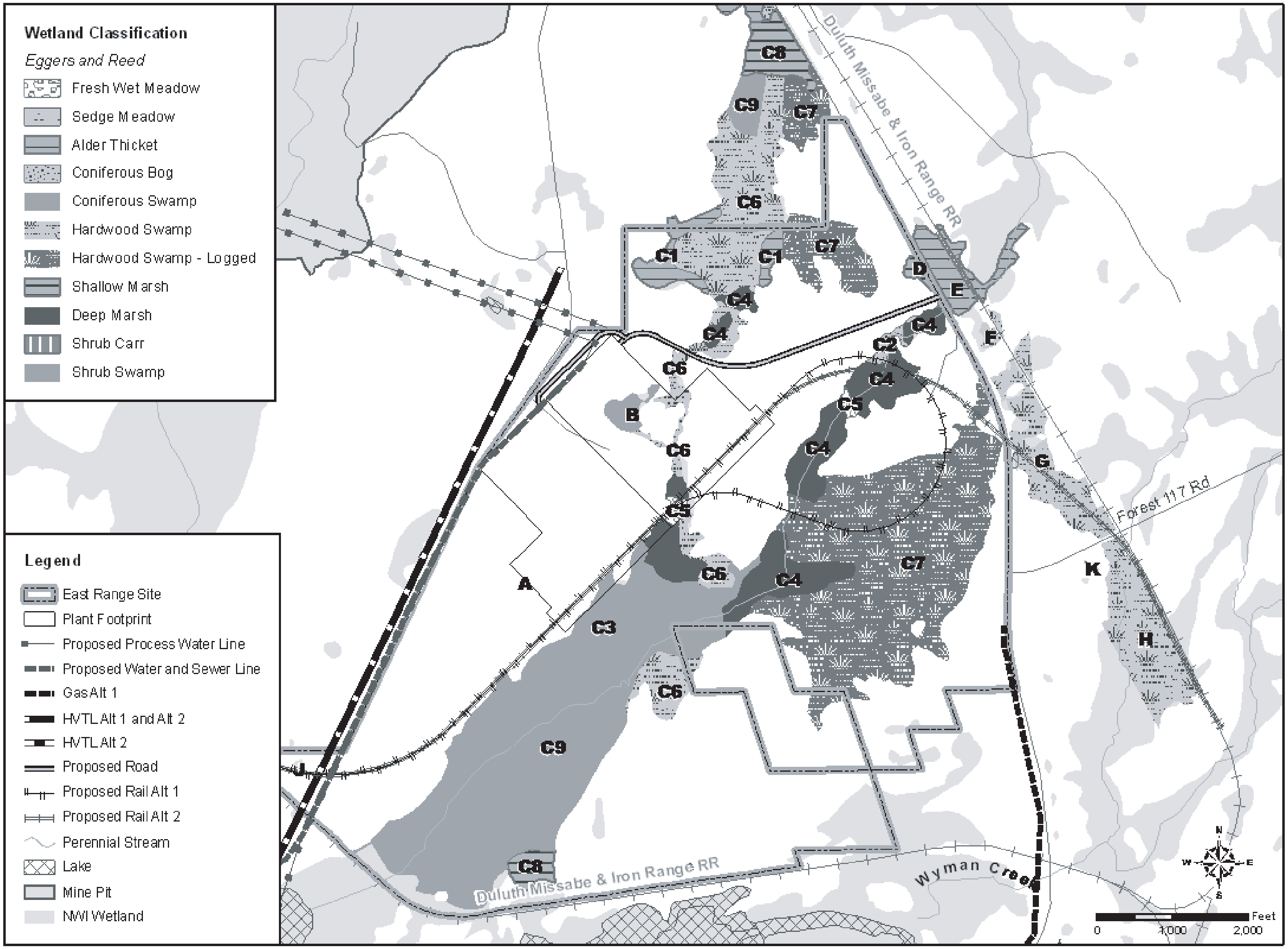

Figure F2-33. East Range Central EIS with Eggers and Reed Wetland Classifications

APPENDIX F3
Minnesota Routine Assessment Method 3.1 Functions and Values Assessment Summary

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Appendix F3

MnRAM 3.1 Functions and Values Assessment Summary

The Minnesota Routine Assessment Method (MnRAM) 3.1 was completed for each wetland delineated on the West Range Site (preferred) and East Range Site (alternative). The results of the Wetland Community Summary and the Wetland Functional Assessment Summary for the both the West and East Range Sites are attached at the end of this document.

West Range Site (Preferred Site)

Wetland Community Summary

The Wetland Community Summary rates each wetland based upon native plant species diversity, presence of rare plant species, and presence of non-native and invasive species. 82% of the wetlands surveyed had a high rating, 15% had a moderate rating, and 3% had a moderate/high rating. The following paragraphs describe the characteristics of each community based on their rating. Detailed descriptions the rating system can be found in the MnRAM 3.1 Comprehensive Guidance[1] (BWSR, 2007).

Eighty two percent (82%) of the wetlands surveyed had a high rating for Vegetative Diversity/Integrity. The hardwood swamps and alder thickets that rated as high had less than 20% dominance of box elder, cottonwood, quaking aspen, and other non-native species as well as an understory dominated by at least five native species of herbaceous vegetation. The coniferous bogs that rated as high were comprised of stands of tamarack or black spruce with the characteristic assemblage of bog vegetation and were not dominated by more than 20% of non-native vegetation. The wet meadows that rated as high were comprised of 10 or more species of native grasses, sedges, ferns, rushes, and forbs. Invasive species comprised less than 20% of total vegetative coverage. Sedge meadows that rated as high were dominated mostly by sedges with a mixture of other native grasses, ferns, rushes, and forbs. Invasive species comprised less than 20% of the herbaceous layer. Shallow marshes that rated as high included dominance of three or more native aquatic plant species (or less species if vegetative quality was high), less than 40% cover of cattails, and less than 20% cover of purple loosestrife.

Fifteen percent (15%) of the wetlands surveyed had a moderate rating for Vegetative Diversity/Integrity. The hardwood swamps and alder thickets that rated as moderate had 20-50% dominance of non-native species and four or fewer native species of herbaceous vegetation. The coniferous bogs that rated as moderate were comprised of characteristic bog vegetation but had 20-50% cover of non-native species in one strata. The wet meadows that rate as moderate were comprised of five to nine species of native grasses, sedges, rushes, ferns, and forbs. Invasive species comprised between 20-50% of vegetative coverage. Sedge meadows that rated as moderate were dominate by sedges but contained 20-40% coverage of non-native species. Shallow marshes that rated as

[1] Minnesota Board of Water and Soil Resources, 2007. *Comprehensive General Guidance for Minnesota Routine Assessment Method (MnRAM) Evaluating Wetland Function, Version 3.1*.

moderate included at least two species of native aquatic plants, cattails comprised 40-85% cover, and/or purple loosestrife comprised 20-50% cover.

Several (3%) of the wetlands were comprised of multiple community types with different ratings. These wetlands were rated as moderate/high for Vegetative Diversity/Integrity. No single wetland community on the entire West Range Site was rated as low. The above paragraphs describe the characteristics of each community type rates as moderate or high.

Wetland Functional Assessment Summary

The Wetland Functional Assessment Summary rates each wetland on the following parameters on a scale of low, moderate, high, exceptional, or not applicable: maintenance of hydrologic regime, flood/stormwater storage, downstream water quality protection, maintenance of wetland water quality, shoreline protection (if applicable), maintenance of wildlife habitat, maintenance of fish habitat, maintenance of amphibian habitat, aesthetics and recreation, commercial uses (if applicable), groundwater interaction, and sensitivity to storm water. Optional questions for restoration potential and stormwater treatment needs were not answered. The descriptions that follow are taken from the MnRAM Comprehensive Guidance (BWSR, 2007).

- Maintenance of Hydrologic Regime
  The ability of the wetland to maintain a hydrologic regime characteristic of the wetland type is evaluated based upon wetland soil and vegetation characteristics, land use within the wetland, land use within the upland watershed contributing to the wetland, and wetland outlet configuration. All wetlands rated as high.

- Flood and Stormwater Storage/Attenuation
  Wetland characteristics which affect the wetland's ability to store and or attenuate stormwater include: condition of wetland soils; presence, extent, and type of wetland vegetation; presence and connectivity of channels; and most importantly outlet configuration. Most wetlands rated as high and few wetlands rated as moderate.

- Downstream Water Quality Protection
  Runoff characteristics that are evaluated include: land use and soils in the upstream watershed, the stormwater delivery system to the wetland, and sediment delivery characteristics. All wetlands rated as high.

- Maintenance of Wetland Water Quality
  The ability of the wetland to sustain its characteristics is evaluated based on characteristics of the contributing subwatershed and indicators within the wetland. Subwatershed conditions which affect the wetland's sustainability in relation to water quality impacts include: upland land use; sediment delivery characteristics to the wetland; stormwater runoff volumes and rates; and the extent, condition, and width of upland buffer. Most wetlands rated as high, approximately one third of wetlands rated as moderate.

- Shoreline Protection
  This function is rated based on the wetlands opportunity to protect the shoreline; i.e. wetlands located in areas frequently experiencing large waves and high currents have the best opportunity to protect the shore. Three wetlands evaluated on the West Range Site had shoreline characteristics. These wetlands rated as moderate. All other wetlands have no shoreline area, therefore this parameter is not applicable for all wetlands.

- Maintenance of Wildlife Habitat Structure
  This function determines the value of a wetland for wildlife in a more general sense, and not based on any specific species. The characteristics evaluated to determine the wildlife habitat function include: vegetative quality, outlet characteristics (which control hydrologic regime), upland land use, wetland soil type and conditions, water quality of storm water runoff entering the wetland, upland buffer extent, condition, and diversity; the interspersion of wetlands in the area; barriers to wildlife movement; wetland size; vegetative and community interspersion within the wetland; and amphibian breeding potential and overwintering habitat. All wetlands rated as moderate.

- Maintenance of Fish Habitat
  The ability of the wetland to support native fish populations is determined by structural factors within the wetland as well as water quality contributions from upland factors. Wetlands rated as high are lacustrine or riverine and provide spawning/nursery habitat, or refuge for native species (included but not limited to game fish). Wetlands rated as low for fish habitat do not have a direct hydrologic connection to a waterbody with a native fishery or have poor water quality. This parameter was not applicable for most wetlands. Few wetlands rated as low, one rated as moderate, and one rated as high.

- Maintenance of Amphibian Habitat
  This function determines the value of a wetland for amphibians in general, not based on specific species. An adequate wetland hydroperiod and the presence or absence of predatory fish are considered to be limiting variables for this function. In general, wetlands must remain inundated until early to mid-June to allow the larval stages to metamorphose into adults. Because many amphibians are partly terrestrial, the characteristics evaluated to determine the amphibian habitat function include numerous hydrology and terrestrial measures. The characteristics evaluated include: upland land use, upland buffer width, water quality of storm water runoff entering the wetland, barriers to wildlife movement, and amphibian breeding potential and overwintering habitat. Most of the wetlands on the West Range Site rated as high and two rated as moderate. This parameter was not applicable for approximately one fifth of the wetlands surveyed.

- Aesthetics, Recreation, Education, Cultural, Science
  The aesthetics/recreation/education/cultural and science function and value of each wetland is evaluated based on the wetland's visibility, accessibility, evidence

of recreational uses, evidence of human influences (e.g. noise and air pollution) and any known educational or cultural purposes. Accessibility of the wetland is key to its aesthetic or educational appreciation. Also, diversity of wetland types or vegetation communities may increase its functional level as compared to monotypic open water or vegetation. Most of the wetlands surveyed rated as low/moderate. The MnRAM calculation for these wetlands was between the criteria for the low rating and the moderate rating. Approximately one fifth of the wetlands rated as moderate and few rated as low.

- Commercial Uses
  No commercial uses were identified, therefore this parameter is not applicable for all wetlands.

- Groundwater Interaction
  Several wetland and watershed characteristics are evaluated to determine the likely interaction including: wetland soil type, upland land use, upland soil types and wetland size, wetland hydroperiod, wetland outlet characteristics, and topographic relief. Most wetlands on the West Range Site were rated as combination discharge/recharge wetlands.

- Wetland Stormwater Sensitivity
  This parameter is directly tied to the vegetative diversity and integrity parameter. Wetlands with high vegetative diversity are sensitive to the addition of stormwater to the subwatershed. The majority of the wetlands on the West Range Site rated exceptional, approximately one fifth rated as high, and approximately one tenth rated as moderate.

East Range Site (Alternative Site)

Wetland Community Summary

The Wetland Community Summary rates each wetland based upon native plant species diversity, presence of rare plant species, and presence of non-native and invasive species. Ten separate wetlands were delineated on the East Range Site. Several of the wetlands were very large wetland complexes comprised of many community types. Of the ten wetlands surveyed, eight (80%) had a high rating and two (20%) had a moderate rating. A summary of the criteria for vegetative diversity rankings is included in the West Range Site portion of this report. Detailed descriptions the rating system can be found in the MnRAM 3.1 Comprehensive Guidance (BWSR, 2007).

Wetland Functional Assessment Summary

Wetland functions and values were assessed using the MnRAM 3.1 and the same methodology as described for the West Range Site. Summaries of the descriptions of each wetland function assessed are included in the West Range Site portion of this document. Full descriptions and formulas used to assess functions can be found in the MnRAM Comprehensive Guidance (BWSR, 2007).

- Maintenance of Hydrologic Regime
  All wetlands rated as high.

- Flood and Stormwater Storage/Attenuation
  Nine wetlands rated as high. Wetland I rated as moderate, most likely because it is a lacustrine fringe wetland and does not store floodwater well.

- Downstream Water Quality Protection
  All wetlands rated as high.

- Maintenance of Wetland Water Quality
  All wetlands rated as moderate, most likely because of the surrounding land use (large amounts of mining and logging) and lack of upland buffers.

- Shoreline Protection
  One wetland, Wetland I, evaluated on the East Range Site had shoreline characteristics. Wetland I rated as high for this function. All other wetlands have no shoreline habitat, therefore this parameter is not applicable for all other wetlands.

- Maintenance of Wildlife Habitat Structure
  All wetlands rated as moderate.

- Maintenance of Fish Habitat
  This parameter was not applicable for six wetlands on the East Range Site. Wetlands F, G, and H rated as low. Wetland I rated as high because it has a lacustrine fringe and provides habitat for fish.

- Maintenance of Amphibian Habitat
  This parameter was not applicable for four wetlands on the East Range Site. Four wetlands rated as moderate in this category, and two wetlands (Wetlands A and B) rated as high.

- Aesthetics, Recreation, Education, Cultural, Science
  Four of the wetlands surveyed rated as low, four rated as moderate, and two (Wetlands A and B) rated as low/moderate. The MnRAM calculation for Wetlands A and B was between the criteria for the low rating and the moderate rating.

- Commercial Uses
  No commercial uses were identified, therefore this parameter is not applicable for all wetlands.

- Groundwater Interaction
  All wetlands on the East Range Site were rated as a combination discharge/recharge wetlands.

- Wetland Stormwater Sensitivity
  Seven of the wetlands on the East Range Site rated as exceptional and the remaining three rated as high.

Alpha	ID	Wet ID	MnRAM ID	Cowardin	Circ. 39 Type	Acres	Mgmt Class	Veg Diversity	Hydrogeomorphology	Hydrologic Regime	Flood Storage	Downstream Water Quality	Wetland Water Quality	Shoreline Protection	Wildlife Habitat	Fishery Habitat	Amphibian Habitat	Aesthetics, Recreation, Education	Commercial	Groundwater Interaction	Stormwater Sensitivity
A	1	A1	31-056-24-14-001-A	PEMB	Type 3	97.00	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	Moderate	High	Moderate	Not Applicable		Not Applicable	High	Moderate	Not Applicable	Discharge	High
A	2	A2	31-056-24-11-002-A	PFO1B	Type 7	0.06	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	3	A3	31-056-24-11-003-A	PFO1C	Type 7	0.10	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	4	A4	31-056-24-10-004-A	PFO1C/F	Type 7	97.00	Manage 1	Moderate	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	6	A6	31-056-24-15-006-A	PFO1C	Type 7	0.38	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
A	7	A7	31-056-24-15-007-A	PFO1C	Type 7	0.04	Preserve	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	8	A8	31-056-24-15-008-A	PEMC	Type 3	0.04	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
A	9	A9	31-056-24-15-009-A	PFO1B	Type 7	0.12	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	10	A10	31-056-24-15-010-A	PEMC	Type 3	0.17	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
A	11	A11	31-056-24-10-011-A	PEMC	Type 3	0.13	Manage 1	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
A	12	A12	31-056-24-10-011-A	PSS1B	Type 6	0.35	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
A	13	A13	31-056-24-10-013-A	PFO1B	Type 7	0.44	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	14	A14	31-056-24-10-014-A	PFO1B	Type 7	0.12	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	15	A15	31-056-24-10-015-A	PEMC	Type 3	0.26	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
A	16	A16	31-056-24-10-016-A	PEMC	Type 3	0.07	Manage 1	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	17	A17	31-056-24-10-017-A	PFO1C	Type 7	0.02	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	18	A18	31-056-24-10-018-A	PFO1C	Type 7	0.11	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	19	A19	31-056-24-10-019-A	PFO1C	Type 7	0.02	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional

A	20	A20	31-056-24-10-020-A	PFO1C	Type 7	0.04	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	21	A21	31-056-24-10-021-A	PFO1C	Type 7	0.01	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	22	A22	31-056-24-10-022-A	PFO1C	Type 7	0.04	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	23	A23	31-056-24-10-023-A	PEMC	Type 3	0.24	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	25	A25	31-056-24-10-025-A	PFO1C	Type 7	0.18	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	26	A26	31-056-24-10-026-A	PFO1C	Type 7	0.03	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	27	A27	31-056-24-10-027-A	PFO1C	Type 7	0.07	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	28	A28	31-056-24-10-028-A	PEMC	Type 3	0.22	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	29	A29	31-056-24-10-029-A	PFO1C	Type 7	0.08	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	30	A30	31-056-24-10-030-A	PEMC	Type 3	0.04	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	31	A31	31-056-24-10-031-A	PFO1C	Type 7	0.48	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	32	A32	31-056-24-11-032-A	PEMC	Type 3	0.14	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	33	A33	31-056-24-11-033-A	PEMC	Type 3	0.07	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	34	A34	31-056-24-11-034-A	PEMC	Type 3	0.08	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Recharge	Exceptional
A	35	A35	31-056-24-11-035-A	PEMC	Type 3	0.02	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	36	A36	31-056-24-11-036-A	PEMC	Type 3	0.04	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	37	A37	31-056-24-11-037-A	PEMC	Type 3	0.36	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	38	A38	31-056-24-11-038-A	PEMC	Type 3	0.07	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	39	A39	31-056-24-11-039-A	PSS1C	Type 6	0.27	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
A	40	A40	31-056-24-11-040-A	PEMC	Type 3	0.06	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional

B	1	B1	31-056-24-11-001-B	PFO1B	Type 7	0.15	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	2	B2	31-056-24-10-002-B	PFO1A	Type 7	0.38	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	3	B3	31-056-24-11-003-B	PFO1A	Type 7	1.06	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	4	B4	31-056-24-11-004-B	PFO1A	Type 7	0.25	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	5	B5	31-056-24-11-005-B	PFO1A	Type 7	0.02	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	6	B6	31-056-24-11-006-B	PFO1A	Type 7	0.02	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	7	B7	31-056-24-11-007-B	PFO1A	Type 7	0.03	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	8	B8	31-056-24-10-008-B	PFO1A	Type 7	0.06	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	9	B9	31-056-24-10-009-B	PFO1A	Type 7	0.29	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	10	B10	31-056-24-10-010-B	PFO1A	Type 7	0.06	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	11	B11	31-056-24-11-011-B	PFO1A	Type 7	0.29	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	12	B12	31-056-24-11-012-B	PFO1A	Type 7	0.05	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	13	B13	31-056-24-11-013-B	PFO1A	Type 7	0.16	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	14	B14	31-056-24-11-014-B	PFO1A	Type 7	0.37	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	15	B15	31-056-24-11-015-B	PSS1C	Type 6	11.07	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	High
B	16	B16	31-056-24-10-016-B	PEMC	Type 3	0.27	Preserve	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	17	B17	31-056-24-10-017-B	PEMB	Type 2	0.03	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	1	C1	31-056-24-12-001-C	PEMC	Type 3	0.31	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
C	2	C2	31-056-24-12-002-C	PEMA	Type 3	0.13	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional

C	3	C3	31-056-24-12-003-C	PEMH	Type 3	2.47	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet), beaver pond	High	Moderate	High	High	Not Applicable	Moderate	Low	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	4	C4	31-056-24-12-004-C	PFO1C	Type 7	79.40	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet), beaver pond	High	High	High	High	Not Applicable		Low	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	6	C6	31-056-24-14-006-C	PFO4	Type 8	0.16	Manage 1	High	Depressional/Tributary (outlet but no perennial inlet or drainage entering from upstream subwatershed)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	9	C9	31-056-24-12-009-C	PEMC	Type 3	21.85	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet), Lacustrine Fringe (edge of deepwater areas)/Shoreland	High	High	High	High	Moderate	Moderate	Moderate	Moderate	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	10	C10	31-056-24-22-010-C	PSS1Ad	Type 6	40.00	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low	Not Applicable	Combination Discharge, Recharge	High
C	11	C11	31-056-24-13-011-C	PEMH1	Type 5	0.88	Manage 1	High	Depressional/Tributary (outlet but no perennial inlet or drainage entering from upstream subwatershed), maybe old borrow pit	High	High	High	Moderate	Not Applicable	Moderate	Low	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
C	12	C12	31-056-24-13-012-C	PSS1C	Type 6	0.67	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
C	13	C13	31-056-24-13-013-C	PSS1C	Type 6	0.90	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
C	14	C14	31-056-24-13-014-C	PEMH2	Type 5	1.02	Manage 1	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	Moderate	High	Moderate	Not Applicable	Moderate	Low	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
C	15	C15	31-056-24-24-015-C	PSS1C	Type 6	4.00	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
C	16	C16	31-056-24-24-016-C	PEMC	Type 3	14.00	Manage 1	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
C	17	C17	31-056-24-23-017-C	LAB2	Type 5	0.54	Manage 1	High	Lacustrine Fringe (edge of deepwater areas)/Shoreland	High	Moderate	High	Moderate	Moderate	Moderate	High	Not Applicable	Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
C	18	C18	31-056-24-23-018-C	PSS1C	Type 6	0.22	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
C	19	C19	31-056-24-24-019-C	PEMH2	Type 5	5.80	Manage 1	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Low	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
C	20	C20	31-056-24-23-020-C	PSS1C	Type 6	4.18	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	High
C	21	C21	31-056-24-14-021-C	PSS1C	Type 6	0.69	Preserve	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
C	22	C22	31-056-24-14-022-C	PSS1C	Type 6	0.62	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
C	23	C23	31-056-24-14-023-C	PSS1C	Type 6	0.22	Preserve	Moderate	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High

C	24	C24	31-056-24-15-024-C	PFO2B	Type 8	0.48	Preserve	Moderate	small bog spruce/tamarack bog	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	26	C26	31-056-24-13-026-C	PFO1C	Type 7	0.12	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	27	C27	31-056-24-15-027-C	PFO1C	Type 7	3.05	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet), divided by road	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	28	C28	31-056-24-15-028-C	PFO1C	Type 7	1.10	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	1	D1	31-056-24-11-001-D	PFO1C	Type 7	0.02	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	2	D2	31-056-24-11-002-D	PEMB	Type 3	1.64	Preserve	High	Depressional/Isolated (no discernable inlets or outlets), Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	Not Applicable	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	3	D3	31-056-24-11-003-D	PEMC	Type 3	0.01	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	5	D5	31-056-24-14-005-D	PEMC	Type 3	0.10	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low	Not Applicable	Combination Discharge, Recharge	Exceptional
D	6	D6	31-056-24-14-006-D	PFO1C	Type 7	0.09	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	8	D8	31-056-24-14-008-D	PFO1C	Type 7	2.95	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	9	D9	31-056-24-14-009-D	PSSA1C	Type 6	1.46	Preserve	High	Lacustrine Fringe (edge of deepwater areas)/Shoreland, western shore of Dunning Lake	High	Moderate	High	High	Moderate	Moderate	Not Applicable	Moderate	Moderate	Not Applicable	Combination Discharge, Recharge	High
D	10	D10	31-056-24-14-010-D	PSS1C	Type 6	0.75	Preserve	High	Depressional/Isolated (no discernable inlets or outlets), connect to wetland D11	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	12	D12	31-056-24-11-012-D	PFO1C	Type 7	0.27	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	13	D13	31-056-24-11-013-D	PFO1C	Type 7	0.06	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	14	D14	31-056-24-11-014-D	PFO1C	Type 7	1.12	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Low / Moderate	Not Applicable	Combination Discharge, Recharge	High
E	1	E1	31-056-24-14-001-E	PEMC	Type 3	1.37	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low	Not Applicable	Combination Discharge, Recharge	High
E	2	E2	31-056-24-23-002-E	PEMB	Type 2	0.70	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low	Not Applicable	Combination Discharge, Recharge	Exceptional
E	3	E3	31-056-24-23-003-E	PEMC	Type 3	0.08	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low	Not Applicable	Combination Discharge, Recharge	Exceptional

E	4	E4	31-056-24-23-004-E	PEMC	Type 3	0.67	Manage 1	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low	Not Applicable	Combination Discharge, Recharge	Exceptional
E	5	E5	31-056-24-23-005-E	PFO1B	Type 8	0.65	Preserve	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low	Not Applicable	Combination Discharge, Recharge	Exceptional
E	6	E6	31-056-24-23-006-E	PEMC	Type 3	0.42	Preserve	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High		High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low	Not Applicable	Combination Discharge, Recharge	Exceptional
E	7	E7	31-056-24-14-007-E	PEMC	Type 3	1.44	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
E	9	E9	31-056-24-03-009-E	PEMB	Type 3	0.24	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Low	High	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
E	11	E11	31-056-24-01-011-E	PEMC	Type 3	18.34	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
E	12	E12	31-056-23-06-012-E	PEMH	Type 3	5.60	Preserve	High	Extensive Peatland/Organic Flat	High	High	High	High	Not Applicable	Moderate	Low	High	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
E	13	E13	31-056-23-05-013-E	PEMC	Type 3	0.13	Manage 1	Moderate	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Low	High	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
E	14	E14	31-056-23-04-014-E	PEMC	Type 3	0.49	Manage 1	Moderate	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Low	High	Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
E	15	E15	31-056-23-09-015-E	PEMC	Type 3	0.14	Manage 1	Moderate	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
E	16	E16	31-056-23-10-016-E	PEMC	Type 3	0.15	Manage 1	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
E	17	E17	31-056-23-10-017-E	PEMC	Type 3	0.76	Manage 1	Moderate	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Moderate
E	18	E18	31-056-23-10-018-E	PEMC	Type 3	8.24	Manage 1	Moderate	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	High	Not Applicable	Moderate	Not Applicable	High	Moderate	Not Applicable	Combination Discharge, Recharge	Moderate

Class	Number	Percent
Manage 3	0	0%
Manage 2	0	0%
Manage 1	16	15%
Preserve	90	85%
Totals:	106	100%

Wet ID	MnRAM ID	Cowardin	Circ. 39 Type	Acres	Mgmt Class	Veg Diversity	Hydrogeomorphology	Hydrologic Regime	Flood Storage	Downstream Water Quality	Wetland Water Quality	Shoreline Protection	Wildlife Habitat	Fishery Habitat	Amphibian Habitat	Aesthetics, Recreation, Education	Commercial	Groundwater Interaction	Stormwater Sensitivity
A	31-059-14-32-001-A	PEMC	Type 2	0.25	Preserve	High	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low/Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
B	31-059-14-32-001-B	PFOB	Type 7	200.00	Preserve	High	Extensive Peatland/Organic Flat	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	High	Low/Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
C	31-059-14-33-001-C	PFOCb	Type 7	270.00	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet), large complex influenced by beaver ponds	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	Moderate	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
D	31-059-14-33-001-D	PSS1B	Type 6	10.00	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low	Not Applicable	Combination Discharge, Recharge	High
E	31-059-14-33-001-E	PSS1B	Type 6	5.27	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low	Not Applicable	Combination Discharge, Recharge	High
F	31-059-14-33-001-F	PFOC	Type 7	2.10	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Low	Moderate	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
G	31-059-14-34-001-G	PFOC	Type 7	19.10	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Low	Moderate	Moderate	Not Applicable	Combination Discharge, Recharge	Exceptional
H	31-059-14-34-001-H	PFOC	Type 7	19.00	Preserve	High	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	High	High	High	Moderate	Not Applicable	Moderate	Low	Moderate	Low	Not Applicable	Combination Discharge, Recharge	Exceptional
I	31-059-14-06-001-I	PSS1B	Type 6	1.30	Preserve	Moderate	Lacustrine Fringe (edge of deepwater areas)/Shoreland	High	Moderate	High	Moderate	High	Moderate	High	Not Applicable	Moderate	Not Applicable	Combination Discharge, Recharge	High
J	31-059-14-05-001-J	PEMC	Type 2	0.05	Manage 1	Moderate	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	Moderate	Not Applicable	Moderate	Not Applicable	Not Applicable	Low	Not Applicable	Combination Discharge, Recharge	Exceptional

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APPENDIX G
MDOC Scoping Decision

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MINNESOTA DEPARTMENT OF COMMERCE

September 8, 2006

TO: Glenn Wilson, Commissioner
DOC (Tel: 651-296-4026)
Edward Garvey, Deputy Commissioner
DOC (Tel: 651-296-9325)

THROUGH: Marya White, Manager
DOC (Tel: 651-297-1773

FROM: William Cole Storm, Staff
DOC Energy Facility Permitting (Tel: 651-296-9535)

RE: DOC Staff Recommendation on Content of the Environmental Impact Statement
Mesaba Energy Project Proposed by Excelsior Energy, Inc.
PUC Docket No. E6472/GS-06-668

ACTION REQUIRED: Signature of the Commissioner on the attached Order, "Environmental Impact Statement Scoping Decision." Once signed, the Department of Commerce (DOC) staff will mail the notice of the order to interested parties.

BACKGROUND:

Excelsior Energy, Inc. is proposing to construct and operate a coal-feedstock Integrated Gasification Combined Cycle ("IGCC") power plant. The proposed power plant will be constructed in two phases; each phase will be capable of producing approximately 606 MW (net) of baseload power.

The U.S. Department of Energy (DOE) selected the Mesaba Energy Project under the Clean Coal Power Initiative Round 2 solicitation for negotiation of a Cooperative Agreement. Under the Cooperative Agreement DOE would provide financial assistance for the proposed project. On October 5, 2005, DOE published a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) in the Federal Register (70 FR 58207). It is DOE's intent to prepare, in cooperation with the Minnesota Department of Commerce and the Minnesota Public Utilities Commission, an EIS that will fulfill the requirements of both the Federal and State environmental review processes.

Excelsior Energy filed a Joint Permit Application for a large electric power generating plant (LEPGP) site permit, a high voltage transmission line (HVTL) routing permit and a pipeline (partial exemption) routing permit on June 16, 2006.

In an Order dated July 28, 2006, the PUC accepted the Joint Permit Application submitted by Excelsior Energy for the Mesaba Energy Project.

The permit application is being reviewed under the Full Review Process (Minn. Rule Chapter 4400) within the Power Plant Siting Act. Under the full permitting process the applicant is required to submit two sites and/or routes (i.e., a preferred and an alternate) for consideration.

As part of the permitting process, the DOC is responsible for certain procedural requirements (i.e., public notice and meetings), issuing the EIS Scoping Decision and the preparation of an Environmental Impact Statement. A contested case hearing will also be conducted following completion of the draft EIS. The PUC has up to one year from the time the application is accepted to complete the process and make a final decision; that decision includes a determination on the adequacy of the EIS and the determination whether to grant the requested permits, as well as, site/route selection and permit conditions.

EIS Scoping Process

The Minnesota Department of Commerce (DOC) held two public informational and Environmental Impact Statement (EIS) scoping meetings for the Mesaba Energy Project on consecutive nights in the vicinities of the preferred and alternative site in northeastern Minnesota.

The first meeting was held on August 22, 2006, at Taconite Community Center in Taconite. The second was held on August 23, 2006, at Hoyt Lakes Arena in Hoyt Lakes.

In satisfying the notification requirements within Minn. Rules 4400.1350, the public informational and EIS scoping meetings were announced in the *EQB Monitor* on July 31, 2006, and published notices appeared in local newspapers, including: the *Scenic Range News* on July 6; the *Duluth News Tribune, Hibbing Daily Tribune, The Mesabi Daily News,* on July 5, the *Grand Rapids Herald-Review* on July 7; and *The East Range Shopper* on July 3. Additionally, notice was sent to those persons whose names are on the EQB general notification list, regional and local governments, and each person whose property is adjacent to any of the proposed sites or routes.

Both meetings began at 7:00 pm Central Daylight Time (CDT) on the respective nights.

The Taconite meeting adjourned at approximately 10:45 pm, and the Hoyt Lakes meeting adjourned at approximately 9:30 pm. Each scoping meeting was preceded by an open house from 4:00 pm to 7:00 pm, during which DOC, U.S. Department of Energy, Office of Fossil Energy, National Energy Technology Laboratory (DOE-NETL) and Excelsior Energy personnel were available to answer questions.

Information packages were available to attendees that included a fact sheet on the State siting and routing process, and the Draft EIS Scoping Document. Also, Excelsior Energy, Inc. exhibited approximately 25 mounted graphic displays illustrating various features of the proposed project.

Collectively, approximately 400 individuals attended the public scoping meetings, including several individuals who attended both meetings. One hundred and fifty-nine individuals signed the attendance list at Taconite; 123 signed the attendance list at Hoyt Lakes. All attendees were invited to provide comments, either written or spoken, on the proposed project.

Those attendees wishing to speak were given an opportunity to do so. Comment sheets were made available for all attendees wishing to provide written comments.

DOC Energy Facility Permitting (EFP) staff led the presentations and presided over both formal meetings. A court recorder was present at each meeting to ensure that all spoken comments were recorded and legally transcribed. Fifty individuals presented oral comments at the meetings.

In addition, DOC-EFP staff provided an e-mail address for members of the public who preferred to submit their comments electronically, a postal address for those who preferred to mail their comments, a telephone fax number for those who preferred to fax their comments and a toll-free telephone number for those who preferred to speak their comments. In all, 49 comments were submitted via e-mail, US Post Service mail, or fax.

The transcripts and all comments are maintained as part of the Administrative Record.

Comments and Responses

All of the various comment submissions were reviewed to characterize specific issues, concerns, and questions, to ensure the consideration of all substantive concerns. Comments received during the public scoping period are intended to help direct and focus the analysis and contents of the EIS.

Operational Information and Design

Several respondents recommended that project operational information and design details be included in the EIS, including process information, information about the expected efficiency and reliability of the plant, feedstocks, utilities and resource requirements, emissions, and controls. Other comments addressed the physical size of the plant and the expected "footprint", rail alignments, transmission corridors, and various other features.

This information will be incorporated into the project/process description sections of the EIS.

Opinions

A number of comments contained statements of opinion and rhetorical questions, such as the desirability of a particular site. Such comments have not been assimilated into the Scoping Decision in all cases; however, the EIS will attempt to address the subjects raised to the extent appropriate.

Need

Many respondents expressed concerns about the need for the proposed facility, both from the perspective of electricity demand (e.g. exemption from certificate of need) and from the perspective of whether coal use is the best choice to meet that demand.

Because the Department has concluded that this facility qualifies as an "innovative energy project,"[1] and because Minnesota Statue 216B.1694, subdivision 2, item 1, has exempted such a project from demonstrating need, issues related to the need, size or type of the facility are excluded from consideration in this matter. Thus, such issues are not within the scope of the EIS. The DOC will not, as part of this environmental review, consider whether a different size or different type plant should be built instead. Nor will the DOC consider the no-build option.

Viability

Additionally, some of the comments conveyed concern over the long-term operation and viability of the project. Respondents questioned whether the envisioned economic benefits of the proposed facility are valid, and whether economics should outweigh the potentially adverse environmental and human effects of construction and operation of the facility.

There is currently a docket before the PUC pertaining to Excelsior Energy's proposed power purchase agreement (Docket E6472/M-05-1993) that will evaluate many of these concerns.

Overall Environmental Impacts

Numerous comments were received with respect to specific natural resources, environmental welfare and human health issues. The majority of the comments were related to the use of natural resources (e.g., coal, land, water, national parks), the discharge of pollutants to the natural environment (e.g. air, water, wetlands, , CO_2 emissions) and adverse health effects, and the socioeconomic impacts of the project (e.g. jobs, taxes, and property values).

Comments were also received relating to eminent domain, increased vehicular and rail traffic, and demands on local community services (e.g. emergency responders, local water and sewer systems, and tourism/recreation). Concerns were also expressed about connected actions and the cumulative effects of current industrial activities and future projects planned within the vicinity of the Mesaba Energy Project.

These issues, along with the typical LEPGP, HVTL and Pipeline routing and siting impacts, have been incorporated into the proposed Order on the Environmental Impact Statement Scoping Decision.

SCHEDULE: The Draft Environmental Impact Statement will be completed February, 2007.

I:\EQB\Power Plant Siting\Projects - Active\Excelsior - Mesaba Energy\Internal Correspodence\Memo to Commr on content of EIS.doc

[1] *See* Direct Testimony of Eilon Amit, at pp. 5-6, MPUC Docket No. E6472/M-05-1993 (petition of Excelsior Energy, Inc. for approval of a power purchase agreement), filed on September 5, 2006.

In the Matter of Excelsior Energy, Joint (LEPGP, HVTL, Pipeline) Application for the Mesaba Energy Project in Itasca and St. Louis Counties)

ENVIRONMENTAL IMPACT STATEMENT SCOPING DECISION

PUC Docket No. E6472/GS-06-668

The above matter has come before the Commissioner of the Department of Commerce (the Department) for a decision on the content of the Environmental Impact Statement (EIS) to be prepared in consideration of the Joint Permit Application for the proposed Mesaba Energy Project from Excelsior Energy.

Having reviewed the matter, and having consulted with staff, I hereby make the following Order on the content of the EIS:

MATTERS TO BE ADDRESSED

The EIS will address the following matters:

Cover Page
Executive Summary
Table of Contents (Including List of Figures, List of Tables)
Acronyms and Abbreviations
Glossary

1. Purpose and Need for the Proposed Action
    - 1.1 Introduction
      (Lead Agency, Cooperating Agencies, Project Proponent, Location)
    - 1.2 Clean Coal Power Initiative (Background and project selection)
    - 1.3 Proposed Action (Brief synopsis distinguishing between DOE's Proposed Action and project proponent's Proposed Action)
    - 1.4 Purpose and Need for the Proposed Action
        - 1.4.1 Purpose of the Proposed Action
        - 1.4.2 Need for the Proposed Action
            - 1.4.2.1 DOE Need
            - 1.4.2.2 Minnesota DOC and PUC Role
            - 1.4.2.3 Project Proponent Need
    - 1.5 Regulatory Framework
        - 1.5.1 National Environmental Policy Act
        - 1.5.2 Minnesota State Requirements
            - 1.5.2.1 Minnesota Rules, Chapter 4400
            - 1.5.2.2 Minnesota Statute 216B.1694 Innovation Energy Project

- 1.5.2.3 Minnesota Rules, Chapter 4415/18 CFR Part 157 of the Natural Gas Act
- 1.5.2.4 Minnesota Environmental Policy Act
- 1.5.2.5 Taconite Tax Relief Area
- 1.5.2.6 Other State Requirements and Permits

1.6 Scoping of the Environmental Impact Statement
- 1.6.1 NEPA Scoping Process
- 1.6.2 Minnesota Rule 4400.1700, subpart 2
- 1.6.2 Public Comments Received
- 1.6.3 Special CCPI Considerations under NEPA
- 1.6.4 Region of Influence
- 1.6.5 Connected Actions (Phase II Power Plant, County Hwy 7 Realignment)

1.7 Associated Actions
- 1.7.1 Related NEPA Compliance Actions (Including Final Programmatic EIS, Clean Coal Technology Demonstration Program, DOE, November 1989)
- 1.7.2 Related DOE CCPI Activities
- 1.7.3 Related Regional Activities

2. Proposed Action and Alternatives

2.1 Description of the Proposed Action (Non-site-specific description and general features of the Mesaba Energy Project)
- 2.1.1 Technology Selection and Process Description
  - 2.1.1.1 Technology Selection (Including discussion of lessons learned from Wabash River Coal Gasification Repowering Project)
  - 2.1.1.2 Gasification Combined-Cycle Technology
  - 2.1.1.3 Process Components and Major Equipment (potential carbon capture/transport/sequestering)
  - 2.1.1.4 Plant Utility Systems
- 2.1.2 Resource Requirements (Inputs)
  (General needs for the plant that affect site selection and help frame the later discussion of how site alternatives were selected and how sites were eliminated)
  - 2.1.2.1 Feedstock and Flux Requirements
  - 2.1.2.2 Natural Gas Requirements
  - 2.1.2.3 Process Water Requirements
  - 2.1.2.4 Infrastructure Requirements
  - 2.1.2.5 Transportation Requirements
  - 2.1.2.6 Land Area Requirements
- 2.1.3 Discharges, Wastes, and Products (Outputs)
  - 2.1.3.1 Air Emissions
  - 2.1.3.2 Water Effluents
  - 2.1.3.3 Liquid Wastes
  - 2.1.3.4 Solid Wastes
  - 2.1.3.5 Marketable Products
  - 2.1.3.6 Toxic and Hazardous Materials
  - 2.1.3.7 Pollution Prevention, Recycling, and Reuse
- 2.1.4 Construction Plans
  - 2.1.4.1 Construction Staging and Schedule
  - 2.1.4.2 Construction Materials and Suppliers
  - 2.1.4.3 Construction Labor
  - 2.1.4.4 Construction Safety Policies and Programs

- 2.1.5 Operation Plans
  - 2.1.5.1 Test Plans
  - 2.1.5.2 Operational Plans
  - 2.1.5.3 Operational Labor
  - 2.1.5.4 Health & Safety Policies and Programs
  - 2.1.5.5 Worst-case Operating Scenario
- 2.2 Alternatives
  - 2.2.1 Alternatives Available to DOE
    - 2.2.1.1 Proposed Action (Proceed continue cost-shared funding beyond preliminary design/project definition)
    - 2.2.1.2 No-Action Alternative (Do not proceed with the cooperative agreement)
  - 2.2.2 Alternatives Sites Considered (by Excelsior Energy)
    - 2.2.2.1 Preferred West Range Site (Including HVTL & Pipeline corridors)
    - 2.2.2.2 Alternative East Range Site (Including HVTL & Pipeline corridors)
    - 2.2.2.3 Alternatives Eliminated from Detailed Evaluation
  - 2.2.3 Alternatives Available to Minnesota PUC
    - 2.2.3.1 Approve Permits for Preferred West Range Site
    - 2.2.3.2 Approve Permits for Alternative East Range Site
    - 2.2.3.3 Disapprove the Permit Application

3. Affected Environment (Note: This section will contain the described information for both the West Range Site and the East Range Site)
   - 3.1 Introduction
   - 3.X Resource Subject (Note: This "X" outline applies to all resource subjects listed below)
     - 3.X.X.1 Regional and Local Conditions
     - 3.X.X.2 Site-specific Conditions
     - 3.X.X.3 Corridor-specific Conditions
   - 3.2 Aesthetics (daytime and nighttime)
     - 3.2.1 Physical Setting
     - 3.2.2 Viewshed
     - 3.2.3 Scenic Resources
   - 3.3 Air Quality and Climate
     - 3.3.1 Local and Regional Climate
     - 3.3.2 Air Quality Regulations
     - 3.3.3 Local and Regional Air Quality
     - 3.3.4 Sources of Air Pollution
     - 3.3.5 Sensitive Receptors (Including Class I Areas)
     - 3.3.6 Air Quality Management Plans
   - 3.4 Geology and Soils
     - 3.4.1 Geology
     - 3.4.2 Mineral Resources and Mining
     - 3.4.3 Seismic Activity
     - 3.4.4 Soils
     - 3.4.5 Prime Farmland
     - 3.4.6 Potential Formations for Geologic Sequestration of CO_2
   - 3.5 Water Resources
     - 3.5.1 Groundwater
     - 3.5.2 Surface Water

- 3.6 Floodplains
  - 3.6.1 Local Hydrology and Drainage
  - 3.6.2 Flood Hazard Areas
- 3.7 Wetlands
- 3.8 Biological Resources
  - 3.8.1 Terrestrial Ecosystems
  - 3.8.2 Aquatic Ecosystems
  - 3.8.3 Protected Species and Habitats
- 3.9 Cultural Resources
  - 3.9.1 Archeological Resources
  - 3.9.2 Historic Resources
  - 3.9.3 Native American Cultural Resources (includes Indian treaty rights)
- 3.10 Land Use
  - 3.10.1 Existing Land Use/Human Settlement
  - 3.10.2 Zoning Ordinances
  - 3.10.3 Local and Regional Land Use Plans
- 3.11 Socioeconomics
  - 3.11.1 Demographics
  - 3.11.2 Housing
  - 3.11.3 Employment and Income
  - 3.11.4 Business and Economy
- 3.12 Environmental Justice
  - 3.12.1 Minority Populations
  - 3.12.2 Low-Income Populations
- 3.13 Community Services
  - 3.13.1 Law Enforcement
  - 3.13.2 Fire Protection
  - 3.13.3 Emergency Response
  - 3.13.4 Parks and Recreation
- 3.14 Utility Systems
  - 3.14.1 Water
  - 3.14.2 Wastewater
  - 3.14.3 Energy
  - 3.14.4 Telecommunications
- 3.15 Traffic and Transportation
  - 3.15.1 Local Roads and LOS
  - 3.15.2 Rail Access (includes impact of rail traffic on emergency vehicle response)
- 3.16 Materials and Waste Management
  - 3.16.1 Construction Materials
  - 3.16.2 Coal and other Feedstock
  - 3.16.3 Landfills
  - 3.16.4 Recycling Facilities
- 3.17 Safety and Health
  - 3.17.1 Occupational Safety Considerations
  - 3.17.2 Community Health Issues
  - 3.17.3 Local and Regional Receptors/Health Risk Assessment
  - 3.17.4 Electromagnetic Fields (EMF) (Including Henshaw effect)

- 3.18 Noise
  - 3.18.1 Local Ordinances
  - 3.18.2 Existing Sources of Noise
  - 3.18.3 Local and Regional Receptors
- 3.19 Light and Glare
  - 3.19.1 Local Ordinances
  - 3.19.2 Existing Light Sources
  - 3.19.3 Local and Regional Receptors

4. Environmental Consequences (Note: This section will contain the described information for both the West Range Site and the East Range Site)
   - 4.1 Introduction (Including categories of relative impact)
   - 4.X Resource Subject (Note: This "x" outline applies to all resource areas listed)
     - 4.X.1 Approach to Impacts Analysis
       - 4.X.1.1 Region of Influence
       - 4.X.1.2 Method of Analysis
       - 4.X.1.3 Criteria of Impacts
     - 4.X.2 Common Impacts of Proposed Action (Including construction and operation, Phases I & II)
     - 4.X.3 Site-specific Impacts (Including construction and operation, Phases I & II)
       - 4.X.3.1 West Range Site
       - 4.X.3.2 East Range Site
     - 4.X.4 Corridor-specific Impacts (Including construction and operation, Phases I & II)
       - 4.X.3.1 West Range Transmission, Pipeline, and Transportation Corridors
       - 4.X.3.2 East Range Transmission, Pipeline, and Transportation Corridors
     - 4.X.5 Impacts of No-Action Alternative
     - 4.X.6 Mitigation of Adverse Impacts
   - 4.2 Aesthetics
   - 4.3 Air Quality (includes discussions on CO_2)
   - 4.4 Geology and Soils
   - 4.5 Water Resources (surface & groundwater, including the Swan & Mississippi)
   - 4.6 Floodplains
   - 4.7 Wetlands
   - 4.8 Biological Resources
   - 4.9 Cultural Resources (includes Indian treaty rights)
   - 4.10 Land Use/Human Settlement (includes recreational land uses)
   - 4.11 Socioeconomics
   - 4.12 Environmental Justice
   - 4.13 Community Services
   - 4.14 Utility Systems
   - 4.15 Traffic and Transportation (includes impact of rail traffic on emergency vehicle response)
   - 4.16 Materials and Waste Management
   - 4.17 Safety and Health
   - 4.18 Noise
   - 4.19 Light and Glare
5. Summary of Environmental Consequences
   - 5.1 Comparative Impacts of Alternatives
   - 5.2 Potential Cumulative Impacts
   - 5.3 Unavoidable Adverse Impacts and Mitigation

5.4 Irreversible and Irretrievable Commitments of Resources
5.5 Relationship between Short-term Uses of the Environment and Long-term Productivity
6. Regulatory Compliance and Permit Requirements
7. Agencies and Individuals Contacted
8. Distribution List
9. References
10. List of Preparers (Including Conflict of Interest Certification)
11. Index

Appendix

The above guide is not intended to serve as a "Table of Contents" for the EIS document, and as such, the organization of the information and data may not be similar to that appearing in the EIS.

IDENTIFICATION OF PERMITS

The EIS will include a list of permits that will be required for the applicant to construct this project.

ISSUES OUTSIDE OF THE ENVIRONMENTAL ASSESSMENT

Because the Department has concluded that this facility qualifies as an "innovative energy project,"[1] and because Minnesota Statue 216B.1694, subdivision 2, item 1, has exempted such a project from demonstrating need, issues related to the need, size or type of the facility are excluded from consideration in this matter. Thus, such issues are not within the scope of the EIS. The DOC will not, as part of this environmental review, consider whether a different size or different type plant should be built instead. Nor will the DOC consider the no-build option.

SCHEDULE

The EIS shall be completed in February, 2007.

Signed this 13 day of September 2006

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE

Glenn Wilson, Commissioner

I:\EQB\Power Plant Siting\Projects - Active\Excelsior - Mesaba Energy\Environmental Review\Scoping Documents\EIS-scoping-decision.doc

[1] *See* Direct Testimony of Eilon Amit, at pp. 5-6, MPUC Docket No. E6472/M-05-1993 (petition of Excelsior Energy, Inc. for approval of a power purchase agreement), filed on September 5, 2006.

APPENDIX H
Process Water Discharge Alternatives (West Range Site)

(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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APPENDIX H1
Environmental Analysis of Alternative Discharge Arrangements

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Environmental Analysis of Alternative Discharge Arrangements:

I. Increased Discharge to Holman Lake and Reduced or Eliminated Discharge to Canisteo Mine Pit
II. Relocation of the Holman Lake Outfall to the Swan River
III. Zero Liquid Discharge Treatment

Prepared by Excelsior Energy Inc.
March 15, 2007 **(modified March 20, 2009)**

Introduction
Excelsior has analyzed the environmental impacts of three alternative discharge arrangements for cooling tower blowdown ("CTB") from the West Range Site. These represent potential mitigation alternatives to the base case that was proposed in Excelsior's National Pollution Discharge Elimination System ("NPDES") permit application. The mitigation alternatives are not necessarily mutually exclusive. Since the East Range Site's placement within the Lake Superior watershed requires complete zero liquid discharge treatment of all water, no alternatives analysis was performed for that Site. **[Note: Since publication of the Draft EIS, Excelsior announced its commitment to implement the enhanced ZLD system at the West Range Site, as described under *Discharge Alternative 3: Zero Liquid Discharge Treatment* below. This would reduce the water demand, eliminate blowdown pipelines, and eliminate the majority of water quality impacts as discussed in the Draft EIS. Excelsior has modified its NPDES/SDS permit application for submittal to the Minnesota Pollution Control Agency (MPCA) to reflect the use of the enhanced ZLD system at the West Range Site. Appendix H2, *Final Water Retention, Recovery & Reuse Report*, has been added for the Final EIS and provides a description of the ZLD system that would treat the non-contact wastewater. See Sections 2.0 and 4.5 (Volume 1) of the Final EIS for updated discussions on water balance and potential water quality impacts, respectively.]**

Discharge Alternative 1: Increased Discharge to Holman Lake and Reduced or Eliminated Discharge to Canisteo Mine Pit

Description

An alternative discharge arrangement to that proposed in Excelsior's application for a NPDES permit would be to discharge a greater portion of the IGCC Power Station's cooling tower blowdown ("CTB") to Holman Lake, thereby significantly reducing or eliminating such discharges to the Canisteo Mine Pit ("CMP") under normal operating conditions. Excelsior is exploring this option, the execution of which will be subject to discussions with the Minnesota Pollution Control Agency ("MPCA"). To examine the full effects possible under this alternative, Excelsior has assumed that 100% of the CTB can be discharged to Holman Lake and that the discharge to the CMP can be eliminated. The ultimate allocation may fall between this case and the one presented in Section 4.5 of the Environmental Impact Statement ("EIS"), and the environmental impacts can be interpolated accordingly.

Water Management Plan

Implementing this alternative would require modest adjustments to the water management plan. These adjustments are the result of the reduction of the appropriation for Phase II by 1,700 gpm (based on five cycles of concentration of CTB rather than three) and a reduction of 300-3,100 gpm of availability from the CMP since its water would no longer be replenished by CTB discharge.

In Phase I operations, the 300 gpm lost from the CMP can be replaced, for example by reducing the discharge from the Hill Annex Mine Pit ("HAMP") Complex to Upper Panasa Lake compared to the base case. The adjusted water management plan is shown in Figure 1. In Phase II, a total of up to 1,400 gpm must be replaced due to the factors mentioned above. The sustainable flows modeled in Excelsior's Water Appropriation Permit application, reproduced in Table 1 below, represent only one possible scenario and were selected to show appropriation from each potential source. An equally likely scenario for Mesaba One and Mesaba Two would be to operate the CMP and HAMP Complex at lower elevations (to obtain flows closer to the maximum estimated flow available) and supplement flows as necessary with water from the Lind Mine Pit and Prairie River.

Figure 1: Phase I Water Operations Flow Rates: West Range IGCC Power Station

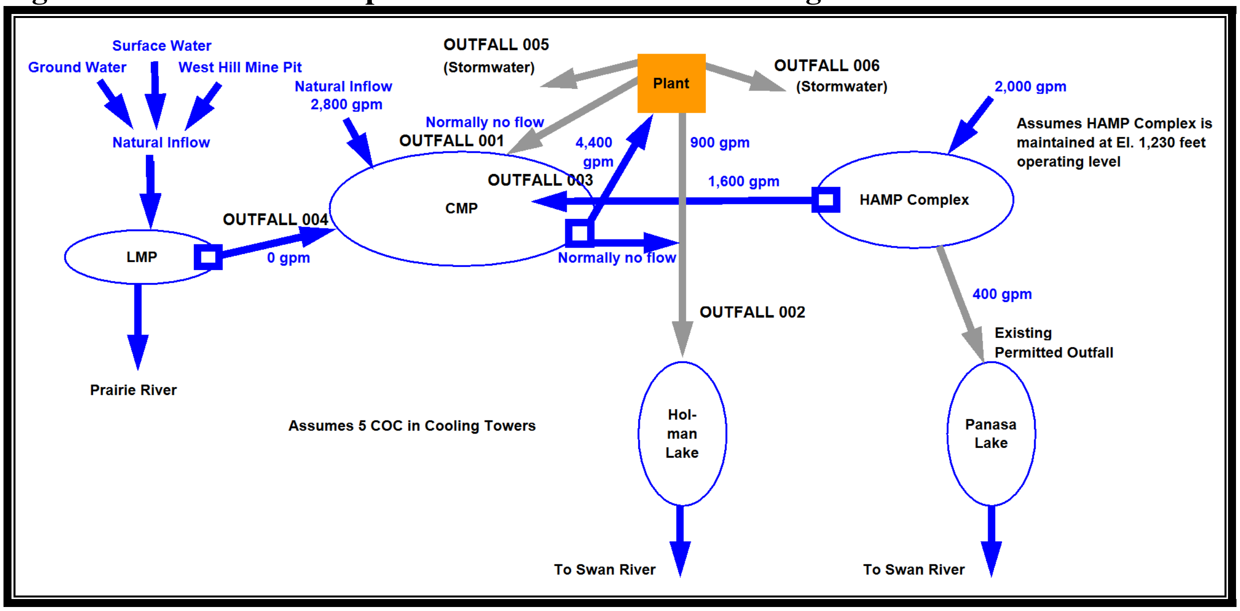


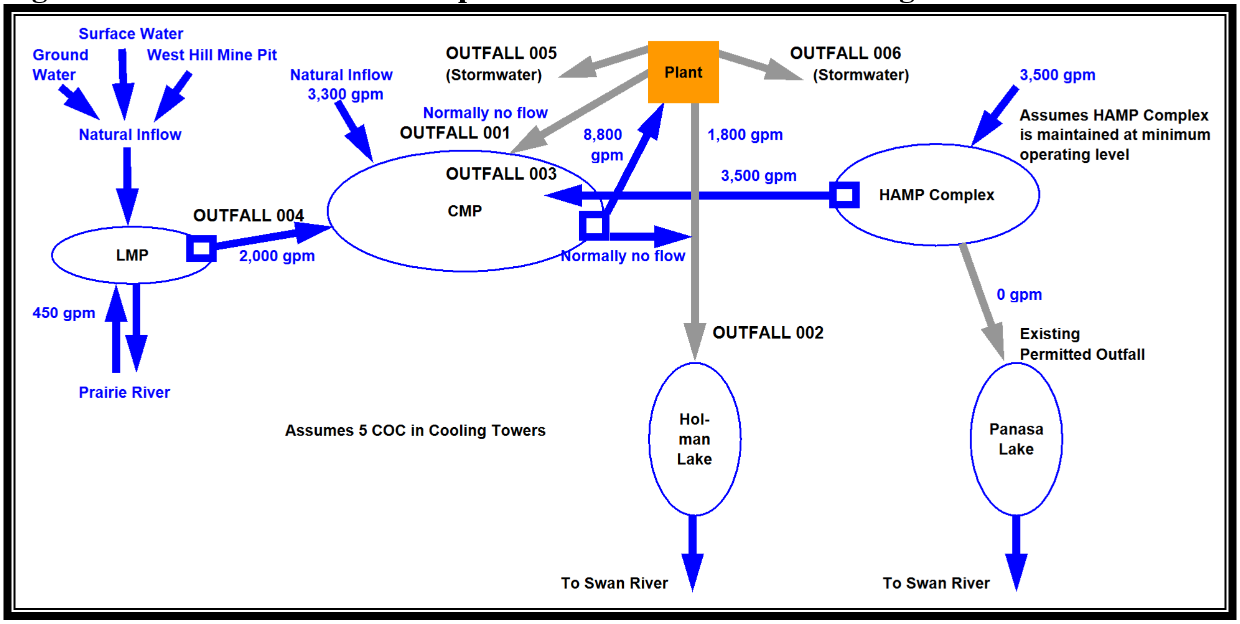
Table 1: Sustainable Flows Modeled in Excelsior's Water Appropriation Permit Application

Water Source	Est. Range of Flow (gpm)	Sustainable Flow for Water Appropriation Modeling (gpm)
Canisteo Mine Pit	810-4,190	2,800
Hill-Annex Mine Pit Complex	1,600-4,030[a]	2,000[b]
Lind Mine Pit	1,600-2,000	1,800[c]
Prairie River	0-2,470[d]	2,470[d]
Discharge from IGCC Power Station	0-3,500	Varies

Notes:
[a]Maximum flow occurs at minimum operating elevation
[b]At an operating elevation of 1,230 ft msl
[c]Based on one summer flow measurement at the LMP outlet and one winter and one summer flow measurement taken at the West Hill Mine Pit outlet
[d]Based on 25% of 7Q10

Figure 2 shows a possible water management plan that could serve Mesaba One and Mesaba Two under the scenario where CTB discharges would be eliminated. In the event that mine pit yields are significantly lower than expected, or during times of extended drought, the option would exist to revert back to the originally proposed arrangement with discharge into the CMP.

Figure 2: Phase I and II Water Operations Flow Rates: West Range IGCC Power Station



Water Quality

The most direct environmental impact associated with this alternative is that by eliminating CTB discharges to the CMP, the water quality of the CMP would remain relatively constant, avoiding the gradual increase in the concentration of pre-existing constituents due to the evaporation of cooling water. Additionally, the water quality of the CTB would no longer escalate as the source water quality would remain relatively constant. This would allow the cooling towers to operate at five cycles of concentration rather than three as specified in the base case. Table 2 shows the estimated concentration of chemical constituents in the CTB discharge for this case. See the section below entitled "Swan River" for further discussion of water quality impacts that would result from water quality trading.

Table 2: Expected IGCC Power Station Discharges and Applicable State Numerical Water Quality Standards

Constituent	Units	Class 2 WQ Standard	Anticipated Effluent Water Quality – Phase I & II (5 COC)
Hardness	mg/l	250	1,540
Alkalinity	mg/l	n/a	--
Bicarbonate	mg/l	n/a	869
Calcium	mg/l	n/a	--
Magnesium	mg/l	n/a	--
Iron	mg/l	n/a	--
Manganese	mg/l	n/a	--
Chloride	mg/l	230	26
Sulfate	mg/l	n/a	487
TDS	mg/l	700	1,685
pH	mg/l	6 - 9	6 - 9
Aluminum	ug/l	125	50
Arsenic	ug/l	53	--
Barium	ug/l	--	--
Cadmium	ug/l	2.0[1]	Note 3
Chromium (6+)	ug/l	32[1]	Note 3
Copper	ug/l	15[1]	Note 3
Fluoride	mg/l	n/a	--
Mercury	ng/l	6.9	4.5
Nickel	ug/l	283[1]	25
Potassium	mg/l	n/a	20
Selenium	ug/l	5	Note 3
Sodium	mg/l	--	--
Specific Conductivity	umhos/cm	1000	2,400[4]
Zinc (3)	ug/l	191[1]	Note 3
Phosphorus	mg/l	1[2]	0.02

[1]Indicates a hardness based standard. It is assumed hardness in the receiving water is >200 mg/L based on available data.
[2]Phosphorus standard is an effluent limit and not a water quality standard.
[3]Results below detection limit.
[4]Values depicted reflect assumed values in the groundwater and LMP

Due to the increased discharge rate of CTB to Holman Lake, concentrations of chemical constituents in Holman Lake would increase, but would not escalate over the long term. Figures 3 and 4 show the modeled concentration of total dissolved solids (TDS) and mercury, respectively, over the life of the project for the base case with CTB discharges to both the CMP and Holman Lake. Figures 5 and 6 show the same for the alternative where CTB discharge to the CMP is eliminated. As in the base case, a variance for hardness and TDS, the standards for which are based on aesthetic rather than health-related concerns, may be necessary.

Figure 3: Water Quality (TDS) of Receiving Waters for Base Case: Discharge to Holman Lake and Canisteo Mine Pit

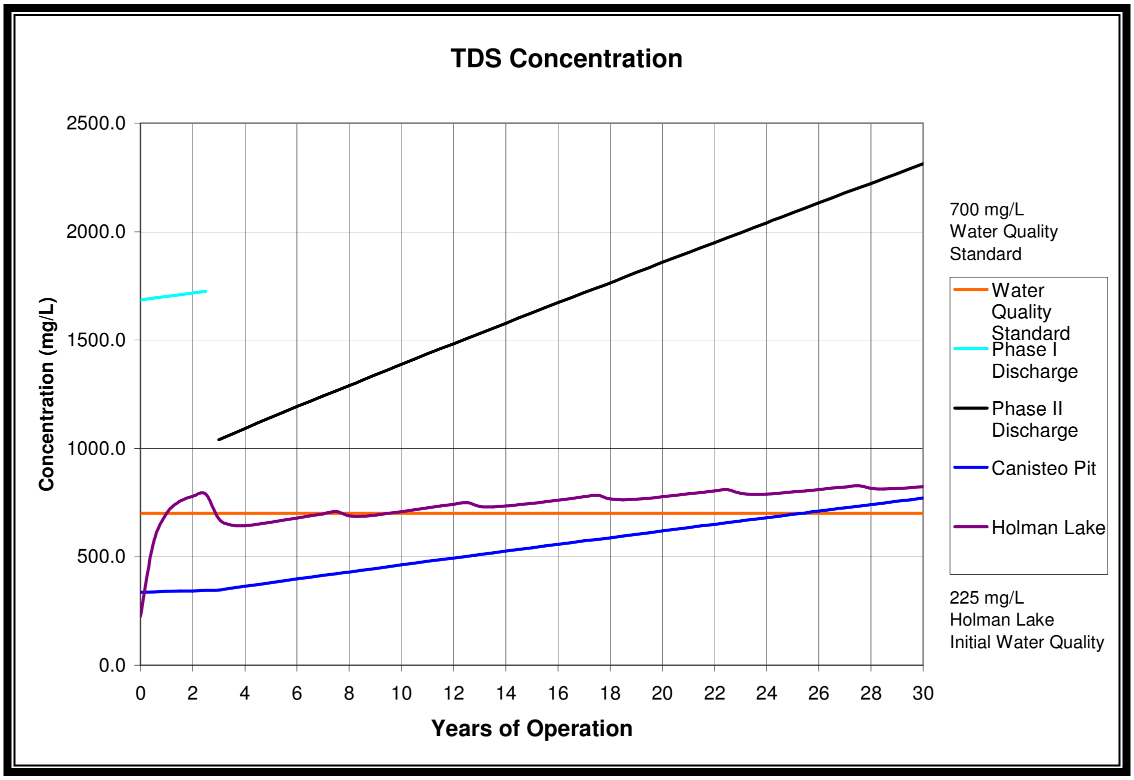


Figure 4: Water Quality (Mercury) of Receiving Waters for Base Case: Discharge to Holman Lake and Canisteo Mine Pit

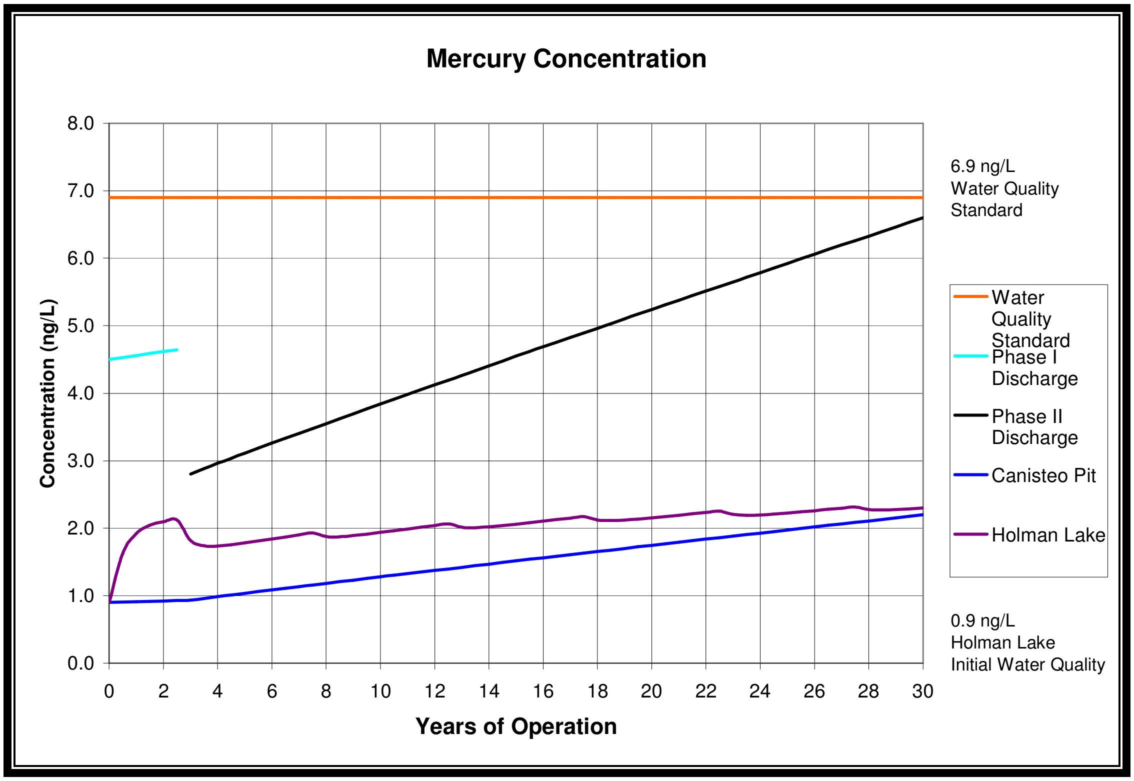


Figure 5: Water Quality (TDS) of Receiving Waters for the Alternative Case: Discharge to Holman Lake Only

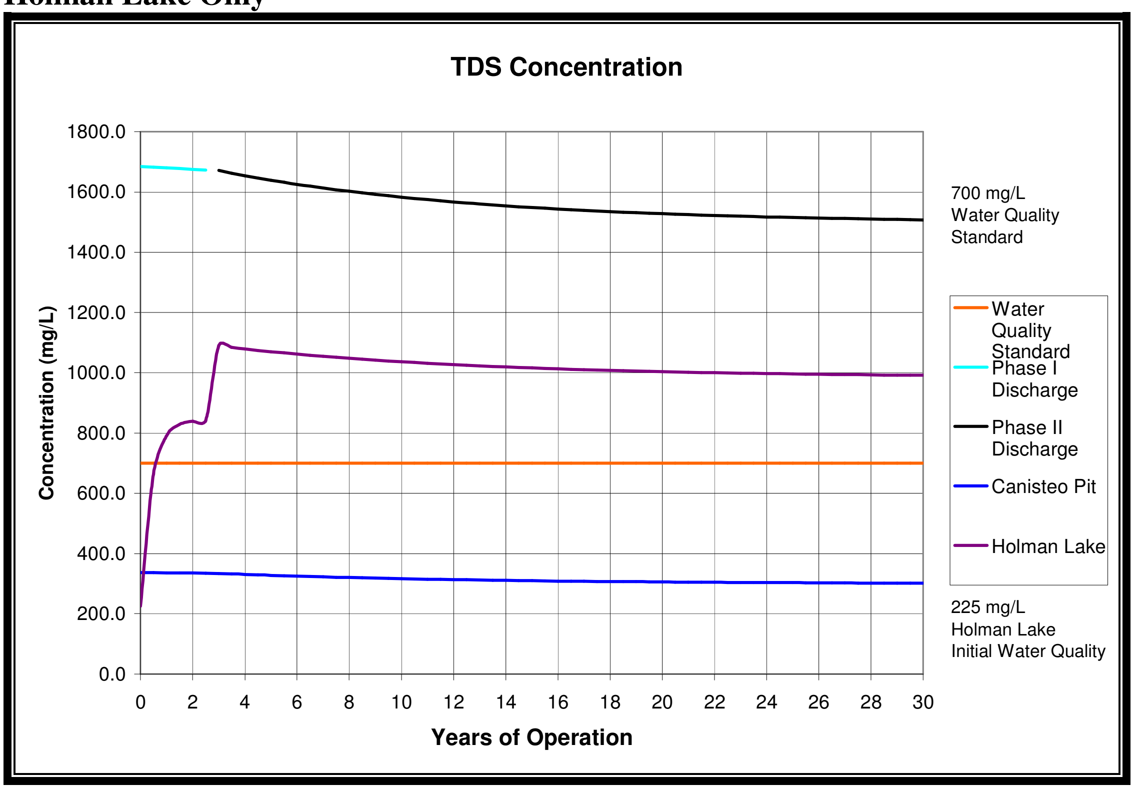
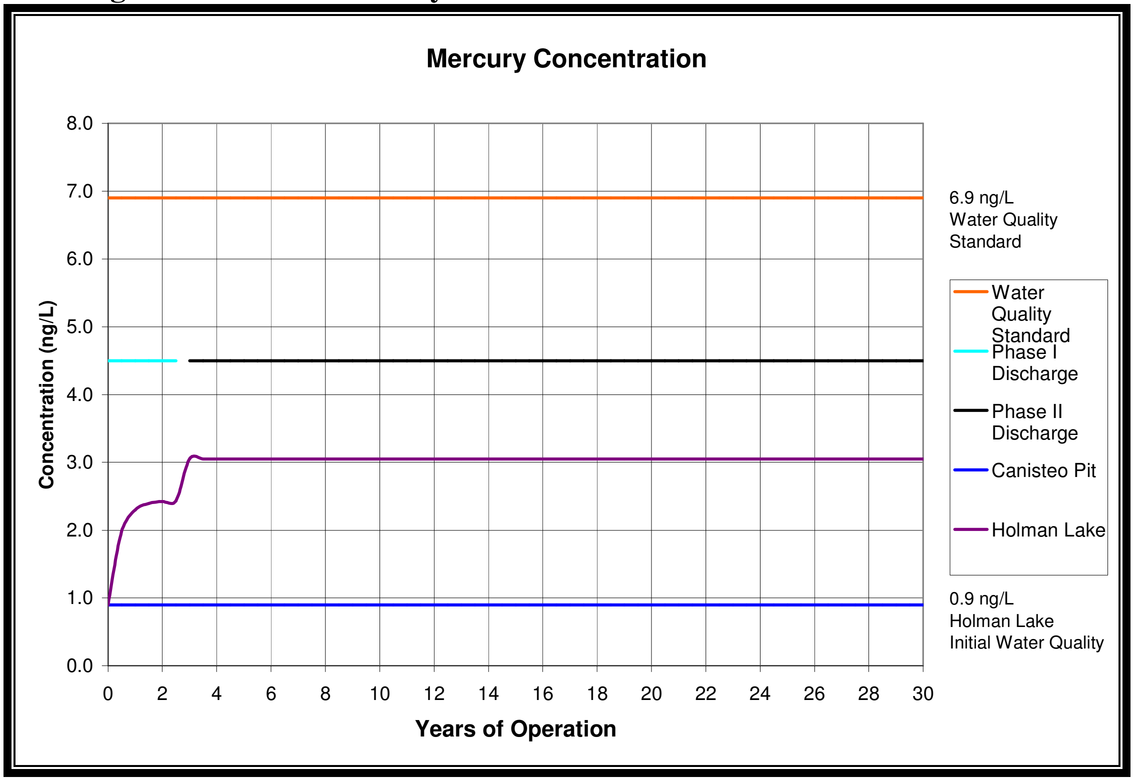


Figure 6: Water Quality (Mercury) of Receiving Waters for the Alternative Case: Discharge to Holman Lake Only



Sulfate

There is currently no water quality standard applicable to sulfate concentrations in the CMP or Holman Lake. However, the MPCA has raised questions regarding the potential relationship between sulfate and the generation of methyl mercury in certain aquatic environments.[1] While it has been demonstrated that the addition of sulfate may stimulate the formation of methyl mercury in peatlands,[2] the relationship may depend on several variables in addition to sulfate. These include organic carbon, the fraction of bioavailable mercury, the presence of adjacent wetlands and peat bogs in particular, and the microbial community structure (not all sulfate reducing bacteria methylate mercury).[3] Therefore, it is unclear at this time whether there would

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[1] May 4, 2006 letter from Minnesota Pollution Control Agency (Richard Sandberg, Manager, Air Quality Permits Section, Industrial Division) to Minnesota Department of Commerce (William Storm, Energy Facility Permitting), page 4. In the letter, the MPCA indicates that increases in sulfate in certain aquatic environments can contribute to the formation of methylmercury in receiving waters.

[2] Branfireun BA, Roulet NT, Kelly CA & Rudd JWM (1999) In situ sulphate stimulation of mercury methylation in a boreal peatland: toward a link between acid rain and methylmercury contamination in remote environments. Global Geochemical Cycles 13: 743-750. Branfireun BA, Bishop K, Roulet NT, Granberg G & Nilsson M (2001) Mercury cycling in boreal ecosystems: The long-term effect of acid rain constituents on peatland pore water methylmercury concentrations. Geophys. Res. Lett. 28: 1227-1230.

[3] Macalady JL, Mack EE & Scow KM (2000) Sediment Microbial Community Structure and Mercury Methylation in Mercury-Polluted Clear Lake, California. Appl. Environ. Microbiol. 66: 1479. Porvari P & Verta M (1995)

be any impact associated with sulfate discharged to Holman Lake via the CTB from Mesaba One and Mesaba Two. To the extent appropriate, this matter will be addressed during the National Pollutant Discharge Elimination System permitting process.

Thermal impacts are expected to be minimal. The thermal modeling presented in the Environmental Supplement, which showed negligible impacts, was based upon a 2,400 gpm flow, which exceeds any flow into Holman Lake that is considered in the base case or this alternative case.

Outflow from Holman Lake

Water flows through Holman Lake and into the Swan River would increase compared to the base case. Table 3 summarizes the conservatively modeled existing flow and the increase in both scenarios. While the relative increase appears large, Holman Lake has historically experienced large fluctuations in flows caused by dewatering flows from nearby mining activity and beaver dam management. Therefore, historical outflows from Holman Lake have far exceeded those that will result from full CTB discharge, and scouring of the outflow from the lake is not likely to be of concern.

Table 3: Water Flows through Holman Lake

	Existing Flow	Maximum CTB Discharge	Total Outflow
Base Case	1,215 gpm	825 gpm	2,040 gpm
Alternative Case	1,215 gpm	1,800 gpm	3,015 gpm

Swan River

The headwaters of the Swan River are located about nine river-miles upstream of Holman Lake. At the outlet of Swan Lake, the origin of the Swan River, the average flow is approximately 28,000 gpm.[4] No forks in the Swan River occur between its origin and Holman Lake and, within that stretch, three streams from named lakes empty therein (these streams emanate from Snowball Lake, Lower Panasa Lake, and Twin Lakes); therefore, the flow rate at the point at which Mesaba's discharge enters the Swan River is expected to be minimal in relation to the existing flow except during periods of extremely low flow in the Swan River.

The Swan River is impaired for mercury and dissolved oxygen (for which phosphorus is the surrogate chemical of concern). Excelsior anticipates that water quality trading – that is, reducing mercury and phosphorus emissions via contractual arrangements with nearby sources in order to offset Mesaba's discharges – will be a valid approach to addressing these regulatory concerns. The MPCA is developing water quality trading rules, but has already issued NPDES

Methylmercury production In flooded soils - a laboratory study. Water, Air, and Soil Poll. 80: 765-773.

[4] Minnesota Steel Project Draft Environmental Impact Statement. p. 4-50. Feb. 2007 (*see* http://files.dnr.state.mn.us/input/environmentalreview/minnsteel/deis/deis_1.pdf).

permits in the past that featured such trading.[5]

Based on preliminary discussions with nearby sources in the watershed, trading opportunities do exist, since additional controls and improved operating practices could reduce their emissions. It is anticipated that under MPCA oversight, Excelsior could enter into agreements with these nearby sources to ensure that the reductions would take place and to compensate the sources for the cost of the reductions. Trading would occur at a ratio of greater than 1:1, thereby reducing the mass loading of mercury and phosphorus to the Swan River. Therefore, under a water quality trading arrangement, the impairment to the Swan River and downstream waters would decrease.

Air Quality

Particulate matter emissions due to cooling tower drift would decrease slightly due to the water quality of the Canisteo Mine Pit remaining relatively constant. Instead of 39 tons/year for Mesaba One and Mesaba Two, worst case emissions would be expected to decrease to 35 tons/year.

Discharge Alternative 2: Relocation of the Holman Lake Outfall to the Swan River

Description

An alternative discharge arrangement to that proposed in Excelsior's application for a NPDES permit would be to relocate the outfall currently proposed into Holman Lake to instead discharge to the Swan River. This alternative could occur independently of or in conjunction with Discharge Alternative 1 as discussed above. It would reduce the concern of localized impacts associated with discharge into a relatively small lake, and may expand the options for water quality trading mentioned in Alternative 1. Environmental impacts associated with the blowdown pipeline alignment could be minimized by following the proposed HVTL and natural gas pipeline corridors for approximately 4.5 miles to where they cross the Swan River. This crossing is less than half a mile upstream from the confluence of Holman Lake's discharge and the Swan River. While the currently proposed pipeline from the plant to Holman Lake could be eliminated, it may be necessary to maintain the proposed tie-in linking the CMP to Holman Lake in order to manage water levels in the CMP.

Two related alternatives include discharge to the Mississippi River and the Prairie River. The large distance to the Mississippi River (approximately 13 miles) rules it out as a reasonable alternative, even though the larger flow would alleviate some other concerns. The Prairie River has larger flows than the Swan River, but not large enough to dismiss the fundamental

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[5] NPDES permits for Southern Minnesota Beet Sugar Cooperative (2004) and Rahr Malting (1997) both included water quality trading.

environmental concerns associated with blowdown discharge such as the need for variances and mercury impairment. Also, it is anticipated that there would be fewer trading partners available in the Prairie River watershed than the Swan River. Finally, the Prairie River empties into Prairie Lake approximately 13 river miles downstream of the potential discharge point. This lake appears to have many residential property owners located on its shoreline and is impaired for fish consumption due to mercury, adding significant uncertainty regarding the practicality of obtaining the necessary discharge permit.

Water Quality

The most direct environmental impacts of this alternative are associated with the water quality of Holman Lake and Swan River. Because Holman Lake flows into the Swan River, the mass load on the watershed of chemicals of concern, such as phosphorus and mercury, would not change under this alternative. However, the allocation of localized impact between Holman Lake and Swan River would be affected.

Under this alternative, impacts to the water quality of Holman Lake as illustrated in Figures 3-6 would be avoided – i.e, concentrations of TDS, hardness, phosphate, mercury, etc. within the lake would remain at background levels. On the other hand, impacts to the Swan River's water quality would be somewhat magnified, as this alternative bypasses the dilutive effect of discharging into Holman Lake. As discussed in Alternative 1, the average flow of Swan River is at least 28,000 gpm, while the maximum discharge to the Swan River would be 1,800 gpm. Therefore, the impact to water quality during normal flow conditions would be modest. However, because the 7Q10 flow of the Swan River is just 800 gpm,[6] the river could consist primarily of CTB during conditions of extremely low flows. While flow augmentation during such periods could be considered a positive effect, the TDS and hardness concentrations would be relatively high. The maximum possible discharge concentrations would be the same as those identified in Table 2, and the allowable mixing zone of 25% of the 7Q10 flow (200 gpm) would do little to dilute those concentrations. As with the base case, a variance request for TDS and hardness, the standards for which are based on aesthetic rather than health-related concerns, may be necessary.

Thermal Impacts

As with water quality, because the blowdown discharge flow would be approximately 6% of the river flow, this alternative would have minimal thermal impacts during average flow conditions. However, the impact could become very significant during low flows, and would most likely introduce the need for a variance for the temperature of the discharge. During worst-case conditions, blowdown water would leave the plant at approximately 86°F during peak summer temperatures,[7] which just meets absolute state water quality standards, but would exceed the relative limit of 3°F above ambient water temperatures (Minn. R. 7050.0220 subp. 5). Cooling

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[6] United States Geological Survey. Low Flow Application for the Swan River near Calumet, MN. Available: http://gisdmnspl.cr.usgs.gov/lowflow/contData/logPearson/p05216860.pdf.

[7] Excelsior Energy. Appendix E to the Mesaba Energy Project NPDES Permit. Submitted to the MPCA June 2006.

ponds of sufficient size may be able to mitigate thermal concerns. Otherwise, due to the low 7Q10 value for the Swan River, it is unlikely that this standard could be met without a variance.

Sulfate and Other Localized Concerns

The possibility of localized impacts, such as the impact of sulfate on the formation of methyl mercury and concerns surrounding the outflow of Holman Lake, would be reduced. While the possibility of methyl mercury formation would not be completely eliminated, some factors that are suggested to be involved with its formation would be diminished. There would generally be less contact with adjacent wetlands under this alternative, and sulfate would be more fully diluted under normal flow conditions. While some localized impact to the Swan River near the point of discharge is possible (see variance discussions above), they are of lesser concern in a flowing river than in a lake.

Pipeline Alignment Impacts

While this alternative would increase the total miles of blowdown pipeline by approximately two miles, it would be along existing corridors, preventing any impacts associated with new pipeline corridors. A 150-ft right-of-way ("ROW") is proposed where HVTL and natural gas pipelines share a corridor. The corridor may be able to accommodate the blowdown pipeline as proposed, or slight additional widening may be necessary. Therefore, while such widening may cause additional wetland and land use impacts, the impacts would be very small, and would be minimized by combining infrastructure corridors to the maximum extent possible.

Discharge Alternative 3: Zero Liquid Discharge Treatment

Description

An alternative to the discharge proposed in Excelsior's NPDES permit application would be to eliminate all CTB discharge through the use of Zero Liquid Discharge ("ZLD") treatment. A ZLD system on the West Range would be implemented as described for the East Range Site in Section 4.5.4 of the EIS. Outside of the Great Lakes watershed and extremely arid regions, ZLD treatment of power plant cooling water is a nearly unprecedented level of treatment. This alternative would eliminate all CTB blowdown discharge and associated pipelines from the facility and would reduce the facility's water appropriation needs. ZLD treatment would incur significant capital and O&M costs, reduce plant efficiency and output, and produce additional solid waste and cooling tower drift. It is possible that this alternative could be combined with either of the first two by using ZLD treatment of a slipstream of the CTB, although such an arrangement may be even less cost effective than ZLD alone. **[Note: Since publication of the Draft EIS, Excelsior has announced its commitment to implement the enhanced ZLD system at the West Range Site, as described under this alternative. See Section 4.5 (Volume 1) of the Final EIS for more details on changes to the water balance and water quality impacts. Note that some of the numerical values as stated in this section were estimated for the Draft EIS. Since publication of the Draft EIS, further analysis, such as wetlands impacts, have been conducted and represent more current estimates. For updated impact estimates, see the various resource sections in Volume 1 of the Final EIS.]**

Water Management Plan
Compared to the base case from the permit application, maximum water appropriation needs for two Mesaba phases under this alternative would decrease from 10,300 gpm to 7,000 gpm.[8] However, the proposed CTB discharge from the plant to the CMP of 2,675 gpm (for Mesaba One and Two) would also be eliminated. Overall, the water needs are up to 625 gpm less than the base case, and up to 1,800 gpm less than required under Alternative 1.

Water Quality
As all direct discharges from the plant would be eliminated, water quality impacts to Holman Lake and the CMP as identified in Figures 3-6 would be avoided – i.e., concentrations of TDS, hardness, phosphate, mercury, etc. within the lake would remain at background levels. There would also be no direct water quality impact to the Swan River. The possibility of localized impacts identified for the base case and other alternatives would also be eliminated.

Solid Waste Disposal
The ZLD system for treating CTB would produce significant amounts of non-hazardous salts that must be transported from the site and landfilled. On the East Range, Mesaba One and Two could produce up to 24,000 tons/year of solid waste from this treatment based on the worst-case source water quality, which has a TDS of up to 1800 mg/L.[9] Because the source water quality on the West Range is much better (approximately 340 mg/L TDS[10]), the maximum salt production from ZLD treatment of the CTB would be less than 5,000 tons/year for Mesaba One and Two.

Plant Capacity and Efficiency
Operation of the ZLD system would consume electricity, adding to the parasitic load within the facility, which has two closely connected effects. First, it reduces the net output capacity of the plant. Second, it reduces the efficiency of the plant proportionately to this reduction in capacity. On the East Range Site, plant capacity could be reduced by up to 2 MW (approximately 0.3%), and the corresponding heat rate increase would be 31 Btu/kWh. As mentioned above, the source water quality at the West Range Site is superior, which is likely to reduce the parasitic load of ZLD treatment versus the East Range Site. Therefore, a 2 MW reduction in plant capacity and 31 Btu/kWh increase in heat rate are likely to overestimate this effect for the West Range Site. However, to the degree that efficiency is reduced, air emissions on a per megawatt hour basis will increase (by a maximum of about 0.3%).

Air Quality
The ZLD system will increase particular matter emissions due to cooling tower drift, as the cycles of concentration at which cooling towers operate would likely be increased. If this figure were doubled, particulate emissions due to drift would increase from 39 tons/year to 78 tons/year, resulting in facility wide particulate emissions of 532 tons/year instead of 493 tons/yr.

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[8] Excelsior Energy. Appendix D to the Mesaba Energy Project NPDES Permit. Submitted to the MPCA, June 2006.
[9] Excelsior Energy. Environmental Supplement to the Joint Permit Application. Submitted to the MN Public Utilities Commission, June 2006. p. I-155.
[10] *Ibid.*

Pipeline Alignment Impacts
Under this alternative, all blowdown pipelines from the plant could be eliminated. While most pipelines share corridors with other infrastructure, the approximately two mile blowdown pipeline to Canisteo Mine Pit represents corridor that could be completely eliminated. Wetland impacts may be reduced by up to 17 acres, and land use impacts would be reduced as well.

Summary
The quantifiable differences between the alternatives are tabulated below. Note that Alternative 2 reflects the base case with the Holman Lake discharge diverted to the Swan River. This alternative could be combined with Alternative 1, which would produce the results shown for that alternative. As described in the analysis, Alternative 1 involves a range of possible flow allocations, and it was assumed for the purposes of this summary that all discharge was redirected from the CMP to Holman Lake. The figures below represent maximum values.

Table 4: Quantitative Impact Comparison across Alternatives

Parameter	Base Case		Alt. 1		Alt. 2	
Number of Phases	1	2	1	2	1	2
Discharge to CMP (gpm)	300	2,675	0	0	300	2,675
Discharge to Swan River Watershed (gpm)	600	825	900	1,800	600	825
Net Water Needed (gpm)	4,100	7,625	4,400	8,800	4,100	7,625
Cycles of Concentration	5	3	5	5	5	3
PM Emissions from Drift (tons/yr)	20	39	18	35	20	39

Table 4 (con't)

Parameter	Alt. 1 & 2		Alt. 3	
Number of Phases	1	2	1	2
Discharge to CMP (gpm)	0	0	0	0
Discharge to Swan River Watershed (gpm)	900	1,800	0	0
Net Water Needed (gpm)	4,400	8,800	3,500	7,000
Cycles of Concentration	5	5	≥10	≥10
PM Emissions from Drift (tons/yr)	18	35	39	78

APPENDIX H2
Water Retention, Recovery & Reuse Report

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Mesaba Energy Project
Final Water Retention, Recovery & Reuse Report

West Range Site
Taconite, Minnesota

Prepared for:

Excelsior Energy Inc.

11100 Wayzata Blvd.
Minnetonka, MN 55305

Prepared By:

Granherne
a KBR company

Granherne Inc.

601 Jefferson
Houston, TX 77002-7900

Project Number J5682

Revision H
January 14, 2009

Appendix H

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1.0 INTRODUCTION

The following is a report for a water retention, recovery and reuse system to service the Excelsior Energy Inc. (Excelsior) Mesaba Energy Project to be located in Taconite, Minnesota (its "West Range Site" in Itasca County). The purpose of this report is to supplement Excelsior's National Pollutant Discharge Elimination System (NPDES) permit application dated June 18, 2006, by describing the water/wastewater management systems to be used at the site to achieve Excelsior's objectives of eliminating all wastewater discharges including storm water discharges associated with industrial activities within the facility's footprint and achieving maximum water recovery and reuse of such wastewaters.

Section 2.0 of this report provides a discussion of the project facility, permit approach, overall water/wastewater management and assumptions used for the systems. A general description of the raw water supply, water retention and recovery and reuse systems are provided in **Section 3.0**. **Section 4.0** provides a more detailed description of the water retention and recovery and reuse systems.

Because the Mesaba facility is still under development/engineering, and because of the evaluation/engineering work required to completely configure the system operation and integrate it into the production operations, the information provided herein is preliminary in nature. As detailed engineering work is performed, the best overall design solution to achieve Excelsior's objectives will be refined.

The intent of this report is to provide a discussion/description of the system operations to be utilized at the facility. In particular, it addresses the design philosophy, general character and approach to be used for the systems so that the permit reviewer can see that the site can achieve its zero discharge objectives. Water and water constituent balances are provided for the project. Once the facility engineering is more established and the system operation can be more completely described an updated version of this report can be provided, along with a set of plans and specifications for the system.

2.0 PROJECT BACKGROUND

The technical background for the project, including a description of the proposed production facility is provided in this section. Additionally, a summary of the overall strategy for the raw water supply, water retention and recovery and reuse systems are provided.

2.1 Technical Background

Excelsior is in the process of seeking regulatory approvals for the first two phases of its Mesaba Energy Project in Taconite, Minnesota. The Project's first phase is included in the portfolio of the U.S. DOE Clean Coal Power Initiative (CCPI) Round 2 series of projects, the capstone of the National Coal RD&D Program managed by the U.S. Department of Energy (DOE) Office of Fossil Energy. It will demonstrate a commercial utility-scale "next-generation" Integrated Gasification Combined Cycle (IGCC) electric power generating facility fueled by coal or other solid, petroleum based feedstocks. The two phases consist of two nominal 600 MW units, Mesaba One and Mesaba Two, for a total nominal capacity of 1,200 MW. A planning perspective of the proposed facilities is shown below in Figure 1-1.

Figure 1-1

The Mesaba Energy Project will deploy substantial technology advancements in gasification, air separation and other plant systems and their integration. It will incorporate design and operational lessons learned from the successful but smaller-scale 262 MW Wabash River Coal Gasification Repowering Project, located in Terre Haute, Indiana; a previous Round 1 DOE clean coal technology project.

2.2 Permit Approach

Excelsior has decided to implement zero discharge for the facility. This report addresses Mesaba One, because the design for Mesaba Two would be substantially identical.

The gasification island of the facility will incorporate a separate zero liquid discharge (ZLD) system. This system will recover and treat wastewater generated from the gasification and slag processing operations that contain certain levels of heavy metals and other contaminants for the facility feedstocks. This system will recover distilled water for reuse in the power plant, reducing fresh water consumption, and more importantly, concentrate heavy metals and other contaminants of concern into a solid waste stream that will be effectively disposed of in an approved waste management facility.

The project's environmental permit applications were submitted to regulatory authorities in 2006. The above ZLD system serving the gasification island has been included in the permit applications and is not further addressed within this report as it is a separate stand alone system from those described herein.

This report identifies the system for treating the project's non-contact wastewater and stormwater streams. These streams include cooling tower blowdown, smaller flows from water treatment system regeneration, use of service water, and surface runoff streams from the project.

Also addressed is the retention of precipitation (rain and snow) for the IGCC Power Station Footprint not including off-site areas, i.e. railroad, power lines, pump stations, pipelines, etc.

2.3 Overall Water/Wastewater Management

The proposed systems for the site utilize processes that are environmentally sound and are practical approaches to implementing a pollution prevention framework. The general strategy for water retention, recovery and reuse will consist of the following concepts:

- Excelsior will operate non-contact cooling towers for the Air Separation Unit (ASU) and gasification equipment (CT-2) and for the power island portion (CT-1) of the facility with cycles of concentration (COC) of 5 (or more) to minimize the amount of cooling tower blowdown to be handled. The resultant blowdown streams will be directed to an Equalization and Surge Pond.
- Water treatment regeneration wastewaters will be directed to either the

cooling towers as make-up or to the Equalization and Surge Pond as the quality dictates.

- Other non-contact wastewaters are collected and pretreated, if required, prior to entering the Surge and Equalization Pond.
- The water as a result of precipitation will be treated by an oil water separator (if necessary) and then directed into the Surge and Equalization Pond. This water will then be treated, if required, and used as cooling tower makeup or directed into the ZLD system for treatment.

2.4 Assumptions/Requirements

Assumptions/requirements for the design of the systems are indicated below.

1. Reliability and maintainability objectives for the ZLD system are high due to the continuous flows into the system. The ZLD system on-line target is 99% (i.e., less than 7.2 hours per month or ~ one 8 hour shift per month of total downtime).
2. Process area surface drainage will be conveyed by a segregated drain system and then to an Oil Water Separator. Recovered oil will be held in a tank for off-site disposal, underflow will be directed to the Surge and Equalization Pond.
3. Rainfall precipitation design shall be based upon a 100 year – 24 hour storm event of ~5.3" per Technical Paper No. 40. Annual snow fall quantities are not considered as their snow melt volumes will be less than the equivalent of the 5.3" per day rainfall event.
4. The gasification/power production facility can be out of service during the design rainfall without discharge from the site.
5. Leachate collection and monitoring systems for ground water protection will be employed.
6. Equipment redundancy shall be provided throughout the systems.

7. Average raw water flow required for Mesaba One is about 3,360 gpm and the peak raw water flow is about 4,980 gpm for Mesaba One based upon 5 COC for the cooling towers. Raw Water will be from the Canisteo Mine Pit (CMP) with mixing with HAMP (Hill Annex Mine Pit) Complex water.
8. Cooling tower operations are defined as 5 COC based upon initial review of raw water supply with calcium as the limiting specie. If it is determined during final design that higher cycles of concentration can be economically achieved, cooling tower operations and ZLD system equipment sizing will be adjusted accordingly.

3.0 WATER UTILITY GENERAL DESCRIPTIONS

This section provides a general description of the raw water supply and the water retention and recovery and reuse systems.

3.1 Raw Water Supply System

The facility will require significant amounts of water with varying specifications for use in the production of electrical power. The purpose of the raw water supply system is to reliably and cost effectively provide sufficient quantity of water service for the process needs.

Section 3.6.1.1 (Pages 262 - 266) of the MPUC Joint Application discusses the West Range Raw Water System in detail. Table 3.2-2 from the NPDES Permit Application below shows raw water source capabilities for the facility.

Table 3.2-2
Water Source Supply Capability

Water Source	Est. Range of Flow (gpm)	Assumed Sustainable Flow for Water Balance Modeling (gpm)
CMP	810-4,190	2,800
HAMP Complex	1,590-4,030	2,000[a] 3,500[b]
LMP	Not yet quantified	1,800[c]
Prairie River	0-2,470[d]	0[e]
Discharge from IGCC Power Station	0-3,500	Varies

[a]At an operating elevation of 1,230 ft.
[b]At minimum operating elevation
[c]Based on a single observation and flow estimate
[d]Maximum available flow assumed to be 25% of the 7Q10 flow of the Prairie River
[e]For modeling purposes, the Prairie River contributions determined to be unnecessary provided LMP flow rate is sustained a 1,800 gpm.

Mixing in the ratio of 2800 gpm from CMP to 2000 gpm from HAMP Complex for investigation of water quality parameters was used for this report and its calculations.

For Mesaba One, water from the HAMP Complex will be pumped via a pump station to the CMP and from the CMP another pump station will pump the water to the facility. Pump redundancy will be provided within each of these pumping stations.

Figure 3-1 below is a conceptual presentation of the raw water flow case for the average case of 890 gpm to the ZLD system and Figure 3-2 is for the raw water flow case for the peak ZLD case of 1,300 gpm.

Figure 3-1 - Average Raw Water Case

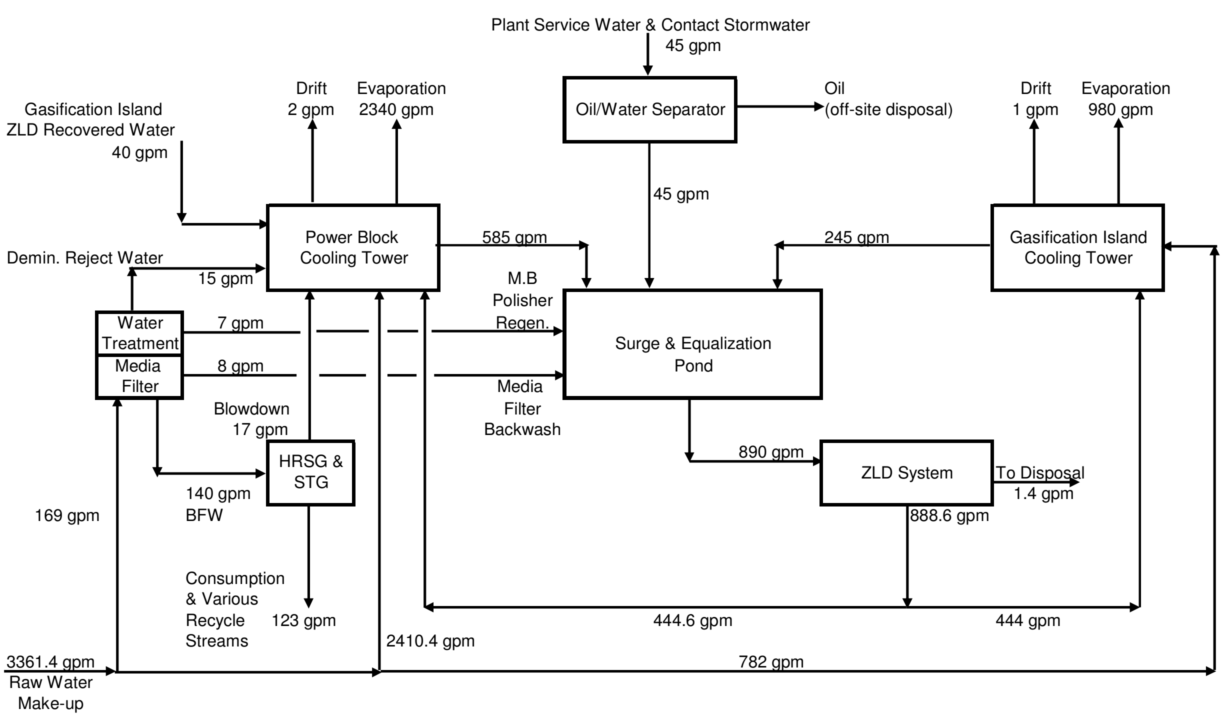
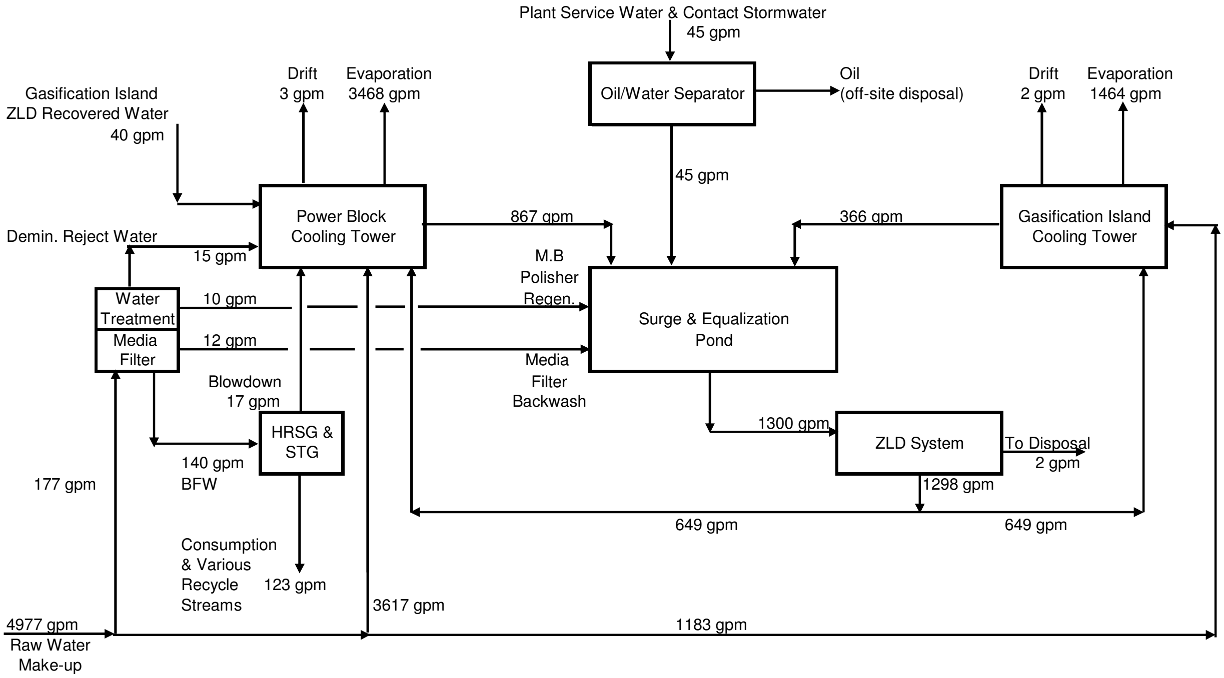


Figure 3-2 - Peak Raw Water Case



3.2 Raw Water Quality

Water quality from CMP and HAMP Complex were evaluated for ionic balance, i.e., to check their cation and anion characterizations and determine any need to adjust the given analyses before their use alone or with any ratioed chemical values. As the following analytical reviews show: cations appear to exceed anions for CMP water by 8.6% and for HAMP Complex by 5.1%.

Table 3-1 - CMP Water Quality

	As ION	As $CaCO_3$	476		As ION	As $CaCO_3$
CALCIUM	55.3	138.1	pH	ALKALINITY	219.5	180.0
MAGNESIUM	40.8	168.1	8.4	CHLORIDE	5.2	7.3
SODIUM	6.6	14.4	TEMP	SULPHATE	103.5	108.0
POTASSIUM	0.0	0.0	25	NITRATE (as NO_3)	0.0	0.0
		320.6				295.3
TRUE COLOUR	0	Pt/Co (HZ) UNITS		TDS ACTUAL	337	mg/L
TURBIDITY	0.0	NTU				
IRON	0.03	mg/L				
MANGANESE	0.01	mg/L				
CALCULATED RAW WATER PARAMETERS						
SCATIONS/SANIONS	108.6%			TDS CALC'D from "AS IONS"	431	mg/L
HARDNESS	306.2	mg/L, as $CaCO_3$		TDS CALC'D from EC	305	mg/L
ALK/(Cl+SO_4)	1.6			TDS	6.2	meq/L
SO4/(Cl+SO_4)	94%			IONIC STRENGTH: SPECIES	0.01029	mol/L
S MONOVALENT IONS	0.00403	meq/L		IONIC STRENGTH: TDS	0.00862	mol/L
S DIVALENT IONS	0.00827	meq/L		ACIDITY	177.1	mg/L, as $CaCO_3$
SODIUM ADSORPTION RATIO	0.16			(ALK-Ca)	41.9	mg/L, as $CaCO_3$
CORROSIVITY INDICES						
LANGELIER SATURATION INDEX (LSI)	1.03			AGGRESSIVENESS INDEX	13.1	
LARSON INDEX	1.2			[Ca_{SAT}]	120	mg/L, as $CaCO_3$
				CALCIUM CARBONATE PRECIPITATION POTENTIAL (CCPP)	18.1	mg/L, as $CaCO_3$

Table 3-2 - HAMP Complex Water Quality

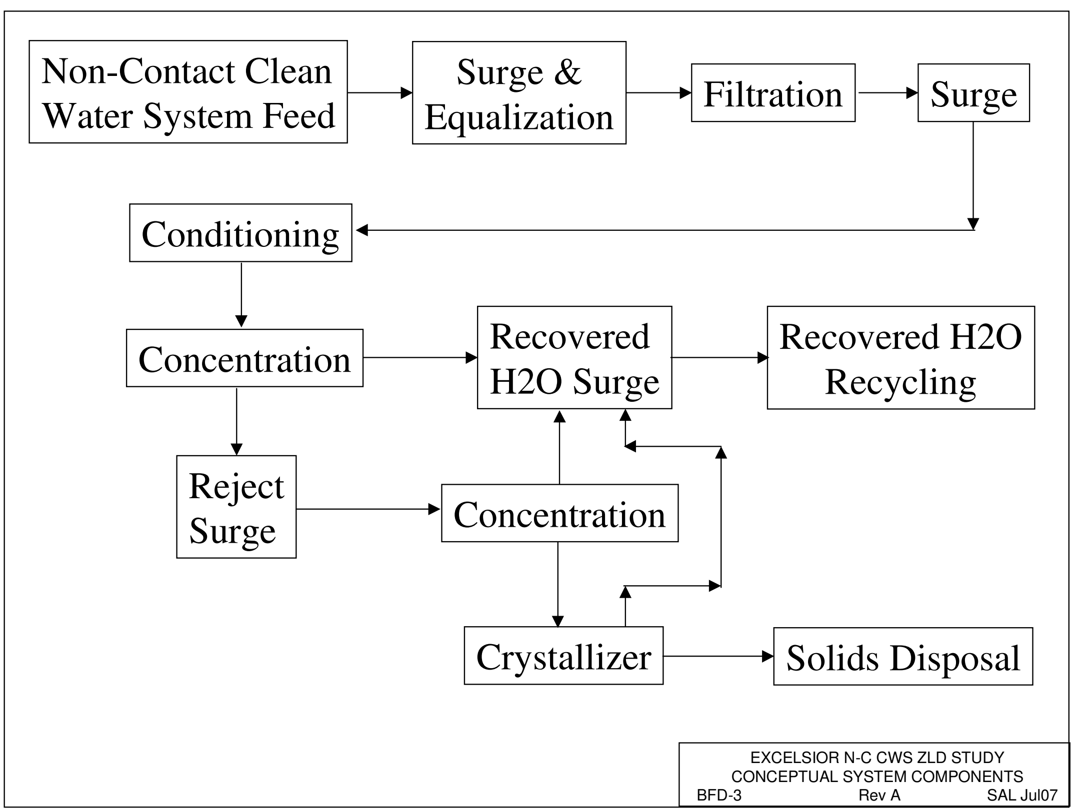
	As ION	As $CaCO_3$	418		As ION	As $CaCO_3$
CALCIUM	58.6	146.3	pH	ALKALINITY	198.8	163.0
MAGNESIUM	20.5	84.4	8.3	CHLORIDE	5.2	7.3
SODIUM	6.2	13.5	TEMP	SULPHATE	59.5	62.1
POTASSIUM	0.0	0.0	25	NITRATE (as NO_3)	0.0	0.0
		244.2				232.4
TRUE COLOUR	80	Pt/Co (HZ) UNITS		TDS ACTUAL	254	mg/L
TURBIDITY	6.0	NTU				
IRON	0.03	mg/L				
MANGANESE	0.01	mg/L				
CALCULATED RAW WATER PARAMETERS						
SCATIONS/SANIONS	105.1%			TDS CALC'D from "AS IONS"	349	mg/L
HARDNESS	230.8	mg/L, as $CaCO_3$		TDS CALC'D from EC	268	mg/L
ALK/(Cl+SO_4)	2.3			TDS	4.8	meq/L
SO4/(Cl+SO_4)	89%			IONIC STRENGTH: SPECIES	0.00769	mol/L
S MONOVALENT IONS	0.00367	meq/L		IONIC STRENGTH: TDS	0.00698	mol/L
S DIVALENT IONS	0.00585	meq/L		ACIDITY	162.3	mg/L, as $CaCO_3$
SODIUM ADSORPTION RATIO	0.18			(ALK-Ca)	16.7	mg/L, as $CaCO_3$
CORROSIVITY INDICES						
LANGELIER SATURATION INDEX (LSI)	0.93			AGGRESSIVENESS INDEX	12.9	
LARSON INDEX	0.8			[Ca_{SAT}]	120	mg/L, as $CaCO_3$
				CALCIUM CARBONATE PRECIPITATION POTENTIAL (CCPP)	26.3	mg/L, as $CaCO_3$

Refer to **Appendix 1** – Average Raw Water Analysis, for the constituents contained in each of the CMP and HAMP Complex water streams. Also included in **Appendix 1** is an equivalent constituent basis when combining 2,800 gpm of CMP water and 2,000 gpm of HAMP Complex water. This equivalent water is the basis for this report.

3.3 ZLD System

The ZLD system combines wastewater system unit operations as depicted in the conceptual block flow diagram, Figure 3-3. The engineering design challenge is to apply appropriately sized and energy efficient technology in recovering water and removing solids for disposal.

Figure 3-3 –ZLD Conceptual Components



3.4 Wastewater Characterization

ZLD system feeds are qualitatively characterized relative to their Total Dissolved Solids (TDS) and Total Suspended Solids (TSS) levels, which ultimately determine sludge generation rates for off-site disposal. Additional parameters of interest include pH as well as dissolved and free organics. Quantitative values of concentration and flow were established to define the feed to the ZLD system.

The following are the feed streams to the ZLD system:

- Cooling Towers (CT-1 and CT-2) Blowdown - These streams are characterized as having elevated TDS levels due to COC within the cooling tower systems. TSS levels are mitigated by filtered raw water makeup and settling in the cooling tower basin.
- Raw water Multi-Media Pressure Filters Backwash - This stream is characterized as having raw water TDS levels and high TSS levels due to its solids removal from the incoming supply water.
- ZLD Pressure Filters Backwash - This stream is characterized as having generally the level of TDS and TSS from the cooling tower blowdown streams since these are the predominant flows.
- Oil-Water Separator Underflow - This stream is characterized as clarified and filtered raw water with minimal oil and grease content.
- Mixed Bed Polisher Regeneration Flows - This stream is characterized as having high TDS and little to no TSS levels due to regeneration chemical strengths; concentrations are diluted somewhat from rinse and backwash volumes used at the end of the regeneration cycle.
- Storm water and snow melt flows will carry some TSS, but have very low TDS.

3.5 Design Feed to the ZLD System

The annual average ZLD feed stream is 890 gpm and the peak feed is 1,300 gpm per Figures 3-1 and 3-2 of this report. The constituents within both the average and peak feed streams are assumed to be the same, i.e. 1357 mg/l of TDS and 66 mg/l of TSS, as the major contributors are the cooling tower blowdown streams.

Table 3-3 below indicates the estimated properties, TDS, TSS and Total Solids expected for the average inlet flow case for the ZLD and Table 3-4 is for the peak case, both for 5 COC for the cooling towers.

Table 3-3 – Water Retention Recovery and Reuse System - Average Case

	Stream	1	2	3	4	5	6	7	8
Parameter	**Description**	**Power Block Cooling Tower Blowdown (@ 5 COC)**	**Gasifier/ ASU Cooling Tower Blowdown (@ 5 COC)**	**Plant Service Water via O/W Separator**	**Mixed Bed Polisher Regen.**	**Media Filter Bacwash**	**WRRS Feed (1+2+3+4+5)**	**Low TDS Streams (3+5)**	**High TDS Streams (1+2+4)**
Temperature	°F	86	86	76	110	76	85.6	68.3	86.2
Pressure	psig	atm	atm	atm	atm	atm	atm	atm	atm
Mass Flow	lb/hr	294,277	123,244	22,524	3,574	4,004	447,623	26,528	421,095
Density	lb/ft3	62.712	67.712	62.4	63.648	62.4	62.4	62.4	62.4
Specific Gravity	H2O = 1	1.005	1.005	1.000	1.020	1.000	1.000	1.000	1.000
Liquid Volume Flow, Avg.	gpm	585	245	45	7	8	890	53	837
Liquid Volume Flow, Avg.	mgd	0.842	0.353	0.065	0.010	0.012	1.282	0.076	1.205
Liquid Volume Flow, Peak	gpm	867	366	45	10	12	1,300	57	1,243
Liquid Volume Flow, Peak	mgd	1.248	0.527	0.065	0.014	0.017	1.872	0.082	1.790
Total Dissolved Solids	mg/l	1402	1402	200	4000	100	1357	125	1431
Total Suspended Solids	mg/l	50	50	20	10	2000	66	116	50
Total Solids	mg/l	1452	1452	220	4010	2100	1423	241	1481
Total Dissolved Solids	lb/hr	410.6	172.0	4.5	14.0	0.4	604.7	3.3	599.7
Total Suspended Solids	lb/hr	14.6	6.1	0.5	0.0	8.0	29.4	3.1	21.0
Total Solids	lb/hr	425.3	178.1	5.0	14.1	8.4	634.1	6.4	620.6
Total Dissolved Solids	lb/day	9,855.3	4,127.4	108.1	336.5	9.6	14,512.3	79.6	14,392.3
Total Suspended Solids	lb/day	351.5	147.2	10.8	0.9	192.3	705.8	73.9	502.9
Total Solids	lb/day	10,206.7	4,274.6	119	337.4	201.9	15,218.1	153.5	14,895.2
Total Dissolved Solids	ton/day	4.928	2.064	0.054	0.168	0.005	7.256	0.040	7.196
Total Suspended Solids	ton/day	0.176	0.074	0.005	0.000	0.096	0.353	0.037	0.251
Total Solids	ton/day	5.103	2.137	0.059	0.169	0.101	7.609	0.077	7.448

Table 3-4 - Water Retention Recovery and Reuse System - Peak Case

	Stream	1	2	3	4	5	6	7	8
Parameter	**Description**	**Power Block Cooling Tower Blowdown (@ 5 COC)**	**Gasifier/ ASU Cooling Tower Blowdown (@ 5 COC)**	**Plant Service Water via O/W Separator**	**Mixed Bed Polisher Regen.**	**Media Filter Bacwash**	**WRRS Feed (1+2+3+4+5)**	**Low TDS Streams (3+5)**	**High TDS Streams (1+2+4)**
Temperature	°F	86	86	76	110	76	85.6	68.3	86.2
Pressure	psig	atm	atm	atm	atm	atm	atm	atm	atm
Mass Flow	lb/hr	294,277	123,244	22,524	3,574	4,004	447,623	26,528	421,095
Density	lb/ft3	62.712	67.712	62.4	63.648	62.4	62.4	62.4	62.4
Specific Gravity	H2O = 1	1.005	1.005	1.000	1.020	1.000	1.000	1.000	1.000
Liquid Volume Flow, Peak	gpm	867	366	45	10	12	1,300	57	1,243
Liquid Volume Flow, Peak	mgd	1.248	0.527	0.065	0.014	0.017	1.872	0.082	1.790
Total Dissolved Solids	mg/l	1402	1402	200	4000	100	1357	125	1431
Total Suspended Solids	mg/l	50	50	20	10	2000	66	116	50
Total Solids	mg/l	1452	1452	220	4010	2100	1423	241	1481
Total Dissolved Solids	lb/hr	608.6	256.9	4.5	20.0	0.6	883.2	3.6	890.6
Total Suspended Solids	lb/hr	21.7	9.2	0.5	0.1	12.0	43.0	3.3	31.1
Total Solids	lb/hr	630.3	266.1	5.0	20.1	12.6	926.2	6.9	921.7
Total Dissolved Solids	lb/day	14,606.0	6,165.9	108.1	480.6	14.4	21,197.7	85.6	21,373.5
Total Suspended Solids	lb/day	520.9	219.9	10.8	0.9	288.4	1031.0	79.5	746.8
Total Solids	lb/day	15,126.9	6,385.8	119	481.5	302.8	22,228.7	165.1	22,120.3
Total Dissolved Solids	ton/day	7.303	3.083	0.054	0.240	0.007	10.599	0.043	10.687
Total Suspended Solids	ton/day	0.260	0.110	0.005	0.000	0.144	0.515	0.040	0.373
Total Solids	ton/day	7.563	3.193	0.059	0.241	0.151	11.114	0.083	11.060

4.0 DETAILED PROCESS DESCRIPTIONS

The following are detailed descriptions of the water retention, recovery and reuse systems.

4.1 Precipitation Retention and Recovery System

Based upon the design rainfall of 5.3 inches/day, the average rainfall is 2.25gpm/1,000 square feet of plot area. Areas that are paved will have a runoff coefficient of 1.0 (all water to retention). Other areas that are not paved will have runoff coefficients of less than 1.0 depending upon the type of surface covering. Calculations show that this rainfall event would result in 30.8 acre-feet of runoff for Mesaba One and 33.6 acre-feet of runoff for Mesaba Two. (Mesaba Two's drainage area is slightly larger due to differences in site grading.)

Equipment areas such as cooling towers will retain the rainfall and will not contribute to the calculations of retention.

Runoff from rainfall and snow melt will be collected in the Surge and Equalization Pond located in the flare area and stored while the water is being recovered and recycled within the facility. The design shows that a pond capacity of 35 acre-feet could be achieved in this location. This capacity is very conservative, as it is more than adequate to accommodate a 24-hr, 100-yr storm event that coincides with a plant outage. During normal plant operation, capacity requirements would be reduced by the cooling towers' ability to work off accumulated runoff.

The collected water will be pumped to the cooling tower basins as makeup over time or, should it for some reason require treatment, be directed into the ZLD system.

The water will be transferred from the Surge and Equalization Pond to the cooling towers via pump(s).

4.2 ZLD System

Figure 4-1 below is a block diagram representation of the ZLD system.

Figure 4-1 - ZLD System Schematic

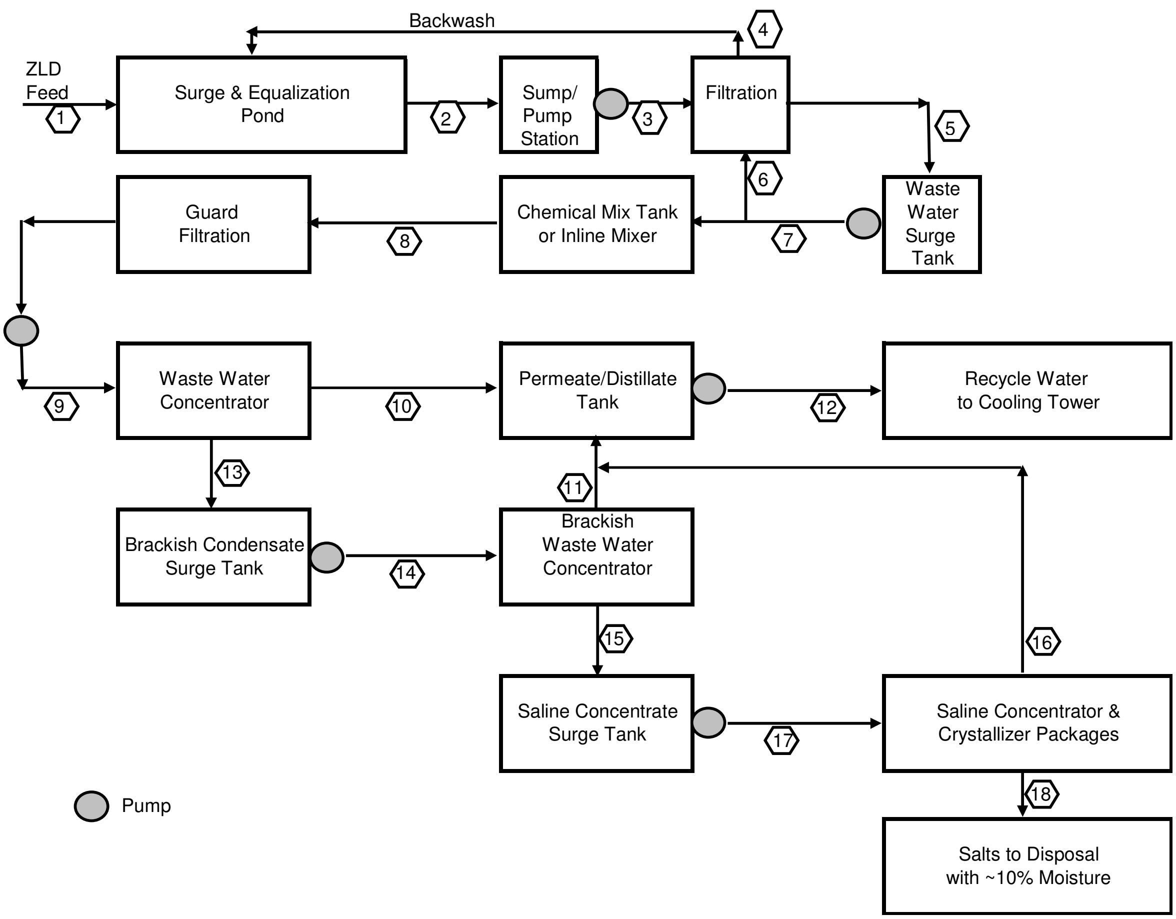


Table 4-1 below indicates the flows and estimated TDS levels at key points (noted in Figure 4-1 above) throughout the ZLD System.

Table 4-1 - ZLD Stream Table

Stream No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Average Case	890	890	890	0	890	0	890	890	890	668	166	888.6	222	222	56	54.6	56	1.4
Peak Case	1,300	1,300	1,300	0	1,300	0	1,300	1,300	1,300	975	244	1,298	325	325	81	79	81	2
Approximate TDS	1,357	1,357	1,357	0	1,357	0	1,357	1,357	1,357	2	73	33	5,423	5,423	21,473	288	21,473	840,410

All of the ZLD feeds will be directed to the Surge and Equalization Pond. Surge and equalization capacity is required to enable system maintenance to be accomplished and to handle intermittent surges of water to regain operational control or balance concentrations in the chemical treatment programs. Accommodation of variable stream compositions and diluting effects from storm water inputs is also a process need to allow downstream systems to operate in an approach to steady state conditions. These needs would be met by the pond described in **Section 4.1** and do not increase the capacity requirements for that pond. A pond would be double lined storage with leak detection and leachate collection. A divided capacity pond system will be provided such that one side can be cleaned of solids from the feed and the backwash from filtration. The second half of the pond would continue to operate during these times.

Settled solids would be removed from the pond on a periodic basis and disposed of off-site at an approved disposal facility.

A common sump with isolation from either side of the pond would be provided with pumps to transfer the feed into the ZLD system or directly to the cooling towers as makeup.

ZLD inlet filtration is required to limit TSS in downstream equipment, especially membrane based systems with extremely small pore diameters. Anthracite coal or activated carbon is typically used as filter media, which allow backwashing and low attrition as well as protection from trace incoming organic compounds.

Backwash for the filters is directed back to the Surge and Equalization Pond where suspended solids will settle out and water is then recycled to the ZLD system.

After passing through the filters the filtered wastewater is directed to a Surge Tank which provides capacity to allow short-term downstream equipment maintenance activities and as a reservoir for backwash water for the filtration equipment.

Pumps take suction from the Surge Tank and pump it through conditioning equipment. Conditioning is a generic term for pH adjustment, anti-scale addition and fine filtering (guard filtration) used in front of wastewater concentrator membrane systems.

After passing through the conditioning equipment pumps increase the wastewater’s pressure before entering the first stage of wastewater concentration.

Concentration is a generic term used for describing physical and molecular separation of solids from wastewater. Modern membrane based systems such as reverse osmosis (RO) and electrodialysis reversal (EDR) act as molecular/ion filters under high to medium pressures, respectively. Concerns with membrane fouling, scaling, and blinding require the upstream conditioning identified above. These conditioning needs and other special design items are what ultimately control the efficiency of water recovery.

Concentrator reject waters typically vary from 10-50% of concentrator feed flow, depending on operating pressures and membrane conditions. Brackish Concentrate Surge Tank capacity is provided after the first concentrator to allow short-term downstream equipment maintenance activities and as a reservoir for backwashing concentration equipment with or without cleaning chemical addition.

Recovered water (permeate) from the concentrator is directed into a Permeate/Distillate Tank from which it is pumped back to the recycle water users.

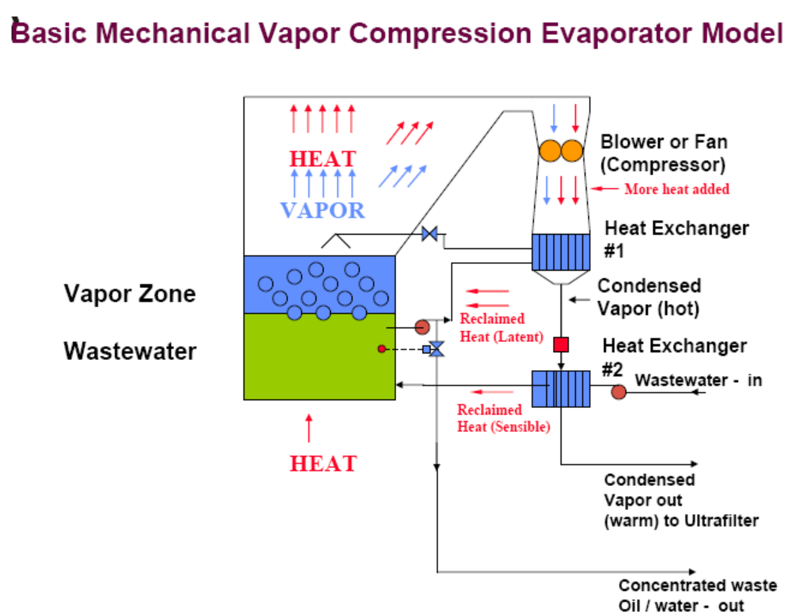
High pressure pumps take suction from the Brackish Concentrate Surge Tank and pass it through a second concentrator for further water recovery.

Recovered water is again directed into the Permeate/Distillate Tank while rejected water is directed into a Saline Concentrate Surge Tank.

From the Saline Concentrate Surge Tank the concentrated wastewater is pumped to the Saline Concentrator and Crystallizer equipment.

A mechanical vapor recompression (MVR) type evaporator, which can use 15-20 times less energy, was selected over a simple cycle evaporator. The MVR evaporator efficiency is accomplished by employing electrical energy to drive a compressor to boost the pressure of steam from the evaporator, so that it can be condensed against recirculated feed and provide the driving energy for the system after initial startup on imported steam. Refer to Figure 4-2 for a generic MVR design.

Figure 4-2



The high levels of dissolved solids entering an evaporator act to increase the boiling point well beyond that of pure water. For instance, seawater with a TDS of approximately 30,000 mg/l exhibits a boiling point elevation of less than 1°F. While saturated sodium chloride at 360,000 mg/l has a boiling point elevation of about 13°F. This boiling point elevation represents a challenge for vapor-compression evaporation in that it increases the pressure ratio that the steam compressor must attain to effect vaporization. Since boiling point elevation determines the pressure ratio in the compressor, it is the main overall factor in operating costs.

Crystallizer operations are tightly linked with the pre-crystallizer concentrator as the high solids concentration feed is taken to its saturation point, creating a "mother liquor" from which solids are precipitated and removed via a centrifuge or other separation or filtration device. Control of the mother liquor concentration is critical to producing a manageable amount of suspended salt crystals and separating them on a routine basis. The controlled continued evaporation of water drives recovery rates, thus steady state operations are highly desirable. The solids disposal objective is production of a 10% moisture content paste, suitable for off-site landfill disposal in an approved facility. Recovered water from the Saline Concentrator and Crystallizer equipment is returned to the Permeate/Distillate Tank.

4.3 System Redundancy and Capacity Requirements

The systems will be able to meet the criteria of processing the required quantity of wastewaters anticipated. Below is the preliminary philosophy to accomplish this.

Pumps throughout the systems including for chemical feed will have spares installed. During detailed engineering arrangements such as 2 – 100%, 3 – 50%, 4 – 33%, etc. will be employed. Tanks in the systems will not have any redundancy.

The Surge and Equalization Pond for each phase will be a single pond which will be divided into two areas such that cleaning of solids can occur in one side while the other is in use. Should an event occur and the complete capacity is required an overflow to the isolated area will be provided such that no water is discharged from the site.

A common sump with pumps installed will be provided with the capability of isolating each side of the pond from the sump. Pumps with redundancy will be provided to transfer the water to the cooling towers or the ZLD system as required.

The pumps in the sump will provide the necessary pressure to pass the water through the ZLD inlet filters. These filters are normally very reliable and an arrangement where the number of filters that are required to process the wastewater during peak period flows will be provided. During backwashing of the filters the surge capacity of the Surge and Equalization Pond will be used until the backwash unit is returned to service.

The guard filters prior to the wastewater concentrator will have a spare filter such that cleaning of one can occur while the system is processing the full throughput.

The concentrators are membrane stacks of multiple vessels. The number of stacks to be provided will be developed during detailed engineering but the sparing philosophy will be that the throughput can be processed while a unit is in its regeneration and/or cleaning mode.

Spare capacity will be built into the ZLD system, but if for some reason a component within the system cannot process the required throughput, the flow through the system will backup into the preceding process storage unit and back through the system until ultimately the Surge & Equalization Pond capacity would be used. For example (see Figure 4-1), if a unit in the Waste Water Concentrator could not process the output from the Guard Filtration system, flow through the Guard Filtration system would be reduced accordingly by controlling the pumps at the outlet of the Waste Water Surge Tank. Once the high level in the Waste Water Surge Tank was reached, one or more of the Sump Pumps taking suction from the Surge & Equalization Pond would shutdown and the level in the pond would begin to rise. After the portion of the system that was not able to process the required throughput returned to service this wastewater in the pond would then be processed through the system over time to return the pond to normal operating level.

As described in **Section 4.1**, the capacity of the Surge and Equalization Pond was determined by the worst-case conditions, i.e., the 24-hr, 100-yr storm during a plant outage. Flow backups caused by partial or complete outages of the ZLD system would not increase the capacity required for the Surge and Equalization Pond. This is because such backups would only occur during plant operation, when the rainfall could be worked off by evaporation from the cooling towers at a rate as high as 3-5,000 gpm, while flow backups from the ZLD system could not exceed 1,300 gpm.

Outside of significant precipitation events, the Surge and Equalization Pond theoretically has capacity to store peak ZLD treatment flows (of 1,300 gpm) for six days. Most of that capacity would be reserved in case a precipitation event did occur, but due to the large size of the pond and the high availability provided by redundant design of the ZLD system, it would be extremely rare that the power plant would need to shut down due to a complete outage of the ZLD system.

4.4 Waste Streams Generated

The waste streams that would be generated as a result of the systems are as follows:

- Solids that would settle out in the cooling tower basins which are periodically cleaned out.
- Solids sludge that would settle out in the Surge and Equalization Pond which are periodically cleaned out.
- Salts generated by the Saline Concentrator and Crystallizer equipment which would contain approximately 10% moisture.

These streams would be transported off-site for disposal in approved facilities. All trace elements that are in the feed to the ZLD system would be retained in the above streams.

The only vent to the atmosphere would be a small moisture vent from the Saline Concentrator and Crystallizer equipment.

4.5 Future Considerations

During the detailed design of the facility further analysis of the water usages and discharges to the ZLD systems within the plant will be undertaken. The ultimate end product of these analyses is to reduce the inlet raw water demands economically.

One primary area where this will be addressed is the COC for the facility's cooling towers. Should higher COC occur, lower raw water needs and lower feed to the ZLD would result.

As noted in Appendix H of the DOE/EIS-0382D Draft Environmental Impact Statement, cooling tower particulate matter emissions from cooling tower drift will increase as the COC at which the cooling towers operate increases. These potentially additional emissions are not addressed further in the report.

5.0 REFERENCES

The following references were used in preparation of this report.

- Application to the Minnesota Pollution Control Agency for a National Pollution Discharge Elimination System Permit, dated June 18, 2006
- Joint Application to the Minnesota Public Utilities Commission for the following Pre-Construction Permits: Large Electric Generating Plant Site Permit, High Voltage Transmission Line Route Permit and Natural Gas Pipeline Routing Permit, dated June 16, 2006
- US DOE Clean Coal Power Initiative Round 2, Project 342 Fact Sheet, 12/06
- MPCA Design Flow and Loading Determination Guidelines for Wastewater Treatment Plants, Water/Wastewater Technical Review and Guidance/#5.20, February 2002
- Issue Paper “B”, Precipitation Frequency Analysis And Use, January 6, 2005, To: Minnesota Stormwater Manual Sub-Committee, From: Emmons & Oliver Resources and Center for Watershed Protection
- Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 years

APPENDIX 1 – Average Raw Water Analyses

Raw Water Analysis and Future Mix

		gpm Mix % Mix	2800 58% CMP	2000 42% HAMP	<DL	Equiv.
Aluminum	mg/L		0.0125	0.0125	1/2	0.013
Antimony	mg/L					0.000
Arsenic	mg/L					0.000
Barium	mg/L		0.028	0.0297		0.029
Beryllium	mg/L					0.000
Cadmium	mg/L		0.005	0.005	1/2	0.005
Calcium	mg/L		55.3	58.6		56.7
Chromium, total	mg/L		0.005	0.005	hex	0.005
Copper	mg/L		0.005	0.005	1/2	0.005
Iron	mg/L		0.025	0.025	1/2	0.025
Lead	mg/L					0.000
Magnesium	mg/L		40.8	20.5		32.3
Manganese	mg/L		0.01	0.01	1/2	0.010
Mercury	mg/L		9E-07	9E-07		0.000
Nickel	mg/L		0.0025	0.0025	1/2	0.003
Potassium	mg/L					0.000
Selenium	mg/L		0.001	0.001	1/2	0.001
Silver	mg/L					0.000
Sodium	mg/L		6.6	6.2		6.4
Strontium	mg/L					0.000
Zinc	mg/L		0.005	0.005	1/2	0.005
INORGANICS						
Alkalinity-Bicarbonate	mg/L					0.000
Alkalinity-Carbonate	mg/L					0.000
Carbon Dioxide (aq)	mg/L					0.000
Chloride	mg/L		5.15	5.2		5.2
Cyanide, free	mg/L					0.000
Fluoride	mg/L					0.000
Nitrate (as N)	mg/L					0.000
o-Phosphate	mg/L					0.000
Sulfate	mg/L		103.5	59.5		85.2
Silica	mg/L					0.000
pH	pH		8.4	8.3		8.358
Solids (TS)	mg/L					0.000
Total Suspended Solids:	mg/L					0.000
BULK PROPERTIES						
Hardness as CACO3			308	229		275.083
Alkalinity			180	163		172.917
TDS			337	254		302.417
Sp. Conductivity	umhos/cm		476	418		451.833
BOD			1	1	1/2	1.000
COD			1	1	1/2	1.000
TOC			1.9	1.9		1.900
TSS			1.5	1.5		1.500
NH3-N			0.05	0.05	1/2	0.050
P, T			0.05	0.05	1/2	0.050