1.9 PROJECT SCHEDULE AND DESCRIPTION OF PROJECT PHASES

For purposes of compliance with the CCPI Cooperative Agreement, the development of Mesaba One is organized into three periods: Period I (Project Definition and Preliminary Design Phase); Period II (Final Design and Construction); and Period III (Demonstration/Operation). The Proponent, in conjunction, with the Project Consortium, will carry out the implementation plan outlined in the Mesaba One Project Schedule, shown at Figure 1.9-1.

1.9.1 Schedule Overview

1.9.1.1 Significant Milestones Achieved To Date

1.9.1.1.1 Secured Development Funding through Notice to Proceed

The Project proponent has secured various sources of private and public funding to fully fund development and engineering through Notice to Proceed. Non-private development funding has been provided from the following federal and state programs:

- DOE - $36 million of DOE funding, in the form of a loan, under Round II of CCPI.
- IRR - Two interest-bearing loan facilities totaling $9.5 million.
- Renewable Development Fund - $10 million grant, from the Xcel Energy Renewable Development Fund.

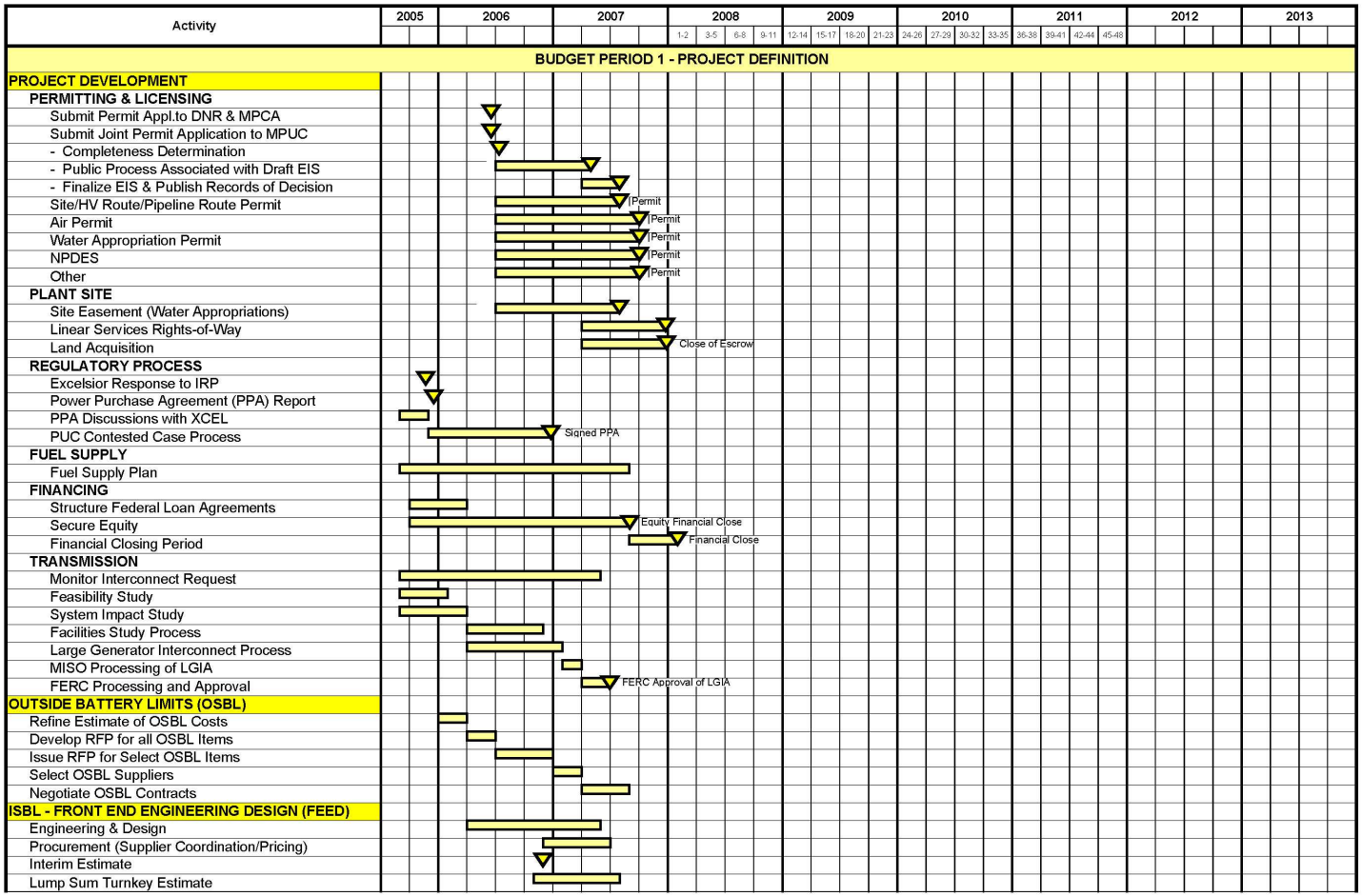
1.9.1.1.2 Permitting and Licensing

Significant progress has been made with respect to the permitting and licensing of Mesaba One and Two, with the federal EIS process having commenced in October 2005. At or about the filing of the Joint Application, the Proponent will also have filed for its preferred Site its air, water, and water appropriation permit applications with the appropriate state agencies.

Figure 1.9-1. Project Schedule (Page 1 of 3)

EXCELSIOR ENERGY INC.
Mesaba Energy Project

PRELIMINARY EPC PROJECT MILESTONE SCHEDULE



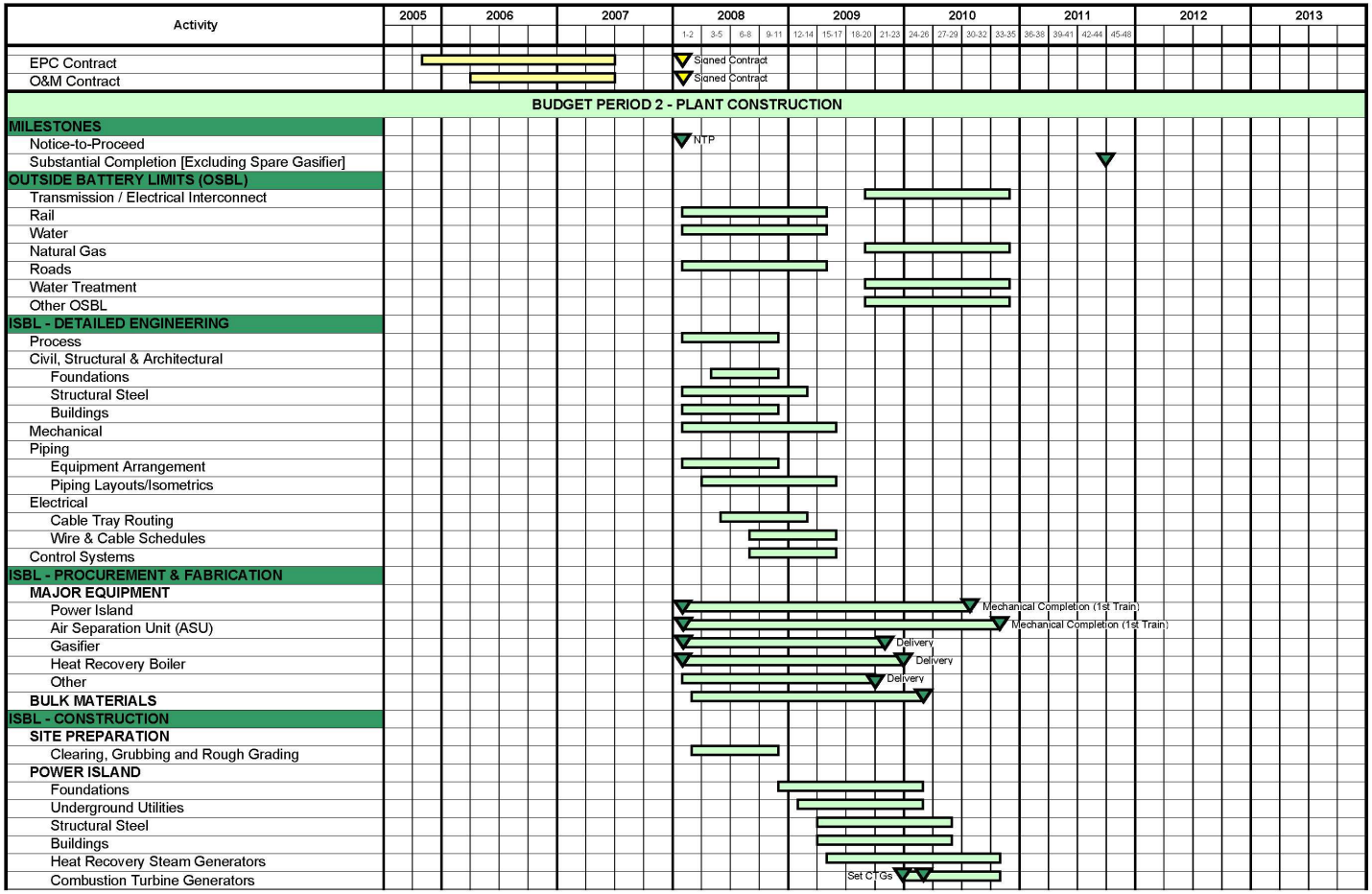
Page 1 of 3

June 06, 2006

Figure 1.9-1. Project Schedule (Page 2 of 3)

EXCELSIOR ENERGY INC.
Mesaba Energy Project

PRELIMINARY EPC PROJECT MILESTONE SCHEDULE



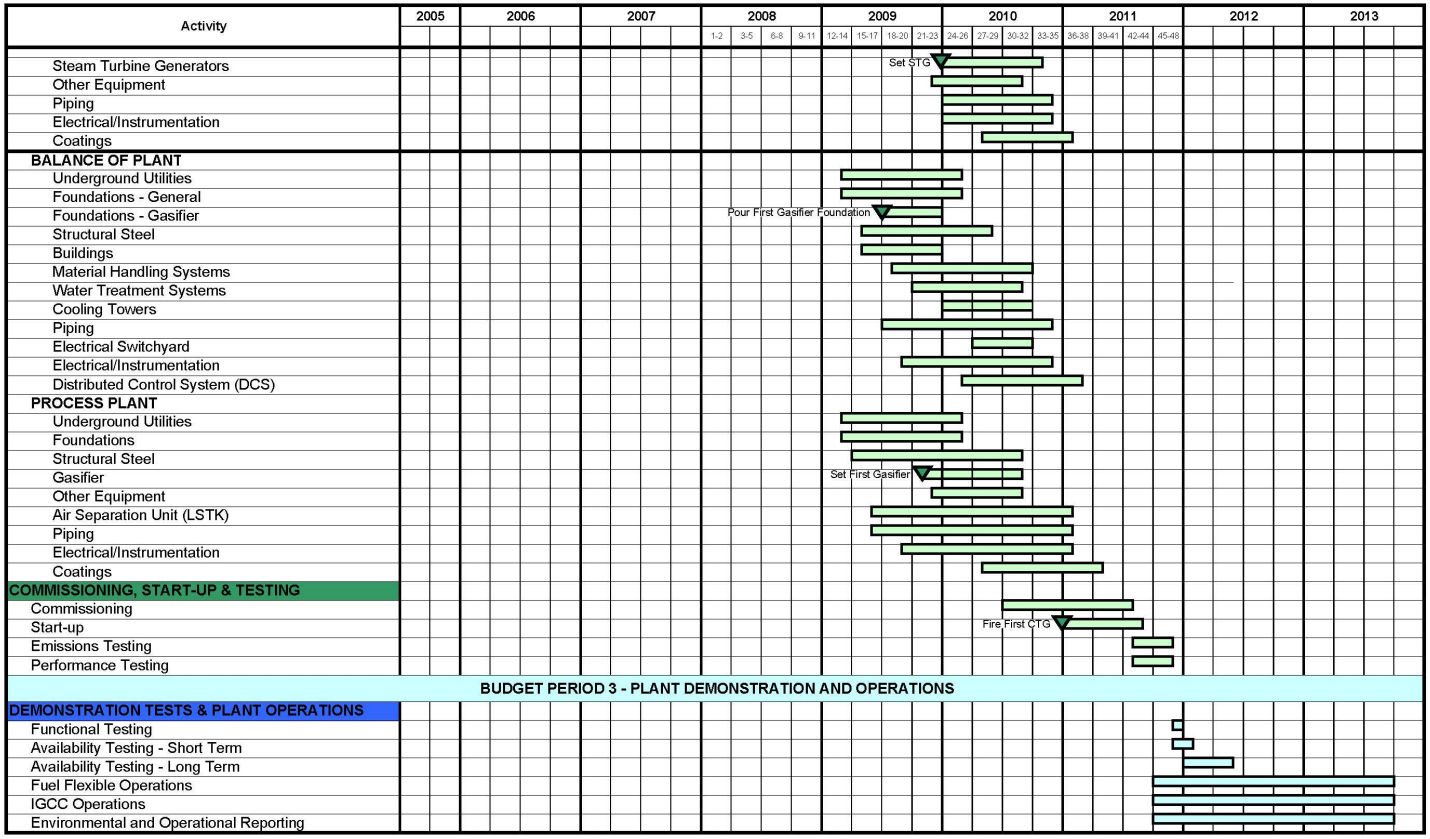
June 06, 2006

Page 2 of 3

Figure 1.9-1. Project Schedule (Page 3 of 3)

EXCELSIOR ENERGY INC.
Mesaba Energy Project

PRELIMINARY EPC PROJECT MILESTONE SCHEDULE



Page 3 of 3

June 06, 2006

1.9.1.1.3 Formation of Project EPC Consortium (Fluor, ConocoPhillips and Siemens)

The Proponent anticipates that FEED services; engineering, procurement, and construction ("EPC"); and operations and maintenance ("O&M") services for Mesaba One will be managed and performed by a consortium of Fluor Enterprises, Inc. ("Fluor") and Siemens Power Generation, Inc. ("Siemens"), with E-Gas™ technology and other design services supplied by ConocoPhillips Company ("ConocoPhillips"). Siemens would supply the power block for the project and together with Fluor would provide certain performance and schedule guarantees required for the project. Fluor would be the lead consortium manager for the detailed design, engineering, procurement and construction of the project under a firm price turnkey contract. Fluor, Siemens and ConocoPhillips have agreed in principle to support the project and intend to develop the appropriate binding contracts during 2006 and 2007.

The formation of the EPC Consortium is important in allowing the Proponent to design and engineer the facility in a cost-effective manner.

Fluor Corporation is one of the world's largest, publicly owned engineering, procurement, construction, and maintenance services organizations and is consistently rated as one of the world's safest contractors. Over the past six years, Fluor has ranked No. 1 four times on FORTUNE magazine's America's Most Admired Companies list in the "Engineering, Construction" category. Engineering News Record ("ENR") magazine ranks Fluor among the top three on their Top Design Build Firms list and Top 100 Contractors by New Contracts list. In recent years, Fluor has built coal-fired and natural gas-fired power projects with a total capacity of more than 120,000 MW. Fluor has constructed more new power plants in the United States than any other EPC firm.

Siemens Power Generation is one of the world's leading specialists in providing: planning, construction and upgrades of power plants; development, production and supply of components and systems; comprehensive plant services; I&C solutions and energy management systems; fuel cells; and turbines, compressors and full-scope solutions for industrial plants, in particular for the oil and gas industry. In 2005, Siemens posted overall sales of approximately $90 billion, and employed a worldwide workforce of 461,000. Siemens Power Generation employs 33,500 worldwide.

ConocoPhillips is one of the world's largest energy companies. Its gasification group, in the Technology Solutions division, will provide support to the Project throughout the course of its development, design, construction, start-up, and operation. The gasification team at ConocoPhillips has more than 300 years of direct experience in the gasification field. The project manager, project engineer, process experts, plant manager, start-up manager, operations and production managers and shift superintendents from Wabash River are all with the business unit and will provide significant assistance to the Proponent in the design, permitting, start-up, and operation of the Mesaba Energy Project.

1.9.1.1.4 Selection of Site and Land Option Agreement

The Proponent acquired an option agreement for control of the West Range IGCC Power Station Footprint and Buffer Land. This property includes approximately 1,260 acres of mostly undeveloped property. Negotiations are currently underway with CE to secure option rights on the properties comprising the East Range IGCC Power Station Footprint and Buffer Land.

1.9.1.1.5 Submission of Large Generator Interconnection Request

In October of 2004, the Proponent submitted a Large Generator Interconnection Procedure ("LGIP") request, numbered G477, to MISO requesting network resource interconnection service with MP's control area from the proposed East Range IGCC Power Station, with the POI proposed at MP's Forbes 500kV/230kV Substation. This was followed in May 2005 with a second LGIP request (G519) for Mesaba One at the West Range Site, with the proposed POI at Minnesota Power's Blackberry 230kV Substation. On February 14, 2006, the Proponent filed a third LGIP request for Mesaba Two at the West Range Site (No.38762-02).

1.9.1.1.6 Transmission System Impact Studies

Both LGIP requests are in the MISO System Impact Study phase. The results of the studies for both the West and East Range Phase I IGCC Power Stations are presented in Section 1.12.1.5. As noted in Section 1.9.1.1.5, the Proponent has submitted an LGIP request that would identify the network reinforcements required for Mesaba Two.

1.9.1.2 Significant Milestones to be Achieved

1.9.1.2.1 Large Generator Interconnect Agreement ("LGIA")

There are several critical milestones within the overall Mesaba One schedule that are related to the transmission development plan. They are important to the success of the Project in meeting its overall project development timeline. Obtaining an approved LGIA will form the basis for allocation of all the costs associated with standalone interconnection equipment and the network upgrades required to be accomplished prior to be being declared a Network Resource by MISO.

1.9.1.2.2 Submittal of Pre-Construction Permit Applications and Environmental Supplement

The Proponent is required to submit an environmental report to state and federal agencies to support preparation of an EIS and, in the case of the MPUC, to support the Joint Site Permit Application. In compliance with these requirements, this ES therefore contains the required detailed information about the Project and its environmental impacts. Issues to be evaluated in the EIS for each site will include alternatives for distributing electricity generated by the Project; use of feedstocks and feedstock blends; access to the facility and means of transport (road and rail) for feedstocks, byproducts, and wastes; water sources; wastewater discharge; air emissions; interconnection to existing natural gas pipelines; socio-economic impacts; wetland impacts; noise; and aesthetics. Besides the Joint Site Permit Application, other preconstruction permit applications will include the Part 70/New Source Review Construction Authorization Application (to the MPCA), the NPDES Permit Application (also to MPCA), the Water Appropriation Permit Application (to the MDNR), and a Wetlands Permit Application (to the U.S. ACOE, Itasca County [for the West Range Site], and MDNR) and local permits and approvals.

1.9.1.2.3 FEED Execution

The FEED of the Project Development Plan will take the current project engineering and design to an advanced design with firm pricing sufficient for securing financing and initiating

construction. The Project Schedule shows the anticipated duration for FEED of approximately 15 months, with commencement of FEED scheduled for the first quarter of 2006.

1.9.1.2.4 Engineering, Procurement, and Construction Plan

Construction does not commence until the Notice to Proceed ("NTP") is given to the contractor following finalization of the EPC Contract and financial close. The EPC contract will reflect the final lump sum turnkey ("LSTK") price for the facility developed in the FEED process and key terms relating to performance, schedules and related liquidated damages, warranties, payment structures, and dispute mechanisms.

1.9.1.2.5 EPC Project Execution Plan (PEP)

The EPC Consortium will present a detailed project execution plan that assures project completion pursuant to a contracted schedule.

1.9.1.2.6 Final Design

Final detailed engineering and design is the responsibility of the EPC Consortium and occurs following receipt of NTP.

The Proponent's personnel, with input from the Owner's Engineer, will oversee project and construction management. Upon satisfaction of all NEPA related requirements and issuances of necessary permits, plant construction will commence. Budget Period II, which includes construction, start-up, and acceptance testing of the entire facility, will begin with receipt of environmental approvals, including NEPA reviews. This is scheduled to occur during the 2nd half of 2007. At NTP, the EPC Consortium will be released to order long lead equipment, begin detailed design efforts, and begin efforts toward mobilization to the field, including contracting with subcontractors.

1.9.1.2.7 Construction

Construction of the facility will be sequenced as shown in the project milestone schedule at Figure 1.9-1. Key schedule elements include construction and start-up of the facility, acceptance testing, environmental systems testing, and demonstrations for the DOE pursuant to the Cooperative Agreement.

1.9.1.2.8 Demonstration and Operation

The Proponent will undertake a one year demonstration as part of the DOE CCPI program, beginning during the first half of 2011. During such time, Mesaba One personnel will monitor and document various performance, efficiency and emission improvements of the IGCC unit.

1.9.1.2.9 Schedule Overview

The Project schedule provided in Figure 1.9-1 is applicable to both the West Range and East Range sites.

1.9.2 Construction Plans

Construction work will begin on the Site during the Spring of 2008 with the work being completed in 2011.

Environmentally sensitive areas at the construction sites will be identified in more detail prior to the start of construction. These locations will be clearly flagged and, if possible, will not be disturbed during site preparation activities. BMPs for control of storm water runoff and erosion protection will be installed and implemented during this time period.

Most construction activities are expected to occur during a single shift between the hours of 7 a.m. and 5:30 p.m., Monday through Saturday. Additional hours and/or a second shift may be necessary to make up schedule deficiencies or to complete critical construction activities. During the warm weather season, a second shift may be utilized to complete civil work activities. X-ray inspection, weld stress-relieving, and some production welding typically occurs during a second shift. The commissioning activities, prior to initial plant startup, will occur 24 hours per day.

1.9.2.1 Site Independent Construction Plans

The EPC contractor will be responsible for the design, procurement and construction of the facility. The following units within the IGCC Power Station will be constructed by the EPC contractor and subcontractors with work on the following elements occurring concurrently:

- Gasification and Gas Treating
- Power Block
- Air Separation Unit
- Feedstock and Product Handling
- Sulfur Recovery and Tail Syngas Recycle
- Balance of Plant (Water treatment, Switchyards, Buildings, and Interconnecting Pipe Racks)

Work outside the battery limits of the plant is described in subsequent sections of this document.

1.9.2.1.1 Construction Support

Mobile trailers or modular offices will be used for owner, contractor and subcontractor personnel, craft change, and lunch areas. The trailers, parking, and material storage will be located within the planned construction site. Construction site access will be controlled for personnel and vehicles. A security fence will be installed around the construction site boundary.

Construction material will be delivered to the construction site by truck and rail. It is expected that 15-20 semi trucks daily will be required to bring material to the construction site. The early completion of the rail spur will allow major plant equipment to be delivered to the construction site. Emergency services will be coordinated with local fire departments, police departments, paramedics, and hospitals. There are major hospitals located in Grand Rapids, Hibbing, Virginia, and Duluth. A first aid office will be on site for minor first aid incidents. Trained/certified Health Safety and Environmental personnel will be continuously on site to respond to and coordinate emergencies.

All temporary facilities will have fire extinguishers, and fire protection will be provided in work areas where welding work is taking place.

During construction, temporary utilities will be provided for construction offices, craft change trailers, lay down areas and the construction areas. Temporary construction power will be provided by the local utility. On-site generators may be used until the temporary power system is completed. Area lighting will be provided and strategically located for safety and security.

Local telecommunication lines will be brought in for the phone and IT communications.

The temporary sanitation facilities will be portable toilets that will be cleaned daily with the waste hauled to a local disposal facility.

Water bottles will be provided for drinking water and construction water will be supplied either by pumping and treatment of surface waters in the vicinity or by connection to the local municipal water system.

Construction water use will be heaviest during the testing phase. Spent hydrotest water will be sampled and tested. If allowed by applicable regulations and permits, spent hydrotest water with suitable chemistry will be routed to the detention basin for disposal to local surface waters. If it is not suitable for routing to the retention basin, the water will be transported by trucks to an appropriately licensed offsite treatment facility. See Section 1.8.5.2 for estimated quantities.

1.9.2.1.2 Phase II Construction

The preceding construction plan description generally applies to both Phase I and Phase II Developments. The Phase II portion of the IGCC Power Station will be installed in the equipment staging and lay down area utilized for Phase I construction. Therefore, a new Phase II staging and lay down area will be identified and prepared at the beginning of the Phase II work, with the required permits and approvals obtained prior to beginning the construction site preparation work.

Detailed construction plans and specifications for Phase II will include provisions necessary to protect construction and plant operating personnel and equipment from potential impacts from the adjacent operating Phase I plant and to minimize IGCC operational disruption during Phase II construction.

Phase II construction work is expected to take place from spring 2010 to 2013.

1.9.2.1.3 Natural Gas Pipeline Construction

The first step in construction of a pipeline is to prepare the ROW. The centerline of the pipeline and points of intersection tangents will be established by a survey. Staking will be at a maximum of 400-foot intervals. A construction ROW up to 100 feet wide would be cleared. Aboveground vegetation and obstacles would only be cleared as necessary to allow safe and efficient use of construction equipment.

Storage areas up to several acres may be required for storing equipment, pipe, and other materials and would be acquired through negotiations with affected landowners.

When encountered along a ROW, fences would be adequately braced before any opening to the fence is made. Locking gates or appropriate fencing would be installed when construction in the area has been completed. Any damage to fences, gates and cattle guards would be restored to the

original condition or replaced. Access and livestock control would be employed during construction to limit impact to the use of the land.

Clearing of the ROW would follow accepted industry practices and sound construction guidelines. In areas where timbering is required, trees would be cut in uniform length and stacked along the ROW based on the owner's preferences. The profile of stumps left from timbering would be as low as possible, and the removal of stumps would be limited to only that necessitated by pipeline installation. Debris created from preparation of the ROW would be disposed of using approved methods during restoration.

After the construction area has been cleared of obstacles and prior to trenching, the area would be graded as necessary to create a relatively flat work surface for the passage of heavy equipment and vehicles for subsequent construction activities. Minimal grading would be required on most of the ROW where the terrain is flat to gently sloping. In particularly difficult terrain, additional construction ROW may be required. Grading and cut-and-fill excavation would be performed to minimize effects on natural drainage and slope stability. On steep terrain or in wet areas where the ROW must be graded at two elevations (i.e., two-toning) or where diversion dams must be built to facilitate construction, the areas would be restored upon completion of construction to original conditions. Excavation and grading would only be undertaken where necessary to increase stability and decrease the gradient of unstable slopes.

The State of Minnesota requires a 54 inch minimum depth of cover in certain areas as detailed in Minn. Stat. § 116I.06, subds. 1, 2, and 3. Specifications will provide for a minimum of 54 inches of ground cover for this proposed pipeline unless waived by the landowner, or to accommodate special construction needs. Federal minimum cover requirements range from 18 inches to 48 inches depending on the circumstances encountered. For most of the proposed route it is anticipated that requirements will call for at least 48 inches of cover over the pipeline.

Most trenching would be performed using a bucket-wheel ditching machine. Conventional tracked backhoes would be used where ground conditions are unsuitable for a ditching machine and if a deeper or wider trench is required. Trench dimensions will comply with applicable land use and regulatory requirements. In wet marshy areas, draglines and clamshells are used to do the ditching. To insure the pipe is buried at the proper depth, the trench will be drained or pumped dry where practicable, or concrete coated pipe will be set on weights to overcome any buoyant force. Where the pipe crosses highway or road ditches, the trench or boring is excavated deep enough to provide a minimum of 54 inches of cover over the pipe. All surfaced road crossings will be installed via directional drilling so that traffic flow will not be interrupted. Directional drilling may be used where the natural gas pipeline crosses lakes, rivers and/or streams.

In areas where there is a need to separate top and subsoil, a two-pass trenching process will be used. The first pass would remove topsoil and the second pass would remove subsoil, with soils from each of the excavations being placed in separate banks. This technique will allow for proper restoration of the soil during the backfilling process. Spoil banks will contain gaps to prevent storm runoff water from backing up or flooding.

The operation of stringing involves the placement of pipe, from a pipe storage facility or from the pipe mill, along the ROW. Pipe will be loaded onto trucks, transported to the ROW, and unloaded by trucks equipped with booms rigged to handle pipe. The pipe would be strung either prior to or after ditching.

After the joints of pipe are strung along the trench and before the sections of pipe are joined together, individual sections of the pipe are bent to allow for uniform fit of the pipeline with the varying contours of the bottom of the trench and to accommodate changes in the route direction. A track-mounted, hydraulic pipe-bending machine is normally used for this purpose when using the size of pipe proposed for this project. The number of degrees of deflection that is allowed in a field bend is limited. Bends required that are greater than that allowed in the field are factory fabricated.

Installation of the pipe, following the bending, commences with internally swabbing the pipe, and aligning the bevels for welding. The weld material is deposited after the proper spacing and alignment of the bevels is accomplished. The line up clamps are held until enough of the weld is completed to assure weld integrity.

A critical phase of pipeline construction is the welding process. Welding is the joining of the individual sections of pipe to form the pipeline, and must be performed by a qualified welder in accordance with welding procedures that meet strict code requirements. Welders must be tested periodically to maintain the rigorous qualifications for certification of pipeline welding.

Every weld will be inspected by radiographic examination to ensure the quality and integrity of the weld. Radiographic examination is a nondestructive method of inspecting the inner structure of welds to determine if any defects are present. Defects would be repaired or removed as outlined in API 1104, which is incorporated by reference in 49 C.F.R. 192.

After welding, the girth weld and the pipe adjacent to the weld must be protected from corrosion. When the field coating or wrapping of the weld is completed, the pipeline is ready to be lowered into the trench. Special side boom tractors spread out along the pipeline simultaneously lift the line and move it over the open trench. The welded string of pipe is then lowered into the trench. An electronic holiday detector is used to monitor the coating during this operation to assure the coating is not damaged.

After the pipe has been lowered into the ditch, the trench will be backfilled. The operation must be performed in a manner that prevents damage to both the pipe and pipe coating from equipment or backfill material. Excess backfill material will be bermed over the ditch centerline to permit natural settling. Where the ditching process was used to separate top and subsoil, backfill is also installed by placing the subsoil into the trench prior to placement of the topsoil to maintain the soil segregation.

After backfilling, the pipeline will be tested to ensure that the system is capable of withstanding the operating pressure for which it was designed. In this process, the pipeline is filled with water at a pressure equal to 1.5 times the design pressure and is maintained for a minimum of eight (8) hours. Water availability and terrain conditions will determine test lengths, and test water will be disposed of pursuant to permit requirements.

The final phase of pipeline construction involves clean up and restoration of the ROW. Removal and disposal of construction debris and any surplus materials will be a part of the clean up. Restoration of the ROW surface involves smoothing by chisel plow or disc harrows or other equipment, and stabilizing when necessary. In non-cropland, the ROW will be re-vegetated according to agreement with the landowner or appropriate government agency.

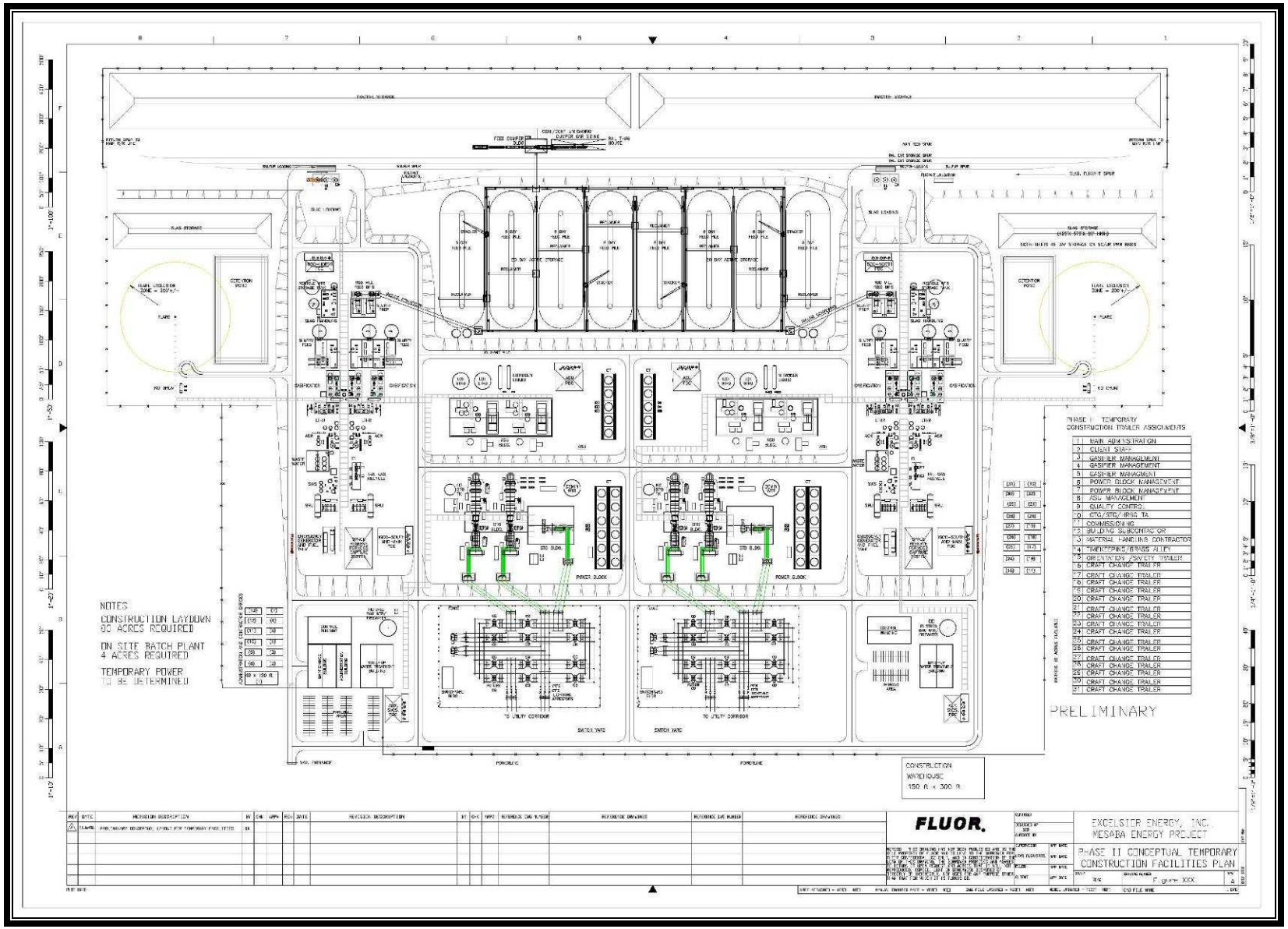
1.9.2.2 West Range (Preferred Site)

The West Range IGCC Power Station Footprint and Buffer Land is mostly wooded and contains several wooded and shrub wetlands within its boundaries. A new plant access road will be constructed off CR 7 and will be utilized for construction worker daily access and trucked material deliveries. It is expected that most traffic to the site will utilize Hwy 169 to access CR 7 and the plant entry.

The first site activities will consist of constructing access roads, rail, clearing brush and trees, leveling, grading, and dewatering the site, and bringing in utilities and undertaking other activities that may be required to prepare the site for construction. Construction parking, temporary offices and material storage locations will be prepared at this time. Activities during this time period will involve the use of large earthmoving equipment needed to clear and prepare the site for construction. Trucks will remove harvested timber, unsuitable soils, and debris off site; haul in fill material for plant equipment areas and roadways; and stockpile additional fill material. Blasting will be required to remove subsurface rock formations during excavation and grading activities. Gravel and road base will be utilized for temporary roads, material storage, and parking areas. Figure 1.9-2 shows the proposed temporary office plans and site parking areas for construction associated with the Phase II Development.

Surficial groundwater levels in soils at the West Range IGCC Power Station Footprint and adjacent Buffer Land are likely to require measures beyond temporary construction dewatering. A permanent dewatering system will likely be needed to ensure long-term water table control at the facility Site.

Figure 1.9-2 Temporary Construction Office Plans Associated with Mesaba Two



1.9.2.3 East Range (Alternate Site)

The East Range IGCC Power Station Footprint and Buffer Land are located within the City of Hoyt Lakes in St. Louis County, Minnesota. The proposed location of the plant contains some wooded and shrub swamps. Various areas within this property have been cleared of trees, and transmission lines exist along the west side of the property. The Duluth, Missabe and Iron Railway Co. (CN subsidiary) track runs along the east and south sides of the property.

Access Road 1 would be constructed off CR 666. These roads will be utilized for worker daily access and trucked material deliveries. It is expected that most of the construction traffic to the site will be from the west where some of the larger communities in the area of St Louis County are located.

It is also anticipated that large equipment required at the site will be shipped by rail. The Duluth, Missabe and Iron Range Railway Company has interchanges with all major railroads operating in Northern Minnesota and large equipment shipments will generally utilize rail service to the site. Equipment will also be trucked to the site when rail shipment is not feasible.

Similar to construction activities at the West Range, the first activities at the East Range will consist of preparing the plot for construction of the facility. This work will involve constructing access roads, clearing brush and trees, dewatering, leveling and grading the site, and bringing in utilities. These activities will involve the use of large earthmoving equipment and potential blasting operations, depending on subsurface conditions. Trucks will haul in fill material for roadways, parking areas, and construction material storage areas. Construction parking, temporary offices, worker change trailers, and material storage locations very similar to those described for the West Range will be prepared at this time. Gravel and road base will be utilized for surfacing temporary roads, material storage, and parking areas. Construction priority will be given to the rail spur so that plant equipment may be received on rail shipments as the project progresses.

Construction support facilities and Phase II construction considerations for the East Range Site would be very similar those previously described for the West Range Site.

1.9.2.4 Power Station Operating Plan

The IGCC Power Station will be operated as a baseload generation facility. Operation will be 24 hours per day except during scheduled outages for maintenance. The facility is designed for high reliability with multiple trains for the key process units. Three gasification trains (at 50% capacity each) are provided (from slurry preparation through dry char removal). Only two gasification trains are required for full power station output. The spare train will normally be in standby service unless maintenance is being performed on one of the gasifier trains. The power station will be designed to achieve an availability of greater than 90% once mature operation is achieved.

1.9.2.5 Turndown Operation

The plant will be capable of “single train operation” where only one gasifier is operating and only one combustion turbine is operating. The single train plant output will be somewhat below one half of the full load output. Additional turndown is possible by reducing the gasifier throughput in either of the two trains or single train operation. Operation at reduced loads is

expected to be limited by physical constraints, as well as the CTG supplier's emission guarantees, to about 70% of the full load output.

1.9.2.6 Operation on Natural Gas

The CTGs must be started on natural gas and loaded to a minimum level before the fuel can be switched to syngas. The CTGs can co-fire natural gas and syngas within limits set by the CTG manufacturer. The CTGs can also operate on 100% natural gas. The power block will be designed to operate on 100% natural gas when required, but at reduced capacity relative to operation on syngas.

1.9.2.7 Natural Gas Pipeline Operation and Maintenance

The pipeline is jurisdictional to the Minnesota Office of Pipeline Safety ("MOPS"). All facilities proposed for the pipeline project will be designed, operated and maintained in accordance with DOT Minimum Federal Safety Standards in Title 49 of C.F.R. Part 192. These regulations were promulgated to ensure protection for the public from failures of natural gas pipeline and related facilities. Part 192 defines and specifies the minimum standards for operating and maintaining pipeline facilities, including the establishment of an Emergency Plan which will provide written procedures to minimize hazards from a gas pipeline emergency. Key elements of any emergency plan will include procedures for:

- Receiving, identifying, and classifying emergency events – gas leakage, fires, explosions and natural disasters
- Establishing and maintaining communications with local fire, police and public officials, and coordinating emergency responses
- Making personnel, equipment, tools and materials available at the scene of an emergency
- Proactive protection for people and insuring human safety from actual or potential hazards
- Emergency shutdown of the system and safely restoring service

The safety standards specified in Part 192 require each pipeline operator to:

- Develop an emergency plan, working with local fire departments and other agencies, to identify personnel to be contacted, equipment to be mobilized, and procedures to be followed in responding to a hazardous condition caused by the pipeline or associated facilities
- Establish and maintain a liaison with the appropriate fire, police and public officials in order to coordinate mutual assistance when responding to emergencies
- Establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a natural gas pipeline emergency and report it to appropriate public officials

Before placing the pipeline in service, the operator will prepare a procedural manual for operation and maintenance of the proposed pipeline.

The pipeline facilities will be operated and maintained in compliance with MOPS regulations. The operator will become a member of the Gopher State Excavators One-Call system that is

utilized to prevent damage to underground pipelines by excavators and others performing underground construction. Periodic aerial and ground inspections by pipeline personnel will be conducted to identify dead vegetation, soil erosion, unauthorized encroachment or other conditions that could result in a safety hazard or require preventative repairs or maintenance. In addition, gas leak detection and cathodic protection surveys will be conducted periodically to ensure proper and adequate corrosion protection and proper operation.

1.9.3 Summary of Test Plans

1.9.3.1 Start-up and Commissioning

The Proponent and its O&M team will develop a Plant Start-up Test Plan and submit the plan to DOE for review and comment. At the completion of construction, the Proponent will commence plant start-up testing in accordance with the approved plan. The testing will begin at the component level and progress through system and integrated plant operations. Upon successful completion of start-up testing, systems will be sequentially turned over to plant operations. Start-up testing of major systems will begin with the combined cycle and balance of plant, followed by the ASU and testing of each of the three gasifier trains, culminating in an integrated operations test of all components and systems. Initial power plant start-up, commissioning, and performance testing will be the responsibility of the EPC Contractor under the turnkey EPC contract. Operating labor, fuel, utilities, catalysts, chemicals, and other consumables will be provided by the Proponent.

1.9.3.2 Operational Demonstration Test Plan

The Proponent will develop an Operational Demonstration Test Plan and submit the plan to DOE for review and comment. The plan will encompass activities that achieve the following objectives:

- Demonstrate mercury removal, activated carbon life expectancy, and operational costs in an IGCC application
- Demonstrate smooth ramp-up to full capacity and greater than 90% annual availability with the spare gasification train
- Demonstrate manifolding of gasification trains and operational swapping
- Demonstrate that phased refractory repair contributes to improved gasifier availability
- Demonstrate the feedstock-flexible design

1.9.3.3 Plant Demonstration and Operations

The plant demonstration and operations effort will be approximately 12-months. The Proponent will implement the Operational Demonstration Test Plan identified in Section 1.9.3.2 and ascertain and document the results of the demonstration in relation to the project objectives. It is also anticipated that the Project will demonstrate improved life for a state-of-the-art refractory, operation of the hybrid cyclone - particulate matter removal system, and document the impact of other plant improvements over the demonstration period. The Proponent will perform the following plant demonstrations and operations as required by the CCPI Cooperative Agreement:

1.9.3.3.1 Feedstock Flexible Design

The Proponent will demonstrate that the Project is capable of accepting and converting various feedstocks to syngas.

1.9.3.3.2 IGCC Operations

As operational experience on the Project is accumulated, the Proponent will tune systems and components for optimized performance and corrective maintenance.

1.9.3.3.3 Environmental and Operational Reporting

Through the demonstration period, the Proponent will ensure environmental and operational performance of the Project is conducted in accordance with all laws and regulations. Thereafter, the Proponent will seek continuous improvements in the operation of the facility.

1.9.4 Plans Following Demonstration Period

The IGCC Power Station will be operated commercially as a base load generating plant (on a 24 hours per day, seven days per week schedule). Routine operating and maintenance activities will consist of activities largely identical to those performed during the demonstration period.

Since there are multiple trains of production equipment (for example, two 50% ASUs and AGRs), maintenance will be performed on one train of equipment while the other remains in production. Since there are three 50% gasification trains (one of which is considered a “spare”) included in the IGCC Power Station’s design, maintenance on the gasification train out-of-service at any point in time is performed at such times. Performing maintenance activities in this manner allows for levelized work load and an optimized production schedule. Periodically, each phase of the IGCC Power Station will be shutdown to perform scheduled maintenance on the STG.

1.10 IGCC POWER STATION LABOR AND CONSTRUCTION MATERIAL REQUIREMENTS

1.10.1 Labor Requirements

1.10.1.1 Construction Labor

Table 1.10-1 below estimates the number of construction personnel working each quarter. It is estimated that the work force on-site at the time of peak construction activities will be approximately 1,500 personnel, including the Proponent's staff and visitors.

Table 1.10-1
Estimated Number of Construction Personnel On Site (Phase I)

YEAR	QUARTER	ESTIMATED NUMBER OF CONSTRUCTION PERSONNEL
2008	1st	0 -50
	2nd	50-100
	3rd	100-150
	4th	200-300
2009	1st	200-300
	2nd	600-800
	3rd	1,200-1,400
	4th	1,100-1,300
2010	1st	900-1,100
	2nd	1,200-1,400
	3rd	900-1,100
	4th	600-800
2011	1st	300-500
	2nd	200-300
	3rd	100-150
	4th	50-100

The labor will be provided through the local Building Trades.

There are numerous motels, lodges and apartments in the surrounding communities with sufficient total capacity to accommodate the project workforce needs.

1.10.1.2 Operations Labor

Operator hiring and training will begin about one year before the commencement of start-up. Gasification area personnel need extensive training in plant operations, reactive chemicals and safety, industrial hygiene, and environmental compliance similar to that of operators in refineries and chemical plants. Generally, the staff will consist of management and engineers (many of whom will have been participating on the Proponent's behalf in the plant design), shift supervision and operations management (who will be hired first and trained at other gasification facilities to the extent practical) and shift operating personnel (who will be trained by the shift supervision personnel). Process simulators will be used as part of the training program. The

operations staff will be integrated into the commissioning team so that they will have hands on experience with the plant beginning when each system is turned over from construction.

In addition to operations and management personnel, the new IGCC Power Station will require qualified staffing to support: power production planning; equipment maintenance; procurement; laboratory chemists and technicians; health, safety, and environmental specialists; administrative support; benefits/human relations; and other necessary functions. The expected number of operating staff is presented in Table 1.10-2.

Table 1.10-2
Estimated Operating Staff Required for IGCC Power Station

SYSTEM	PHASE I STAFF	PHASE II STAFF
Gasification and ASU Subtotal	96	64
Combined Cycle Power Block Subtotal	11	11
Total Staff Requirement	107	75

In addition to the permanent operations staff, there will be ongoing contract maintenance work for scheduled and un-planned outages. Contract maintenance will typically include inspections and overhauls for the ASU compressors, the CTGs, the STG, gasifier refractory repair and replacement, catalyst and sorbent change outs, and other non-routine maintenance.

1.10.2 Construction Materials and Suppliers

Construction materials will be procured by the EPC contractor. Materials will be shipped from suppliers located throughout the country and globally. These materials will be transported to the site by rail and truck. Local procurement can be expected to be the cost-effective choice for concrete ready-mix suppliers, road base and gravel fill suppliers, reinforcing steel fabrication, construction equipment rentals, office supplies, temporary sanitation facilities, and other commodities and services.

1.11 Site-Specific Requirements

1.11.1 West Range (Preferred Site)

1.11.1.1 Rail Loop Access

Rail access into the West Range IGCC Power Station is from existing BNSF/CN tracks. The rail loop is discussed in detail in Section 1.12.3.1.2.

1.11.1.2 High Voltage Electrical Switchyard and Interconnection to HVTLs

Electric power would be produced by two CTGs and by one STG in each phase. Each of the generators would have an associated main transformer that boosts the generator output voltage up to 230kV. HVTLs from each of the main transformers would be connected to the switchyard. The switchyard would contain the required breakers, metering and distribution facilities to provide internal power to the IGCC Power Station and export power to the grid. Phase I would require two double circuit 345 kV lines operated at 230kV voltage to export power to the grid. Phase II would only require additional upgrade equipment, with the two lines then being operated at 345 kV. Section 1.12.1.2.1 provides detailed information about the HVTL requirements for the West Range IGCC Power Station.

1.11.1.3 Raw Water Intake Structure and Pump House

The raw water requirement for the IGCC Power Station will principally come from the integration of abandoned mine pits located near the site. The CMP and HAMP Complex are the water sources for the Phase I IGCC Power Station. Each phase would be expected to have a peak raw water demand of about 6,500 gpm, with most of this volume used to replace water evaporated in the cooling towers. Both sources would be required to support the water demand for the Phase I IGCC Power Station. The demand for the combined Phase I and II IGCC Power Station is expected to require additional Water Resources beyond the two mine pits identified above. The Proponent has identified such additional Water Resources to include the LMP and the Prairie River.

A raw water intake structure will be used to supply a pump house located on the east end of the CMP. The pump house will contain two or more pumps that would forward raw water to the IGCC Power Station. Floating pump systems in the LMP and Gross-Marble Mine Pits ("GMMP") (the GMMP is part of the HAMP Complex) would be used to forward water to the CMP. Section 1.12.4.2 discusses the volumes of water that are expected to be withdrawn from each of these resources and the manner in which such resources would be used.

1.11.1.4 Raw Water Pipeline

A raw water pipeline would convey raw water from the raw water pump house on the CMP to the IGCC Power Station. The raw water pump house and pipeline will include control systems, metering, and any required surge protection facilities. The raw water pumps will be started and stopped remotely from the IGCC Power Station.

1.11.1.5 Raw Water Treatment

Raw water from the raw water pipeline will be filtered prior to use in the IGCC Power Station. Any waste resulting from the raw water treatment process will be taken to a local non-hazardous landfill for disposal.

1.11.1.6 Cooling Tower Blowdown

Heat must be rejected from the power plant condenser in order to maintain proper steam cycle characteristics. The Phase I and Phase II IGCC Power Station will use cooling towers to reduce the amount of water required to be withdrawn from Water Resources in the vicinity of the West Range Site.

1.11.1.7 Potable Water System

The potable water demand is generated by construction and operational demands, with the former significantly greater than the latter. Notwithstanding this difference, the potable water demand is relatively small (about 30 gallons per day per person) and is expected to be provided from the City of Taconite. As an alternative, clarified, filtered raw water could be treated and disinfected to meet potable water standards.

1.11.1.8 Sanitary Waste System

The sanitary wastewater produced during operation of the IGCC Power Station is also relatively small (about 30 gallons per day per person) and is expected to be pumped to the City of Taconite POTW. As an alternative, the sanitary wastewater could be processed within the IGCC Power Station with the treated effluent discharged to nearby receiving water(s).

1.11.1.9 Natural Gas Supply Pipeline and Metering Station

Natural gas would be used to start up the IGCC facility and used as a backup fuel if syngas is not available. The maximum natural gas flow is expected to be about 105 million standard cubic feet of gas per day per phase of the IGCC Power Station. Natural gas would be supplied through a direct connection to the GLG Pipeline located about 15 miles due south of the West Range IGCC Power Station and/or from NNG's tapping point located in La Prairie, Minnesota, about 12 miles west southwest of the Project Site. The Proponent will contract with either or both entities for natural gas transportation capacity for quantities and at pressures sufficient to operate the IGCC Power Station at maximum load while operating on backup fuel. The Proponent will purchase natural gas through a series of contracts with gas suppliers in order to obtain the lowest overall fuel price and contract conditions for this commodity.

1.11.1.10 Treated Wastewater Forwarding System

Wastewater discharged from the IGCC Power Station will be composed primarily of cooling tower blowdown. In the wastewater, the mineral content will be about five to eight times that found in the raw water, due to concentration by evaporation in the cooling tower. Contact cooling water will be segregated from cooling tower blowdown and routed through a ZLD system, thereby ensuring that no trace elements carried over from feedstock will be discharged to receiving waters.

Process drains that may contain oil will be segregated and passed through an oily water separator before being collected in an oily wastewater forwarding sump and recycled to the gasifier via water used to slurry the feedstock.

Blowdown from the HRSGs will be collected and reused as cooling tower makeup. Cooling tower blowdown will be monitored for pH, temperature, total residual chlorine (TRC), and foaming. De-chlorination, anti-foam and acid/base neutralization systems will be used to maintain compliance with permit conditions. Cooling tower blowdown will be pumped directly to the CMP or Holman Lake via a wastewater pipeline or other discrete conveyance.

1.11.1.11 Wastewater Pipeline and Outfall Structure

The wastewater pipeline will carry cooling tower blowdown directly to the CMP or Holman Lake. The treated cooling tower blowdown may be blended with relatively low flow wastewater streams from other plant systems (see Table 1.8-18). These additional streams include blowdown from the HRSGs, boiler feedwater demineralizers, and intermittent storm water. An outfall structure will be provided so that the thermal and concentration effects to receiving waters would be minimized and comply with applicable regulations.

1.11.1.12 Storm Water Collection and Detention

Storm water generated during IGCC Power Station operation would be managed in three ways:

- Storm water associated with industrial activity (see 40 C.F.R. 122.26(b)(14) for a definition of "storm water associated with industrial activity") would be segregated from process equipment by curbs, elevated drain funnels and other means, and returned as make-up to the feedstock slurrying system or for other process water use.

- Storm water not associated with industrial activity that could become contaminated with oil (such as parking lot areas) will be routed through an oil/water separator and then to the cooling tower blow down sump prior to discharge off-site.

- Storm water from other areas would be routed to the storm water detention pond where settling can occur and initial rainfall ("first flush") can be contained, checked, and released in a controlled manner.

1.11.1.13 Plant Access Road

Road access to the West Range IGCC Power Station will likely be from two directions. Heavy construction traffic would access the IGCC Power Station from U.S. Highway 169 about 1.4 miles east of CR 7. The intersection of U.S. Highway 169 and CR 7 is currently deemed by the Itasca County Engineer to be too dangerous for such use due to the steep approach to U.S. Highway 169 that now exists. Heavy equipment traffic associated with the Phase I and II Developments would be moving too slowly from a dead stop at the existing intersection and traffic coming from either direction on U.S. Highway 169 moving at highway speeds could have difficulty slowing down in time to avoid accidents with such slow moving vehicles. The County intends to construct, own, and operate a new alignment of CR 7 for purposes of addressing this concern.

The new alignment proposed by Itasca County is shown on Figure 1.5-7 and would extend the existing alignment straight east at the point where south-bound traffic on CR 7 now makes a final turn to the south about 0.9 miles north of the existing intersection of CR 7 and U.S. Highway 169. The current stretch of CR 7 between U.S. Highway 169 and the point referenced immediately above would meet the new CR 7 in a "T" intersection. Employee traffic coming to the IGCC Power Station from the south would stop at the new intersection (of old CR 7 and new CR 7), turn east, travel about 500 feet and turn north into the Power Station's entrance road. Employee traffic coming from the north down CR 7 would travel by the solid waste transfer station a distance of about 1,000 feet and turn north into the West Range IGCC Power Station's entrance road.

Given the County's intent to develop the new alignment to address the needs of local traffic projections, the Proponent has adopted the approach as its preferred alternative for accessing the IGCC Power Station. Construction traffic will be required to access the West Range Site through use of the existing CR 7 alignment if construction of the new alignment is delaid.

Figure 1.5-7 shows the proposed modifications to the existing roadways. The site access road would terminate at the main gate of the IGCC Power Station. Employee traffic would still be routed to the West Range IGCC Power Station via CR 7 (see Section 1.12.3.2).

1.11.1.14 Feedstock Suppliers, Locations, and Transportation/Distribution Methods

As discussed previously, the West Range IGCC Power Station has several rail delivery options. The Duluth, Missabe and Iron Range Railroad, recently acquired by the CN, serves the Project Site and can deliver Illinois No. 6 coal, petroleum coke, or feedstocks from Canada. Coal shipments from Montana and Wyoming (PRB sub-bituminous coal) can be shipped by rail to the Project Site via the BNSF Railway. Petroleum coke may also be railed or trucked from several locations throughout the country.

1.11.2 East Range (Alternate Site)

1.11.2.1 Rail Loop Access

Rail access into the East Range IGCC Power Station would be via existing CN trackage. The two site-specific options available for access to and egress from the East Range IGCC Power Station are discussed in Section 1.12.3.1.3.

1.11.2.2 High Voltage Electrical Switchyard and Interconnection to High Voltage Transmission Lines (HVTLs)

The equipment used to generate electricity at the East Range IGCC Power Station is identical to the equipment used at the West Range. Equipment used to transform electricity for export to the POI at Forbes would be similar to that at the West Range, however, the East Range IGCC Power Station will be configured for operation at 345kV at the time Mesaba One is first started up. This may not be the case for the West Range IGCC Power Station. Two Separate 345kV HVTL on separate routes would be used to provide the necessary redundancy to meet the n-1 single failure criterion (see Section 1.12.1.1.2). Each GO HVTL would be a double circuit 345kV/115kV, the 115kV HVTL being MP's existing line occupying the ROW within which the Proponent's 345kV HVTL must travel. An additional 30 feet of ROW will be required along one of the existing routes to support a predictable construction schedule. Section 1.12.1.3

provides detailed information about the HVTL requirements for the West Range IGCC Power Station.

1.11.2.3 Raw Water Intake Structure and Pump House

The raw water requirement for the IGCC Power Station will principally come from the coordinated use of water from abandoned mine pits located near the IGCC Power Station Footprint. The largest mine pit nearby the Station Footprint would be used as a reservoir from which Mesaba One and Mesaba Two would obtain their process water. The Proponents would install a permanent pumphouse on this reservoir. Water from other nearby abandoned mine pits would be pumped into the large reservoir on a seasonal basis from floating pump stations. The demand for water at the East Range IGCC Power Station will be less than the West Range Power Station because a ZLD system (required to comply with stringent regulations applying to wastewater discharges to Lake Superior Basin surface waters) would be used to recycle water to the maximum extent possible. This system produces large amounts of residual minerals that will require landfilling in a permitted facility. The demand for the combined Phase I and II IGCC Power Station is expected to require periodic appropriations from Colby Lake during times of high inflow thereto. The ZLD system would allow for the potential use of wastewaters from other industrial neighbors. The ZLD system requires station power above that required for the West Range IGCC Power Station making the East Range IGCC Power Station less efficient and more costly to operate. The infrastructure required to pump water to the East Range IGCC Power Station is discussed in Section 1.12.4.3. The added costs for running the ZLD system are quantified in Section 2.8 of the Joint Application.

1.11.2.4 Raw Water Pipelines

The site-specific pipeline infracstructure required to transfer water from the abandoned mine pits to the large storage reservoir is discussed in Section 1.12.4.3.2.

1.11.2.5 Potable Water System

The East Range IGCC Power Station will get its potable water from the Hoyt Lakes municipal water supply. The infrastructure required to connect to the City's water supply and the suitability of system for providing the Power Station's ultimate needs are discussed in Section 1.12.7.3.

1.11.2.6 Sanitary Waste System

The East Range IGCC Power Station will connect to the Hoyt Lakes POTW for treatment of its domestic wastewaters. The suitability of the Hoyt Lakes POTW and the infrastructure required to connect thereto is discussed in Section 1.12.6.3.5.

1.11.2.7 Natural Gas Supply Pipeline

The Proponent would contract with NNG to provide the natural gas pipeline transportation from which natural gas would be obtained for starting up the IGCC Power Station and operating it under contingencies associated with the delivery of solid feedstocks to the gasifier. NNG would permit, install, and operated the natural gas pipeline in accordance with State and Federal guidelines identified in Section 1.2.6.2.8.

1.11.2.8 Treated Wastewater Forwarding System

All process water generated by the East Range IGCC Power Station would be treated by the ZLD system identified in Section 1.11.2.3 above.

1.11.2.9 Wastewater Pipeline and Outfall Structure

No process water blowdown pipeline and no outfall structure would be required for the East Range IGCC Power Station.

1.11.2.10 Storm Water Collection and Detention

See Section 1.2.6.2.7 for a discussion regarding the Proponent's responsibilities in preparing an SWPPP.

1.11.2.11 Plant Access Road

Access to the East Range IGCC Power Station will be from an existing County Road that receives light travel. The requirements for upgrading CR 666 and the minimal impacts associated with constructing the access road to the Power Station are introduced in Section 1.12.3.2.2.

1.11.2.12 Feedstock Suppliers, Locations, and Transportation/Distribution Methods

See Section 1.7.1 for a description of the potential feedstocks for the IGCC Power Station. The specific options for feedstock deliveries are discussed in Sections 1.12.3.1.1 and 1.12.3.1.3. The material handling system for receiving and distributing the feedstocks are described in Section 1.8.1.1.5.

1.12 INFRASTRUCTURE REQUIREMENTS AND JUSTIFICATION OF ALTERNATIVES

1.12.1 Electric Transmission

This section describes the design of the proposed HVTLs required for the project and their operation. The names attached to the plans and routes discussed in this section are provided in Table 1.5-1 in Section 1.5.1.2.2.D

1.12.1.1 Electrical Design Considerations and Switchyards

1.12.1.1.1 Generator Output

Electric power for each of the two phases of the IGCC Power Station will be produced by two CTGs (about 220 MW each) and by one STG (up to 300 MW). The voltage level characterizing the electrical output of the CTG and STG (16.5kV and 18kV, respectively) will be below the level needed to transmit the Station's net electric output to its POI. Transformation to the appropriate voltage will occur prior to the Power Station's switchyard. The design and cost of the IGCC Power Station are currently based on such transformation delivering to the switchyard at a voltage of 230kV the generators' gross electric power output.

1.12.1.1.2 Conductor Capacity and Generator Outlet HVTLs

Based on the Station's nominal net electric output of 606 MW at a 0.90 power factor, one bundled conductor 230kV transmission line rated at 1,585 Amperes is sufficient to carry the peak electrical output of Mesaba One or Mesaba Two. A single 345kV bundled conductor rated at 2,113 Amperes could carry the full 1,212 MW net electric power output from Mesaba One and Mesaba Two. However, a minimum of three 230kV HVTLs, two 345kV HVTLs, or a combination of two 230kV HVTLs and one 345kV HVTL would be required to satisfy the single failure criterion design element (that is, loss of one GO HVTL could occur without interrupting the Phase I and II IGCC Power Station's delivery of its peak output power to the POI).

1.12.1.1.3 Interconnection Voltage

The choice between transforming the output power of Mesaba One and/or Mesaba Two to 230kV or 345kV is not solely dependent upon the distance between the Power Station and its POI (although distance is important because power losses increase with increasing distance from the POI). The choice is also dependent upon voltage levels at which the substation currently operates (the electrical equipment required to transform power from one level to another is very expensive) and existing "down stream" power flow constraints.

1.12.1.1.3A Operating Voltage of Regional Electric Transmission System

The regional high voltage transmission system on the Iron Range operates mainly at 115kV and 230kV. Efforts to bolster Minnesota's ability to exchange power between regions with fewer attendant losses will dictate that new transmission developments in the region operate at higher voltages. The Proponent believes that 345kV will be the future standard on which such transmission developments on the Iron Range will be focused and has based its decision for the

IGCC Power Station's interconnection voltage on that premise. The results of MISO's Interconnection Studies (see Sections 1.9.1.1.5, 1.9.1.1.6, and 1.9.1.2.2) will confirm whether the Proponent's decision regarding the likelihood of future 345kV development at the two substations is appropriate.

1.12.1.1.3B Flexibility Required Pending MISO's Decision-Making

Until such time as MISO confirms its decision on the interconnection voltage for Mesaba One and Mesaba Two, the Proponent is requesting an HVTL Route Permit that allows flexibility to change its West Range interconnection voltage plans (use of 345kV at the East Range Power Station is dictated due the increased power losses that would otherwise occur if the system was operated at 230kV). In Section 1.5.1.2.2, the Proponent has identified two HVTL plans to deal with uncertainties related to MISO's decision-making on the West Range interconnection request. The first plan, identified as Plan A, is based on the presumption that future 345kV developments in Northern Minnesota are imminent. The second plan, defined as Plan B, is based on a potential MISO determination that the region's electrical transmission system is best served by maintaining the Blackberry Substation's electrical connections to the grid at 230kV. If MISO decides otherwise, the addition of a 345kV bus at the substation is likely and the Proponent would implement Plan A (see Section 1.5.1.2.2B and 1.5.1.2.2C for a detailed explanation of the Proponent's Preferred Plan A and Contingent Plan B).

1.12.1.1.3C IGCC Power Station Developments Required to Operate At 345kV

The layout of the IGCC Power Station switchyard is shown in Figures 1.12-1, 1.12-2, and 1.12-3. This layout is applicable to both West and East Range developments. Increasing the voltage at which the IGCC Power Station delivers its output power to the POI will require the addition of a 345kV bus at the POI and autotransformers at the Station's switchyard.

1.12.1.1.4 West Range Switchyard

1.12.1.1.4A Plan A

Phase I and II Developments would include interconnecting to the POI with two 345kV HVTLs placed on single steel pole structures and initially operating at 230kV for Phase I. The length of the radial HVTLs required to reach the Blackberry Substation is on the order of 10 miles. The line losses associated with operation of the 345kV GO HVTLs at 230kV are acceptable and therefore 230kV represents the preferred interconnection voltage for Mesaba One. To avoid increased power losses that would occur upon start up of Mesaba Two, the interconnection voltage will be converted to 345kV commencing with its operation.

The electrical layout of the switchyard for Mesaba One is currently designed for 230kV. Prior to commencing operation of Mesaba Two, additional autotransformers, a 345kV busbar and associated breakers will be added to the IGCC Power Station's switchyard to convert the Phase I GO facilities outlets to 345kV operation. The switchyard serving Mesaba Two will connect that unit's generators to one of the two 345kV GO HVTLs delivering the IGCC Power Station's output power to the grid. Figure 1.12-3 shows the configuration of the West Range IGCC Power Station switchyard commencing with operation of Mesaba Two.

Figure 1.12-1. Conceptual One Line Diagram for West Range and East Range IGCC Power Stations Depicting 230kV Switchyard

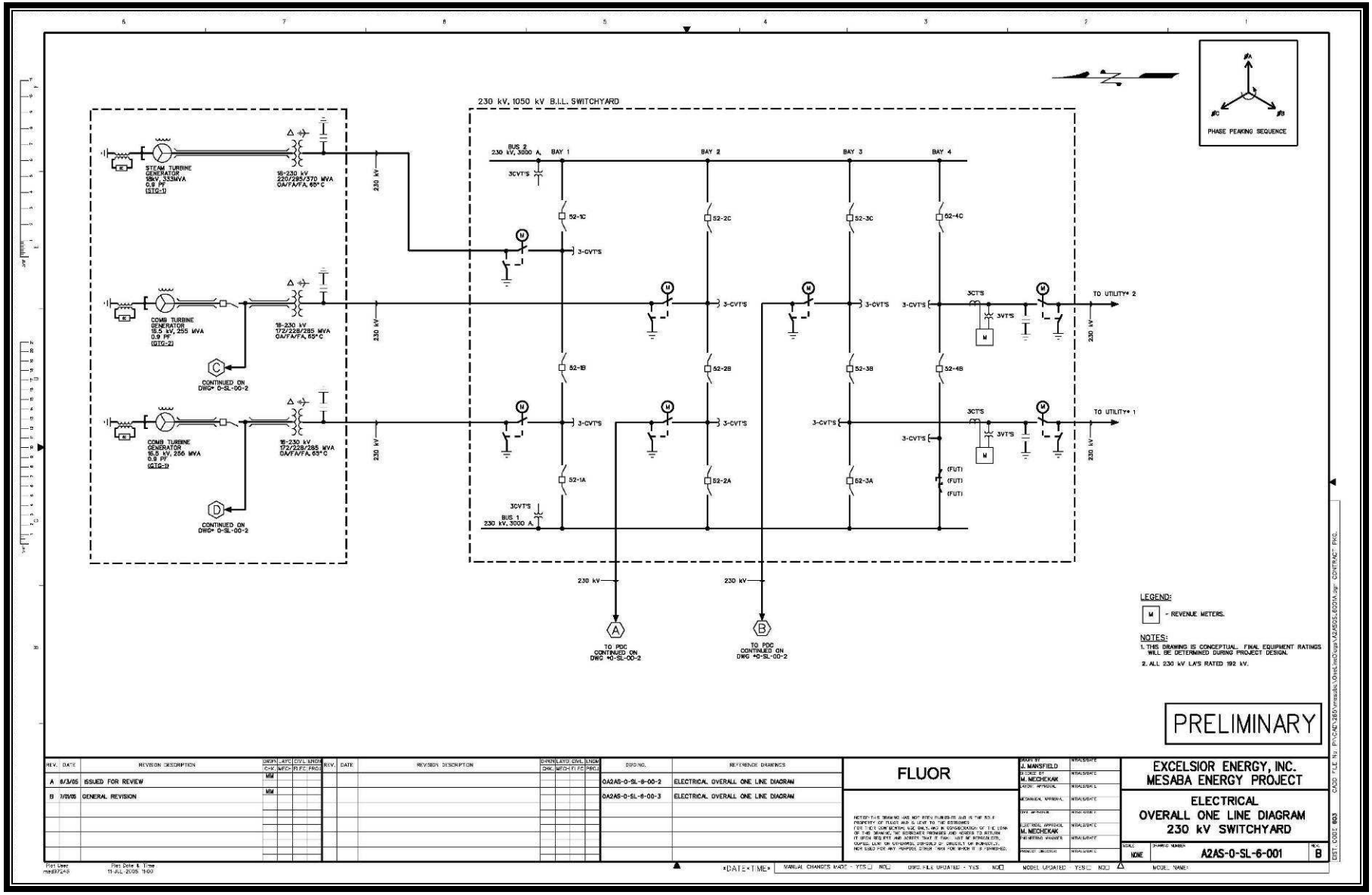


Figure 1.12-2. Conceptual One Line Diagram for West Range and East Range Sites Depicting 230kV Feeds to ASU, Power Block, and IGCC Substation

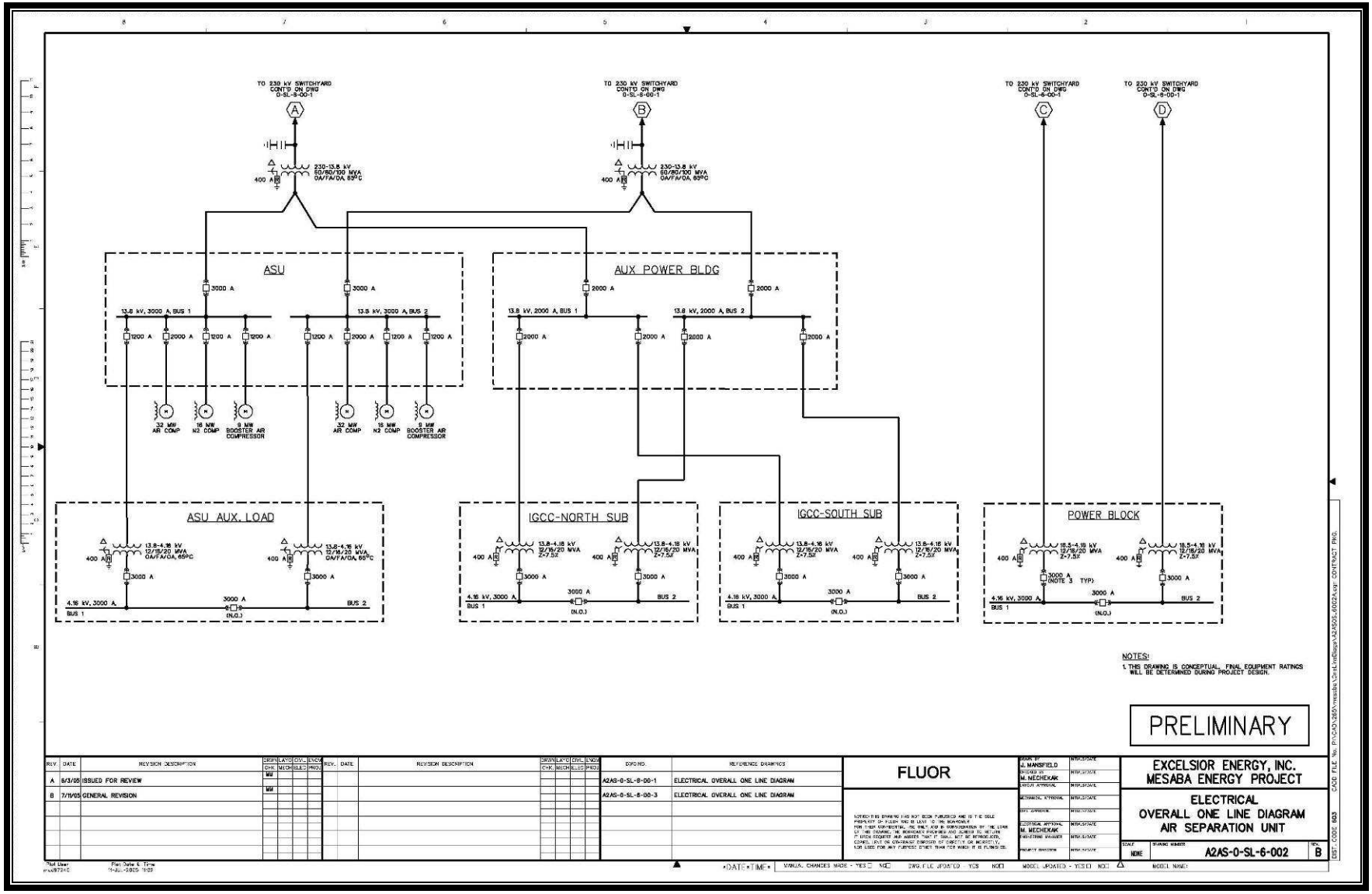
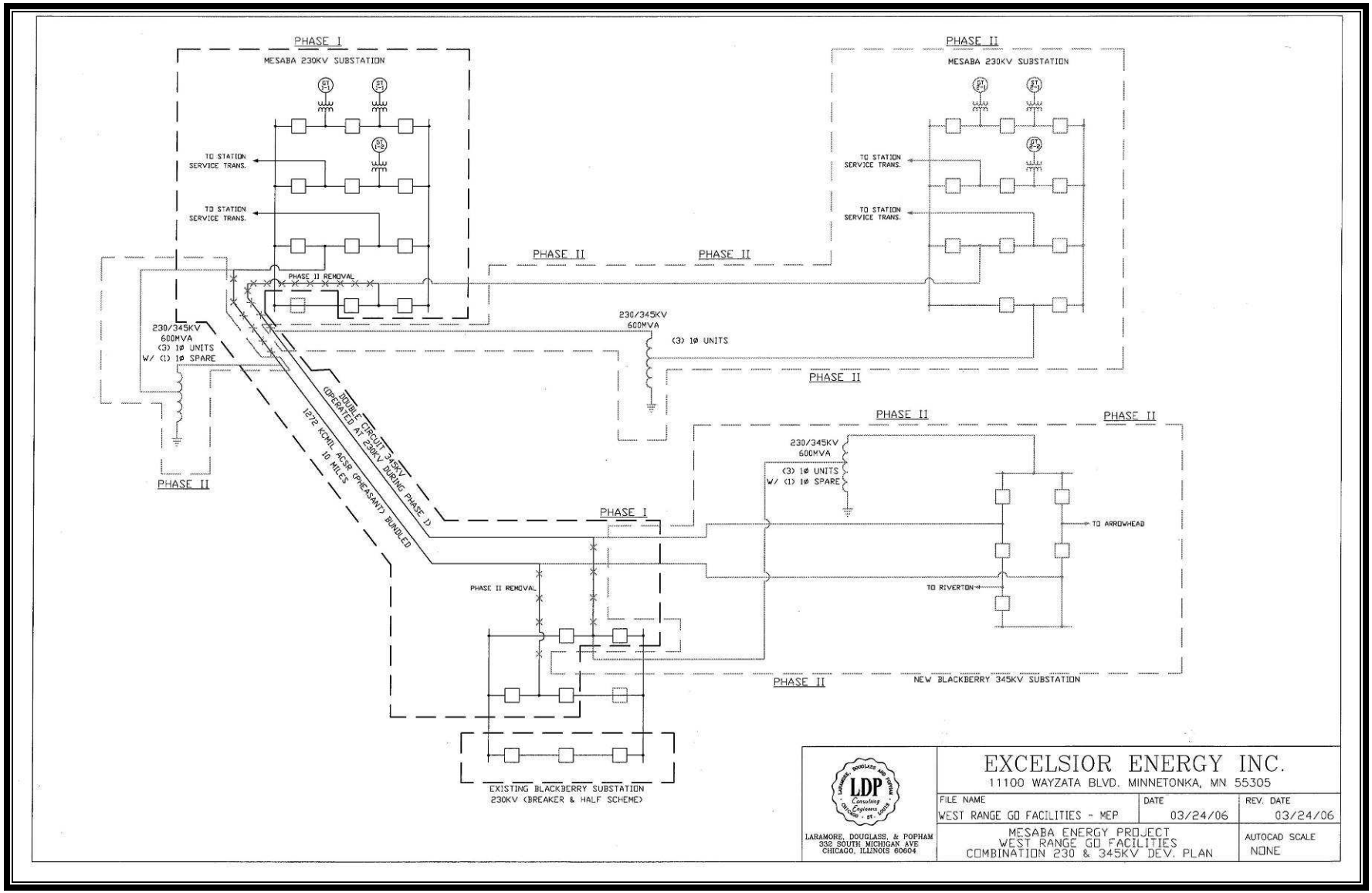


Figure 1.12-3 West Range Plan A Phase I and II IGCC Power Station Switchyard Design



1.12.1.1.4B Plan B

1.12.1.1.4B(1)(a) Phase I Preferred Route (WRB-1)

Phase I Developments under Plan B would include interconnecting to the POI with two 230kV HVTLs placed on single steel pole structures. As previously noted, these double circuited lines would not be sufficient to meet the single failure criterion with the addition of Mesaba Two.

The output voltage rating of the single HVTL required to provide the necessary redundancy for the Phase II developments would depend upon the route identified through the PPSA process. The preferred Route WRB-2 would allow the Phase II HVTL to be developed at 230kV. The alternate Route WRB-2A would require the Phase II HVTL to be developed at 345kV. These two options would require different substation designs.

1.12.1.1.4B(1)(b) Phase II Preferred Route WRB-2

The switchyard design assuming the preferred route (for Phase II) is approved during the PPSA process is shown in Figure 1.12-4.

1.12.1.1.4B(1)(c) Phase II Alternate Route WRB-2A

The switchyard design assuming the alternate route (for Phase II) is approved during the PPSA process is shown in Figure 1.12-5.

1.12.1.1.5 East Range IGCC Power Station Switchyard

The high voltage switchyard for the East Range IGCC Power Station will be configured at 345kV to serve Mesaba One. The decision to operate the switchyard at 345kV commencing with startup of Mesaba One is based on a net line loss totaling about 5 MW less than that which would otherwise occur if the GO facilities were operated at 230kV. Over the project life, the capacity gain associated with 345kV development relative to the 230kV option more than offsets the 345kV development's higher capital cost.

The high voltage switchyard required to transmit the entire output from Mesaba One and Mesaba Two to the POI with minimum line losses will be installed to serve Mesaba One. Although work will be required in the switchyard to connect Mesaba Two to the GO HVTLs and to provide station power back to Mesaba Two, no further development of the GO HVTLs will be required.

The East Range IGCC Power Station switchyard design is shown in Figure 1.12-6.

Figure 1.12-4 West Range Plan B Phase II Preferred Route (WRB-2) IGCC Power Station Switchyard Design

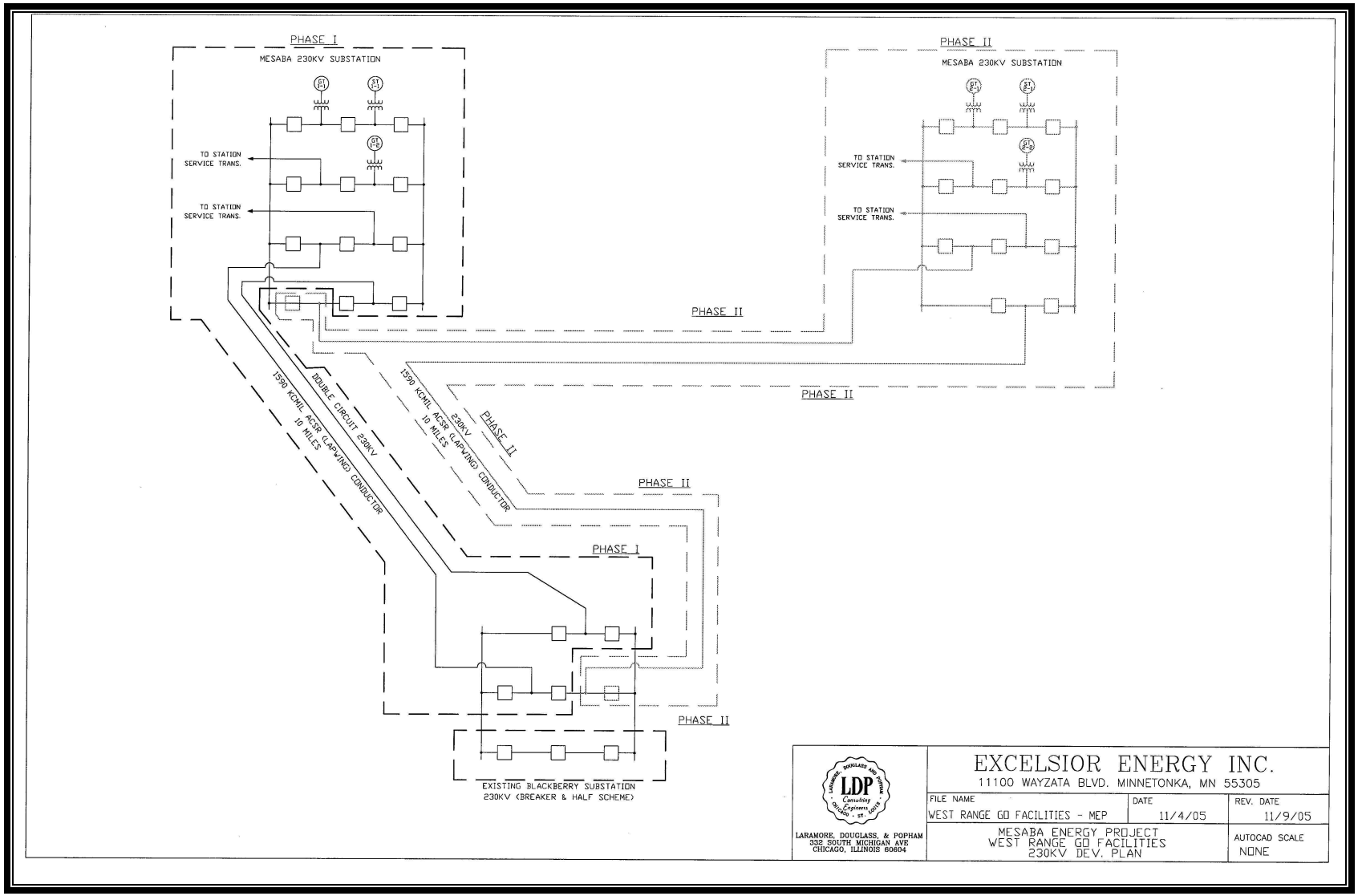


Figure 1.12-5 West Range Plan B Phase II Alternate Route (WRB-2A) IGCC Power Station Switchyard Design

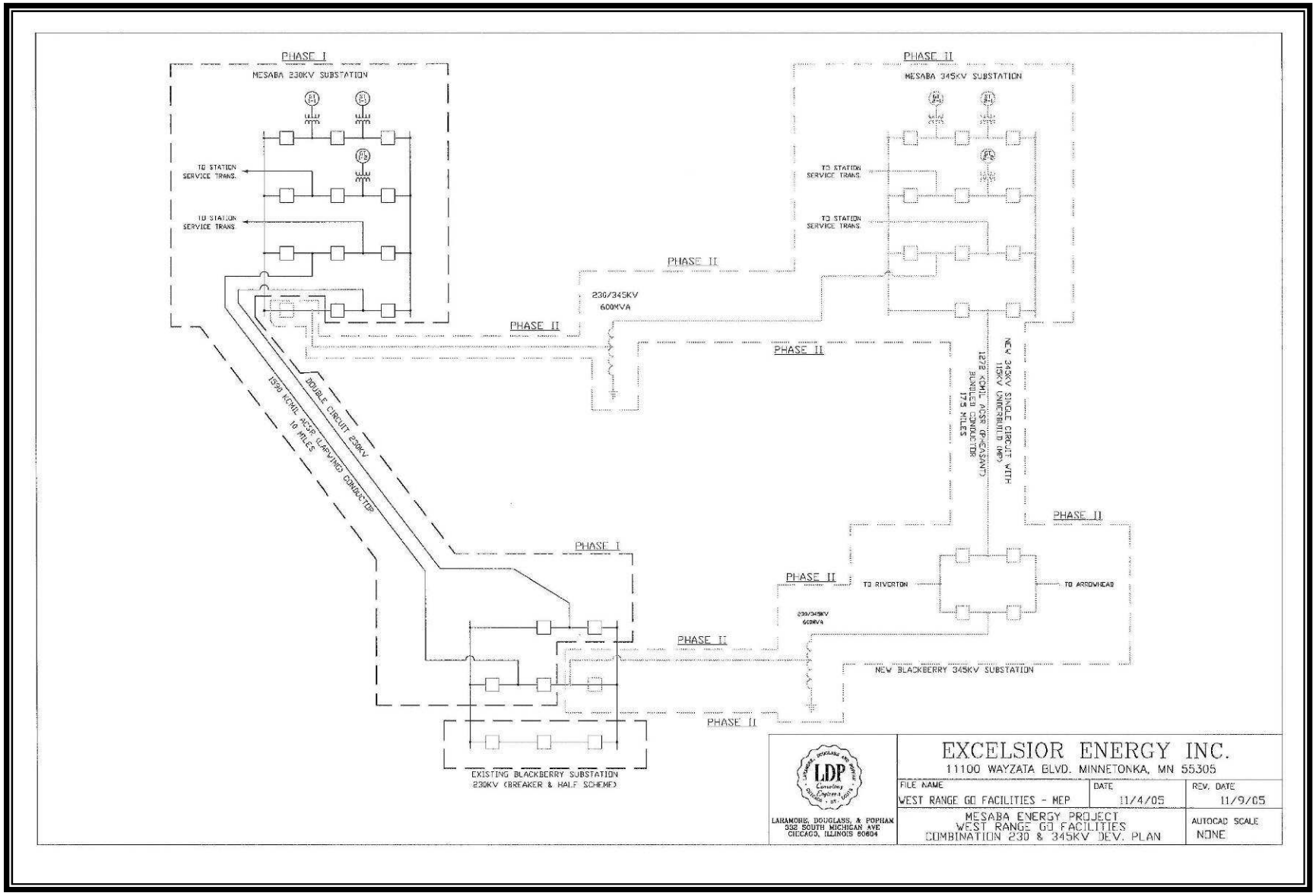
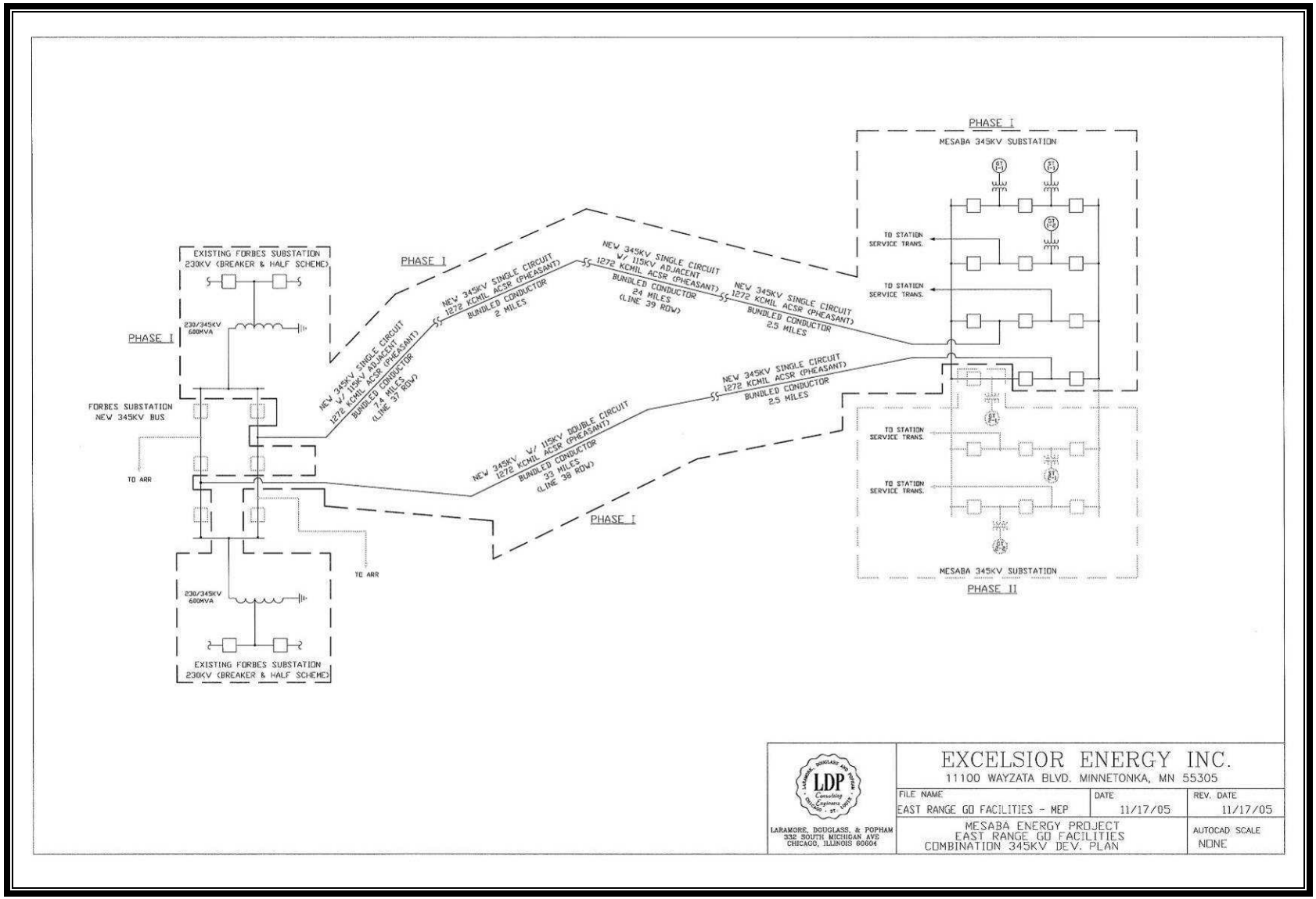


Figure 1.12-6 East Range IGCC Power Station Switchyard Design



1.12.1.2 Generator Outlet Routes: Special considerations

1.12.1.2.1 West Range IGCC Power Station

1.12.1.2.1A Preferred Plan A

As noted, the proposed approach to providing generator outlets for the West Range IGCC Power Station consists of constructing a double circuit 345kV HVTL from the IGCC Power Station to the Blackberry Substation, operating such HVTLs at 230kV for Phase I, and thereafter converting the operating voltage of both circuits to 345kV for Phase II. This approach offers, at a relatively small marginal cost, the needed redundancy to meet the single failure criterion and accommodate the entire output of Mesaba One and Mesaba Two though use of just two HVTLs.

Wherever practical, the Proponent has sought to use existing routes for the GO HVTLs. Whenever the GO HVTLs are routed along existing HVTL corridors with active HVTLs present, the 345kV double circuit HVTL structures would be configured to carry existing HVTLs (the configuration and dimension of such structures is presented in Section 1.12.1.3.1A(1)).

The Plan A preferred Route WRA-1 and alternate Route WRA-1A are shown in Figure 1.5-13 and special considerations are described in the paragraphs below.

1.12.1.2.1A(1)(a) Preferred GO HVTL Route (WRA-1)

Figures 1.5-28 through 1.5-30 show the preferred Route WRA-1 for Plan A. This double circuit 345kV option would travel east from the Phase I IGCC Power Station's switchyard to MP's existing 45L ROW and then south about 1.6 miles to the retired Greenway Substation. The HVTL route would continue south on double circuit 345kV structures approximately 6.2 miles from the Greenway Substation over new ROW to intersect MP's 83L and 20L. The route would follow the existing MP ROW about 1.1 miles east to the Blackberry Substation using a double circuit 345kV line with 115kV under build to carry the 20L along. This route provides a direct path between the IGCC Power Station and the POI, traverses mostly remote areas, and minimizes impacts on residences. The double circuit configuration of the structures requires the narrowest ROW width for 2 circuits. This smaller ROW footprint dictates less tree trimming, less easement cost and generally would have fewer landowner impacts when compared to other configurations. Special considerations along this route appear to be minimized given the remote nature of the surroundings, minimal number and length of water crossings, and generally level topography.

The new ROW traverses both forested areas and wetlands. Tree clearing will be required along the forested portion and special considerations will need to be applied to the wetland areas. Easements must be negotiated with several property owners, at which time the routing may be subject to some minor changes. The existing abandoned section of 45L would be removed. The 115kV 20L must be overbuilt or moved to the existing cross arms under the 83L. The line changes in the 83L/20L ROW will likely result in one mile of taller transmission structures for the double circuit 345kV line with its 115kV underbuild. The obvious disadvantage of the Plan A 345kV double circuit is that it will afford less route diversity than two separate circuits on individual ROWs.

The structures to be used along preferred Route WRA-1 are identified in Section 1.12.1.3.1A(1).

1.12.1.2.1A(1)(b) Alternate HVTL Route (WRA-1A)

Figures 1.5-31 through 1.5-33 show the alternate Route WRA-1A. This route is described in Section 1.5.2.3.1B. Special considerations along this route include an increased number and length of crossings of the Swan River, topographical challenges where hills meet open water, and an increased number of spans across open areas (these areas include cleared fields and gravel mining operations).

In general, the double circuit structures carrying the two 345kV HVTLs on the alternate Route WRA-1A will be identical to those used in the Plan A preferred route.

1.12.1.2.1A(1)(c) Plan A Routing Summary

Table 1.12-1 below compares the preferred and alternate routes considered under Plan A.

Table 1.12-1
West Range Transmission Line Design Summary: Plan A

HVTL Segment Description	Existing HVTL Rating	Existing Corridor Widths	Approx. Length	Widening Or New Corridor Needed?	HVTL Structure Type	Conductor Type
Preferred 345kV Route WRA-1 (see Figures 1.5-13 and 1.12-10)						
45/28L	115kV	145 ft	1.6 miles	No	See Figures 1.12-12 and 1.12-13	1272 KCMIL ACSR (Pheasant) Conductor
82/20L	230kV	150 ft	1.0 miles	No		
New ROW between Greenway & Blackberry Substations	Not Applicable	Not Applicable	6.3 miles	100 ft ;150 ft where sharing ROW with NG Pipeline		
Alternate 345kV Route WRA-1A (see Figures 1.5-13 and 1.12-14)						
45/28L	115kV	145 ft	1.6 miles	No	See Figures 1.12-12 and 1.12-13	1272 KCMIL ACSR (Pheasant) Conductor
62L/63L	230kV	150 ft	0.9 miles	No		
New ROW between Greenway & Blackberry Substations	Not Applicable	Not Applicable	5.8 miles	100 ft ; 150 ft where sharing ROW with NG Pipeline		

1.12.1.2.2 Contingent Plan B

If the Proponent must abandon Plan A as a result of MISO's Interconnection Studies, it will implement Plan B developments as identified in Table 1.12-2 below. The basis for these options is described in the narrative presented in the subsections below.

Table 1.12-2
Plan B HVTL Routing Options

Route Name (see Table 1.5-1)	Plan B Phase I and II Routing Options		
	Preferred Option 1 (see Figure 1.5-14)	Alternate Option 2 (see Figure 1.5-15)	Alternate Option 3 (see Figure 1.5-16)
WRB-1	Phase I		Phase I
WRB-1A or WRB-2	Phase II (WRB-2)	Phase I (WRB-1A)	
WRB-2A		Phase II	Phase II

1.12.1.2.2A Plan B Phase I

1.12.1.2.2A(1)(a) Preferred Route (WRB-1)

The Plan B preferred Route WRB-1 is identical to the preferred Plan A Route WRA-1 with the exception that 230kV HVTLs will be used to deliver output power from Mesaba One to the POI. The double circuit 230kV structures will be shorter by approximately 30 ft (110 ft for the 230kV structures vs. 140 ft for the 345kV structures). The double circuit 230kV with underbuild will be shorter by the same amount (125 ft for the 230kV structures vs. 155 ft for the 345kV structures). The structure summary is provided in Figure 1.12-16 along with the appropriate ROW calculations for each structure in Figures 1.12-19 and 1.12-20.

1.12.1.2.2A(1)(b) Phase I Alternate Route (WRB-1A)

The Plan B Phase I Alternate Route WRB-1A is identical to the alternate Plan A Route WRA-1A with the exception that 230kV HVTLs will be used to deliver output power from Mesaba One to the POI. The structure summary for this route is identical to that shown in Figure 1.12-16.

Table 1.12-3 West Range Transmission Line Design Summary: Plan B Phase I

HVTL Segment Description	Existing HVTL Rating	Existing Corridor Widths	Approx. Length	Widening Of Corridor Needed?	HVTL Tower Type	Conductor Type
Preferred 230kV Route WRB-1 (Figures 1.5-14 and 1.12-15)						
45/28L	115KV	145 ft	1.6 miles	No	See Figures 1.12-19 and 1.12-20	1590 KCMIL ACSR (Lapwing) Conductor
82/20L	230kV	150 ft	1.0 miles	No		
New ROW between Greenway & Blackberry Substations	Not Applicable	Not Applicable	6.3 miles	100 ft ;150 ft where sharing ROW with NG Pipeline; 150 ft where two structures occupy one corridor		
Alternative 230kV Route WRB-1A (Figures 1.5-14 and 1.12-15)						
45/28L	115KV	145 ft	1.6 miles	No	See Figures 1.12-19 and 1.12-20	1590 KCMIL ACSR (Lapwing) Conductor
62L/63L	230kV	150 ft	0.9 miles	No		
New ROW between Greenway & Blackberry Substations	Not Applicable	Not Applicable	5.8 miles	100 ft ;150 ft where sharing ROW with NG Pipeline; 150 ft where two structures occupy one corridor		

1.12.1.2.2B Phase II

1.12.1.2.2B(1)(a) Preferred Route (WRB-2)

The Plan B Phase II Preferred Route WRB-2 will be the route not selected for Phase I as noted above in Section 1.5.2.3.2B(1). The structures to be used in the Plan B Phase II Preferred Route are shown in Figures 1.12-17 and 1.12-21.

1.12.1.2.2B(1)(b) Alternate Route (WRB-2A)

If the Plan B preferred Route WRB-2 is not selected, the Proponent will use two existing corridors with a combined length almost twice that required to reach the POI using the preferred route (about 18 miles in length versus 9 miles in length for the preferred route). Because of the increased length of this route to the POI, a 345kV HVTL rated at 1,212 MW would be required to avoid significant line losses and power flow imbalances.

The 345kV alternate line would travel east from the Phase I and II IGCC Power Station to the 45L corridor and then north about 1.2 miles from the point of intersection on single circuit wood "H" frame or delta structures to the point where it intersects with 28L. The route would then

follow 28L east approximately 7.8 miles to a point nearby the intersection of 28L and 62L just north of Pengilly. At this point, a short new ROW will be required (see Figure 1.12-7 and the following paragraph). The Proponent's new HVTL would then travel southwest approximately 6.7 miles to the Blackberry Substation on single circuit 345kV or 230kV delta configured structures with a 115kV underbuild to carry 62L. Utilization of the alternate route would provide route diversity as it is completely separated from the 230kV double circuit route specified for the Phase I IGCC Power Station.

The width of the ROW associated with the existing 28L corridor is currently 145 feet. The width of the ROW for the 62L/63L corridor varies between 160 and 340 feet for most of its length. A 0.7 mile segment of the 62L/63L corridor located about 3.7 miles from the Nashwauk Substation narrows significantly and will require special towers and new ROW to carry the lines traversing this segment. Figure 1.12 -7 illustrates how the 62L/63L ROW varies as a function of distance from the Nashwauk Substation. This is the only special consideration along this existing route.

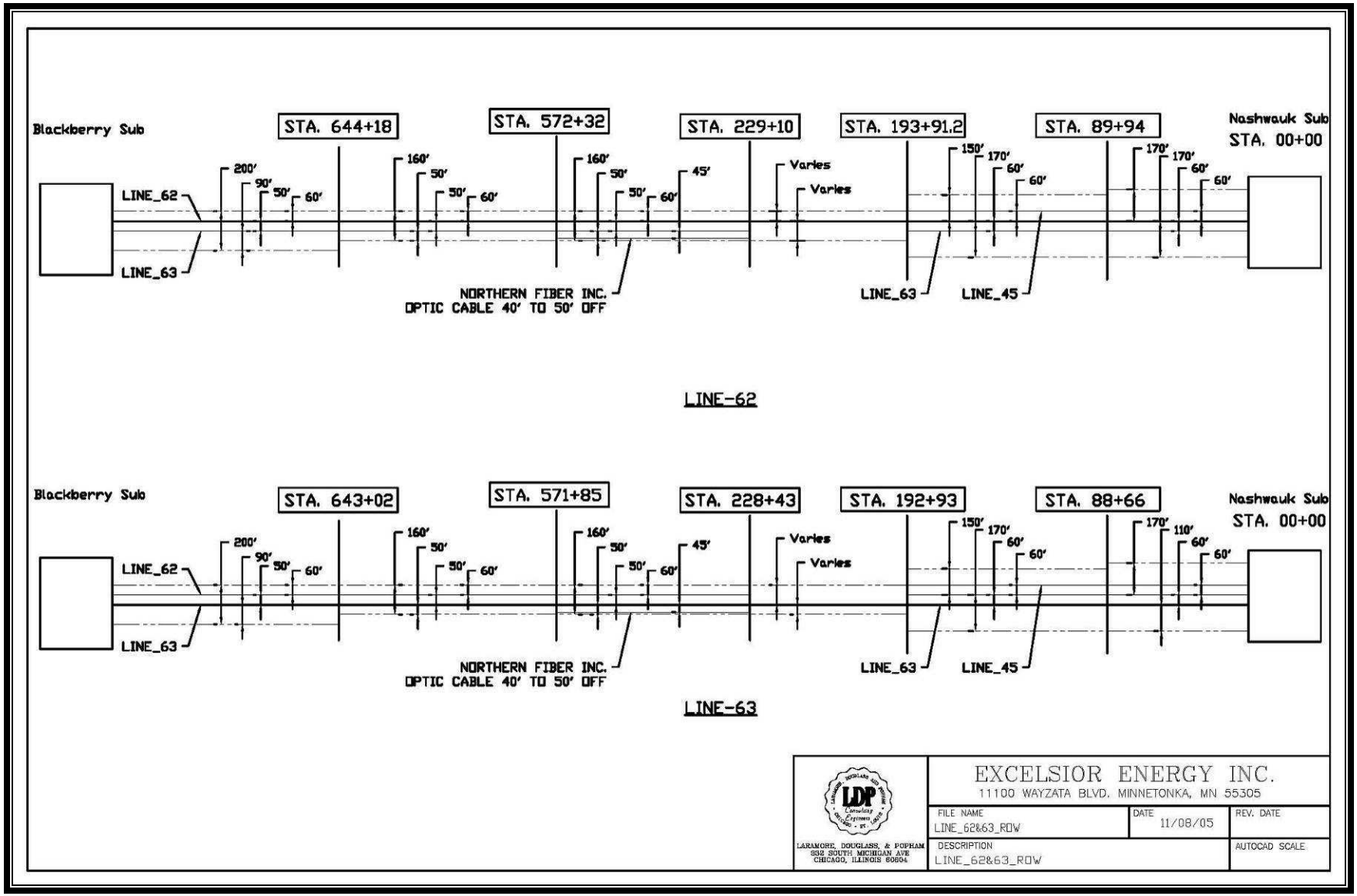
1.12.1.2.2B(1)(c) Plan B Phase II Routing Summary

Table 1.12-4 below compares the preferred and alternate routes considered under Plan B.

Table 1.12-4 West Range Transmission Line Design Summary: Plan B Phase II

HVTL Segment Description	Existing HVTL Rating	Existing Corridor Widths	Approx. Length	Widening Of Corridor Needed?	HVTL Type	Conductor Type
Preferred 230kV Route WRB-2 (Figure s 1.12-15, 1.5-15, and 1.5-16))						
45/28L	115KV	145 ft	1.6 miles	No	See Figures 1.12-17 and 1.12-21	1590 KCMIL ACSR (Lapwing) Conductor
62L/63L	230kV	160-340ft	0.9 miles	No		
New ROW between Greenway & Blackberry Substations	Not Applicable	Not Applicable	5.8 miles	100 ft ;150 ft where sharing ROW with NG Pipeline; 150 ft where two structures occupy one corridor		
OR (Figure 1.12-15)						
45/28L	115KV	145 ft	1.6 miles	No	See Figures 1.12-17 and 1.12-21	1590 KCMIL ACSR (Lapwing) Conductor
82/20L	230kV	150 ft	1.0 miles	No		
New ROW between Greenwway & Blackberry Substations	Not Applicable	Not Applicable	6.3 miles	100 ft ;150 ft where sharing ROW with NG Pipeline; 150 ft where two structures occupy one corridor		
Alternate 345kV Route WRB-2A (Figure 1.12-22)						
45/28L	115kV	145 ft	8.8 miles	No	See Figures 1.12-25, 1.12-26 and 1.12-27	1272 KCMIL ACSR (Pheasant) Conductor
62/63L	115kV	160-340 ft	8.7 miles	No		
New ROW 28L between 62L/63L	Not Applicable	Not Applicable	0.5miles	100 ft		

Figure 1.12-7 ROW Widths Along Existing 62L/63L HVTL Corridor



1.12.1.2.3 East Range Site

The proposed approach to providing GO facilities for the East Range IGCC Power Station consists of constructing two new 345kV HVTLs from the IGCC Power Station to the Forbes Substation. Both new lines will be constructed during Phase I to meet the single failure criterion and provide the capacity to meet the GO requirements for both the Phase I and II IGCC Power Station. Each line would follow existing 115kV HVTLs (39L/37L and 38L) along most of their length. Where the new lines parallel the existing lines, the existing lines would be transferred to the new line structures, resulting in new single structure, double circuit (345kV/115kV) lines. The proposed transmission line routes are shown in Figure 1.5-18. Table 1.12-5 includes a summary of the East Range transmission line design information under this generator outlet approach.

Table 1.12-5
East Range HVTL Design Summary

HVTL Segment Description	Existing HVTL Rating	Existing Corridor Widths	Approx. Length	Widening Of Corridor Needed?	HVTL Tower Type & Number	Conductor Type
43L Route						
New ROW parallel to 43L	138kV	No	2.5 miles	100 ft	See Figure 1.12-12	1272 KCMIL ACSR (Pheasant) Conductor
Preferred 39L/37L Route						
39L	115kV	100 ft	23.6 miles	30 ft	See Figures 1.12-32 – 1.12-36	1272 KCMIL ACSR (Pheasant) Conductor
New ROW	Not Applicable	Not Applicable	2.0 miles	100 ft		
37L	115kV	100 ft	7.4 miles	30 ft		
38L Leg						
38L	115kV	100 ft	33.0 miles	No	See Figures 1.12-25, 1.12-26, and 1.12-27	1272 KCMIL ACSR (Pheasant) Conductor

The 345kV HVTLs would be constructed along the existing 38L and 39L/37L HVTL routes in a manner that minimizes environmental impacts associated with the expansion of existing ROWs. The proposed construction sequence for the preferred route is as follows.

- The Proponent will acquire an additional 30 feet of ROW along the entire length of the existing 39L/37L HVTL.
- Using the additional ROW width, the Proponent will construct a structure type that allows for the MP 115kV lines (39L and 37L) to be transferred to an available circuit position on the steel pole paralleling the 345kV position. The initial 345kV circuit would be installed and energized at 115kV.

- After the first circuit is energized at 115kV, the "H" Frame structures on the 39L/37L ROW would be removed, and an additional circuit of 115kV would be installed in the open circuit position paralleling the 345kV conductor.
- The energizing of the second 115kV circuit will allow for the de-energizing and removal of the existing 38L 115kV line, and the subsequent construction of the second new 345kV/115kV double-circuit line within the existing 38L ROW.
- After construction of the two new lines is completed, each line would be energized with 345kV/115kV double-circuits. The net increase will be two new 345kV lines to provide the necessary GO for the East Range IGCC Power Station.

If the alternate route is selected the construction sequence would be similar, with the actions on the 39L/37L and 38L lines reversed.

1.12.1.3 Structures and ROW Requirements

The Proponent is proposing to use single steel pole structures along most of its HVTL segments. The foundation design for these structures in well drained soils is provided in Figure 1.12-8. Different foundations are needed in poorly drained, compressible soils. In such instances foundations similar to that presented in Figure 1.12-9 will be used.

Steel light duty "H" frame structures may be proposed for a portion of the transmission line segments on the Buffer Land and/or where other demands warrant their placement (see Section 1.12.1.3.1C). The selection of structure type and required height are dictated by the line voltage, the number of circuits carried by the structure, clearance requirements and economic considerations. Construction and permanent ROW requirements are dependent on the structure configuration and are described in this section.

1.12.1.3.1 West Range

1.12.1.3.1A Plan A

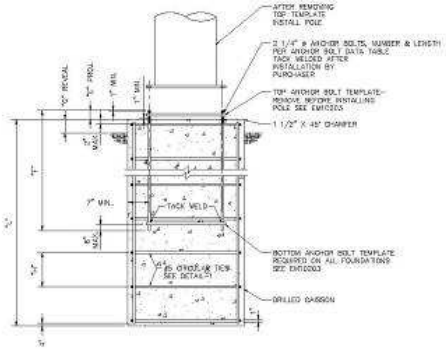
1.12.1.3.1A(1)(a) Preferred Route WRA-1

Figure 1.12-10 shows the 345kV double circuit preferred route line segments. A preliminary summary of the HVTL structure configurations and heights that would be used along the 345kV preferred Route WRA-1 are provided in Figure 1.12-11. A detailed analysis showing the ROW required for each of the structures and the dimensions upon which the ROW calculation is based is provided in Figure 1.12-13 and 1.12-14. The height of the new structures would exceed that of the existing "H" frame 115kV towers by a maximum of 70 to 85 feet depending upon which double circuit configuration is utilized (that is, double circuit or double circuit with underbuild).

1.12.1.3.1A(1)(b) Alternate Route WRA-1A

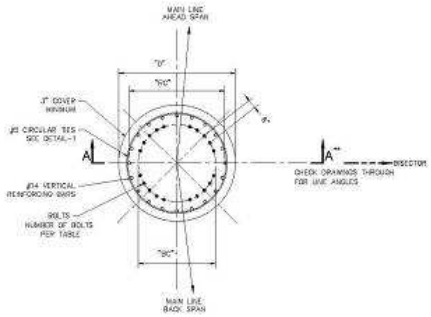
Figure 1.12-14 shows the 345kV double circuit alternate route line segments. The summary of the HVTL structure configurations and heights that would be used along the 345kV alternate Route WRA-1A are provided in Figure 1.12-11. The variation in structure height is also shown.

Figure 1.12-8 Single Pole Steel HVTL Structure Foundation Design



SECTION A–A
SCALE: NONE

DETAIL – 1
TYPICAL BENDING DIAGRAM FOR #3 CIRCULAR TIE BARS



FOUNDATION PLAN
FOUNDATION ORIENTATION SHOWN W.R.T. AHEAD & BACK SPAN
SCALE: NONE

ANCHOR BOLT DATA							FOUNDATION DETAIL				
NO. OF BOLTS 2 1/4" DIA.	NO. OF # 14 VERTICAL RE-BARS	DIMENSIONS					CAISSON DIAM. "D"	OVERALL LENGTH "L"	SPACING BETWEEN BOLTS ON "BC"	DIAM. "RC"	CLEAR SPACING BETWEEN RE-BARS ON "RC"
		"BC"	"E"	"F"	"G"	"H"					
44	40	81	1"	120"	1"	18"	12'	40.5'	6"	108"	7"
16	16	59	1"	93"	1"	18"	7'	19.5'	6"	73"	12.5"
16	16	61	1"	101"	1"	18"	7'	18'	6"	73"	12.5"
16	16	60	1"	97"	1"	18"	7'	34.5'	6"	73"	12.5"
16	16	60	1"	97"	1"	18"	7'	33.5'	6"	73"	12.5"
16	16	61	1"	101"	1"	18"	7'	24'	6"	73"	12.5"
60	54	118	1"	120"	1"	18"	12'	50' *	6"	133"	6"

NOTE:
TYPICAL FOUNDATION FOR REFERENCE ONLY.

LDP Consulting Engineers
LARAMORE, DOUGLASS & POPHAM
532 SOUTH MICHIGAN AVE
CHICAGO, ILLINOIS 60604

EXCELSIOR ENERGY INC.
11100 WAYZATA BLVD. MINNETONKA, MN 55305

FILE NAME	DATE		REV. DATE
FOUNDATION	10/04/05		
DESCRIPTION: TYPICAL FOUNDATION			AUTOCAD SCALE

Figure 1.12-9 Pile Foundations for Poorly Drained, Compressible Soils

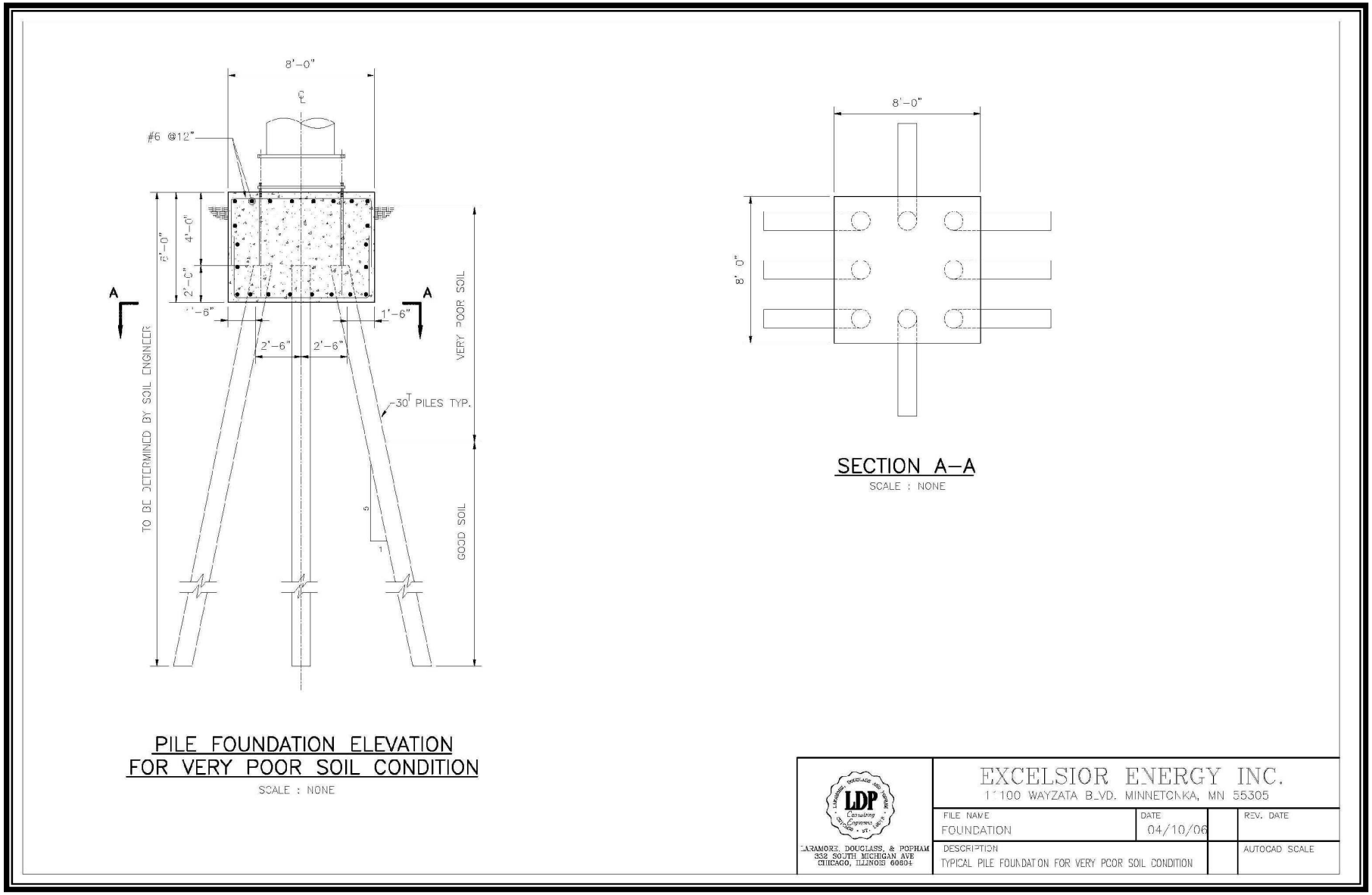


Figure 1.12-10 345kV HVTL Double Circuit Structures Along West Range Plan A Preferred Route (WRA-1)

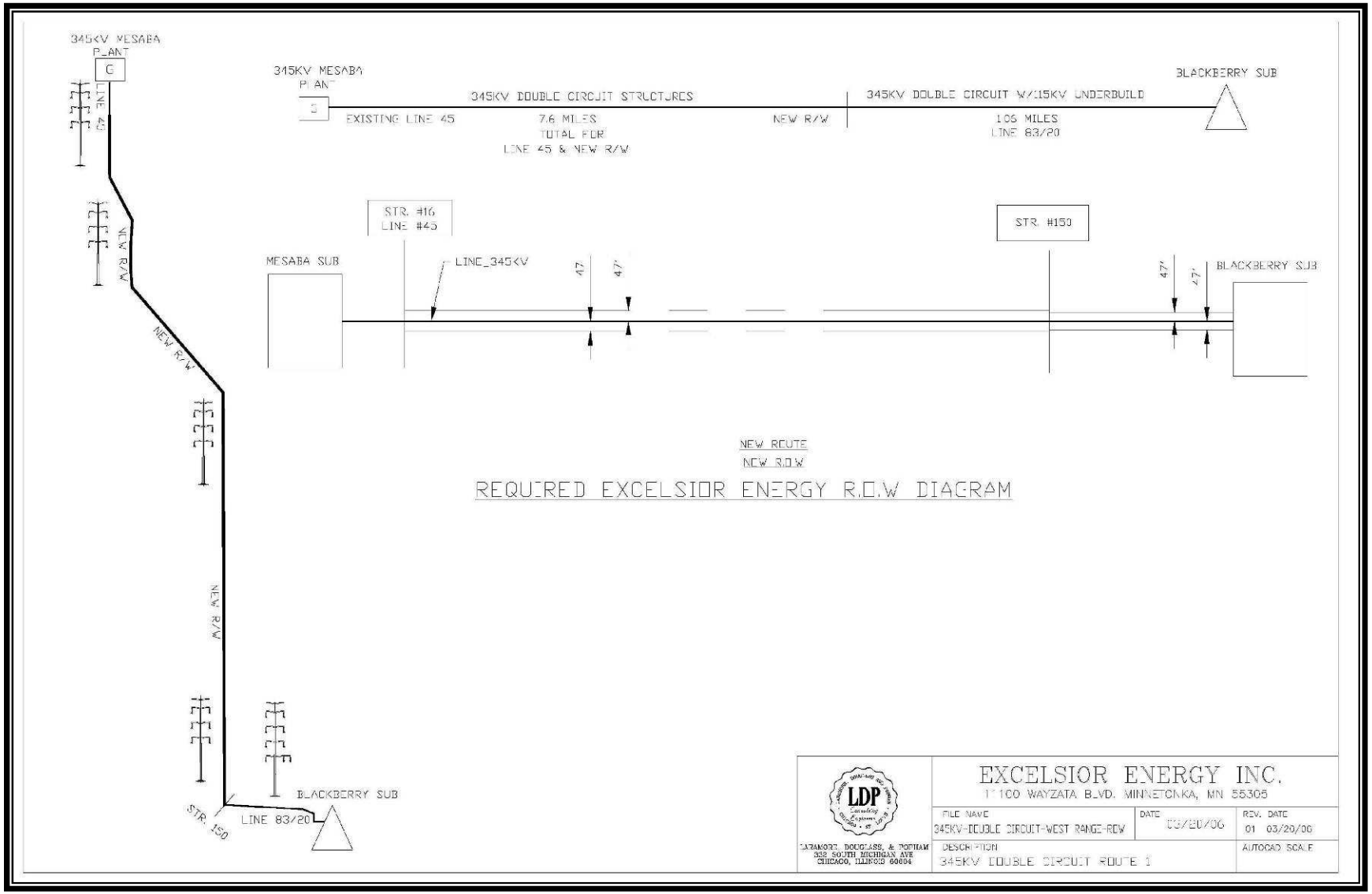
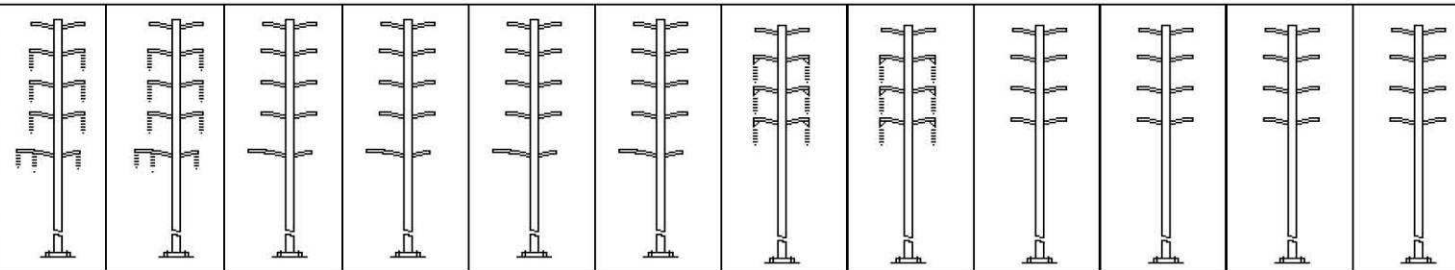


Figure 1.12-11 345kV HVTL Double Circuit Structures Along West Range Plan A Preferred Route (WRA-1)

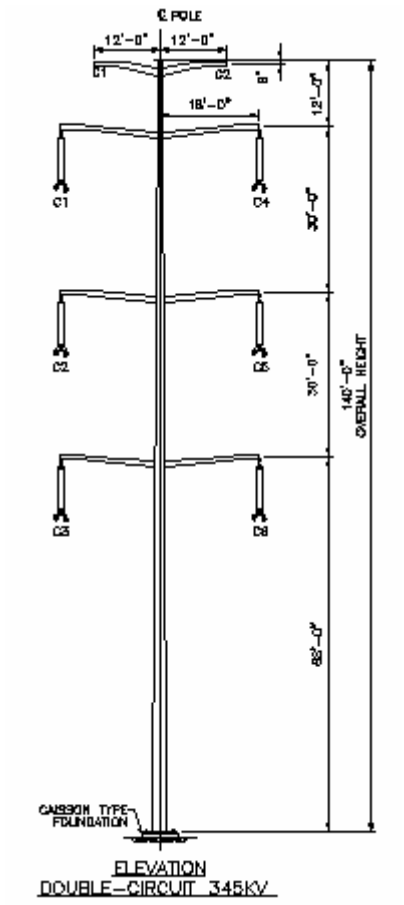
Mesaba Energy Project
Preliminary Corridor Structure Design for the Diamond Lake Site Route
345kV Preliminary Structure Summary

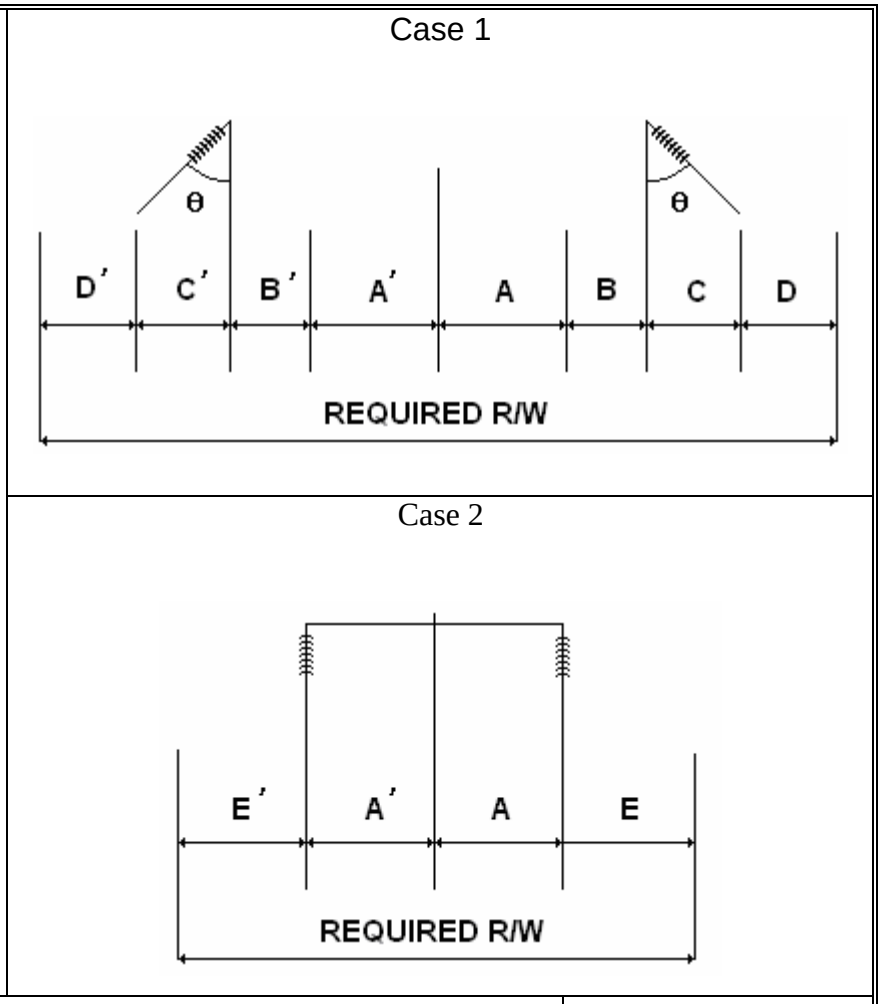


Height	Structure Type											
	SUS1_UB	SUS2_UB	STR1_UB	STR2_UB	DED1_UB	DED2_UB	SUS1	SUS2	STR1	STR2	DED1	DED2
	0°- 2°	2°- 6°	6°- 15°	15°- 30°	30°- 60°	60°- 90°	0°- 2°	2°- 6°	6°- 15°	15°- 30°	30°- 60°	60°- 90°
132										3	6	
140							57					
147				1	0	3						
150							2				0	1
153	6											
168	1											
Total	7	0	0	1	0	3	59	0	0	3	6	1

80 Structures

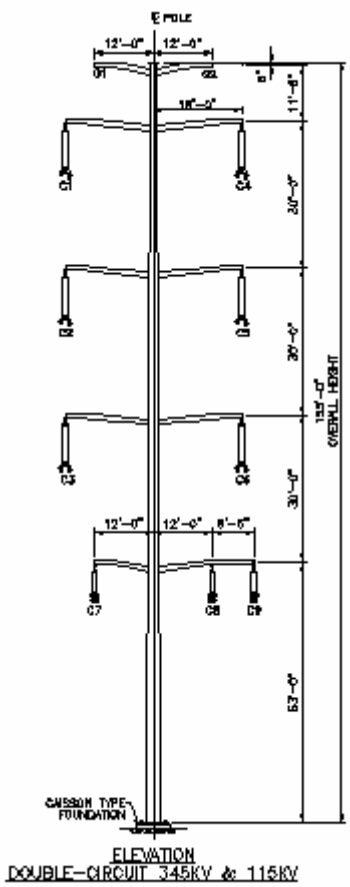
Figure 1.12-12 ROW Calculation for 345kV HVTL Structures Along West Range Plan A Preferred and Alternate Routes (WRA-1 and WRA-1A) and 43L from IGCC Power Station to Laskin



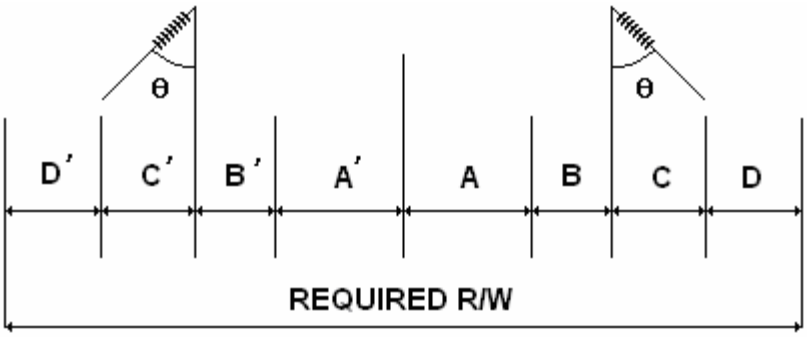


Required Distance (Right side of structure)		Width (ft)
A	Distance between end of arm conductor attachment and center of structure	18
B	Structure attachment deviation due to deflection	5
C	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	10.8
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	13.8
	Required Permanent ROW (The larger value between Case 1 and Case 2) **A + B + C + D**	**91.6**

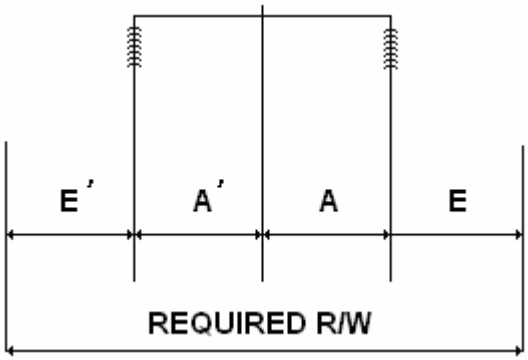
Figure 1.12-13 ROW Calculation for 345kV Double Circuit Structure with 115kV Underbuild Along West Range Plan A Preferred and Alternate Routes (WRA-1 and WRA-1A)



Case 1

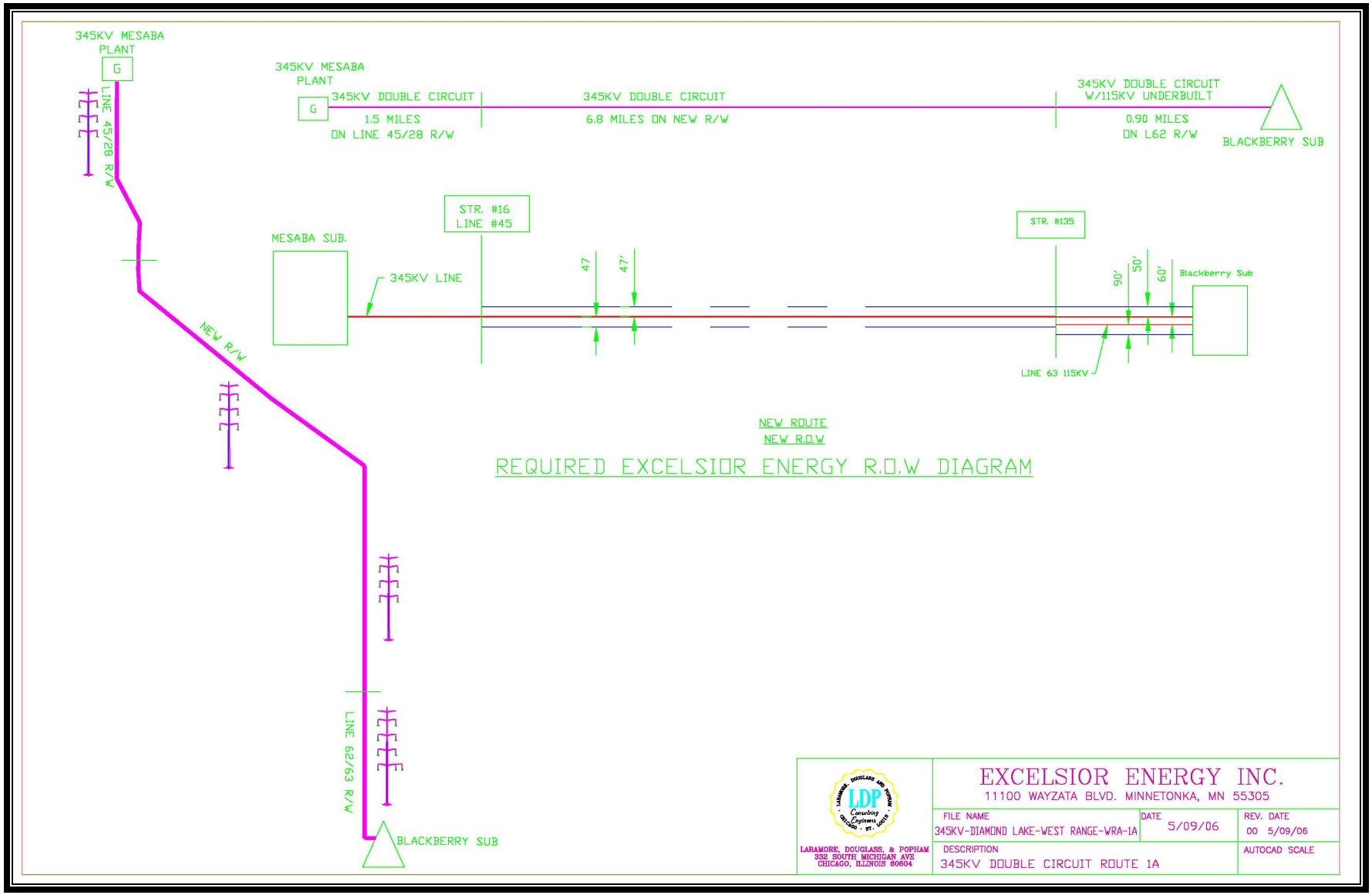


Case 2



Required Distance (Left Side of Structure)		Width (ft)
A'	Distance between end of arm conductor attachment and center of structure (345kV arm)	18
B'	Structure attachment deviation due to deflection	5
C'	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	12
D'	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	10.8
E'	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	13.8
	Required Permanent ROW (The larger value between Case 1 and Case 2). **A' + B' + C' + D'**	**91.6**

Figure 1.12-14 345kV HVTL Double Circuit Structures Along West Range Plan A Alternate Route (WRA-1A)



1.12.1.3.1B Plan B

1.12.1.3.1B(1)(a) Preferred Routes: Phase I and II

The Proponent's preferred option for Plan B involves the combination of the two shortest, most direct routes between the IGCC Power Station and its POI. This combination includes the Preferred Route WRB-1 for Phase I and Alternate Route WRB-2 for Phase II. The routing schematic showing the HVTL structures used along the line segments is shown in Figure 1.12-15. Structure summaries for the double circuit 230kV structures are provided in Figure 1.12-16. The layout and required width of the permanent ROW along the line segment within which the double circuit and single circuit 230kV HVTLs traverse the same corridor is illustrated in Figure 1.12-17. The width of permanent ROW and the methodology used in calculating it for each of the structure types are provided in Figures 1.12-18, 1.12-19, 1.12-20, and Figure 1.12-21 for the 230kV double circuit, the 230kV double circuit with 115kV underbuild, the 230kV single circuit, and the 230kV single circuit with underbuild structures, respectively.

1.12.1.3.1B(1)(b) Alternate Routes: Phase I and II

Table 1.12-2 above identifies two alternatives (Option 2 and Option 3) to the Plan B preferred routes described in the preceding section. Figures 1.5-15 and 1.5-16 provide the routing diagrams for Option 2 and Option 3. The structure summary for the Plan B Phase I Alternate Rout WRB-1A would be nearly identical to that shown in Figure 1.12-16 for the Plan B Phase I Preferred Route WRB-1 identified in Section 1.12.1.3.1B(1) above (a fewer number of structures will be required for the Plan B Phase I Alternate Route WRB-1A because its length is about 0.5 miles shorter). The 230kV double circuit structure types used in the Plan B Phase I Alternate Route WRB-1A have been shown in Figures 1.12-18 and 1.12-19.

The routing schematic for the Plan B Phase II Alternate Route WRB-2A is shown in Figure 1.12-22. The structure summary for this route is shown in Figure 1.12-23. The permanent ROW calculations for the single circuit 345kV with 115kV underbuild single pole structures are shown in Figure 1.12-24 (for spans of 750 feet or shorter) and Figure 1.12-25 and Figure 1.12-26 (for spans up to 1,100 feet). The permanent ROW calculation for the single circuit 345kV delta configuration structures considered for use is presented in Figure 1.12-35.

1.12.1.3.1C "H" Frame Structures

The Proponent may opt to use "H" frame structures for stretches of the HVTL that traverse its property and/or where aesthetic concerns demand use of shorter, less visible structures. The dimensions for 230kV and the basis for the permanent ROW calculations and 345kV "H" frame structures are presented in Figures 1.12-27 and 1.12-28.

Figure 1.12-15 230kV HVTL Double Circuit Structures Along West Range Plan B Phase I and II Preferred Routes (WRB-1 + WRB-2) See Table 1.12-2 for Option 1

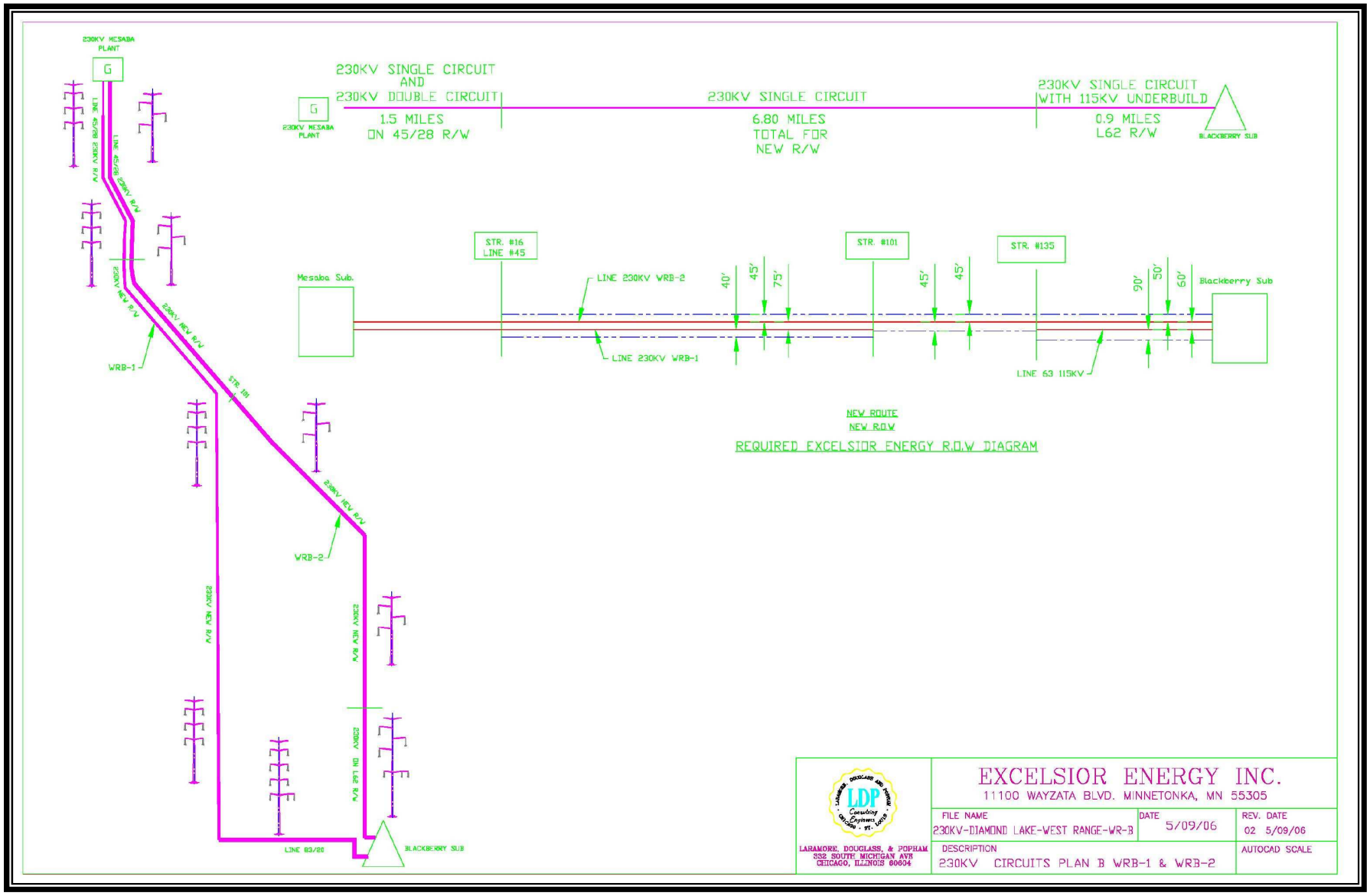
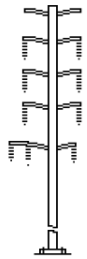
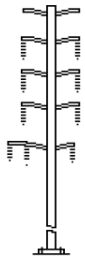
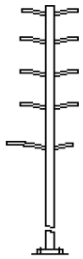
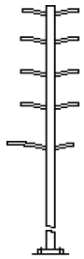
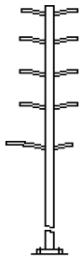
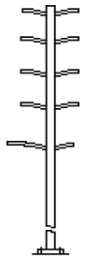
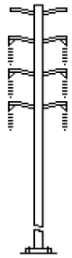
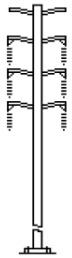
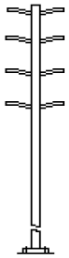
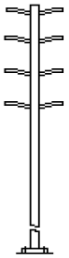
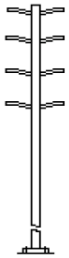
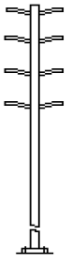


Figure 1.12-16 Plan B Phase I Preferred Route WRB-1 230kV Double Circuit HVTL Structure Summary

Mesaba Energy Project

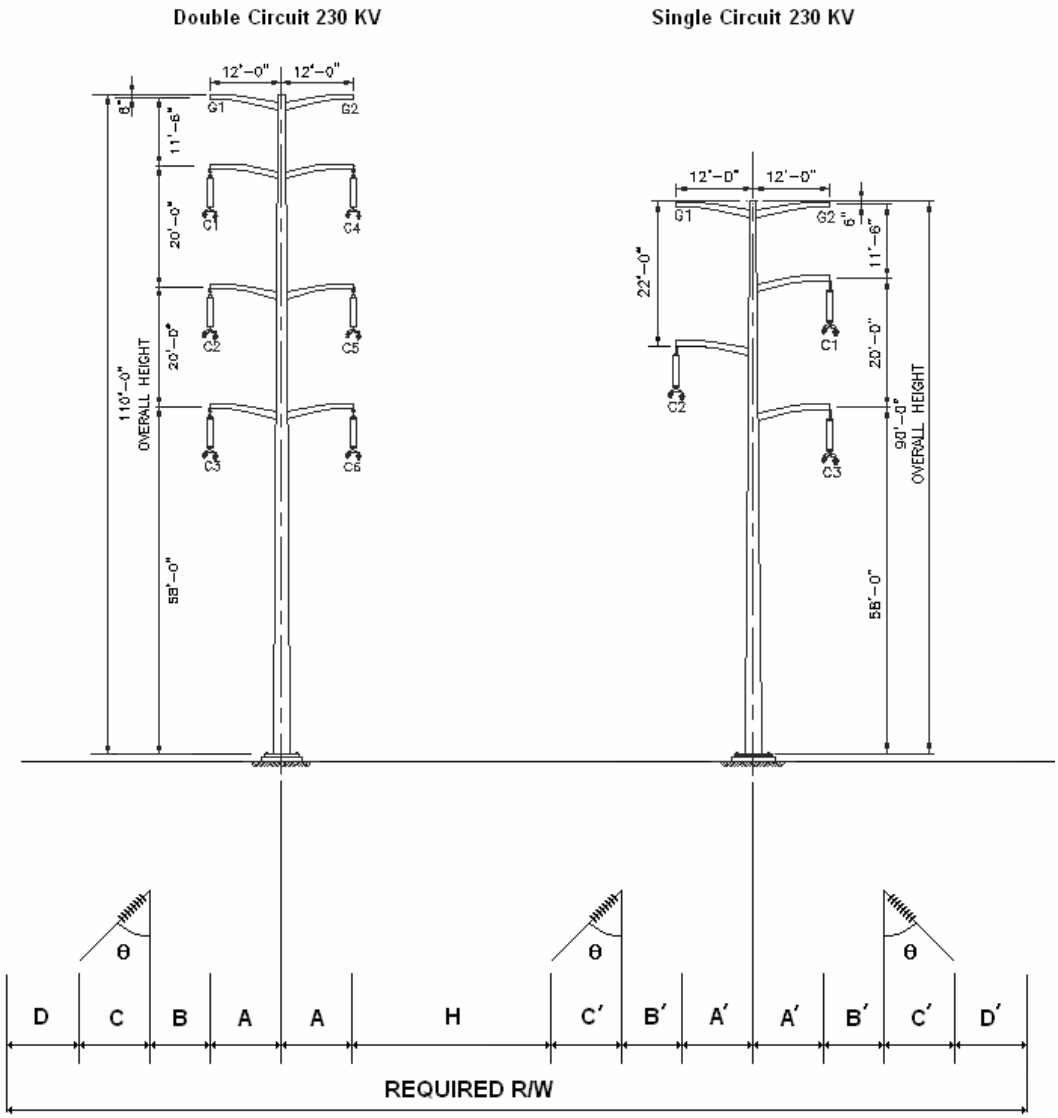
Preliminary Corridor Structure Design for the West Range Site: Alternative 1 Route, Phase I

230kV Preliminary Structure Summary

	Structure Type											
												
Height	SUS1_UB	SUS2_UB	STR1_UB	STR2_UB	DED1_UB	DED2_UB	SUS1	SUS2	STR1	STR2	DED1	DED2
	0°- 2°	2°- 6°	6°- 15°	15°- 30°	30°- 60°	60°- 90°	0°- 2°	2°- 6°	6°- 15°	15°- 30°	30°- 60°	60°- 90°
107										3	6	
115							57					
122				1	0	3						
125							2				0	1
128	6											
143	1											
Total	7	0	0	1	0	3	59	0	0	3	6	1

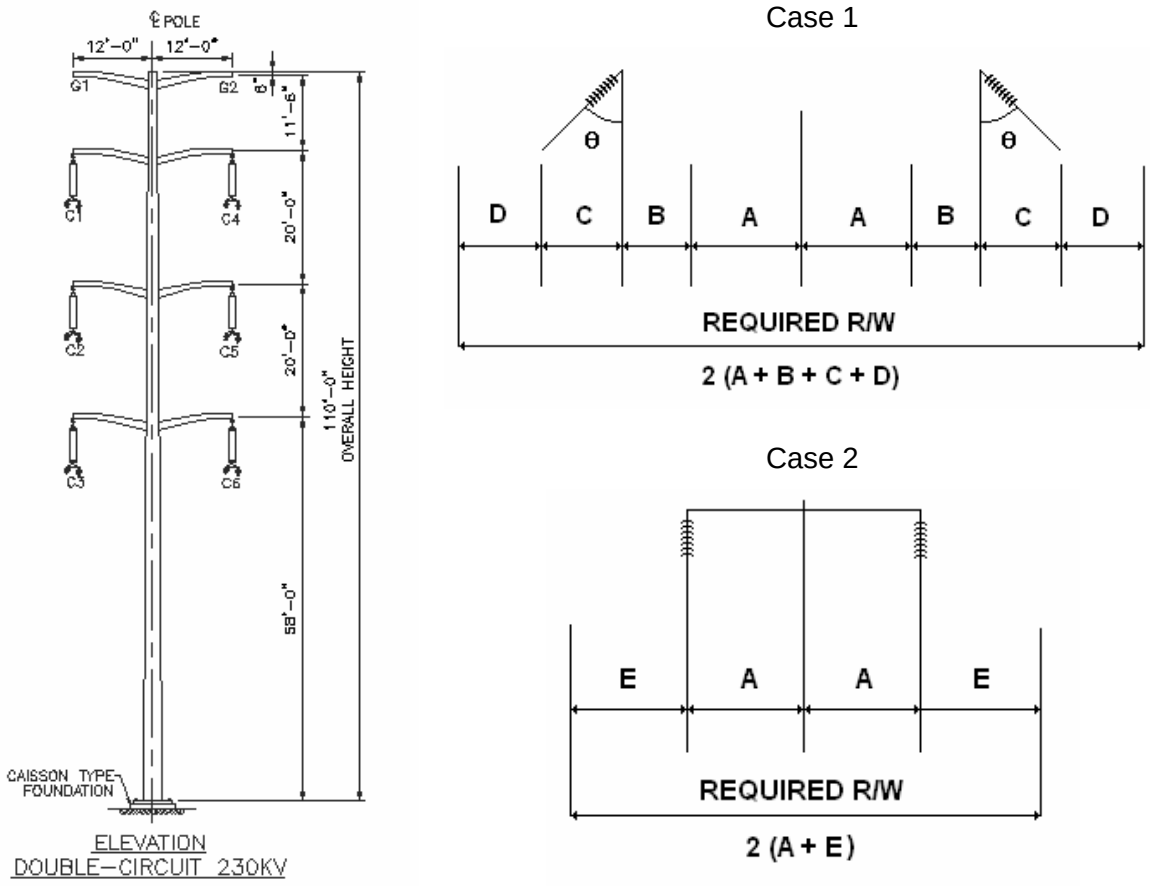
80 Structures

Figure 1.12-17 ROW Calculations for 230kV Double Circuit and 230kV Single Circuit HVTL



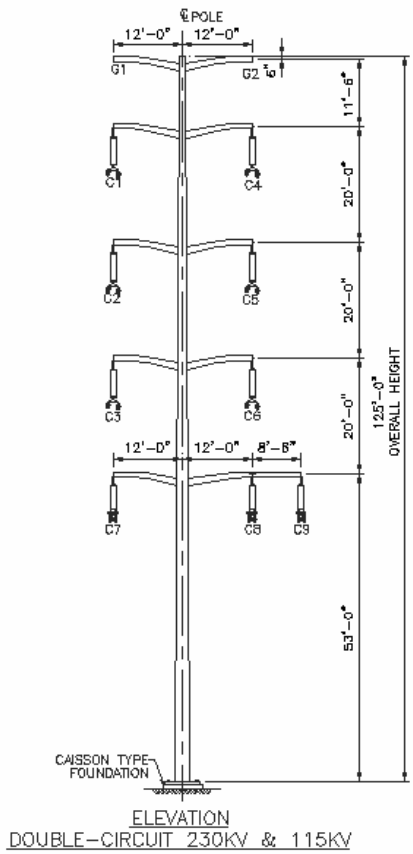
	Required Distance	Width (ft)
A	Distance between end of arm conductor attachment and center of structure	12
B	Structure attachment deviation due to deflection	4
C	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	8.25
H	Minimum horizontal working distance between arms to provide safe construction and maintenance between parallel lines	25
A'	Distance between end of arm conductor attachment and center of structure	12
B'	Structure attachment deviation due to deflection	4
C'	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	12
D'	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	8.25
	Permanent ROW = 2A + B + C + D + H + 2 (A' + B' + C') + D'	**137.50**

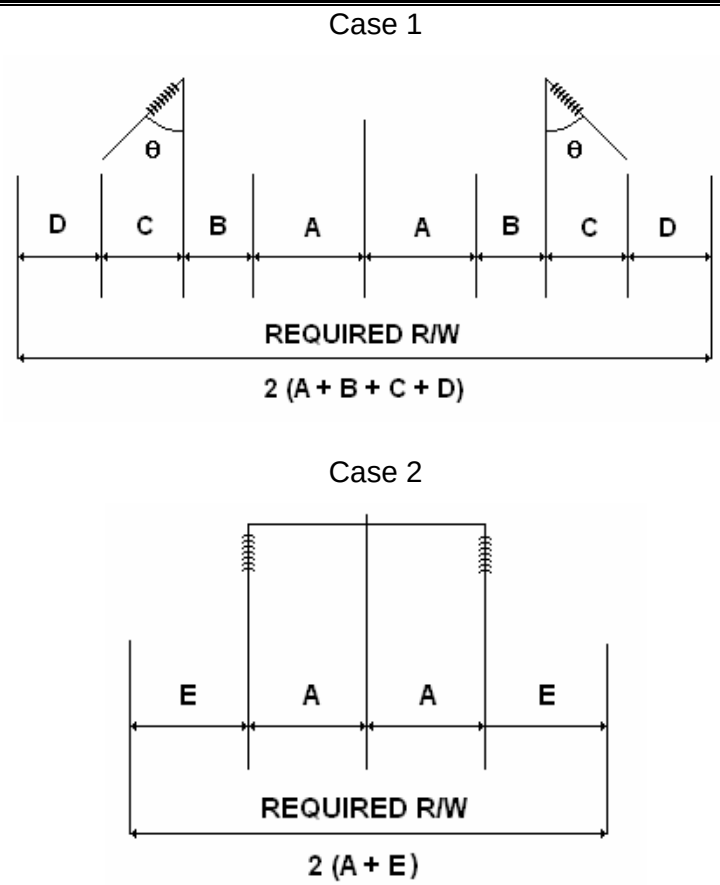
Figure 1.12-18 Permanent ROW Calculation for 230kV Double Circuit HVTL



	Required Distance	Width (ft)
A	Distance between end of arm conductor attachment and center of structure	12
B	Structure attachment deviation due to deflection	4
C	Blowout. Obtained from PLS_CADD 3D model with Twin Cardinal conductor at 6 psf	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	8.25
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	11
	Required Right of Way (The larger value between Case 1 and Case 2)	**72.5**

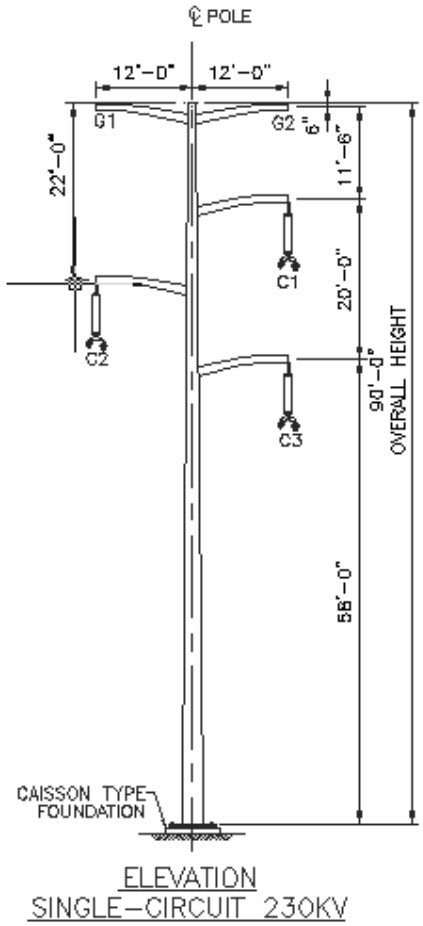
Figure 1.12-19 Permanent ROW Calculation for 230kV Double Circuit HVTL with 115kV Underbuild



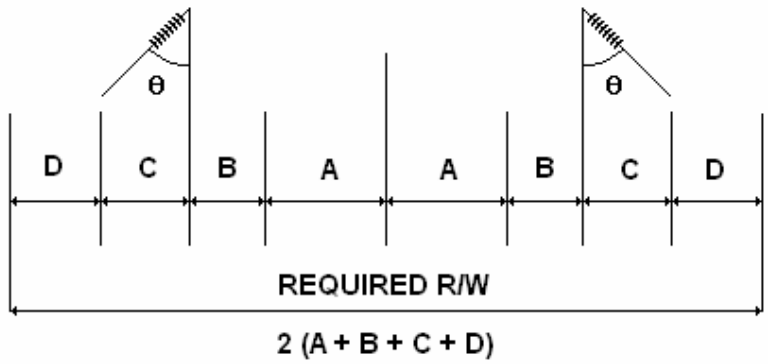


	Required Distance	Width (ft)
A	Distance between end of arm conductor attachment and center of structure	20.5
B	Structure attachment deviation due to deflection	4
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak (636 MCM) conductor at 6 psf for 115 Circuit	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	9.6
	Required ROW (The larger value between Case 1 and Case 2)	**86.2**

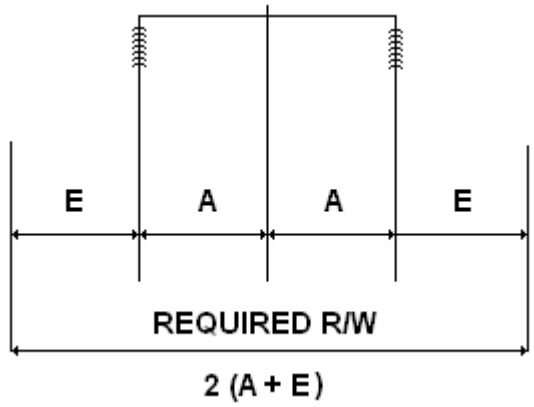
Figure 1.12-20 ROW Calculation for 230kV Single Circuit HVTL



Case 1



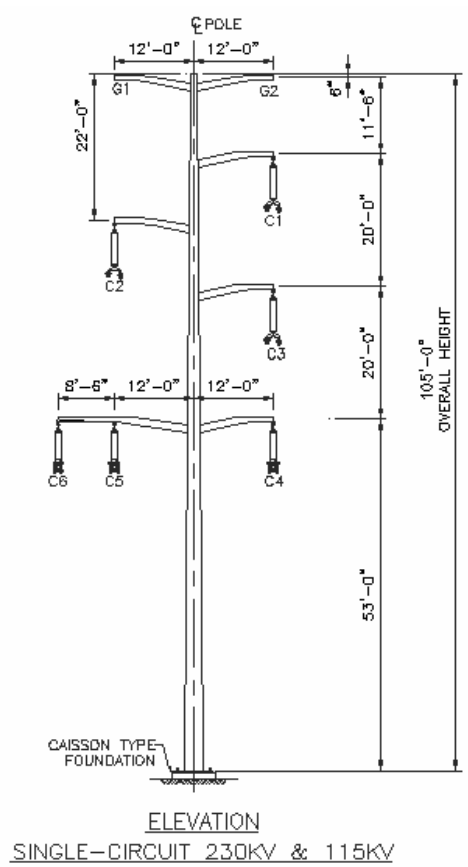
Case 2



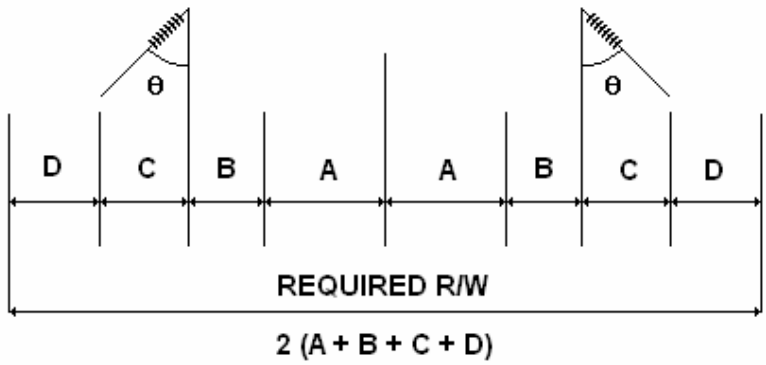
Required Distance		Width (ft)
A	Distance between end of arm conductor attachment and center of structure	12
B	Structure attachment deviation due to deflection	4
C	Blowout. Obtained from PLS_CADD 3D model with Twin Cardinal conductor at 6 psf	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	8.25
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	11
	Required Permanent ROW (The larger value between Case 1 and Case 2)	**72.5**

Figure 1.12-21 ROW Calculation for 230kV Single Circuit HVTL with Underbuild

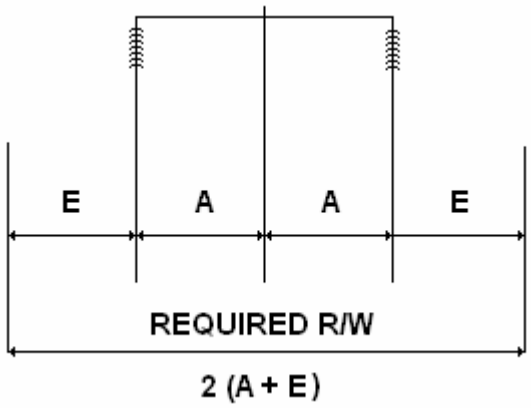
Right of Way (ROW) for 230 KV - 1 CKT with 115 KV



Case 1



Case 2



Required Distance		Width (ft)
A	Distance between end of arm conductor attachment and center of structure	20.5
B	Structure attachment deviation due to deflection	4
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak (636 MCM) conductor at 6 psf for 115 Circuit	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	9.6
	Required ROW (The larger value between Case 1 and Case 2)	**86.2**

Figure 1.12-22 345kV HVTL Single Circuit Delta Configuration Structures With 115kV Underbuild Along West Range Plan B Phase II Alternate Route (WRB-2A) See Table 1.12-2 for Option 2

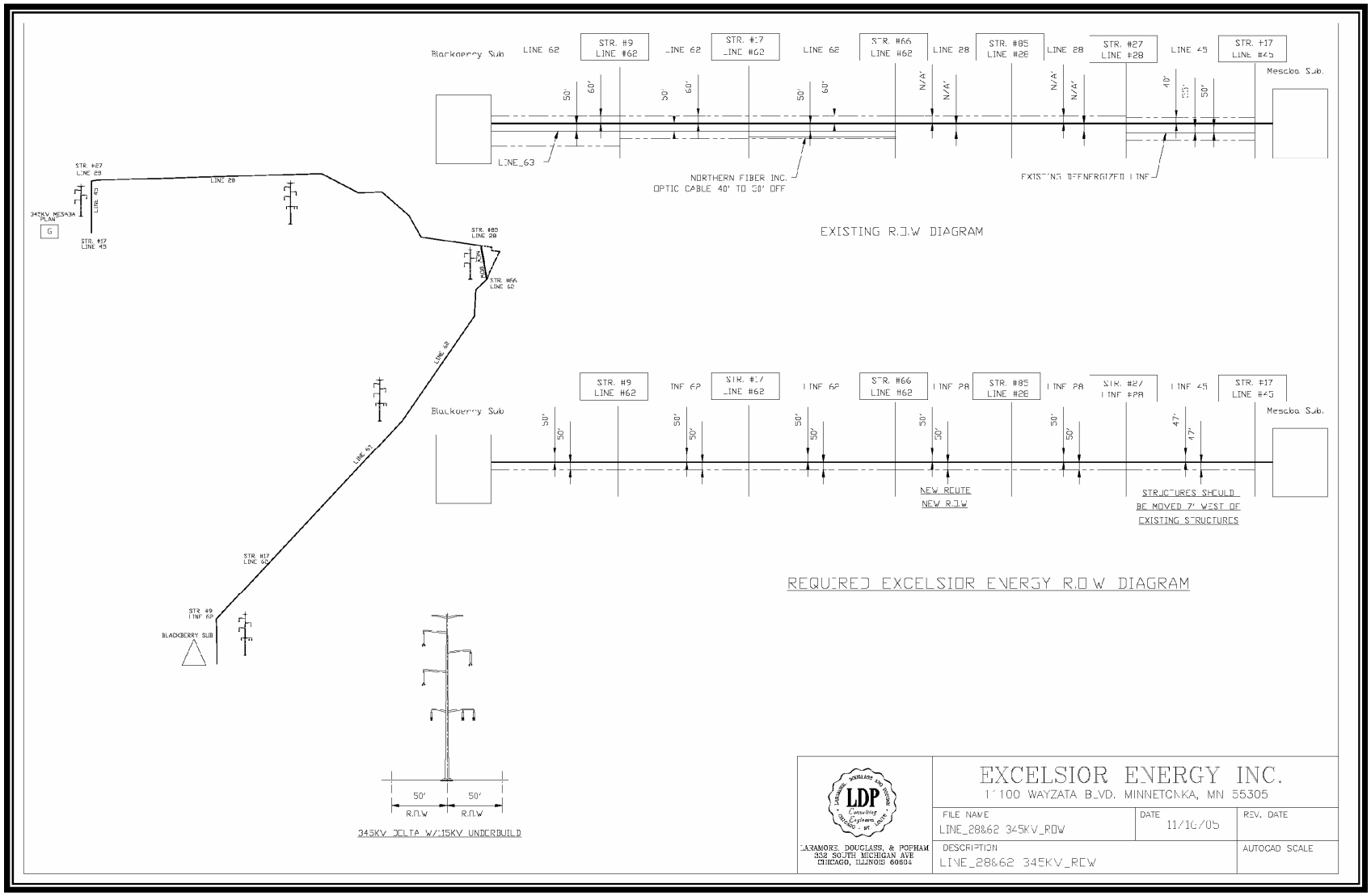


Figure 1.12-23 Structure Summary for Plan B Phase II Alternate Route (WRB-2A)

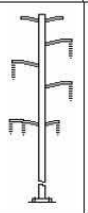
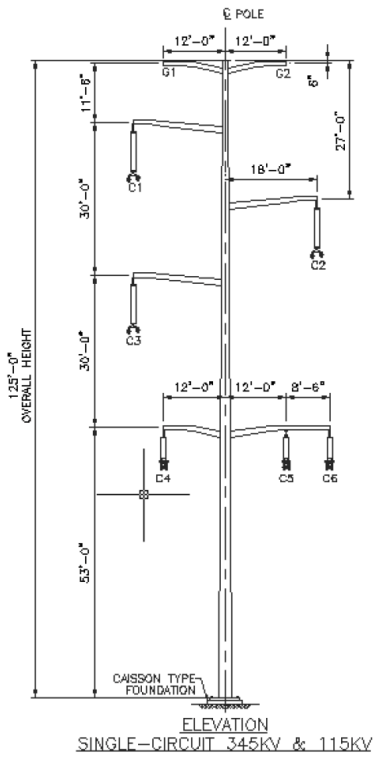
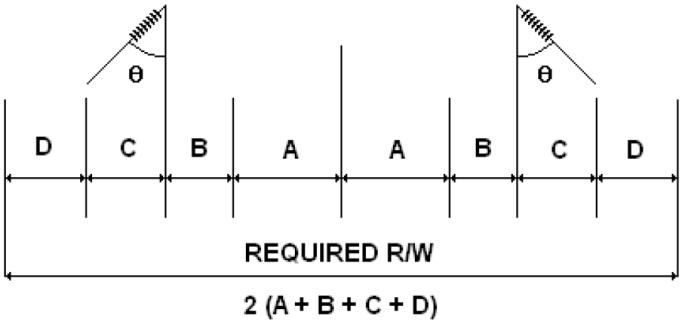
	Structure Type										
	1	2	3	4	5	6	7	8	9	10	11
											
Height	SUS1_UB	SUS2_UB	STR1_UB	STR2_UB	DED1_UB	DED2_UB	SUS1	SUS2	RAN1	DED1	DED2
	0° - 2°	2°-6°	6°-15°	15°-30°	30°-60°	60°-90°	0° - 2°	2°-15°	15°-30°	30°-60°	60°-90°
107	1										1
108.5							1				
110.0							8				
113.0	1										
117.5	77						8				
119.0							1				
120.0			1								
122.0	18						1				
124.0					2	1					
124.5				3							
126.0			1								
126.5	11						1				
128.5											1
129.0					2						
131.0	1										
133.0											1
133.5					1						
135.5											
137.0									1		
137.5						1					
140.0	1										
144.5											
149.0											
Total	110	0	2	3	5	2	20	0	1	0	3

Figure 1.12-24 Permanent ROW Calculation for 345kV Single Circuit Delta Configuration With 115kV Underbuild (750 ft Span)

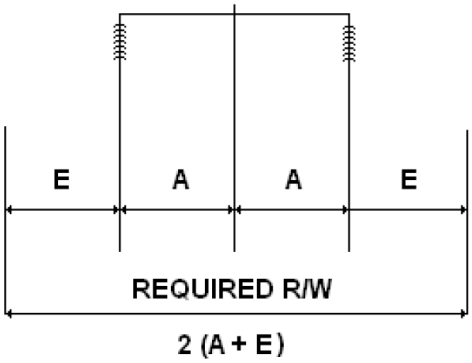
Right of Way (ROW) for 345 KV - 1 CKT with 115 KV



Case 1

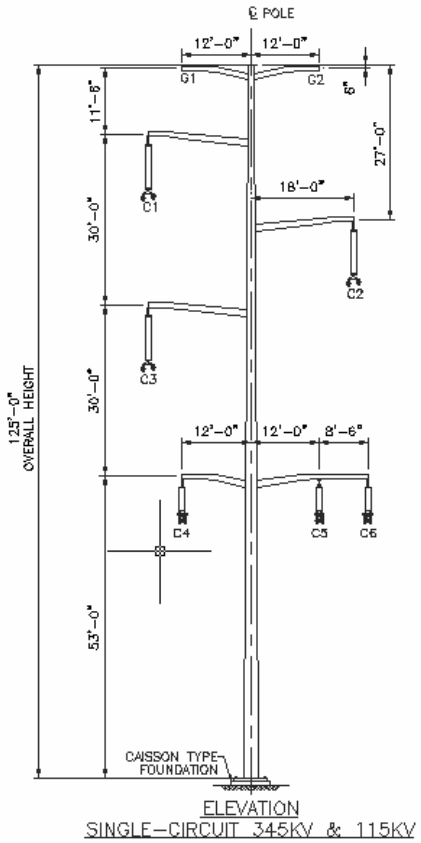


Case 2

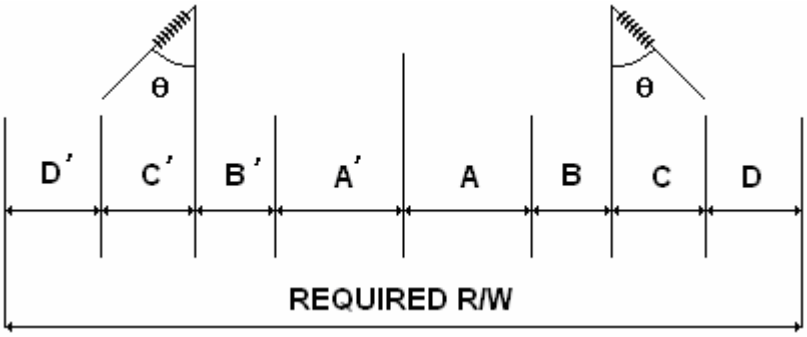


Required Distance		Width (ft)
A	Distance between end of arm conductor attachment and center of structure	20.5
B	Structure attachment deviation due to deflection	5
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak (636 MCM) conductor at 6 psf for 115 KV circuit.	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	9.6
	Required ROW (The larger value between Case 1 and Case 2)	**88.2**

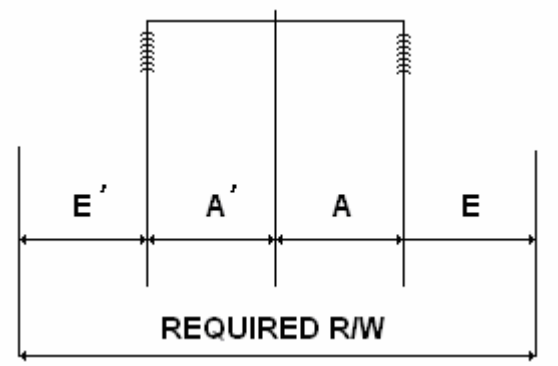
Figure 1.12-25 Permanent ROW Calculation for 345kV Single Circuit Delta Configuration With 115kV Underbuild (1100 ft Span Right Side)



Case 1

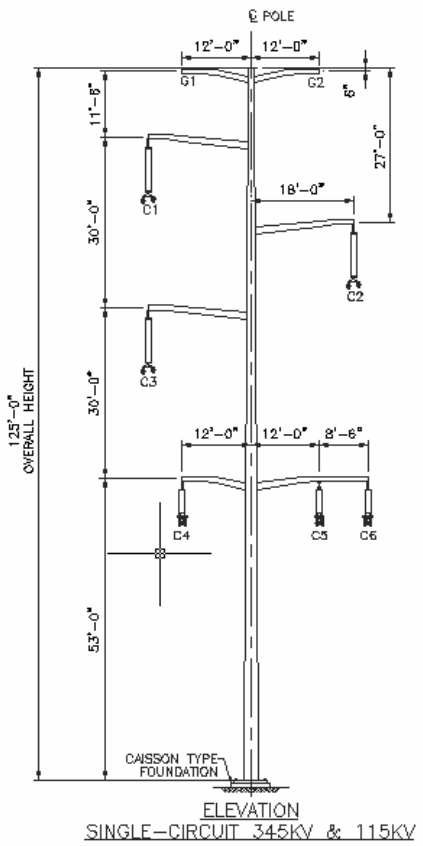


Case 2

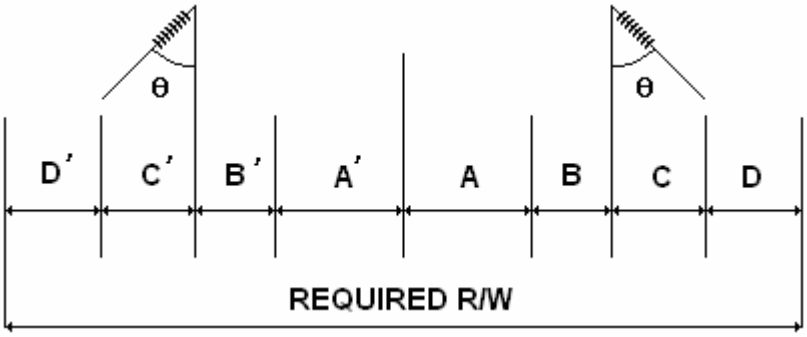


Required Distance (Right side of structure)		Width (ft)
A	Distance between end of arm conductor attachment and center of structure (115kV lower arm)	20.5
B	Structure attachment deviation due to deflection	5
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak (636 MCM) conductor at 6 psf for 115kV circuit.	20.3
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	9.6
	Required ROW (The larger value between Case 1 and Case 2) **A + B + C + D**	**52.4**

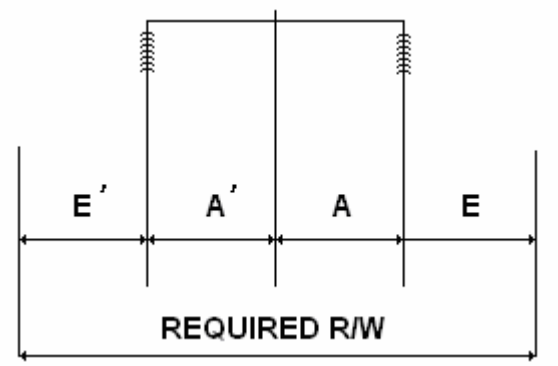
Figure 1.12-26 Permanent ROW Calculation for 345kV Single Circuit Delta Configuration With 115kV Underbuild (1100 ft Span Left Side)



Case 1



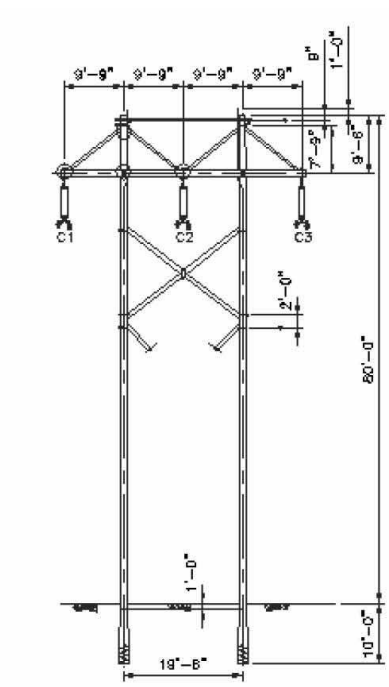
Case 2



Required Distance (Left Side of Structure)		Width (ft)
A'	Distance between end of arm conductor attachment and center of structure (345kV)	18
B'	Structure attachment deviation due to deflection	6
C'	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	18.7
D'	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	10.8
E'	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	13.8
	Required ROW (The larger value between Case 1 and Case 2). **A' + B' + C' + D'**	**53.5**
Total ROW	**52.4 + 53.5**	**105.9**

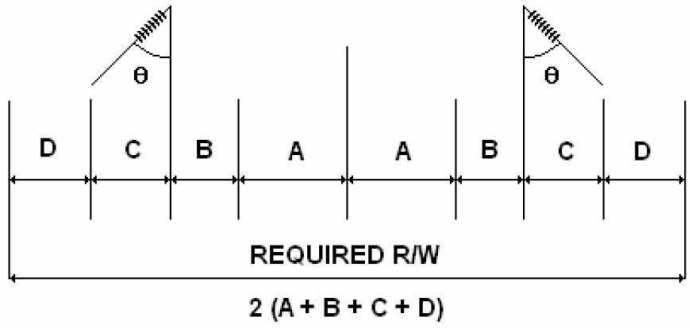
Figure 1.12-27 Permanent ROW Calculations for 230kV "H" Frame Structure

Right of Way (ROW) for 230 KV - H-FRAME

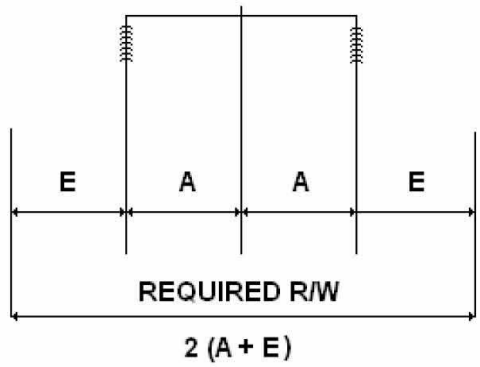


ELEVATION
SINGLE-CIRCUIT 230KV H-FRAME

Case 1



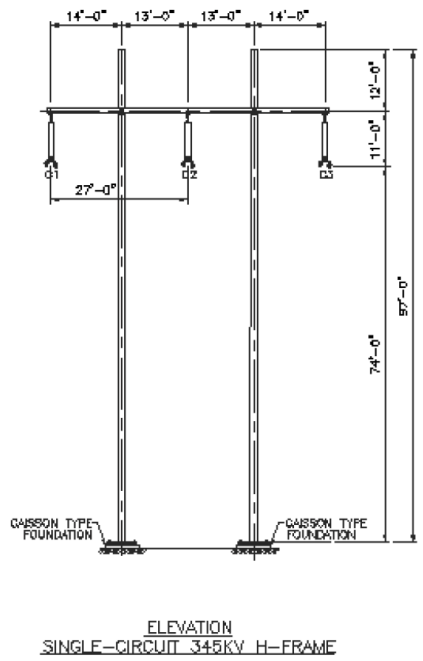
Case 2



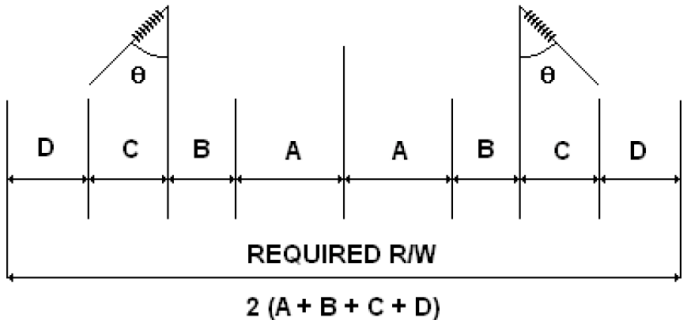
Required Distance		Width (ft)
A	Distance between end of arm conductor attachment and center of structure	17.5
B	Structure attachment deviation due to deflection	3
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak conductor at 6 psf	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	9.6
	Required ROW (The larger value between Case 1 and Case 2)	**78.2**

Figure 1.12-28 Permanent ROW Calculations for 345kV "H" Frame Structure for Special Uses

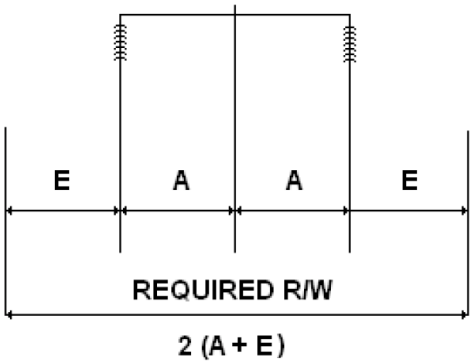
Right of Way (ROW) for 345 KV - H-FRAME



Case 1



Case 2



Required Distance		Width (ft)
A	Distance between end of arm conductor attachment and center of structure	26
B	Structure attachment deviation due to deflection	3
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak conductor at 6 psf for 115 KV circuit.	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	10.8
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	13.8
	Required ROW (The larger value between Case 1 and Case 2)	**103.6**

1.12.1.3.2 East Range

Given that the Proponent has opted to use 345kV as the basis for its East Range GO HVTL facilities, only two unstaggered HVTLs are required to provide the necessary route diversity required by the (n-1) single failure criterion (see Section 1.12.1.1.2). Since the likelihood of routing the 34L around the Virginia Substation using existing HVTL routes is deemed improbable – that is, unlikely to be accomplished without the addition of a significant new length of ROW – and the existing 38L and 39L/37L routes can be followed with minimal ROW additions, the Proponent has limited the routes under consideration to the 39L/37L and 38L options. Figure 1.5-18 shows the proposed routes along which the GO HVTLs for Mesaba One and Mesaba Two will traverse on route to the Forbes Substation. The Preferred 39L/37L Route will require a short new section of HVTL about 2 miles in length, but the new section would mostly traverse lands previously disturbed by mining.

Using a combination of "hot" construction techniques (that is, handling HVTLs in an energized state), tall HVTL towers, and carefully selected times during the year when power flows on the existing 39L and 38L HVTLs are at relatively low levels, the Proponent could construct a new HVTL completely inside the existing ROW of either line. By staying "along" the existing ROW for more than 80% of the node-to-node distance, the Proponent would be able to take advantage of Minn. R. 4400.2000, subps. 1.D and 1.E and avoid considering an alternative HVTL route to either the 39L/37L or 38L routes. However, the cost and risk associated with the use of such construction techniques makes using them a dubious choice for the sole purpose of avoiding consideration of an alternative route.

1.12.1.3.2A Constructability

In order to construct the initial double circuit 345kV/115kV vertical steel pole structure on either of the existing 38L or 39L/37L ROWs, an additional 30 feet of ROW must be added to the edge of the existing ROW. This proposed additional width will allow proper construction and electrical clearances to the existing 115kV "H" frame structures and conductors under initial operation. As the vertical steel pole structures will be constructed adjacent to the existing "H" frame centerline approximately 31.5 feet off center, such construction requires the additional ROW.

The best option for widening 39L appears to be acquiring ROW on the south side of the existing ROW from the Laskin Substation to Highway 97, then moving to the north side from Highway 97 to, and across, the Thunderbird Mine. The 39L has single-family residential conflicts in three potential locations and potentially one industrial site conflict. These narrow sections of ROW will necessitate either hot line construction or construction in short, scheduled outage windows on the existing line in affected ROWs.

The 37L is expandable on either side of the ROW since the only conflicts involve existing transmission lines, which may require outage windows for construction.

The potential addition of ROW for the Alternate 38L Route would be proposed for the north side of the existing structures. This route conflicts with three to four short sections of existing 38L where single family residences are located on the north side of the existing 115kV ROW. The ROW in these locations is too narrow for a 30-foot expansion. Therefore, the Proponent would propose to construct these sections during short, scheduled line outages, or under hot line construction, on the existing 38L 115kV "H" frame centerline.

The construction staging and sequence scenario would be the same regardless of which route configuration would be designated "preferred." The vertical double circuit construction will only be required on one of the two chosen routes. The structure foundations will be installed first approximately 31.5 feet off centerline. While the foundation installation is under way in the winter months, ROW clearing would also be completed. Included in the ROW clearing would be the removal of dangerous trees overhanging the expanded ROW. The erection of the steel pole structures would be scheduled in accordance with the completion of foundations with the 345kV cross-arms facing away from the existing 115kV MP circuit. The bundled 345kV-1272 kcmil ACSR "Pheasant" conductor would be installed while the existing 115kV "H" frame HVTLs remain in service. Once the 345kV circuit is installed, the load from the existing 115kV HVTL would be transferred to the new 345kV HVTL and then temporarily operated at 115kV to replace the existing MP 115kV HVTL. If desired, the existing "H" frame structures can be removed from the ROW. The open side of the 345kV vertical structure would then be built with 115kV insulators, hardware and 954-kcmil ACSR "Rail" conductor, while the 345kV side of the HVTL remains energized at 115kV.

The new double circuit transmission line would temporarily be operated as 38L on one side and 39L on the other side. The new HVTLs would be connected to the breakers for 38L and 39L by short temporary transmission lines. While 38L and 39L follow different routes, both lines begin and terminate at the same substations. The relaying and protection schemes would be temporally reset to provide line protection; and would provide sufficient failure contingencies to allow the remaining "H" frame HVTL within the existing 38L corridor to be removed. A new 345kV delta configuration structure with 115kV under-build would be constructed along the existing centerline of the 115kV HVTL not selected as the preferred route (the preferred route being the route along which the additional 30 feet of ROW is required). Once construction is complete, the 345kV/115kV HVTL operating temporarily as a double circuit 115kV HVTL would be converted to its intended 345kV voltage. MP would thereafter have two 115kV lines operating on separate routes, on the same structures, with the IGCC Power Station's 345kV HVTLs.

The 38L and 39L both have active substations on the lines, which must remain in service during the line construction. The Peary Substation on 38L (see Figure 1.5-49) can be served from a short radial feed from 16L. The Lakeland Substation on 39L (see Figure 1.5-49) requires a longer radial feed from the new HVTL either to 37L or from the Syl Laskin Substation. The Lakeland Substation limits the rebuild of 39L to two sections divided at approximately the half way point of 39L. Since the Lakeland Substation will represent a single contingency during the construction, a switch could be installed at the intersection of 38L and 39L to increase the reliability at Lakeland Substation.

1.12.1.3.2B Preferred Configuration

1.12.1.3.2B(1)(a) Preferred 39L/37L Route

Figure 1.12-___ shows the 345kV/115kV double circuit preferred 39L/37L Route line segments. A preliminary summary of the HVTL structure configurations and heights that would be used along the 345kV preferred 39L/37L Route are provided in Figure 1.12-___. A detailed analysis showing the permanent ROW required for each of the structures is provided in Figures 1.12-___ and 1.12-32 (the double circuit 345kV/115kV structure sufficient to span 750 feet); Figure 1.12-33 and Figure 1.12-34 show the double circuit 345kV/115kV structure sufficient to span 1,100 feet. The ROW calculations for the single circuit delta configuration 345kV structure is shown in Figure 1.12-35. These structures would be constructed in the new ROW connecting 39L and 37L.

1.12.1.3.2B(1)(b) Alternate 38L Route

The Alternate 38L Route would be configured with 345kV delta structures with 115kV underbuild. The routing schematic for this route is provided in Figure 1.12-36. The structures along the 38L route have been shown previously in Figures 1.12-24 through 1.12-26. The structure summary for the 38L route is shown in Figure 1.12-37.

1.12.1.3.2B(1)(c) Construction

The positioning of the double circuit 345kV/115kV structure next to the existing 115kV "H" frame structure is shown in Figure 1.12-38. The ROW calculations for the existing "H" Frame structure and 345kV double circuit structure are presented in Figure 1.12-39.

1.12.1.3.2C Alternate Configuration

The alternate configuration would involve reversing the route from which the additional 30 feet of ROW is acquired. That is, the 30 feet of additional permanent ROW would be taken from the 38L Route instead of the 39L/37L Route.

Figure 1.12-29 East Range Preferred 39L/37L 345kV HVTL Route and Structure Configurations

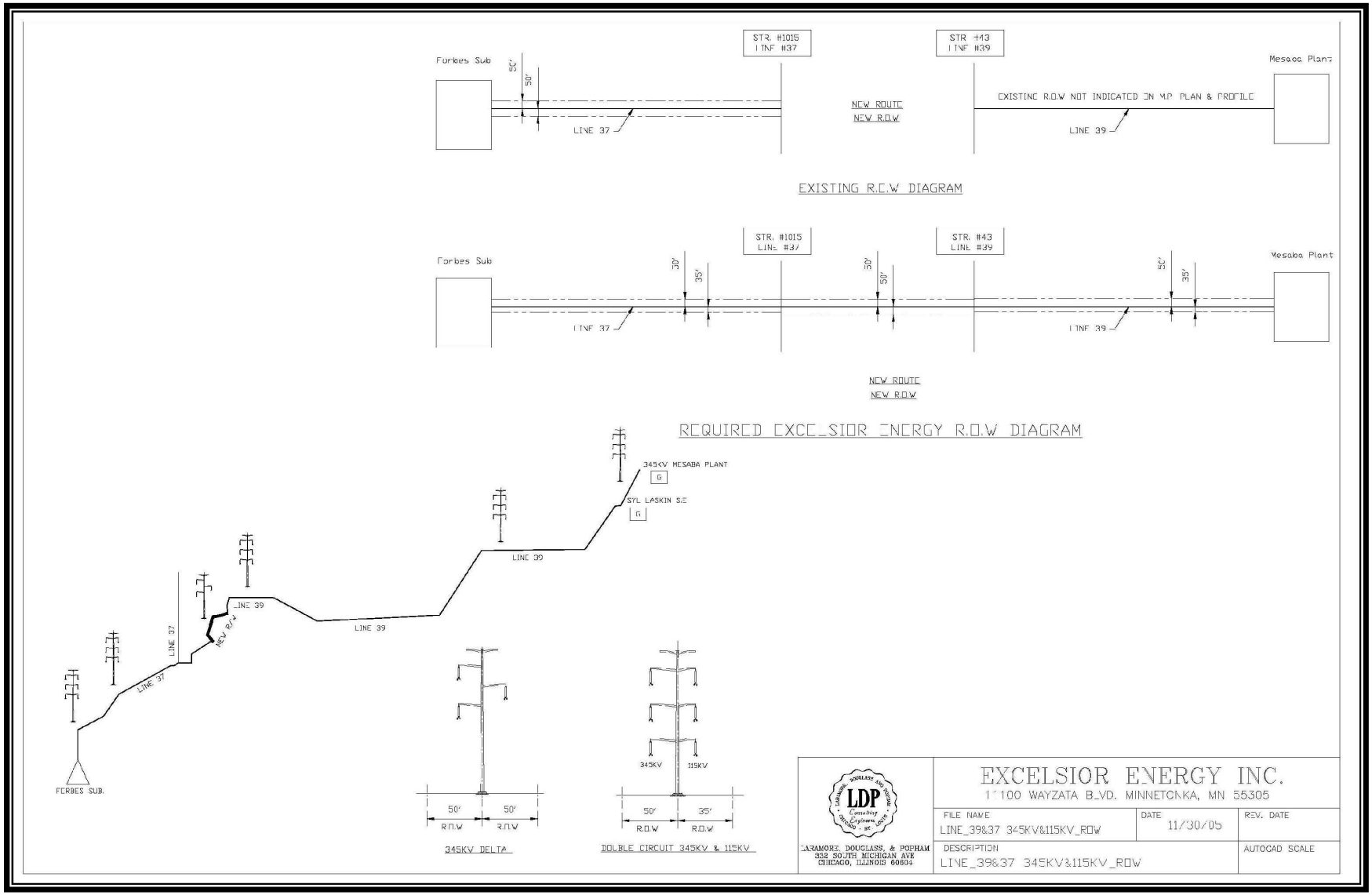
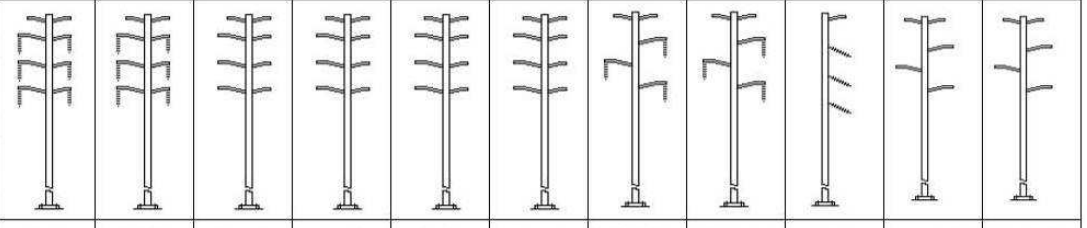


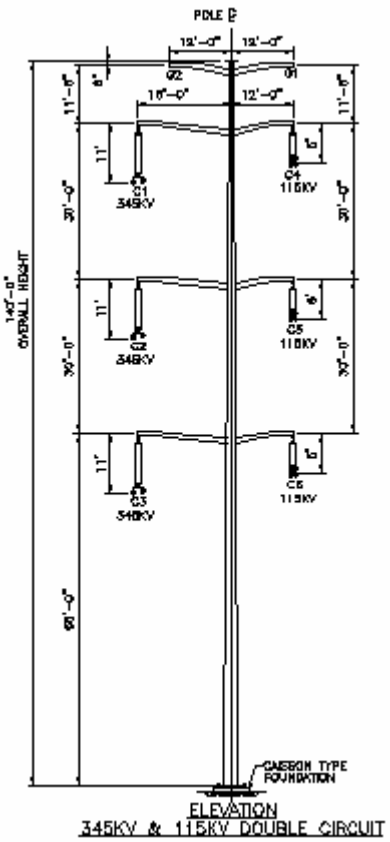
Figure 1.12-30 East Range 39l/37L Leg HVTL Structure Summary



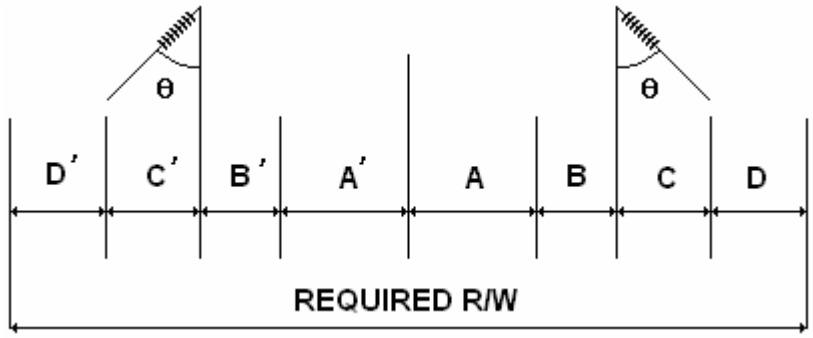
	1	2	3	4	5	6	7	8	9	10	10
Height	SUS1	SUS2	STR1	STR2	DED1	DED2	SUS1(DLT)	SUS2(DLT)	RAN1	DED1(DLT)	DED2(DLT)
	0° - 2°	2°-6°	6°-15°	15°-30°	30°-60°	60°-90°	0° - 2°	2°-15°	15°-30°	30°-60°	60°-90°
90								1	2	2	3
100							11		1		
105							1				
120	1									1	
124	139										
128	1		2	1	10						
129	54										
130						1					
132			1	1	7	2					
133	23						1				
134	1										
137	3		2		3	1					
138	16										
139	1										
141						2					
142	5				2						1
147	6				1					1	
151	1										
155							1				
156	1										
Total	252	0	5	2	23	6	14	1	3	4	4

314 Structures

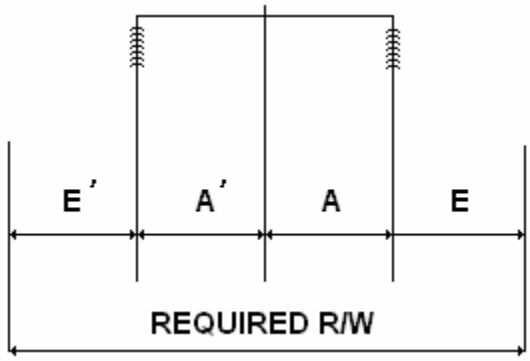
Figure 1.12-31 East Range 39L/37L Leg HVTL Permanent ROW Calculation-345kV/115kV Double Circuit, 750 Foot Span, Right Side Structure



Case 1

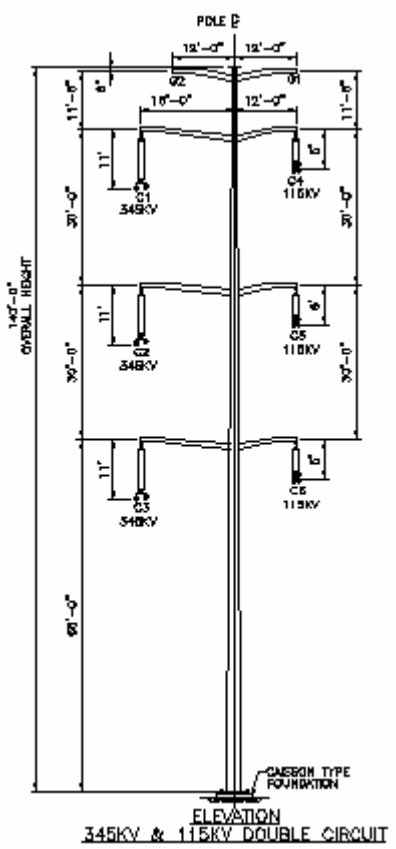


Case 2

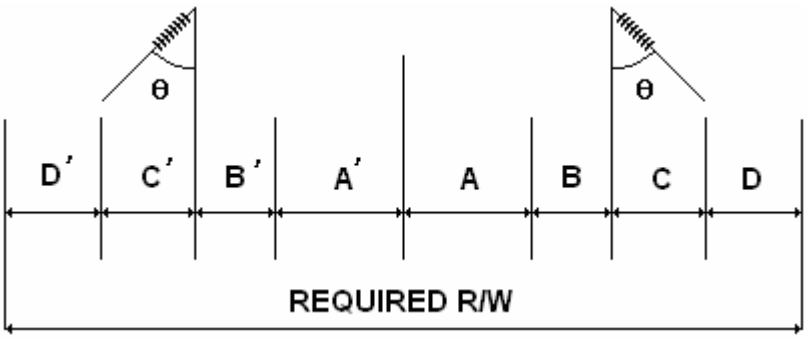


Required Distance (Right side of structure)		Width (ft)
A	Distance between end of arm conductor attachment and center of structure (115kV arm)	12
B	Structure attachment deviation due to deflection	6
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak (636 MCM) conductor at 6 psf for 115kV circuit.	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	9.6
	Required Permanent ROW (The larger value between Case 1 and Case 2) **A + B + C + D**	**36.6**

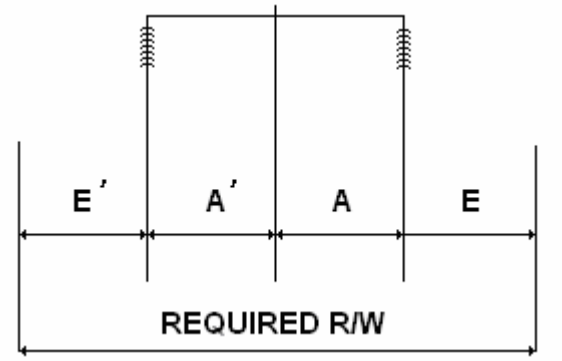
Figure 1.12-32 East Range 39L/37L Leg HVTL Permanent ROW Calculation-345kV/115kV Double Circuit, 750 Foot Span, Left Side Structure



Case 1

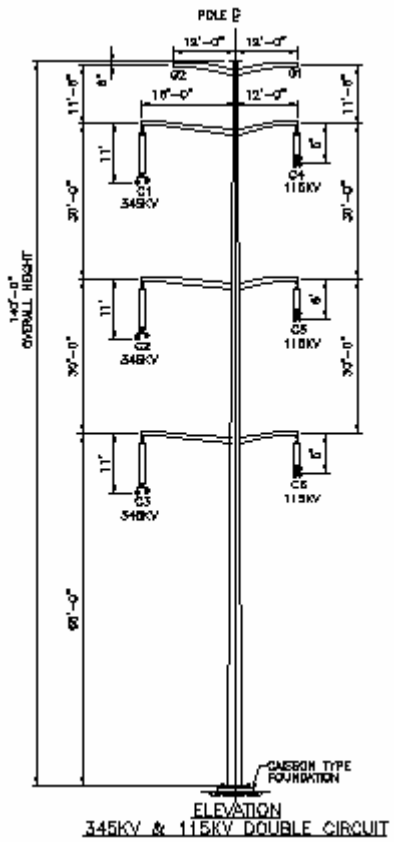


Case 2

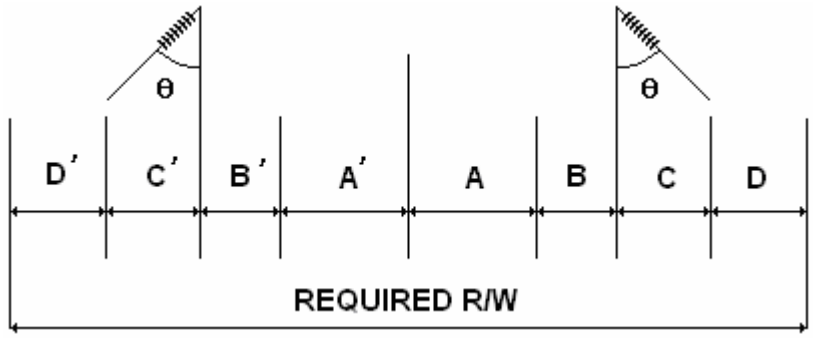


Required Distance (Left Side of Structure)		Width (ft)
A'	Distance between end of arm conductor attachment and center of structure (345kV arm)	18
B'	Structure attachment deviation due to deflection	6
C'	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	12
D'	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	10.8
E'	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	13.8
	Required Permanent ROW (The larger value between Case 1 and Case 2). **A' + B' + C' + D'**	**46.8**
Total ROW	**36.6 + 46.81**	**83.4**

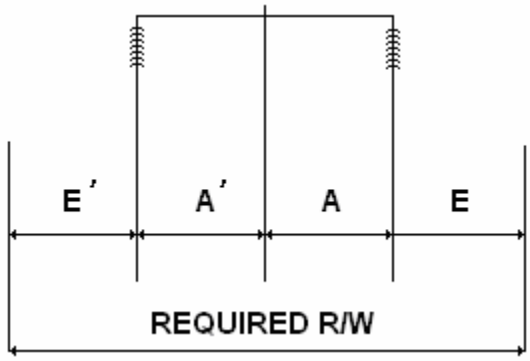
Figure 1.12-33 East Range 39L/37L Leg HVTL Permanent ROW Calculation-345kV/115kV Double Circuit, 1100 Foot Span, Right Side Structure



Case 1

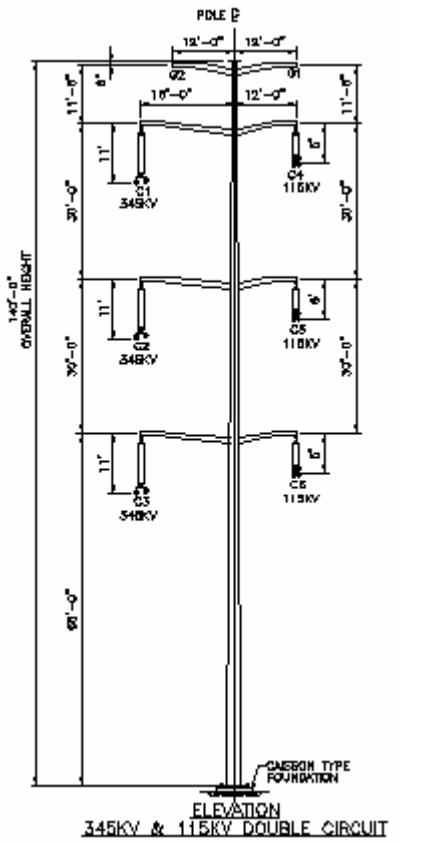


Case 2

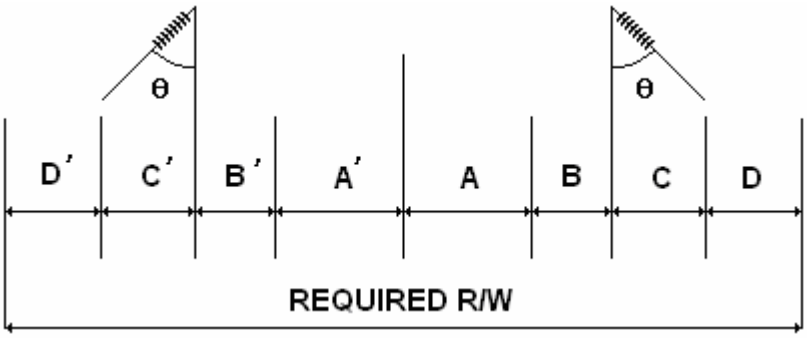


Required Distance (Right side of structure)		Width (ft)
A	Distance between end of arm conductor attachment and center of structure (115kV arm)	12
B	Structure attachment deviation due to deflection	6
C	Blowout. Obtained from PLS_CADD 3D model with Grosbeak (636 MCM) conductor at 6 psf for 115kV circuit.	20.3
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	9.6
	Required Permanent ROW (The larger value between Case 1 and Case 2) **A + B + C + D**	**44.9**

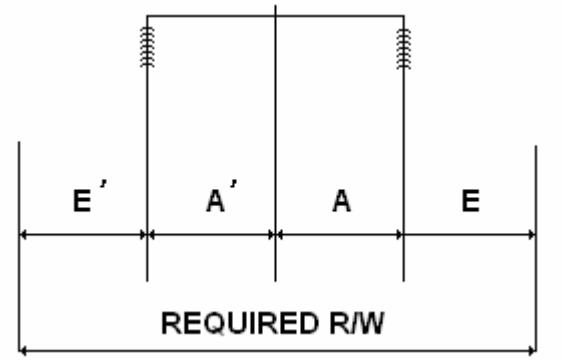
Figure 1.12-34 East Range 39L/37L Leg HVTL Permanent ROW Calculation-345kV/115kV Double Circuit, 1100 Foot Span, Left Side Structure



Case 1

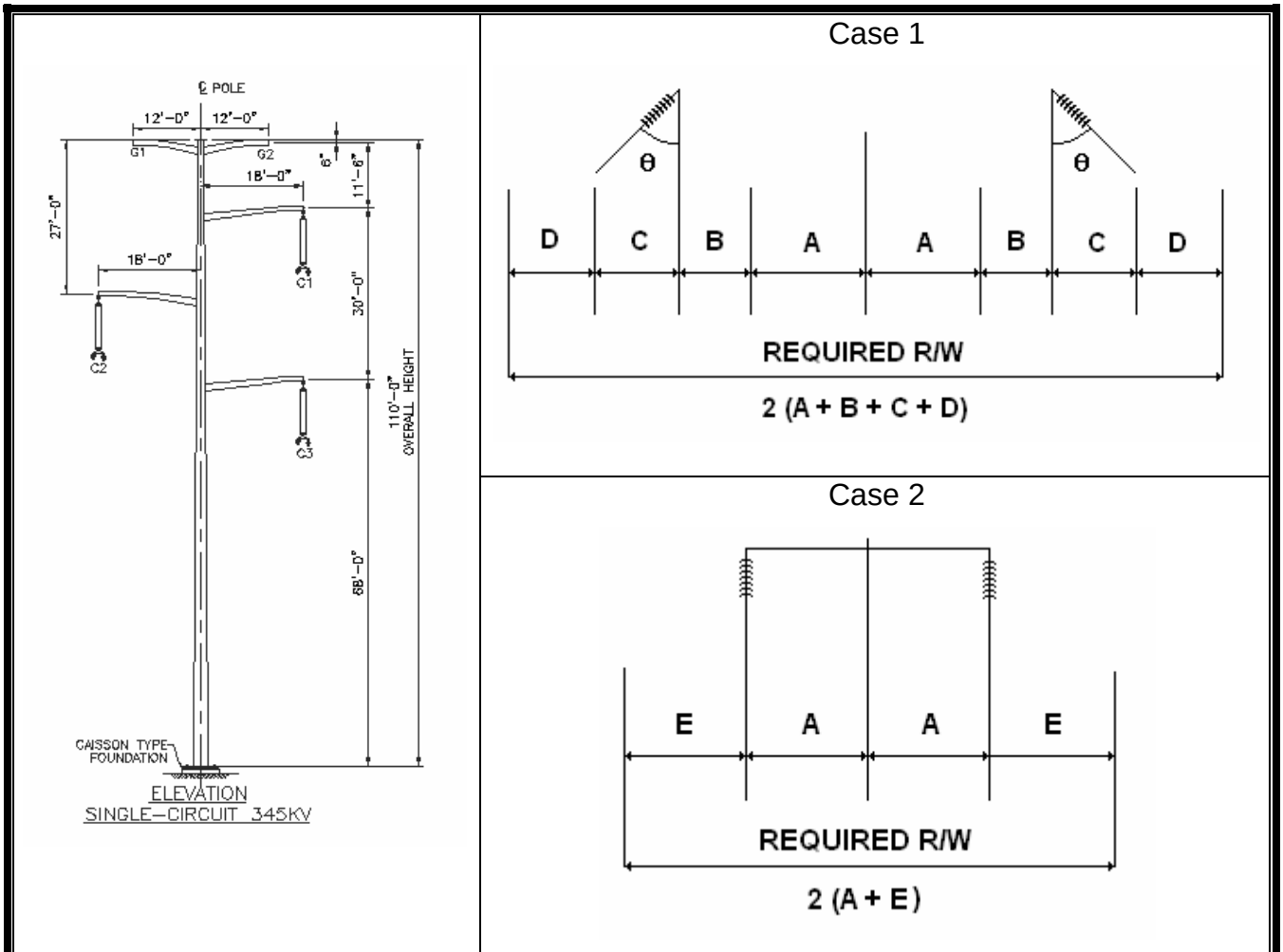


Case 2



Required Distance (Left Side of Structure)		Width (ft)
A'	Distance between end of arm conductor attachment and center of structure (345kV arm)	18
B'	Structure attachment deviation due to deflection	6
C'	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	18.7
D'	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	10.8
E'	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	13.8
	Required Permanent ROW (The larger value between Case 1 and Case 2). **A' + B' + C' + D'**	**53.5**
Total Permanent ROW	**44.9 + 53.5**	**98.4**

Figure 1.12-35 East Range 39L/37L Leg HVTL Permanent ROW Calculation-345kV Single Circuit Structure



Required Distance		Width (ft)
A	Distance between end of arm conductor attachment and center of structure	18
B	Structure attachment deviation due to deflection	5
C	Blowout. Obtained from PLS_CADD 3D model with Twin Pheasant conductor at 6 psf	12
D	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	10.8
E	Clearance requirement to building or objects with conductor at rest per NESC Rule 234	13.8
	Required Permanent ROW (The larger value between Case 1 and Case 2)	**91.6**

Figure 1.12-36 East Range Alternate 38L 345kV HVTL Route and Structure Configurations

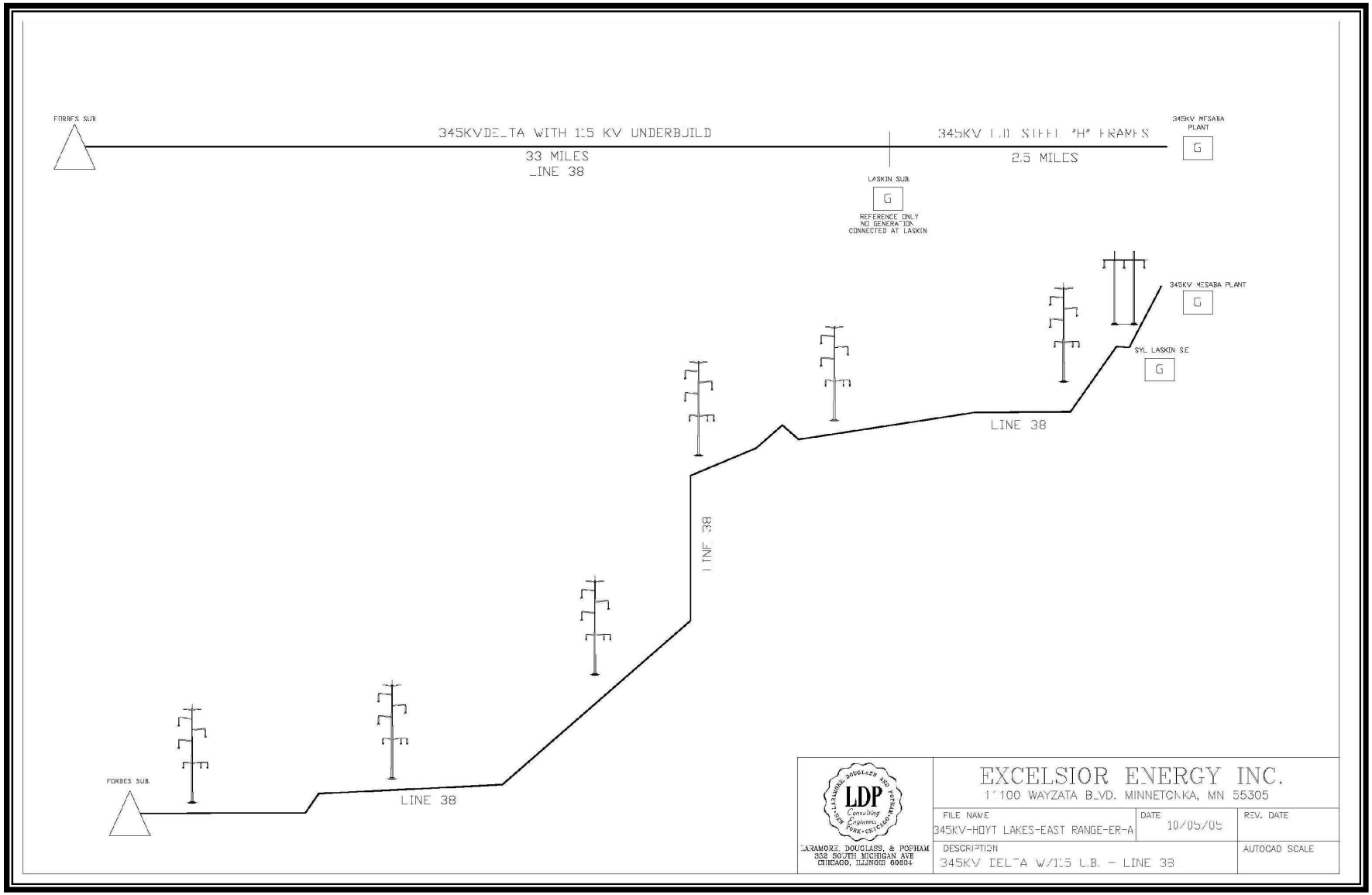
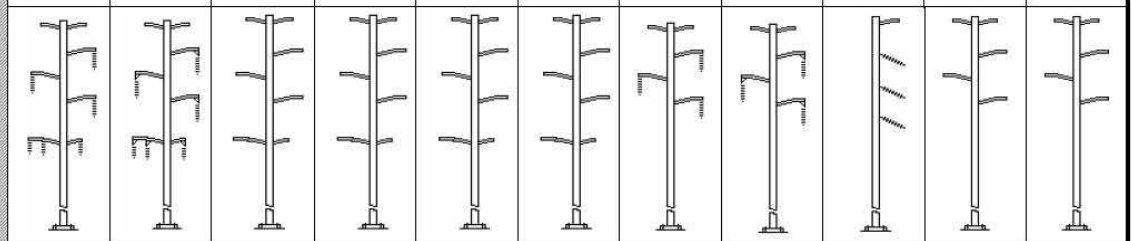


Figure 1.12-37 East Range 38L Leg HVTL Structure Summary

Mesaba Energy Project
Preliminary Corridor Structure Design for the East Route
Preliminary Structure Summary Line 38 and 43



	1	2	3	4	5	6	7	8	9	10	11
Height	SUS1_UB	SUS2_UB	STR1_UB	STR2_UB	DED1_UB	DED2_UB	SUS1	SUS2	RAN1	DED1	DED2
	0° - 2°	2°-6°	6°-15°	15°-30°	30°-60°	60°-90°	0° - 2°	2°-15°	15°-30°	30°-60°	60°-90°
115	1										
120	13										
124	149	1	1		6	3					
129	46				1						
132					1						
133.0	25		1			1	1				
134.0	1										
137.0						1					
138.0	6										
139.0	1										
142.0	5				3					1	
147.0											1
Total	247	1	2	0	11	5	1	0	0	1	1

269 Structures

Figure 1.12-38 HVTL Structure Configuration for Route to which 30 Foot Permanent ROW Is Added

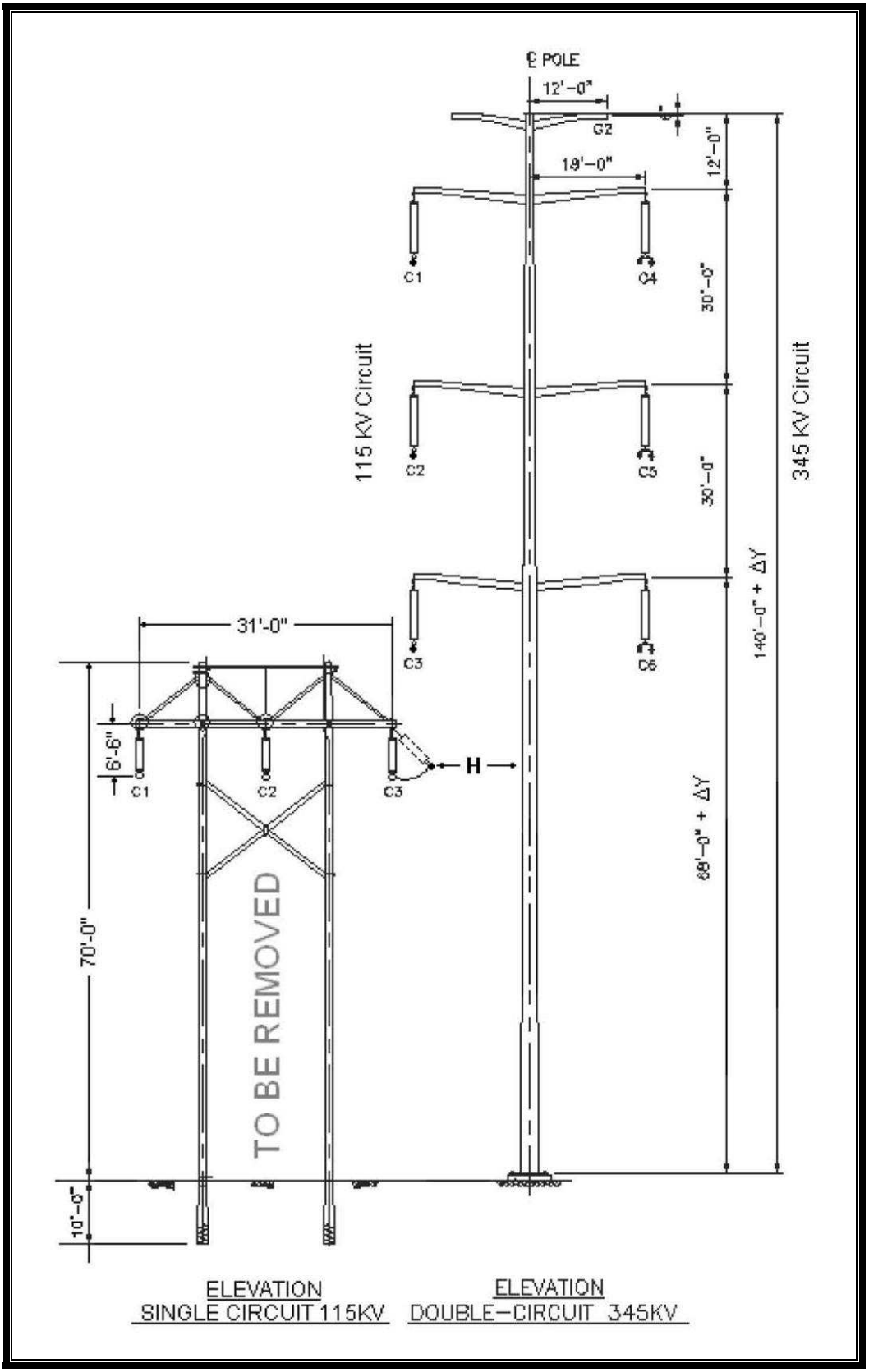
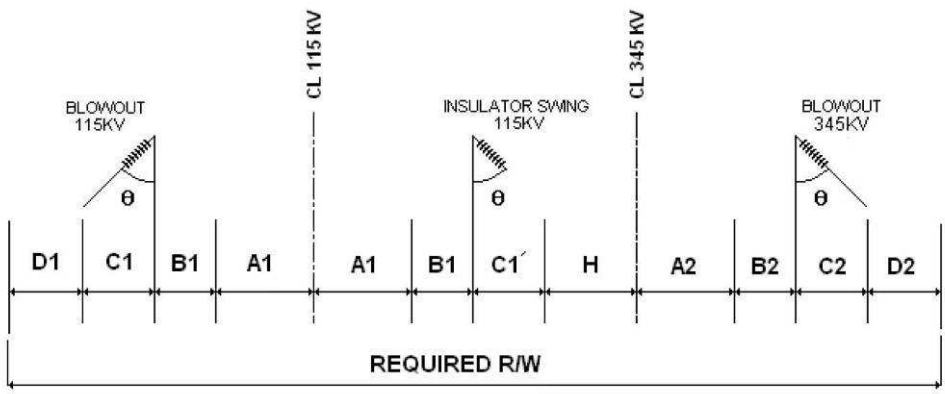


Figure 1.12-39 Permanent ROW Calculation for New Double Circuit HVTL Tower Orientation Assuming 750-foot Span Between Towers



ROW		Width (ft)
From Left ROW Edge to 115 KV center line		
A1	Distance between end of arm conductor attachment and center of structure	15.5
B1	Structure attachment deviation due to deflection	3
C1	Blowout for Grosbeak conductor at 6 psf	12
D1	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234	6.6
		37.1
From 115 center line to 345 KV center line		
A1	Distance between end of arm conductor attachment and center of structure	15.5
B1	Structure attachment deviation due to deflection	3
C1'	Blowout for Grosbeak conductor at 6 psf	3
H	Required working clearance	10
		31.5
From 345 KV center line to the right ROW edge		
A2	Distance between end of arm conductor attachment and center of structure	18
B2	Structure attachment deviation due to deflection	5
C2	Blowout for Twin Pheasant conductor at 6 psf	12
D2	Clearance requirement to building or objects with conductor displaced by wind per NESC Rule 234 for 345 kV	10.8
		45.8
Additional ROW (31.5 + 45.8) - 50		**27.3**
Recovered ROW (50 + 31.5) – 45.8		**35.7**

1.12.1.4 Conductors

Two different size conductors for each transmission line segment were evaluated. The proposed conductor, listed for each line segment, was selected based on an economic analysis that estimated the lowest cost considering initial construction cost, power losses due to line characteristics and construction sequencing to account for the time value of funds. The line impedances and power flow data for each conductor type operating at 230 kV are identified in Table 1.12-6a. The line impedances and power flow data for each conductor type operating at 345kV are included in Table 1.12-6b. The rating for each conductor is presented in Table 1.12-6c.

Table 1.12-6a
Conductor Impedances and Power Flow Data

	230KV ER-A/ER-B 795KCMIL Bundle	230KV ER-C 795KCMIL Bundle	230KV ER-A/ER-B 1590KCMIL	230KV ER-C 1590KCMIL	230KV WR-A 795KCMIL Bundle	230KV WR-B 795KCMIL Bundle	230KV WR-A 1590KCMIL	230KV WR-B 1590KCMIL
Pr (MW)	583.710408	582.388675	583.059919	581.651236	594.9268	591.474692	594.71364	591.148182
Vr (kV)	230	230	230	230	230	230	230	230
Ir (AMP)	1475.03605	1468.93385	1465.12214	1460.42143	1544.385	1519.8395	1535.88	1508.43805
P.F.r	0.99338839	0.99525635	0.99899573	0.99978988	0.967013	0.97692836	0.9720193	0.98376905
Sine(PFr Angle)	0.11480204	0.09728716	0.04480541	0.02049887	0.254727	0.21356727	0.2349008	0.17943929
L (mile)	35.5	38.7	35.5	38.7	10	17.5	10	17.5
R+ (Ohm)/mile	0.0703	0.0703	0.0741	0.0741	0.0709	0.0703	0.0747	0.0741
R0 (Ohm)/mile	0.6592	0.6592	0.6626	0.6626	0.629	0.6592	0.6328	0.6626
X+ (Ohm)/mile	0.56	0.56	0.7483	0.7483	0.566	0.56	0.7559	0.7483
X0 (Ohm)/mile	1.8892	1.8892	2.077	2.077	1.926	1.8892	2.116	2.077
Xc+ (M Ohm)/mile	0.1322	0.1322	0.1646	0.1646	0.1322	0.1322	0.1747	0.1646
Xc0 (M Ohm)/mile	0.2414	0.2414	0.2838	0.2838	0.2515	0.2414	0.294	0.2838
Ps (MW)	600	600	600	600	600	600	600	600
Delta(Es,Vr) DEG	11.5979972	12.6068233	15.6205642	17.0134434	3.436089	5.86102724	4.6072413	7.85460924
P loss (MW)	16.2895918*	17.6113247**	16.9400808*	18.3487643**	5.073159*	8.52530805**	5.2863559*	8.8518179**
V drop (Kv)	22.2553512	24.1610981	29.4521444	32.0039732	6.63396	11.3041845	8.7852074	14.9479028
Es (KV)	247.215918	248.242862	248.888716	249.689789	236.1152	239.928406	237.42271	241.741884
%Regulation	7.48518186	7.93167913	8.21248505	8.56077771	2.658804	4.31669839	3.2272662	5.10516678
P.F.s	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95

* When only unit 1 is in service, the two lines will operate in parallel resulting in 25% of losses shown.
** When both units are in operation, the three lines will operate in parallel resulting in reduced losses from those shown in the table.

Table 1.12-6b Conductor Impedances and Power Flow Data: 345kV

345 KV LINE IMPEDANCES AND POWER FLOW DATA (REV1)
(600 MW Generation at 0.95 Power Factor)

	345KV ER-A/ER-B 954KCMIL BUNDLE	345KV ER-A/ER-B 1272KCMIL BUNDLE	345KV WR-1A 954KCMIL BUNDLE	345KV WR-2A 954KCMIL BUNDLE	345KV WR-1B 954KCMIL BUNDLE	345KV WR-1A 1272KCMIL BUNDLE	345KV WR-2A 1272KCMIL BUNDLE	345KV WR-1B 1272KCMIL BUNDLE
Pr (MW)	593.273698	594.8309783	598.002447	598.01863	596.5632363	598.4706794	598.4315168	597.3657458
Vr (kV)	345	345	345	345	345	345	345	345
Ir (AMP)	1016.699879	1019.461745	1043.921686	1043.964	1035.081572	1044.792888	1044.748021	1036.551184
P.F.r	0.976551925	0.976462708	0.95866762	0.9586547	0.964528194	0.958618238	0.958596675	0.964456359
Sine(PFr Angle)	0.215281997	0.215686302	0.284528372	0.2845719	0.263979855	0.284694702	0.2847673	0.264242185
L (mile)	35.5	35.5	10	10	17.5	10	10	17.5
R+ (Ohm)/mile	0.0611	0.0467	0.0611	0.0606	0.0611	0.0467	0.0479	0.0467
R0 (Ohm)/mile	0.6206	0.6062	0.6206	0.6218	0.6206	0.6062	0.6074	0.6062
X+ (Ohm)/mile	0.6034	0.5947	0.6034	0.6023	0.6034	0.5947	0.5936	0.5947
X0 (Ohm)/mile	1.8334	1.8247	1.8334	1.8367	1.8334	1.8247	1.828	1.8247
Xc+ (M Ohm)/mile	0.1423	0.1402	0.1423	0.1414	0.1423	0.1402	0.1392	0.1402
Xc0 (M Ohm)/mile	0.2355	0.2333	0.2355	0.2304	0.2355	0.2333	0.2283	0.2333
Ps (MW)	600	600	600	600	600	600	600	600
Delta(Es,Vr) DEG	5.7604818	5.736769081	1.66354358	1.6609418	2.887365764	1.653606465	1.649268995	2.871788264
P loss (MW)	6.726301985*	5.169021705*	1.997552968**	1.9813671**	3.436763654**	1.529320644**	1.568483239**	2.634254243**
V drop (Kv)	10.98930946	10.83829436	3.178463278	3.172593	5.5152081	3.128901295	3.123515171	5.432383933
Es (KV)	358.6631018	357.6914871	349.3105906	349.29643	352.2938282	349.0193334	349.034321	351.7943769
%Regulation	3.960319355	3.6786919	1.249446557	1.2453411	2.114153108	1.165024163	1.169368412	1.969384615
P.F.s	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95

* When only unit 1 is in service, the two lines will operate in parallel resulting in 25% of losses shown.
** When only unit 1 is in service, lines 1A and 1B or 2A and 1B will be operating in parallel resulting in reduced losses from those shown in the table.

Table 1.12-6c
Conductor Rating Data

Conductor Selection	
Rating Ampacity Criteria	
Temp	30 C / 86 F
Wind Speed	2.0 ft/s
Angle b/w wind and Cond.	90 deg
Cond. Elev	1400 ft
Sun Time	12 hrs
Cond. Lat	47 deg
Atmosphere	Clear
Day of Yr.	June 30
230 kV System	
1-Generator 600MW - 1585 A (.95 PF)	
Conductor Type	**100C/212F**
1-1590 kcm ACSR "Lapwing	1601 A
2-795 kcm ACSR " Drake"	2128 A
345 kV System	
2-Generator 1200MW - 2113 A (.95 PF)	
Conductor Type	**100C/212F**
2-954 kcm ACSR "Cardinal"	2328 A
2-1272 kcm ACSR "Pheasant"	2785 A
115 kV System	
Conductor Emergency Rating	
Conductor Type	**135C/275F**
1-954 kcm ACSR "Cardinal"	1411 A

1.12.1.5 Other Transmission Network Reinforcements

In addition to the necessary generator outlet HVTLs identified above, the Proponent anticipates that network reinforcements[14] will be required within other existing HVTL corridors leading to load centers and/or at substations down-network of the Blackberry and Forbes Substations. MISO is the organization with responsibility to coordinate the objective review of, and ultimately approve, all transmission-related additions and alterations. MISO's LGIP is the process established to facilitate such review and approval.

1.12.1.5.1 West Range Site

At the Proponent's request (formally logged as MISO Queue No. 38491-01), the LGIP has been initiated and designated as Project G519. MISO has recently completed the system impact study ("SIS") conducted as part of the LGIP, the results of which are reported in the following Section 1.12.1.5.1A.

1.12.1.5.1A Mesaba One Reinforcements

The N-1 contingency analysis conducted by MISO found that Mesaba One causes the Blackberry-Riverton 230kV circuit to overload. MISO has proposed adding a new 73 mile 230kV circuit from MP's Clay Boswell Station to the Riverton Substation (near Brainerd) to alleviate this and any other injection overloads. The N–2 contingency analysis indicated that regional electric generators may be required to back down from their rated generating capacity to protect the HVTLs and protective equipment remaining on the system. The conclusion of the short circuit analysis is that the interconnection of Mesaba One at the Blackberry POI causes four breakers at the Nashwauk 115kV bus to become overdutied. The following proposed network upgrades resolve all local injection issues identified in MISO's analysis for interconnecting Mesaba One as an Energy Resource: [15]

- Upgrade existing 115kV HVTL connecting Clay Boswell Station to Riverton Substation to 230kV HVTL
- Add new 230kV bus position for Boswell-Riverton line at Boswell
- Add new 230kV bus position for Boswell-Riverton line at Riverton
- Add new 230kV substation at Hill City

[14] Network reinforcements are defined as upgrades to the existing transmission system designed to eliminate new constraints on existing generating resources that would otherwise interfere with the existing generator's capability to place into commerce the amount of energy it provided to existing load centers prior to introducing new generating capacity at a point intermediate to such pre-existing load centers.

[15] FERC Order No. 2003-A, issued on 3/5/04, clarified that an interconnection customer may request either "energy" or "network" resource interconnection service. Energy resource service is basic, minimal service, providing access to existing transmission capacity on an as-available basis. In contrast, network resource interconnection service is far more flexible and comprehensive, allowing the generation facility to be identified by a network customer as a network resource. While both services allow the interconnection customer to place the power produced by a generating facility on to the transmission system at the point of interconnection, FERC said neither guarantees delivery service because they do not allow a customer to withdraw power at any particular delivery point. However, network interconnection service customers can ask for delivery service at the time of interconnection and tailor the service to their needs, just as they do now.

- Replace 4 115kV circuit breakers at Nashwauk.

Additional deliverability studies will be performed to determine whether Mesaba One can be designated as a network resource.

1.12.1.5.1B Mesaba Two Reinforcements

With addition of Mesaba Two, the existing 230kV HVTLs between i) the Blackberry and Arrowhead 230/115kV Substations and ii) the Blackberry and Riverton Substations are likely candidates for upgrading and/or double circuiting to increase transfer capabilities to the south. In the powerflow studies performed by the Proponent, the circuits on these corridors were upgraded to 345kV as part of a combined generator outlet/network reinforcement delivery concept for the Phase II Development. The studies also indicated that additional 345kV reinforcements would likely be needed beyond the Riverton substation to Great River Energy's Benton County Substation to accommodate Mesaba Two.

The Proponent has recently submitted to MISO an LGIP request (formally logged as MISO Queue No. 38762-02 and designated as G597) for Mesaba Two to confirm the required network reinforcements for the Phase II Development.

1.12.1.5.2 East Range Site

At the Proponent's request (formally logged as MISO Queue No. 38280-01), the LGIP has been initiated and designated as Project G477. MISO has recently completed the SIS conducted as part of the LGIP.

1.12.1.5.2A Mesaba One Reinforcements

The study conducted by MISO assumed that Mesaba One had a summer output of 531 MW and winter output of 552 MW (as opposed to 606 MW in the case of the IGCC Power Station on the West Range Site). In similar fashion to the study conducted for the West Range IGCC Power Station, the East Range SIS involved an assessment of system performance based on steady state analysis, contingency analysis, constrained interface analysis, short circuit analysis and stability analysis. Based on the study results, no network upgrades are required for Mesaba One to interconnect as an Energy Resource. Additional deliverability studies will be performed to determine whether Mesaba One can be designated as a network resource.

1.12.1.5.2B Mesaba Two Reinforcements

Based upon the Proponent's preliminary system powerflow studies, the full output of Mesaba One and Mesaba Two is likely to require the addition of two new 345kV circuits in existing corridors between i) the Forbes Substation and the Arrowhead Substation (located in Proctor, MN near Duluth) and ii) the Arrowhead Substation and the Twin Cities 345kV system. These new circuits will be placed in existing routes and will provide for a robust reinforcement plan. It may be sufficient to upgrade existing 230kV circuits between these locations to 345kV for one of these circuit paths. Such upgrades would involve replacing existing HVTL towers with double

circuit structures similar to what has been proposed for the 39L/37L and 38L GO HVTLs. This would minimize, if not eliminate, the need to acquire new ROWs.

1.12.1.6 Transmission Line Construction

Areas that are stable and dry can be worked on during summer months, with difficult swampy areas reserved for winter construction. In areas where the frozen ground will not support weight, cribbing or matting is laid on the ground, to spread the weight. Most vehicle traffic will use the temporary HVTL ROW for construction, with possible placement of a few temporary access roads to the ROW. In some areas additional temporary ROW will be required for access. Erosion control measures will be implemented to minimize erosion during construction.

The steel structures will be supported by a drilled concrete pier foundation that will require an excavation 15 to 55 feet deep and 7 to 12 feet in diameter. Concrete piers can easily be drilled in frozen soils, with curing agents added to the concrete mix while pouring. In peat, special foundation structures will be required as shown in Figure 1.12-9. Once the concrete has cured, towers are assembled and erected. Poles will be delivered to structure locations and placed on the ROW and out of the clear zone of any adjacent roadways or designated pathways. Insulators and other hardware will be attached while the pole is on the ground, and the pole will then be lifted, placed, and secured on the foundation by a crane or similar heavy equipment.

Once the structures have been erected, conductors will be installed by establishing a stringing setup area on a portion of the ROW. The conductors are added after the towers are in place and dressed out. Pulleys placed on the insulators allow the cable to be pulled along the route with pulling and tensioning equipment, thereby allowing the wire to be pulled over the swampy areas. Conductor stringing operations will also require brief access to each structure to secure the conductor cable to the insulators or to install shield wire clamps once final tensioning is completed. Temporary guard or clearance poles will be installed as needed over existing distribution or communication lines, streets, roads, highways, railways or other obstructions after any necessary notifications are made and permits obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables.

Construction crews will comply with local, state, National Electric Safety Code ("NESC") and other applicable standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, ROW widths, erection of power poles and stringing of transmission line conductors. During construction, crews will attempt to limit ground disturbance wherever possible. Disturbed areas will be restored to their original condition to the extent practicable and as negotiated with landowners. Post-construction reclamation activities include removing and disposing of debris, dismantling all temporary facilities (including staging and lay down areas), leveling or filling tire ruts, employing appropriate erosion control measures, and reseeding areas disturbed by construction activities with vegetation similar to that which was removed.

Construction for the East Range is expected to be spread over two years, with the West Range preferred transmission plan likely being completed in one winter season.

1.12.1.7 Transmission Line Operation and Maintenance

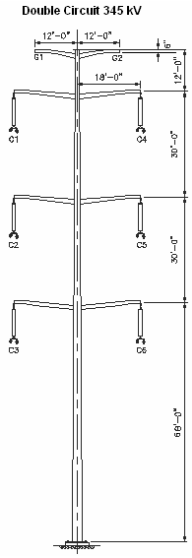
The owners will periodically perform inspections, maintain equipment and make repairs over the life of the line. As well, the owners will also conduct routine ROW maintenance approximately

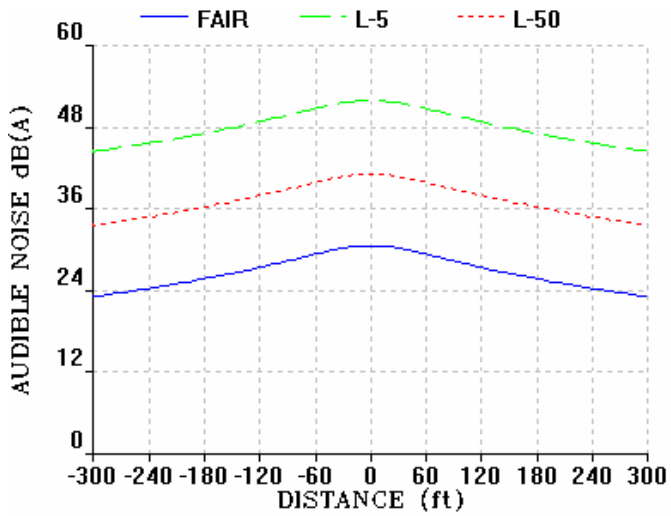
every five years to remove undesired vegetation that may interfere with the safe and reliable operation of the HVTL.

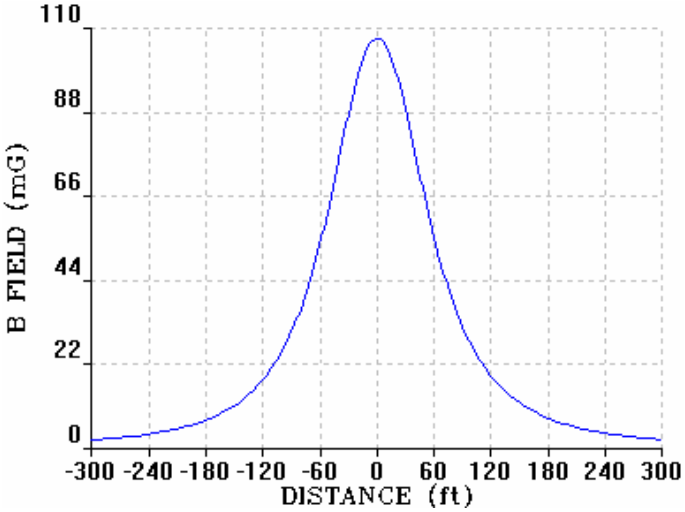
1.12.1.8 Electric and Magnetic Fields and Noise

The electric and magnetic fields ("EMF") and noise levels modeled for the proposed transmission lines are shown in Figures 1.12-40 through 1.12-50. As designed, all such levels will be in compliance with applicable State and Federal standards.

Figure 1.12-40 Electric and Magnetic Field Calculations for Double Circuit 345kV HVTL







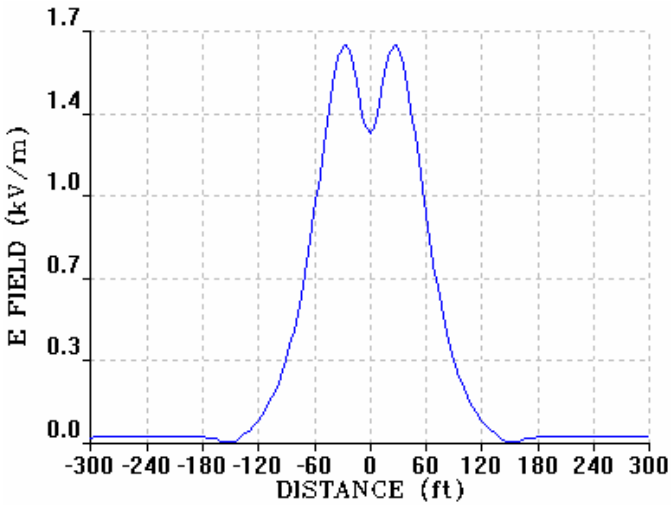
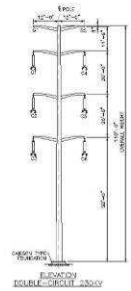


Figure 1.12-41 Electric and Magnetic Field and Noise Values-230kV Double Circuit HVTL

EMF Report for 230 KV – 2 CKT Lapwing 1590 MCM 45/7



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	46.92
	Magnetic Field at 50 ft in mG	20.37
Electric Field	Electric Field at the center line in kV/m	0.43
	Electric Field at 50 ft in kV/m	0.23
Audible Noise	L50 Fair at CL in dB(A)	33.9
	L50 Rain at CL in dB(A)	54.5
	Leq(24) at CL in dB(A)	42.5
	Ldn at CL in dB(A)	50.2
	L50 Fair at 50 ft in dB(A)	32.5
	L50 Rain at 50 ft in dB(A)	53.1
	Leq(24) at 50 ft in dB(A)	41.2
	Ldn at 50 ft in dB(A)	48.9

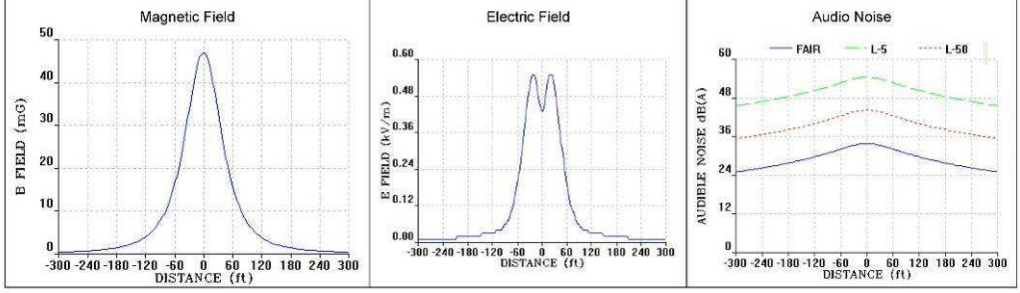
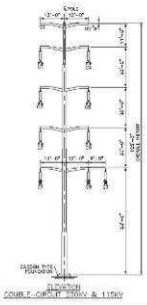


Figure 1.12-42 Electric and Magnetic Field and Noise Values-230kV Double Circuit HVTL with 115kV Underbuild

EMF Report for 230 KV – 2 CKT Lapwing 1590 MCM 45/7 – 115 KV Grosbeak 636 MCM 26/7



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	109.58
	Magnetic Field at 50 ft in mG	61.14
Electric Field	Electric Field at the center line in kV/m	0.32
	Electric Field at 50 ft in kV/m	0.66
Audible Noise	L50 Fair at CL in dB(A)	18.4
	L50 Rain at CL in dB(A)	43.7
	Leq(24) at CL in dB(A)	28.9
	Ldn at CL in dB(A)	36.8
	L50 Fair at 50 ft in dB(A)	17.8
	L50 Rain at 50 ft in dB(A)	43.0
	Leq(24) at 50 ft in dB(A)	28.3
	Ldn at 50 ft in dB(A)	36.1

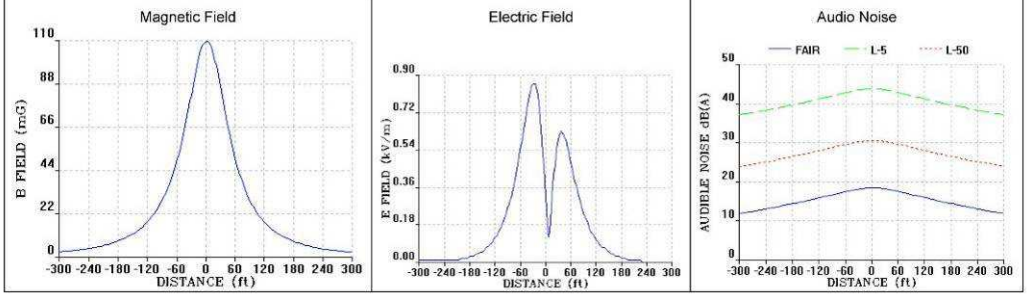
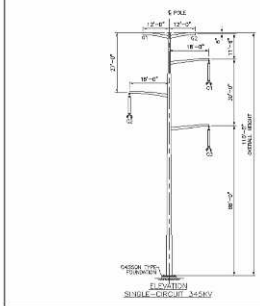
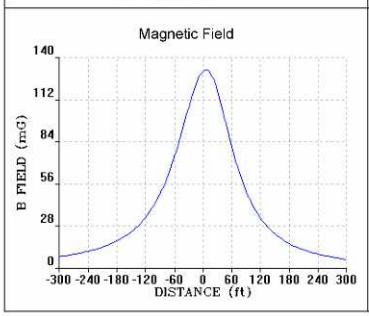


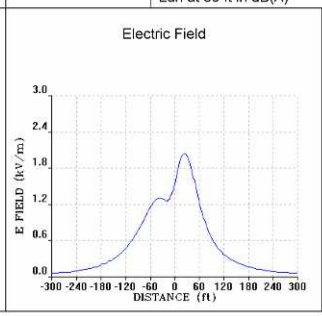
Figure 1.12-43 Electric and Magnetic Field and Noise Values-345kV Delta Tower HVTL

Electromagnetic Field Report for 345 KV – 1 CKT Delta Bundle (• •) Pheasant 1272 MCM 54/19



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	130.82
	Magnetic Field at 50 ft in mG	93.58
Electric Field	Electric Field at the center line in kV/m	1.54
	Electric Field at 50 ft in kV/m	1.53
Audible Noise	L50 Fair at CL in dB(A)	25.4
	L50 Rain at CL in dB(A)	47.8
	Leq(24) at CL in dB(A)	34.6
	Ldn at CL in dB(A)	42.4
	L50 Fair at 50 ft in dB(A)	24.9
	L50 Rain at 50 ft in dB(A)	47.2
	Leq(24) at 50 ft in dB(A)	34.1
	Ldn at 50 ft in dB(A)	41.9





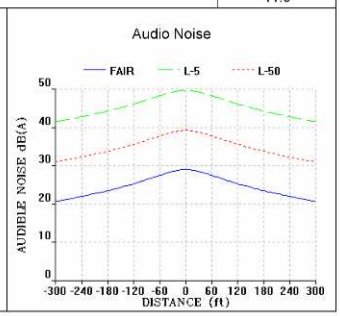
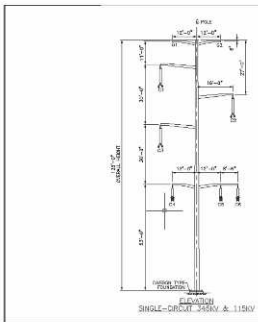
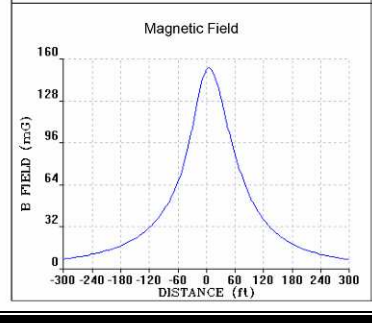


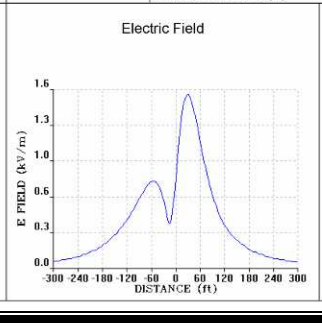
Figure 1.12-44 Electric and Magnetic Field and Noise Values-345kV Delta Tower HVTL with 115kV Underbuild

EMF Report for 345 KV – 1 CKT Delta Bundle (• •) Pheasant 1272 MCM 54/19 – 115 KV Grosbeak 636 MCM 26/7



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	151.60
	Magnetic Field at 50 ft in mG	101.05
Electric Field	Electric Field at the center line in kV/m	0.806
	Electric Field at 50 ft in kV/m	1.32
Audible Noise	L50 Fair at CL in dB(A)	24.0
	L50 Rain at CL in dB(A)	46.6
	Leq(24) at CL in dB(A)	33.2
	Ldn at CL in dB(A)	41.0
	L50 Fair at 50 ft in dB(A)	23.6
	L50 Rain at 50 ft in dB(A)	46.1
	Leq(24) at 50 ft in dB(A)	33.8
	Ldn at 50 ft in dB(A)	40.6





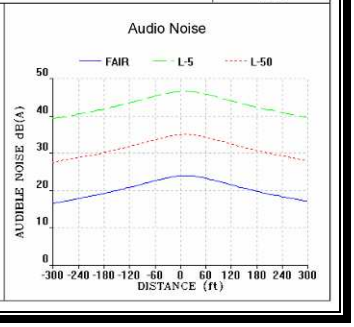
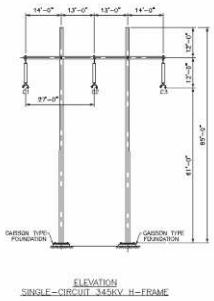
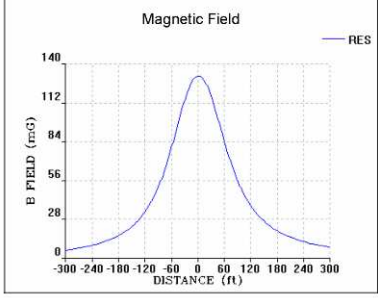


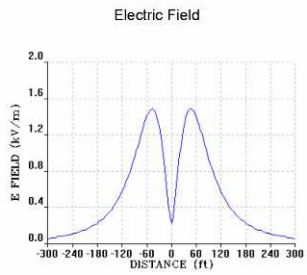
Figure 1.12-45 Electric and Magnetic Field and Noise Values-345kV H-Frame HVTL

Electromagnetic Field Report for 345 KV – 1 CKT H-Frame Bundle (• •) Pheasant 1272 MCM 54/19



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	184.86
	Magnetic Field at 50 ft in mG	122.08
Electric Field	Electric Field at the center line in kV/m	0.6
	Electric Field at 50 ft in kV/m	2.0
Electric Audible Noise	L50 Fair at CL in dB(A)	29.2
	L50 Rain at CL in dB(A)	50.2
	Leq(24) at CL in dB(A)	37.8
	Ldn at CL in dB(A)	45.6
	L50 Fair at 50 ft in dB(A)	27.8
	L50 Rain at 50 ft in dB(A)	48.9
	Leq(24) at 50 ft in dB(A)	36.5
	Ldn at 50 ft in dB(A)	44.2





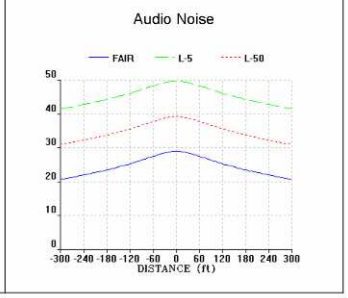
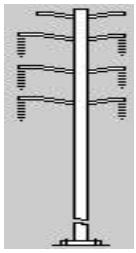
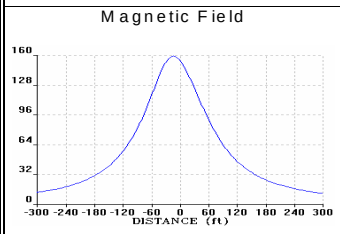
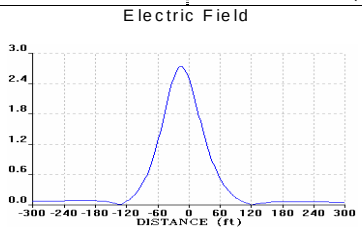


Figure 1.12-46 Electric and Magnetic Field and Noise Values-345kV/115kV Double Circuit Delta Tower HVTL



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	153.8
	Magnetic Field at 50 ft in mG	101.3
Electric Field	Electric Field at the center line in kV/m	2.49
	Electric Field at 50 ft in kV/m	.74
Audible Noise	L50 Fair at CL in dB(A)	24.4
	L50 Rain at CL in dB(A)	46.8
	Leq(24) at CL in dB(A)	35.3
	Ldn at CL in dB(A)	40.5
	L50 Fair at 50 ft in dB(A)	23.1
	L50 Rain at 50 ft in dB(A)	45.4
	Leq(24) at 50 ft in dB(A)	33.9
	Ldn at 50 ft in dB(A)	39.1





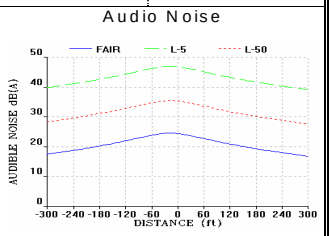
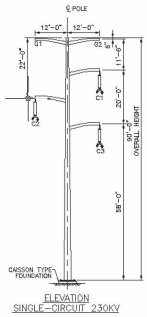


Figure 1.12-47 Electric and Magnetic Field and Noise Values-230kV Single Circuit Delta Structure

EMF Report for 230 KV – 1 CKT Delta Lapwing 1590 MCM 45/7



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	96.59
	Magnetic Field at 50 ft in mG	57.38
Electric Field	Electric Field at the center line in kV/m	0.83
	Electric Field at 50 ft in kV/m	0.61
Audible Noise	L50 Fair at CL in dB(A)	19.4
	L50 Rain at CL in dB(A)	44.3
	Leq(24) at CL in dB(A)	29.7
	Ldn at CL in dB(A)	37.6
	L50 Fair at 50 ft in dB(A)	18.3
	L50 Rain at 50 ft in dB(A)	43.2
	Leq(24) at 50 ft in dB(A)	28.7
	Ldn at 50 ft in dB(A)	36.5

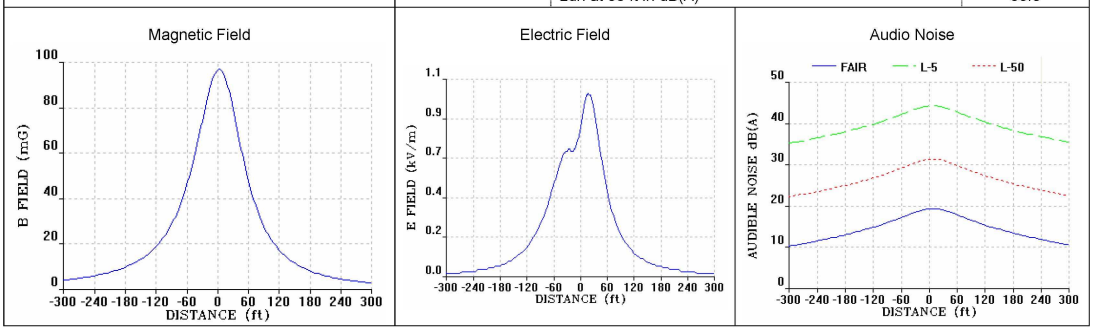
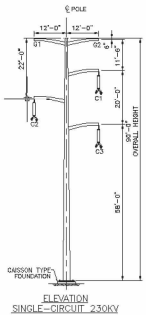


Figure 1.12-48 Electric and Magnetic Field and Noise Values-230kV Delta HVTL (Drake)

EMF Report for 230 KV – 1 CKT Delta Bundle (• •) Drake 795 MCM 26/7



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	96.59
	Magnetic Field at 50 ft in mG	57.38
Electric Field	Electric Field at the center line in kV/m	1.11
	Electric Field at 50 ft in kV/m	0.80
Audible Noise	L50 Fair at CL in dB(A)	8.8
	L50 Rain at CL in dB(A)	36.9
	Leq(24) at CL in dB(A)	20.1
	Ldn at CL in dB(A)	28.0
	L50 Fair at 50 ft in dB(A)	7.8
	L50 Rain at 50 ft in dB(A)	35.9
	Leq(24) at 50 ft in dB(A)	19.1
	Ldn at 50 ft in dB(A)	26.9

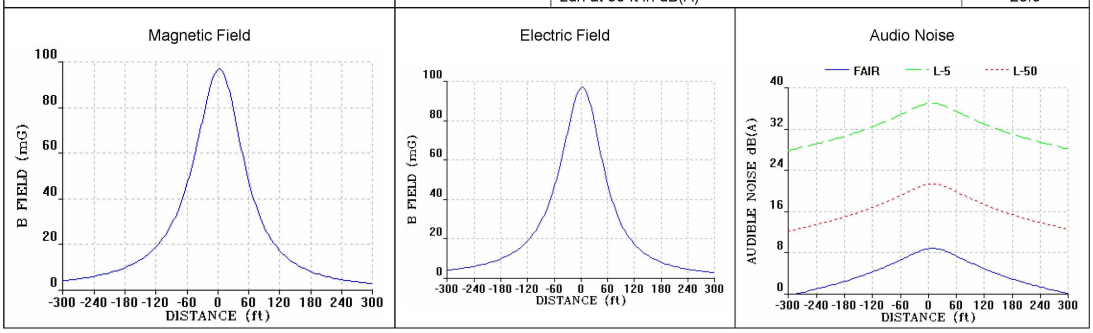
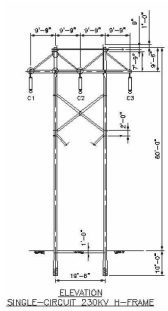


Figure 1.12-49 Electric and Magnetic Field and Noise Values for Single Circuit HVTL Structure

EMF Report for 230 KV – 1 CKT H-Frame Lapwing 1590 MCM 45/7



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	129.88
	Magnetic Field at 50 ft in mG	74.27
Electric Field	Electric Field at the center line in kV/m	0.18
	Electric Field at 50 ft in kV/m	0.89
Audible Noise	L50 Fair at CL in dB(A)	21.0
	L50 Rain at CL in dB(A)	45.3
	Leq(24) at CL in dB(A)	31.1
	Ldn at CL in dB(A)	38.9
	L50 Fair at 50 ft in dB(A)	19.4
	L50 Rain at 50 ft in dB(A)	43.7
	Leq(24) at 50 ft in dB(A)	29.5
	Ldn at 50 ft in dB(A)	37.3

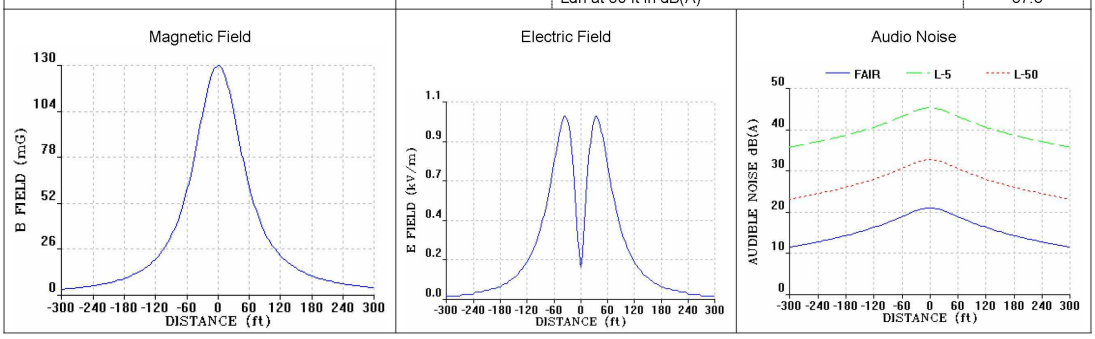
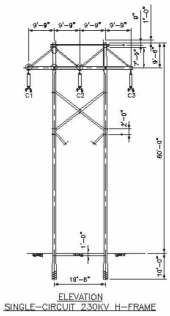
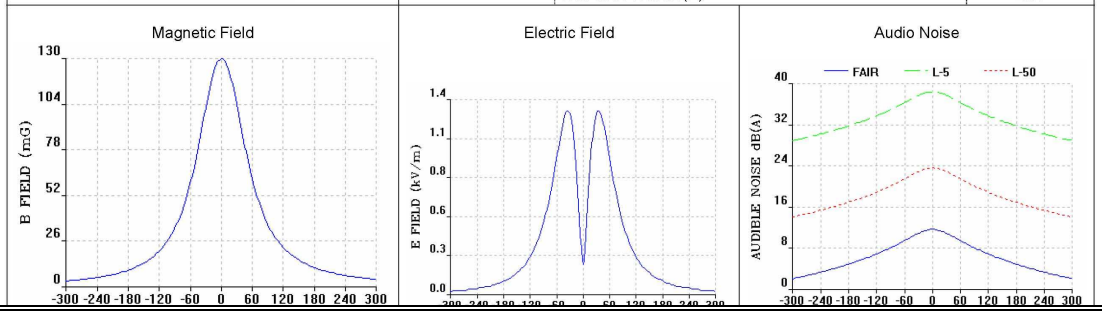


Figure 1.12-50 Electric and Magnetic Field and Noise Values-230kV Single Circuit HVTL Structure

EMF Report for 230 KV – 1 CKT H-Frame Bundle (• •) Drake 795 MCM 26/7



Electromagnetic Field & Audible noise values		
Magnetic Field	Magnetic Field at the center line in mG	129.88
	Magnetic Field at 50 ft in mG	74.27
Electric Field	Electric Field at the center line in kV/m	0.21
	Electric Field at 50 ft in kV/m	1.16
Audible Noise	L50 Fair at CL in dB(A)	11.7
	L50 Rain at CL in dB(A)	38.4
	Leq(24) at CL in dB(A)	22.3
	Ldn at CL in dB(A)	30.2
	L50 Fair at 50 ft in dB(A)	10.0
	L50 Rain at 50 ft in dB(A)	36.8
	Leq(24) at 50 ft in dB(A)	20.6
	Ldn at 50 ft in dB(A)	28.5



1.12.1.9 HVTL Route Comparisons

Table 1.12-7 is included to enable a comparison of key measures associated with the GO facilities development at each site.

Table 1.12-7
Comparison of GO Facilities for West and East Range Sites

	East Range Site		West Range Site			
			Plan A		Plan B	
PHASE I	**Preferred Route**	**Alternative**	**Preferred Route**	**Alternate**	**Preferred Route**	**Alternate**
Total HVTL Circuit (miles)	68.3	68.3	17.4	16.6	17.4	17.4
New ROW (acres)	4	4	6.2	5.8	6.2	5.8
Widened ROW (acres)	31.5	29	0	0	0	0
Permanent Land Use (acres)	166	165	134	121	134	121
Line Loss (MW)	5	5	1.4	1.4	2.2	2.2
PHASE I + PHASE II						
Total Circuit (miles)	68.3	68.3	17.4	16.6	25.7	35.5
New ROW (acres)	4	4	6.2	5.8	12	6.2
Widened ROW (acres)	31.5	29	0	0	0	0
Permanent Land Use (acres)	166	165	134	121	194	134
Line Loss (MW)	11.5	11.5	3.5	3.5	6.5	5.8

The new land use impact for the West Range GO facilities is 134 acres is less than that required for the East Range GO facilities. The 17.4 ROW miles is also about one-fourth of that for the East Range Site. These shorter lengths reduce potential visual and environmental impacts. Lower line losses of one-fourth to one-half effectively increases the Project's overall thermal efficiency, and reduces emission rates.

A comparison of GO HVTL costs between the West Range and East Range Sites is presented in Section 2.8.

Transmission constructability is another component aspect that must be considered when comparing site GO facility developments. Since all plans were developed to minimize the need for new ROW by utilizing existing transmission corridors to the maximum extent possible, issues associated with obtaining extended outages of the existing transmission lines to either upgrade or replace with new double circuit structures is of importance. In the case of the West Range GO facilities development, there are only minor constructability issues associated with Phase I and Phase II Developments.

Either route under Plan A involves sharing a short section of ROW with an existing 115kV HVTL (in the case of the Plan A Preferred Route, the Proponent's 345kV HVTL will be designed to carry MP's existing 20L 115kV HVTL; in the case of the Plan A Alternate Route, the Proponent's 345kV HVTL will carry MP's existing 62L 115kV). In both instances, the distance shared with the existing 115kV HVTL is minimal (that is, one mile or less). Plan A

Phase II only involves the installation of site and substation equipment necessary for higher voltages as the double-circuit 345kV line will convert from 230kV to 345kV operation.

Additional difficulties are encountered if MISO or the state should decide to select the Plan B Phase II Alternate Route. The Plan B Phase II Alternate Route (WRB-2A) involves replacing portions of two existing 115kV HVTL lines with new double circuit 345/115kV structures for about 18 miles. However, there appears to be sufficient redundancy in the local area 115kV system that would allow for extended outages, especially if coordinated with outages of the Clay Boswell Generating Station and large industrial loads in the area.

For the East Range GO facilities development, the three 115kV lines emanating from the Syl Laskin Generating Station that are proposed to be rebuilt as new double circuit structures are a critical component of the transmission which make up the 'North Shore Loop' system. This system provides service to the entire Arrowhead region of the East Range and Lake Superior North Shore and serves as generator outlet for the Laskin, Taconite Harbor, and Silver Bay generating stations. An outage on any of these three lines necessitates a reduction in this generation and places service to the area load at risk. Extended outages for reconstruction would likely be unacceptable to the industrial and other customers requiring electric service from such facilities. To therefore avoid disruption of service, the concept of building the first new double circuit line alongside (off-centerline) of one of the existing 115kV lines by acquiring an additional 30 feet of ROW has been incorporated into the GO facilities development plans. This would reduce the outages necessary for construction and the cut over to the new circuits. These short duration outages should be able to be coordinated with planned generating unit outages to minimize financial and other impacts. Nonetheless, constructability is a much more significant issue with the East Range GO facility development plans.

1.12.2 Natural Gas Pipeline

Depending upon the distance over which natural gas must be transported, quantities sufficient to fulfill needs for the IGCC Power Station can be supplied via one 16 inch diameter pipeline (in the case of the West Range Station) or one 16 inch diameter (in the case of the East Range Station) natural gas pipeline. It is possible that a local gas utility or municipal entity may own and construct the natural gas pipeline infrastructure, which would serve both the IGCC Power Station, the proposed Minnesota Steel facility located nearby, and/or other operations. In the instance of having to supply peak natural gas requirements for Mesaba One, Mesaba Two and Minnesota Steel a 24-inch pipeline would be required. To cover the foreseeable supply scenarios that could arise, the Proponent is providing in Section 1.12.2.1 information for 16, 20, and 24-inch natural gas pipelines.

1.12.2.1 West Range Natural Gas Pipeline Design Specifications

1.12.2.1.1 Regulatory Requirements

The U.S. DOT Safety Regulations, Title 49 C.F.R. Part 192, prescribes minimum federal safety standards for construction, operation and maintenance of natural gas pipelines. The Proponent or its pipeline operator will comply with 49 C.F.R. Part 192 in constructing, operating and maintaining any proposed pipelines serving the Project. Pipeline safety matters for such facilities are under the jurisdiction of MOPS. The natural gas pipeline design specifications required by Minn. R. 4415.0120, subp. 1 are presented below for 16, 20 and 24-inch outside diameter ("OD") natural gas pipelines.

Natural Gas Pipeline Design Specifications			
Nominal Pipe Size (Inches)	**16 OD**	**20 OD**	**24 OD**
Pipe type	**API 5L, PSL-2, ERW**		
Nominal wall thickness (inches)	0.280	0.312	0.375
Pipe Design Factor	The entire length of the pipeline is being designed to a Class 3 location design factor of 0.50.		
Longitudinal or seam joint	1.00		
Class location and requirements	The entire length of the pipeline will be considered Class 3 for design and operation purposes		
Specified minimum yield strength (pounds per square inch gauge)	60,000	65,000	65,000
Tensile strength (pounds per square inch gauge)	75,000	80,000	80,000

1.12.2.1.2 Operating Pressure

The normal and maximum allowable operating pressures for the pipeline are provided below.

Nominal Pipe Size (Inches)	16 OD	20 OD	24 OD
Normal Operating Pressure (pounds per square inch gauge)	The normal operating pressure will depend on the status of the GLG lines and the usage requirements of the IGCC Power Station.		
Maximum allowable operating pressure (pounds per square inch gauge)	1050	1014	1016

1.12.2.1.3 Associated Facilities

Launcher and receiver facilities will be located at each end of the pipeline to allow for cleaning and internal inspection of the pipeline using intelligent pig technology. The only other associated facilities on the ROW beside markers required by the DOT will be cathodic protection facilities. These will consist of a rectifier and ground bed whose location will be determined by actual measurement of pipe to soil potentials along the route after the pipeline is installed.

1.12.2.1.4 Product Description and Capacity Information

The only product carried in the pipeline will be sweet processed natural gas that is in compliance with the tariff filed by GLG. MSDS for natural gas and odorant additive are attached to the Joint Application as Appendix 4.

The planned minimum and maximum design capacities of the pipeline are as follows:

- Planned minimum design capacity – 0 million cubic feet of natural gas per day (0 Mcfd)
- Maximum design capacity – 210 million cubic feet of natural gas per day (105 Mcfd per Phase)

1.12.2.1.5 Land Requirements

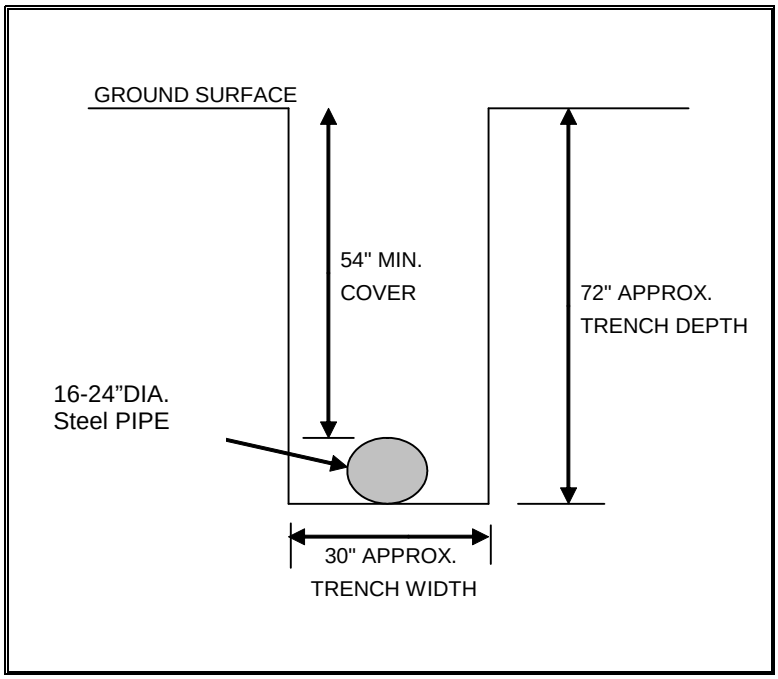
The Proponent or other owner will negotiate with landowners for easements to install the pipeline on each individual tract that the route would cross. Generally, the easement terms would allow the operator the perpetual right to construct, maintain, operate, repair, replace, abandon, and/or remove the pipeline and related appurtenances. It would allow the grantee necessary ingress and egress to accomplish those purposes. The grantor would agree to not build any building in the easement or remove any cover from over the pipeline without the consent of the grantee. Compensation would be determined based on the value of the land at the time the easement is acquired. Landowners will be compensated for any crop damages or other merchantable item losses incurred due to construction activity.

Estimates of land use requirements are provided as follows:

- Permanent ROW length, average width, and estimated acreage:
- The total ROW length is approximately 13.2 miles. The permanent ROW width will be 70 feet. Estimated acreage within the permanent ROW is 112 acres.
- Temporary ROW (workspace) length, estimated width, and estimated acreage:
- An additional 30 feet of temporary workspace will be acquired along the pipeline route. Estimated additional acreage within the temporary ROW is 48 acres. It is anticipated that this space may not be fully utilized but would give construction crews approximately 100 feet of ROW for workspace if needed. Localized conditions such as roads, railroads and water body crossings may require additional temporary workspace to complete the installation. When deemed necessary, permission to use temporary workspace will be obtained from landowners adjacent to the permanent ROW.
- Estimated range of minimum trench or ditch dimensions including bottom width, top width, depth, and volume of excavation:
    a. Estimated trench bottom width - 30 inches
    b. Estimated trench depth - 72 inches
    c. Estimated trench top width - 30 inches
    d. Estimated excavation – 40,000 cubic yards
- Minimum depth of cover for state and federal requirements: 54 inches

A typical cross-section for the open trench section of the proposed gas pipeline is shown in Figure 1.12-51.

Figure 1.12-51
Typical Section-Gas Pipeline Open Trench Installation



- ROWs sharing or paralleling: type of facility in the ROW, and the estimated length, width, and acreage of the ROW:

The proposed pipeline route easements will parallel existing electric transmission ROW for 1.3 miles, existing gas pipeline ROW for 0.9 miles, and proposed electric transmission ROW for 4.2 miles (see Figures 1.5-35 through 1.5-38).

1.12.2.2 East Range Natural Gas Pipeline Design Specifications

The East Range Natural Gas Pipeline would be sized at approximately 16 inches. Therefore the design specification would mirror those for the West Range IGCC Power Station.

1.12.3 Transportation

Transportation-related elements associated with development and operation of the IGCC Power Station are primarily dependent upon the specific conditions at each Project Site. Project elements associated with rail and highway transportation are discussed in this section.

1.12.3.1 Rail

The Project would require coal and other materials to be delivered to the Project Sites by train. The BNSF and CN Railways are the two predominant rail providers in the region serving the West and East Range sites. A map of the rail trackage owned and operated by these two entities in the Project vicinity is provided in Figure 1.12-52.

An important element in the Proponent's site selection process considered whether a site was or could be served by more than one rail provider via their own trackage. Having such capability

would provide consumers with more competition and flexibility in the fuel supply equation, and should result in lower fuel costs over the life of the project.

1.12.3.1.1 Site Independent Project Elements

Coal is the most significant commodity that will be delivered to the Project Sites. Delivery of coal under peak operation and unloading conditions is discussed in Sections 1.7.1.1 and 1.7.1.2, respectively. Table 1.12-8 presents the variation that could be expected in coal deliveries under the best and worst case conditions as a function of the feedstock consumed.

Table 1.12-8
Projected Coal Deliveries to the West Range Project Site

COAL CONSUMED	PEAK USE (TPD)	UNIT TRAIN DELIVERIES (RND TRIPS/WEEK)[1]	
		WORST CASE	BEST CASE[2]
Sub-Bituminous (Powder River Basin)	8,550	4-5	3-4
Bituminous (Ill. No. 6)	6,120	3-4	2-3
Sub-Bituminous/Pet. Coke Blend (50:50)	6,450	3-4	2-3

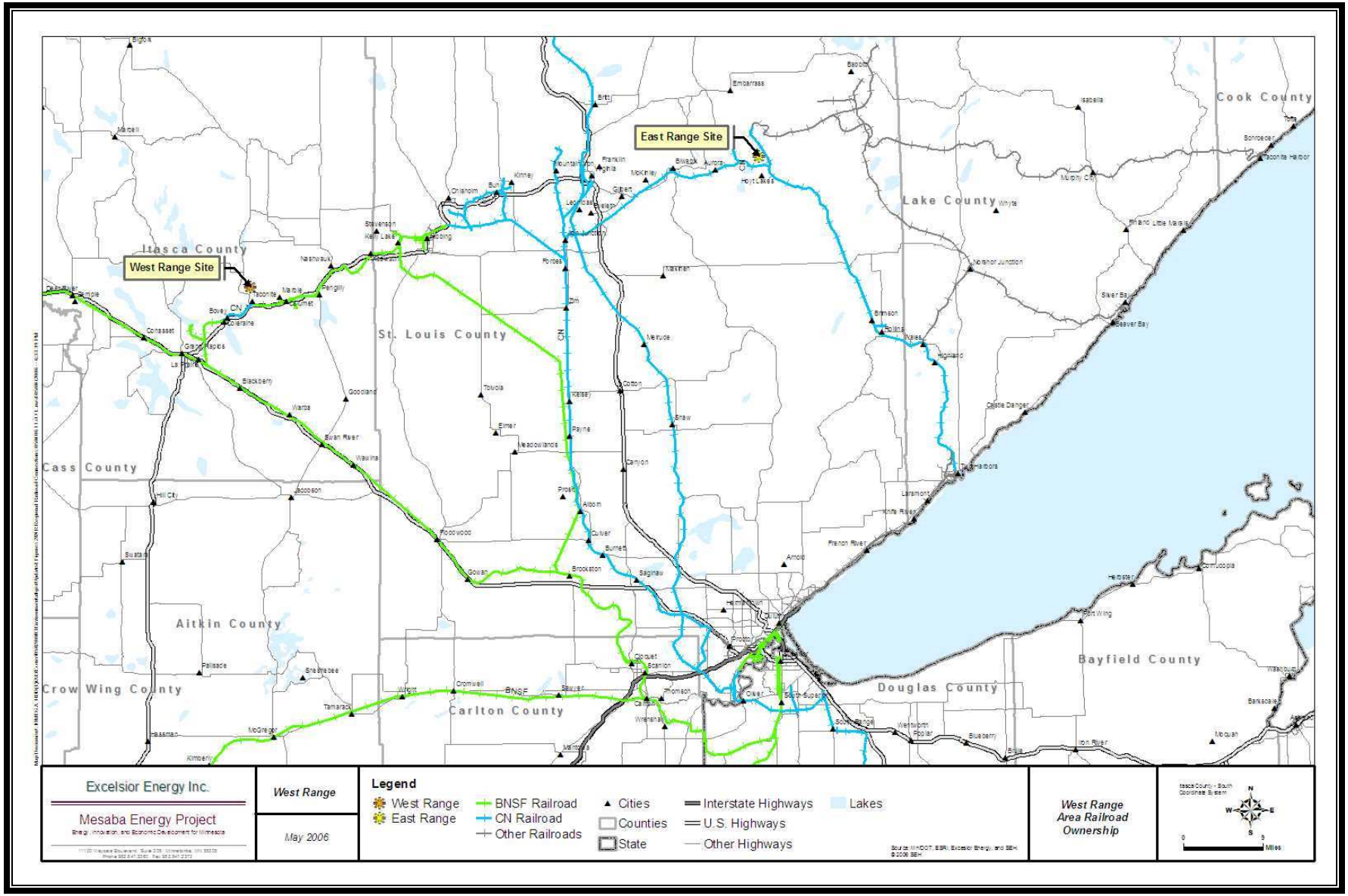
1. Phase I IGCC Power Station deliveries; number of deliveries for Phase I and II Power Station would double.
2. Best case conditions represented by 135 car unit train with 119 tons per car or about 16,070 tons per unit train.

Rail cars arriving via unit trains will be unloaded using a state-of-the-art rapid discharge rotary dumper with an automatic railcar positioner. The rail loop and positioner allow a full-length 8,000-foot long coal train (a 135 car unit train) to be pulled through the site without uncoupling any of the cars. Each rail car would be rotated upside down inside the rotary dumper building to unload the coal contained therein. The dumper building would be enclosed and maintained under negative pressure during the unloading process to minimize fugitive emissions. Design of the dumper building's dust control system is further described in Section 1.8.1.1.5

Each unit train would take approximately 3 to 4 hours to unload. The impact of peak unit train rail deliveries on local traffic is discussed in Sections 1.12.3.1.2B and 1.12.3.1.2C.

Other incoming materials using train delivery could include petroleum coke, slag, flux, and construction materials and equipment. Construction deliveries would likely total two trains per week. Outgoing trained material would likely include elemental sulfur, the source of which would be hydrogen sulfide in syngas produced by the gasifier. Depending upon the fuel being used, the Phase I IGCC Power Station would produce between 500 and 800 tons per day of slag, a black, non-hazardous, glass-like material that may have industrial uses. Also, depending upon the fuel being used, the Station would produce between 30-160 tons per day of elemental sulfur that may be sold and/or transported off site.

Figure 1.12-52. BNSF and CN Rail Trackage Operated in the Project Vicinity



There are three major design criteria essential for a unit coal train unloading facility. The first is the length of track. A 135 car unit coal train, about 8,000 feet in length, must be completely clear of the mainline track during the unloading operation. The second major design consideration involves the maximum degree of curve. A rail track curve greater than six degrees will have higher levels of track maintenance and may cause problems for the computer guided unloading system. Third is the issue of track profile grade. During the unloading operation, the computer-guided system will control the movement of the train. To facilitate the use of such computer-guided systems, it is important that the track be level as 135 car unit trains will weigh some 20,000 tons. Track grades in non-unloading areas also need to be restricted to the ruling grades on the mainline tracks.

A Railroad Design Guideline based on BNSF and CN unit train standards was developed to formalize site selection criteria and identify major considerations in site layout. The minimum acceptable curvatures, grades and turnout size specified in the Guideline are presented in Table 1.12-9. A typical track section consistent with the Design Guideline is illustrated in Figure 1.12-53.

Finally, connecting the BNSF and/or CN with the IGCC Power Station on the West or East Range Project Sites requires approvals from each of those companies, but does not require other public approvals.

Table 1.12-9
Railroad Design Criteria for Phase I: West and East Range Sites

ATTRIBUTE	PREFERRED CRITERIA	MAXIMUM CRITERIA
Train size, cars per unit train	115	135
Coal per car, tons	119	
Train length, feet	6,600	7,700
Maximum grade approach track	0.3 %	0.4 %
Maximum grade on unloading track	0.00%	0.1%
Maximum grade for on coal train tracks	0.5 %	1.0%
Maximum curvature, empty coal train	5° (1,146ft. radius)	6° (955 ft. radius)
Maximum curvature, loaded coal train	2° (2,865 ft. radius)	3° (1,910 ft. radius)
Maximum curvature, plant tracks	7.5º (764 ft. radius)	9.5º (603 ft. radius)
Public grade crossings	None allowed in unloading areas	

1.12.3.1.2 West Range Site

1.12.3.1.2A General

The West Range IGCC Power Station is located approximately 1.5 miles north of the mainline tracks of the BNSF and CN (see Figure 1.12-54).

Historically, the BNSF and CN railroads had their own mainline tracks throughout the area around Grand Rapids, Minnesota. In the 1960s, the BNSF and CN railroads combined their

regional operations to a single track. The BNSF currently owns most of the 80 mile track from Gunn (an unincorporated "railroad town" located immediately east of La Prairie, Minnesota) to Brookston (near Carlton, MN), except for a 4 to 4.5-mile portion of track beginning about 0.5 mile east of CR 7 and west to Bovey. A detail of the eastern boundary of CN's ownership point is provided in Figure 1.12-54. Since railroads are restricted from originating or delivering traffic from another railroad's line, even though many share each other's tracks, this short section of rail track owned by CN allows it direct access to the West Range IGCC Power Station (the mechanism allowing such access is discussed in the section below titled "CN Rail Deliveries"). BNSF deliveries of coal to the West Range IGCC Power Station can only originate east of the ownership boundary shown in Figure 1.12-55.

1.12.3.1.2B BNSF Rail Operations in the Project Vicinity

The shortest route for delivering coal from the Powder River Basin to the West Range IGCC Power Station is via the BNSF trackage across North Dakota. The preferred route would pass through Fargo, ND, north to Grand Forks, ND and across Minnesota through Grand Rapids to Gunn and then to Taconite. About six trains per day currently travel on the BNSF line through Grand Rapids at speeds up to 25 mile per hour. Traveling at 25 miles per hour, a unit coal train would take approximately three to four minutes to clear each grade crossing. Nine grade crossings (a location where a public highway, road, street, or private roadway, including associated sidewalks and pathways, crosses one or more railroad tracks at grade) are located within the city limits of Grand Rapids and La Prairie.

The track from Gunn to the West Range IGCC Power Station (about 12.5 miles in length) also operates at speeds of 25 miles per hour and has traditionally carried 4 to 10 trains per day. This track segment has another six public grade crossings.

An alternative route to the West Range IGCC Power Station via BNSF trackage would be from Brookston northward to Kelly Lake and Keewatin and westward to the plant site. This alternative route is illustrated in Figure 1.12-56. This route would have a speed limit of 25 miles per hour and would primarily be used for non-coal train operations. Use of this route by unit coal trains would add over 100 miles to the trip in each direction and would require the trains to ascend a significant grade north of Brookston. Unit coal trains would only use this route if there were a major track problem east of Gunn. If this were the case, BNSF trains would access the West Range IGCC Power Station using the east "Y" trackage. Although the 5º curvature of the east "Y" track is outside the design criteria for unit coal trains presented in Table 1.12-9, the trackage could support occasional unit train deliveries of coal.

1.12.3.1.2C CN Rail Deliveries

The CN delivery of coal would be from the Superior, WI area northward to Virginia and then west past Hibbing and Keewatin to Taconite/Bovey. The CN trackage within this route is shown in Figure 1.12-57. CN unit coal trains would be required to undertake the following steps to access the Optioned Property:

1. Approach the West Range IGCC Power Station from the east,
2. Travel past the site, and either
3. Back into the site, or

4. Stop in Bovey, have the locomotives disconnect from in front of the train, reconnect to the other end of the train, and access the Site from the west.

A reverse move would be required for the empty train. To accommodate such maneuvers, unit coal trains supplied by CN would use an existing siding in Bovey that would need to be lengthened. Other CN deliveries to the plant would occur via the same type of movement, but with much shorter trains. Neither CN unit train movements nor non-coal movements required to access the West Range IGCC Power Station in the manner described would block any public grade crossings near the site.

Figure 1.12-53. Typical Cross Section of Rail Track Meeting Design Guideline

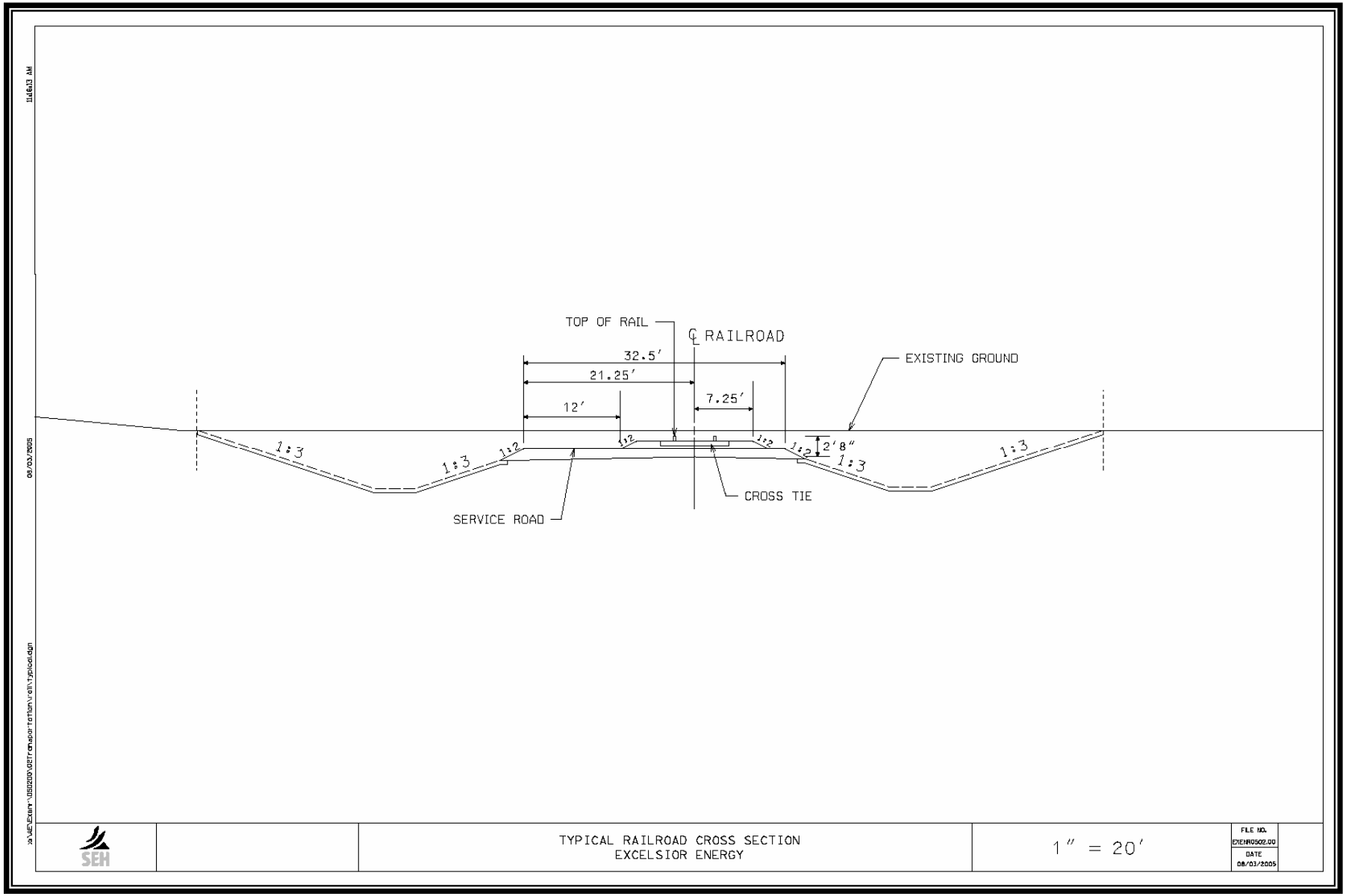


Figure 1.12-54 Regional Railroad Tracks Highlighting CN Track in the Vicinity of the West Range Site

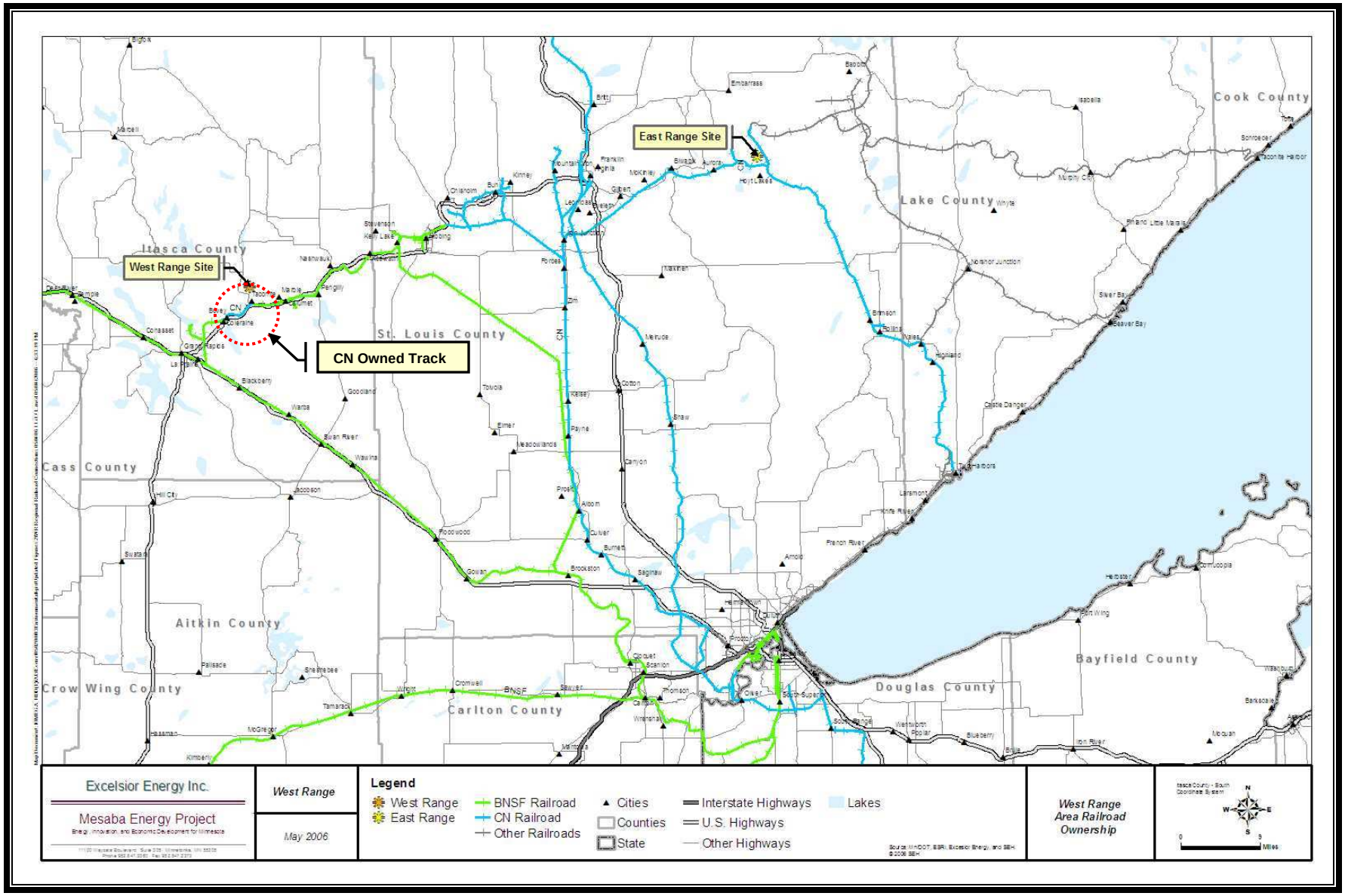


Figure 1.12-55 BNSF and CN Ownership Boundary Near the West Range IGCC Power Station

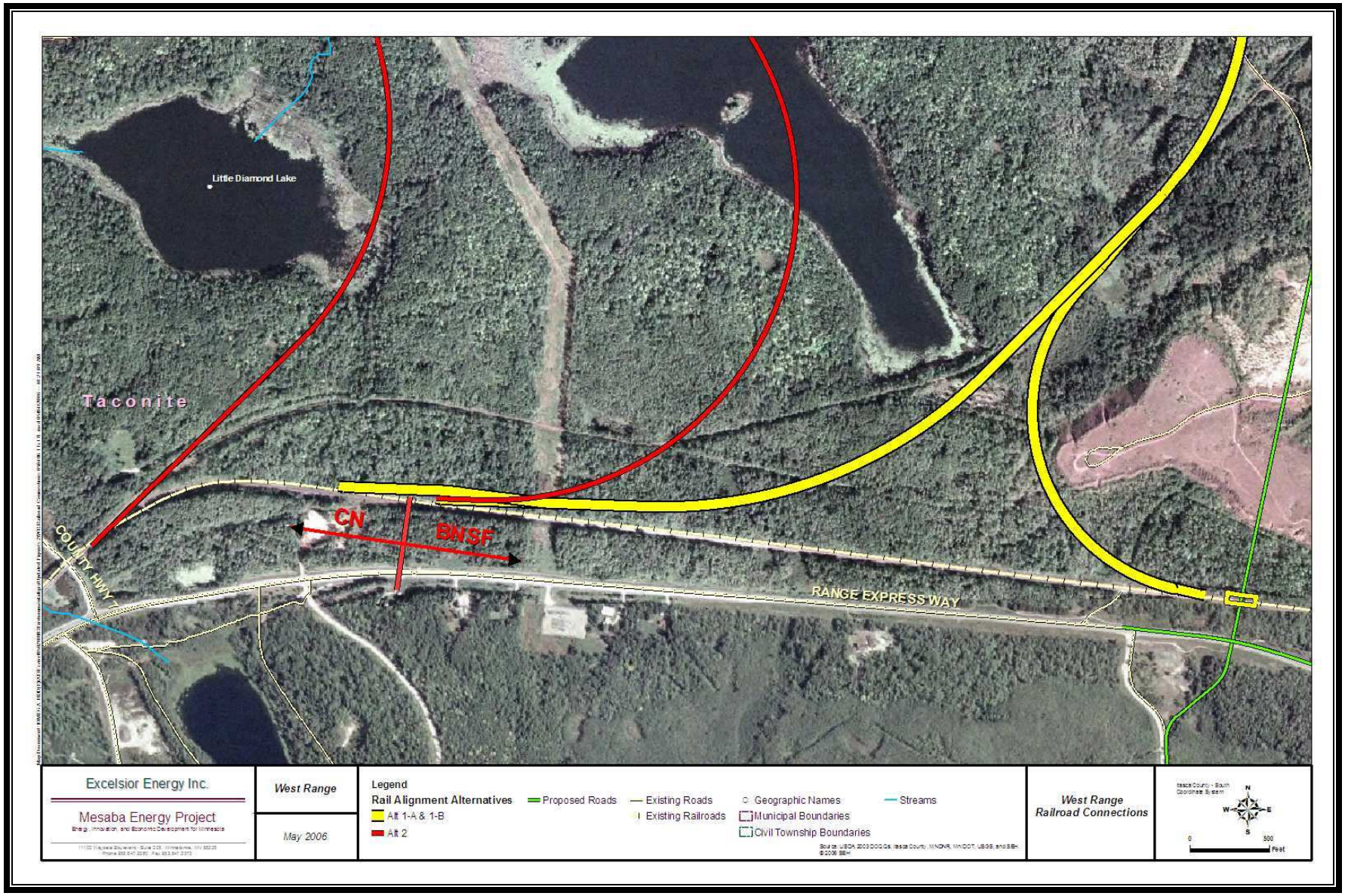


Figure 1.12-56 Alternative Routes for the BNSF To Serve the West Range IGCC Power Station

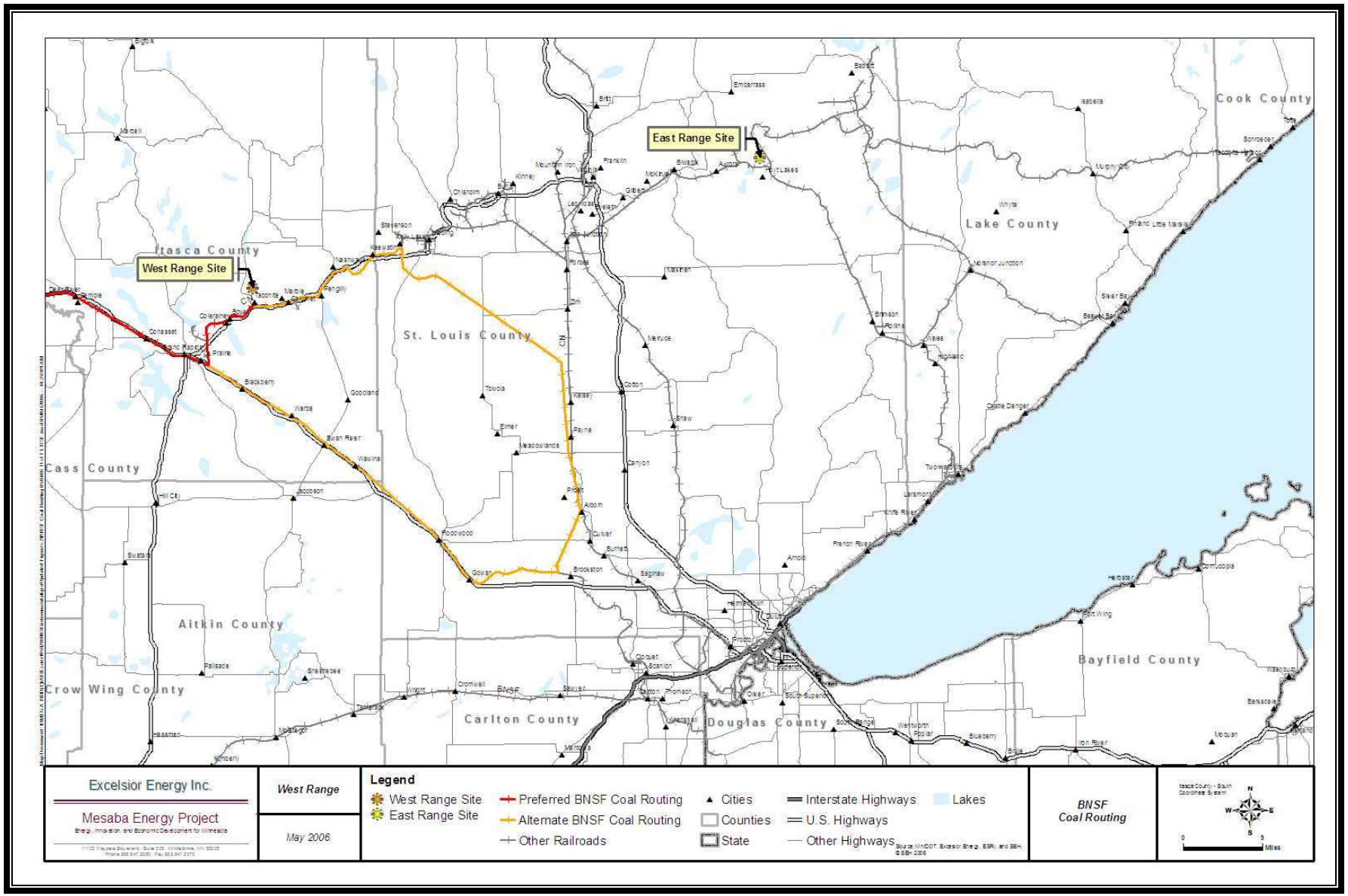
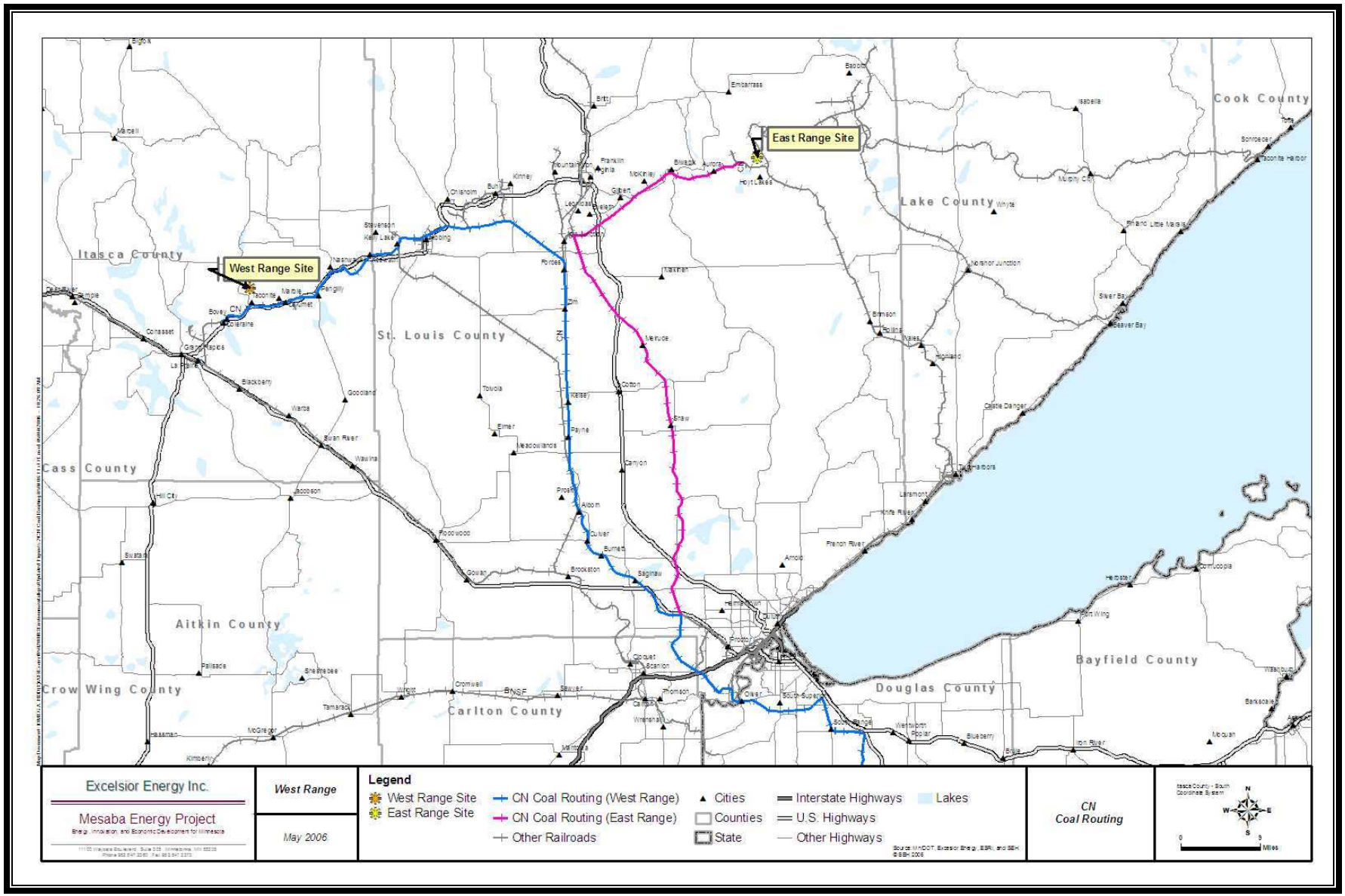


Figure 1.12-57. Alternative Routes for the CN To Serve the West Range or East Range Sites



The short length of CN track in the vicinity of the West Range Site is temporarily out of service because of rising water levels in the CMP. Since the cessation of mining, the CMP has continued to fill with water and as of May 2005, the sloughing of bank material separating the current CN track through Bovey from the steep edge of the mine pit has decreased in distance from 100 feet to 50 feet (a useful discussion about the rising water levels and their effect on rail traffic can be found at the following link: http://www.mepartnership.org/mep_whatsnew.asp?new_id=756). The Mesaba Energy Project would greatly rectify this circumstance by lowering water levels in the CMP, thereby enhancing the ability to make use of the CN track (CN has determined that repairs to this line were not appropriate in the absence of a long term solution to keep water levels from rising). At the request of the BNSF or another local shipper, the track would be required to be placed back in service under current common carrier regulations of the Surface Transportation Board (an agency of the U.S. Department of Transportation that regulates railroad service and provides a forum for rate and service disputes).

1.12.3.1.2D Alternatives: Introduction

The major issues involved with providing railroad access into the West Range IGCC Power Station include the following: site elevation/topography relative to that of the existing trackage; avoiding undue impacts to Big Diamond and Dunning Lakes; avoiding mine dumps (locations where soils and rock overlying natural resources that have been mined have been permanently placed, such historical placement often not subject to rules governing reclamation) and pits; and rail connection and operational issues. In considering these elements, three rail alignments were identified and evaluated. These alternatives were initially deemed to be viable and all appeared to have a reasonable chance to meet prescribed engineering criteria. However, during subsequent detailed review, Alternative 2 proved to be compromised from both engineering and environmental perspectives and was dropped from further consideration. The detailed review process is discussed in the section below titled “Alternative 2.”

1.12.3.1.2D(1)(a) Alternative 1

Figure 1.12-58 illustrates the IGCC Power Station Footprint relative to the location of the existing rail lines and identifies the additional trackage needed to access the Power Station under Alternative 1. This alternative includes a rail corridor that would allow access to the Station from the west by both BNSF and CN unit trains. The eastern approach would normally be used by the BNSF for delivering materials other than coal. Unit coal trains would only use the eastern approach in the situation where a western approach was unavailable.

Two miles of new track would be constructed between the existing mainline track and southern boundary of the West Range IGCC Power Station Footprint and Buffer Land; an additional four miles of new track would be constructed from the south boundary to access the Power Station and form a portion of the rail loop lying within the property boundaries.

Two different alignments were evaluated as part of Alternative 1. As shown on Figure 1.12-58, the alignment for Alternative 1-A bifurcates from the existing CN and BNSF main lines that run parallel to Highway 169 and then turns to the northwest between Big Diamond Lake and Dunning Lake. The alignment for Alternative 1-B, also shown in Figure 1.12-58, would split from the CN and BNSF rail lines in the same location, but instead of diverting northwest between Big Diamond and Dunning Lakes would continue running north on the east side of Dunning Lake and, once north of the lake, would run west to the proposed site. Both

Alternatives 1-A and 1-B would include a loop to the north of the proposed facility and in both instances the coal trains would exit via the same route of entry.

The alignments for Alternatives 1-A and 1-B meet the general design criteria provided in Table 1.12-9 and can accommodate access by two rail service providers. Acceptable curve radiuses require that the track alignment be directed east of Big Diamond Lake. The new alignment south of Big Diamond Lake generally follows an old railroad grade around the southern tip of the lake. In order to avoid a large mine dump, Alternative 1-A turns to the northwest to follow a new corridor between Big Diamond Lake and Dunning Lake. To provide an acceptable grade for the Alternative 1-A, track will require filling low areas located between the two lakes and cutting from terrain obstacles into the plant site. The rail loop for Alternative 1-A will be mostly on a fill section.

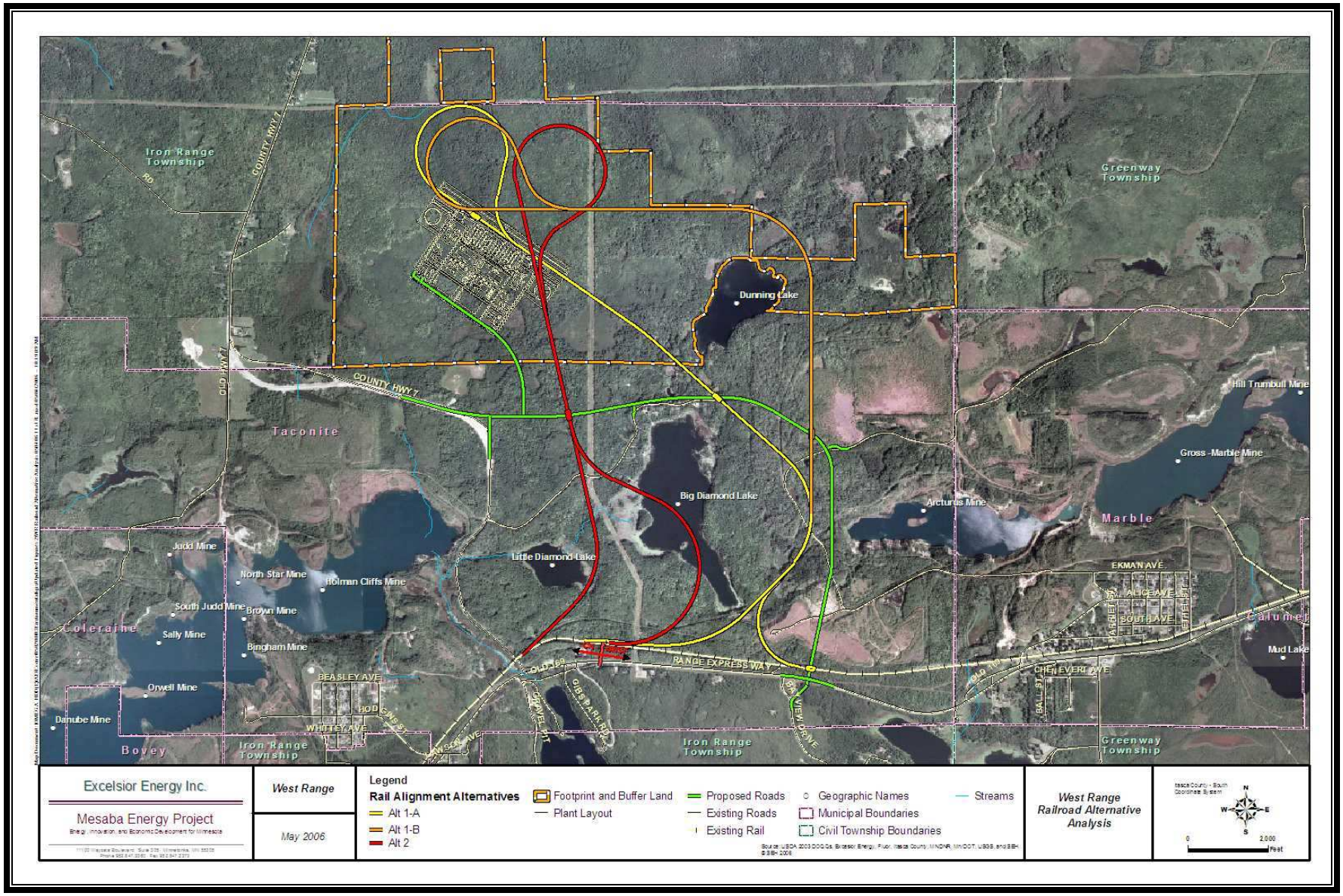
Alternative 1-B follows the same alignment as 1-A for the first 6,000 feet but then heads due north and to the east of Dunning Lake. At a point north of Dunning Lake, Alternative 1-B curves 90º to the west and follows a straight line to the Station Footprint. To provide an acceptable grade for the Alternative 1-B, track would require cutting through a large mine dump east of Big Diamond Lake, and through a large wetland area on the north east corner of Dunning Lake and significant additional contouring on-route to the rail loop. The rail loop would be mostly on a fill section.

Alternative 1-A will be situated within 400 feet of a four season residence located north of the track near Dunning Lake. Alternative 1-B is about 1,200 feet from this residence. The closest residence on Big Diamond Lake is about 700 feet from the proposed track. Section 3.10.4 addresses noise and vibration impacts in the vicinity of the West Range IGCC Power Station and on these properties in particular.

Both Alternatives 1-A and 1-B would meet acceptable alignment, grade, and rail operations criteria. The length of rail line required for construction of these alternatives would total approximately six and seven miles, respectively. A rail bridge over the new access roadway to the West Range IGCC Power Station would be constructed to avoid crossings that could cause major traffic interruptions close to the IGCC Power Station. Existing roadways that would be affected by the rail spur into the site are forest roads that can be re-routed without causing major traffic disruptions. The traffic impacts associated with such changes are discussed in Section 3.12.

The alignment for Alternative 1-B would result in greater impacts to wetland areas, would place the rail dumper building in the wrong part of the site (requiring coal to be conveyed across a significant distance to the IGCC Power Station), and would require significant earth removal work (as the route would cut across several large mine dumps and existing terrain features). The only practical benefit this alignment offers over Alternative 1-A is that it would divert rail traffic away from the several residential properties located on Big Diamond and Dunning Lakes. Alternative 1-A would require easements over or acquisition of some private property. Wetland impacts for each alternative and mitigation requirements are discussed in detail in Section 3.6. The affected environment and impacts to environmental, socioeconomic, and other related criteria are described further in Section 2 and Section 3. Table 1.12-10 presents a summary of these impacts for the two alternatives.

Figure 1.12-58. Alternative Rail Layouts Evaluated for the West Range IGCC Power Station



The two alternatives were judged to be about the same with regard to plant layout and roadway impacts. The plant orientation would be slightly different for Alternative 1-B. Both alternatives would have a surplus of cut/fill material that would need to be disposed of near the plant site. Alternative 1-A is deemed to be superior to Alternative 1-B for the following reasons:

1. Less impact to wetlands
2. Avoids an area of high probability of historic artifacts near Dunning Lake
3. Better alignment of the curves
4. Lower cost

Table 1.12-10
Railroad Alternatives Analysis

	Alternative 1A	**Alternative 1B**	**Alternative 2**
Total length of track (miles)	6.0	6.9	4.5
Off site length of track	15,900	19,000	9,000
Train speed (mph)	10	10	10
Maximum grade	0.30 %	0.35%	0.40%
Maximum Curvature (loaded coal train)	2 degrees 30 minutes	3 degrees	3 degrees
Off site ROW (acre)	35	43	20
Largest cut (ft)	65	120	*
Largest fill (ft)	25	25	*
Approximate cut Qty (cu.yd.)	3,000,000	8,500,000	*
Approximate fill Qty (cu.yd.)	2,000,000	2,000,000	*
No of residences within 1000 feet	3	0	0
Closest residence (FT)	400	2,000	1,200
Acceptable alignment	Yes	Yes	No
Comments	Preferred		Discarded

*Was not computed because alignment was discarded.

1.12.3.1.2D(1)(b) West Range Rail Line Alternative 2

The Proponent evaluated the possibility of accessing the West Range IGCC Power Station via a rail corridor that would split from the existing CN rail line at a point due south of Little Diamond Lake as shown on Figure 1.12-58 and run north between Little and Big Diamond Lakes. This alternative would include a loop to the northeast of the Station Footprint as in Alternative 1 and allow CN unit coal trains to exit the Optioned Property via their same route of entry. There would be a slight impact to Little Diamond Lake on the southeast corner.

The BNSF would not be able to originate a shipment using the CN trackage that would be constructed as part of this alternative rail supply option. Instead, BNSF shipments would be required to originate from a point west of the proposed CN rail spur and southwest of Big Diamond Lake. This origination point would require a sizable portion of Big Diamond Lake to be filled to maintain acceptable curvatures as per the Railroad Design Guideline. Figure 1.12-58 shows that the amount of filling required to allow BNSF to access this route from the west would be prohibitive.

The BNSF access from the east would require coal trains to be routed an additional 100 miles through Carlton. The disadvantages to this routing have been discussed earlier in Section 1.12.3.1.2B. Additional track work, including a railroad diamond for the Minnesota Steel project, would also be required (a railroad diamond is where two tracks cross each other at the same elevation; such diamonds are difficult to maintain and are to be avoided if possible).

An additional alternative provided the CN access from the west side of Big Diamond Lake and the BNSF access from the east side of the Lake. This too was discarded because of duplication of tracks, direction difficulties relative to the position of the coal dumper, impacts to a much larger area around Big Diamond Lake, and the same impact to residents as Alternative 1-B.

Alternate 2 is not acceptable from railroad engineering, environmental impact, and cost perspectives, and has been eliminated from further consideration.

1.12.3.1.3 East Range Rail Line Alternatives

1.12.3.1.3A Alternatives: Introduction

The East Range Site does not provide for the option of immediate competition between rail providers. The nearest competitive railroad is the BNSF Railway near Hibbing, 40 miles from the East Range IGCC Power Station Footprint. Realistically, the CN will be the only feasible near-term rail service provider into the East Range IGCC Power Station. Longer term, it may be possible to utilize the port at Taconite Harbor and CE's privately owned railroad to provide feedstock to the East Range IGCC Power Station, but for now, this option is considered unlikely.

The East Range IGCC Power Station is located approximately one mile north and one mile west of two CN tracks. The east-west track runs from Eveleth to Two Harbors. The north-south track connects with the east-west track southeast of the site and extends north to Embarrass. The north-south track connects with the east-west track at Wyman Junction (about 1.7 miles southeast of the East Range IGCC Power Station Footprint) and extends northward to Embarrass. Coal would be delivered by other railroads to the CN at either Superior, Wisconsin or to a railroad yard south of Eveleth, Minnesota. The CN would deliver coal to the site from Eveleth as shown in Figure 1.12-57. Empty unit trains would return by the same route. The layout of the proposed rail alignments are presented in _____ 1.5-2 and 1.5-10.

The CN operates daily on the track servicing Laskin, the former LTV Taconite Plant, and several proposed and existing industrial customers.

Existing roadways that would be affected by the rail spur into the Site are forest roads that can be re-routed without causing major traffic disruptions. The traffic impacts associated with such changes are discussed in Section 3.12

The East Range IGCC Power Station Footprint and Buffer Land is divided between upland and wetland areas. Most of the southern area is wetland. The railroad loop will impact this wetland area and the most significant rail routing issue of the site is to maintain the rail elevation high enough to minimize wetland impacts, but low enough to have acceptable grades. The wetland elevation is about 1,470-1,475 ft msl.

The Railroad Design Guideline presented in Table 1.12-9 was used to identify and avoid major flaws in the East Range IGCC Power Station rail alignments. A typical track cross section consistent with the Design Guideline is illustrated in Figure 1.12-53.

1.12.3.1.3A(1)(a) East Range Rail Line Alternative 1

Alternative 1 is a traditional coal loop that will handle a complete coal train and allow return in the same direction. The track would start near MP's Laskin spur and travel east northeast to the IGCC Power Station Footprint. The track would be about 17,800 feet long plus additional plant track for miscellaneous chemicals and products. The track will begin at about elevation 1,455 feet and the coal loop will be at set at about 1,465-1,470 feet.

No residential dwellings are located near the proposed track but some wetland mitigation would be required. The track is near the base of a waste rock dump that may require special treatment to avoid sloughing onto the rail track.

1.12.3.1.3A(1)(b) East Range Rail Alternative 2

Alternative 2 is an alignment that would handle a complete coal train, but would cross the site (rather than looping within it) and connect with the CN north-south track just north of Wyman Junction. This track would be about 18,500 feet long and have the coal dumper centered in the middle. The train would leave the track at an elevation of 1,455 feet, climb to a dumper elevation of about 1,465-1,470 feet and continue to climb to the about 1,485 feet at the north-south CN track. To maintain a workable grade, this track would have to cross under CR 666, requiring construction of a roadway bridge.

1.12.3.1.3A(1)(c) Comparison of Alternatives

The primary advantage of Alternative 2 is that less environmental impact will occur to wetlands within the proposed East Range Property Boundary. The primary disadvantages are i) there are limited locations at which to construct the rotary coal dumper; ii) the track elevation on the east end is 35 feet higher in elevation than the west end (making the profile grades difficult); and iii) the total coal train aesthetic impacts are spread over a larger area (the trains will be more visible from CR 666, noise impacts will be more discernable, and dusting from the rail cars would increase because the cars would be more exposed to the wind).

Similar to Alternative 1, the track is not located near any residential buildings, requires some wetland mitigation, and is impacted by its proximity to the nearby waste rock dump.

Table 1.12-11 provides a quantitative comparison between the two rail alignments.

Table 1.12-11
East Range Railroad Alternatives Analysis

	Alternative 1	**Alternative 2**
Total length of track (miles)	3.4	3.5
Off site length of track (miles)	1.25	2.1
Train speed (mph)	10	10
Maximum grade	0.40 %	0.40%
Maximum Curvature (loaded coal train)	2 degree 30 minutes	3 degrees
Off site ROW (acre)	15	26
Largest cut (ft)	50	50

	Alternative 1	Alternative 2
Largest fill (ft)	20	20
Approximate cut Qty (cu.yd.)	2,300,000	2,100,000
Approximate fill Qty (cu.yd.)	60,000	60,000
No of residences within 1000 feet	0	0
Closest residence (ft)	Over 500 feet	Over 500 feet
Acceptable alignment?	Yes	Yes

1.12.3.1.4 Construction

Construction of the new railroad trackage will require additional off site ROW to be obtained. The proposed ROW will be 100 feet wide with additional width needed in some of the cuts or fill sections. A typical track cross section based on the Railroad Design Guidelines summarized in Table 1.12-11 was developed and presented in Figure 1.12-53.

The track work would begin immediately after construction approval has been received. The track and grading would take approximately 6 to 9 months to construct.

Railroads are constructed similar to roadways. The track will be constructed on a 100-foot wide ROW with a 32 foot wide prepared roadbed on which the track will be constructed. There may be areas where permanent or temporary easements may be needed to accommodate the larger fill or cut sections. The side slopes will be 1:3 with a 5-foot wide flat bottom ditch for drainage. The prepared roadway will have the track offset to one side of centerline to allow for a 12 foot wide railroad inspection road alongside.

The coal unloading process requires the track elevation to be level. Thus, the approach grades will be limited to 0.3 per cent. The grading and track work will be built using best practices and conform to the American Railway Engineering and Maintenance of Way Association ("AREMA") standards.

The track alignment and construction limits will be established by a field survey. The ROW will be cleared following accepted industry practices and sound construction guidelines. In areas where timbering is required, the trees would be cut in uniform length and stacked along the ROW for recycling. Debris created from preparation of the ROW would be disposed of using approved methods.

The low areas will be filled and hills will be removed to provide a smooth grade. Drainage structures and bridges will be built. These activities will be done with large earth moving equipment normally used for road building. The embankments will be compacted and 12 inches of finely graded compacted granular material (sub-ballast) will be placed on the top. Vegetation will be reestablished on the slopes and other impacted areas. Detailed discussion regarding wetland impacts and treatment are in Section 2.7 and Section 3.6.

After the sub-ballast is placed, specialized construction equipment will be used to construct the track. The track will consist of railroad ballast (rock), steel rails, timber crossties and other miscellaneous materials. A stockpile area for the track material will be located on the plant site. The material will be distributed by truck to the final location and the rails will be carefully spiked to the proper gage on the crossties. Railroad ballast will be dumped using construction equipment mounted on the rails. A specialized piece of construction equipment, called a tamper, will be used to raise the track through the ballast, and the ballast will be compacted under the

crossties. The track surface will be smoothed to a tolerance of 1/16 of an inch. The ballast will then be shaped to form a uniform ballast section.

1.12.3.2 Roadway Infrastructure

1.12.3.2.1 West Range Site

The West Range IGCC Power Station is located about 1.5 miles north of State Highway 169 (a four-lane east-west highway), about 0.4 miles to the east of Itasca CR 7, a two-lane highway running mostly in a north-south direction and about 0.25 miles north of an east-west stretch of CR 7. Other road corridors in the project area include the Cross-Range Heavy Haul Road, a gravel road which has been in place for generations as a way to allow heavy or slow loads to be transported between mines across the Iron Range. In the project area, the Cross-Range Heavy Haul Road also serves as access to a cluster of homes in the Big Diamond Lake/Dunning Lake area. The existing roadway system in the vicinity of the West Range Site is shown on Figure 1.12-59.

1.12.3.2.1A Access Road 1

In discussing access to the IGCC Power Station with Itasca County, the County Engineer indicated the County's interest in re-routing the alignment of CR 7 to better serve local traffic patterns and the additional traffic related to the two large projects in the process of undergoing environmental review (the Proponent's Mesaba One and Two and the Minnesota Steel Industries, LLC project designed to produce sheet steel from taconite ore). This realignment of CR 7 would serve as the primary access road (hereafter "Access Road 1") to the IGCC Power Station, and would better handle heavy equipment and increased traffic volumes resulting from construction activities tied to the two projects. The realignment would involve constructing a new two-lane roadway, beginning at a new access point on State Highway 169, approximately 7,000 feet east of CR 7. The new road would cross underneath the adjacent rail line, proceed due north, then curve west between Big Diamond and Dunning Lakes before terminating in its connection with CR 7, just southwest of the Station Footprint.

Itasca County would construct and own the realigned roadway. Further, the County would seek to move the CR 7 designation to the new roadway and include it as part of the County's State Aid system. This would put all future maintenance of the road under the County's responsibility. The section of existing CR 7 between the plant and State Highway 169 would remain in place as either a lower level County Road, or turned back to the City of Taconite as a City street. The benefits to moving the designation would be to provide a better access point to U.S. Highway 169. The current intersection of CR 7 and State Highway 169 has poor visibility, relatively steep grades, and problems with slope stability.

Access Road 1 would be designed to meet Minnesota State Aid standards (the standards used by Minnesota cities and counties for the construction of roadways eligible for State funding). All alignments, horizontal curves, and clear zones would be designed for 55 miles per hour. A typical roadway cross section is shown in Figure 1.12-60. The impacts associated with the County's construction of Access Road 1 have been fully studied and are included in Sections 2 and 3 of this ES analysis.

Figure 1.12-59 Existing Highway System in the Vicinity of the West Range Site

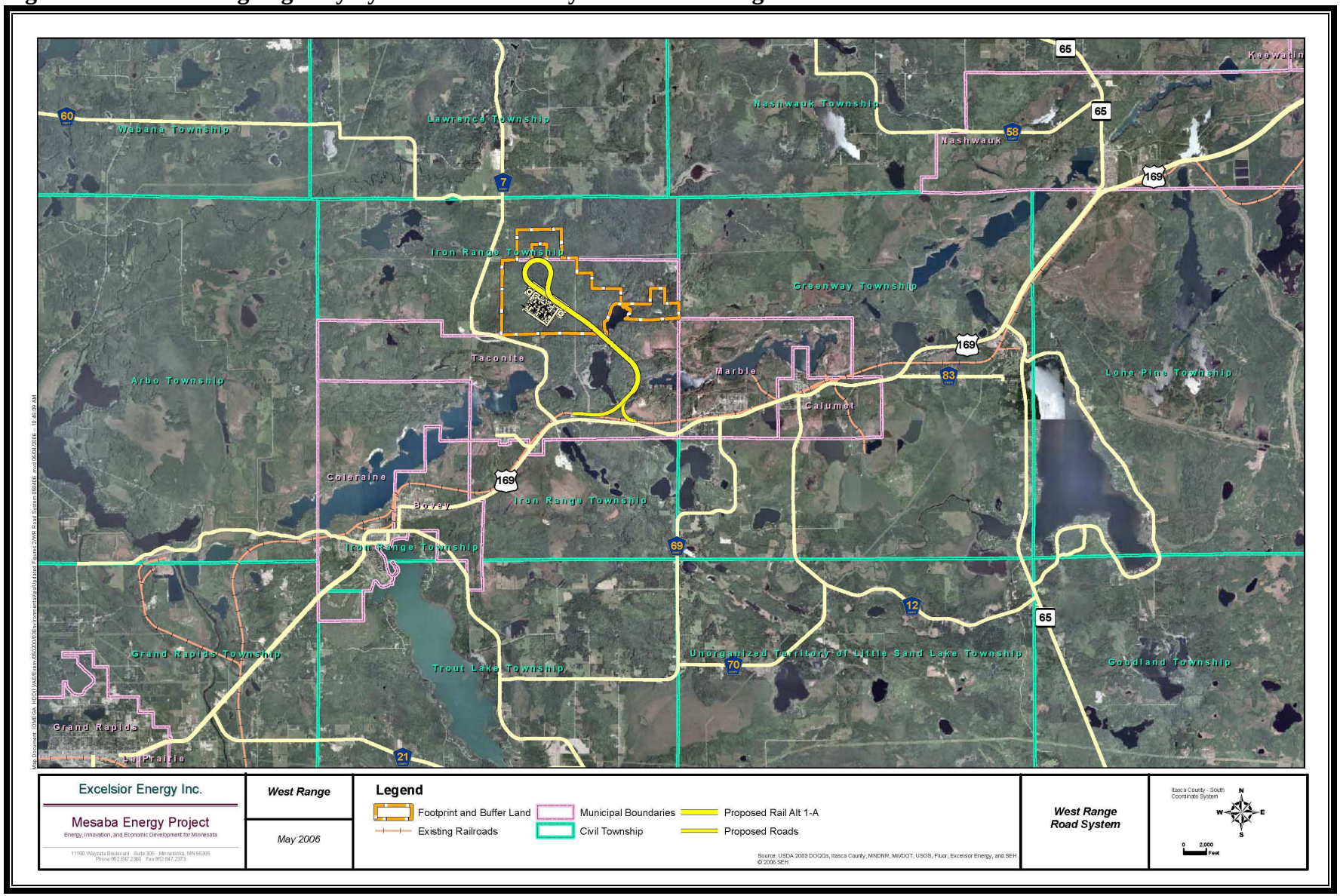
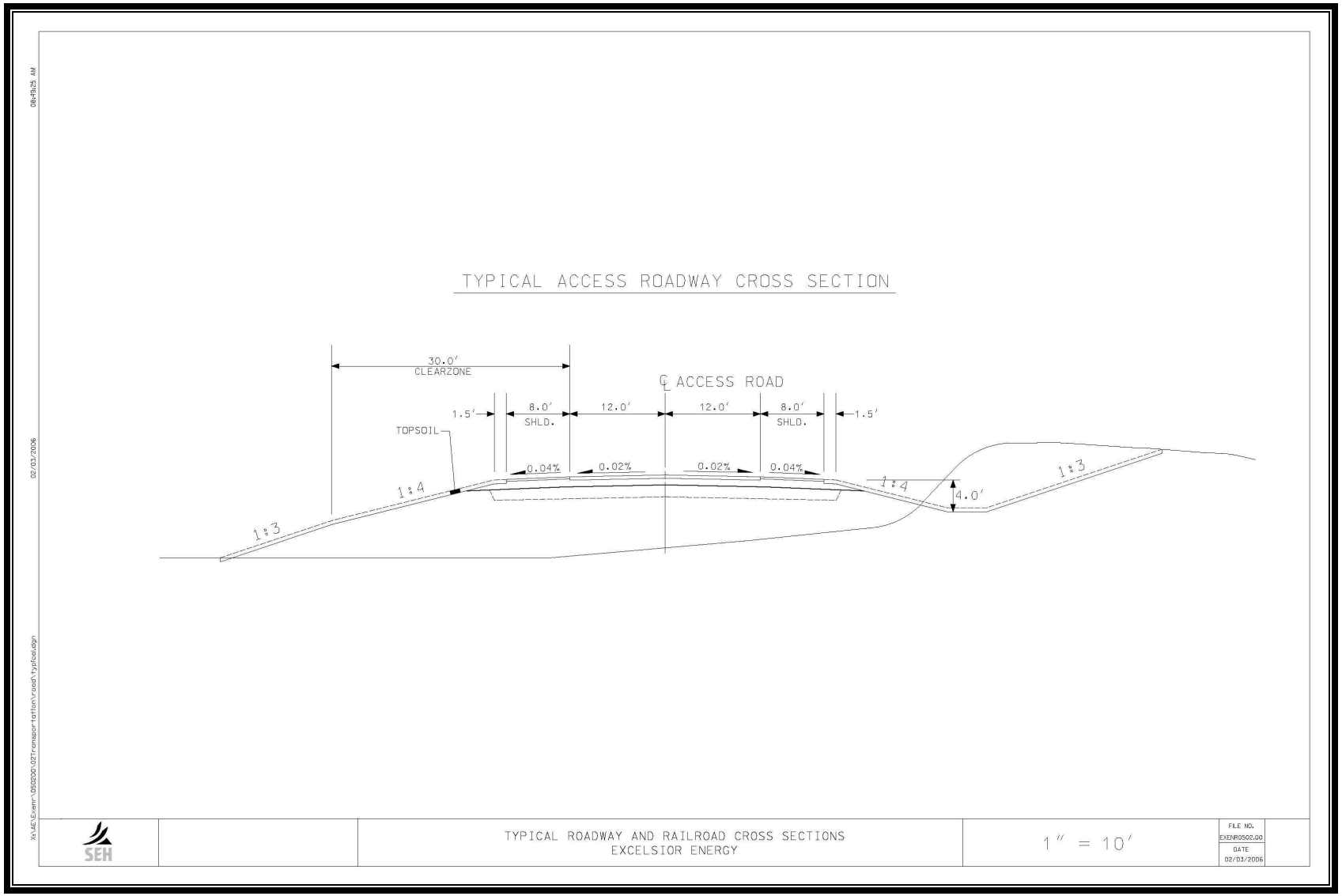


Figure 1.12-60 Cross Section of a Typical Access Road



1.12.3.2.1B Access Road 2

The IGCC Power Station would be served by one driveway off Access Road 1 (hereafter, the driveway off Access Road 1 or CR 7, as the case may be, will be termed "Access Road 2"). The proposed roadway system is shown in Figure 1.5-7. If Access Road 1 is in place prior to construction of Mesaba One, all construction and plant employee traffic would use it to access the IGCC Power Station. However, it may be necessary, based on the timing of Itasca County's construction of Access Road 1, for the plant to be served by a driveway off existing CR 7 (a simple extension of Access Road 2) until Access Road 1 is completed.

If Access Road 1 is never constructed, special turning lanes onto CR 7 and US Highway 169 would be required.

1.12.3.2.1C Discussion

The connection to U.S. Highway 169 under either scenario (timely construction of the new access road or delayed construction) will require that both right and left turn lanes be constructed on Highway 169. A permit from the Minnesota DOT will be required to complete this work. Minnesota DOT staff has been involved in the discussions about the location of the new connection to Highway 169. The preferred alternative was selected after studying other options. Originally, there were discussions about providing access by simply adding driveways off CR 7 near the plant. After discussions with the County, this option was dismissed because of concerns about adding plant truck and passenger traffic to the poor intersection of CR 7 and State Highway 169.

Another option that was dismissed was to upgrade the Cross-Range Heavy Haul Road and connect plant driveways from there. This option was dismissed because of the number of substandard horizontal and vertical curves on the Cross-Range Haul Road. In addition, it required utilization of the problem intersection of CR 7 and State Highway 169.

The preferred alternative connects to both CR 7 and State Highway 169, and provides the flexibility to have heavy equipment vehicles use either direction, which will be helpful when CR 7, U.S. Highway 169, or Access Road 1 are closed or reconstructed in the future.

A Traffic Volume Forecast Memorandum was completed for the West Range Site, the results of which are included in Section 3.12.2.1. This Memorandum shows existing traffic volumes, as well as forecast volumes, during construction (2008) and the 20 years following plant construction (2028).

Only minor modifications will be required to CR 7 to tie-in to Access Road 1. These modifications are discussed in Section 3.12.1.1.1. The proposed access roadway will be in place prior to peak construction activities of the plant, so there should be little impact to the existing system from construction.

1.12.3.2.2 East Range Site

1.12.3.2.2A Regional Roadway System

The existing transportation system in the vicinity of the East Range Site consists entirely of county roads. The nearest state highway is State Highway 135 that serves the west edge of Aurora, approximately 7 miles to the west. The primary county road in the area is CR 110 which

connects with State Highway 135 in Aurora, then passes through Hoyt Lakes. CR 110 forms the western terminus of the Superior National Forest Scenic Byway. This Byway, also known as Forest Highway 11, has been recently constructed and serves to connect the North Shore of Lake Superior with the Mesaba Iron Range. The east-west section of CR 110 that runs through Hoyt Lakes parallels and is about 1.6 miles south of the southern boundary of the proposed East Range IGCC Power Station Footprint and Buffer Land. The regional roadway system is shown in Figure 1.12-61.

1.12.3.2.2B Approaching the East Range IGCC Power Station

In order to access the East Range IGCC Power Station, traffic approaching from the west will travel on CR 110 and turn north onto CR 666 at the first major intersection in Hoyt Lakes. This intersection is controlled as a four-way stop. CR 666 travels to the north about 1.6 miles where it adjoins the eastern boundary of the East Range IGCC Power Station Footprint and Buffer Land for a distance of about 1.4 miles. CR 666 continues beyond the East Range IGCC Power Station Footprint and Buffer Land a distance of about 2.1 miles further north-northeast to the Cliffs-Erie administration building.

Traffic approaching Hoyt Lakes from the east will be traveling on CR 110, turn north onto Hampshire Drive at the first major intersection upon coming into town, travel about 0.3 miles, and turn northeast onto CR 666 toward the site.

On August 10, 2005, President Bush signed into law Public Law 109-59, which authorized $2.4 million for construction of a new highway between the bridge over the Partridge River on CR 565 in Hoyt Lakes to the intersection of Highways 21 and 70 in Babbitt. This project will create a feasible option for approaching the Hoyt Lakes area from the north. Previously, the only approach from the north would have been a circuitous trip south on State Highway 135. Once in Hoyt Lakes, traffic would approach the site as described above.

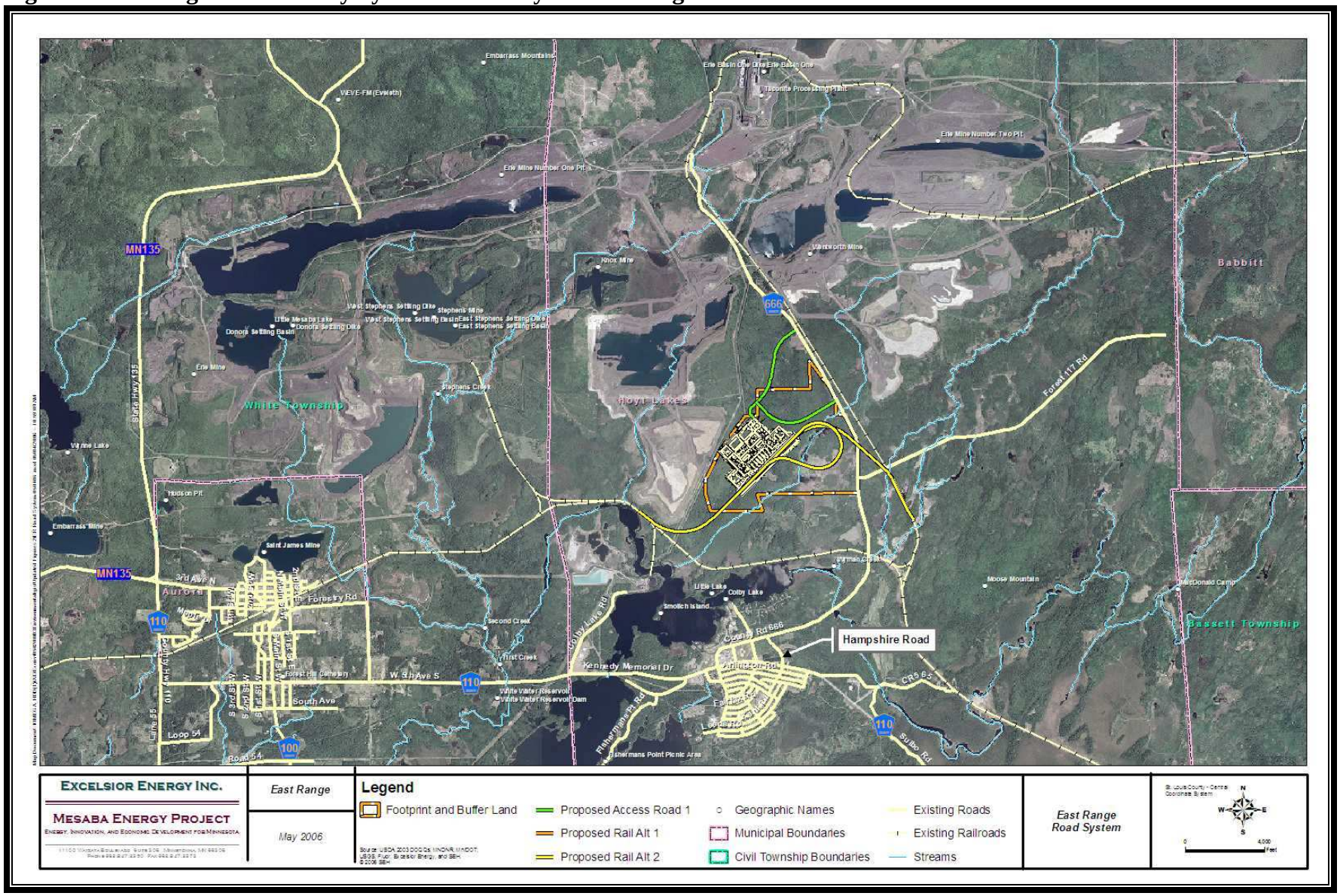
1.12.3.2.2C Access Road 1

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. Proposed Access Road 1 consists of a loop roadway to serve the IGCC Power Station from CR 666. This loop will have two access points onto CR 666 and was designed to provide gentle curves, good sightlines, minimal impacts to wetlands, and avoidance of the historic drilling site to the east of the plant.

Traffic will enter the site from the north access point. During construction and other periods of peak volumes, traffic will exit the site at the south access point. After the IGCC Power Station assumes normal operations and traffic patterns have been established, traffic may be allowed to exit the Station from either access point. Having two access points off CR 666 will also provide flexibility in accessing the Station during construction of Access Road 1 and in the future when maintenance or construction work is performed on CR 666.

Easements would be required over lands currently owned by St. Louis County and a minimal number of private parties.

Figure 1.12-61 Regional Roadway System in Vicinity of East Range Site



1.12.4 Process Water Supply

1.12.4.1 Water Supplies (Non-Potable): Site Independent Features

1.12.4.1.1 Water Use (Non-Potable)

Process water is required at the IGCC Power Station for the following purposes: i) to condense steam used in the power cycle (the water from which the steam in the power cycle will originate is of very high quality and, for economic reasons, could not simply be vented to the atmosphere as low grade steam); ii) for slurrying coal fed to the gasifier; and iii) for various other contact/non-contact cooling purposes. Table 1.12-12 is provided to show the annual average and peak rates at which water would be appropriated for all such purposes.

Table 1.12-12
Water Appropriation Requirements

Phase	West Range IGCC Power Station		East Range IGCC Power Station	
	Average Annual Appropriation (GPM)	Peak Appropriation (GPM)	Average Annual Appropriation (GPM)	Peak Appropriation (GPM)
Mesaba One	4,000[a]-4,400[b]	6,500	3,700[a]	5,000
Mesaba One & Two	8,800[b]-10,300[c]	15,200	7,400[a]	10,000

[a]Based on 8 COC in the gasification island and the power block cooling towers
[b]Based on 5 COC in the gasification island and the power block cooling towers
[c]Based on 3 COC in the gasification island and the power block cooling towers

The largest share of the water appropriated is consumed by evaporative cooling. Figures 1.8-6a and 1.8-6b indicate that the annual average rate of evaporative loss would be on the order of 3,320 gpm for Mesaba One; evaporative losses from Mesaba Two would be expected to be identical. Peak evaporative losses for each phase of the IGCC Power Station are identified in the NPDES permit application as approaching 3,500 gpm. Peak utilization rates will occur on hot summer days.

The maximum appropriation of water from the resources at either site will be dependent upon many factors, including: the cycles of concentration in the cooling towers; the fuel consumed; ambient conditions; the extent to which cooling tower blowdown is treated to remove total dissolved solids; the chemistry of the receiving waters; and the water quality criteria standards applied to those waters. The cycles of concentration in the cooling towers will be dependent upon source water chemistry, including the concentrations of mercury, total dissolved solids and hardness. In general, if the source water is relatively low in total dissolved solids, the cycles of concentration in the IGCC Power Station's cooling towers can be increased, resulting in lower make-up rates.

The West and East Range IGCC Power Stations do not differ greatly in their need for water, but do differ greatly in how wastewaters from the IGCC Power Station must be managed. In the case of the East Range IGCC Power Station, all wastewaters (other than domestic wastewaters) will be processed through a ZLD system such that there will be no process-related wastewaters, including non-contact cooling tower blowdown, discharged from the IGCC Power Station. The reason for the difference in approach between the two sites is a function of the East Range Site's

location in the Lake Superior Basin watershed (see Section 1.12.5.3.1 to obtain citations to the rules governing discharges to this watershed). The water quality criteria standards for mercury applied to surface waters in this watershed are 1.3 nanograms per liter. Dischargers to surface waters in the watershed must meet this standard at the end of the discharge pipe (that is, there is no allowance for a mixing zone within which the concentration of mercury is allow to equilibrate). The background concentration of mercury in the East Range source waters is on the order of 0.5-0.9 nanograms per liter, resulting in cooling tower blowdown concentrations of mercury in the range of 1.5-9.0 nanograms per liter (assuming that three to ten COC were used in the cooling tower, respectively).

The site-specific issues identified in the preceding paragraphs (as well as the prohibition on new or expanded discharges of certain chemicals to waters that are impaired because of such chemicals) will be discussed in more detail in the following sections. Essentially, the combination of these two considerations lead to the conclusion that on the East Range Site, discharges of cooling tower blowdown must be entirely avoided in order to obtain the required preconstruction permits.

1.12.4.1.2 Water Intakes and Pumping Systems

The types of water intake structures and pumping systems will be similar for the West and East Range IGCC Power Stations. Two types of intake structures will be employed for withdrawal from Water Resources: one designed for permanent withdrawals and one for seasonal withdrawals. As the front end engineering and design of the IGCC Power Station proceeds, the design concepts presented herein will be tailored to each specific circumstance and optimized to reduce power consumption demands. A conceptual design for the two types of intake systems (a caisson intake system for permanent applications and a floating intake system for seasonal use), are described below and illustrated in Figures 1.12-63 and 1.12-64, respectively.

1.12.4.1.2A Caisson Intake

This concept includes construction of a 13–20 foot diameter vertical shaft that will act as a wet well. The caisson will be formed with concrete in the unconsolidated overburden but may be able to utilize the bedrock as a wall in the deeper parts of the structure depending on competence and fractures. The actual diameter of the vertical shaft will be based on equipment requirements such as number of pumps and the dimensions of the pumping equipment, as well as on constructability issues related to connecting the shaft to the pit. The caisson will be constructed to an elevation necessary to obtain submerged pumping conditions under the lowest anticipated pit water levels, including an emergency buffer. Connecting the shaft to the pit can be accomplished by several methods. One such method includes constructing a large horizontal tunnel, approximately 10 feet diameter, from the caisson to the pit for water collection.

Water will enter the central caisson through the horizontal tunnel and rise to the normal water elevation. The horizontal tunnel would be constructed using hard rock tunneling techniques. The tunneling would be stopped short of the pit to allow the equipment to be removed prior to flooding of the caisson by pit water. The final opening from the horizontal intake tunnel to the pit would be made blasting or by drilling on the pit side from a barge on the pit water surface. The horizontal tunnel will be sized to limit intake velocities to 0.5 feet per second. With this method, the screening requirements of Section 316(b) of the Clean Water Act will be

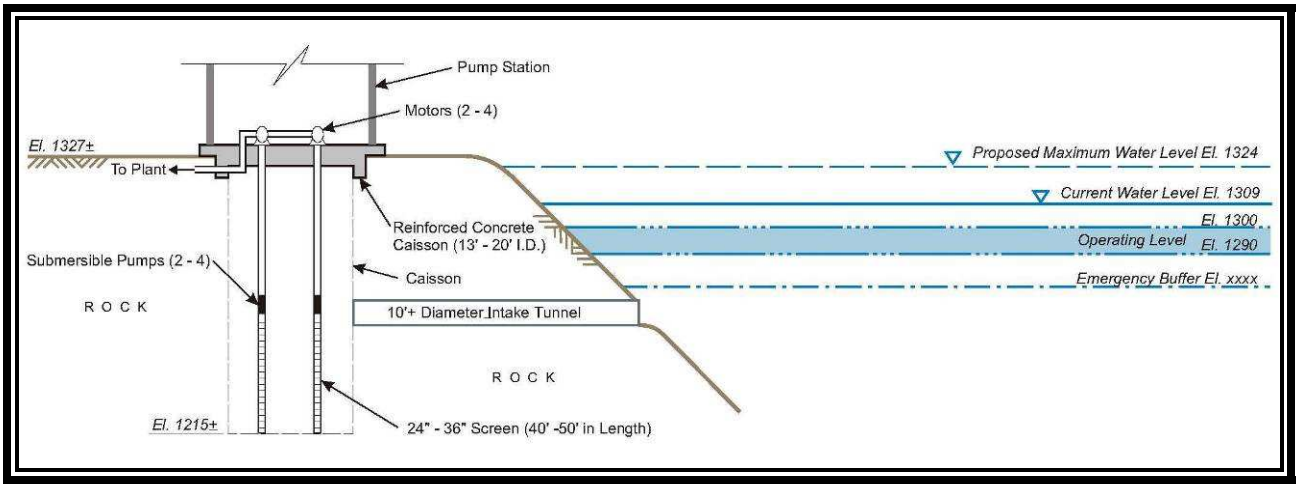
accomplished in the caisson itself using either tee screens or conventional well screens. Pumps in the caisson will be conventional turbine pumps commonly used in wet well applications.

Using either method, a system will be installed that will allow access to the deeper, cooler water if determined to be necessary or cost effective. A new supply pipe will be constructed from the caisson to deliver cooling water to the IGCC Power Station for cooling and other plant needs.

A section of this concept is shown in Figure 1.12-62. This design provides:

- A system that meets 316(b) requirements that reflect the best technology available ("BTA") to protect aquatic organisms from impingement or entrainment.
- Reliable construction that will minimize potential maintenance and supply issues.
- An inlet tunnel that is designed to limit intake velocities to 0.5 feet per second to meet 316(b) requirements and allow fish to freely swim in and out of tunnel.
- Installation of well screens or tee screens to meet 316(b) requirements, thereby eliminating requirements for a flat panel wedgewire intake screen at the entrance to the horizontal tunnel.
- Well screens, if used in the caisson, installed so that they could be removed for maintenance.
- A caisson depth designed to allow access to the deeper water if desired and to ensure thermal stratification is not negatively disrupted. The structure could also be modified to include some form of deeper suction piping to feed the main intake with deeper colder water.

Figure 1.12-62. Conceptual Illustration of Caisson-Type Intake Structure



1.12.4.1.2B Floating Intake

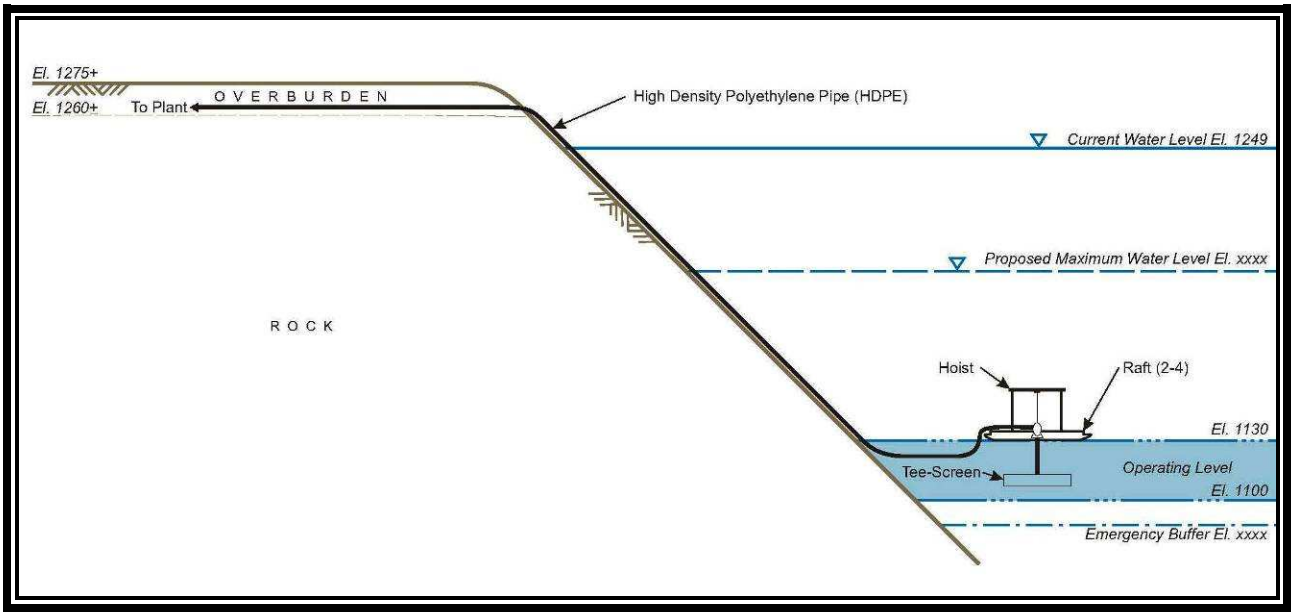
Floating intake structures conducive to fluctuating water levels are available and commonly used by mines for pumping systems. This system includes placing pumps and intake structures on a floating platform in the mine pit. A pipe with wedgewire screen is extended to withdraw water from the desired depth. A sufficient length of screen will be provided to ensure intake velocities are maintained below 0.5 feet per second and to ensure thermal stratification is not negatively

disrupted. Supply pipe will be designed to convey water from the floating platform to the facility.

A section of this concept is shown in Figure 1.12-63. This design will provide:

- A system that meets 316(b) requirements by employing the BTA to protect aquatic organisms from impingement or entrainment.
- Consistent suction characteristics for the pumps (fluctuating water surfaces could otherwise be problematic).
- Readily accessible main components (except for the deeper intake components).
- Economical construction costs.
- Potential for use of off-the-shelf systems.
- An easily accessible submerged pump intake.
- The option of using less expensive horizontally mounted motors.
- A floating dock or other pier structure to allow for maintenance and access to the intake structure. Bubblers or agitators could be utilized to prevent freeze-up if winter operation is necessary.

Figure 1.12-63. Conceptual Illustration of Floating-Type Intake Structure



1.12.4.2 West Range Process Water System

1.12.4.2.1 Process Water Alternatives

One of the reasons the West Range Site is an exceptional location for a power station is that abundant sources of water are located nearby. Several abandoned mining pits located in proximity to the site are either currently filled with water and overflowing, are being pumped to avoid flooding of important historical resources due to rising water levels, or are threatening to

flood due to rising water levels. Specifically, these Pits include the LMP, the HAMP Complex, and the CMP, respectively. (These mine pits are shown on Figure 1.8-8. As noted in Table 1.12-15 below, the Arcturus Mine Pit ["AMP"], GMMP, and HAMP combine to form the HAMP Complex). The present circumstances allow Mesaba One and Mesaba Two to become part of the solution to a difficult problem for the communities surrounding these resources or to parties that are currently paying to have water pumped from the pits to maintain acceptable levels. Section 1.12.4.2.2 outlines what has been done to assess the match between Water Resources and power station requirements.

The Proponent has identified the resources listed in Table 1.12-13 as potential sources of process water for operation of West Range IGCC Power Station. The chemistry of the waters listed in the table, where available, is presented in Table 1.8-20 in Section 1.8.2.2.3.

Table 1.12-13
Process Water Resources Identified for Use by the West Range IGCC Power Station

POTENTIAL RESOURCE	OVER-FLOWING OR RISING?	INFORMATION SOURCE	PHASE	ALTERNATIVE
CMP	Rising	MDNR	I/II	**1**
HAMP Complex*	Dewatered on ongoing basis to avoid flooding of Hill-Annex State Park	MDNR & Barr	I/II	
LMP	Overflowing	SEH Field Data	I/II	
Prairie River	NA	Minnesota Power	I/II	
Greenway Mine Pit	Overflowing	SEH Field Data	II	Considered As Part of Alternative No. 1, But Rejected on Basis of Cost Effectiveness
Mississippi River	NA	MDNR	II	2
Groundwater	NA	None	I/II	3

*The HAMP Complex includes the AMP, GMMP, and HAMP.
NA = Not Applicable

The amount of water currently available in each of the source water mine pits is presented in Table 1.12-14.

Table 1.12-14
Abandoned Mine Pit Water Sources

Water Source	Water Surface Elevation (feet) (November 2005)	Surface Area (acres) (November 2005)	Estimated Volume (acre-feet) (November 2005)
CMP	1,309	1,400	150,000
HAMP Complex			
HAMP	1249	216	20,600
AMP	1269	105	4,490
GMMP	1249	141	11,100
LMP	1265	82	8,310

The sustainable[16] supply capability for each water source was estimated using information supplied by the MDNR, previous engineering studies, and information supplied by local government units. The actual sustainable rates that will be realized are dependent on factors including precipitation, evaporation, pit water levels and hydrogeological conditions. The estimated water source supply capabilities are presented in Table 1.12-15.

Table 1.12-15
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[a]	2,000[b]
LMP	1,600-2,000	1,800[c]
Prairie River	0-2,470[d]	2,470[d]
Discharge from IGCC Power Station	350-3,500	Varies[e]

[a]Maximum flow occurs at minimum operating elevation
[b]At an operating elevation of 1,230 ft msl
[c]Estimates of flow are based on one summer flow measurement at the LMP outlet and one summer and one winter measurement taken at the West Hill Mine Pit outlet
[d]Maximum available flow assumed to be 25% of the 7Q10 flow of the Prairie River
[e]Water returned to the CMP is expected to be 350 gpm during Phase I operations and 2,650-3,500 gpm during Phase II operations

[16] The term sustainable is used in this context to imply that water levels within all pits can be kept at levels that will be somewhat consistent with existing uses.

1.12.4.2.2 Process Water Alternative 1

Table 1.12-16 matches water needs shown for the IGCC Power Station (this table contains information from Table 1.8-16 with two columns added) with the potential supplies shown in Table 1.12-15. The assessment regarding long term sustainable flows was based on: i) discussions with the MDNR regarding the availability of water in each of the above resources; ii) analyzing stage-storage data made available by the MDNR; iii) reviewing information the MDNR had published on each such resource (Barr, 2004, Barr, 1987, Leibfried, 2001, MDNR, 2004); and iv) collecting primary data to confirm the available resource. The last column in Table 1.12-16 represents the Proponent's conclusion with regard to the capability of the resources listed to meet the operational requirements of Mesaba One and Mesaba One and Mesaba Two. The conclusion regarding water supplies for Mesaba One is that sufficient water supplies are available to demonstrate the long term, sustainable provision of water for Station needs.

Table 1.12-16
Water Appropriation Requirements Matched with Water Supply Capabilities

Phase	Average Annual Appropriation (GPM)	Peak Appropriation (GPM)	Long Term Sustainable Flow (GPM)	Sufficient to Meet Annual Avg. Flow Requirement (Yes/No)
Mesaba One	4,000[a]-4,400[b]	6,500	> 9,100[c]	Yes
Mesaba One & Two	8,800[b]-10,300[d]	15,200	> 9,100[c] > 11,700[e]	Yes

[a]Based on 8 COC in the gasification island and the power block cooling towers

[b]Based on 5 COC in the gasification island and the power block cooling towers

[c]The flow presented is the sum of the values in the third column of Table 1.12-15 rounded to two significant figures; the greater than symbol is applied because the quantity does not account for 300 gpm recycled to CMP during Phase I operations (see Figure 1.8-11a)

[d]Based on 3 COC in the gasification island and the power block cooling towers

[e] The flow presented is the sum of the values in the third column of Table 1.12-15 and includes the minimum quantity of water expected to be returned to the CMP during the combined operation of Mesaba One and Two rounded to two significant figures; the greater than symbol is applied because the quantity assumes minimum quantity recycled to CMP (see Figure 1.8-11b)

For the combined needs of Mesaba One and Two, existing data currently shows that greater flows than those presented in Table 1.12-16 for the CMP might possibly be available as inflows of water may increase with decreasing water levels in the CMP. To be conservative, the Proponent has not assumed the availability of such potential excess flows.

Information available for the HAMP Complex also suggests increased water flows into the HAMP Complex with decreasing water elevations. For example, records show evidence of flows between 3,900 and 4,000 gpm during the initial years following cessation of mining. However, this increased flow is also not used in the sustainable flow values presented in Table 1.12-16. Additional flow is available from non-contact cooling water discharges from the IGCC Power Station directly into the CMP. The basis for direct discharges into the CMP is discussed in greater detail in Section 1.12.5.2 and in the NPDES Permit Application that is

attached to the Joint Application as Appendix 6. Such discharges would be conducted in accordance with all rules and regulations and could decrease reliance on one or more of the Water Resources listed. However, because of the uncertainty of sufficient flows for Mesaba One and Mesaba Two from such sources, the Proponent has chosen to also propose water appropriation from the Prairie River and the LMP to ensure adequate water supplies for both phases.

Each of the Water Resources identified above is at a lower surface elevation than that of the IGCC Power Station. Therefore, conveyance of the water to the Station requires that it be pumped. Figure 1.8-8 provides the location for the process water pump stations and pipelines.

Section 1.12.4.2.2A supplies additional information regarding each of the Water Resources discussed above.

1.12.4.2.2A Water Sources – Existing Information

1.12.4.2.2A(1) CMP Complex

The Canisteo Mine was one of 18 different properties, operated over time by six different companies, that made up the 4.5 mile long natural ore mining complex. In 1907, the Holman-Cliffs, Diamond, and Canisteo properties were the first to begin shipping ore. By September 1985, mining across the entire length of the ore complex had ceased after having shipped more than 194,500,000 long tons of ore (MDNR, 2001).

During active mining it was necessary to pump water from the individual pits making up the mining complex to permit mining of the iron ore body. Once the pits were abandoned, dewatering operations ceased and they began to fill with water. Waters that had received pumped input, in lieu of natural drainage, were cut off from this water supply as runoff and ground water began to fill the abandoned pits. Water rose dramatically in the first several years following abandonment but was not monitored.

Bathymetric data has been collected by the MDNR and was used to develop a stage-storage relationship for the pit. The MDNR has also collected stage (water elevation) data since 1989. However, stage data was not collected on a daily basis until 1995. Because less detailed stage data exists for the period from 1989 to 1995, it was necessary to calculate long-term average inflow. Based on the available stage data and the stage-storage relationship for the pit, an average recharge of 3,160 gpm was calculated over this period. Bathymetric mapping of the pit has been developed by the Proponent's consultant, based on electronic sampling of the mined surface through the water column.

Daily stage data from 1995 to present is available from the MDNR, although some data gaps exist. The MDNR continues to collect daily stage data. From 1995 to present, recharge rates range from 810 gpm to 4,190 gpm, with an average of 2,580 gpm. The water surface elevation in the mine pit on November 1, 2005 was 1,309 feet, which corresponds to a surface area of 1,393 acres and a water volume of 149,500 acre-feet. Although groundwater movements are difficult to quantify, it appears that the amount of seepage out of the mine pit increases significantly when the water surface elevation is above the bedrock elevation (approximately 1300).

When the data from years in which the stage was above 1300 (after year 2000) are not included, recharge rates ranged from 1,820 gpm to 4,190 gpm, with an average of 2,980 gpm.

The CMP does not currently discharge directly to surface waters. Water input to the pit includes surface water runoff and groundwater inflow. Water leaves the pit through groundwater seepage and evaporation.

The west end of the mining complex, the Buckeye Mine Pit, filled with water and began being used for recreational fishing after a boat launch was installed and the MDNR began to stock lake trout. As water continued to rise in each of the pits across the abandoned mining complex, the pits became interconnected. The Buckeye Mine Pit became connected to the other pits in the early 1990's. The connected series of pits is locally referred to as the CMP and now the entire length of the Pit receives occasional recreational use by virtue of access via the Buckeye Mine Pit boat launch. For safety, security, and operational reasons, the Proponent proposes that this boat launch eventually be removed.

Some stocking of lake trout in the west end of the conjoined pits (formerly the Buckeye Mine Pit) has occurred since 1999 and as a result lake trout have begun to populate waters in the eastern end of the CMP. Illegal stocking and/or unintended transport of other species may have also occurred.

According to the MDNR's sampling of the CMP, rainbow smelt are present in the pit. It is unknown if the effects of rainbow smelt on a fishery in this area are negative or positive.

The trophic state of the CMP is considered to be oligotrophic. Water that enters into the mine pit is mostly groundwater. Since there is relatively little surficial inflow to the pit, the quantity of nutrients and biota is also relatively low. This low amount of nutrients and biota results in a deficiency in the food chain within the pit with a resulting poor fishery and slow fish growth.

Black crappie, bluegill, horneyhead chub, largemouth bass, pumpkinseed sunfish, painted turtle, rainbow trout, rock bass, snapping turtle, walleye, white sucker, and yellow perch have been found in the Canisteo and Buckeye Mine Pits by the MDNR. Bass appear to be in the pit, but they also grow slowly.

1.12.4.2.2A(2) HAMP Complex

The HAMP Complex consists of four main mine pits: Arcturus ("AMP"), GMMP, Hill-Trumbull, and Hill Annex (the latter two of which are referred throughout this document as the HAMP). Mining operations kept the pits completely dewatered until 1979. Following 1979, some dewatering took place and some of the pits began to fill with water. By 1981, all mining operations had ceased (Barr, 1987). Hill Annex was established as a state park in 1988 by the Minnesota Legislature and is controlled by the MDNR – Division of Parks and Recreation.

The AMP, GMMP, and HAMP were separated by large masses of rock during mining operations. Following the cessation of mining, water levels in the pits began to rise, and the GMMP became connected to the HAMP when the water surface elevation reached approximately 1,215 feet. The water surface in the AMP is higher than that of the other pits, and has not become connected by water to the other pits. Water currently overflows out of the AMP into the GMMP. On November 1, 2005, the stage measured in the HAMP Complex by the Proponent's consultant was 1,247 feet. At that same time, the stage measured in the AMP was 1,269 feet.

Pumping records have been maintained by the MDNR since 1973, and the MDNR Hill Annex staff continues to report dewatering volumes on a monthly basis.

Bathymetric data was collected by the Proponent's consultant in the fall of 2005, and a stage-storage relationship was developed for the AMP, GMMP, and HAMP pits from such data.

Stage data were collected by the MDNR from 1993 through 2002 for Hill Annex. Because the stage data were not collected on a regular basis, this data could not be used for a detailed yearly estimate of pit recharge. The stage in GMMP, HAMP was measured at 1,247, and AMP was measured at 1,269 on November 1, 2005. The Proponent's consultant continues to measure stage at all of the pits within the HAMP Complex.

Actual recharge rates when the pits were dewatered from 1973-1979 were calculated based upon pumping records. Recharge rates during this period range from 3,230 gpm to 4,030 gpm.

Based on the stage-storage relationship, pumping records, and stage measurements, some long-term average recharge rates can be calculated. Assuming that the pits were completely dewatered on January 1, 1979 and the AMP was completely full by 1999, an average recharge rate of 2,150 gpm was calculated using the stage-storage relationship, the stage measured on December 9, 1999, and historical pumping records.

A second long-term average recharge rate was calculated by adding the difference in volume in the pits between December 9, 1999 and November 1, 2005, and adding the volume of water pumped over this time period. The average recharge rate between the end of 1999 to 2005 was determined to be 1,590 gpm.

Uncertainties in the long-term average recharge rates calculated arise because of potentially missing data and pumping records, as well as highly variable groundwater head conditions. Recharge rates were calculated by the MDNR and independently by the Proponent's consultants. The HAMP Complex is not managed as a fishery and the MDNR has never stocked the pit. Sampling in 1990 failed to identify any game species in the mine pit. Some small species such as brook sticklebacks and common shiner were captured in minnow traps.

1.12.4.2.2A(3) Lind Mine Pit

Very little historical water surface elevation and outflow data are available on the LMP. The pit has filled with water and has an outlet pipe that discharges to the Prairie River.

Bathymetric mapping of the pit has been developed by the Proponent's consultant, based on electronic sampling of the mined surface through the water column.

Common shiner and black crappie were sampled by the MDNR in this pit. Black crappie appear to be naturally reproducing and the black crappie sampled appear to be near average with respect to growth rate. West Hill Mine Pit has filled with water following the cessation of mining and currently discharges to the LMP through two 8 inch diameter HDPE pipes.

On November 2, 2005, the Proponent's consultant measured the pipe size, flow depth, and flow velocity at the LMP pipe outlet and determined the outflow from the pump at the time to be 1,800 gpm. A majority of the outflow appears to come from the West Hill Mine Pit. During the November 2, 2005 field trip, the Proponent's consultant measured the pipe size, flow depth, and flow velocity at the West Hill Mine Pit pipe outlet and determined the outflow to be approximately 1,570 gpm. A follow-up flow measurement was taken at the West Hill Mine Pit drain pipe on February 17, 2006 and showed a flow between 1,600 gpm and 2,000 gpm.

1.12.4.2.2A(4) Prairie River

The Proponent will also withdraw water from the Prairie River to supply and supplement the water resource needs of Mesaba One and Mesaba Two. The Proponent's consultant obtained river gauge data and conducted statistical analyses of the appropriate data to assess the potential supply characteristics of the Prairie River. Average monthly flow rates are shown in Figure 1.12-64. MP reported an average flow for August 29, 2005 of 27 cfs (450 gpm).

Gauge data have been collected intermittently at a USGS gauging station for a period of 16 years. The USGS gauge is located near the CR 7 crossing of the Prairie River, north of Taconite.

Gauge data have also been collected intermittently at the Prairie Lake Hydropower Dam, which is several miles downstream of the USGS gauge station. Flow data were collected from 1925 to 1957 on a monthly average basis while under the control and ownership of Blandin Paper Company. MP assumed control and ownership of the facility and collected flow data from 1997 to 2005 on a daily basis. Since the river flows are buffered by the lake and managed at the dam, the variability in the daily flow rates is not as extreme as the USGS Prairie River gauge site.

The Proponent proposes to withdraw water from the Prairie River at an appropriation point downstream of the Prairie Lake Hydropower Facility. At this point, the Proponent's water withdrawals will not impact power production at the hydropower facility.

1.12.4.2.2B EPA Clean Water Act Rule 316(b)

1.12.4.2.2B(1) Background

The EPA Clean Water Act ("CWA") Rule 316(b) contains criteria regarding Cooling Water Intake Structures ("CWIS"). The rule specific to CWIS on fresh water rivers states that the maximum amount of water that can be taken is "5% of the mean annual flow or 25% of the 7Q10, whichever is the lesser (66 FR 65300)."

The 7Q10 is the seven day low flow average with a 10-year recurrence interval. The Weibull distribution[17] is the preferred statistical method used to determine the 7Q10, and requires that the top 80% of flow measurements be dropped as they are not considered to be true "low flows." The basis for the calculations used in determining the 7Q10 flow rate for the Prairie River is presented in Appendix F of the Water Appropriation Permit Application attached to the Joint Application as Appendix 9. In general, river flows are plotted (on a log scale) against reoccurrence interval (on a normal scale) and an exponential regression is used to best fit a regression line to the data points. The point on the graph where the best fit line intersects the 10 year recurrence interval is the 7Q10.

1.12.4.2.2B(2) Statistical Analysis

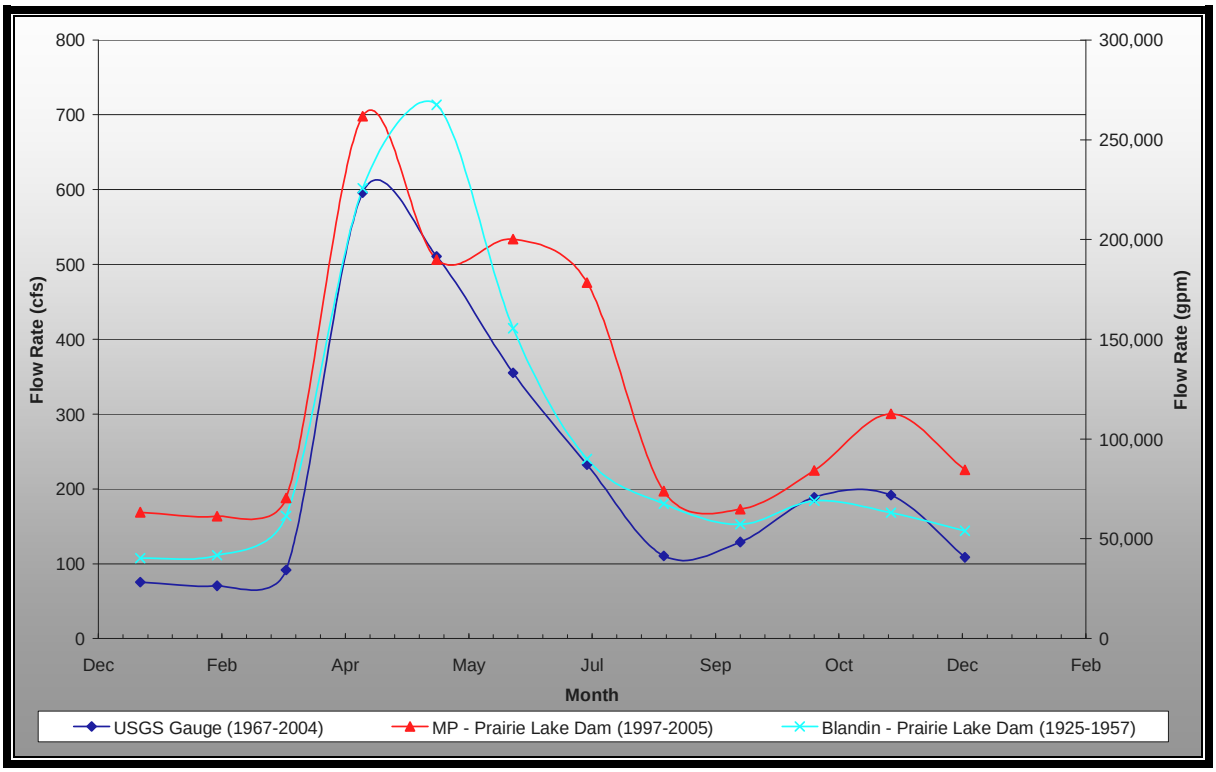
To be conservative, only the data collected by MP at the Prairie Lake Dam from 1998 to 2004 were utilized in the determination of the mean annual flow and the 7Q10 determination. Since full year records for 1997 and 2005 were not available, such data were eliminated from consideration. The Blandin data from 1925-1957 were recorded on a monthly average basis and

[17] Weibull, Wallodi, "A Statistical Distribution Function of Wide Applicability," Journal of Applied Mechanics, Vol. 18, pp. 293-297, 1951.

could not be used to determine the 7Q10. Data from the USGS gauge were also not used because the point of taking is several miles downstream of the USGS gauging station and Prairie Lake.

The mean annual flow in the Prairie River is 319 cfs, and 5% of that flow is equal to 16 cfs. The 7Q10 in the Prairie River was determined to be 22 cfs, and 25% of that flow is equal to 5.5 cfs. Since 25% of the 7Q10 is the smaller amount, the maximum rate at which water can be appropriated from the Prairie River at one time is 2,468 gpm (5.5 cfs).

Figure 1.12-64 Average Monthly Flow Rates for Prairie River



1.12.4.2.2C Water Sources: Conclusion Regarding Adequacy of Alternative 1 Supplies

Even if the Proponent completely utilized all the water from any single potential resource in the vicinity of the West Range Site, there is no such resource capable of supplying all of the water requirements for two phases of plant development. Therefore, in consideration of its own needs and to help solve the local flooding problems previously described, the Proponent undertook to develop a comprehensive water resource management plan for the West Range IGCC Power Station. In so doing, it identified four sources of water that will support the full load operation of two phases.

1.12.4.2.2C(1) Introduction

The proposed water supply system for Mesaba One and Two will consist of three mine pits, three pumping stations, and an engineered orifice to draw water from the Prairie River. In the case of Mesaba One, water in the CMP will be pumped to the IGCC Power Station and water from the

HAMP Complex will be pumped to the CMP as necessary to maintain water levels from dropping too low (the intent in the early years of the IGCC Power Station's operation will be to lower water levels in the CMP). Mesaba One and Two will require an additional pump station on the LMP and installation of an engineered orifice that allows water from the Prairie River to flow by gravity to the LMP. A pumping station in the LMP will then pump water to the CMP. The pumping capacity for each of the pump stations is summarized in Table 1.12-17

Table 1.12-17
West Range Pumping Station Capacities

Pump Station Location	Peak Flow (gpm)
CMP	15,200
HAMP Complex	7,000
LMP / Prairie River	7,000

1.12.4.2.2C(2) CMP Pumping Station

A series of pumps will provide a pumping capacity between 3,500 gpm and 7,000 gpm for Mesaba One and between 8,800 gpm and 15,200 gpm for Mesaba One and Two. This capacity will be provided in a permanent pumping station proposed at the southeast corner of the CMP (see Figure 1.12-62 in Section 1.12.4.1.2A for a conceptual illustration of the caisson-type pump station). A standby pump will be incorporated for use during a failure or maintenance of one of the primary pumps. The pump station intake will meet the Section 316(b) Clean Water Act requirements for cooling water intake structures (such requirements are addressed as part of the NPDES permitting process). The pipeline that extends from the CMP to the West Range IGCC Power Station will be approximately 36 inches in diameter. The length of the pipeline that extends from the CMP to the West Range IGCC Power Station is approximately at 11,100 feet.

1.12.4.2.2C(3) HAMP Complex and LMP Pumping Stations

A floating pump station will be installed at the GMMP end of the HAMP (see Figure 1.12-63 in Section 1.12.4.1.2B for a conceptual illustration of the floating pump station). The pump station will have a capacity of 7,000 gpm and be installed in the GMMP. Water will be directed into the CMP. The pipeline that extends from the GMMP to the CMP will be approximately 24 inches in diameter and is expected to be approximately 25,400 feet in length.

A pump station designed in the same manner as the HAMP Complex pumping station with a capacity of 7,000 gpm will be installed in the northeast corner of the LMP, and water will be directed to the CMP. The pipeline that extends from the LMP to the CMP will be approximately 24 inches in diameter with a length of 11,300 feet.

Pumping capacity at the HAMP Complex and the LMP must allow for the capture of the 12-month average annual water supply on a seasonal basis.

1.12.4.2.2C(4) Prairie River Intake

An engineered intake structure capable of accepting a maximum rate of 2,470 gpm from the Prairie River will be installed in the river and directed into the LMP for storage. The engineered

intake structure will be approximately 18 inches in diameter and approximately 200 feet in length.

1.12.4.2.2C(5) Pipeline Infrastructure

Routing for the pipelines will be primarily on public property adjacent to existing transportation corridors. Figure 1.8-7 shows an overview of the water supply plan. Figures 1.12-65, 1.12-66, 1.12-67, and 1.12-68 show more detailed intake and discharge locations. Mapbooks showing the entire length of each segment of pipeline are attached as Appendix B in the Proponent's Water Appropriation Permit Application attached as Appendix 9 to the Joint Application.

Figure 1.12-65 CMP Pump Station and GMMP Pump Station Discharge Point

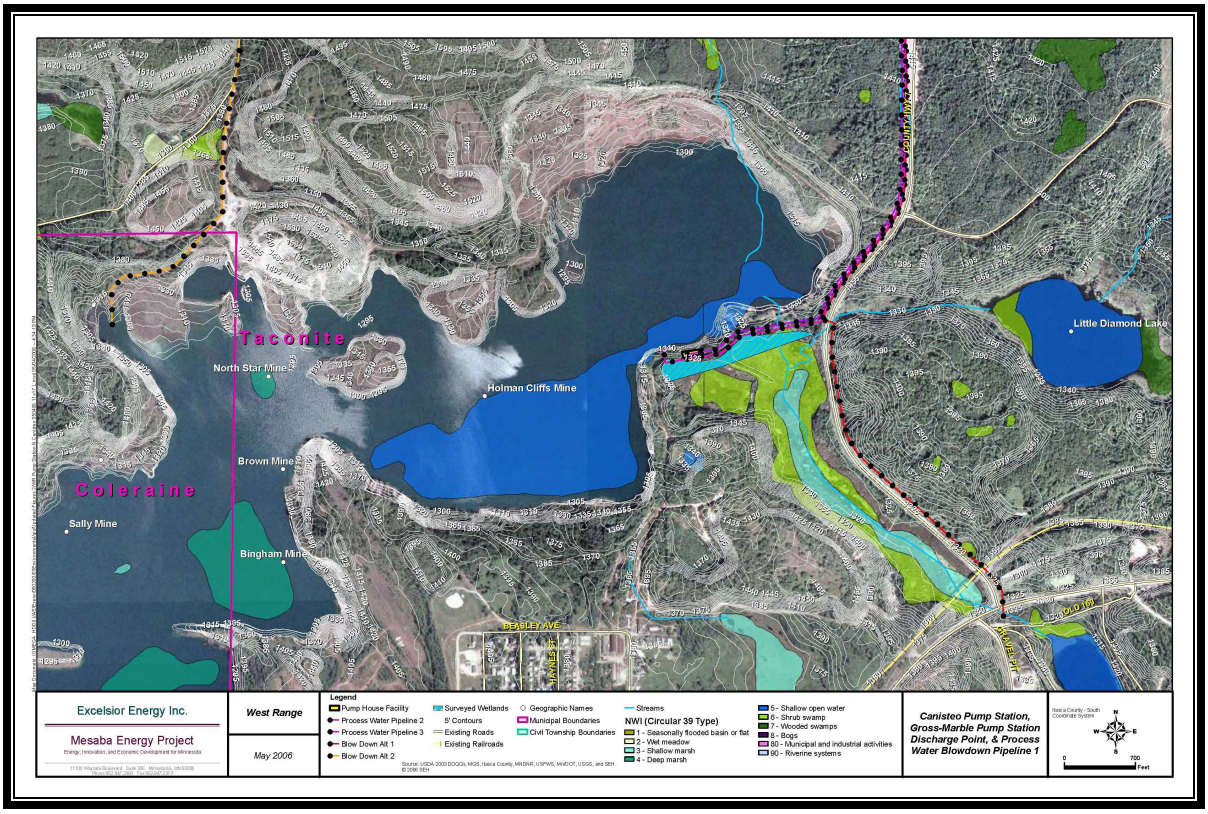


Figure 1.12-66 GMMP Pump Station

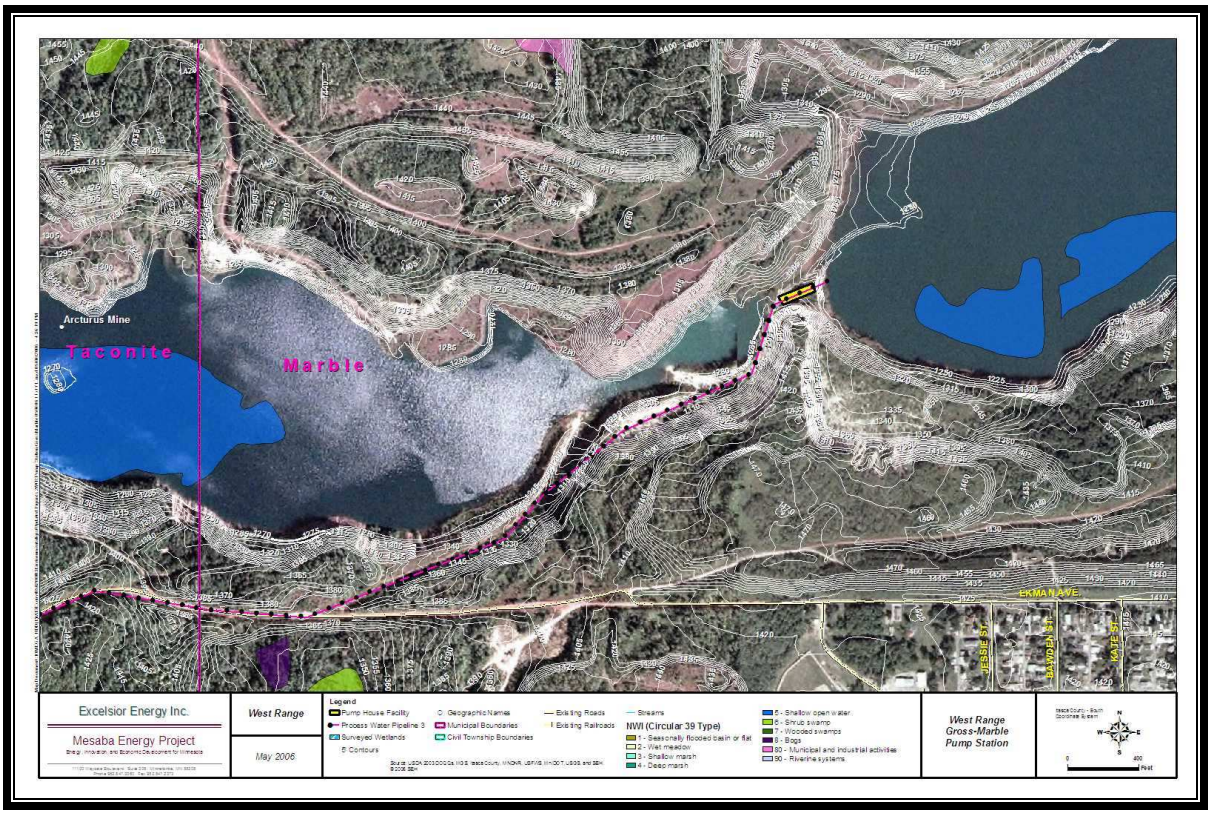


Figure 1.12-67 LMP Pump Station and Prairie River Station Structure

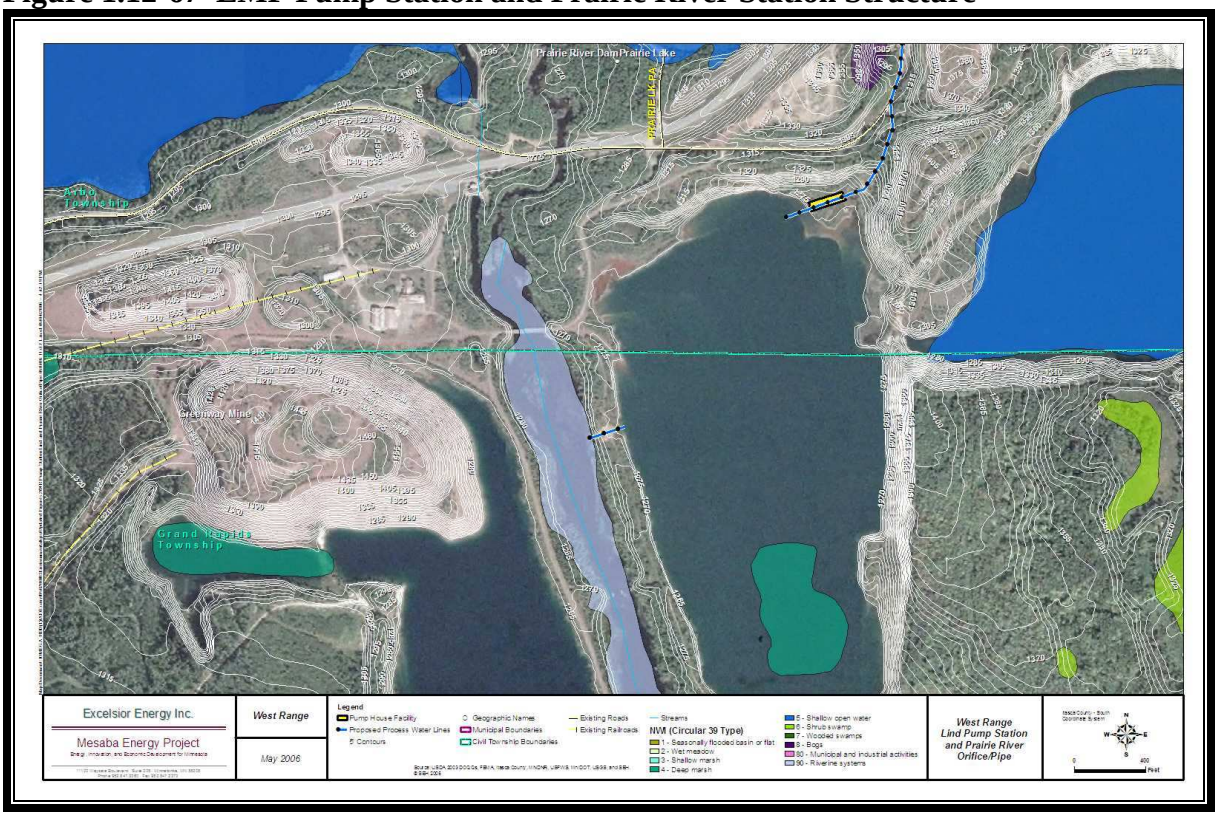
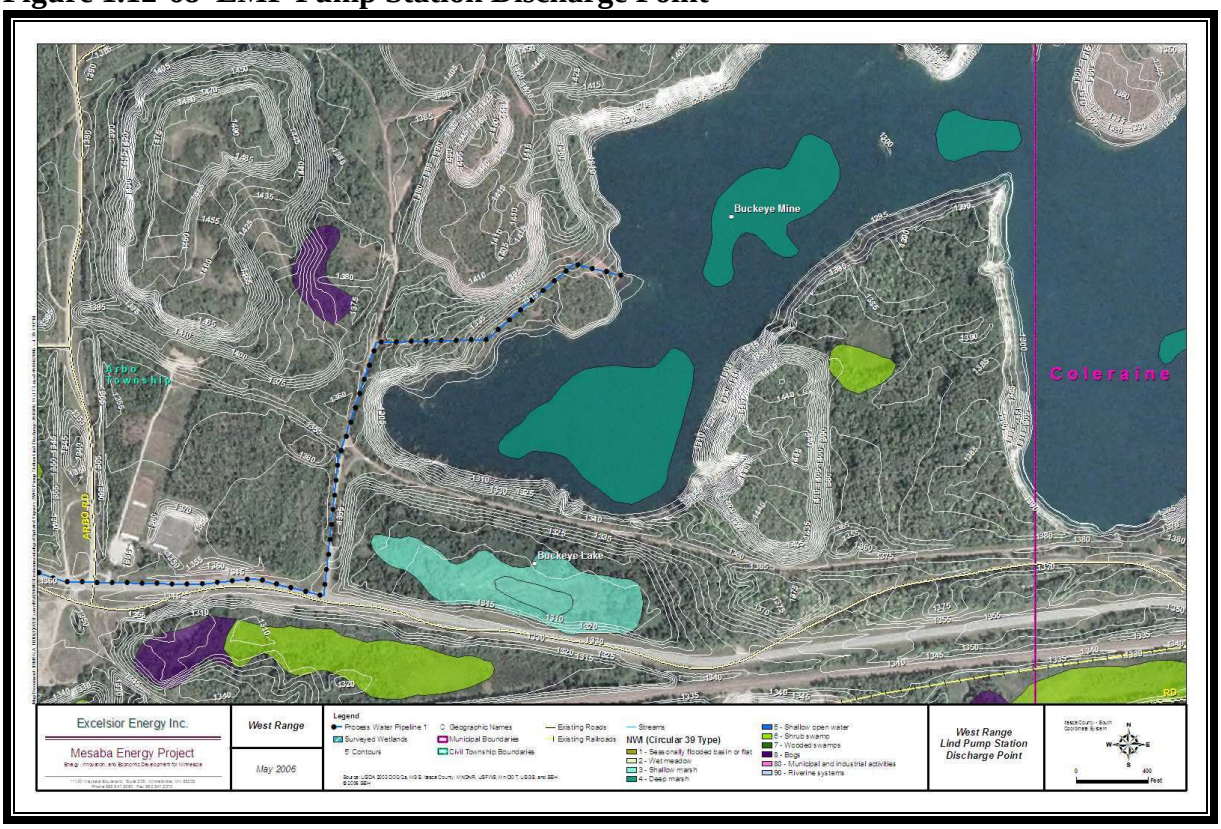


Figure 1.12-68 LMP Pump Station Discharge Point



1.12.4.2.2D Water Management Plan

The operation of Mesaba One and Two and their impacts on water levels in the CMP have been modeled. Modeling results indicate that water levels in the CMP could fluctuate up to two feet during a year with average rainfall. Under drought conditions, water levels in the CMP could fluctuate up to six feet. Figure 1.12-69 shows the average and drought-case scenario in the CMP during one years' operation with Mesaba One and Mesaba Two in-service. Figure 1.12-70 shows the impact of operating Mesaba One and Mesaba Two on water levels in the CMP when drought conditions extend to five years. In this instance, CMP water levels are predicted to be lowered by up to 30 feet.

Based on the model runs conducted, the Proponent is proposing to operate the CMP within an operating range of 1,260-1,290 ft msl with a contingency plan range of 1,250-1,260 ft msl. The contingency plan range is proposed to accommodate the five-year drought scenario. The Proponent proposes to operate within the 1,290-1,300 ft msl range during extremely wet periods. In the event water levels in the CMP cannot be controlled (that is, continue to rise) through water withdrawals required for operating Mesaba One and/or Mesaba One and Two, a cross-tie into the Holman Lake discharge pipe will allow excess CMP waters to be pumped to Holman Lake on an as needed basis. The cross-tie will contain sufficient protection to ensure that unwanted species are not inadvertently directed into Holman Lake. The Proponent and/or the MDNR, through an approved mechanism derived during the permitting process, will have the capability to operate the existing pump in the HAMP to manage water levels in the complex during wet periods.

Figure 1.12-69 Modeled Annual Variation in CMP Water Levels

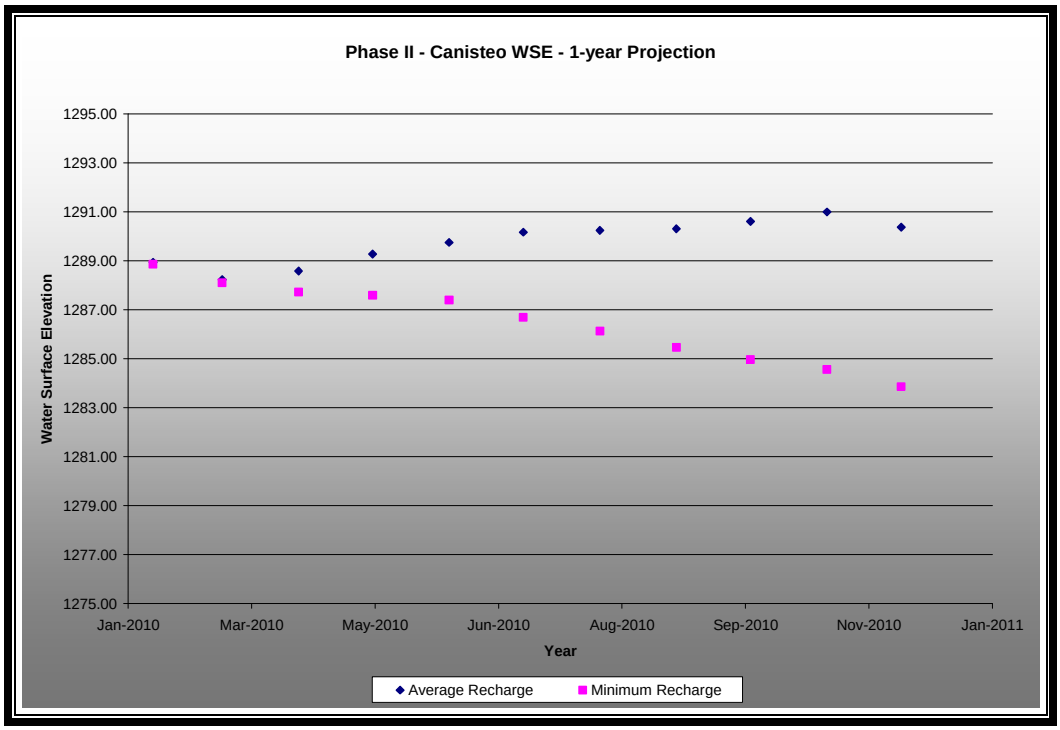
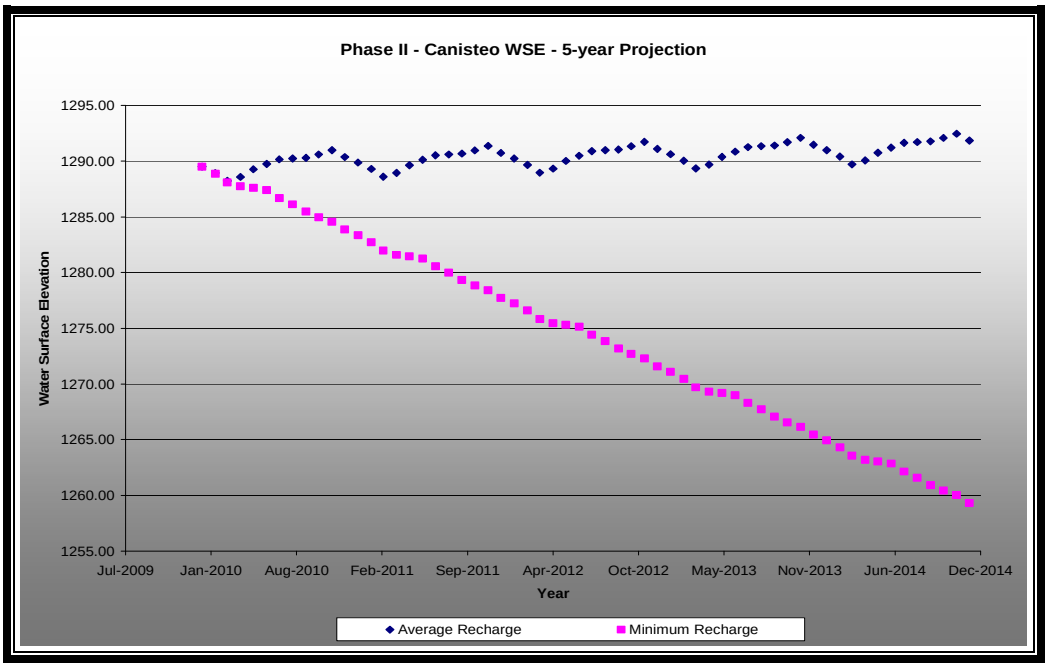


Figure 1.12-70 Modeled 5-Year Variation in CMP Water Levels



1.12.4.2.2D(1) Water Levels and Water Balance During Operation of Phase I and Phase II.

The CMP contains some land bridges that are below a water surface elevation of approximately 1,260 ft msl. The intended operation of the CMP will be to maintain water levels above 1,260 ft msl, unless such other levels are otherwise necessary or required.

The pit water surface elevation will be 1,290 ± 2 ft msl during a typical year. Water from the other pits will help to augment water levels in the CMP, and should help to prevent significant water level changes.

The GMMP will typically be operated in the range of 1,220-1,230 ft msl. Significantly higher flows are believed to be available if the water level in the HAMP is reduced below the now-submerged land bridge located between the GMMP and the HAMP. Discussions will be required between the Proponent and the MDNR to determine whether operation at greatly reduced water levels in the HAMP is advisable and, if so, under what conditions such operation would be desirable.

The LMP will be operated in the range of 1,190-1,250 ft msl during a typical year. The operating ranges in the GMMP and LMP will allow for storage of water during non-pumping periods. Pumping is unlikely to occur during the winter or if there is equipment failure or system maintenance needs.

Within the context of the permitting process, the Proponent will create a monitoring plan to record levels within the mine pits from which water supplies for the IGCC Power Station will be derived, levels within the receiving waters to which cooling tower blowdown will be discharged, and the pumping rates at which waters are transferred.

1.12.4.2.3 West Range Site Process Water Alternative 2

The Mississippi River is considered a potential water source for the supply of water to the Phase I and II IGCC Power Station. However, the 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 pit flooding issues of CMP and HAMP. For these reasons, Alternative 2 has been determined to be currently unnecessary and inferior to Alternative 1.

1.12.4.2.4 West Range Site Process Water Alternative 3

Consideration was 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 can only likely produce between 200 and 300 gpm. Therefore, 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 breadth of this well field, the effect of the drawdown on other nearby wells, and the connections that would have to be maintained would present insurmountable logistical problems. For these reasons, Alternative 3 has also been determined to be impracticable and inferior to Alternative 1. Alternative 3 also does not address the serious flooding issues presented by the Canisteo and Hill Annex pits.

1.12.4.3 East Range Process Water System

1.12.4.3.1 Water Supply Requirements

As shown in Section 1.12.4.1.1 in Table 1.12-12, the water supply required to serve the East Range IGCC Power Station is reduced in comparison to that required for the West Range IGCC Power Station. Figure 1.8-13 shows that cooling tower blowdown that would otherwise be discharged to receiving water (for example, Holman Lake in the case of the West Range IGCC

Power Station) is processed through an RO system to recover water that can be recycled within the Station. The brine wastewater from the RO is processed in a MVR evaporator/crystallizer that serves as the principal component of the ZLD system (see Section 1.6.6.3.2 for a description of the ZLD system applied to contact water cooling). Water recovered from the ZLD system is recycled for make up water where needed.

As shown in Table 1.12-12, water appropriations can be reduced by up to 700 gpm per phase through use of such recycling efforts. The auxiliary power required to operate the ZLD system is noted in Section 1.6.6.3.2 to be about 2 MW per phase. In addition, the TDS present in the East Range mine pit waters produces significant quantities of additional solids that must be disposed in an industrial solid waste landfill (see Section 1.8.5.1.3).

Although the ZLD system's power consumption and solids production are negatives in an economic context, the ZLD system allows the IGCC Power Station to play a synergistic role with the industrial mining operations seeking to locate on the East Range industrial site. The potential for such industrial synergies is discussed in Section 1.8.3.3. In the following section, potential opportunities for reusing water (turning what might be considered a waste stream from the mining entities into a source of water for the IGCC Power Station) are identified.

1.12.4.3.2 Process Water Alternatives

Sources of water to meet the needs of Mesaba One and Two on the East Range Site are identified in Table 1.12-18 below. The sustainable supply capability for each water source was estimated using information supplied by the MDNR, previous engineering studies, and information supplied by local government units. The actual sustainable rates that will be realized are dependent on several factors, including precipitation, evaporation, pit water level and hydrogeological conditions. These sources are shown relative to the location of the facility in Figure 1.12-71 and Figure 1.12-72, the latter of which shows the linking of the various mine pits and Colby Lake with Mine Pit 2 West Extension ("2WX").

Table 1.12-18
Water Supply Alternatives for the East Range IGCC Power Station

Abandoned Mine Pit	Estimated Range of Flow (gpm)	Information Source	Average Annual Flow (gpm)
Mine Pit 6		1	1,800
Mine Pit 2 WX		1	700
Mine Pit 2 West		1	900
Mine Pit 2 East		1	100
Mine Pit 3	150-450	2	300
Donora Mine Pit	130-380	2	260
Stephens Mine Pit	190-590	2	390
Knox Mine Pit	20-70	2	45
Mine Pit 9S	90-270	2	180
Mine Pit 1 Effluent	0-1000	3	1,000
PolyMet Mining Dewatering Operations	2,000-8,000	4	4000
Colby Lake	See Note 5	5	2,900*
		Total Resource (gpm)	12,600

1. East Range Hydrology Report, MDNR, Division of Lands and Minerals, Division of Waters, March 2004.
2. Range of flow based on the surface drainage area to the pit and average yearly rates of runoff. See Figure 1.12-71 to identify the watershed basins that contribute to the surficial input into each mine pit. This should be considered a first order approximation as 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.
3. MPCA NPDES Permit Issued to Mesabi Nugget. Mine Pit 1 effluent represents the wastewater discharged from Mesabi Nugget's permitted operation of Mine Pit 1 in accordance with terms of a NPDES Permit.
4. North Met Mine Environmental Assessment Worksheet.
5. MP–Cliffs-Erie Water Appropriation Permit No. 490135; Permitted withdrawal is 12,000 gpm average daily withdrawal over continuous 60-day average; 15,000 gpm peak; and 6,307.2 million gallons per year.

*Approximate average appropriation rate in CY2000

Figure 1.12-71 East Range Site Water Resources in Relationship to IGCC Power Station

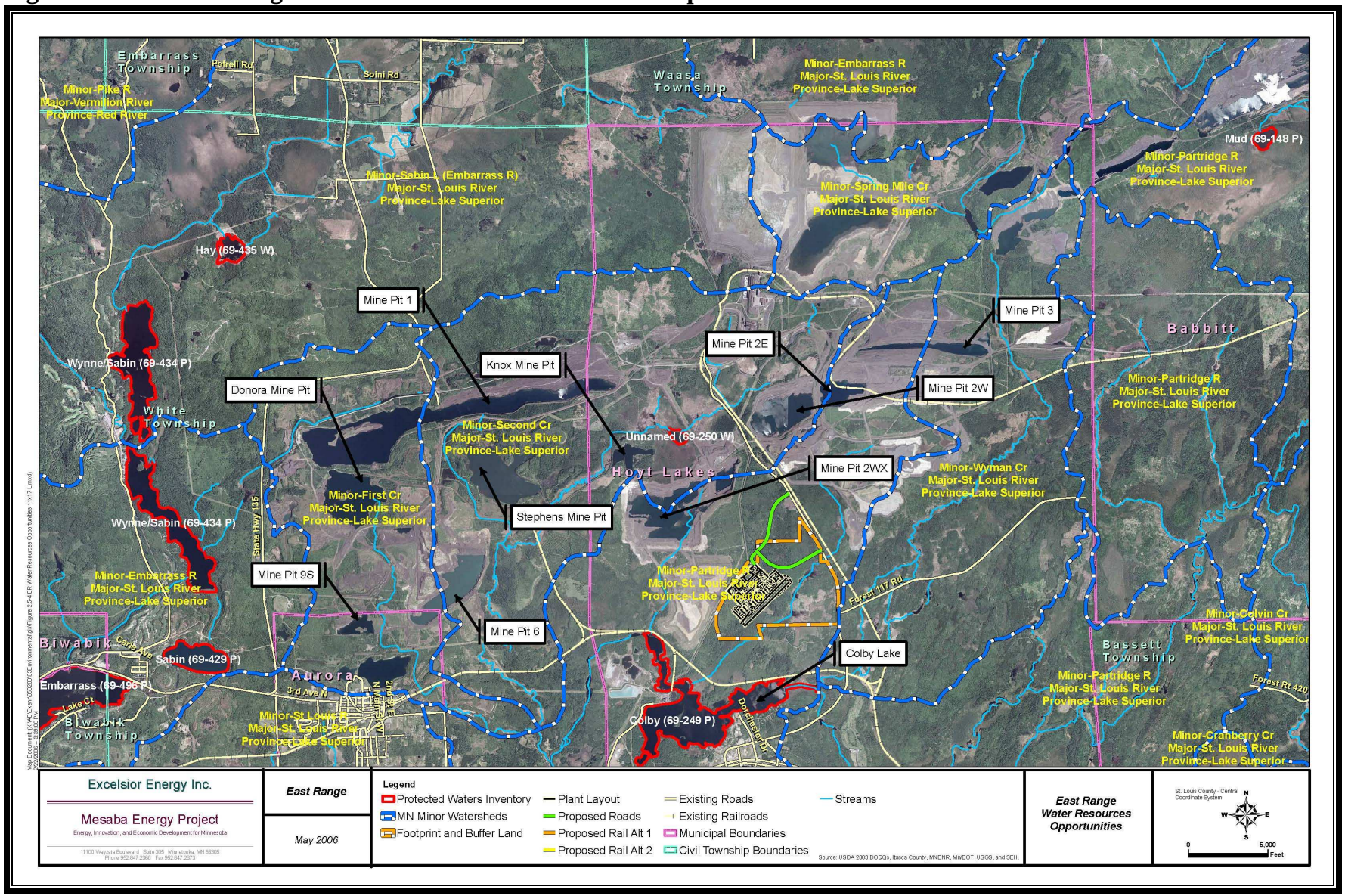
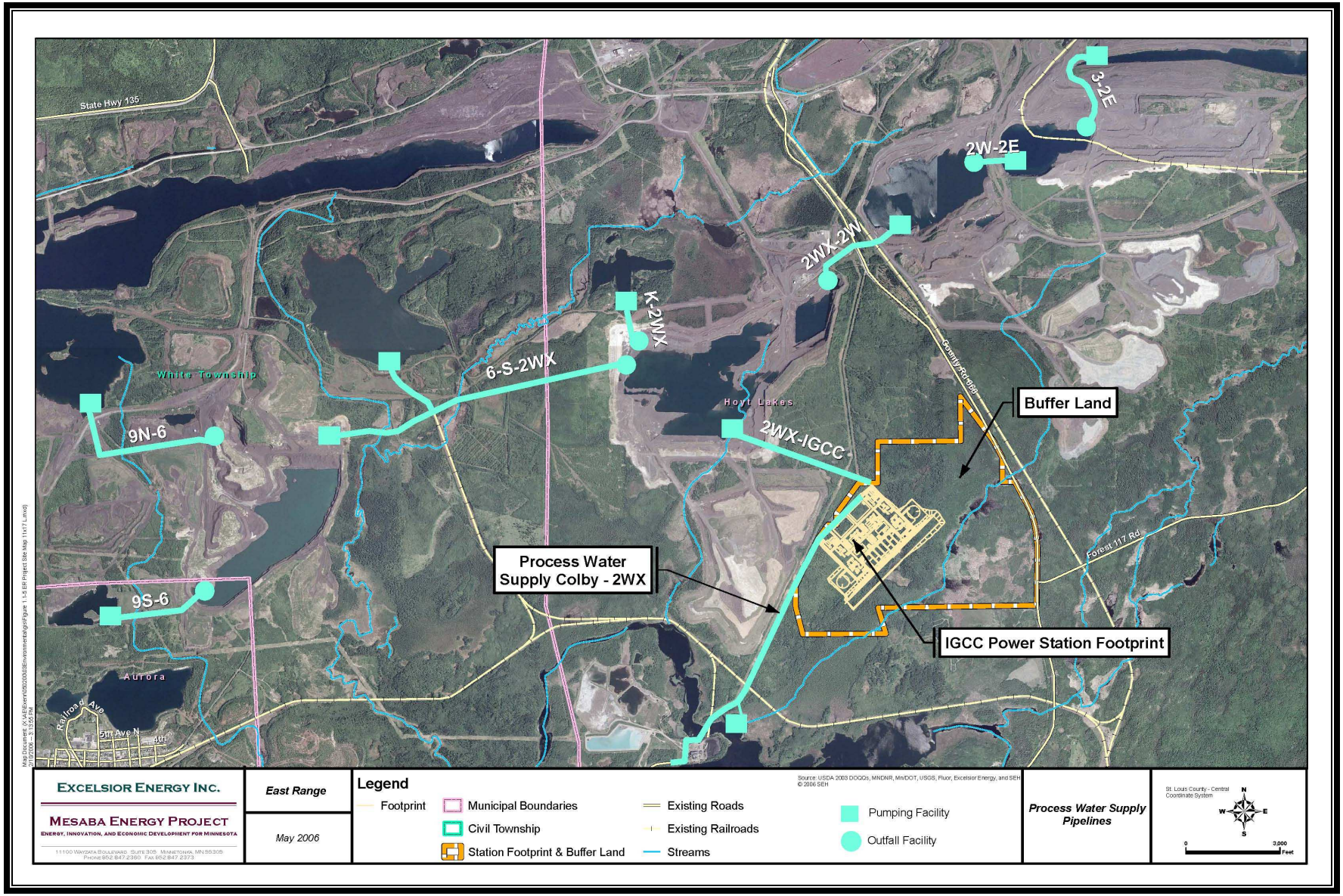


Figure 1.12-72 East Range Process Water Supply Pipeline Segments



Water levels in several of the pits are rising, but pose no current threat to public health and/or welfare unlike levels in the HAMP Complex and CMP. And, unlike the CMP and HAMP Complex, there is no current need to control water levels in any of the pits proposed for use on the East Range Site. Therefore, water supplies from any of the individual East Range pits can be over-pumped as necessary to meet demands of Mesaba One and Mesaba Two. As noted for the West Range IGCC Power Station, the water management plan for the East Range IGCC Power Station will be subject to environmental review and permitting process approvals. Mine Pit 2WX would serve as the reservoir from which the IGCC Power Station would appropriate water to meet its needs. This is similar to the function the CMP serves in the West Range Water Resource Management Plan. A permanent pumping station would be placed within 2WX and would receive input from one or more of the pits identified in Table 1.12-18 and shown in Figures 1.12-72 and 1.12-73. In the event of high inflow rates into Colby Lake during spring run off or during high precipitation events, water will be pumped from Colby Lake into 2WX.

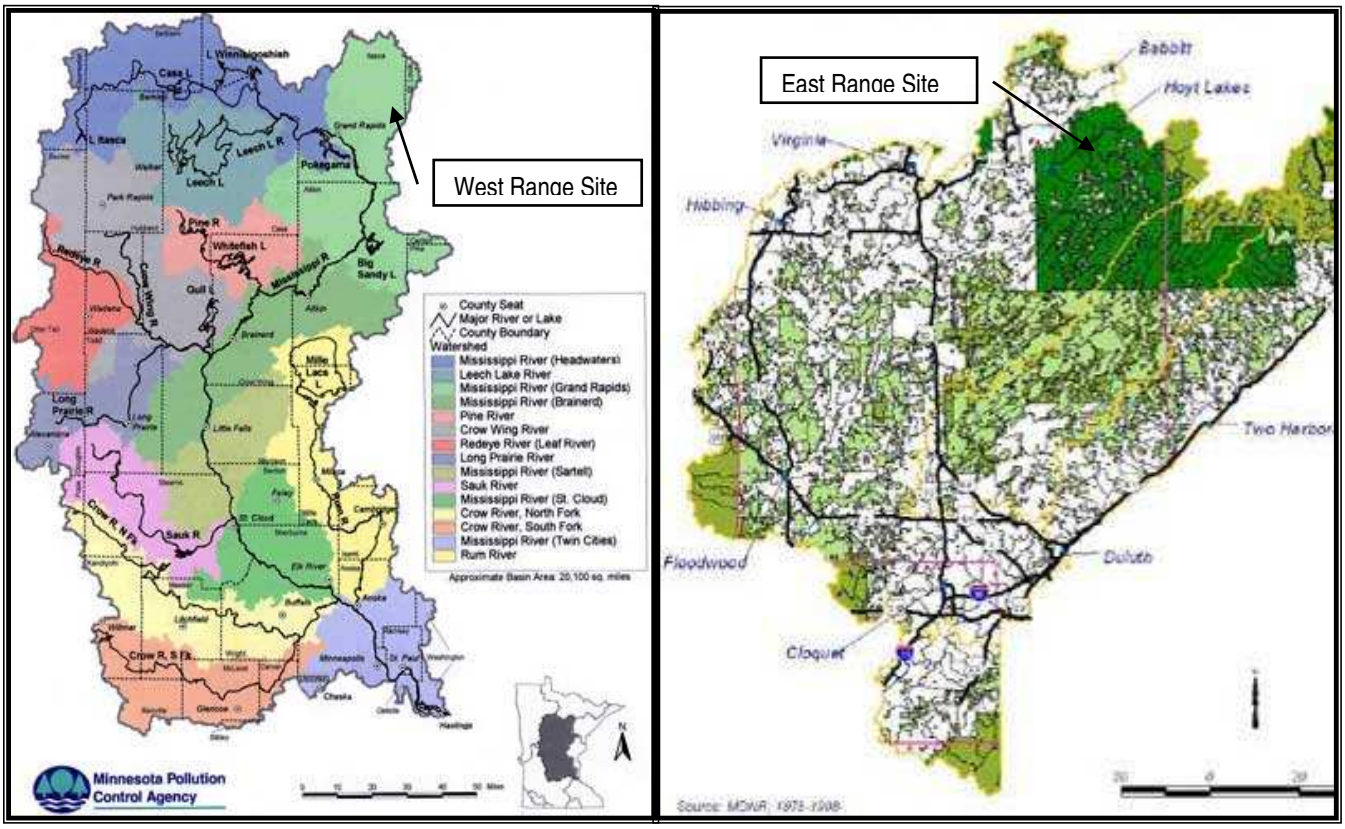
The total water available in these pits is considerable, having a combined surface area on the order of over 1,300 acres. The Proponent continues to refine its Water Resource Management Plan for the East Range IGCC Power Station, however, given the number of voluminous sources of water on the site, the flexibility of operating them over a wide range of water levels, and the capability of supplementing such sources with water from Colby Lake during periods of high flow, the amount of water to sustain Mesaba One and Mesaba Two over the long term is reasonably assured.

1.12.5 Process Wastewater Discharges

1.12.5.1 Site Independent Features

Site independent features of the IGCC Power Station related to water effluents are discussed in Section 1.8.2.1. As noted, such features include the use of a ZLD system to eliminate environmental impacts associated with wastewaters generated in the process of cleaning the syngas. The major difference between the preferred and alternate sites with respect to effluent discharge is how cooling tower blowdown is managed. In introducing the topic of effluent discharges in Section 1.8.2, the source of the difference between how cooling tower blowdown would be handled at each site was attributed to the different watershed basins within which the two sites are located. The West Range Site is located within the Upper Mississippi Basin watershed and the East Range Site is located in the Lake Superior Basin watershed. The specific location of each site within its own watershed basin is presented in Figure 1.12-73 below.

Figure 1.12-73. Preferred and Alternate Site Locations Within Their Watershed Basins



1.12.5.2 West Range Site Process Water Discharges (Cooling Tower Blowdown Only)

1.12.5.2.1 Regulatory Requirements in Upper Mississippi River Basin Watershed

Water quality criteria applied to waters located within the Upper Mississippi River basin are defined at Minn. R. ch. 7050. At Minn. R. 7050.0185 ("Non-Degradation for All Waters"), subp. 5 ("Determination of Significance"), the rule states:

> A person proposing a new or expanded discharge of sewage, industrial waste, or other wastes shall submit to the commissioner the information required to determine whether the discharge is significant under subpart 2. If the discharge is sewage, the flow rate used to determine significance under this part is the design average wet weather flow for the wettest 30-day period. For discharges of industrial and other wastes, the flow rate to be used is the design maximum daily flow rate. In determining the significance of a discharge to a lake or other nonflowing receiving water, a mixing zone may be established under the guidelines of part 7050.0210, subp. 5.

At Minn. R. 7050.0210 ("General Standards For Dischargers to Waters of the State"), subp. 5 ("Mixing Zones"), the rule states:

> Subp. 5. **Mixing zones.** Reasonable allowance will be made for dilution of the effluents, which are in compliance with part 7050.0211 or 7050.0212, as applicable, following discharge into waters of the state. The agency, by allowing

dilution, may consider the effect on all uses of the waters of the state into which the effluents are discharged. The extent of dilution allowed regarding any specific discharge as specified in subpart 7 shall not violate the applicable water quality standards. Means for expediting mixing and dispersion of sewage, industrial waste, or other waste effluents in the receiving waters are to be provided so far as practicable when deemed necessary by the agency to maintain the quality of the receiving waters in accordance with applicable standards. Mixing zones must be established by the agency on an individual basis, with primary consideration being given to the following guidelines:

A. Mixing zones in rivers shall permit an acceptable passageway for the movement of fish.

B. The total mixing zone or zones at any transect of the stream should contain no more than 25 percent of the cross sectional area and/or volume of flow of the stream, and should not extend over more than 50 percent of the width.

C. Mixing zone characteristics shall not be lethal to aquatic organisms.

D. For contaminants other than heat, the FAV, as defined in part 7050.0218, subpart 3, item O, for toxic pollutants should not be exceeded as a one-day mean concentration at any point in the mixing zone;.

E. Mixing zones should be as small as possible, and not intersect spawning or nursery areas, migratory routes, water intakes, nor mouths of rivers.

F. Overlapping of mixing zones should be minimized and measures taken to prevent adverse synergistic effects.

This subpart applies in cases where a Class 7 water is tributary to a Class 2 water.

The most stringent water quality criterion for mercury in all waters within the Upper Mississippi Basin watershed is 6.9 nanograms per liter (chronic standard). The median concentration of mercury in water recently sampled in the main pits from which water supplies for the IGCC Power Station would be appropriated is 0.9 nanograms per liter. The combination of the water quality criterion and the potential allowance of a mixing zone provides some operational flexibility for the plant. For example, the cooling tower can be cycled up almost eight times, thereby reducing the quantity of make-up water to the cooling towers.

1.12.5.2.2 West Range Site Effluent Discharge Alternative 1

Alternative 1 is described in detail in Section 1.8.2.2.2 and an extensive discussion of other alternatives is provided in the NPDES Permit Application attached as Appendix 6 in the Joint Application.

The outfalls associated with the discharge of cooling tower blowdown – Outfalls 001 and 002 – are shown in schematic form in Figure 1.8-11a and on an aerial photograph in Figure 1.8-12.

1.12.5.2.2A Justification for Alternative 1

Holman Lake and the CMP and HAMP are not impaired waters. However, the water from those water bodies, either now or in the future, will ultimately discharge into the Swan River, which is impaired for mercury and dissolved oxygen.[18] The Swan River flows into a reach of the Mississippi River (between the Swan River and Sandy River) that is also impaired for mercury. Other downstream reaches of the Mississippi River are also impaired for fecal coliform, PCBs, dissolved oxygen, and turbidity. Cooling tower blowdown will not contain fecal coliform or PCBs. Any turbidity discharged will be minimal and will meet numerical effluent limits.

Information provided in the remainder of this section demonstrates that the proposed IGCC Power Station discharge will not cause or contribute to the impairment of the water bodies downstream of the proposed discharge, and is therefore licensable under the Clean Water Act.

1.12.5.2.2A(1) No Mercury or Phosphorus will be added to Water Discharged from the IGCC Power Station

The operation of the IGCC Power Station will not add mercury, phosphorus or other pollutants that are associated with impairment concerns to the receiving waters. There will be no added mercury or phosphorus to the proposed Outfall 002 discharge into Holman Lake. Waste streams that will be discharged from the IGCC Power Station will consist primarily of cooling tower blowdown blended with relatively low-flow additional wastewater streams from other plant systems (including HRSG blowdown, boiler feed water demineralizers and intermittent treated water from the oil/water separator serving the plant drainage system). All other contact process water is managed and treated in the ZLD system. All sanitary wastewater will be sent to a nearby POTW.

1.12.5.2.2A(2) Mass Discharge from IGCC Power Station will be Lower than Current Discharges

The proposed operation of the Phase I IGCC Power Station will result in no increase in the mass of mercury or phosphorus over that currently permitted from the HAMP Complex under NPDES Discharge Permit MN0030198. The MDNR also holds a water use permit, No. 510144 for appropriating water from the HAMP. General permit information is summarized in Table 1.12-19 and a copy of the HAMP Complex NPDES Permit is attached as Appendix E of the Joint Application. The MDNR has been pumping water from the HAMP since the 1989 timeframe to control water levels in the pit, and has discharged the water into Panasa Lake and ultimately to the Swan River.[19] Prior to 1989, the HAMP Complex was pumped to allow mining activities.

---

[18] The Clean Water Act requires states to publish, every two years, an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list, is based on violations of water quality standards and is organized by river basin. The most recent draft of the State's list of impaired waters was placed on the MPCA's web site on December 19, 2005 (MPCA,2005b). The draft list indicates that the entire length of the Swan River from Swan Lake to the Mississippi River is listed as impaired for dissolved oxygen ("DO") and mercury. See http://www.pca.state.mn.us/water/tmdl/index.html.

[19] Discharges of Canisteo Mine Pit water to the Swan River watershed has also occurred during past mining operations. NPDES permits for those discharges are available in MPCA files but detailed records of actual pumping activities are limited.

Table 1.12-19
Summary of Hill-Annex Mine Pit NPDES and Appropriations Permits

Permit Number	Date Issued	Expiration Date	Permit Holder	Average Discharge Rate (MGD/ gpm)	Maximum Discharge Rate (MGD/ gpm)	Annual Average Discharge Volume (acre-feet)	Receiving Water Body
NPDES Permit							
0030198	June 3, 2003	May 31, 2008	MDNR	4.5/3,125	9.0/6,250	--	Panasa Lake
Appropriations Permit							
510144	Not available	NA	MDNR	10.08/7,000	--	10,485	--

The mass of a constituent permitted to be discharged to the Swan River watershed under the existing HAMP pumping permit was estimated by using the average discharge rate in the NPDES permit and an assumed mine pit water concentration based on the analytical results from the Hill-Annex Mine Pit. The estimated mass of mercury and phosphorus permitted annually is shown in Table 1.12-20.

Table 1.12-20
Estimated Annual Mass Permitted for Discharge to the Swan River Watershed From the Hill-Annex Mine Pit

Constituent	Estimated Concentration	Permitted Average Annual Discharge Rate	Permitted Annual Mass Discharge
Mercury	0.9 ng/L	3,125 gpm	5.6 g
Phosphorus	0.1 mg/L		621 kg

The Proponent will operate the IGCC Power Station within parameters that assure that the actual mass of mercury and phosphorus discharged to the Swan River will not exceed that currently allowed under the existing MDNR NPDES permit. The mass discharged will be the sum of each constituent associated with:

1. Water discharged into Holman Lake at Outfall 002 from the IGCC Power Station or the CMP (Mercury and phosphorus contained in the minor volume water streams that ultimately flow to the ZLD system need not be considered in the water discharge mass balance calculations. Similarly, mercury volatized in the cooling towers or in the processes is expected to be negligible and is not considered in this calculation).
2. Water pumped to Panasa Lake from the HAMP Complex for water level control permitted under existing NPDES Permit MN0030198.

The results of mass balance calculations, based on expected source water quality (see Table 1.8-20), expected IGCC Power Station operation, and assumed HAMP Complex water level management pumping rates are shown in Figure 1.12-74 (mercury) and Figure 1.12-75 (phosphorus). The mass balance calculation demonstrates that mercury and phosphorus

discharged from Outfall 002 and the existing Panasa Lake outfall will be maintained at annual quantities equal to or less than that allowed under the current permit.

Figure 1.12-74
Annual Mass of Mercury Discharged to Holman Lake

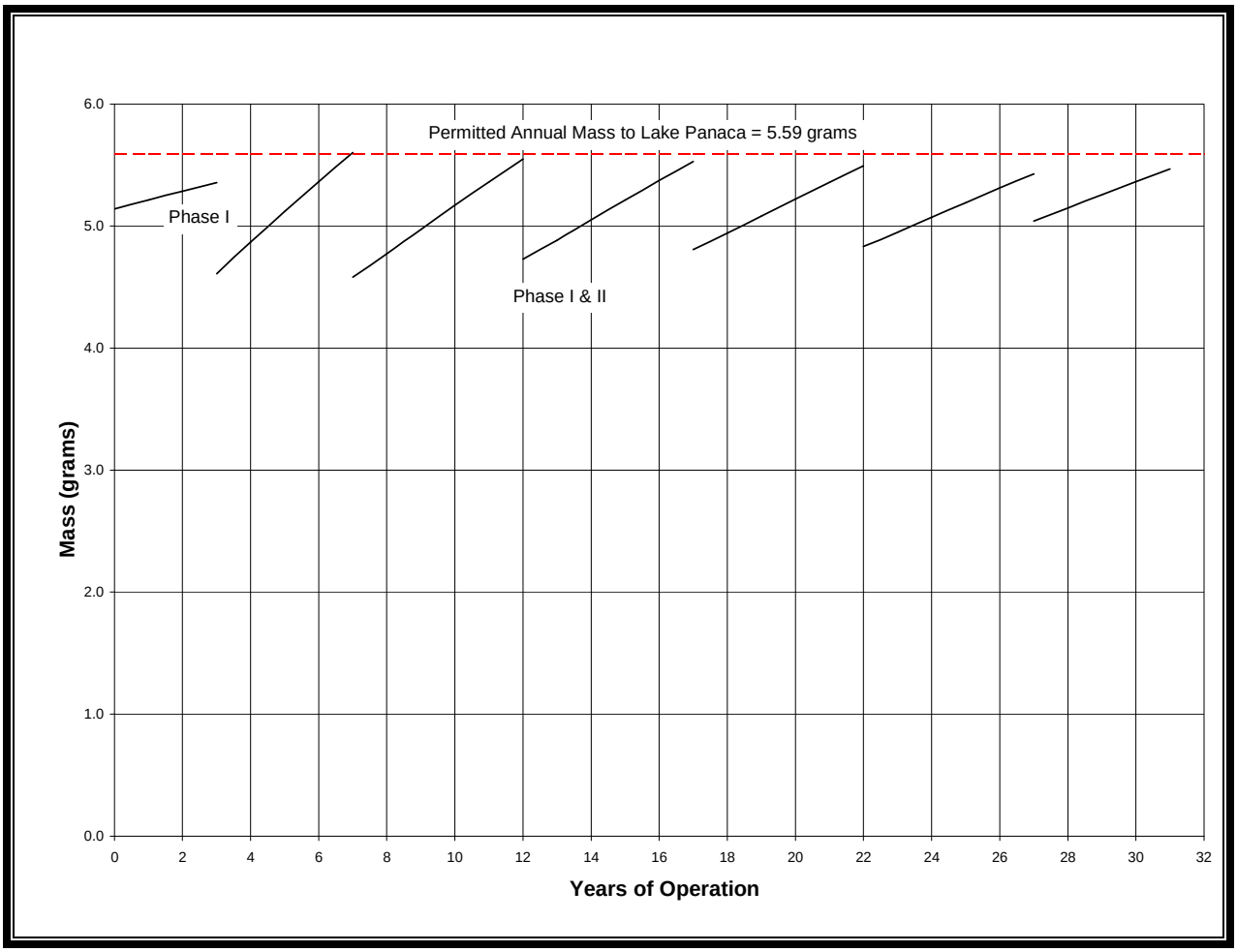
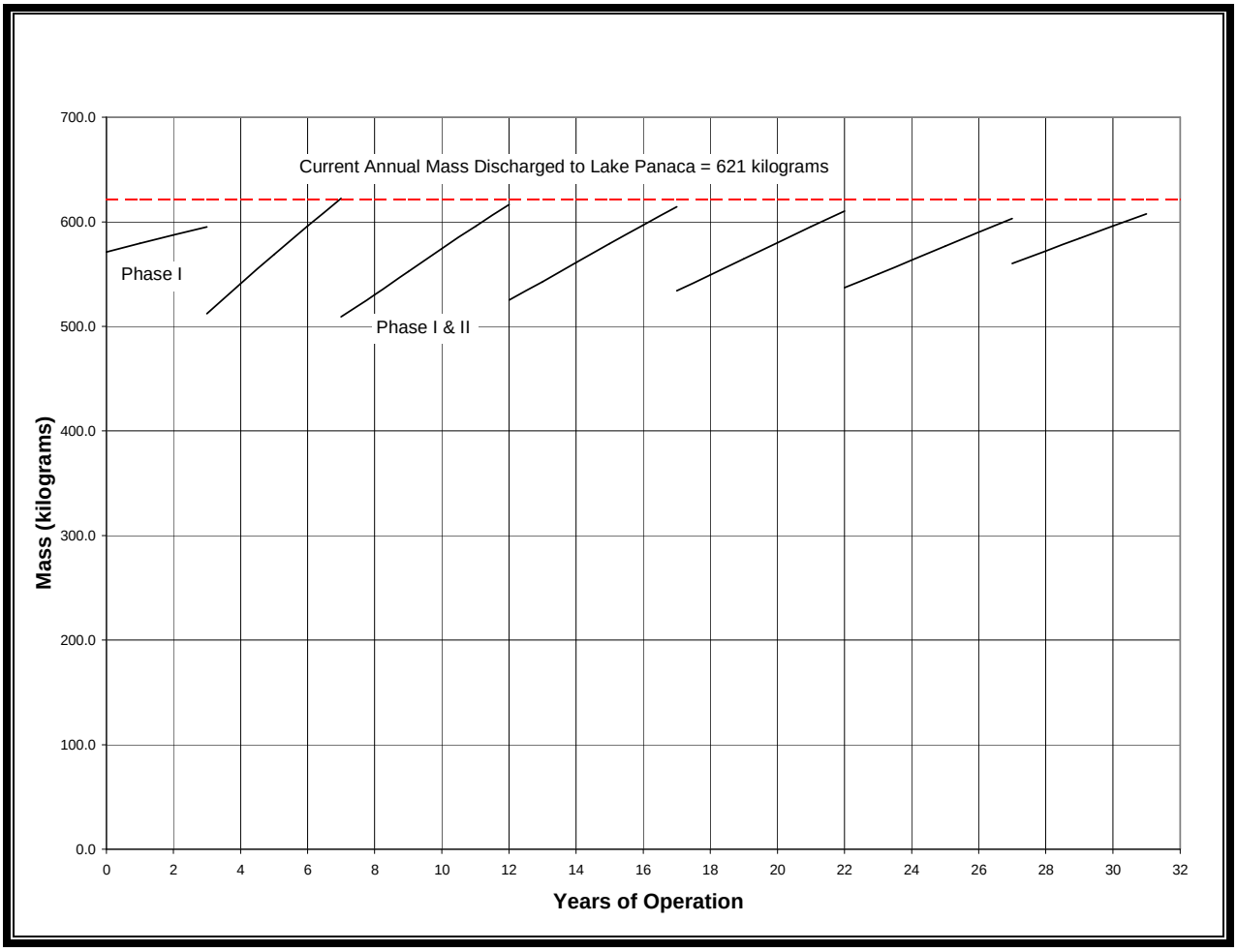


Figure 1.12-75
Annual Mass of Phosphorus Discharged to Holman Lake



1.12.5.3 East Range Site

1.12.5.3.1 Regulatory Requirements in Lake Superior Basin Watershed

Water quality criteria applied to waters located within the Lake Superior Basin are defined at Minn. R. ch. 7052. At Minn. R. 7052.0211, subp. 3 ("Mixing zones for bioaccumulative chemicals of concern [BCC]"), the rule states:

> After March 9, 1998, acute and chronic mixing zones shall not be allowed for new and expanded discharges of bioaccumulative chemicals of concern (BCC) to the Lake Superior Basin.

Paragraph K of Minn. R. 7052.0350 confirms mercury as both a BCC and a bioaccumulative substance of immediate concern. The water quality criterion for mercury in all waters within the Lake Superior Basin watershed is 1.3 nanograms per liter concentration. The combination of this criterion and the elimination of a mixing zone for BCCs is of great concern to facilities that would otherwise try to operate cooling towers within the Lake Superior Basin watershed. The reason for the concern arises because the median concentration of mercury in water recently

sampled in two of the main pits from which water supplies for the IGCC Power Station would be appropriated is on the order of 0.75 nanograms per liter. This means that the cycles of concentration at which the cooling towers could operate would be reduced so severely so as to preclude their use.[20]

The most effective solution for dealing with the mercury discharge issue on the East Range Site is to totally eliminate the discharge of cooling tower blowdown. This can be done by enlarging the zero liquid discharge system to handle all of the IGCC Power Station's non-domestic wastewater streams. In this configuration, the IGCC Power Station would be designed to evaporate whatever water that cannot be reused in the plant processes and leave only a solid stream of salts for disposal at a licensed treatment/disposal facility. This scheme would significantly increase the cost of the IGCC Power Station but would allow for the utilization of the East Range Site.

A schematic diagram showing how the ZLD system would be integrated into the design of Mesaba One and Mesaba Two is shown in Figure 1.8-13.

1.12.5.3.2 East Range Site Alternatives for Managing Cooling Tower Blowdown Limited to ZLD

Discharge of cooling tower blowdown to any receiving waters in the Lake Superior Basin watershed is likely infeasible in the absence of use of an existing permit having sufficient discharge rights, and whose operating authority could be transferred to the Proponent. The Proponent is not aware of the existence of any such permits.

The Hoyt Lakes POTW was considered as an alternative, but was determined to not have sufficient existing capacity to manage the quantities of cooling tower blowdown that would be produced. In addition, an expansion of the existing system could not be done without a major non-degradation study.

These options, in addition to the unproven prospect of treating the IGCC Power Station's cooling tower blowdown to remove mercury, were deemed less likely to be approved than the ZLD system described above.

Expanding the capacity of the ZLD system would leave domestic wastewater as the only effluent discharge from the IGCC Power Station on the East Range Site. The alternatives for dealing with this waste stream are identified in the following section.

1.12.6 Domestic Wastewater Treatment Alternatives

1.12.6.1 Site Independent Features

The Proponent has several options from which to choose in treating its domestic wastewaters. They include treating such wastewaters via tertiary treatment processes and discharging effluents

[20] If the end-of-the-pipe standard for mercury is less than twice the value of the mercury concentration measured in the water to be used for cooling, the amount of water that could be evaporated prior to being discharged in compliance with the 1.3 nanogram per liter standard would be minimal. The use of the cooling towers in such a manner would resemble a once-through cooling system, result in extreme pumping costs, and provide practically no margin of error to comply with the Lake Superior Basin's water quality criterion for mercury.

to local surface water, using a septic system, or discharging to a local POTW. These options represent the best alternatives for both the West and East Range Sites.

1.12.6.1.1 Estimated Domestic Wastewater Flows

About 1,500 construction personnel are expected to be on site during periods of peak construction activity associated with Mesaba One and Mesaba Two. Assuming each worker would generate an average of 30 gallons of wastewater per day, the estimated peak wastewater flows from the West Range Site during construction would be about 45,000 gallons per day ("gpd"). Construction activities associated with Mesaba One are projected to take approximately 44 months.

Construction of Mesaba Two would overlap activities associated with construction of Mesaba One. Mesaba Two is expected to be complete about 24 months after Mesaba One begins commercial operation. Peak construction periods associated with each phase are expected to be staggered in such a way that peak construction activities for Mesaba One would not overlap with those for Mesaba Two.

At the conclusion of construction, the number of permanent personnel at the Phase I IGCC Power Station would number about 110 people (see Table 1.10-2 in Section 1.10.1.2). The volume of wastewater generated by each person during operation versus that during construction is expected to be higher due to the use of showers and locker room facilities. During operation each person will generate about 30 gallons of wastewater per day. Therefore the expected amount of domestic wastewater generated per day during operations would total about 3,300 gpd. This total does not reflect the likelihood that the number of people on site at any one time will be greater than the operations staff due to the presence of equipment contractors, outage crews, and tour groups.

The operational work force for Mesaba Two would number about 75 individuals (that is, somewhat fewer than that required for Mesaba One due to the overlap with Mesaba Two of managerial responsibilities, supervisory and administrative personnel responsibilities, and some maintenance). The overall operational work force for Mesaba One and Two is expected to total about 185 people. Using the 30 gpd wastewater generation rate identified above, the expected amount of wastewater from Mesaba One and Two would total about 5,500 gpd.

To accommodate the additional flows as a result of the added number of people on site during tours, special maintenance/construction activities, and outages, the capacity of the system will be set at 7,500 gpd. This added capacity adds the capability to accommodate about 140 additional individuals on-site during operation of Mesaba One and an additional 70 individuals during operation of Mesaba One and Two. This flow is based on Mesaba One and Two having restrooms, locker rooms, showers, and break room facilities.

1.12.6.2 West Range Site

1.12.6.2.1 Alternatives Considered

The Proponent has evaluated two options for treating and disposing domestic wastewaters produced during construction and operation of Mesaba One and Mesaba Two. The first option involves constructing a wastewater treatment facility ("WWTF") to treat domestic wastewater on site and releasing treated effluents to Little Diamond Lake or adding the treated effluent to the

cooling tower blowdown stream that is discharged to the CMP and Holman Lake (see Section 1.8.2.2.2). The second option involves connecting to the Coleraine-Bovey-Taconite POTW at the Taconite pump station located approximately 2 miles south of the West Range IGCC Power Station. The Proponent has selected the latter alternative as its preferred approach.

1.12.6.2.1A Existing POTWs

The cities of Taconite, Bovey and Coleraine have a joint wastewater commission that manages the POTW located in Coleraine, approximately 4 miles southwest of the West Range IGCC Power Station Footprint. The POTW receives wastewater from the three cities and discharges treated effluent to the Swan River. The system has a design capacity of 499,000 gpd and received an average flow of 334,000 gpd during the period from January 1 through May 31, 2005. During the wettest 30-day period, the system received an average of 444,000 gpd with a peak day of 969,000 gpd. During the wettest period of the year, and under peak construction activities, the Coleraine POTW would be operating at its peak design capacity. On peak days, the POTW would be already overloaded.

1.12.6.2.1B Swan River On List of State's Impaired Waters

The Clean Water Act requires states to publish, every two years, an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list, is based on violations of water quality standards and is organized by river basin. The most recent draft of the State's list of impaired waters was placed on the MPCA's web site on December 19, 2005 (MPCA, 2005b). The draft list indicates that the entire length of the Swan River from Swan Lake to the Mississippi River is listed as impaired for dissolved oxygen ("DO") and mercury. NPDES permit applications for new or expanded dischargers requesting to use the Swan River as a receiving water must prove their discharges will not cause or contribute to the impaired status under the Clean Water Act,

1.12.6.2.1C Minnesota Pollution Control Agency's Phosphorus Strategy (Minn. R. 7050.0211 subp. 1a)

While there is currently no water quality standard for phosphorus, the MPCA has a current practice of limiting such discharges to 1.0 mg/L at the end-of-the-pipe. In practice, however, a discharger able to meet this limit may still be prohibited by the MPCA from obtaining a permit if the Agency has reason to believe that measurable quantities of phosphorus would be released upstream of a receiving water impaired for DO. The proponents have taken care to avoid the use of phosphorus-containing chemicals to minimize the impact of the Agency's current practice in this regard.

1.12.6.2.2 Domestic Wastewater Alternative No. 1

The first alternative would consist of constructing adjacent to and southwest of the IGCC Power Station a stabilization pond WWTF with the capacity to treat 45,000 gallons of domestic wastewater per day (the maximum projected flow from Mesaba One and Two). Once the Phase I IGCC Power Station is placed into operation the WWTF would receive a maximum of 7,500 gallons of domestic wastewater per day due to the reduced staff required to operate the station relative to that required to construct it. Due to the decrease in domestic wastewater flow, part of the WWTF would be closed and abandoned in accordance with Minnesota Rules. Other

modifications would be made to the WWTF at this time to link it to the IGCC Power Station's domestic wastewater collection system.

Once treated, effluent from the WWTF would be routed off-site through i) an 8-inch diameter gravity sewer pipeline to Little Diamond Lake (located approximately 1.4 miles south-southeast of the IGCC Power Station) or ii) via the cooling tower blowdown line leading to the CMP and/or Holman Lake. Figure 1.12-75 illustrates the location of Domestic Wastewater Alternative 1 and its supporting infrastructure.

The MPCA's preliminary discharge limits for Little Diamond Lake and Holman Lake are 25 mg/l biochemical oxygen demand ("BOD"), 45 mg/l total suspended solids ("TSS"), and 1 mg/l total phosphorus ("TP"); see Minn. R. 7050.0211, subps.1, 3B, and 1a, respectively. The stabilization pond facility would be able to meet the BOD and TSS limits. However, in order to meet the TP limit, some chemical addition would be required before the effluent is discharged from the WWTF. To remove phosphorous, either ferric chloride or alum would be applied to the pond prior to discharging treated wastewaters. Alternative 1 would require a part-time licensed operator on-site to monitor discharges and assure the WWTF meets the monitoring and discharge requirements specified in the NPDES permit.

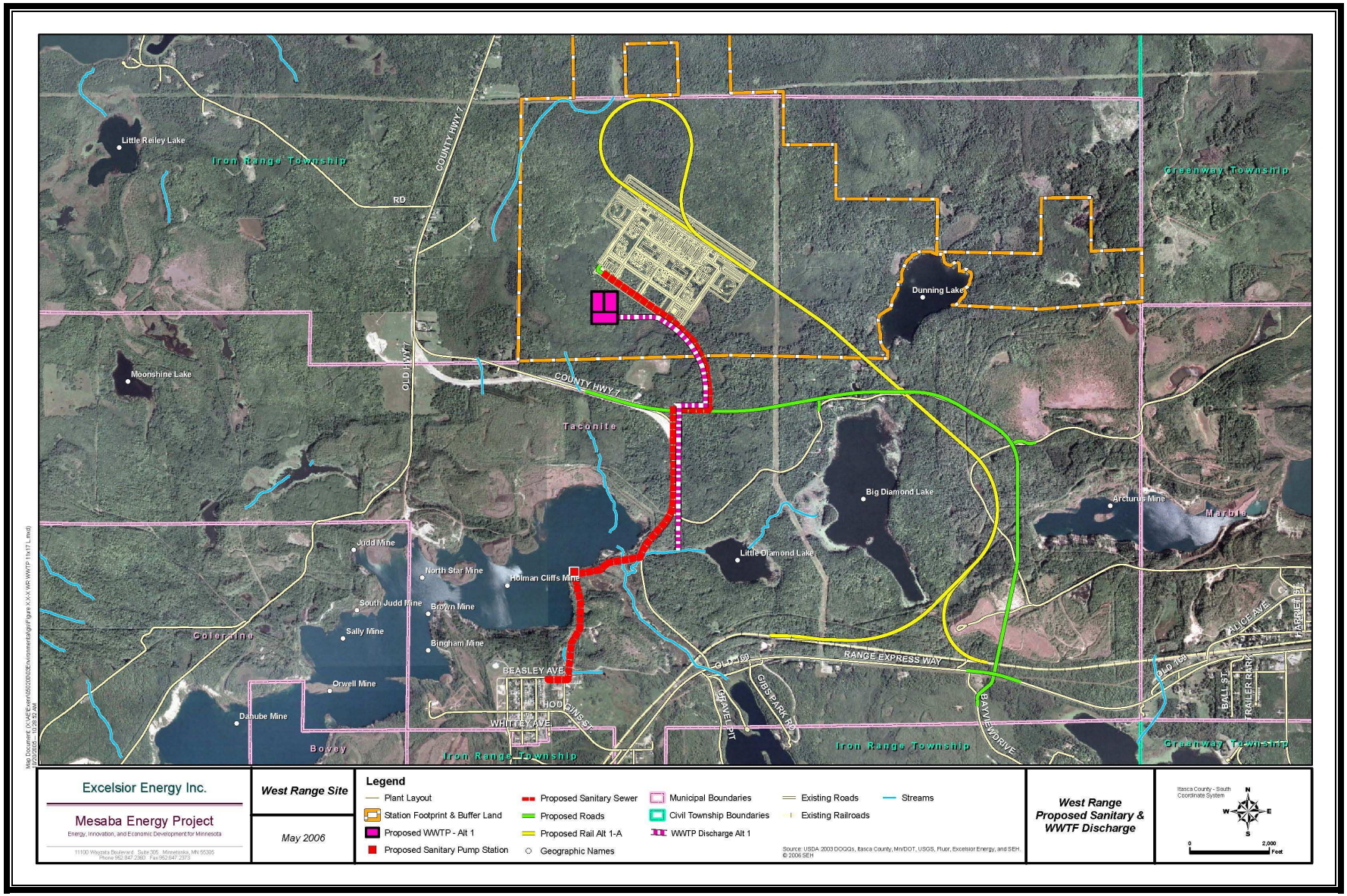
The Proponent would be required to obtain a new NPDES permit to discharge treated domestic wastewaters to Little Diamond Lake or to the CMP and/or Holman Lake. Although treatment to reduce phosphorus levels is available, present uncertainties associated with concerns over new or expanded discharges to waters impaired for phosphorus and dissolved oxygen make this alternative less likely of being approved without controversy. Treated wastewater effluent from the IGCC Power Station that is discharged to either of these receiving waters could increase the level of these nutrients and cause algae and other aquatic plant growth. Additional information on the wastewater effluent characteristics is provided in Section 1.8.2.2.4.

Water quality standards for DO and mercury for the Swan River are provided in Table 1.12-21

Table 1.12-21
Water Quality Criteria Standards for the Swan River

Parameter	2B	Comments
Dissolved Oxygen, DO	5.0 mg/l as a daily minimum	Class 2B standard may be modified on a site-specific basis except that no site-specific standard shall be less than 5 mg/l as a daily average and 4 mg/l as a daily minimum.
Mercury	0.0069 μg/l	Class 2B standard shown is a chronic standard ("CS") that is far more stringent than either the maximum standard ("MS") or the final acute value ("FAV")
Applicable Water Quality Standard	Minn. R. § 7050.0222 subp.4	

Figure 1.12-76. Domestic Wastewater Treatment Options for West Range IGCC Power Station



If the U.S. EPA overturned the MPCA's decision of placing the Swan River on the list of impaired waters for DO, the Proponent would still be required to show that the treated domestic wastewaters from Mesaba One and Mesaba Two would not cause or contribute to impairment of Lake Pepin.

Alternative 1 would require a construction ROW 50 feet wide and a permanent ROW 30 feet wide resulting in a total impact of approximately 10 acres and 6 acres, respectively. Section 2 and 3 of this EIV provide a discussion of the affected environment and potential environmental consequences along the pipeline corridor.

1.12.6.2.3 West Range Domestic Wastewater Alternative 2

The second option available to dispose of domestic wastewaters produced by the IGCC Power Station would be to connect the Station to the Coleraine-Bovey-Taconite wastewater collection and treatment system. This would consist of constructing approximately 10,000 feet of 12-inch gravity sewer pipeline, a pump station, and 2,400 feet of force main from the West Range IGCC Power Station, in a southerly direction, to the City of Taconite's main pump station, located in the northeast corner of the City.

Domestic Wastewater Alternative 2 will require a construction ROW 50 feet wide and a permanent ROW 30 feet wide resulting in a total impact of approximately 14 acres and 8 acres, respectively. Figure 1.5-7 illustrates the route for the domestic wastewater sewer system to connect to the City of Taconite's system.

The 12-inch sewer pipeline, pump station, and force main would have ample capacity to convey the maximum projected wastewater flow of 45,000 gpd during construction (and the 7,500 gpd expected flows for the operational phase of Mesaba One and Mesaba Two) and the existing Coleraine-Bovey-Taconite POTW has capacity available to treat such quantities.

Alternative 2 holds several advantages over the on-site treatment option. First, the gravity sewer system would be an asset to the City of Taconite allowing future connections to other residential, commercial or industrial establishments north and east of the City. Second, the Proponent would not be required to hire an operator to monitor the system. Third, potential concern surrounding the addition of a new outfall discharging effluent from a domestic wastewater treatment system to public waters impaired for dissolved oxygen and nutrients would be avoided.

One issue concerning Taconite's collection system is the amount of inflow and infiltration ("I/I") entering the system during periods of rainfall or high groundwater. At such times, excess flow can exceed the capacity of the main wastewater pump station in Taconite, creating a need to bypass untreated wastewater into a natural pond system. Larger pumps could be installed in the pump station to remedy this problem or the City's collection system could be rehabilitated to prevent extraneous water from entering the sewers. The amount of I/I entering the Taconite collection system can cause the natural pond system to overflow, releasing untreated wastewater into nearby surface waters.

1.12.6.2.4 Conclusions: Treatment of Domestic Wastewaters

Alternative 2 is considered the preferable approach for treating domestic wastewaters because it is advantageous to the community, avoids issues surrounding new and expanded discharges to impaired waters, and is environmentally preferable.

1.12.6.3 East Range Domestic Wastewater Treatment

As noted in Section 1.12.6.1 the two primary options available for wastewater treatment and disposal for the East Range IGCC Power Station include constructing a wastewater treatment facility to treat domestic wastewaters on site or connecting to the existing Hoyt Lakes POTW. The estimated flows to be handled by the domestic wastewater treatment facility during construction and operation are provided in Section 1.12.6.1.1.

1.12.6.3.1 Regulatory Setting

The MPCA has designated Colby Lake and the Partridge River as impaired for mercury and fish consumption (see listings of impaired waters approved by the U.S. EPA and the new 2006 list drafted by the MPCA on the MPCA's web site at http://www.pca.state.mn.us/water/tmdl/index.html#tmdl). However, neither is listed for nutrients or DO. As well, the St. Louis River (of which the Partridge River is a tributary) from its headwaters to its discharge into Lake Superior is not listed as impaired for nutrients or DO. Finally, Lake Superior is not listed as impaired for either nutrients or DO. Therefore, the MPCA's Phosphorus Strategy (see Section 1.12.6.2.4) applies and would require that the proposed WWTF meet a limit of 1 mg/l total phosphorus ("TP").

1.12.6.3.2 Existing Wastewater Facilities

The East Range IGCC Power Station is located approximately 1.6 miles north of CR 110, the main road cutting through the City of Hoyt Lakes. The City of Hoyt Lakes owns, operates and maintains a POTW comprised of a wastewater collection system and wastewater treatment units. The POTW receives wastewater from the residential, commercial and industrial establishments within the city and discharges treated effluent to Whitewater Lake. The system has a design capacity of 680,000 gpd and receives an average flow of approximately 300,000 gpd.

1.12.6.3.3 On-Site WWTF Alternatives

There are many styles of WWTFs but most fall into the two categories of pond systems and mechanical plants (usually activated sludge). A stabilization pond facility will require chemical application to meet the TP limit. An activated sludge facility can remove phosphorus biologically, which is dramatically cheaper than chemical removal. However for the relatively small treatment facility needed for the volume of wastewater produced by the project, the capital cost and O&M costs for an activated sludge facility would far exceed the cost savings recognized from biological phosphorus removal. Due to the high capital and O&M costs, an activated sludge facility was eliminated as an option.

1.12.6.3.4 Alternative 1: On-Site Wastewater Treatment

This alternative would consist of constructing a stabilization pond facility with the capacity to treat 45,000 gpd at a location near the facility. The stabilization pond facility will consist of three earthen-dike basins that provide a total detention time of 210 days. The basins would require a total area of 12 acres. A 12-inch effluent gravity sewer would be constructed to convey treated effluent to the mine drainage stream running northeast to southwest through the project site. The effluent stream will discharge into Colby Lake. The length of this sewer pipe would be approximately 1,200 feet to reach the stream.

A disadvantage of this alternative is the treatment facility would be required to have a capacity of 45,000 gpd to meet construction demands, but would receive only about 25% of this design flow after the construction of the project is complete. Thus part of the facility would have to be abandoned and other modifications made to the facility at the completion of Mesaba Two. Another potential concern with the on-site WWTF is that effluent from the system would discharge into Colby Lake, which is the source for the Hoyt Lakes drinking water treatment plant.

The project will be required to obtain an NPDES permit for this discharge and a part-time licensed WWTF operator will be required to manage the treatment system. This staffing requirement will increase annual operating costs.

1.12.6.3.5 Alternative 2: Connect to the Hoyt Lakes Wastewater System

The second option available for the disposal of domestic wastewater is to connect to the City of Hoyt Lakes' wastewater collection and treatment system. This will 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. The wastewater piping will parallel the existing high voltage power line easement along the west side of the proposed property boundary, south to Colby Lake. A pump station will 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 MP on the north end of Colby Lake Road. The 12-inch sewer pipe would have ample capacity to convey the estimated peak wastewater flow of 45,000 gpd during construction. The existing Hoyt Lakes wastewater treatment facility has capacity available to treat the estimated flow from the proposed project.

There are several advantages to this option when compared to on-site treatment. One advantage is ownership of the sewer constructed for the project could be turned over to the City of Hoyt Lakes for operation and maintenance. Thus the only annual operating and maintenance costs for this option would be the sewer use charges from the City. A WWTF operator will not be required to monitor the system.

One disadvantage is the sewer system has to cross Colby Lake. This increases the cost and will require a MDNR permit. The lake is about 10 feet deep where the crossing would be constructed and the sewer is expected to be placed about 15 feet below the lake bottom. If rock is encountered at the lake crossing, then microtunneling would be required in lieu of directional drilling which would increase construction costs. Soil borings would be required to confirm rock elevations along the proposed pipe alignment and at the location of the proposed treatment

1.12.6.3.6 Implementation and Impact

Both of the alternatives would require piping which would have to traverse forested areas and hilly terrain, which does not preclude either alternative. However the environmental impact of discharging to the City's water supply is not a particularly appealing option for a project proponent trying to maintain City's residents' strong support of the IGCC Power Station. Alternatively, the existing Hoyt Lakes POTW has a permit to discharge into Whitewater Lake and that system will not require modification to add the anticipated wastewater flow from Mesaba One and Two.

1.12.6.3.7 Results and Conclusions

Construction of a 12-inch gravity sewer pipeline from the Station Footprint to the City of Hoyt Lakes collection system has tangible advantages over the option of an on-site treatment facility and is the preferred approach to handle domestic wastewaters from Mesaba One and Two.

1.12.7 Potable Water Supply

1.12.7.1 Site Independent Features

During construction of Mesaba One and Mesaba Two, the peak estimated potable water requirement for the IGCC facility would be 45,000 gpd based on 1,500 construction personnel using on average 30 gallons of potable water per person per day. The annual usage during the construction phase is estimated at 5 million gallons. The construction phase is projected to last 44 months. After construction of Mesaba One and Two the water demand will drop to about 7,500 gpd (Section 1.12.6.1.1 discusses that the potable water system will be conservatively designed in anticipation of 250 individuals being on site year around). The annual usage for the facility during normal operation is estimated at approximately 2.7 million gallons.

1.12.7.2 West Range

1.12.7.2.1 Potable Water Supply Alternative 1

The closest potable water source to the West Range IGCC Power Station is the City of Taconite located about 2.5 miles south of the Station Footprint. Taconite is permitted to use 20 million gallons a year based on their current ground water permit and is currently using 8 million gallons a year. The City has excess well capacity and can provide the required water both during and after construction without the need to modify its existing groundwater permit.

To provide water to Mesaba One and Two, an 8” diameter pipeline would be constructed from the existing City system to the Station Footprint as shown in Figure 1.5-7. The referenced pipeline routing was chosen as the preferred route because it is the most efficient route from the City to the project site and the installation of the pipe would be more economical because it would be bundled along with pipelines serving other processes. The alternative route considered would have extended the pipe east from the City to Highway 169, run parallel along the west side of 169 to CR 7, parallel the west side of CR 7 and crossed under the highway to the Station Footprint. This routing was longer, would require more piping, and increased the cost of installing the pipe.

A booster station will be needed near the connection point to the City water distribution system in order to provide the required water pressure to the IGCC Power Station. The booster station would pump water from the Taconite system at a variable rate from 20 to 100 gpm. The wide pumping range is required due to the fluctuations in water use that would occur throughout the day at the Power Station.

Due to the possible expansion of the water system to the north, the City of Taconite is considering adding a residential/industrial sub-division on the south side of CR 7 south of the Optioned Property. The City has estimated the potable water requirement for the sub-division to be about 10,000 gpd, with an annual use of 4 million gallons. The City has the well capacity to supply water to the proposed sub-division and the facility under their current ground water

permit. Residential water use fluctuates widely over the course of the day so a 50,000 gallon elevated storage tank would likely be required to provide adequate flow for high use times and provide storage for fire flow requirements to the proposed sub-division. If the City decides to install the tower, the size of the booster station pumps will need to be increased to accommodate the increased head of pressure. The pumps in the booster station would increase in size to pump water at a constant rate of 200gpm. The booster station will pump water into the tower and the tower will provide water to the sub-division and the IGCC Power Station. Water from the proposed tower could also flow back to the City when the pumps were not running and provide additional water capacity to the City's existing system. Due to the higher elevation of the proposed tower, water pressure must be reduced prior to entering the existing system.

The City of Taconite would own and maintain the booster station, pipeline, and tower and the Proponent would enter into an agreement with the City to purchase water. The design of the pipeline, booster station, and tower must meet the requirements of, and be approved by, the Minnesota Department of Health.

Construction of the potable water pipeline and booster station would require a full construction season. To ensure potable water is available at the Optioned Property during peak construction activities, construction of the pipeline and booster station must be initiated as soon as the Proponent obtains the preconstruction permits for the IGCC Power Station. Until such time as potable water can be obtained from the City of Taconite, potable water requirements will be supplied by tanker truck or other means.

1.12.7.2.2 Water Supply Alternative 2

Alternative 2 consists of constructing an on-site treatment facility with the capacity to treat 7,500 gpd of raw water from the CMP and HAMP Complex to provide potable water to the Mesaba One and Two.

A micro-filtration system will be used to treat raw water pumped to the site from the local mine pits. To operate properly, micro-filtration systems must treat water on a daily basis. Therefore, the filtration unit will treat water at the rate of 10 gpm to potable drinking water standards. This treatment rate was determined based on a run time of approximately 12.5 hours to provide the daily water requirement of the facility. Micro-filtration systems need to treat water on a continuous basis and requires that chlorine be added to the treated water for disinfection.

Construction of a building to house the filtration system, a 5,000 gallon underground reservoir, and pump will be required as part of this alternative. Wide fluctuations of water use would occur during the course of the day and the reservoir would provide the water needed at high use times. The pump would supply the water from the reservoir to the facility at the required flow rate and pressure.

The design of the water treatment facility would have to meet the requirements of, and be approved by, the Minnesota Department of Health.

The EPA classifies any facility that provides potable water to 25 or more individuals every day as a non-transient non-community public water supply system and the IGCC facility would be included in that classification. This would require the treatment facility to be operated by a certified water operator and the treated water would be required to meet all standards of the Federal Safe Drinking Water Act and the Minnesota Department of Health.

1.12.7.2.3 Conclusions

The Proponent's preferred alternative is to purchase water from the City of Taconite.

1.12.7.3 East Range Potable Water Supply

Consistent with the options for supplying potable water to the West Range IGCC Power Station, the two alternatives for supplying potable water to the East Range IGCC Power Station are to connect to the Hoyt Lakes water distribution system or construct an on-site water treatment facility to treat a portion of the process water that is pumped to the IGCC Power Station.

1.12.7.3.1 Existing Water Supply Facilities

The Station Footprint for the East Range IGCC Power Station will be located approximately 1.6 miles north of CR 110, the main road cutting through the City of Hoyt Lakes. Hoyt Lakes' potable water is supplied from a 1.5 million gallon per day ("MGD") surface water treatment plant located on the north end of town by Colby Lake. The plant was constructed in 1954 and is in fairly good shape overall. Raw water is supplied to the plant from two intakes located in Colby Lake. The intakes are set at different depths and the quality of the water dictates which intake is used to supply water to the plant. Treated water is pumped to a 1.7 million gallon standpipe located in the center of town and to a 150,000 gallon elevated tower located west of the City in the Laskin Energy Park. A pumping station is located at the standpipe that can pump water to the elevated tower when the water treatment plant is not operating. The booster station has three pumps and can supply water to the elevated tower at a maximum rate of 1,200 gpm. The elevated tower supplies water to the Industrial Park site and MP through a 12-inch distribution main.

The average water use for the City of Hoyt Lakes is 275,000 gpd with maximum day demands of 700,000 gpd.

1.12.7.3.2 Alternative 1: Connection to Hoyt Lakes Water System

This alternative would consist of constructing a 6-inch pipeline approximately 11,000 feet from the East Range IGCC Power Station to the 12-inch water main that serves MP. Figure 1.5-10 shows the preliminary routing of the water main. The proposed routing would require that a portion of the water main cross Colby Lake.

MP uses an average of 75,000 gpd or 100 gpm over a 24-hour day. This nominal usage allows for capacity in the existing 12–inch pipeline to supply the additional potable water requirement of 45,000 gpd to the Mesaba One and Two during construction and the 7,500 gpd during normal operations. The proposed 6-inch pipeline will 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.

MP has discussed with the City the possibility of increasing their water usage in the future, but has not lodged such a request at this time. The City also has the potential to provide water to other industries that may locate to north of the Station Footprint. If the water demand from the 12-inch pipeline is increased, the flow and pressure of the water supplied to the IGCC Power Station may decrease, thus requiring the Proponent to consider adding a booster station and/or storage tower.

Under this alternative, the City of Hoyt Lakes would own and maintain the pipeline and the Proponent would enter into an agreement with the City to purchase water.

The primary advantage to using the existing Hoyt Lakes system is that the City would be responsible for maintaining the quality of the water and the operating and maintenance costs associated with the treatment equipment and distribution system. If equipment upgrades are required at the water treatment plant, the costs for such equipment upgrades are spread over the entire customer base.

Directional drilling and installation of high-density polyethylene pipe are assumed for the portion of the water main to be installed under Colby Lake. If bedrock is encountered beneath the lake, directional drilling cannot be used. Instead, the pipeline would be installed by microtunneling. At this time, no subsurface information beneath Colby Lake is available.

1.12.7.3.3 Alternative 2: On-Site Treatment Facility

The second potable water supply option available is the construction of an on-site treatment facility with the capacity to treat and supply 7,500 gpd of potable water to Mesaba One and Two.

A micro-filtration system meeting the description supplied at Section 1.12.7.2.2 for the West Range IGCC Power Station would be used to treat a portion of the process water procured for project cooling systems that would be pumped to the Station Footprint from nearby mine pits in the vicinity of the East Range Site.

Chemicals in addition to chlorine may be required for treatment based on the chemical constituents in the source water and would be determined during front end engineering design of the IGCC Power Station.

One advantage of this alternative is that the IGCC Power Station would not have to purchase water from the City and would have control over its own water supply. This is also the alternative's principal disadvantage, that is the IGCC Power Station would be required to operate, maintain and upgrade the water treatment system as per Minnesota Department of Health standards.

Construction of an on-site water treatment facility with a small storage reservoir and supply pump has an estimated annual operating and maintenance cost of approximately $20,000 per year.

1.12.7.3.4 Conclusions

Connecting to the City of Hoyt Lakes potable water distribution system is the preferred option for the IGCC Power Station located on the East Range Site.

1.13 SITING PROCESS AND DESCRIPTION OF SITES

1.13.1 Site Selection Process

The site selection process and selection criteria required several years of study that included a three tiered siting process to identify the most favorable Project Area. The first tier was conducted at the state level, whereby the State of Minnesota enacted a statute in 2003 that included a condition that required an "innovative energy project" to be located in the TTRA (see Minn. Stat. § 216B.1694, subd. 1(3)). The Proponent then determined which regions across the TTRA had the necessary minimum utility-related (i.e., HVTL, water, gas, etc.) access, road access, and other required infrastructure components to develop this type of project.

Once the initial candidate areas of the TTRA were identified, a second tier of evaluation was performed that included review of engineering feasibility, environmental compatibility, community support and acceptance, and other criteria. The conclusion of this second tier evaluation resulted in the identification of the potential Project areas as described in this report.

The third tier of evaluation including a detailed analysis of the candidate Project areas is provided in this application. The discussion below provides more detail of the siting study and analyses performed by the Proponent.

Selection of a suitable site is one of the most important activities in the successful development of new power generation facilities. The Proponent's site selection process consisted of a four-step process based on the following principal tasks:

- Develop selection criteria.
- Inspect/evaluate potential sites.
- Establish short list of potential sites.
- Select candidate site(s).

Each of these four site selection components is discussed below.

1.13.1.1 Development of Selection Criteria

Selection criteria consist of a broad range of topics and issues that assisted in the identification of the potential sites and the ultimate selection of the preferred site. The following broad categories were addressed during the Proponent's siting process, and which the Proponent focused upon in its search for a preferred site:

1.13.1.1.1A Potential Site Locations and Initial Screening Criteria

In accordance with the 2003 Minnesota State Statute, "innovative energy projects" can be developed on up to three sites located in the TTRA of Northeastern Minnesota. Based upon the requirements of the statute, all of the Proponent's siting activities have been focused on this geographic area. Both the Proponent's preferred and alternate sites have received an appropriate designation by the Commissioner of the IRR as "innovative energy projects."

Within the TTRA, the Proponent employed certain site-specific criteria which considered the potential effects of IGCC development on nearby communities and residences, including such

factors as the number and location of residences affected by either the potential plant location itself or the development of needed infrastructure such as railroad spurs, highway access, high voltage transmission lines, and the associated noise during construction and operational phases of the facility and related operations and activities.

1.13.1.1.1B Permitting and Environmental Assessment [or "Permitting Criteria"]

Site permitting criteria focused on those issues related to obtaining preconstruction permits to license the operation of an IGCC Power Station at a particular site. The major permitting issues relate to air emissions, wetlands, water supply, wastewater discharges, and natural/cultural resources, and include considerations such as:

- Air – Analysis of the proposed Mesaba Energy Project included ascertaining the potential impact on Class I areas. Cumulative impacts of current and proposed projects were also taken into consideration.
- Wetlands – Wetlands were identified to assist in the placement of the proposed plant site and associated utility corridors in order to limit potential impact. In areas where wetland impacts could not be avoided, mitigative measures were developed.
- Groundwater – Will there be any solid waste disposal landfills on the site? If so, what is the depth to groundwater and how might groundwater be impacted?
- Floodplains – How will the proposed Project impact floodplains on the site?
- Water Supply –Are potential sources of water supply available, in what quantity/quality, and from what source or sources?
- Wastewater Discharges – Are POTWs located in 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?
- 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?
- 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?
- 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?

1.13.1.1.1C Technical Criteria

The Proponent's technical criteria focused on those issues related to the construction of the IGCC Power Station and associated infrastructure, and included considerations such as:

- Plant Expansion – Although the IGCC Power Station Footprint requires only about 200 acres (excluding the rail loop), it was considered desirable to have access to 1000 acres or more of land to accommodate the Phase I and Phase II Developments and to isolate the facility for safety, security, dissipation of noise, and other considerations.

- 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?
- 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?
- 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?
- Natural Gas – How and where does the interconnection to the natural gas pipeline system occur and what is its available capacity?
- 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.?

1.13.1.2 Candidate Sites

Utilizing the above and other relevant criteria, the Proponent initially identified and reviewed eleven potential sites within the TTRA. As part of the Proponent's review and analysis process, the eleven site locations were informally disclosed to the IRR at an early stage, and comments and suggestions of agency personnel and others were solicited and considered. Various community leaders and public officials knowledgeable about the region presented suggestions for the consideration of candidate sites. A contact was also received from an official of an Indian Reservation located within the TTRA.

One of the Proponent's important goals was to identify sites for consideration and potential development within each of the East Range, Central Range, and West Range regions of the TTRA. A second goal was to seek potential sites at existing large industrial facilities. Following the detailed evaluation of environmental, engineering, and other factors, the initial list of eleven sites was narrowed to six potential sites. These six sites include at least one from each area of the Iron Range region noted above, two large industrial sites, and a mix of brownfield and greenfield sites. All sites were considered to be licensable based upon preliminary investigations and evaluations. The six candidate sites and the location of the nearest community to each are as follows:

Site Name	Minnesota Community (Region)
Industrial No. 1 (CE)	Hoyt Lakes (East Range)
Industrial No. 2 (Minntac)	Mountain Iron (Central Range)
Mountain Iron	Mountain Iron (Central Range)
Industrial No. 3 (United Taconite)	Eveleth/Forbes (Central Range)
Hibbing Industrial Park	Hibbing/Chisholm (Central Range)
West Range (CMP/HAMP Complex)	Taconite/Bovey (West Range)

1.13.1.3 Evaluation of Sites

The Proponent further reviewed each of the six sites and quantitatively ranked them using its site selection criteria and personal knowledge, judgment, and experience required for siting large power plants. The results of these evaluations and rankings were:

1. West Range
2. Industrial No. 2
3. Industrial No. 3
4. Hibbing Industrial Park
5. Industrial No. 1
6. Mountain Iron

Following the site ranking and evaluation, the Proponent proceeded to make its final selection of preferred and alternative sites. The 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. Due to the fact that the industrial sites would require extensive negotiations due to facility integration and other licensing and engineering issues, such sites were ruled out from further consideration as the location for Phase I and Phase II of the Mesaba Energy Project.

The West Range Site has been selected as the Proponent's preferred LEPGP Site for the following principal reasons:

- It received the highest ranking score in the Proponent's quantitative analysis process.
- It lies outside the Lake Superior Basin watershed, thereby facilitating permitting and licensing.
- Plant make-up water is readily available from the CMP and HAMP Complex. Overflow from these abandoned pits is a significant problem for local communities and the Minnesota Department of Natural Resources. Use of water from such pits provides a solution for these overflow problems. Alternative sources of water are also available to the West Range IGCC Power Station and in likely quantities to supply any shortfall that could be encountered in supplying Phase I and Phase II developments at the site 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 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.
- The Proponent has obtained 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 indicate broad support for 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 have identified and set aside for industrial development. IRR and St. Louis County have also played important roles in assembling a land package of some 850 acres, with additional acreage appearing to be readily available. Impacts on local residences are deemed manageable and local communities are supportive. Additionally, a new Central Range water treatment facility has been proposed for the area.
- Adequate make up water exists in local mine pits.
- Although the site is located within the Lake Superior Basin watershed, it appears that the City of Hibbing's POTW may be of sufficient size to handle such discharges and therefore qualify for a variance from the rigid standards imposed on discharges of mercury by regulations implementing the GLI.
- 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 is under the control of the IRR, but its ultimate availability as a site for IGCC Power Station development will not be definitively known in time to be considered a viable alternative site for permitting purposes. Therefore, the East Range Site is viewed as the best alternative 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:

- The level of regional support for the Project is high for all sites. However, given its early identification as a potential site, the level of support provided by the local communities surrounding the East Range Site is very favorable.
- IRR has secured through negotiation in the LTV bankruptcy proceeding (LTV was the original landowner of property now occupied by 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 appears to exist in local mine pits and other surface waters (i.e., Colby Lake and Whitewater Reservoir) in amounts sufficient to support Phase I and Phase II facilities.
- The closest residential neighbors are more than 0.5 miles from the site.
- The site provides ready access to infrastructure needed to support plant operations.

The Proponent proposes the East Range Site for its alternate Site in the State's Power Plant Siting evaluation. This Site is 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 dictates the use of two separate corridors, and significant 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 appears to be feasible and the use of a nearby Lake Superior port is uncertain.
- The site is closer to Class I areas, which could result in air permitting difficulties.

1.13.2 Reasonable Alternatives

1.13.2.1 DOE's Limited Role in Non-Federal-Government Projects

The goals of a federal action establish the limits of reasonable alternatives under the NEPA process. Congress established the CCPI Program with a specific goal— to accelerate commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. DOE's purpose in considering the proposed action (to provide cost-shared funding and a federal loan guarantee) is to meet the goal of the program by demonstrating the commercial deployment of IGCC technology. Reasonable alternatives to the proposed action must be capable of meeting this purpose.

Congress directed DOE to pursue the goals of the legislation by providing partial funding for projects owned and controlled by non-federal-government participants. This statutory requirement places DOE in a much more limited role than if the federal government were the owner and operator of the project. In the latter situation, DOE would typically review a wide variety of reasonable alternatives to the proposed action. However, in dealing with a non-federal applicant, the scope of alternatives is necessarily more restricted, and DOE gives substantial weight to the needs of the proposer in establishing reasonable alternatives to the proposed action. Moreover, under the CCPI Program, DOE's role is limited to approving or disapproving the project as proposed by the participant.

Thus, from DOE's perspective, the only reasonable alternative to the proposed action is the no-action alternative. Under the proposed action, Project activities would include final engineering, construction, and testing and demonstration of the technology. Under the no-action alternative, DOE would not provide partial funding for the final engineering, construction, and operation of the plant. In the absence of DOE funding, the sponsor may still construct the Project, but it might not demonstrate all features as proposed for CCPI Program support. DOE will also consider other reasonable alternatives that may be suggested during the public scoping period. The no-action alternative is discussed in Section 1.13.3 below.

1.13.2.2 State's Role in Considering Reasonable Alternatives

From the State's perspective, reasonable alternatives to the Project are established under the State's Power Plant Siting Act and, in the case of an innovative energy project, under Minn. Stat. § 216B.1694. The Act specifies the process under which alternative project sites are evaluated and largely consist of those evaluations set forth in this Environmental Information Volume; the innovative energy project statute narrows the alternatives that would have otherwise been investigated for projects not defined as such.

1.13.2.3 State Law Defines MEP's Technological Type and Location

State law (Minn. Stat. § 216B.243 "Certificate of need for large energy facility") dictates that no proposed large energy facility shall be certified for construction unless the applicant can show that demand for electricity cannot be met more cost effectively through energy conservation and load-management measures and unless the applicant has otherwise justified its need. In assessing need, the State Public Utilities Commission must evaluate, among other things, the following:

- the accuracy of the long-range energy demand forecasts on which the necessity for the facility is based;
- the effect of existing or possible energy conservation programs or other federal or state legislation on long-term energy demand;
- the relationship of the proposed facility to overall state energy needs;
- possible alternatives for satisfying the energy demand or transmission needs including but not limited to potential for increased efficiency and upgrading of existing energy generation and transmission facilities, load-management programs, and distributed generation; and
- any feasible combination of energy conservation improvements, that can (i) replace part or all of the energy to be provided by the proposed facility, and (ii) compete with it economically.

However, in 2003, the Minnesota State legislature – recognizing that i) the State's baseload generating facilities were aging, ii) no new, baseload facilities had been constructed since 1985 to replace them, iii) the State needs a reliable, low-cost baseload source of electricity, and iv) new electric generating technologies were available that could use coal as a feedstock, operate at high efficiencies, and significantly reduce pollutant emissions relative to conventional pulverized coal boiler-based steam electric generating plants – enacted the Enabling Legislation (Minn. Stat. § 216B.1694) defining an "innovative energy project" and exempting such projects and their associated transmission infrastructure from the certificate of need process. The natural gas pipeline to be permitted at either the West or East Range Sites will be under the 50-mile threshold set forth by Minn. Stat. § 216B.2421, subd. 2(4) for a "large energy facility" and, therefore, is also exempt from the requirement to obtain a certificate of need.

The 2003 statute that provides an innovative energy project the above exemptions from the State's CON process requires the Project be located in the TTRA in northeastern Minnesota. In Section 1.4.1.1, the Mesaba Energy Project's designation as an innovative energy project was confirmed. Given the Enabling Legislation it would be unlawful to introduce other technologies and consider sites outside Northeastern Minnesota. Therefore, the range of technologies and the sites considered by the Proponent were necessarily limited to IGCC technology and locations within the TTRA. Other technologies and locations outside the TTRA have therefore been dismissed.

1.13.2.4 State Law Guides Project's Size, Timing and Number of Sites

The Enabling Legislation provides at Minn. Stat. § 216B.1693 (entitled "Clean energy technology") the following guidance as to the Project's size and timing:

- If the commission finds that a clean energy technology is or is likely to be a least-cost resource, including the costs of ancillary services and other generation and transmission upgrades necessary, the utility that owns a nuclear generating facility shall supply at least two percent of the electric energy provided to retail customers from clean energy technology. The Proponent based its 13% CET minimum on NSP-North's projected retail energy sales of 47,104,732 MWh for 2012.[21]
- Electric energy required by this section shall be supplied by the innovative energy project defined in section 216B.1694, subdivision 1, unless the commission finds doing so contrary to the public interest.
- For purposes of this section, "clean energy technology" means a technology utilizing coal as a primary fuel in a highly efficient combined-cycle configuration with significantly reduced sulfur dioxide, nitrogen oxide, particulate matter, and mercury emissions from those of traditional technologies.

A second incentive provided to an innovative energy project is specified at Minn. Stat. § 216B.1694, subd. 2(a)(7) and stipulates that such a project:

> "shall be entitled to enter into a contract with a public utility that owns a nuclear generation facility in the state to provide 450 megawatts of baseload capacity and energy under a long-term contract, subject to the approval of the terms and conditions of the contract by the commission."

Pursuant to these statutory incentives, the Proponent filed an application for approval of a proposed Power Purchase Agreement and related findings with the Minnesota Public Utilities Commission. Such application was filed in December 2005 and has been referred to a hearing examiner in accordance with direction from the MPUC.

1.13.3 No Action Alternative

Under the no-action alternative, DOE would not provide cost-shared funding for final engineering, construction, and testing and demonstration of the technology. Consequently, commercial deployment of IGCC technologies could be significantly delayed, resulting in damage to the environment and frustration of the nation's energy and environmental policies.

The construction and operation of the Mesaba Energy Project would contribute to the CCPI Program goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States.

---

[21] The source of this forecast is Xcel Energy's Response to the Minnesota Department of Commerce Information Request No. 61 in the Matter of Northern States Power Company d/b/a Xcel Energy's Application for Approval of Its 2005-2019 Resource Plan.

1.14 Comparison of Alternatives

See Sections 2.7 and 2.8 of the Joint Application.