Final Environmental Assessment and Notice of Wetland Involvement

for the

Construction and Operation of a Proposed Cellulosic Biorefinery, Mascoma Corporation, Kinross Charter Township, Michigan

DOE/EA-1705

U.S. Department of Energy
Energy Efficiency and Renewable Energy

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Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

DOE/EA-1705

FINDING OF NO SIGNIFICANT IMPACT FOR THE CONSTRUCTION AND OPERATION OF A PROPOSED CELLULOSIC BIOREFINERY, MASCOMA CORPORATION, KINROSS CHARTER TOWNSHIP, MICHIGAN

AGENCY: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: Under the Energy Policy Act of 2005 (EPAct 2005), the United States (U.S.) Congress has directed the U.S. Department of Energy (DOE) to carry out a program to demonstrate the commercial application of integrated biorefineries for the production of ethanol from cellulosic feedstocks. Federal funding for cellulosic ethanol production facilities is intended to further the government's goal of rendering cellulosic ethanol cost-competitive with corn ethanol by 2012 and, along with increased automobile fuel efficiency, reducing gasoline consumption in the U.S. by 20% within 10 years.

In May 2007, pursuant to § 932 of EPAct 2005, DOE issued a Funding Opportunity Announcement (FOA) that requested applications to design, construct, build and operate/validate an integrated biorefinery demonstration employing terrestrial lignocellulosic feedstocks for the production of some combination of (i) liquid transportation fuel(s) that is a fungible replacement for liquid transportation fuels currently used in the existing infrastructure; (ii) biobased chemicals; and, (iii) substitutes for petroleum-based feedstocks and products. Use of a wide variety of lignocellulosic terrestrial feedstocks was encouraged other than feedstocks primarily grown for food. This FOA focused on potential integrated systems meeting the guidance in EPAct § 932(c) (1), (2) and (4). The proposed biorefinery demonstration scale was to be approximately one-tenth of the projected scale of a first-commercial facility. Mascoma Corporation (Mascoma) applied for and was selected to negotiate for an award of financial assistance to aid in the construction and operation of their planned cellulosic ethanol biorefinery that met these criteria.

Based on this selection, the DOE is proposing to provide up to $58.5 million in federal funding to Mascoma Corporation (Mascoma) for the final design, construction, and operation of a cellulose-to-ethanol biorefinery, in Kinross Charter Township, Michigan (Frontier Project). Mascoma's subrecipient, Frontier Kinross, LLC (Frontier), a subsidiary of Frontier Renewable Resources, LLC (jointly owned by Mascoma Corporation and J.M. Longyear, LLC) would develop and operate the biorefinery. DOE has authorized Mascoma to expend Federal funding for preliminary activities including preliminary engineering design, the completion of this Environmental Assessment (EA), permitting, and pilot scale testing. These activities are associated with the proposed project and do

not significantly impact the environment nor represent an irreversible or irretrievable commitment of Federal funds in advance of the conclusion of this EA. DOE is currently proposing to authorize the expenditure of Federal funding for Mascoma to complete final design, construct, and initially operate the Frontier Project. Based on preliminary construction cost estimates, the total Frontier Project cost would be approximately $245 million.

Mascoma is proposing to use federal funding to design, construct, and operate a biorefinery that would produce ethanol and other co-products from cellulosic materials (the Frontier Project). The initial phase of proposed project would utilize approximately 770 bone dry tons (BDT) per day of clean wood chips (from hardwood pulpwood) to produce up to approximately 21.75 million gallons per year (mgy) of denatured ethanol (or 20 mgy anhydrous ethanol). Eventually the Frontier Project could be expanded to a fully commercial scale operation that utilizes 1,540 BDT per day of clean wood chips to produce 42.5 mgy of denatured ethanol (or 40 mgy anhydrous ethanol). While the DOE is currently proposing to fund the initial 20 mgy facility, the Final EA analyzes the construction and operation of the 40 million gpy facility as Mascoma may expand the facility in the future.

Before DOE can authorize funding for the Frontier Project, DOE must examine the potential environmental impacts of DOE's Proposed Action in accordance with the *National Environmental Policy Act* (NEPA). All discussion, analysis, and findings related to the potential impacts of final design, construction and operation of the Frontier Cellulosic Biorefinery Project, including mitigation measures, are contained in the *Final Environmental Assessment for the Construction and Operation of a Proposed Cellulosic Biorefinery, Mascoma Corporation, Kinross Charter Township, Michigan.* (Final EA; DOE/EA-1705). The Final EA is hereby incorporated by reference.

DOE prepared this FONSI in accordance with NEPA, the Council on Environmental Quality regulations for implementing NEPA, as amended (40 CFR Parts 1500 to 1508), and DOE NEPA regulations (10 CFR Part 1021).

ENVIRONMENTAL IMPACTS: The Final EA examined the potential environmental impacts of the Proposed Action and No-Action Alternative. Under the No-Action Alternative, DOE would not authorize the use of federal funds for the Frontier Project, which DOE assumes for purposes of the EA would not proceed without federal funding. This assumption allows a comparison between the potential impacts of the project as proposed and the impacts of not proceeding with the project.

DOE analyzed forest, biological, cultural and water (including wetland) resources, land use, meteorology, air quality, geology and soils, waste management, hazard and accidents, safety and occupational health, infrastructure, noise, aesthetics, traffic, socioeconomics and environmental justice, as well as cumulative impacts of the proposed project. DOE has determined that for all resource areas there would be no impacts or that the potential impacts would be negligible. During the preparation of the EA, DOE determined that the construction and operation of the Frontier Project would have the greatest potential for impacts on air quality, forest resources, and water resources (specifically wetlands). The analyses associated with these resource areas are discussed in

more detail below. A complete analysis of all potential environmental impacts is presented in the Final EA.

Air Quality

The Frontier Project would be a source of air emissions during both construction and operation. During construction air emissions would consist primarily of fugitive dust generated by site grading and vehicles moving on the site and exhaust emissions from construction equipment and trucks. The primary risks from blowing dust particles relate to human health and human nuisance values. Dust emissions would be minimized by using appropriate fugitive dust control measures, such as road watering, temporary vegetative cover, or dust suppressants, as needed. Therefore, impacts to air quality during the construction phase of the project would be minor and temporary.

Potential emissions during operations would come from several sources. The Michigan Department of Natural Resources and Environment (MDEQ) requires new facilities that would have air pollutant emissions to acquire an air permit to construct prior to beginning construction. The application for the air permit has been submitted to the MDEQ for review. Refined dispersion modeling for the Frontier Project (completed for PM10, SO2, and NO2, and CO) indicated that the project, as described and analyzed in the EA, would not cause or contribute to an exceedance of the National Ambient Air Quality Standards. In addition, State of Michigan requires that all facilities that emit Toxic Air Pollutants (TACs) complete an analysis to demonstrate compliance with the State screening levels that are set to protect the general population, including sensitive subgroups. Based on a combination of screening level analysis and refined modeling analysis, Frontier demonstrated compliance with the TAC requirements.

A life cycle analysis (LCA) for greenhouse gas (GHG) emissions from the proposed Frontier Project was completed using the most recent version of the SimaPro LCA program and database. Emission of all greenhouse gases were weighted according to their 100-year global warming potentials to arrive at the final GHG results. The LCA data is presented as CO_2 equivalent (CO_2e) emission per gallon of ethanol produced. According to the analysis, the proposed Frontier Project yields a net reduction of 26,822 tons per year of CO_2e emissions.

Based on the analysis completed in the air permitting process and the preparation of the EA, DOE has been determined that there will be no significant impacts to air quality as a result of implementation of the Frontier Project.

Forest Resources

The Frontier Project, as analyzed in the Final EA, would require a total of 1,129.8 thousand green tons per year of hardwood pulpwood. Approximately 71,000 acres of timber would be harvested annually to supply the fiber required for the proposed project. Mixed hardwood pulpwood and chips for the proposed Frontier Project would be sourced through the traditional hardwood pulpwood supply-chain infrastructure existing in the Michigan's Eastern Upper Peninsula and Northern Lower Peninsula. Within 150 miles of the proposed Frontier site, there are approximately 8,313,000 acres

of commercial forest lands. This is the portion of the total forest area which has traditionally been harvested and managed as timberlands since the late 1800's. It includes the timberlands of all major ownership groups Federal, State, large commercial, and large to small private forest lands. It is "second-growth", which in many cases has been harvested and re-grown multiple times over many decades. A significant portion of this forest is re-established on lands once cleared and farmed for decades and then later abandoned to return to a forested state.

Utilizing pulpwood from the Eastern Upper Peninsula and Northern Lower Peninsula forests to supply fiber for the Frontier Project would not constitute a new use of the resource. Several pulpwood facilities have closed in the region in recent years and the Frontier Project's pulpwood usage would be similar in total volume, essentially replacing pulpwood previously used by those closed facilities. The effect on the total forest resource would be no different than that created by the harvest that supported the former mills. Mascoma has committed that the Frontier Project will establish a Sustainable Forestry Initiative (SFI) certified procurement process. Mascoma would require that Frontier, through its wood fiber procurement agreements and other supply relationships, work to encourage and influence private landowners and wood suppliers to participate in forest certification initiatives. Mascoma, through Frontier would require verification of logger participation in Sustainable Forestry Education professional logger training and certification programs and conformance to Michigan Best Management Practices.

Based on the utilization of an existing supply-chain for hardwood-pulpwood, availability of feedstock within the project area, and Mascoma's commitment to implementing a certified SFI procurement plan, DOE has been determined that there will be no significant impacts to forest resources as a result of implementation of the Frontier Project.

Water Resources - Wetlands

The proposed Frontier Project site is comprised of 355 acres. The facility would be constructed on the southernmost 40-acre parcel. There were five wetlands identified within the 355 acre site, however no wetlands were identified on the 40-acre parcel where construction would occur. Mascoma, through its subrecipient Frontier, would develop a Soil Erosion and Sediment Control (SESC) Plan to protect the identified wetlands during construction activities. Requirements of the SESC plan are discussed in Section 3.6.3.3. The biorefinery would be designed and operated such that impact to the five wetlands is avoided. Therefore, no impacts to the wetlands on the proposed site would be expected as a result of the Proposed Action.

Rail service to the proposed site would be established by construction of a rail spur from the existing rail line located east of Kinross, Michigan. Frontier has completed and submitted a rail corridor alternatives analysis to the MDEQ for the proposed rail corridor. The alternatives analysis included three potential routes for the rail line and the final route has not yet been selected. A wetland delineation was completed for the entire rail corridor. Fifteen wetlands were identified and then determined to be jurisdictional. Impacts to the identified wetlands may require a joint permit from the MDEQ and the U.S. Army Corps of Engineers (USACE). Once the rail route is selected

Mascoma will work with MDEQ and USACE, in accordance with Section 404 of the Clean Water Act and Part 303 of the Natural Resources and Environmental Protection Act, Public Act 451 of 1994, to determine required mitigation. MDEQ will make the final determination regarding the necessary permitting and mitigation requirements.

Based on Mascoma's commitment to develop and implement a SESC Plan for the project site and implementation of all permit and mitigation requirements dictated by MDEQ's, DOE has been determined that there will be no significant impacts to wetland resources as a result of implementation of the Frontier Project.

PUBLIC PARTICIPATION IN THE EA PROCESS: In accordance with the applicable regulations and policies, DOE sent scoping letters to potentially interested local, state, and Federal agencies, including the U.S. Fish and Wildlife Service (USFWS), the Michigan Department of Natural Resources and Environment (MDEQ), the Michigan Department of Transportation (MDOT), and the Michigan State Historic Preservation Office (SHPO). DOE sent scoping letters to other potentially interested individuals, organizations, the Inter-Tribal council of Michigan, and the Sault Ste. Marie Tribe of Chippewa Indians. DOE also published the Scoping Letter on-line at the DOE Golden Reading Room at http://www.eere.energy.gov/golden/Reading_Room.aspx. The scoping letter described the Proposed Action and requested assistance in identifying potential issues that could be evaluated in the EA. In response to the scoping letters, DOE received comments and questions from individuals, organizations, or agencies regarding the proposed project. Comments received during Public Scoping were addressed, as appropriate, in the EA.

DOE published the Draft EA in the DOE Golden Field Office Public Reading Room for a 30-day review period and sent Notices of Availability (NOA) to interested agencies and individuals indicating that the Draft EA was available on-line for review and comment. DOE received a total of 28 comment letters or e-mail messages regarding the Draft EA. Eleven letters were received from local or regional residents, seven letters were received from local or regional businesses, six letters were received from government organizations or the offices of elected officials, one letter was received from a forestry trade association, one letter was received from an environmental organization, and one letter was received from a tribal health organization. Fourteen of the letters expressed support for the project but did not contain specific questions or comments. Fourteen of the letters contained questions or comments regarding the project. The Final EA summarized the comments and, as appropriate, included specific DOE responses or modifications to Draft EA text.

DETERMINATION: Based on the information presented in the Final EA (DOE/EA-1705), DOE determined that the Proposed Action would not constitute a major Federal action significantly affecting the quality of the human environment within the context of NEPA. Therefore, preparation of an environmental impact statement is not required, and DOE is issuing this FONSI.

Mascoma and Frontier's commitment to obtain and comply with all appropriate Federal, state and local permits required for construction, operation, and other activities related to the Frontier Project,

and to minimize the potential impacts through the implementation of Best Management Practices and various mitigation practices detailed in the EA, shall be incorporated and enforceable through DOE's financial assistance agreement..

The Final EA is available at the DOE Golden Field Office Reading Room Website, http://www.eere.energy.gov/golden/Reading_Room.aspx, and the DOE NEPA Website at http://www.nepa.energy.gov.

For questions about this FONSI, please contact:

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For further information on the DOE NEPA process contact:

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Washington, DC 20585
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Issued in Golden, Colorado., this 1st day of July 2011.

Carol Battershell
Golden Field Office Manager
Office of Energy Efficiency and Renewable Energy
United States Department of Energy

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Executive Summary

Under the Energy Policy Act (EPAct) of 2005, the United States (U.S.) Congress directed the U.S. Department of Energy (DOE) to carry out a program to demonstrate integrated biorefineries for the production of transportation fuel from lignocellulosic feedstocks. Federal funding for lignocellulosic fuel production facilities is intended to further the government's goal of rendering lignocellulosic fuel cost-competitive with fossil fuel by 2012 and, along with increased automobile fuel efficiency, reducing fossil fuel consumption in the U.S. by 20 percent within 10 years.

In May 2007, pursuant to §932 of EPAct 2005, DOE issued a Funding Opportunity Announcement (FOA) for applications to design, construct, build and operate/validate an integrated biorefinery demonstration employing terrestrial lignocellulosic feedstocks for the production of some combination of (i) liquid transportation fuel(s) that is a fungible replacement for liquid transportation fuels currently used in the existing infrastructure; (ii) biobased chemicals; and, (iii) substitutes for petroleum-based feedstocks and products. The objective of this FOA was to support demonstrations that will validate key process metrics and provide the kinds of continuous, operational data at the scale needed to lower the technical risks associated with financing a future commercial plant. Mascoma Corporation (Mascoma) applied to the FOA, and was selected to negotiate for an award of financial assistance to aid in the design, construction and operation of a cellulosic ethanol biorefinery in Kinross Charter Township (Kinross), Michigan (the Frontier Project).

DOE has authorized Mascoma to expend Federal funding for preliminary activities including preliminary engineering design, the completion of this Environmental Assessment (EA), permitting, and pilot scale testing. These activities are associated with the proposed project and do not significantly impact the environment nor represent an irreversible or irretrievable commitment of Federal funds in advance of the conclusion of this EA. DOE is currently proposing to authorize the expenditure of Federal funding for Mascoma to complete final design, construct, and initially operate the Frontier Project.

In accordance with DOE and CEQ National Environmental Policy Act (NEPA) implementing regulations, DOE is required to evaluate the potential environmental impacts of DOE facilities, operations, and related funding decisions. The proposal to use Federal funds to support the Frontier Project requires that DOE address NEPA requirements and related environmental documentation and permitting requirements. In compliance with NEPA (42 United States Code [USC] §§ 4321 *et seq.*) and DOE's NEPA implementing regulations (10 Code of Federal Regulations [CFR] Part 1021 & 1022) and procedures, this environmental assessment and notice of wetland involvement (EA) examines the potential environmental impacts of DOE's Proposed Action and a No Action Alternative. This EA also addresses the requirements of Section 106 of the National Historic Preservation Act of 1966 (NHPA) revised regulations, "Protection of Historic Properties" (36 CFR Part 800) which became effective January 11, 2001.

The Frontier Project consists of the design, construction and operation of a biorefinery producing ethanol and other co-products from cellulosic materials utilizing a proprietary pretreatment and fermentation process. The initial Frontier Project is being developed to produce approximately 21.0 million gallons per year (mgy) of denatured ethanol (20 mgy of anhydrous ethanol) from about 770 bone dry short tons per day (BDTPD) of cellulosic materials consisting primarily of woody biomass (clean chips). The expected lifespan of the proposed Frontier Project is 40 years. This Environmental Assessment evaluated the potential impacts of this project at a scale twice this size or 42.5 mgy of denatured ethanol (40 mgy anhydrous ethanol) from 1540 BDTPD of cellulosic materials. This additional analysis was conducted because the facility is envisioned to be built in modules of 20 mgy of anhydrous cellulosic ethanol and once this initial module is completed and operating successfully, a second module of 20 mgy anhydrous cellulosic ethanol would likely be built. DOE's decision to authorize funding would be for the initial 20 mgy anhydrous cellulosic ethanol module only. The environmental consequences of the 20 mgy facility would be commensurately less than for a 40 mgy facility.

The objectives of the Frontier Project are as follows:

- Design and construct a commercial scale biorefinery that utilizes advanced cellulose-to-ethanol conversion technologies; the cellulosic feedstock would be primarily hardwood pulpwood.
- Implement a sustainable biomass collection, storage, and delivery system to provide feedstock to the biorefinery.
- Maximize alternative energy production and minimize traditional energy usage.
- Operate the biorefinery systems to:
  - Validate the technology at commercial scale.
  - Validate the economics at commercial scale.
  - Enable replication of the technology at new cellulosic-to-ethanol facilities.

In compliance with the statutory mandate of § 932 of EPAct 2005 § 932, DOE has implemented a program to demonstrate the commercial application of integrated biorefineries that produce ethanol from cellulosic feedstocks. The facility that would be constructed and operated as a result of the Proposed Action would meet the requirements of §932 by using renewable supplies of wood to produce fuel-grade ethanol. The Proposed Action also would support DOE's mission to reduce dependency on fossil fuels and commercialize cellulosic technologies as well as curb greenhouse gas (GHG) emissions. By providing financial assistance to support the construction of the proposed cellulosic ethanol production biorefinery, DOE would support national energy needs and the development of alternative fuel sources.

This report presents the EA prepared pursuant to the DOE NEPA process. This report provides information on:

- The proposed Frontier Project;
- The alternative sites considered;
- The No Action Alternative; and
- The potential environmental impacts/benefits of the Proposed Action including cumulative impacts.

The EA study areas include:

- Forest Resources
- Biological Resources
- Land Use
- Cultural Resources
- Air Quality and Meteorology
- Geology and Soils
- Water Resources
- Waste Management, Hazardous Materials, and Genetically Modified Organisms
- Hazard Review and Accident and Risk Analysis
- Occupational Health and Safety
- Infrastructure
- Noise
- Aesthetics

- Traffic
- Socioeconomics and Environmental Justice
- The Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity
- Irreversible and Irretrievable Commitments of Resources
- Unavoidable Adverse Impacts

Mitigation measures were identified during the development of the Frontier Project and this Environmental Assessment and are described in Chapter 2 as part of the Proposed Action. These mitigation measures would be incorporated and binding through the financial assistance award.

Acronyms, Abbreviations, and Terms

°F	Degrees Fahrenheit
$\mu g/m^3$	microgram per cubic meter
ATVs	All Terrain Vehicles
APHIS	Animal and Plant Health Inspection Service
AST	Aboveground storage tank
ATC	American Transmission Company
BDT	Bone Dry Ton
BDTPD	bone dry short tons per day
BSA	Biodiversity Stewardship Area
bgs	Below ground surface
CCPHD	Chippewa County Public Health Department
CFR	Code of Federal Regulations
CHP	Combined heat and power
CIP	clean-in-place
DAP	Diammonium phosphate
dBA	Decibels adjusted
DOE	U.S. Department of Energy
DOT	Department of Transportation
EA	Environmental Assessment
EAC	Early Action Compact
EPAct 2005	Energy Policy Act
ft^2	Square Feet
Frontier	Frontier Renewable Resources, LLC.
FSC	Forest Stewardship Council
GAFMP	Generally Accepted Forest Management Practices
GGPC	Gitchie Gumee Pellet Company
GMO	genetically modified organism
gpd	gallons per day
gpm	gallons per minute
GP	Georgia-Pacific
GTPD	Green Tons Per Day
GT	Green tons
HAP	Hazardous air pollutant
Inc.	Incorporated
Kinross	Kinross Charter Township

K_{sat}	Saturated Hydraulic Conductivity
kV	Kilovolt
Kw	Kilowatt
KOH	potassium hydroxide
lbs	Pounds
LLC	Limited Liability Corporation
MAP	Mitigation Action Plan
MCAN	Microbial Commercialization Activity Notice
MDEQ	Michigan Department of Environment Quality
MDNR	Michigan Department of Natural Resources
MDNRE	Michigan Department of Natural Resources and Environment (MDNRE formed in 2010 by combining MDNR & MDEQ)
MTU	Michigan Technological University
mg/m^3	milligram per cubic meter
mgd	Million gallons per day
mgy	Million gallons per year
MGT/yr	Million green tons per year
MMBTU	Million British Thermal Units
MNFI	Michigan Natural Features Inventory
NaOH	Sodium Hydroxide
NAAQS	National Ambient Air Quality Standards
NAIP	National Agriculture Imagery Program
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIH	National Institutes of Health
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NSPS	New Source Performance Standard
PGA	Peak Ground Acceleration
PM	Particulate Matter
PM_{10}	Particulate Matter Less Than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 Microns
ppm	Part per Million
SIP	State Implementation Plan
SFE	Sustainable Forestry Education
SFI	Sustainable Forestry Initiative
SO_2	Sulfur Dioxide

SSURGO	NRCS Soils Survey Geographic Database
tpd	Ton per day
tpy	Ton per year
TSCA	Toxic Substance Control Act
$\mu g/m^3$	Microgram per Cubic Meter
UPEA	Upper Peninsula Engineers & Architects
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WWTP	Wastewater treatment plant

1.0 Introduction

1.1 Background

Under the Energy Policy Act (EPAct) of 2005, the United States (U.S.) Congress directed the U.S. Department of Energy (DOE) to carry out a program to demonstrate integrated biorefineries for the production of transportation fuel from lignocellulosic feedstocks. Federal funding for lignocellulosic fuel production facilities is intended to further the government's goal of rendering lignocellulosic fuel cost-competitive with fossil fuel by 2012 and, along with increased automobile fuel efficiency, reducing fossil fuel consumption in the U.S. by 20 percent within 10 years.

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1.2 Proposed Project Overview

Mascoma, through its subrecipient, Frontier Kinross, LLC (Frontier), a subsidiary of Frontier Renewable Resources, LLC, is proposing to construct and operate a cellulose-to-ethanol biorefinery near Kinross, Michigan. Frontier is jointly owned by Mascoma Corporation and J.M. Longyear, LLC. Mascoma Corporation is a renewable fuels research and development company that has developed a process to produce commercial quantities of lignocellulosic ethanol from woody biomass. J.M. Longyear is a natural resource management and industrial project development company based in Marquette, Michigan. J.M. Longyear manages more than 100,000 acres of company-owned forestlands in Michigan and Canada. J.M. Longyear forestland management and harvest operations, including road construction and maintenance operations of its 72,000 acres within the U.S., are conducted within standards and guidelines of the Forest Stewardship Council (FSC) standard and have been certified as well managed forest lands by the FSC, Certificate Registration No. SW-FM/COC-003804. J.M. Longyear also purchases timber stumpage from other private and public forest landowners on which it conducts harvest operations under the same guidelines as used on J.M. Longyear forest lands.

The initial phase of proposed project would utilize approximately 770 bone dry tons (BDT) per day of clean wood chips (from hardwood pulpwood) to produce up to approximately 21.0 million gallons per year (mgy) of denatured ethanol (or 20 mgy anhydrous ethanol). Eventually the Frontier Project could be expanded to utilize 1,540 BDT per day of clean wood chips to produce 42.5 mgy of denatured ethanol (or 40 mgy anhydrous ethanol). The expected lifespan of the proposed Frontier Project is 40 years.

All of the bark and most of the co-products, such as the lignin and spent cellulose from the process would be used to produce steam and electricity in a biomass boiler on-site. Excess co-products would be sold off-site as a fuel. A stable market exists in Michigan for lignin as fuel.

The proposed Frontier Project site property is comprised of 355 acres in the Kinross Charter Township of Chippewa County, Michigan. The proposed biorefinery site is adjacent to the former Kincheloe U.S. Air Force base in Kinross. The site is predominantly wooded with no existing structures and limited unpaved trails present. A snowmobile trail borders approximately ¼ mile of the property along the northwest corner. Based on a review of soil maps and the National Wetland Inventory (NWI) maps, approximately 20 to 40% of the site may be classified as either forested or scrub-shrub wetlands. The land that the biorefinery would be situated on is currently zoned as Heavy Industrial. See Figure 1, Site Location Map, for an overview of the general property and access to area roads.

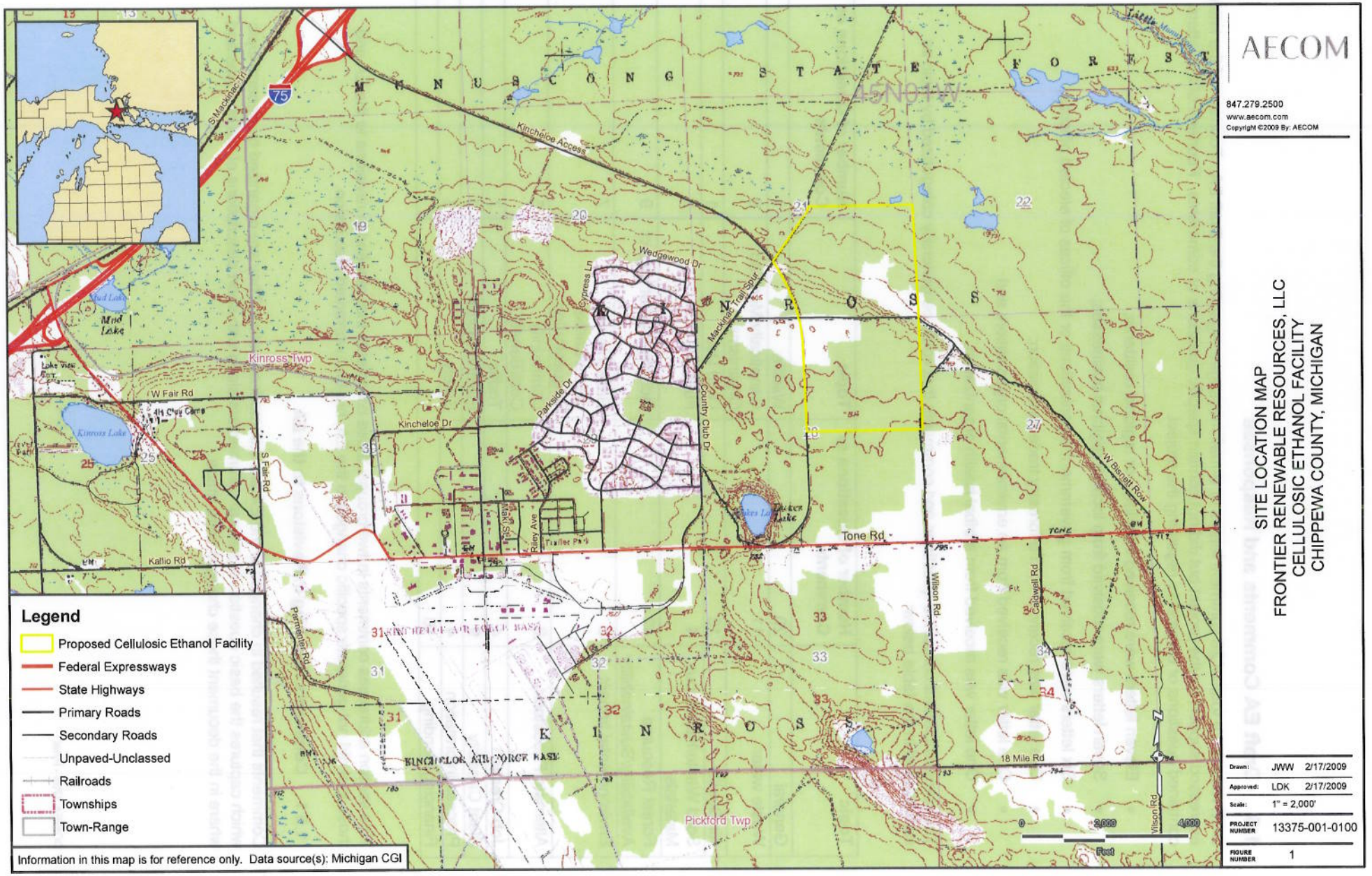
1.3 Purpose and Need

In compliance with the statutory mandate of § 932 of EPAct 2005 § 932, DOE has implemented a program to demonstrate the commercial application of integrated biorefineries that produce ethanol from cellulosic feedstocks. The biorefinery that would be constructed and operated as a result of the Proposed Action would meet the requirements of §932 by using renewable supplies of biomass, primarily wood and wood waste to produce fuel-grade ethanol. The Proposed Action would support DOE's mission to reduce dependency on fossil fuels and commercialize cellulosic technologies. By providing financial assistance to support the construction of the proposed biorefinery, DOE would support national energy needs and the development of alternative fuel sources.

1.4 Public Scoping

In accordance with the applicable regulations and policies, DOE sent scoping letters to potentially interested local, state, and Federal agencies, including the U.S. Fish and Wildlife Service (USFWS), the Michigan Department of Natural Resources (MDNR), the Michigan Department of Transportation (MDOT), and the Michigan State Historic Preservation Office (SHPO). DOE sent scoping letters to other potentially interested individuals, organizations, the Inter-Tribal council of Michigan, and the Sault Ste. Marie Tribe of Chippewa Indians. DOE also published the Scoping Letter on-line at the DOE Golden Reading Room. The scoping letter described the Proposed Action and requested assistance in identifying potential issues that could be evaluated in the EA. In response to the scoping letters, DOE received comments and questions from individuals, organizations, or agencies regarding the Proposed Action. Comments received on the Scoping letter have been addressed as appropriate in this EA.

Appendix A contains a copy of the scoping letters, the scoping letter distribution list, and a summary table of the comments.



AECOM

847.279.2500
www.aecom.com

SITE LOCATION MAP
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	JWW	2/17/2009
Approved:	LDK	2/17/2009
Scale:	1" = 2,000'	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	1	

1.5 Draft EA Comments and Responses

DOE received a total of 28 comment letters or e-mail messages regarding the Draft EA. Fourteen of the letters expressed support for the project but did not contain specific questions or comments. Fourteen of the letters contained questions or comments regarding the project.

- Eleven letters were received from local or regional residents;
- Seven letters were received from local or regional businesses;
- Six letters were received from government organizations or the offices of elected officials;
- One letter was received from a forestry trade association;
- One letter was received from an environmental organization; and
- One letter was received from a tribal health organization.

The comment letters contained questions and comments that could be generally categorized by topic as summarized in the table below:

Topic	Number of Questions or Comments	Topic	Number of Questions or Comments
General	20	Wildlife	1
Waste water	11	Genetically Modified Organisms	8
Air Quality	13	Land Use	1
Solid Waste/Hazardous Materials	4	Fuel Use	2
Forest Resource Availability/Sustainability	42	Industry/Market Impact	9
Environmental Impact	6	Greenhouse gases/Carbon Sequestration	7
Alternate Feedstock	2	Community Cost/Benefit	6
Job Creation	4	Traffic	7
Plant Capacity	9	Electric Usage	2
Process Information	4	Safety	3
Financing/Funding	16		

This section addresses comments in two groups: those comments that resulted in revisions to the EA and those that did not generate specific changes to the EA, but that warranted discussion.

1.5.1 Comments Resulting in Revisions to the EA

Comments that resulted in changes to the EA are summarized below. They are organized by general topic which captures the basic question of several commenters along with short descriptions of the changes and where in the document those changes were made.

Wastewater

Comment Summary – DOE received multiple comments regarding the proposed use of the Kinross Waste Water Treatment Plant (WWTP). More specifically, one commenter suggested that the amount of sludge generated at the WWTP would increase and have impacts on landfill capacity.

Response/Revisions- DOE added text to Sections 3.8.1.4 and 3.8.3.3 explaining that, due to the low quantity of suspended solids in the wastewater that will be produced, there will not be a major increase in sludge produced at the WWTP and disposed of in the landfill.

Landfill capacity

Comment Summary – DOE received a comment expressing concern about the lack of options identified in the EA for disposal of waste from the Frontier facility.

Response/Revisions– DOE added text to Sections 3.9.1.1 and 3.9.3.1 of the providing an additional option for disposal of solid waste and discussion of associated impacts on landfill operations.

Genetically Modified Organisms (GMO)

Comment Summary – DOE received multiple questions regarding the GMO "kill system" and disposal of GMO waste.

Response/Revisions– DOE added text to Section 2.2.3.4 further explaining the "kill system" and disposal requirements for GMOs.

Caustic and acid products

Comment Summary – DOE received a question regarding what happens to the caustic and acid product that is used in the process.

Response/Revisions– DOE added text to Section 2.2.3.10 further explaining the use and disposal of caustic soda, acids and other materials.

Air Quality

Comment Summary– DOE received several comments regarding the release of contaminants to the air, the cumulative impacts of the Frontier Project combined with existing facilities in the area, and the adverse impact of air pollutants on sensitive receptors.

Discussion– DOE has considered the potential air quality impacts of the Frontier Project along with the existing sources of air emissions in the project area and presented the analysis in the EA. The existing facilities were considered as part of the baseline air quality information presented in the EA in section 3.6.1.1.

Section 3.6.3 of the EA was modified to include updated information on the Michigan Department of Environmental Quality (MDEQ) permitting process and to further discuss the potential impacts of the project with regard to the National Ambient Air Quality Standards (NAAQS) and Toxic Air Contaminants (TAC). As stated in the revised section, the MDEQ air permitting process applies conservative assumptions regarding exposure to nearby and further away receptors applies and standards that are protective of sensitive receptors.

Bacteria and fermentation operations

Comment Summary – DOE received a comment expressing safety concerns related to bacteria present in the fermentation system.

Response/Revisions– DOE added text to Section 2.9.3.3 providing additional information about the bacteria present in the process and prevention of contamination.

Feedstock supply

Comment Summary – DOE received multiple comments regarding the feedstock supply chain, the feedstock (cellulose) growth cycle, and impacts related to feedstock harvest.

Response/Revisions– The feedstock for the Frontier project would be sourced through the existing hardwood supply chain in the Eastern Upper Peninsula and Northern Lower Peninsula of Michigan. DOE added text to Section 3.1.1. citing the findings of multiple studies that establish basis for the subsequent analysis of feedstock supply and impacts associated with harvest. DOE added text to Section 3.1.3.1 providing additional detail regarding use of low-demand hardwood species.

1.5.2 Comments Not Generating EA Changes but Warranting Discussion

Comments warranting a response but which did not otherwise result in changes to the EA are summarized and addressed below by general topic.

General Comments

Comment summary– DOE received comments regarding the authorship of the draft EA as well as the Section 7 consultation with the United States Fish and Wildlife Service.

Discussion– The environmental assessment was completed in a three-party arrangement between DOE, Mascoma and AECOM. AECOM prepared the Environmental Assessment on behalf of DOE and was paid by Mascoma using cost-shared project funds. DOE is responsible for independently verifying all data presented in the EA.

AECOM completed Section 7 consultation with USFWS on behalf of DOE. DOE independently verified the information presented to USFWS by AECOM. Section 7 consultation with the USFWS was completed for the project site only because the feedstock for the Frontier project would be sourced through the traditional hardwood supply chain in the Eastern Upper Peninsula and Northern Lower Peninsula of Michigan. To minimize potential impacts of feedstock harvest and transportation on biological and other resources, Mascoma has committed that the Frontier project will establish a timber procurement process and be certified under the Sustainable Forestry Initiative (SFI) certified procurement process guidelines. Frontier would, through its wood fiber procurement agreements and other supply relationships, work to encourage and influence private landowners and wood suppliers to participate in forest certification initiatives. Frontier would require verification of logger participation in Sustainable Forestry Education (SFE) professional logger training and certification programs and conformance to Michigan Best Management Practices.

Comment summary – DOE received comments regarding consideration of alternate project sites, alternate feedstocks and alternatives to the project other than the 'no action alternative'.

Discussion– DOE's proposed action is limited to deciding whether or not to provide Federal funding in support of final design, construction, and operation of the proposed facility. Therefore, no alternate sites, technologies or feedstocks are evaluated in the EA.

Comment Summary– DOE received comments regarding changes in the proposed project that occurred between public scoping and the release of the draft EA.

Discussion– DOE determined that the changes in the proposed project that were made between public scoping and the release of the draft EA were not extensive enough to warrant additional scoping. The site, the technology, and the majority of the project elements remain consistent with what was presented in scoping.

Comment Summary–DOE received a comment expressing concern about the total amount of energy used to produce ethanol. Specifically, the comment asserted that the boilers would use more energy per year than the Frontier project would produce.

Discussion– The six natural gas package boilers in the original proposal have been replaced with one bubbling fluidized bed boiler which would use the bark and lignin generated in the process as the primary fuel. Just as a heater in a house needs to be able to keep that house warm on the coldest winter day, but does not operate that way all the time, the Frontier boiler system must be sized to be able to provide enough steam to meet the maximum needs, such as during start up in the middle of winter. However, most of the time the Frontier facility would use much less than the maximum available steam to produce ethanol.

1.6 Report Content

This report presents the EA prepared pursuant to the DOE NEPA process. This report provides information on:

- The proposed Frontier Project;
- The alternative sites considered;
- The No Action Alternative; and
- The potential environmental impacts/benefits of the Proposed Action including cumulative impacts.

The EA study areas include:

- Forest Resources
- Biological Resources
- Land Use
- Cultural Resources
- Air Quality and Meteorology
- Geology and Soils
- Water Resources
- Waste Management, Hazardous Materials, and Genetically Modified Organisms
- Hazard Review and Accident and Risk Analysis
- Occupational Health and Safety
- Infrastructure
- Noise
- Aesthetics
- Traffic
- Socioeconomics and Environmental Justice
- The Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity
- Irreversible and Irretrievable Commitments of Resources
- Unavoidable Adverse Impacts
- Cumulative Impacts

Comment Summary– DOE received comments requesting the preparation of an EIS and a public hearing.

Discussion– Prior to providing Federal funding for final design, construction and operation of the Frontier project, DOE completed the environmental assessment in order to determine whether an environmental impact statement is required. The analysis in the environmental assessment supports a Finding of No Significant Impact and therefore DOE has determined that an EIS is not required. While DOE determined a public meeting was not necessary for this environmental assessment, DOE provided the public considerable opportunity to provide comments during the EA process. Per DOE NEPA implementing regulations, a public meeting is not required as part of the preparation of an environmental assessment.

Comment Summary– DOE received a comment requesting that a bond for potential environmental clean-up be required.

Discussion– While other Federal agencies that are responsible for land/resource management may require applicants to post a bond for environmental cleanup, bonding is not part of the DOE financial assistance process.

Wastewater

Comment Summary– DOE received several comments regarding the wastewater and the ability of the municipal sewage treatment plant to process wastewater from the proposed facility.

Discussion– As stated in Section 3.8.3.3 of the EA, DOE expects that the wastewater characteristics will be at or below "Normal Sewage Strength" as defined by Kinross. A pretreatment system would be constructed, if necessary, to meet this expectation.

Frontier is not proposing to construct any settling ponds for treatment of waste water. Retention or detention ponds may be included as a part of the facility storm water control system as discussed in Section 3.8.3.4 of the draft EA.

Comment Summary– DOE received a comment expressing concern over wastewater treatment forming toxins, dioxins, and other by-products from a reaction with chlorine.

Discussion– The water treatment processes used in this plant would consist of (1) reverse osmosis (RO) system for treating well water to make boiler feed water, and (2) an anaerobic biological digestion system to treat acetic acid and residual ethanol in distilled water being recycled into the yeast propagation and fermentation processes. These processes would not involve the addition of toxic chemicals. Nutrients and pH buffers would be added for the anaerobic bacteria in the digestion system. No chlorine would be used in the processes.

No dioxin formation would be expected because the RO and anaerobic digestion systems do not use chemical reactions. Chemical reactions are required to form dioxin and similar toxins.

Electric demand

Comment Summary– DOE received a question regarding long term electric use and concern about the how much of the available electric supply would be used by the Frontier project.

Discussion– For the facilities evaluated in this EA, Frontier would generate sufficient power on-site to provide all of own needs during normal operation. Frontier would need to connect to the Cloverland distribution system to provide for limited power use in the office building and for cold start up of the facility. As a result, Frontier will use very little of the existing line load. (For a 20 mgy facility, most power will be supplied by existing capacity held by Cloverland and this demand is well within their capacity to supply). .

Energy use in production of ethanol

2.0 Proposed Action and Project Alternatives

As required by Federal regulation, this EA addresses the possible environmental impacts of the Proposed Action and the No Action Alternative. Section 2.1 discusses the No Action Alternative. Section 2.2 describes the activities that would occur if DOE decides to authorize the expenditure Federal funding for the proposed project.

2.1 No Action Alternative

An evaluation of a No Action Alternative is required under the CEQ regulations (40 C.F.R. § 1502.14(d)) and the DOE NEPA implementing regulations (10 C.F.R. § 1021.321(c)). Under the No Action Alternative, DOE would not authorize expenditure of Federal funds for the proposed project and Mascoma would not design, construct, or start-up the Frontier Project. Although this project could proceed if DOE decided not to provide financial assistance, the Department has assumed, for the purposes of comparison in this EA, that the project would not proceed without its assistance. If the project proceeded without DOE assistance, the potential impacts would be essentially identical to those under the DOE Proposed Action (that is, providing assistance that enables the project to proceed).

2.2 Proposed Action

DOE is proposing to authorize the expenditure of Federal funding (up to $59 million) for Mascoma to design, construct, and initially operate an integrated biorefinery in Kinross, Michigan (the Frontier Project).

DOE has authorized Mascoma to expend Federal funding for preliminary activities including preliminary engineering design, the completion of this Environmental Assessment (EA), permitting, and pilot scale testing. These activities are associated with the proposed project and do not significantly impact the environment nor represent an irreversible or irretrievable commitment of Federal funds in advance of the conclusion of this EA.

The Proposed Action consists of the design, construction and operation of a biorefinery producing ethanol and other co-products from cellulosic materials utilizing a proprietary pretreatment and fermentation process. The proposed construction, for which DOE is proposing to authorize expenditures, is to produce approximately 21.0 million gallons per year (mgy) of denatured ethanol (20 mgy of anhydrous ethanol) from about 770 bone dry short tons per day (BDTPD) of cellulosic materials consisting primarily of woody biomass (clean chips). However, this Environmental Assessment evaluates the potential impacts of this project at a scale twice this size or 42.5 mgy of denatured ethanol (40 mgy anhydrous ethanol) from 1540 BDTPD of cellulosic materials. This additional analysis was conducted because the facility is envisioned to be built in modules of 20 mgy of anhydrous cellulosic ethanol and once this initial module is completed and operating successfully, the facility may be expanded by building a second 20 mgy module to supply a total output of 40 mgy anhydrous cellulosic ethanol.

Hence, the authorization for expenditure of DOE funds would only be for the first 20 mgy facility. However, the analysis provided in this Environmental Assessment addresses a 40 mgy facility. All data, tables, analyses and results are based on the environmental consequences of building a 40 mgy facility but actual impacts would be less for a 20 mgy facility.

This section will describe the different unit operations required to operate the Frontier Project, the waste streams generated, and the estimated workforce requirements. The basic components of the project would be:

- Cellulosic Material Collection, Receiving, and Handling
- Cellulosic Material Conversion to Sugars
- Fermentation of Cellulosic Sugars

- Ethanol Distillation
- Ethanol Storage and Loading
- Natural Gas Boilers
- Co-products production
- Supporting Infrastructure

2.2.1 Project Overview and Purpose

The objectives of the Frontier Project are as follows:

- Design and construct a commercial scale biorefinery that utilizes advanced cellulose-to-ethanol conversion technologies; the cellulosic feedstock would be primarily hardwood pulpwood.
- Implement a sustainable biomass collection, storage, and delivery system to provide feedstock to the biorefinery.
- Maximize alternative energy production and minimize traditional energy usage.
- Operate the biorefinery systems to:
  - Validate the technology at commercial scale.
  - Validate the economics at commercial scale.
  - Enable replication of the technology to increase the size of the Frontier facility at Kinross and also provide design and operational expertise that could be applied for other, new cellulosic-to-ethanol facilities that Mascoma or Frontier might build in the future.

2.2.2 Project Location and Site Plan

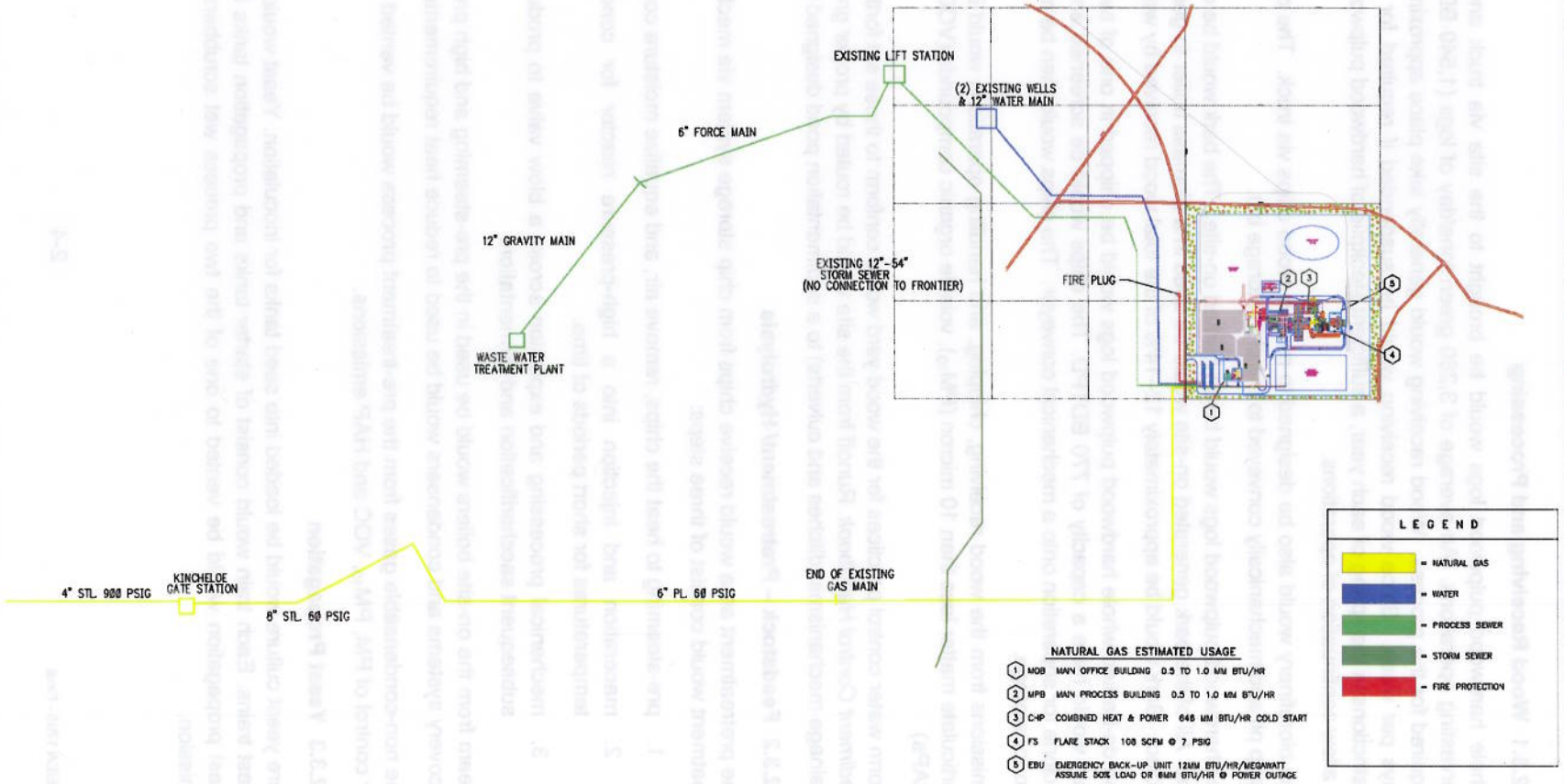
The proposed Frontier Project site property is comprised of 355 acres located approximately ½ mile northeast of Kinross, Michigan. The proposed Frontier site consists of predominantly wooded land with no existing structures and limited unpaved trails used for recreational vehicles such as snowmobiles and All Terrain Vehicles (ATVs). The proposed cellulosic ethanol biorefinery would be constructed on approximately 50 acres located in the southernmost 160 acres of the property. See Figure 2, Site Layout Map. The study area for this EA is the 355 acre proposed site and a rail corridor from the proposed site to the existing rail mainline located west of I-75.

The official property description is:

> Chippewa County, Kinross Township, T45N, R01W, Sections 21 and 28: All that part of the S ½, of Section 21 lying E of the centerline of Gaines Highway, EXCEPT that part lying west of the easterly edge of State Designated Snowmobile Trail # 49 otherwise known as the Mackinac Trail Spur. AND, All that part of the North ½, of Section 28 lying E of the centerline of Gaines Highway, Excepting and reserving unto the State of Michigan an access easement to enable the State of Michigan to access an adjacent parcel described as: The NW ¼ of SE ¼ of Section 28 (benefited parcel).

A rail spur would be constructed from the existing rail line west of the proposal project site to the project site looping north of Kinross, See Figure 1, Site Location Map, for an overview of the general property and access to area roads and rail.

The 355-acre parcel of land proposed for the site was transferred from the State of Michigan effective March 5, 2009 in a land transfer agreement between J.M. Longyear and the State of Michigan.



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SITE LAYOUT
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:
Approved:
Scale:
PROJECT NUMBER 60140061
FIGURE NUMBER 2

2.2.3 Process Description

The following paragraphs present a process description for the proposed project.

2.2.3.1 Wood Receiving and Processing

Whole hardwood pulpwood logs would be brought to the site via truck and rail from surrounding timber harvesting operations. An average of 3,260 green tons/day of logs (1,540 BDTPD of clean chips) would be required for the process. Wood receiving would generally take place approximately 24 hours per day, seven days per week. Since wood receiving would be suspended if required for "mud season" or due to road restrictions in the spring of each year, a sufficient stockpile of hardwood pulpwood would be maintained on-site to allow continuation of operations.

The biorefinery would also be designed to receive wood chips via truck. The chips would be off-loaded into a dump pit and mechanically conveyed to the chip storage bin.

The hardwood pulpwood logs would be de-barked on-site. The bark would be conveyed to an outdoor storage pile. All of the bark generated on-site would be used in a biomass boiler to generate steam and power for the project. Bark would be approximately 12–14% of the total wood received by weight.

The de-barked whole hardwood pulpwood logs would be chipped in one of two parallel chipping trains. Each train would have a capacity of 770 BDTPD. The chips would be screened and pneumatically conveyed to a cyclone for separation onto a mechanical conveyor. The chips would then be mechanically conveyed to a chip silo for storage.

Emissions from the wood receiving, chipping, and handling operations would include particulate matter (PM), particulate matter less than 10 micron (PM_{10}), volatile organic compounds (VOC), and hazardous air pollutants (HAPs).

Storm water control practices for the wood yard would conform to those set forth in the *Michigan Erosion & Sediment Control Handbook*. Runoff from the site would be routed by proper grading practices and other drainage mechanisms (ditches and culverts) to a sedimentation pond designed for a maximum storm event.

2.2.3.2 Feedstock – Pretreatment/ Hydrolysis

The pretreatment area would receive chips from chip storage system via mechanical conveyor. The pre-treatment would consist of three steps:

1. pre-steaming to heat the chips, remove air, and equalize moisture content;
2. maceration and injection into a high-pressure reactor for conditioning with steam at high temperatures for short periods of time.
3. mechanical processing and explosion across a blow valve to produce characteristics suitable for subsequent saccharification and fermentation.

Steam from the on-site boilers would be used in the pre-steaming and high pressure reactor system. Heat recovery systems and condensers would be used to reduce heat requirements.

The non-condensable gases from the pre-treatment process would be vented to a wet process scrubber for control of PM, PM_{10}, VOC and HAP emissions.

2.2.3.3 Yeast Propagation

Pure yeast culture would be loaded into seed tanks for inoculation. Yeast would be propagated in one of three yeast trains. Each train would consist of starter tanks and propagation tanks in series. CO_2 emissions from yeast propagation would be vented to one of the two process wet scrubbers for control of VOC and HAP emission.

2.2.3.4 Fermentation

Fermenters would be partially filled with water, yeast and enzymes (if needed). Pretreated feedstock would be fed to each fermenter. Following fermentation, the contents (beer) would be pumped to the Beer Column Feed Tank for further processing. CO_2 gas and VOCs evolved during fermentation would be vented to a wet scrubber to remove the VOCs from the vapor stream. Scrubbed CO_2 gas would be vented to the atmosphere, and the resulting scrubber water bearing the ethanol would be pumped to the beer column feed tank.

The various process tanks and Beer Column Feed Tank would operate at essentially atmospheric pressure. CO_2 vent gases from each vessel would be collected in a common header and taken to a wet scrubber for ethanol removal.

As noted in the above paragraphs, VOC and HAP emissions would be controlled by one of three wet scrubber systems, one each on the two pretreatment trains and other process vessels and one on the fermentation system.

The containment area for the fermentation vessels would be designed to open outside the building to provide for ventilation of CO_2 if the lower manways of the vessels are removed. Failure to provide adequate ventilation of this area could present a safety hazard.

All process water used in the fermentation area would be evaporator condensate quality and would be disinfected to remove bacterial contamination. All leakage of seal or flush water would be collected in on-site sumps and treated to kill genetically modified organisms. The "kill system" would use heat to kill the GMO. There would be consolidation of all water-based streams that may contain live GMO's at the beer well. The actual "kill" would occur during heating the entire beer stream to at least 180°F for a period of approximately 30 minutes or more during the distillation preheat, CO_2 degassing, and ethanol distillation processes. At least 99.9999 percent of the genetically modified organisms would be killed as prescribed under the USEPA Toxic Substance Control ACT (TSCA) regulations.

Additionally, vapor streams which may contain GMOs attached to aerosol particles, would be passed through a wet scrubber before discharged to the atmosphere, and the water leaving the scrubber would be reused in the process and eventually pass through the distillation heat-kill process described above.

2.2.3.5 Distillation

The distillation system would receive the beer from the Beer Column Feed Tank and remove and dehydrate the ethanol. The main equipment in the area would be composed of a beer column, a rectifying column, a molecular sieve unit, and a vent-scrubbing column together with the associated pumps and heat exchangers. Ethanol from the distillation system would be approximately 190 proof (95% alcohol).

A two bed molecular sieve unit would be designed for vapor phase operation to purify the ethanol from 190 proof to 200 proof. The molecular sieve systems would include the necessary exchangers for regeneration of the media and cooling of the product ethanol. The vent gases from each unit would be collectively passed through a common vent condenser, removing ethanol from the gas stream. The vent condenser would handle the vent stream from the distillation area only. Non-condensable gases from distillation would be vented to one of the two process wet scrubbers for control of VOC and HAP emissions.

2.2.3.6 Thin Stillage Evaporation and Evaporator Condensate Anaerobic Bio-treatment

Thin stillage (water and residual solids after distillation) from the distillation column would be concentrated in a stillage evaporator system to increase the solids content. The stillage concentrate (syrup) from the evaporator system would be stored in a syrup tank before being fed as liquid fuel to the biomass boiler described in Section 2.2.3.11.

Process condensate (condensed water with small amounts of organic compounds and organic acids) from the evaporator system would be stored in a process condensate tank. The condensate would be pumped to anaerobic bio treatment system to reduce the soluble organic acids and also other organic compounds that would sometimes present in trace quantities.

Two or more anaerobic bio treatment reactors, operating in parallel, would be used to treat the process condensate. The resulting treated water would be recycled within the plant. The excess treated water would be discharged to the Kinross Charter Township wastewater treatment facility.

Exhaust gas from the anaerobic bio treatment reactors would be rich in methane and would be burned in the biomass boiler described in Section 2.2.3.11. Sludge from the reactors would also be burned in the biomass boiler.

2.2.3.7 Ethanol Storage / Load Out

Product ethanol from the distillation area would be directed to one of four shift tanks for holding until testing of the product is complete. The anhydrous ethanol would be denatured with unleaded gasoline (maximum of RVP15) and transferred to one of two product storage tanks. Denatured product would be loaded into tank trucks for transportation off-site to customers.

The following storage tanks would be included in the ethanol storage area:

- Four (4) – Shifts tanks (35,000 gallons each)
- One (1) – Denaturant (gasoline) tank (50,000 gallons)
- Two (2) – Product storage tank (650,000 gallons each for 10 days total storage)

Emission control for VOC and HAP would be achieved through the use of storage tanks with floating roofs designed to comply with New Source Performance Standard (NSPS) 40 Code of Federal Regulations (CFR) Subpart Kb. VOC and HAP emissions from the truck load out would be controlled using an interlocked flare system.

2.2.3.8 Spent Solids Handling and Drying

After distillation, the spent solids, consisting primarily of lignin residue, would be separated from the liquid phase using centrifuges. The solids moisture content would be approximately 60%. The solids would be mechanically conveyed to a low temperature natural gas fired dryer. The dryer would use only pipeline quality natural gas to evaporate water from the solids to achieve a moisture content of as low as 30%. The dryer would operate at a temperature of approximately 85°C (185°F).

Emissions from the dryer would include VOC and HAP. No emission control system is planned for this source.

2.2.3.9 Genetically Modified Organisms and Control Techniques

Properties of the Frontier GMO

The intended organism for cellulosic ethanol production at the Frontier biorefinery would be *Saccharomyces cerevisiae*, commonly known as baker's or brewer's yeast, which has been genetically modified. *Saccharomyces cerevisiae* has an extensive history of use in the area of food processing. This yeast has been used for centuries as leavening for bread and as a fermenter of alcoholic beverages and has a prolonged history of industrial use.

The Food and Drug Administration rates Brewer's Yeast extract as Generally Recognized as Safe (FDA, 1986). Furthermore, the National Institutes of Health (NIH) in its Guidelines for Research Involving Recombinant DNA Molecules (DHHS, 1986) considers *S. cerevisiae* a safe organism. Most experiments involving *S. cerevisiae* have been exempted from the NIH Guidelines based on an analysis of safety.

Control of the GMO

The GMO would be stored for use in frozen vials of approximately 1.5 ml. Master vials would be provided by Mascoma Corporation and would be shipped or hand carried to Frontier on occasion, as needed. Chain of custody of these transported vials would be monitored and documented. Working stock vials may be made by

trained Frontier personnel. All vials would be stored in secure freezers on-site, and potentially at secure freezers in an off-site location.

Initial propagation of the GMOs from the vials would occur in Frontier laboratory facilities in flasks. These activities would be conducted in facilities with limited access and would be done by trained personnel.

Trained personnel would transport the flasks with the propagated yeasts to the fermentation section of the factory, where they would be added to the propagation (seed) tanks. After a specified incubation time, the contents of the propagation tanks, containing the GMO yeasts would be transferred to the production fermenters though transfer piping.

After the specified incubation time in the production fermenters, the contents of the fermenters, including liquids and solids, containing the GMO yeasts would be transferred to a beer well tank or directly to the ethanol beer distillation column through transfer piping. During the boiling and distillation process, the yeast would be killed by heat.

The propagation tanks, fermenters, and transfer piping would be cleaned-in-place (CIP) with multiple cleaning cycles, including a caustic cleaning cycle. This step would purge residual yeast to a CIP waste tank. The contents of the CIP waste tank would be sent to the ethanol beer distillation column, where the yeast would be killed by heat.

Through these procedures, the majority of the GMO yeasts in the liquid and liquid/solid slurry waste streams would be killed in compliance with EPA regulatory requirements.

The scrubber water, which includes water from scrubbing the off-gas of the propagation tanks and fermenters, may contain low levels of GMO yeast due to aerosol formation in these tanks. The scrubber water would be sent to the distillation column for further heat deactivation prior to being discharged from the biorefinery.

There will be no other sources of wastewater in the biorefinery which would contain viable GMO yeast.

Catastrophic Failure

In the rare event of a catastrophic tank failure, grading would be such that the bulk of the tank contents would accumulate in an area with concrete barriers, enabling the sumping of much of the material to the beerwell, where it would be sent to distillation for inactivation. Remaining beer after sumping would be cleaned with chemical disinfectant application.

The safety profile of the yeast is such that release of GMO due to catastrophic equipment failure would result in negligible impact to workers and the environment. Industrial microorganisms in the environment are typically disadvantaged relative to native organisms. The GMO yeast in this process would likely be competitively disadvantaged, as the expression of the additional proteins provides a burden to rapid growth of the organism.

Frontier expects to qualify for a Tier I contained structure exemption and would notify EPA as required by the TSCA regulations. If in the unlikely case the requirements for a Tier 1 contained structure exemption could not be met, the alternative would be to submit a Microbial Commercialization Activity Notice (MCAN) application to the USEPA. Approval through this process can be granted by the USEPA after a 90 day review period if there are no objections. This approval would be expected to be straightforward given the safety profile of *S. cerevisiae*, as discussed above.

2.2.3.10 Clean-In-Place

A clean-in-place (CIP) system will be installed to clean vessels, piping, and heat exchangers and fermentation vessels of contaminated material. The clean-in-place system will use a hot solution of sodium hydroxide (NaOH) to kill contaminant organisms.

After each CIP cleaning cycle, some of the sodium hydroxide-containing solution, combined with neutral-pH rinse water, would be forwarded to the Beer Well where it would be combined with the fermented beer. Acids and bases used for pH control in the upstream processes (pretreatment of wood chips, yeast propagation, and fermentation) also would be contained in the finished beer. This beer would be sent through the distillation system to remove ethanol, and then centrifuged to remove the spent biomass solids. The spent biomass solids would make up the lignin byproduct. The lignin would be burned in the on-site biomass boiler, or dried and shipped to another user who burns this stream.

Dissolved solids leaving the water stream from the centrifuge would be pumped to the recycle water evaporator, where they would be concentrated. This concentrate would be added to the lignin prior to its being burned in the biomass boiler or shipped off-site. Thus, the caustic soda and other acid and bases would end up in the ash from the on-site biomass boiler or with a lignin co-product shipped off site.

2.2.3.11 Steam and Power Generation

Frontier would construct a combined heat and power (CHP) system to provide electric power and process steam for the facility. The CHP would consist of a biomass boiler and a steam turbine. The biomass boiler would combust up to eight types of fuel to generate high pressure and temperature steam. The fuels would include:

1. Bark and waste wood from the debarking and chipping operation (hog fuel)
2. Dry lignin at 30% moisture content, from on-site storage
3. Un-dried lignin at 60% moisture content;
4. Evaporator syrup at 70% moisture content;
5. Methane-rich gas from the anaerobic bio treatment reactors;
6. Sludge from the anaerobic bio treatment reactors;
7. Natural gas, for cold boiler pre-heat and startup periods; and
8. Wood chips as supplemental fuel for process plant startup periods.

All of the bark and approximately 80% of the lignin generated on-site would be used in the biomass boiler. The facility would not need to import solid fuel for their operations. The high pressure steam from the biomass boiler would power a steam turbine to produce electricity. The turbine would produce approximately 15 MW of power. As discussed in Section 2.2.3.13, this would be sufficient power to meet the peak power needs of the facility. Excess power, when available, may be sold to the electric grid. Power for cold starts of the facility and a small portion of ongoing electrical usage would be purchased from Cloverland Electric.

Low pressure steam, from the outlet of the steam turbine, would be piped to the processing area for use in the pretreatment area, distillation system, and other process areas. The low pressure steam would also be used to heat water which would in turn heat the lignin dryer. The biomass boiler would be large enough to provide all of the process steam required by the facility.

2.2.3.12 Support Operations and Facilities

Cooling towers would be dry type systems that use electric fans to blow air across finned water tubes. No emissions would be associated with the cooling towers.

The biorefinery would have two natural gas fired emergency generators that would each operate at 2,000 kilowatt (KW) each for no more than 100 hours per year. The biorefinery would also have an emergency fire water pump that would use natural gas as the fuel which would operate at 500 HP for no more than 500 hours per year.

Other required support operations and facilities would include:

- Maintenance shop
- Aboveground storage tanks for process chemicals
- Administrative offices
- Laboratory
- Truck weighing scales
- Central control room
- Power distribution centers or Machine Control Centers
- Custody transfer station

2.2.3.13 Supporting Infrastructure

The following utilities would be required for biorefinery operation.

- Biorefinery Water Usage: 150 gpm – average
- Process Water Discharge: 100 gpm – average
- Biorefinery Steam Usage: 172,600 lb/hr. peak load per train, 345,200 lb/hr total
- Power: 21,681 – connected horsepower
- 17.7 MW – connected load
- 10.9 MW – estimated average load
- 14.1 MW – estimated peak load

Cloverland Electric Cooperative (Cloverland) owns and operates the electric distribution system in and around the Kinross Charter Township. Cloverland would be the provider of the electric power to the proposed Frontier Project. Frontier will contract with Cloverland to provide power for cold starts of the facility and a small portion of ongoing electrical usage. Cloverland is determining whether to feed the project site from the village or to construct a transmission line from the existing grid along I-75. Cloverland would be responsible for consultation and completion of any environmental review that might be required for the interconnect.

The proposed Frontier project site is currently undeveloped. Therefore, no municipal sewer services have been extended into the area. Kinross provides sewage collection and treatment services to the residential and commercial area immediately to the west of the Frontier site. A connection to the existing force main would be required to convey wastewater from the proposed site to the Kinross waste water treatment plant (WWTP). Modifications to the force main system, including upgrades of two lift stations would likely need to be completed to support the flow from the Frontier site. Due to regional topography, minimum pipe slope requirements and pipe bury depth requirement, it does not appear feasible to convey wastewater from the Frontier site solely via gravity. Frontier would be responsible for the costs associated with construction of the sewer system connection. No upgrades to the Kinross WWTP are anticipated to support the proposed project.

A connection to the existing Kinross water system will also be required to provide potable and process water to the proposed facility.

2.2.3.14 Start up, Shutdown, Maintenance, and Emergency Conditions

The Frontier Project would normally operate 24 hours per day, seven days per week. On an annual basis, it is expected that the biorefinery would operate approximately 347 days per year. Minor maintenance activities would be regularly scheduled throughout the operating year with an additional biorefinery-wide shutdown scheduled each year for major maintenance activities that require the entire biorefinery to be off-line. This would limit the number of times the biorefinery goes through a complete start up and shut down cycle.

Standard Operating Procedures (SOPs) would be developed for each operating system and the associated pollution control systems. SOPs would be developed for:

- Wood receiving and handling;
- Pretreatment and Hydrolysis;
- Filtration;
- Separation;
- Neutralization;
- Acid Reclamation;
- Fermentation, and distillation systems; and
- Ethanol and denaturant loading and storage.

The Frontier Project would shut down under emergency conditions such as power or process water loss. The Frontier Project would have emergency fire pumps in the event of a fire.

The pollution control systems associated with wood receiving, handling, and storage would be interconnected with the motor controls on the process equipment. Shutdown of the pollution control device would automatically shut down the associated process.

The Frontier Project fermentation and distillation systems would have wet scrubbers to remove ethanol and VOC from the vapor stream.

The unused lignin from the Frontier Project (approximately 20%) would be sold off-site. A stable market for the excess lignin exists in Michigan. Temporary on-site storage may be required during inclement weather or to accumulate sufficient spent lignin to accommodate efficient transportation methods. Long-term, on-site storage of the lignin is not anticipated to minimize the potential for odor impacts.

2.2.4 Construction

2.2.4.1 Preconstruction Surveying and Geotechnical Analysis

A limited geotechnical survey has been completed to facilitate development of preliminary site layout plans. A detailed site survey including full topographic analysis was completed during the spring of 2009. An additional geotechnical survey would be required to allow final design of building foundations, soil stability under parking areas and roadways.

2.2.4.2 Grading and Earthworks

The site grading design would be completed to minimize the impact to the surrounding environment. Site development practices would conform to those set forth in the *Michigan Erosion & Sediment Control Handbook*. Development of the site would be completed on approximately 50 acres located within the southern 160 acres of the site. Figure 1 shows the proposed site layout.

Frontier would apply for a Soil Erosion and Sedimentation Control (SESC) permit through Chippewa County, prior to starting construction. Since the overall earth disturbance would be greater than 5 acres, Frontier would apply for a Notice of Coverage through the MDEQ as part of the National Pollutant Discharge Elimination System (NPDES) for storm water discharges from construction activities. Frontier would utilize engineering and construction best management practices (BMPs) to control the amount of sedimentation and erosion created by the construction process. The BMPs would include but not be limited to:

- minimizing traffic and activity outside the construction area,
- using silt fencing, hay bales, rip rap and/or

- sedimentation ponds.

In accordance with Michigan's Part 91, Soil Erosion And Sedimentation Control (SESC), of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended, Frontier would routinely inspect the BMPs to ensure implementation and to evaluate whether additional measures would be required to prevent unnecessary impacts during construction.

2.2.4.3 Roads and Facility Access

The proposed Frontier site currently has access from the west by South Gaines Highway (Gaines Road) and an unpaved road bisecting the property called West Bisnett Road. As shown on the site location map (Figure 1), the main route serving this area is Interstate 75, which is within three miles of the proposed biorefinery site. M-80 and South Gaines Highway have exits from Interstate 75 and would likely serve as traffic routes to the proposed Frontier site. These roads are high volume and high tonnage roadways.

On average the proposed Frontier biorefinery would receive approximately 2 trucks per day delivering sawmill chips, 77 log trucks per day delivering hardwood pulpwood logs to supply biomass material for normal operations. Other deliveries would be expected to require 4 to 6 trucks per week for miscellaneous chemicals and supplies. The proposed Frontier biorefinery also would have approximately 70 passenger vehicles arriving per day for employees and visitors. Because of the current road configuration, none of the trucks or passenger vehicles would have to travel through Kinross, commercial or residential areas to reach the Frontier site.

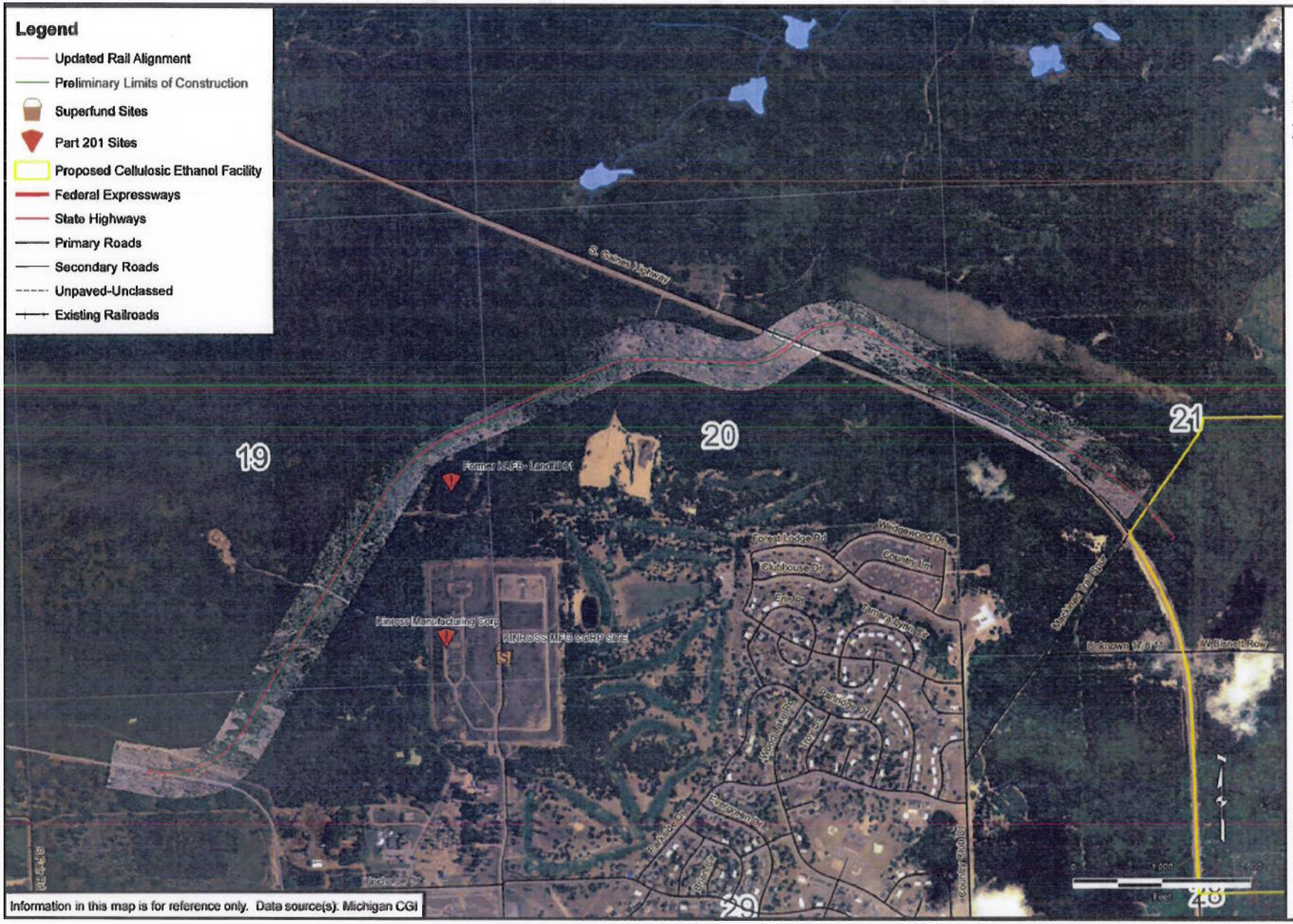
New turn lanes would be needed at the entrance to the Frontier site. Permits for the turn lanes may be required from the MDOT and/or Chippewa County.

All on-site roads would be designed for single loop traffic. All traffic would enter and exit the site via the main entrance guardhouse. After entering the site, all truck traffic would be routed away from employee and visitor traffic. The truck route would include two manned truck scales located inside the biorefinery security perimeter. Pulpwood and wood chip trucks would be weighed entering and exiting the biorefinery, as would all delivery trucks (chemical, fuel, etc.).

2.2.4.4 Rail Access

Rail service to the proposed site would be established by construction of a rail spur from the existing rail line located east of Kinross. Whole hardwood pulpwood logs would be delivered by rail. Lignin and denatured ethanol would be shipped from the biorefinery by rail and truck. As shown on Figure 3, the new rail spur would be routed north of Kinross and enter the proposed site from the north. An at-grade crossing would be constructed on the Gaines Highway. Sufficient track length would be constructed on-site to allow for staging of empty and full rail cars.

A maximum of two trains per day would use the spur for wood delivery and ethanol or lignin shipments. Each rail car delivery or shipment would replace two wood hauling trucks accessing the proposed site. Average daily rail delivery of pulpwood would be six railcars per day.



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UPDATED RAIL ALIGNMENT
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:	JWW	12/8/2009
Approved:	IM	12/8/2009
Scale:	1" = 1,000'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	3	

2.2.4.5 Major Buildings and Structures

The Frontier biorefinery would require construction of a number of major buildings, process areas, and structures. These would include:

Table 2-1 – Major Buildings, Process Areas, and Structures

Site, Facility or Unit Operation	Description and Intended Use	Building Size
Wood Yard	Approximately 20 acres for whole log storage. Log piles would be up to 35 feet in height.	Not Applicable
Log Debarker and Bark Pile	Debarker, log conveyors, bark conveyor, and bark pile	Not Applicable
Wood Chipper Building	One wood chipping train including wood chippers, conveyors, screens, and separation cyclones	120'L x 60'W x 35'H
Chip Storage Area	Three chip storage silos and conveyors	Not Applicable
Pretreatment, Yeast Propagation, Fermentation and Chemical Storage Building	Pre-steaming vessels, high pressure reactors, biomass refiners and blow valves. Three yeast propagation trains with five tanks in each train. Bulk chemical storage tanks.	100'L x 127'W x 50'H
Fermentation Area	Sixteen fermenters, one beer well tank	50'diameter x 65'H each
Cooling Tower Area	Mechanical Fan Cooling Towers	36'L x 36'W x 50'H
Utility Building	Electric Control Center Air Compressors Emergency Generators and Fire Pump	64'L x 36'W x 40'H
Biomass Boiler Building	One biomass boiler and one steam turbine	125'L x 100'W x 50'H
Distillation Building	Beer Column, Rectifier Column, Molecular Sieves	82'L x 55'W x 125'H
Evaporator Building	Two evaporator trains	45'L x 45'W x 90'H
Lignin Dryer Building	Lignin Dryer	23'L x 73'W x 65'H
Ethanol Storage and Load Out Area	Four ethanol shift tanks, Two Denatured ethanol storage tanks, one denaturant tank	Shift Tanks - 20'diameter x 15'H each Storage tanks – 50'diameter x 42'H each Denaturant Tank - 15'diameter x 15'H

2.2.4.6 Construction Schedule

Construction is proposed to begin in the second or third calendar quarter of 2011. Construction duration is expected to be approximately 18 to 24 months with first fermentation occurring in 2013.

2.2.4.7 Construction Staffing

Frontier would have full time construction management on-site throughout the entire duration of the project. Frontier would construct a contractor area near the construction-site where temporary job trailers and warehouses could be erected. Frontier would establish a temporary office on the site where all people entering the construction work zones would report. It would be Frontier policy for all construction labor to park their vehicles in the established contactor area. Only construction equipment and supervisor vehicles would be allowed in the construction zones.

Frontier would have appropriate project management staff on-site during all active construction time. Their primary role would be to monitor the overall performance and compliance of each individual contractor on-site. Frontier would not self-perform any of its own construction labor, so sub-contractors would be used throughout this process. By utilizing the sub-contractor supervision chain of command, Frontier employees could leverage their management to the entire work force. Additionally, Frontier management staff would visit the site on a regular basis to monitor installation and safety.

At the peak of construction, Frontier would employ approximately six people on-site full time. The sub-contractor labor force would be on average around 150.

2.2.5 Operations

2.2.5.1 Material Balance and Logistics

Table 2-2 summarizes resources and products that Frontier Project would require for the production of 42.5 mgy of denatured cellulosic ethanol. Additional details are presented in the following paragraphs.

Table 2-2 – Summary of Frontier Project Material Balance

Input Description	Frontier
Cellulosic material	971,600 green tons clean debarked wood chips per year 1,129,780 green tons of logs per year
Process Water	0.216 mgd
Potable Water	2,500 gpd
Yeast	Initial loading for yeast train only
Denaturant (gasoline or natural gas liquids)	2.5 mgy
Natural gas usage	0.1 MMSCF/year
Electricity	10.9 MW – estimated average load
Yeast Nutrients	Approximately 26,000 tons per year (tpy)
Process Chemicals	Approximately 7,500 tpy
Diesel Fuel (Wood Harvest)	Approximately 1.35 mgy
Diesel Fuel (Wood Transport)	Approximately 1.6 mgy
Diesel Fuel (Wood yard Usage)	Approximately 0.8 mgy

Bark (from on-site operations)	456 tpd
Lignin (from on-site operations)	420 tpd
Output Description	**Biorefinery Products**
Anhydrous Ethanol	40 mgy
Ethanol @ 5% Denaturant	42.5 mgy
Lignin	105 tpd
Waste Material Description	**Annual Production**
Cooling tower and boiler water discharge	0.14 mgd
Non-hazardous solid waste	25 tons/week
Hazardous Waste	<220 lb/month
Boiler Ash	44 tpd
Air Potential Emissions	
NO_X	229.3 tpy
VOC	145.2 tpy
CO	186.9tpy
PM	200.12 tpy
PM_{10}	140.9 tpy
$PM_{2.5}$	113.1 tpy
SO_2	42.6 tpy
GHGs	
CO_2	
Biogenic CO_2	458,484 tons/year
Anthropogenic CO_2	7,800 tons/year

2.2.5.2 Biomass Requirements

The raw material for the Frontier biorefinery would be in the form of mixed hardwood pulpwood and chips. For the purposes of raw material supply planning, the Frontier biorefinery would require 1,129,780 green tons of hardwood pulpwood logs per year (971,600 green tons clean, debarked chips per year). This volume would be sourced through the existing traditional hardwood pulpwood supply chain infrastructure in the Michigan's Eastern Upper Peninsula and Northern Lower Peninsula. Hardwood pulpwood would consist of aspen, hard and soft maple, oak and other hardwoods. The majority of biomass would be in the form of roundwood. Biomass, in the form of hardwood pulpwood chips, may also be sourced from lumber mills or other users that have excess chips available. The Frontier biorefinery would not use softwoods such as pine (jack, red or white), cedar or other softwoods. Also, the Frontier biorefinery would not use high value timber, such as saw logs or veneer logs.

The biomass for the proposed project would come from within a 150 mile radius of Kinross. Over the life of the facility, the approximate annual distribution of biomass harvest is shown in Table 2-3.

Table 2-3 Approximate Biomass Harvest Distribution

Pulpwood Supply Zone (radius - miles)	Distribution of Volume by Zone (percent)	Delivered Wood Volume by Zone (Approximate Green Tons per Year)
0-30	10%	113,000
30-60	20%	226,000
60-90	25%	282,500
90-120	25%	282,500
120-150	20%	226,000

Biomass would be sourced from all types of forest ownerships in the region. These would include private forest lands, state owned and managed forest lands, and USFS National Forest Lands. Timber harvest is not allowed on National or State park lands. Therefore, these lands are not included in the biomass resource availability analysis. Additionally, because this is primarily a U.S. and Michigan based initiative and sufficient resource is clearly available from within Michigan. Therefore, Frontier is conservatively basing the project on that forest resource. Ultimately, some Canadian wood fiber may be utilized, but the viability of the project is not dependent upon Canadian pulpwood fiber. If Frontier were to utilize pulpwood from Canada, it would come from forest areas similar to those in Michigan, which have been historically managed and harvested sustainably for pulpwood and other timber products for many decades..

Timber harvests from National Forest lands would only be from tracts where compliance with NEPA has been demonstrated. Timber harvests from Michigan state lands and forests are subject to environmental review processes, public notification and review, and the practices and procedures established in the Michigan State Forest Management Plan. Annual audits by an independent third party FSC auditor monitors compliance with the specified practices and procedures detailed in the Michigan State Forest Management Plan. Timber harvests from JM Longyear properties (or similar large land/forest resource management companies) are subject to the provisions of the forest management plan prepared as part of their FSC or Sustainable Forestry Initiative (SFI) certification. Annual audits by an independent third party FSC or SFI auditor monitors compliance with the specified practices and procedures detailed in the plan.

Frontier would establish a SFI certified timber procurement process.. Frontier would, through its wood fiber procurement agreements and other supply relationships, work to encourage and influence private landowners and wood suppliers to participate in forest certification initiatives. Frontier would require verification of logger participation in Sustainable Forestry Education (SFE) professional logger training and certification programs and conformance to Michigan Best Management Practices.

2.2.5.3 Permits, Approvals, and Plans

The Frontier Project would require a number of environmental permits, approvals, and plans for construction and operation. The permits, plans, and approvals are included in Table 2-4 below:

Table 2-4 – Frontier Project Potentially Applicable Permits and Approvals

Need For	Permit Name	Agency	Complete By	Notes
Air Emissions	Permit to Install (PTI)	Michigan Department of Natural Resources and Environment (MDEQ)	Construction	The air Permit to Install has been issued by the MDEQ. Mascoma would ensure that Frontier would apply for a permit modification application for the biomass boiler CHP system.
Building Permits	For Construction activities	Chippewa County	Construction	For site development and buildings
Building Permits	Construction	State of Michigan	Construction	For electrical, mechanical and plumbing permits
Deliveries to Site	Overload Limit Permits – Construction deliveries	County and Michigan DOT as applicable.	Construction	Prior to start of construction & operations as necessary.
Fire Protection	Hazardous Material Inventory and Emergency Response Plan	Chippewa County Local Emergency Planning Commission	Operations	Consultation during design. Inspections during construction and operations.
Hazardous Material/Waste	Hazardous Waste Generator ID	USEPA EPA	Operations	TBD (for soiled rags, used oil, etc.)
Land Use Zoning	For planned use	Chippewa County	Construction	Property currently zoned industrial.
Site Access	Right of Way, Drive Way Permit	Chippewa County	Construction	Required before construction
Surface Water Resources	Stormwater Permit for General Construction	Chippewa-East Mackinac Conservation District (CEMCD)	Construction	Filing under General Permit. Submit Notice of Intent, Stormwater Pollution Prevention Plan, and fees prior to start of construction.

Need For	Permit Name	Agency	Complete By	Notes
Water Supply	Water use Permit	Kinross Charter Township	Construction	Approximately 200 gallons per minute of water would be provided to the biorefinery by the Kinross Charter Township
Water Discharge	Significant Discharge Permit	Kinross Charter Township	Operations	Required for wastewater discharge of more than 25,000 gallons per day
Alcohol Fuel Permit	For production and sale of fuel ethanol	Bureau of Alcohol, Tobacco & Firearms	Operations	
Wetlands	Joint Permit Application: USACE Section 404 Permit/ MDEQ Part 303 of NREPA, Act 451 of 1994	USACE- Detroit District, Soo Area Office/ MDEQ	Construction	Wetland impacts would be mitigated by constructing additional wetlands and/or purchasing wetland credits from an existing wetland mitigation bank.
Aboveground Storage Tanks (ASTs)	Installation of Aboveground Storage Tanks	MDEQ	Construction	Required for ASTs that contain a liquid with a flash point of <200 °F

2.2.5.4 Operational Workforce

The Frontier Project would employ approximately 70 full-time workers. Frontier expects to hire the necessary skilled personnel from existing local and/or regional resources.

2.2.5.5 Project Design Features to Minimize Threat from Intentional Destructive Activities

The Frontier Project would be designed to include measures to minimize potential threats or damages from intentional destructive acts (i.e. acts of sabotage or terrorism). The biorefinery design would include security fences, security lighting, and communication procedures with the local 911 emergency response system. In addition, the biorefinery would be manned 24 hours per day and equipped with automation that allows remote emergency shutdown and cutoff of process units and loading racks.

2.3 Alternative Sites Considered

In 2008, Mascoma evaluated a former Georgia Pacific site near Gaylord, Michigan for the proposed project. The site featured good access to infrastructure and, as a brownfield site, minimal potential environmental impacts. The site was rejected by Mascoma due to existing on-site contamination and the need for significant infrastructure upgrades.

Between April and June 2008 Mascoma and J.M. Longyear, LLC (prior to the formation of Frontier Renewable Resources or Frontier Kinross) evaluated three potential sites for development of the proposed Frontier biorefinery in the area of the former Kincheloe Air Force Base.

- Site #1: located south of Gaines Highway and north of the existing wastewater treatment plant and golf course.
- Site #2: located west of interstate I-75 approximately one mile north of the Gaines Highway exit ramp.
- Site #3: located northeast of the Kinross airport on the east side of Gaines Highway.

The analysis included evaluation of known natural and manmade features, as well as regulated natural resources, wildlife, and land developments in the area that would impact successful development of the proposed biorefinery. The evaluation was completed through the use of readily available data.

The project team considered the following data during the review:

- Biological resources, including wetlands and plant communities (wetland information from the National Wetland Inventory and the plant communities from the Michigan Natural Features Inventory).
- Land use.
- Electrical transmission and other infrastructure services (roads, rails, transmission lines, and substations).
- Any Federal lands or lands involving Federal funding.
- State and Federally listed threatened and endangered species (T&E information from the Michigan Natural Features Inventory.).
- Aerial orthophotography.
- Roads, rails, terminals, and ports.
- USGS 7.5-Minute Topoquadrangles.
- Hydrography (lakes, ponds, streams, and rivers).
- EPA Toxics Release Inventory (TRI).
- Waste management facilities.
- Superfund sites.
- Airports and private airstrips.
- Schools, churches, hospitals, nursing homes, and other sensitive community resources.
- Soils
- Geology, bedrock, and geologic landforms.
- Michigan Leaking Underground Storage Tanks, USTs, and Part 201.
- Drinking water wells.
- Estimated groundwater recharge.
- Water table depths.

- Water table contours.
- Wastewater treatment plant locations.

Following completion of the review, the Mascoma project team visited each of the three sites. The sites were ranked considering potential environmental impacts, community impacts, infrastructure requirements, transportation routes, and site access. The results of the evaluation identified the following:

- Site #1 features included good access to municipal utilities, transportation corridors for rail and truck access, and had only sparse wetland areas. Site #1 was rejected by Frontier because it was close to residential areas, included an environmental contamination site (Superfund site) and lacked sufficient acreage to allow flexibility in design and construction of the biorefinery.

- Site #2 features included good access to transportation corridors (adjacent to CN railway main line and I-75). The site was rejected because the area consisted primarily of wetlands with limited upland areas. Construction would have resulted in unacceptable environmental impacts. Additionally, the municipal utilities were the furthest away of the three sites.

- Site #3 features included over 300 acres of upland area with good access to transportation corridors (Gaines Highway to I-75). Municipal utilities were within a reasonable distance and would require only minor upgrades to support the proposed project. Sufficient land was available to allow flexibility to avoid adverse impacts to on-site wetlands. Site #3 was far enough from existing development to minimize impacts on the community from noise, odors, traffic, or visual impacts. Site #3 was selected for the proposed project.

As a result of the review process, Mascoma selected Site #3 for the proposed Frontier biorefinery. Mascoma identified Site #3 in its application to DOE, and accordingly this EA is evaluating Site #3. The other sites are not under consideration or evaluated in this EA.

2.4 Mitigation Measures

Mascoma has made the commitments in Table 2-5 to mitigate potential impacts that were identified during the development of the Frontier Project and the preparation of this EA. These commitments would be incorporated and binding through the DOE financial assistance award. For purposes of this EA, the term "mitigation measures" is broadly defined. The measures below were not necessarily included to decrease the level of impact below significant; i.e., the impacts may have been less than signification with or without the measures, but the measures were put into place to further reduce the likelihood of impacts and to ensure the project is carried out in a environmentally responsible manner.

Table 2-5 Mitigation Measures and Follow-on Actions Integral to or Incorporated into the Proposed Project.

Mitigation Measure	Legal Authority or other driver
Mascoma would require Frontier to develop appropriate spill response, pollution prevention, and emergency response plans (ERPs) to address the medical and environmental hazards associated with the Frontier Project. The plans would include, at a minimum, a Pollution Incident Prevention Plan (PIPP), Spill Prevention, Control and Countermeasure (SPCC) Plan, a Storm Water Pollution Prevention Plan (SWPPP), and an ERP. EA § 3.8, 3.9, 3.10 and 3.11	The plans would be completed in accordance with Federal and Michigan Occupational Safety and Health Administration and United States Environmental Protection Agency and Michigan Department of Natural Resources and Environment regulations and guidance.
Mascoma would require Frontier to develop a Soil Erosion and Sedimentation Control Plan (SESC) to prevent excess erosion or degradation of the site and to protect wetlands during construction activities. The construction contractor would be required to complete the permit application and SESC plan as required by Part 91 for submission to the Chippewa-East Mackinac Conservation District (CEMCD). The construction contractor would also be required to provide a State of Michigan certified storm water operator to inspect the construction activities one each week and 24 hours after a precipitation event to ensure that all soil erosion control measures are operating properly. EA § 3.8	Michigan Department of Environmental Quality: Part 91, Soil Erosion And Sedimentation Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.
Mascoma would require Frontier to implement procedures so that the storm water control practices for the wood yard would conform to those set forth in the *Michigan Erosion & Sediment Control Handbook*. Runoff from the site would be routed by proper grading practices and other drainage mechanisms (ditches and culverts) to a sedimentation pond designed for a maximum storm event. EA § 3.8	Michigan Department of Environmental Quality Soil Erosion and Sedimentation Control Program

Mitigation Measure	Legal Authority or other driver
Mascoma would require Frontier to establish a Sustainable Forestry Initiative (SFI) certified procurement process. Frontier would, through its wood fiber procurement agreements and other supply relationships, work to encourage and influence private landowners and wood suppliers to participate in forest certification initiatives. Frontier would require verification of logger participation in Sustainable Forestry Education (SFE) professional logger training and certification programs and conformance to Michigan Best Management Practices. EA § 3.1	Mascoma
Mascoma would require Frontier to submit an air permit modification application with an ambient air quality modeling analysis and Toxic Air Contaminant (TAC) analysis that demonstrates that the facility would meet all Federal and State regulatory limits, and would not cause or contribute to an exceedance of the National Ambient Air Quality Standards or Michigan TAC thresholds. EA § 3.6	Michigan Department of Environmental Quality, Part 55 (Air Pollution Control) of the Natural Resources and Environmental Protection Act, Public Act 451 of 1994, as amended.
Mascoma would require Frontier to apply for and acquire a Joint Permit from the MDEQ and the USACE, and implement mitigation action as required by that permit for wetland impacts resulting from construction activities. EA § 3.2	Michigan Department of Environmental Quality: Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, Public Act 451 of 1994, as amended. US Army Corps of Engineers: Section 404 of the Clean Water Act

3.0 Affected Environment and Environmental Consequences of the Alternatives

3.1 Forest Resources

3.1.1 Affected Environment

Mixed hardwood pulpwood and chips for the proposed Frontier Project would be sourced through the traditional hardwood pulpwood supply chain infrastructure existing in the Michigan's Eastern Upper Peninsula and Northern Lower Peninsula.

The first lumber mill was established in the Upper Peninsula of Michigan by the US Army in 1822. By 1863 over 1,600 mills were operating in Michigan. The peak timber harvest occurred in 1890 when 5.5 billion board feet of lumber were produced (Michigan Forest Products Council, 2011). Timber harvest has continued to be a major industry in Michigan and the Upper Peninsula.

Within 150 miles of the proposed Frontier site, there are approximately 8,313,000 acres of commercial forest lands. This is the portion of the total forest area that has traditionally been harvested and managed as timberlands since the late 1800's. It includes the timberlands of all major ownership groups Federal, State, large commercial, and large to small private forest lands. It is "second-growth", which in many cases has been harvested and re-grown multiple times over many decades. A significant portion of this forest is re-established on lands once cleared and farmed for decades and then later abandoned to return to a forested state.

Excluded from the forest resource analyzed for the intended supply for Frontier are all other forest lands that are in some form of protected status either by statute or special management restriction including:

- By designation in National Forest Plans or State Forest Plans,
- National Wildlife Refuge areas,
- National Seashore area,
- State and National Parks, and
- A myriad of other special status designations.

By policy National Forest Plans must ensure that species and habitat diversity are addressed, not only at the broader forest-wide level, but also be a key consideration in the areas managed primarily for timber production.

Similarly, State Forests are managed under plans and policies which specifically balance timber production with protections to maintain natural diversity and specific habitats across the landscape. Additionally State Forests are dual certified by the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council FSC) systems; each of which contain specific criteria and indicators for maintaining biodiversity within managed forests. Large commercial owners are also certified under either SFI or FSC systems and subject to similar expectations to maintain key natural and diverse characteristics of forest ecosystems at a level appropriate to their level of effect on the overall landscape in a given region.

Smaller private landowners, while not generally participating in forest certification systems, are influenced by either consulting foresters assisting them with management planning or timber sale preparation, or certified loggers who are bound by their certification through the Sustainable Forest Education program to operate under the principals of sustainable forestry, and all regulations and guidelines regarding protection of water quality, protection of endangered species and habitats; and recognizing and maintaining unique ecological, historical, and cultural resource.

Frontier along with existing forest products industry members are committed to further broadening participation by smaller forest land owners in a form of forest certification which is appropriate to small landowners and small businesses.

Frontier contracted for an initial resource study in 2009 (Timber Supply Outlook for Kinross, Michigan; Tessa Systems, LLC; March 2009) , and supported a second resource study in 2010 through the Feedstock Supply Chain Center of Energy Excellence (COEE) Research Projects with Michigan State Univ. and Michigan Technological Univ. (Timber Resources and Factors Affecting Timber Availability and Sustainability for Kinross, Michigan; L. A. Leefers and J. Michael Vasievich, Department of Forestry, Michigan State Univ.; December , 2010) , to verify that the wood fiber required to supply the Kinross cellulosic ethanol plant is available from the forests within the Michigan portion of the supply region around Kinross, MI. Both studies utilized the USFS Forest Inventory and Analysis (FIA) data for the region.

Long-term analysis of growth data from FIA have demonstrated that net growth in excess of removals has been a continuing long-term trend throughout Michigan forests. This trend continued throughout the period of time when removals were higher than current levels required to supply three large wood using facilities (G-P Board plant, Sappi Paper mill, Menasha Corp Paper mill, using a combined total of more than 1.4 million green tons) but are now closed. During that time, the total volume of growing stock has actually been accumulating and increasing the total standing inventory of wood fiber in Michigan's forests. Total forested area has increased, average diameter of trees in the forests has increased, and the number of medium and larger size trees has increased while the number of smaller size trees has decreased (Michigan's Forest Resources, 2008 USFS Research Note NRS-50).

According to the Timber Resources and Factors Affecting Timber Availability and Sustainability for Kinross, Michigan, Prepared for Feedstock Supply Chain Center of Energy Excellence, December 2010 (Timber Supply Report) net annual growth (total growth less mortality) of the timber resource is about 6,683 thousand green tons annually (thousand GT/yr) on growing stock trees within 150 miles of the proposed Frontier site. This growth is 16% aspen, 31% maple, 10% oak, 6% other hardwoods, 20% pine, 17% other softwoods. Total net annual growth of all hardwoods is 4,187.8 thousand GT/yr.

Table 3-1 - Net Annual Growth

Species Group	<30 miles	30-60 miles	60-90 miles	90-120 miles	120-150 miles	Supply Area Total	Area Pct
	Thousand GT/yr						
Aspen	79.8	64.6	190	288.9	425	1048.3	15.7%
Maple	97.6	203	459.7	627.7	654.6	2042.6	30.6%
Oak	9.4	-8	77.1	184.5	406.3	669.3	10.0%
Upland HW	-9.9	-5.5	126.2	126.7	44.5	282	4.2%
Lowland HW	-10	-2.5	11	72.4	74.7	145.6	2.2%
Total Hardwoods	166.9	251.6	864	1300.2	1605.1	4187.8	62.7%
Pine	65.2	63.4	183.5	407	647.4	1366.5	20.4%
Upland SW	63.6	66.2	57.9	107.7	136.4	431.8	6.5%
Lowland SW	97.9	105.3	98.7	141.7	253.5	697.1	10.4%
Softwoods	226.7	234.9	340.1	656.4	1037.3	2495.4	37.3%
All Species	393.5	486.6	1204.1	1956.5	2642.5	6683.2	100%
Green Tons/Acre	0.6	0.65	0.75	0.9	0.85	0.75	

As shown on Table 3-2, current annual removals of all species of growing stock timber are about 3,556.5 thousand GT/yr within 150 miles of Kinross. This volume was 17% aspen, 28% maple, 6% oak, 16% other hardwood, 22% pine, and 11% other softwood. Total current annual removal of mixed hardwood is about 2391.1thousand green tons.

Table 3-2 - Net Annual Removals

Species Group	<30 miles	30-60 miles	60-90 miles	90-120 miles	120-150 miles	Supply Area Total	Area Pct
	Thousand GT/yr						
Aspen	54	23.9	109.6	144.6	272.8	604.9	17.0%
Maple	83.7	138.8	198	174.6	421	1016.1	28.6%
Oak	2	0	11.4	28.2	161	202.6	5.7%
Upland HW	11.7	85.3	148.3	124.4	140.6	510.3	14.3%
Lowland HW	15.9	0	10	6.8	24.5	57.2	1.6%
Total Hardwoods	167.3	248	477.3	478.6	1019.9	2391.1	67.2%
Pine	75.1	46.4	71.8	254.8	320.6	768.7	21.6%
Upland SW	54.1	41.4	54.9	57.3	49.4	257.1	7.2%
Lowland SW	18	13.3	13.3	17.7	77.3	139.6	3.9%
Softwoods	147.2	101.1	140	329.8	447.3	1165.4	32.8%
All Species	314.5	349.1	617.3	808.4	1467.2	3556.5	100%
Green Tons/Acre	0.5	0.25	0.4	0.35	0.55	0.41	

A realistic estimate of raw material supply, takes into account both the net growth on the forest, and the removals already occurring. Net annual growth less current annual removals or usage – *sustainable fiber supply* – is an assessment of the fiber that can be utilized over time without depleting the current growing stock inventory. This is shown below in Table 3-3 - Net Annual Growth Less Removals.

Harvest methods and techniques employed by pulpwood suppliers will be the same as those which have been used for decades in the region to supply current and former facilities that used hardwood pulpwood. The majority of the hardwood forest types will be thinned or harvested using tree selection methods or shelterwood methods. A minor portion of the pulpwood will be aspen harvested using the clearcut method. All harvesting in the region is subject to sustainable forest management and harvesting practices, monitored by both landowners, some of whom are certified under SFI or FSC systems, and certified procurement systems operated by all of the large pulpwood consuming facilities. All loggers who sell and deliver pulpwood to these facilities have been required achieve and maintain certification under the Sustainable Forestry Education (SFE) program. The SFE training and certification requirement has been in place in this region since the late 1990's.

Additionally, secondary fiber sources, such as sawmills capable of supplying clean residual chips would provide fiber to the biorefinery. The current potential for sawmill chips in the supply region within close proximity is approximately 20,000 tons, which could offset approximately 2 percent of the green pulpwood volume.

Since the analysis period for the timber supply report was 2004-2008, the data in Table 3-2 for removals does not fully account for the closure of the Georgia-Pacific (GP) Particle Board Mill at Gaylord, Michigan in March of 2006, the former S. D. Warren pulp and paper mill at Muskegon or the Menasha mill in Otsego, Michigan. The GP facility was within the 150 mile radius of the Frontier biorefinery site at Kinross. GP's annual wood fiber usage was approximately 740,000 GT/yr. The S. D. Warren mill used about 450,000 GT/yr, a portion of

which came from within the proposed Frontier supply area. Menasha used about 480,000 GT/yr, a small portion of which came from within the proposed Frontier supply area.

All planning for raw material supply has excluded potentially available forest resources in Ontario, Canada because this is primarily a U.S. and Michigan based initiative and sufficient resource is clearly available from within Michigan. Therefore, Frontier is conservatively basing the project on that forest resource. Ultimately, some Canadian wood fiber may be utilized, but the viability of the project is not dependent upon Canadian pulpwood fiber. Any pulpwood utilized from Canada, would come from forest areas similar to those in Michigan, which have been historically managed and harvested sustainably for pulpwood and other timber products for many decades, and would be subject to Frontier's SFI certified procurement process. Canadian Crown (similar to Federal forest lands in the US) forest lands within the area of Ontario Province which would be within Frontier's feasible supply radius are certified under the Canadian FSC Standard. Canada also has the Canada's National Standard for Sustainable Forest Management (CAN/CSA-Z809) which is used on a majority of non-Crown lands in Canada. The Canadian Standards Association (CSA) worked with a diverse range of stakeholders interested in sustainable forest management representing consumers, environmental groups, government, industry, Aboriginal, academia and other stakeholders to develop the CAN/CSA-Z809. The CAN/CSA-Z809 is similar in scope to the SFI program in Michigan.

Table 3-3 - Net Annual Growth less Removals (Surplus Growth)

Species Group	<30 miles	30-60 miles	60-90 miles	90-120 miles	120-150 miles	Supply Area Total	Area Pct
			Thousand GT/yr				
Aspen	25.8	40.7	80.5	144.3	152.2	443.5	14.2%
Maple	13.9	64.3	261.7	453.2	233.6	1026.7	32.8%
Oak	7.3	-8	65.7	156.3	245.3	466.6	14.9%
Upland HW	-21.7	-90.8	-22	2.2	-96.1	-228.4	-7.3%
Lowland HW	-25.9	-2.5	0.9	65.6	50.2	88.3	2.8%
Total Hardwoods	-0.6	3.8	386.7	821.5	585.2	1796.6	57.5%
Pine	-9.9	17.1	111.6	152.2	326.8	597.8	19.1%
Upland SW	9.5	24.7	3	50.4	87	174.6	5.6%
Lowland SW	80	92	85.4	124	176.3	557.7	17.8%
Softwoods	79.5	133.8	200.1	326.6	590.1	1330.1	42.5%
All Species	79	137.5	586.8	1148.1	1175.3	3126.7	100%
Green Tons/Acre	0.1	0.4	0.4	0.5	0.3	0.34	

As discussed above the Timber Supply Report indicates that net annual hardwood growth exceeds current removals by all wood users within the supply area for the proposed Frontier biorefinery by approximately 1,797 thousand GT/yr.

The region around the Kinross currently has a minimal demand for hardwood pulpwood. The larger hardwood pulpwood using facilities are concentrated in the western Upper Peninsula, northern Wisconsin, and northeastern Minnesota all more than 150 miles from Kinross. The nearest hardwood pulp and paper mill in Canada is approximately 170 miles east in Espanola, Ontario. There will likely be minimal direct competition between Frontier and these existing hardwood using facilities for hardwood pulpwood.

The nearest softwood pulp and paper mill is St. Mary's Paper is located approximately 25 miles North in Sault Ste. Marie, Ontario, Canada. It uses softwood pulpwood as feedstock. There will be no direct competition

between Frontier and this facility. It is more likely that the increased market for hardwood in the region would have a complementary affect on softwood pulpwood using facilities, as this facilitates the harvesting and or thinning of mixed species stands, and would likely increase softwood pulpwood availability.

One particle board operated by Louisiana-Pacific is located at Newberry, Michigan, approximately 50 miles west which uses aspen as its primary feedstock. The Weyerhaeuser particle board mill is located more than 150 miles south at Grayling, Michigan which also uses aspen as its primary feedstock. While Frontier can utilize aspen, it is not a necessary feedstock, as there is ample surplus mixed hardwood of other species within the region. It is not likely that Frontier will compete heavily for aspen pulpwood with either of the existing particle board mills in the region. It is more likely that an improved market for more mixed hardwood could be complementary to the aspen and softwood pulpwood using facilities, as this facilitates the harvesting and or thinning of mixed species stands.

One new forest products business company, the Gitchie Gumee Pellet Company (GGPC), began operations in Kinross Charter Township in June 2010. GGPC manufactures wood pellets for use a fuel on the former Kincheloe air force base. GGPC has the capacity to manufacture up to 20,000 tons of wood pellets per year. GGPC uses a combination of wood waste, forest-thinning, and sawdust to produce their pellets. It is likely that the increase market for hardwood in the region would make more wood waste and forest thinning available for GGPC. GGPC may also be a potential purchaser of lignin from the proposed Frontier Project.

Between 1996 and 2004, hardwood pulpwood and aspen prices were relatively stable at approximately $24.00 per GT. In 2004 and 2005 two conditions coincided to cause a sharp increase in the price to approximately $40 per GT for both hardwood pulpwood and aspen:

1. South African Paper Products, Inc. (SAPPI) of Cloquet, Minnesota had completed a large expansion of their hardwood processing capacity. In order to support their operations, SAPPI began sourcing hardwood pulpwood from the western Upper Peninsula of Michigan; and

2. A number of large forest products companies sold their timber lands. As a result, these companies entered the open market for forest resources.

In 2006 and 2007, the price of both aspen and hardwood pulpwood declined to less than $30 per GT as the market stabilized and a number of mills closed. This was followed by a short term increase in price to approximately $36 per GT in 2008 and 2009 that was driven primarily by the increase in the cost of diesel fuel. Buyers needed to offer a fuel cost offset to maintain deliveries of timber. Since the economic decline began in 2008, the price of aspen and hardwood pulpwood has been steadily declining as additional cutbacks have occurred in the forest products industries in the Upper Peninsula. The price for aspen in 2010 was approximately $28 per GT while hardwood pulpwood was approximately $32 per GT (Prentiss & Carlisle, 2009).

While, published long-term price trend data for the Kinross sub-region is not available from third party sources, experience data acquired by Longyear through long-term operational experience in the region, confirm that hardwood pulpwood pricing in and around Kinross is somewhat lower than State averages.

The existing forest lands have been managed, including the type of harvesting and frequency of harvest, for decades by various owner groups to supply pulpwood to the current and former mill facilities. Most of the forest area in the region has been harvested multiple times, has been regenerated successfully each time, and continues to grow and provide timber, habitat for wildlife, recreational opportunities, and other resources.

Four different land types/owners would be suppliers of pulpwood for the Frontier Project:

- National Forest Service lands
- Michigan State forest lands
- Private managed forest lands including timber owned and operated by JM Longyear; and

- Private lands owned and operated by other individuals, families and companies

Private managed forest lands are differentiated from other private lands in two primary ways.

1. Private forest lands are managed specifically to provide timber for commercial use; and
2. Private forest lands enrolled in certain state programs, such as the Commercial Forest program, which gives tax breaks for owners who keep their land open for recreation, are open to the public for hunting, fishing, and other recreational purposes.

Owners of other private lands may allow commercial timber harvest, but do not necessarily have that use as the primary purpose.

The Tribes that are signatory to the 1836 Treaty of Washington and the public have rights to hunt, fish and gather for personal use and subsistence on private forest lands enrolled in the above mentioned state programs. The public and Tribes do not have similar rights on other private lands unless granted by the owner.

3.1.1.1 National Forest Land Management

Timber harvest and sales are part of the forest management processes established by the US Forest Service. Prior to each timber sale, the Forest Service completes a multistep evaluation process. The first step is a detailed analysis of the appropriate forest management activities to be completed in each National Forest. If a timber sale is selected as an option for forest management, the Forest Service is required to complete an environmental review before the timber tract is sold. The environmental review process for the Forest Service is governed by the NEPA implementing regulations and Forest Service policies and procedures for environmental review.

The NEPA process begins with a Scoping document that describes the proposed timber sale and requests input from the public, other government agencies, and the Federally Recognized Tribes in the area on potential concerns or issues. The Forest Service reviews the responses to the Scoping document and utilizes that input to guide preparation of an EA or Environmental Impact Statement (EIS). Each EA or EIS addresses the following topics:

- Project Alternatives;
- Air Quality;
- Geology and Soils;
- Biological Resources, including threatened and endangered species, wildlife diversity, and habitat;
- Water Resources, including wetlands and surface water bodies;
- Cultural Resources, including historic and archeological resources;
- Land Use, including habitat conservation and sustainablility;
- Noise;
- Traffic, including access and harvest methods; and
- Economics

Other topics may be included depending on site specific needs or criteria.

The draft EA is provided to the public, government agencies and Tribes for review and comment. The draft EA is also posted electronically on the Forest Service website for easy access. If requested, a public hearing is conducted to accept additional input from the public. The Forest Service uses the information in the EA and the input from the public to make a determination if unmitigatable significant impacts would occur. If the EA

process yields the conclusion that a Finding of No Significant Impact (FONSI) is appropriate, the Forest Service publishes the draft FONSI for review and comment by the public, government agencies and Tribes. If a FONSI is not appropriate, additional information is gathered or the sale process does not go forward for that tract.

3.1.1.2 Michigan State Forest Land Management

In accordance with Part 525, Sustainable Forestry on State Forest Lands, MDNR is required to manage the state forest in a manner that is consistent with the principles of sustainable forestry, and to prepare and implement a management plan that states long-term management objectives and the means of achieving these objectives.

Part 525 also required the MDNR to seek and maintain third party certification of the management of the state forest that satisfies sustainable forestry standards of at least one credible certification program. Subsequently, the MDNR was certified under the standards of the FSC and the SFI. These standards also require the MDNR to write, implement, and maintain forest management plans. Additional information on FSC Certification is contained in Section 3.1.1.3.

The MDNR uses a 3-tiered planning structure for the management of Michigan's state forest resources: statewide, regional and forest management unit levels. The Michigan State Forest Management Plan and four Regional State Forest Management Plans (RSFMPs) provide landscape-level analyses and direction to enable tactical decisions for management of forest stands and compartments at the unit level. The aggregate of all forest prescriptions from compartment reviews are contained in the annual plan of work, which represents the tactical level of planning for state forest operations. The MDNR is also developing strategic plans that will address all ownerships in a region (including all MDNR lands – forests, parks and wildlife areas, other public plans, and private lands), which will be known as Ecoregional Resource Plans. Ecoregional Resource Plans will provide strategic goals and objectives that will also provide guidance for Regional State Forest Management Plans and other state planning efforts. (MDNR 2008).

Michigan's nearly 3.9 million acres of State Forest Land are divided into 15 Forest Management Units. Each of the state's 15 Forest Management Units are divided into blocks called compartments.

Using aerial photographs, land surveys, and other site specific information, MDNR foresters visit, record biological data and map by tree species on all the state-owned land in each compartment. Based on this information, foresters make initial recommendations for forest treatments including clear cutting, selective thinning, prescribed fires, tree planting or no treatment at all.

The inventory and draft recommendations are then reviewed by Forest Recreation Specialists, and often Ecologists, Foresters, Wildlife Biologists, and Fisheries Biologists. This review results in management recommendations that have an ecosystem or holistic land management perspective. A broad range of biological, economic and social values and benefits are considered, including: campground management, fish habitat and river corridor protection, game species management, gas, mineral, oil, and timber management, historic and cultural resources, insect, disease, and invasive species management, rare or fragile species and natural community protection, soil protection, trail location and maintenance, wildfire control, and others.

The management draft recommendations are reviewed with the Tribes prior to the publication of the compartment report to solicit comments and address Tribal questions or concerns.

The management recommendations are then presented at Open Houses. As the name implies, Open Houses are informal sessions that give citizens an opportunity to speak with foresters, wildlife biologists, and other resource professionals. The inventories, compartment maps, and recommended management actions are available for the public to look at and to provide suggestions to MDNR staff.

Modifications to the management recommendations are then incorporated into a finalized compartment plan to be presented at the "Compartment Review". The Compartment Review is a formal presentation that incorporates information from the initial inventory, the multi-disciplinary input period, and the open house. The presentation outlines the formal management plan for the compartment and includes an explanation of forest treatments if any are proposed. (www.michigan.gov/dnr, Reviewed November 2010)

In addition to the above programs, the MDNR has established the Biodiversity Stewardship Area (BSA) program to identify and preserve areas of state and private land that exhibit exceptional biodiversity. The MDNR would continue to evaluate State owned land through their existing BSA programs. Participation by private land owners is strictly voluntary. Private land owners would still be able to submit their property for participation in the BSA process. Candidate areas would be assessed by regional teams of MDNR staff and stakeholders. These teams would make a formal recommendation to the MDNR for a set of areas that should be included in the BSA network for their region. MDNR leadership (the MDNR's Statewide Council Certification Programs) would make the final decision after internal and public review. This process would not be affected by the proposed Frontier Project

As a result of widespread adoption of SFI certification by forest industry and many of the major land management entities within Michigan since the 1990's, training programs were established for loggers, foresters and other land management practitioners. All loggers and contractors who harvest timber on certified lands or sell timber products to certified mills, are required to acquire and maintain certification through the SFE program. SFE training includes both classroom training on sustainable and environmentally protective harvest methods as well as in-field training on practical applications and techniques to minimize impacts to forest lands, critical habitats, and environmentally sensitive areas. Annual refresher training is required to maintain the SFE certification.

3.1.1.3 J.M Longyear Managed Forest Lands

As noted in Section 1.3, JM Longyear is FSC certified on the lands they own and manage. (Certificate Registration No. SW-FM/COC-003804). The *FSC Principles and Criteria* (P&C) describe how the forests have to be managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. They include managerial aspects as well as environmental and social requirements. The FSC P&C form the basis for all FSC forest management standards.

- ***Principle* 1.** Compliance with all applicable laws and international treaties
- ***Principle* 2.** Demonstrated and uncontested, clearly defined, long–term land *tenure* and use rights
- ***Principle* 3.** Recognition and respect of indigenous peoples' rights
- ***Principle* 4.** Maintenance or enhancement of long-term social and economic well-being of forest workers and local communities and respect of worker's rights in *compliance* with International Labour Organisation (ILO) conventions
- ***Principle* 5.** Equitable use and sharing of benefits derived from the forest
- ***Principle* 6.** Reduction of environmental impact of logging activities and maintenance of the ecological functions and integrity of the forest
- ***Principle* 7.** Appropriate and continuously updated management plan
- ***Principle* 8.** Appropriate monitoring and assessment activities to assess the condition of the forest, management activities and their social and environmental impacts
- ***Principle* 9.** Maintenance of High Conservation Value Forests (HCVFs) defined as environmental and social values that are considered to be of outstanding significance or critical importance
- ***Principle* 10.** In addition to *compliance* with all of the above, plantations must contribute to reduce the pressures on and promote the restoration and conservation of natural forests.

FSC requires completion of a number of actions and studies before a company can be certified. These actions include:

- Surveying each parcel of timberland and determining the growth potential of timber on that parcel
- Identification of wetlands, stream corridors, and other surface water bodies;
- Identification of wildlife habitats;
- Identification of threatened and endangered species; and
- Identification of high value conservation areas.

FSC certification requires each company to develop a comprehensive forest resource management plan. The management plan must contain policies, procedures, monitoring actions, and recordkeeping actions for all aspects of operations. Specific actions include:

- Limiting harvest amount to ensure that harvest does not exceed growth;
- Establishing buffer zones for critical habitats, wetlands, and other sensitive areas;
- Establishing harvest restrictions to avoid nesting/mating areas and times for sensitive species;
- Avoiding high value conservation areas;
- Employing harvest practices that minimize soil impacts and erosion.
- Providing training to employees on legal requirements, conservation methods, habitat preservation, and sustainable forestry practices;
- Being an equal opportunity employer;
- Using non-discriminatory selection criteria for contractors; and
- Using SFE certified loggers and contractors.

FSC certification requires that the company participate in annual independent third party audits of their management plans and practices. The auditor must be certified by FSC through a separate process. If corrective actions are identified by the auditor, a schedule for addressing the corrective action must be established and documentation maintained to document completion.

3.1.1.4 Private Land Owners

Private landowners are generally too small and/or have a harvest frequency that makes certification through FSC or SFI impractical. The MDNR has developed guidance documents, such as the Michigan Woody Biomass Harvesting Guidance (MDNR, May 2010) and other processes to assist private landowners with developing a sustainable woody biomass harvest plan. This includes offering technical assistance to private forest owners through the Forest Stewardship Program. This program provides cost share assistance for the purpose of having a forest stewardship plan written. Information included in a forest stewardship plan includes unbiased information about the trees and vegetation currently growing on the land, potential forest stands that could be grown on the land, soils present and their qualities, wildlife habitat quality, any threatened and endangered species -any invasive species-or insect/diseases noticed, and management recommendations that would help the landowner meet their objectives for owning the land and keep the resource sustainable. Forest stewardship plans are written by professional foresters or certified natural resource professionals, as well as reviewed by a DNR Service Forester, to ensure that the information and recommendations made are sound (MDNR, 2011).

Additionally, SFI and FSC certification processes have been created for the purchasing company's procurement systems. The procurement certification process requires companies to establish the practices and procedures to ensure that timber is purchased from individuals and companies who, although not certified through FSC or SFI, are following sustainable and environmentally protective harvesting practices. Frontier would establish a SFI certified procurement process.

Similar to the SFI and FSC certification process for timber lands, the procurement certification process requires preparation of a procurement plan that details the policies, practices, inspections, monitoring and recordkeeping a company is going to employ. The plan must include provisions for:

- Contractual obligations for the timber seller to harvest in an environmentally sound manner;
- Requirements to use trained loggers (such as SFE certified loggers and contractors);
- Stop work parameters for timber purchases in the event of non-compliance;
- Field verification of harvest practices on the private landowners parcels; and
- Participation in annual third party independent audits of the procurement system.

3.1.1.5 Biological Resources

Flora and fauna are impacted by existing timber harvest activities. Some species, such as understory vegetation, some bird species, and some mammals benefit from the change in cover and biological diversity. Other species, which prefer in mature forest stands, do not benefit from timber harvest activities.

As noted above, Federal, State and FSC/SFI certified forests are evaluated for potential impacts to flora and fauna prior any timber harvest. Those processes ensure that impacts to biological resources are minimized. The use of FSC procurements processes, SFE trained loggers, and/or Michigan forest stewardship plans provide the similar protections on private lands.

3.1.1.6 Air Quality

Timber harvest utilizing mechanical equipment use diesel fuel and have related air emissions. Dust emissions can also occur during harvest activities. These air emission sources are temporary within each harvest area, generally being present for less than one week in any location. Air emissions are minimized by following the Generally Accepted Forest Management Practices (GAFMPs) developed by the MDNR as part of the Right to Forest Act of 2002 (MDNR, 2006).

The Seney National Wildlife Refuge is located approximately 78 miles west of the proposed Frontier Project site. The Seney National Wildlife Refuge is defined as a Class I area for air quality regulation and protection. Class I areas are areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas. No other Class I areas are within the 150 harvest radius of the proposed Frontier Project.

As noted in Section 3.6, the Upper Peninsula of Michigan is in attainment for the National Ambient Air Quality Standards (NAAQS) established by the USEPA for all criteria pollutants. The NAAQS are established at a level that is protective of human health (including sensitive populations) and the environment.

3.1.1.7 Soils and Water Quality

Construction of temporary and permanent logging roads creates localized impacts to soil and can impact surface water. Compaction, cutting and/or placement of fill, construction of water crossings may occur during this construction. In accordance with existing Michigan regulations, numerous permits may be required prior to conducting timber harvest activities.

When constructing a new or upgrading an existing stream crossing, there are three specific Michigan statutes of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), that always apply. These are: Part 31, Water Resources Protection; Part 91, Soil Erosion and Sedimentation Control; and Part 301, Inland Lakes and Streams. For each part, there are a legal set of rules and regulations that apply. In certain cases, Part 303, Wetlands Protection and Part 305, Natural Rivers, may also apply, if a stream crossing occurs in a wetland environment or on a stream within the watershed boundary of a legally designated Natural River system.

To be in compliance with Parts 31, 301 and 303, the responsible party must complete the MDEQ/United States Army Corps of Engineering (USACE) "Joint Permit Application" (JPA) package. The JPA covers permit requirements pursuant to State and Federal rules and regulations for construction activities where the land meets the water and including streams and wetlands. These types of areas are often referred to as the land/water interface.

Part 91, Soil Erosion and Sedimentation Control (SESC) of the Natural Resources and Environmental Protection Act, PA 451, 1994, as amended (NREPA), has the primary intent of protecting the waters of the State from the deposition of sediment and wind erosion as the result of earth change activities during construction. Specifically, a Part 91 permit is required for those activities involving earth changes that are one (1) or more acres in size or within 500 feet of a lake or stream (MDEQ, February 2009).

The MDNR has developed a guidance manual, Sustainable Soil and Water Quality Practices on Forest Land (MDNR, February 2009). The guidance manual contains best management practices (BMPs) in the context of those practices that not only protect surface water quality, but soil quality too. Properly applying these practices enables the responsible party or parties to meet pertinent environmental protection regulations. Voluntarily applying these practices will, under most weather conditions, prevent sediment or other nonpoint sources of pollution from going into a stream or other open water body.

As noted above, Federal, State and FSC/SFI certified forests are evaluated for potential impacts to surface water or soil prior any timber harvest. Those processes ensure that impacts to surface water and soils are minimized. The use of FSC procurements processes, SFE trained loggers, and/or Michigan forest stewardship plans provide similar protections on private lands.

3.1.1.8 Noise

Timber harvest is currently conducted within 150 miles of the proposed Frontier site using vehicle based mechanical equipment including processors, feller bunchers, forwarders, and haul trucks. Some manual cutting is also completed using chain saws.

Processors and feller bunchers emit noise from their saws and diesel engines. Forwarders and trucks emit noise from their diesel engines. Chain saws use a two cycle engine which also emits noise. These noise sources are temporary within each harvest area, generally being present for less than one week during any harvest period which usually occurs at intervals greater than 15 years in any harvest area. Noise impacts are minimized by following the GAFMPs developed by the MDNR.

3.1.1.9 Hazardous Materials and Spill Prevention

The hazardous materials required for timber harvest include diesel fuel and maintenance fluids (hydraulic fluid, oil, grease, etc). Spills of these materials can occur during timber harvest activities. Chemical releases in Michigan are potentially reportable under one or more of twenty-six different State and Federal regulations. The "Release Notification Requirements in Michigan" table, compiled by the DEQ Environmental Science and Services Division, is designed to help owners and operators of facilities in Michigan, including vehicles and farms, determine their potential notification and reporting requirements, in the event of a chemical release.

Proper equipment maintenance, including routine checks of hoses and fittings, is the key to protecting surface water and ground water resources from the impacts of fuel and lubricant spills and leaks. Implementation of BMPs for spill prevention, such as having a spill prevention plan, locating fueling and maintenance areas away from water bodies, having a spill kit and trash disposal bins minimize the likelihood of a release and the potential for that release to impact soil or surface water. SFE training for loggers includes information on these reporting requirements and BMPS.

3.1.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would result in no forest resources being utilized for the proposed Frontier Project. Forest resources within the proposed Frontier harvest area would continue to be harvested for existing facilities including wood products, pulp and paper manufacturing, and biomass fuel production. Current harvest techniques would not be modified on any of the land types within the proposed harvest area.

3.1.3 Environmental Consequences of the Proposed Action

3.1.3.1 Timber Harvest

As discussed in Section 2.2.5.1, a total of 1,129.8 thousand GT/yr of hardwood pulpwood would be required for the proposed Frontier Project at the 40 MGY production level. Approximately 71,000 acres of timber would be harvested annually to supply the fiber required for the proposed Frontier Project. As discussed in detail in the following paragraphs, the proposed Frontier Project would utilize approximately 63% of the hardwood annual growth in excess of current harvest levels.

As noted in Section 3.1.1, since the analysis period for the timber supply report was 2004-2008, the data for removals does not yet fully reflect the affects of the closure of several large mills during the 2005-2008 period, all of which used primarily hardwood pulpwood in their operations. The Georgia-Pacific (GP) Particle Board Mill at Gaylord, Michigan, which closed in March of 2006, is within the 150 mile radius of the Frontier biorefinery site at Kinross and had an annual wood fiber usage of approximately 740 thousand GT/yr. Additionally, the former S.D. Warren pulp and paper mill, which closed in the same timeframe used about 450 thousand GT/yr., a portion of which came from the Frontier supply area. The total amount of hardwood pulpwood used by these three mills from the harvest area for the Frontier Project would provide approximately 65 percent of the hardwood quantity required for the Frontier biorefinery.

Therefore, additional wood fiber previously used by just these two mills is now available over and above the surplus growth volume indicated in the resource study. The sustainable inventory level within 150 miles of the proposed Frontier site is estimated to be in excess of 220% of the projected hardwood pulpwood requirement at a production level of 42.5 mgy of denatured ethanol.

Utilizing pulpwood from the Eastern Upper Peninsula and Northern Lower Peninsula. forests to supply fiber for the Frontier Project would not constitute a new use of the resource. As noted above, a number of pulpwood end users have ceased operation in recent years in the harvest radius proposed for the Frontier Project. The Frontier Project's pulpwood usage would be similar in total volume, essentially replacing pulpwood previously used by those closed facilities. The effect on the total forest resource would be no different than that created by the harvest that supported the former mills.

As noted in Section 3.1.1, the region around the Kinross currently has a minimal demand for hardwood pulpwood due to the distance to the facilities in the western Upper Peninsula, northern Wisconsin, northeastern Minnesota and Canada, (all more than 150 miles from Kinross). There will likely be minimal direct competition between Frontier and these existing hardwood using facilities for hardwood pulpwood.

Frontier would use standard roundwood pulpwood as feedstock for its process to produce cellulosic ethanol. Pulpwood is generally considered to be the lowest value wood product obtained from various species trees.

Frontier process could use any species of hardwood, which would provide flexibility in its procurement strategy. This would allow Frontier to adjust its focus in specific portions of the procurement area toward hardwood species which are in low demand and avoid species in high demand. For example, there are areas with significant surplus inventory of basswood and oak pulpwood, but little or no market demand for either species. Frontier's purchase of substantial volumes of these low demand species of pulpwood in these areas should have minimal effect on the wood supply or pricing for existing facilities.

The opposite situation exists for aspen in several locations. But while Frontier could utilize aspen in its process, it has the option to avoid it where demand and competition for this species is high. Throughout much of the procurement area, Frontier's purchase of hardwood species for which there are currently little or no

market would actually create opportunities which complement the procurement efforts of other existing facilities. By creating more opportunity to harvest and thin stands with mixed species, which have been avoided in the past because there were no markets for some species of hardwood pulpwood, more total pulpwood, as well as additional volumes of those species targeted by existing facilities would be made available for the overall market.

There will be no direct competition between Frontier and St. Mary's Paper in Sault Ste. Marie, Ontario, Canada as it uses softwood pulpwood as feedstock. It is more likely that the increased market for hardwood in the region would have a complementary affect on softwood pulpwood using facilities, as this facilitates the harvesting and/or thinning of mixed species stands, and would likely increase softwood pulpwood availability.

While Frontier can utilize aspen, it is not a necessary feedstock, as there is ample surplus mixed hardwood of other species within the region. It is not likely that Frontier will compete heavily for aspen pulpwood with either of the existing particle board mills, Louisiana-Pacific in Newberry, Michigan, or Weyerhaeuser in Grayling, Michigan. It is more likely that an improved market for more mixed hardwood could be complementary to the aspen and softwood pulpwood using facilities, as this facilitates the harvesting and or thinning of mixed species stands.

Timber harvests from National Forest lands would only be from tracts where the USFS completes the appropriate NEPA review.

Timber harvests from Michigan state lands and forests are subject to environmental review processes, public notification and review, and the practices and procedures established in the Michigan State Forest Management Plan. Annual audits by an independent third party FSC auditor monitors compliance with the specified practices and procedures detailed in the Plan.

Timber harvests from JM Longyear properties (or similar large land/forest resource management companies) are subject to the provisions of the forest management plan prepared as part of their FSC or SFI certification. Annual audits by an independent third party FSC or SFI auditor monitors compliance with the specified practices and procedures detailed in the plan.

Frontier would establish a Sustainable Forestry Initiative (SFI) certified procurement process. Frontier would, through its wood fiber procurement agreements and other supply relationships, work to encourage and influence private landowners and wood suppliers to participate in forest certification initiatives. Frontier would require verification of logger participation in SFE professional logger training and certification programs and conformance to Michigan Best Management Practices.

3.1.3.2 Biological Resources, Air Quality, Soils and Water Quality, Noise, Hazardous Materials and Spill Prevention

As stated previously in section 3.1.3.1, the level of harvest necessary to supply the hardwood pulpwood feedstock for the Frontier facility does not constitute a new use of the forest resources in the region. The cumulative volume of hardwood used by recently closed pulpwood using mills in the harvest radius for the Frontier Project would be approximately 65% of the total needed for Frontier. Following long-standing practices within the region, the majority of volume will be produced from partial stand harvests using tree selection or shelterwood methods. A minor volume may come from clearcuts typically used to harvest and regenerate aspen, or for maintenance of specific habitat conditions which require early seral stages of aspen, oak or other forest types. This will not contribute to decline in mature northern hardwoods habitat. Rather, the additional market created for smaller pulpwood-sized hardwoods will encourage a higher level of thinning and stand improvement activities which facilitate the creation of hardwood stand structure and conditions with a greater component of larger trees. Also, since the forest inventory will still be increasing, the average age of the forest resource will increase across the region.

Harvesting and thinning promotes and maintains vigorous growth in most hardwood forest types, by removing damaged, diseased, and mature or over-mature slow growing trees, and re-allocating the now freed-up

resources (i.e., growing space, nutrients, and sunlight) to remaining healthier, vigorous, dominant trees capable of more efficiently occupying the site and utilizing those resources, growing larger trees at an increased rate. This results in an increase in net growth of the residual stand of trees (gross growth minus losses due to rot, damage and mortality). More vigorous growth also results in more carbon accumulation in new wood, and less release from the break-down of dead, dying and rotting material, the majority of this volume having been removed in the harvest and thinning operations.

Harvesting and transportation of forest resources for the proposed Frontier Project would be completed by existing contractors using existing techniques. The Federal, State and local regulations, plans, and guidance documents would not be affected.

Timber harvests from National Forest lands would only be from tracts where the USFS has completed the appropriate NEPA review. Similarly, State Forests are managed under plans and policies which specifically balance timber production with protections to maintain natural diversity and specific habitats across the landscape. Additionally State Forests are dual certified by the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC) systems; each of which contain specific criteria and indicators for maintaining biodiversity within managed forests. Large commercial owners are also certified under either SFI or FSC systems and subject to similar expectations to maintain key natural and diverse characteristics of forest ecosystems at a level appropriate to their level of effect on the overall landscape in a given region. All of the above programs also specifically protect air quality, including air quality in Class I areas such as the Seney National Wildlife Area, water quality, wildlife, including threatened and endangered species, critical habitat, cultural resources, and establish best management practices to reduce the potential erosion, spills or other impacts to the soils. Based on the level and the protections offered by the existing environmental review processes, DOE does not expect any impacts to air quality, including air quality in Class I areas such as the Seney National Wildlife Area, water quality, wildlife, including threatened and endangered species, critical habitat, or cultural resources within the harvest area.

Smaller private landowners, while not generally participating in forest certification systems, are influenced by either consulting foresters assisting them with management planning or timber sale preparation, or certified loggers who are bound by their certification through the Sustainable Forest Education program to operate under the principals of sustainable forestry, and all regulations and guidelines regarding protection of water quality, protection of riparian habitat, protection of endangered species and habitats; and recognizing and maintaining unique ecological, historical, and cultural resource. Frontier along with existing forest products industry members are committed to further broadening participation by smaller forest land owners in a form of forest certification which is appropriate to small landowners and small businesses.

Therefore, with the level of commitment developed over the past decade throughout both the forest landowners, the loggers and wood producers, and consuming mills to managing, harvesting and operating in forest lands, within accepted regulations, guidelines, and principles of sustainability, there would be no expected change in impacts from those impacts presented in sections 3.1.1.5 through 3.1.1.8 to biological resources, air quality, soils and water quality, noise, hazardous materials and spill prevention related to harvest and transportation of forest resources for the Frontier Project.

3.2 Biological Resources

This section discusses the biological resources on the proposed Frontier site and rail spur. Forest resources were discussed in Section 3.1.

3.2.1 Affected Environment

The proposed Frontier site consists of approximately 355 acres of predominantly wooded land with no existing structures and limited unpaved trails used for recreational vehicles. The proposed cellulosic ethanol biorefinery would be constructed on approximately 50 acres located in the southernmost 160 acres of the property.

Frontier completed a wetland boundary delineation on the 355 acre Frontier Project area from April 27th to May 1st and June 1st through 4th, 2009 (*AECOM, August, 2009*) utilizing the U.S. Army Corps of Engineers (USACE) 1987 Wetland Delineation Methodology with respect to the definition of a wetland according to the State of Michigan. The USACE methodology requires that, under normal circumstances, hydric soils, wetland hydrology, and hydrophytic vegetation must be present for an area to be defined as a wetland. Upland and wetland determination plots were completed along the boundaries of all identified wetlands. For each wetland, pertinent information was recorded on field data sheets, and the wetland boundary was flagged and surveyed using a Trimble® GeoXT™ GPS surveying unit.

Frontier also completed a wetland delineation from August 31 to September 3, 2009 within a corridor of land contiguous to the project area that is the proposed location for the construction of a new railroad spur (*AECOM, November, 2009*). The rail spur would be used for shipment of raw materials to the site and ethanol and lignin from the site.

The wetland boundary delineations were completed with the following tasks and goals in mind:

- To identify, delineate and survey the boundaries of all wetlands located within the proposed project area;
- To characterize each wetland based on soil, hydrologic and vegetative features;
- To determine if current development plans for the site would cause immediate impact to existing on-site wetlands (i.e. if dredge or fill of wetlands would be required), and
- To state jurisdictional and regulatory requirements that may apply depending on planned activities within, or impacts to, the wetlands.

3.2.1.1 Frontier Project Area Wetlands

During the onsite investigation, no wetlands were identified within the boundaries of the southern 160 acres of the site. This was determined by walking equidistant transects across the area from east to west, and from south to north. These transects were roughly located along the boundaries and centerline of each 40-acre parcel. GPS points along with photographs were taken at various locations along the transects to document site conditions.

Five wetlands were identified and delineated within the 355 acre Frontier Project investigation area, all located within the two northernmost 40-acre parcels. Utilizing the USACE wetland delineation methodology with regard to the MDEQ definition of a wetland, the 5 delineated wetlands are jurisdictional under state and Federal law. Their relative sizes and locations are depicted on Figures 4 through 7. No wetlands were encountered within the rest of the project site.

Wetland 1

At approximately 13.7 acres in size, Wetland 1 is the largest and most extensive wetland found on the Frontier site. This wetland occupies areas nearest the northern project site boundary, and extends from the western site boundary to the eastern site boundary. The western half of this wetland can best be described as an elongated swale or drainage course. This drainage course contained standing water during both site visits in April and June, and likely obtains its hydrology from interconnection with the water table and/or surface connection with large wetlands to the west of the site. Given that the ground surface generally slopes to the

east and northeast in this area, it is likely that water in this drainage course flows east towards the largest portion of Wetland 1 during rainfall events. This western portion of the wetland appears to be part of a dune-swale complex type setting that continues to the north. Data plots 3A-WET, 8-WET and 9A-WET were completed within this portion of Wetland 1. Some of the dominant vegetative species observed at these locations included red maple (*Acer rubrum* - FAC), black spruce (*Picea mariana* – FACW), balsam fir (*Abies balsamea* - FACW) and various sphagnum (*Sphagnum spp.* – OBL) and sedge species (*Carex spp.* – FAC to OBL). Soils encountered in the western half of Wetland 1 were found to be sands, silts and/or cobbles with muck or peat surface horizons. The predominant soil type mapped by NRCS in the western half of Wetland 1 is Kalkaska sand.

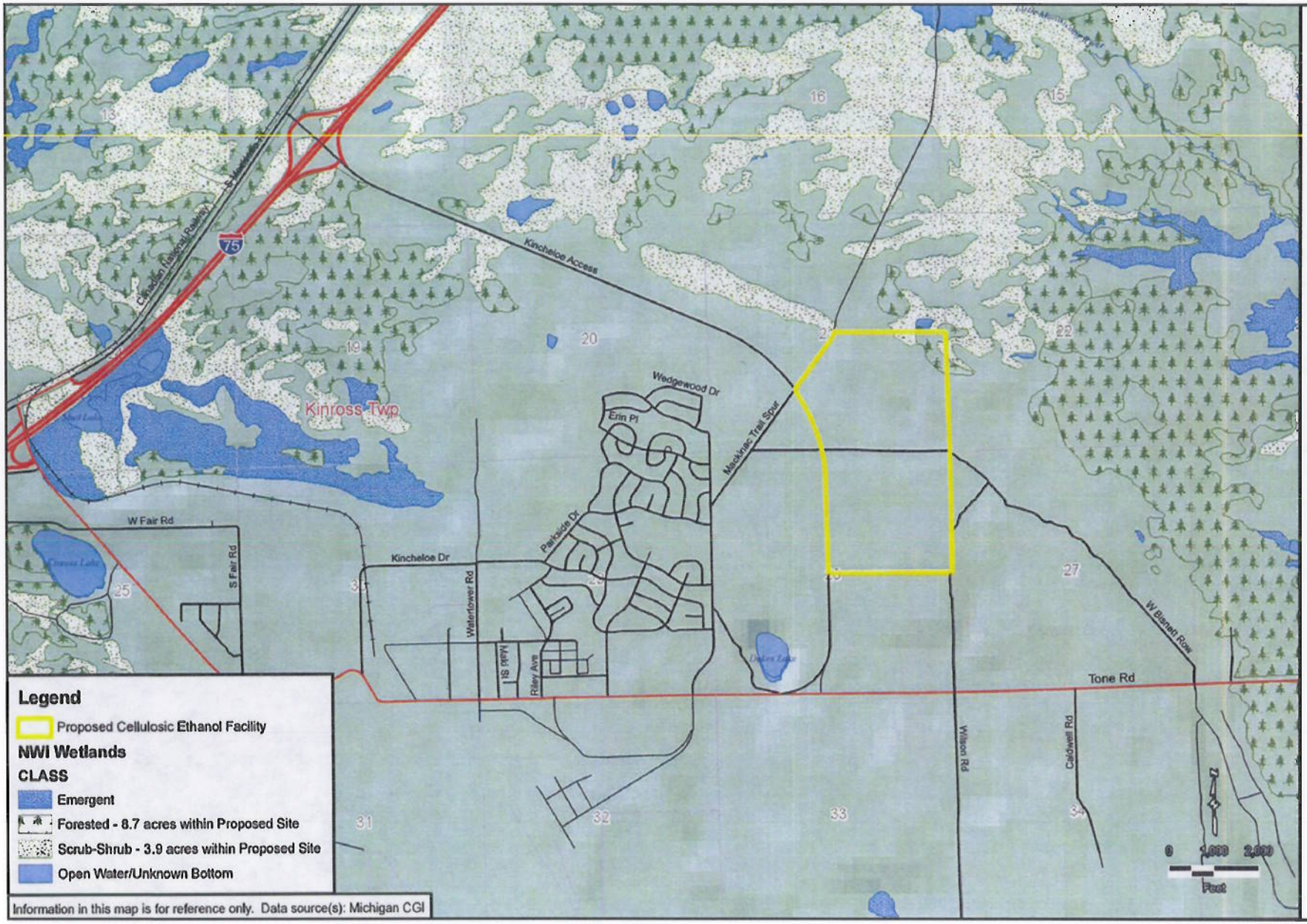

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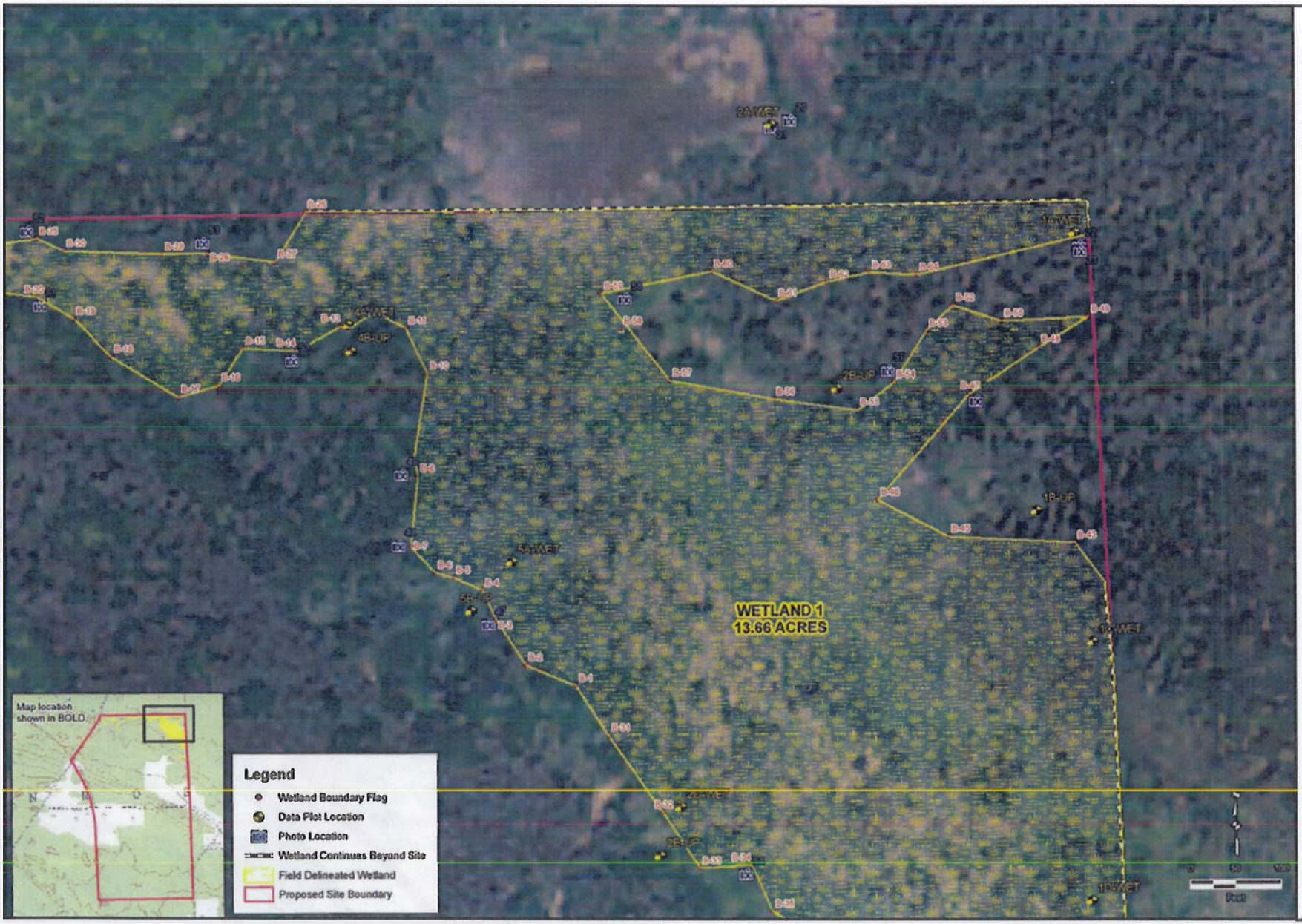
FIGURE NUMBER	4	



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Approved:	LDK	6/25/2009
Scale:	1" = 100'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	5	

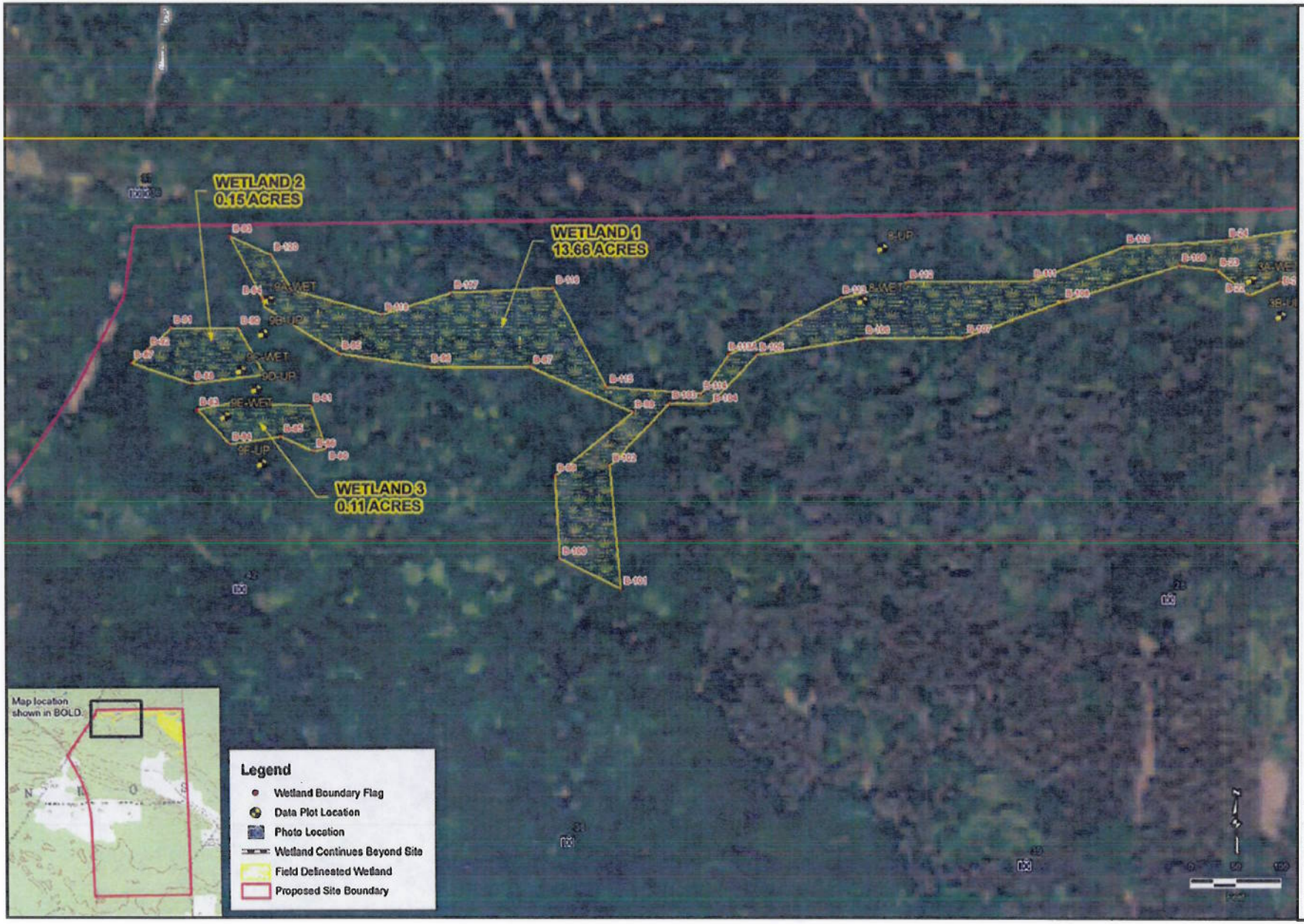

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FIGURE NUMBER	6	

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Scale	1" = 100'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	7	

Near the center of the northern Frontier Project site boundary, Wetland 1 transitions from a generally isolated drainage course to a wider, more diverse wetland that occupies the northeastern corner of the project site. This eastern portion contains a mixture of open water, wet meadow, shrub swamp and tamarack swamp, and has a few small interspersed upland areas. This diverse combination of habitats can also be attributed to the dune-swale type ground surface present in the area, which allows for a variety of hydrologic conditions and establishment of various vegetative species. Data plots 1A-WET, 1C-WET, 1D-WET, 2D-WET, 4A-WET and 5A-WET were completed within the eastern portion of Wetland 1. Similar to the western portion of Wetland 1, plots 1A and 5A-WET were observed to have black spruce, red maple and balsam fir, as well as a relatively high dominance of tamarack (*Larix larcinea* – FACW). Data plots 1C and 4A-WET were shown to have similar species present, but were located in more shrub-scrub to open-water wetland areas. The predominance of leatherleaf (*Chamaedaphne calyculata* – OBL) was a general distinguishing factor. Similarly, the presence of northern white cedar (*Thuja occidentalis* – FACW) at data plots 1D and 2D-WET distinguished them from other portions of Wetland 1. Among all of the Wetland 1 data plots, hydrologic conditions varied from saturated within 1 foot of the surface to inundated for several inches. Soil conditions, however, stayed relatively consistent across the area with 7.5 YR 2.5/1 peat and/or muck surface layers over sandy to silty sub-horizons. The sandy or silty sub-horizons were observed to have colorations typically ranging from 7.5 YR 2.5/1 to 2.5/3 or 7.5 YR 5/1 to 5/2. Mapped soil types in the eastern portion of Wetland 1 include Croswell-AuGres sands, Dawson and Loxley peats, and Kinross-Wainola complex soils.

A few small, isolated upland areas were included in Wetland 1 as their size and extent were not significant, and did not warrant their identification and separation from the wetland.

Wetland 2

Wetland 2 is approximately 0.15 acres in size, and is located just south of the far western end of Wetland 1. This wetland exists in a relatively small, near-circular depression, and is separated from Wetland 1 by an elongated sandy ridge. The lowest ground surface elevation of this wetland is approximately the same as the lowest portions of Wetland 1, making it likely that the two wetlands are hydrologically connected via seepage through the sandy ridge. Data plot 9C-WET was completed within this small, wooded wetland. Dominant hydrophytic vegetation present included yellow birch (*Betula alleghaniensis* – FAC), balsam fir and red maple. Sphagnum moss was also present in the most saturated portions of the wetland. Standing water was observed at 2 inches below ground surface in a 16-inch deep soil pit, with saturation occurring up to the surface. Soils from 0 to 5 inches below ground surface were found to be 7.5 YR 2.5/2 mucky silts. Soils from 5 to 16 inches below ground surface were found to be 7.5 YR 5/1 sands that had a significant amount of organic streaking. The mapped soil type in this location is Croswell-Au Gres sands.

Wetland 3

Wetland 3 is located immediately to the south of Wetland 2, and is approximately 0.11 acres in size. Similar to Wetland 2, this wetland is located in a small depression, is wooded, and is separated from the adjacent wetlands by an elongated sandy ridge. Data plot 9E-WET was completed within Wetland 3. The dominant vegetative species were also the same as in Wetland 2: yellow birch, balsam fir, red maple and sphagnum moss. The herbaceous vegetative stratum was scant, if at all present, in Wetlands 2 and 3. In Wetland 3, free water was observed in a soil pit at 1 inch below the surface, with the soil saturated at the surface. Soils observed in the pit included a 7.5 YR 2.5/1 mucky loam from 0 to 3 inches below the surface. A 7.5 YR 4/1 sand was found below the mucky loam. Croswell-Au Gres sands are the mapped in the western portion of Wetland 3, and Kalkaska sands are mapped in the eastern portion of Wetland 3.

Wetland 4

Wetland 4 is the smallest of the wetlands documented on the Frontier site, and is approximately 917 square feet in size. This wetland is located along the eastern site boundary, immediately to the south of Wetland 1. Similar to Wetlands 2 and 3, Wetland 4 is located in a sandy depression that is wooded and is separated from adjacent wetlands by elongated sandy ridges. Data plot 6-WET was completed within this wetland. Dominant vegetation included red maple, black spruce and quaking aspen (Populus tremuloides – FAC). Sphagnum

moss was also present in the most saturated areas of this wetland. Soil saturation was evident at the ground surface, and free water was observed in a 16-inch soil pit at 3 inches below the surface. Soils present at this location included 7.5 YR 2.5/1 loam with organics from 0 to 6 inches below the surface, and 7.5 YR 5/3 sand with common, distinct 7.5 YR 5/6 mottling from 6 to 16 inches. The mapped soil types in the area of Wetland 4 are Croswell-Au Gres sands.

Wetland 5

Wetland 5 is located immediately to the south of Wetland 4 and is approximately 0.35 acres in size. This wetland is also located in a sandy depression, but is more spread out and irregular shaped than Wetlands 2, 3 and 4. Data plot 7-WET was completed within the boundaries of Wetland 5. Here, vegetation differed only slightly from the other wetlands, with the addition of such species as starflower (*Trientalis borealis* – FAC+) and common blue violet (*Viola sororia* – FACW). Red maple and black spruce were the dominant hydrophytic tree species present. Again, soils at plot 7-WET were saturated at the surface, and free water was present in a 16-inch soil pit at 10 inches below the surface. Soils documented at this location included a 7.5 YR 2.5/1 sandy loam from 0 to 0.5 inches and a 5 YR 5/1 sand from 0.5 to 16 inches that had many prominent 7.5 YR 5/6 mottles.

3.2.1.2 Railroad Corridor

Rail service to the proposed site would be established by construction of a rail spur from the existing Canadian National Railway (CN) rail line located west of the proposed site. As shown on Figure 3, the new rail spur would be routed north of Kinross and enter the proposed site from the north. The Frontier railroad corridor can most easily be described by splitting it into two sections: the section that lies entirely north of the Kincheloe Access Road (a.k.a. Gaines Highway) (North Section), and the section that extends south from Kincheloe Access Road to the existing railroad track (South Section).

North Section: The North Section has ground surface topography that gently slopes away from Kincheloe Access Road to the north and northeast, towards an extensive, elongated wetland area. This wetland occupies approximately the northern one-half of the North Section, and is composed of a combination of sphagnum-tamarack bog areas, shrub-scrub areas and open water swamp. The transition between this wetland and the upland areas is very abrupt, and is made apparent by a very distinct rise in ground surface elevation, along with a sudden transition from peaty to sandy soils. The upland areas are sandy and gently sloping, with the majority being occupied by mature red pine stands. The pine stands are linear in nature, and have the appearance of a plantation or former restoration site. Understory vegetation is relatively sparse, with shrubby, shade-loving species such as beaked hazelnut being the most common. The far eastern and western ends of the North Section are vegetated with immature aspen stands, and other deciduous species that vary in maturity. Also, an existing two-track road and an all-terrain-vehicle (ATV) trail run the across the length of this corridor area, essentially parallel to the Kincheloe Access Road.

South Section: The South Section of the proposed Frontier rail corridor has a relatively diverse mixture of uplands and lowlands, deciduous and evergreen forests, and level to sloping ground surfaces. Ground surface elevations tend to be the highest in the east-central part of the South Section, with lower areas prevalent in the north, west and south. The higher upland areas tend to have sandy to loamy soils, while the lowest areas (commonly occupied by wetlands) typically have peat and organic soils. The north end of the South Section is primarily vegetated by thick, immature aspen stands that can be seen when driving by along the Kincheloe Access Road. Traveling south out of this area, thick spruce-fir forests and wooded wetlands can be found closest to the western corridor boundary, while mature, mixed upland stands of conifers and hardwoods are common along the eastern boundary. Roughly the southern one-third of the South Section is occupied by a relatively large wetland that transitions from spruce-tamarack peat bog in the north to an open water swamp lined with cattail stands in the south. This wetland extends across the entire corridor from east to west, and contains a few areas of upland "islands" that are distinguishable by their mature red and white pine stands.

The depths of these bog and marsh areas appeared to be several feet deep, and could not be navigated by foot. The southern-most end of the rail corridor contains sandy upland areas that transition abruptly to the large marsh wetland in a distinct east-west line. Immature aspen stands are present and are mixed with other, slightly more mature hardwood forests.

Other features to note in the South Section include an east-west running transmission line that is adjacent to the far southern corridor boundary, "two track" ATV trails that run beneath the transmission line as well as throughout the rest of the area, and the presence of a closed landfill in the east-central portion of the South Section. Several groundwater monitoring wells are located around the perimeter of the old landfill. These wells have painted protector pipes that are visible when traveling the nearby ATV trails.

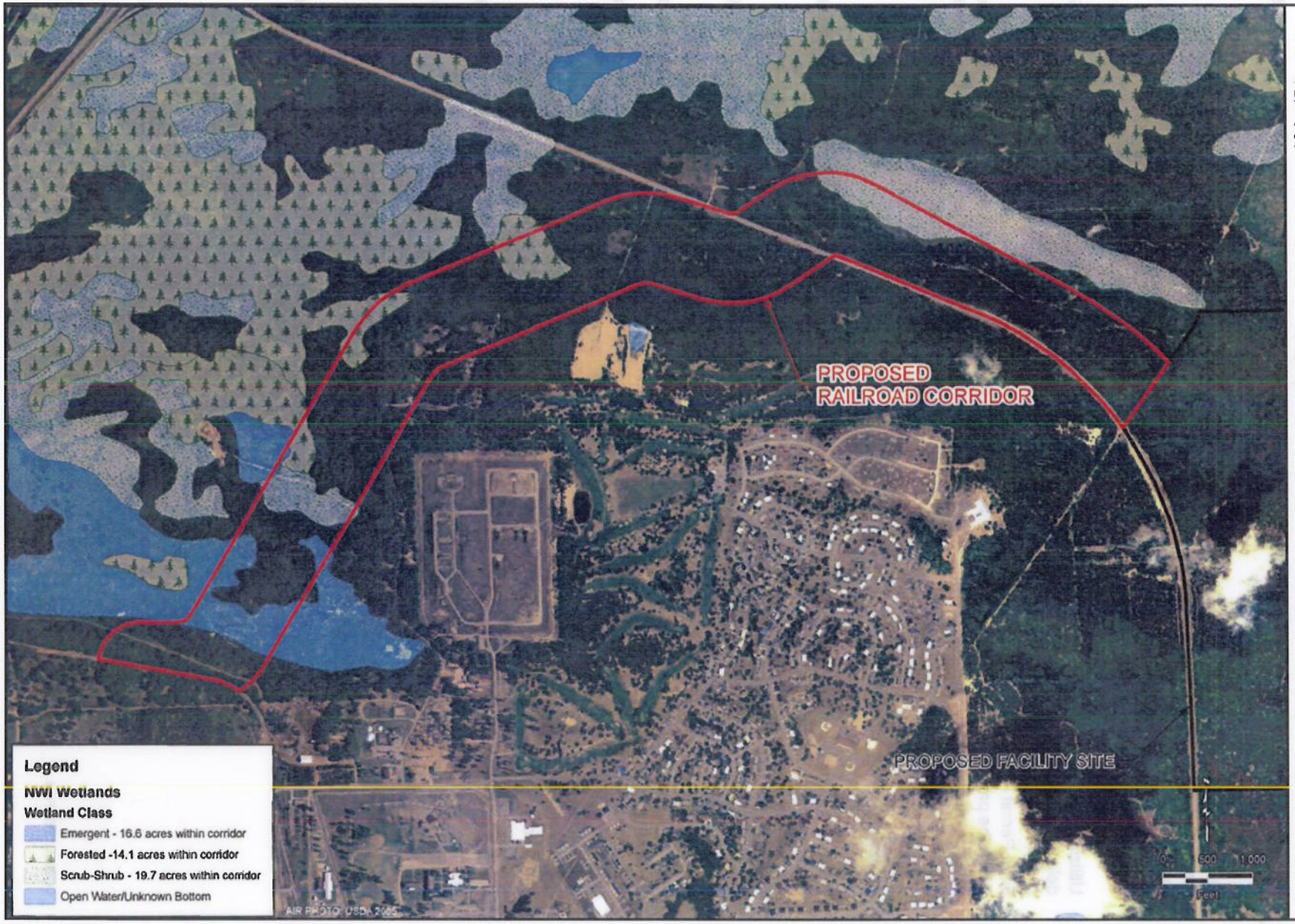
Utilizing the USACE wetland delineation methodology with regard to the MDEQ definition of a wetland, all 15 delineated wetlands are jurisdictional under state and/or Federal law. In accordance with Section 404 of the Clean Water Act and Part 303 of the NREPA, Act 451 of 1994, any impacts to these wetlands may require a Joint Permit Application (JPA)from the MDEQ and USACE. Fifteen wetlands were identified and delineated within the proposed Frontier rail corridor investigation area. The proposed location of the Frontier rail corridor is indicated over a 2005 aerial photo on Figure 8. The wetland locations and sizes are depicted in the attached Figures 9 through 12. These wetlands varied in vegetative and hydrologic characteristics, and were present in several locations throughout the corridor.

Wetland 1

Wetland 1 is approximately 41.8 acres in size and is by far the largest wetland present within the proposed rail corridor. Its southernmost boundary runs nearly parallel with the railroad track at the south end of the proposed corridor, and is offset from it by approximately 500 feet. Near this boundary, Wetland 1 is a large, open-water marsh containing patches of emergent vegetation such as cattails, along with some areas that appear to contain submergent vegetation. As described in Section 2.0, this marsh area is extensive, deep (4 feet or more) and contains a few upland "islands" that support stands of pine trees. Continuing north approximately 600 feet from the southern wetland boundary, the wetland begins to transition from marsh to peat bog. In these areas, it appears that several inches to more than a foot of saturated sphagnum moss may be present, along with a few intermixed upland "islands." These observations were made by looking south from the northernmost portion of Wetland 1, as travel by foot was not possible due to the depth of water. What could be observed in the bog areas was the type of tree or shrub vegetation present, which included black spruce (*Picea mariana* – FACW), tamarack (*Larix laricina* - FACW), Labrador tea (*Ledum groenlandicum* - OBL) and winterberry (*Ilex verticillata* – FACW+). Again, the upland islands were visible due to the small stands of red pines that could be seen through and above the tree canopy. This deep bog area extends for approximately 800 to 1,000 feet further to the north where the sphagnum mat still persists, but the depth to mineral soils becomes shallower making it possible to walk within the wetland by foot. Here, the types of tree and shrub-layer vegetation is very similar as to the south, with the exception of the presence of more ferns (typically of the royal fern family). These vegetative and hydrologic characteristics remain consistent up to the northernmost boundary of Wetland 1.

In addition to the natural hydrology most likely supplied by intersection with the water table, Wetland 1 also receives water from the discharge of the Kinross wastewater treatment plant.

Wetland 1 extends considerably to the east and west outside of the proposed Frontier rail corridor. Relocation of the corridor in these directions would not likely result in avoidance of the wetland.



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PROPOSED RAILROAD CORRIDOR
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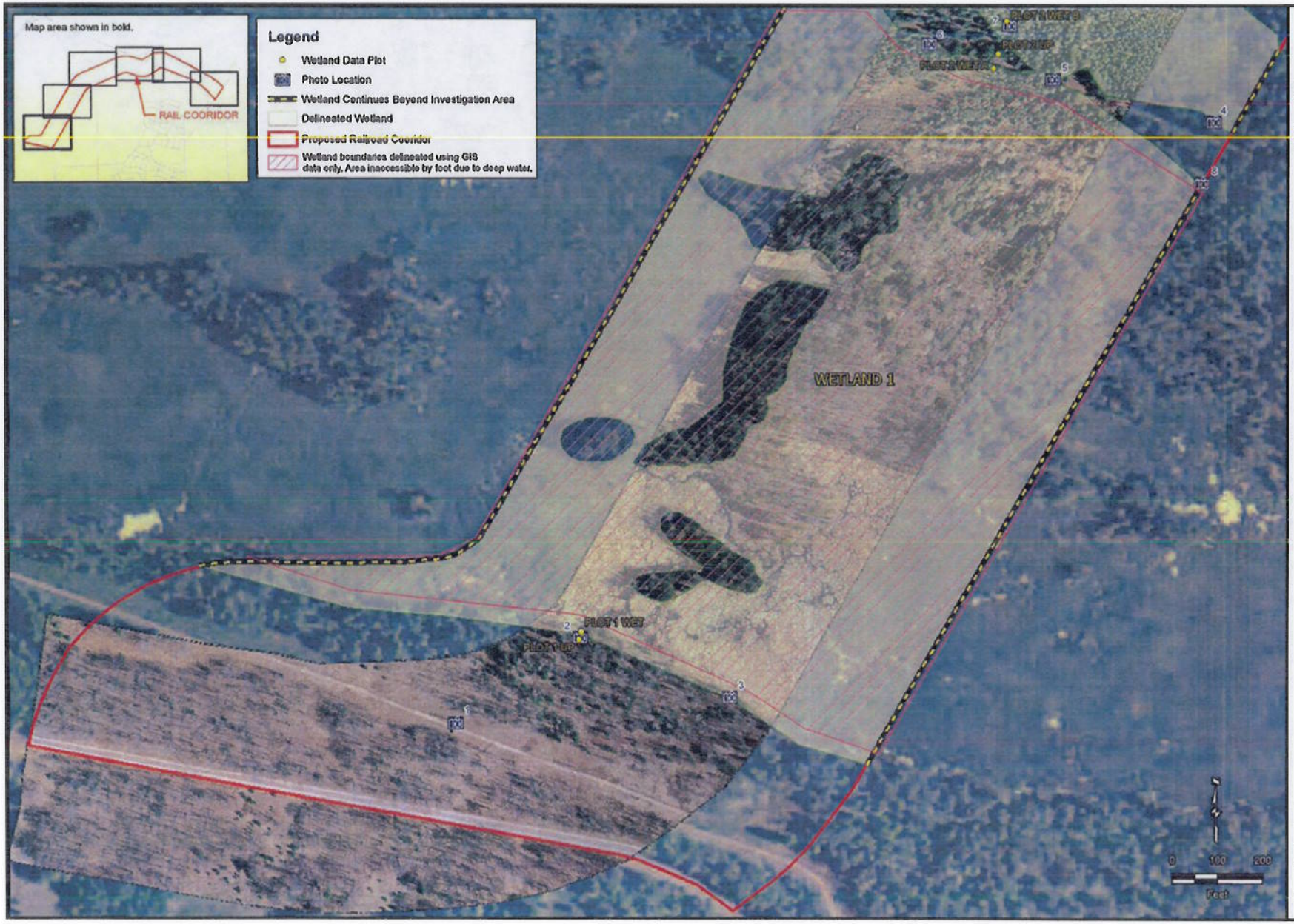
Approved:	LDH	10/21/2009
Scale:	1" = 1,000'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	8	



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DELINEATED WETLANDS AND PHOTO LOCATIONS
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PROPOSED RAILROAD CORRIDOR
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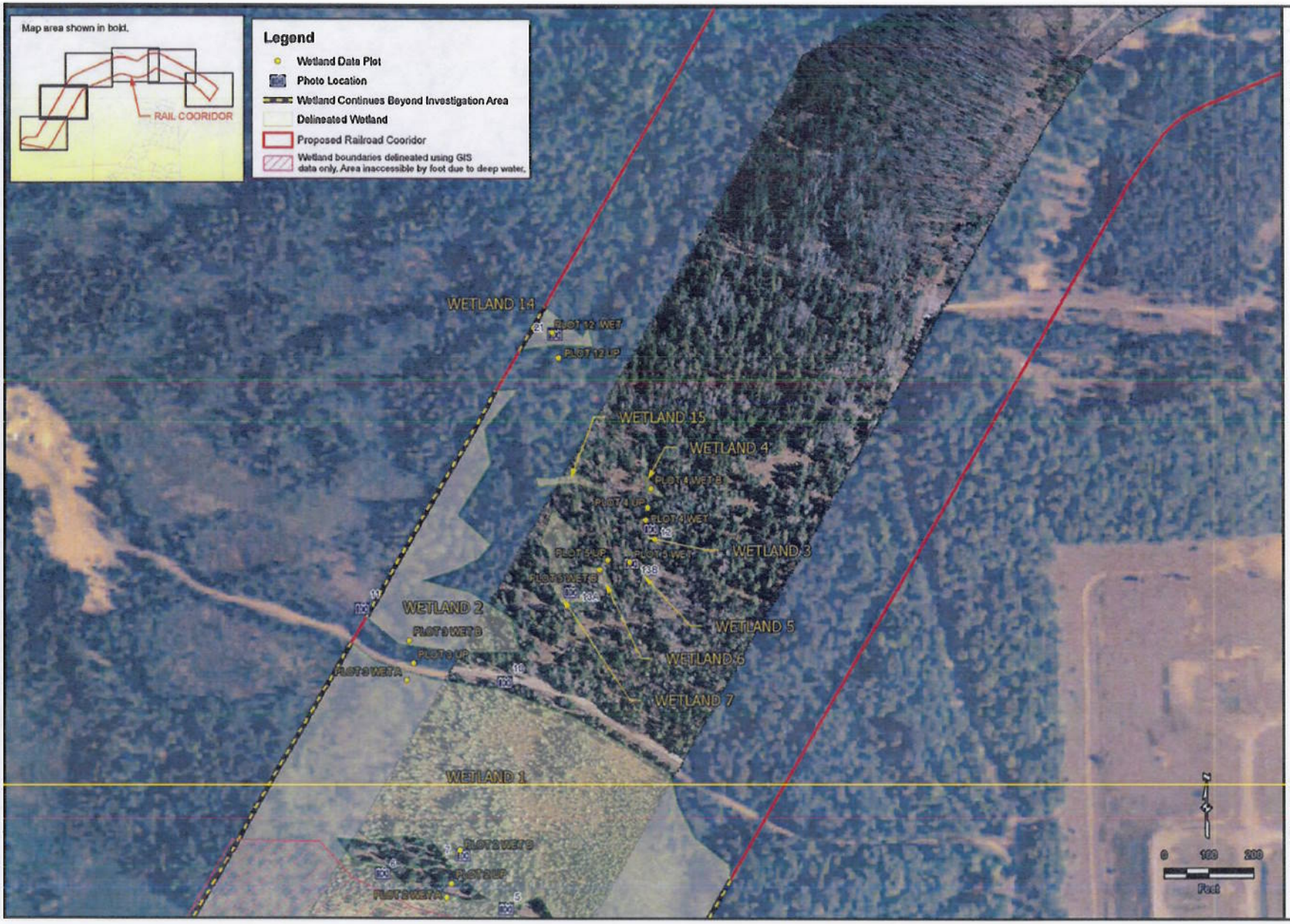
Scale:	1" = 200'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	9	



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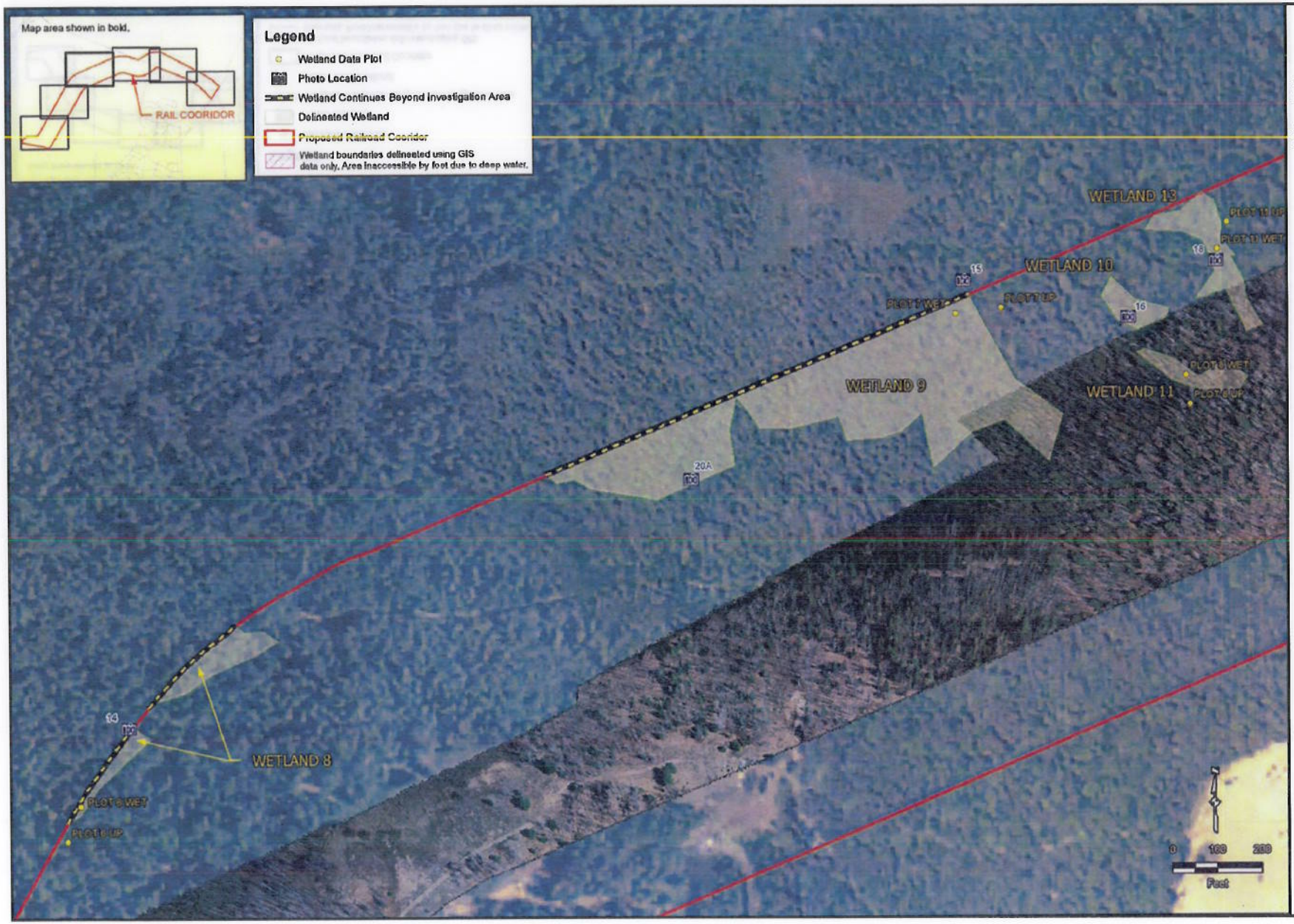
PROPOSED RAILROAD CORRIDOR
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	1" = 200'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	10	



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Drawn:	SJE	10/21/2009
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Scale:	1" = 200'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	11	

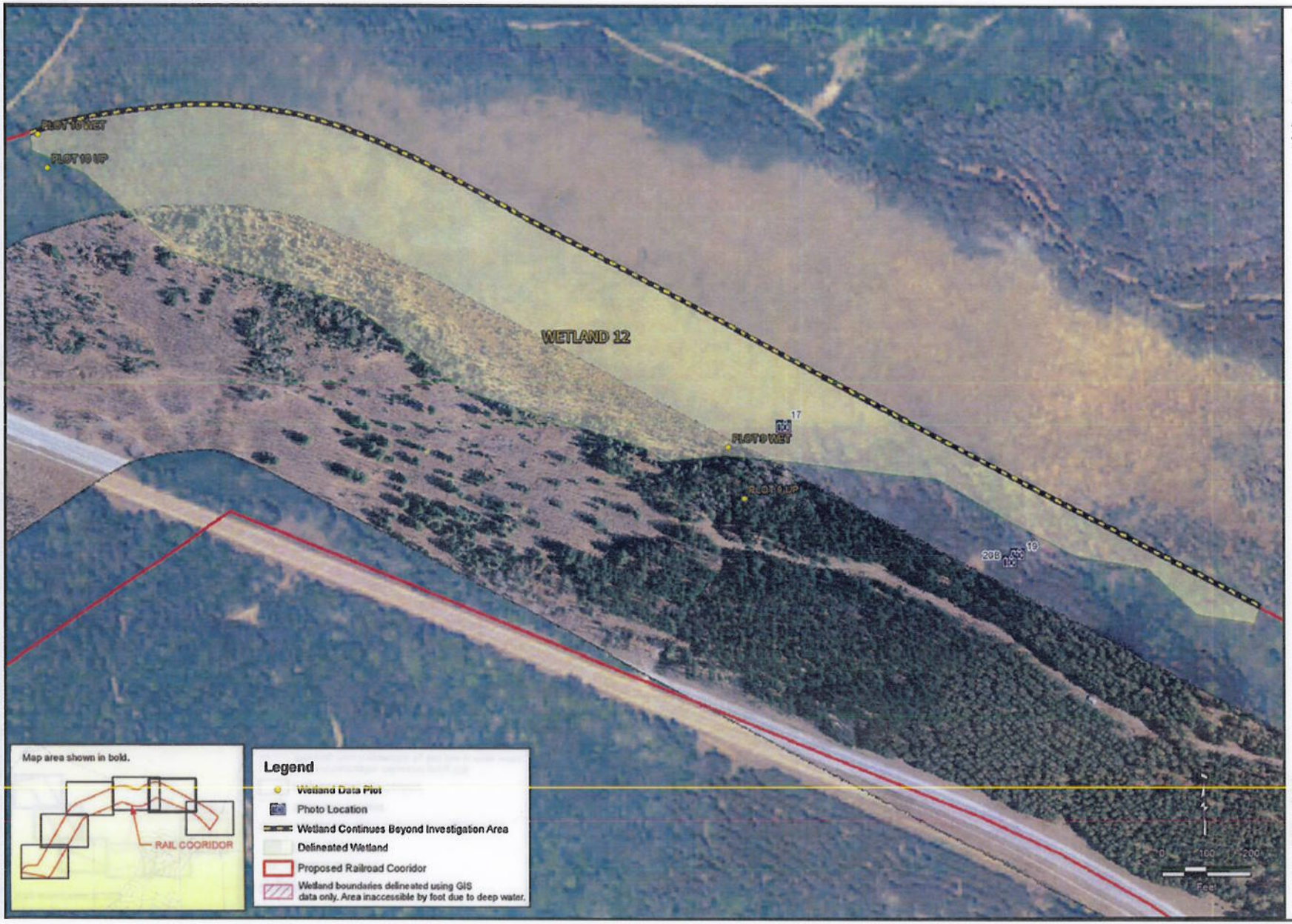

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FIGURE NUMBER	12	

Wetland 2

Wetland 2 is approximately 1.75 acres in size, and is located directly north of Wetland 1 along the western corridor boundary. This wetland is separated from Wetland 1 by a sandy dirt road that runs east to west across the proposed rail corridor. Upon observation of the soil, hydrologic and vegetative characteristics of Wetland 2, it is obvious that Wetland 2 was at one time an extension or part of Wetland 1, and has only become separated due to placement of the dirt road. Wetland 2 continues to have the characteristic peat mat (approximately one foot deep), and black spruce-tamarack mixture similar to Wetland 1. Labrador tea and leatherleaf (*Chamaedaphne calyculata* – OBL) are dominant within the shrub layer of Wetland 2, along with a few other species typical of wet meadows such as Canada bluejoint (*Calamagrostis canadensis* – OBL). Mottled sandy soils were present immediately below the 1-foot layer of peat and organics. The source of hydrology for Wetland 2 appears to be primarily from intersection with the water table, although runoff from ground surface slopes to the east may also contribute, especially during spring snow melt.

Wetlands 3, 4, 5, 6, 7 & 8

Wetlands 3, 4, 5, 6, 7 and 8 are all relatively small in size (all <0.06 acres except Wetland 7), and are located in a cluster to the north of Wetland 1 and to the east of Wetland 2. The following are the respective sizes of each wetland:

- Wetland 3 = 1,049 sq.ft.
- Wetland 4 = 665 sq.ft.,
- Wetland 5 = 1,168 sq.ft.
- Wetland 6 = 1,649 sq.ft.
- Wetland 7 = 9,927 sq.ft.
- Wetland 8 = 2,448 sq.ft.

These wetlands are being described collectively as they are all located in the same general area, are relatively close in size, and have similar geomorphic, hydrologic, soil and vegetative characteristics. These wetlands exist in a grouping of small ground surface depressions, and can be described as wet meadows. Each of these wetlands has a relatively thin layer (3-5 in.) of peaty or organic soils above sandy mineral soils, and exhibit saturation from 12 inches below to just above the ground surface. Vegetation common to all or most of these wetlands included Canada bluejoint, blue flag iris (*Iris versicolor* – OBL), sphagnum moss (*Sphagnum* spp. – OBL), red maple (*Acer rubrum* – FAC), and white birch (*Betula papyrifera* – FACU+). The discontinuity of these wetland areas, their thin organic soil layers, and their location between higher ground surface elevations (to the north and east) and lower surface elevations (to the south), indicates that they are transitional in nature and may not be saturated as often as Wetland 1 to the south. This further supports the likely possibility that these "depressional" wetlands are just skimming the surface of the groundwater table, it being their primary source of hydrology.

Wetland 9

Wetland 9 is 0.17 acres in size and is located directly north of Wetland 2 along the western corridor boundary. This wetland supports similar vegetation as Wetlands 3 through 8 (sphagnum and Canada bluejoint), although has a more prevalent shrub layer of speckled alder (*Alnus incana ssp. rugosa*[1] – OBL). This wetland exists in a distinct ground surface depression that is located in the center of a red pine stand. Also similar to Wetlands 3 through 8, wetland 9 exhibited a 4-inch layer of peat and organics over sandy soils, and saturation at the surface. Again, the primary source of hydrology is most likely connectivity to the groundwater table.

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[1] Naming per www.plants.usda.gov for "speckled alder."

Wetland 10

Wetland 10 is located north of wetland 2 along the western corridor boundary where the corridor bends slightly toward the northeast. It appears that this wetland is comprised of two separate areas. These two areas are actually connected on the west side of the corridor boundary (outside of the investigation area), and are part of one continuous wetland. The total area that Wetland 10 occupies within the corridor boundaries is 0.33 acres. This wetland is a mixture of alder thickets and meadow-like openings that support patches of sphagnum and various herbaceous species. Prevalent species identified within Wetland 10 included speckled alder, blue flag iris, red maple and low bush blueberry (*Vaccinium angustifolium* – FACU). Soil and hydrologic conditions typical of Wetland 10 were approximately 8 inches of peat and organics over low-chroma sands, with saturation occurring up to the surface. As the entire soil profile (from 0 to 16 inches) was saturated at this location, it was again indicative of wetland hydrology being supported by connectivity to the groundwater table.

Wetland 11

Wetland 11 is located in the west-central portion of the proposed rail corridor, and also abuts the western corridor boundary. It is 4.24 acres in size, and is thickly forested. Trees here vary in maturity from sapling to canopy-height. Species include speckled alder, balsam fir (*Abies balsamea* – FACW), red maple, black spruce and white birch. Sphagnum moss is also prevalent throughout this wetland, as well as blue flag iris and Canada bluejoint. The transition zone between this wetland and the upland areas to the east is extremely gradual, and occurs in an area where the ground surface has several slight undulations. These undulations are so marginal in nature (wetland-wise) that upland species are present on the tops of the "humps," while wetland species are present in the low areas between them. The boundaries of Wetland 11 were delineated in locations where either the transition zone was very narrow, or, at the point where the low dips covered more ground surface than the upland "humps." These sandy, undulating ground surfaces are typical of pre-historic lake beds, and are similar to those identified on an adjacent property. Soils present in Wetland 11 were similar to those in many of the previously described wetlands, with approximately 6 inches of organics layered over low-chroma sands. Observation of wetland hydrology indicated saturation at the ground surface and up to 1 or 2 inches of inundation. As this wetland delineation was completed in the driest part of the growing season, it can be assumed that water depths may typically be greater, and further supports hydrologic support of the groundwater table (versus rainfall runoff).

Wetlands 12, 13 & 14

Similar to Wetlands 3 through 8, Wetlands 12, 13 and 14 are being described collectively as they are comparable in size, are located in a grouping, and have similar characteristics. These wetlands are located directly northeast of Wetland 11, adjacent to the western corridor boundary, and have the following sizes:

- Wetland 12 = 0.24 acres
- Wetland 13 = 0.20 acres
- Wetland 14 = 0.49 acres

These wetlands exist in a group of isolated ground surface depressions, and have vegetative and soil characteristics similar to Wetland 11. Hydrophytic tree species observed in these wetlands include red maple, quaking aspen (*Populus tremuloides* – FAC) and balsam fir. Other species identified included sphagnum, Canada bluejoint and cinnamon fern (*Osmunda cinnamomea* – FACW). Soil saturation levels were generally at the ground surface, with soil textures continuing to match other wetland areas: 3 to 4 inches of peat and organics over low-chroma sands (chroma of 1 or 2). As the ground surface elevations of these wetlands are similar to that of Wetland 11, it is likely their source of hydrology is the same (groundwater).

Wetland 15

Wetland 15 is the second largest and northernmost wetland delineated within the proposed Frontier rail corridor. It is 15.99 acres in size and extends to the north beyond the northernmost corridor boundary. The portions of this wetland that lie within the proposed corridor are primarily tamarack swamp. Features exemplary of this wetland type are: a several inch to several foot- thick mat of sphagnum supporting scattered tamarack and black spruce, along with interspersed shrub species such as Labrador tea and leatherleaf. Moving to the east outside of the corridor, dominant vegetation transitions to more of a shrub-carr regime, where standing water and shrub-layer species are prevalent. Within the corridor, the transition from upland pine stands to tamarack swamp is extremely abrupt, and is marked by a distinct drop in ground surface elevation that runs parallel with the northern corridor boundary. Here, dry sandy soils convert to peaty soils that are either saturated or inundated. The depth of peat observed near the middle of the delineated corridor boundary was approximately 6 inches, and was underlain by sands with chromas of 1 to 2. Along this wetland transition, as well as near the boundaries of several other wetlands on the site, low bush blueberry seemed to be the most prevalent indicator of change from upland to wetland. As the geomorphic and soil conditions within, and near, Wetland 15 are similar to those of other delineated wetlands, it is assumed that the source of hydrology for this wetland is also connectivity with the groundwater table. This is also supported by the fact that this wetland was highly saturated during the driest months of the year, and does not appear to be connected to, or contiguous with any water bodies such as lakes or rivers.

3.2.1.3 Protected Species

In order to determine if Federal or state endangered, threatened, special concern species, exemplary natural plant communities or unique natural features exist within the boundaries of the Frontier project site, Frontier consulted with the U.S. Fish and Wildlife Service (USFWS), Michigan Department of Natural Resources (MDNR) and Michigan Natural Features Inventory (MNFI).

On February 13, 2009, a consultation was completed with the MDNR through their on-line Endangered Species Assessment program[2]. This resulted in the generation of letters from MDNR stating that the following endangered species may be present in Chippewa County:

- piping plover;
- dwarf lake iris;
- Houghton's goldenrod;
- Pitcher's thistle;
- American Hart's tongue fern;
- Canada lynx;
- gray wolf; and
- Kirtland's warbler.

However, since the Frontier site does not contain appropriate habitat for the listed plant species; the gray wolf, Canada Lynx, and Kirtland's warbler have a very large territories; and Canada lynx has not been seen in Chippewa County since 2004, the MDNR concluded that "...project activities may proceed. It has been determined that Federal or state endangered, threatened, special concern species, exemplary natural plant communities or unique natural features are not known to occur at or near the location specified." The MDNR consultation was completed for Sections 21 and 28, T45N, R1W. The MDNR response letters are included in Appendix C.

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[2] http://www.mcgi.state.mi.us/esa/

A consultation letter was submitted to the USFWS on February 17, 2009 regarding the potential presence of threatened and endangered species for the Frontier project site. The USFWS response concurred with the MDNR regarding the potential presence of threatened and endangered species. The consult letter and USFWS e-mail response are included in Appendix C.

Lastly, MNFI database data was reviewed to determine if threatened, endangered or special concern species, unique plant communities or natural features exist or have been documented within the Frontier Project boundaries and the proposed railroad corridor. The results of this database search are displayed in Figure 13, which indicates species/community/natural feature occurrences and likelihoods and also depicts the boundaries of the Frontier Project site and the proposed railroad corridor. Recently documented occurrences are indicated with squares marked with an "S" for special concern, "T" for threatened and an "E" for endangered. The map indicates no occurrences are documented within the proposed project boundaries. The MNFI occurrences nearest the proposed Frontier biorefinery lie approximately 5 miles away from the biorefinery boundaries and approximately 1 mile from the proposed railroad corridor. Species, habitat and feature "likelihoods" are also indicated on Figure 17. These "high," "medium," and "low" likelihood areas represent locations in which threatened or endangered species were once identified, but are not currently confirmed to be present. The level of likelihood is generally based on how long ago the identification occurred. Similar to the other data sets, the Frontier project area and proposed railroad corridor have "no status" for species likelihood, indicating no endangered, threatened or special concern species, communities or features were recorded at that location (MNFI, 2009).

During the wetland delineations of the proposed Frontier site and the proposed railroad corridor, the sites were also surveyed for the presence of potentially protected plant species. No threatened, endangered, or special concern plant species were encountered during the wetland delineation.

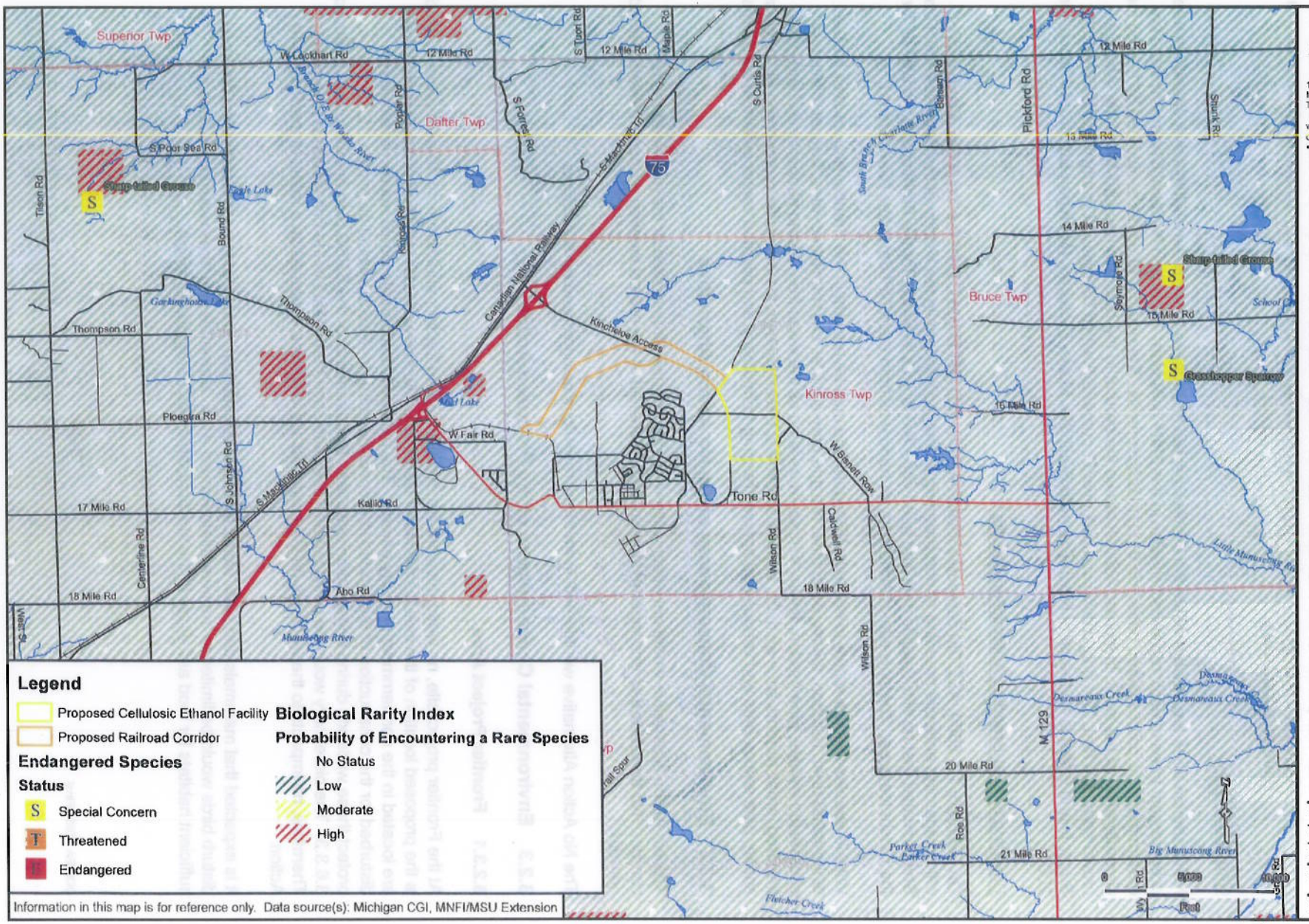
Special Ecological Sites or Geologic Features

Special ecological sites and geologic features that occur in Michigan are documented within the MNFI database. The search of the database for the Frontier project area indicated that these types of features are not located within or near the project area.

Federal and State Wildlife Areas

Various maps of the Frontier project vicinity were developed to determine if any Federal or state nature or wildlife preserves, scenic rivers or state parks are located in close proximity to the site. The following are the results of this search:

- The Munuscong Wildlife Management Area is the nearest nature or wildlife preserve to the Frontier project site. This area lies approximately 7 miles to the southeast on Munuscong Lake, and is a state managed wildlife area.
- The nearest Federal or state scenic river is the Carp River Scenic Area. It lies approximately 27 miles to the southwest near the town of Charles, Michigan.
- The nearest state park to the Frontier project site is the Munuscong River State Forest Campground, which is located in the Munuscong Wildlife Management Area. A private campground, Clear Lake Campground, is located 3-4 miles to the north of the project site on county road H63.
- Various tracts of the Lake Superior State Forest surround the Kincheloe and Chippewa County Airport areas.



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BIOLOGICAL RARITY INDEX
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:	JWW	2/17/2009
Approved:	LDK	2/17/2009
Scale:	1" = 1 MILE	
PROJECT NUMBER	60140061	
FIGURE NUMBER	13	

The Eastern portion of the Hiawatha National Forest lies 7 to 8 miles to the west of the project site. This portion of the Hiawatha National Forest reaches from the shore of Lake Superior to the shores of Lakes Huron and Michigan. It is most likely the largest Federal holding of land near the Frontier project area.

Champion Trees

No champion trees are located within the Frontier project boundaries or within several miles. A champion tree is the largest trees of each registered species in the State or Nation. State and National Champion trees are determined by a point system, based on three measurements. The number of points is obtained by adding the circumference of the trunk, in inches, 4.5 feet above the ground to the height in feet and 1/4 of the average crown spread in feet. The only champion trees ever documented within Chippewa County were identified on Sugar Island which is northeast of Kincheloe near Sault Ste. Marie, Michigan. (Michigan Botanical Association, 2006).

Breeding or Non-Breeding Animal Populations

On February 18, 2009, AECOM contacted MDNR wildlife biologist Erynn Call of the Sault Ste. Marie district office regarding potential breeding or non-breeding animal populations in the vicinity of the Frontier project site. She indicated that no site-specific data had been collected or was available for the Frontier site, as well as for the Kincheloe area. The only site-specific data on hand was from the MNFI database (Call, Erynn).

Wildlife species that are native to northern Michigan, and may be present in the Frontier project area include: white-tailed deer, raccoon, skunk, porcupine, red and gray squirrel, chipmunks, coyotes, bobcat, black bear, short-tailed weasel, pine marten, fisher, various frogs such as the wood frog, spring peeper or eastern gray tree frog, small rodents such as mice, shrews and voles, turtles such as the box turtle or snapping turtle, grass snake, pine snake, bats and various bird species ranging from downy and pileated woodpeckers to songbirds.

3.2.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would not affect wetlands in the Frontier project area or the proposed railroad corridor. No threatened or endangered species were identified at the project location or the proposed railroad corridor.

The No Action Alternative would result in no forest resources being utilized for this project.

3.2.3 Environmental Consequences of the Proposed Action

3.2.3.1 Frontier Project Area

At the Frontier project site, no wetlands were encountered within the four southernmost 40-acre parcels, which is the proposed location of the cellulosic ethanol biorefinery. All five wetlands identified at the biorefinery site are located in the northernmost property parcels. The northernmost parcels would not be developed or disturbed for the construction of the proposed Frontier biorefinery. Frontier would develop a SESC Plan to protect these wetlands during construction activities. Requirements of the SESC plan are discussed in Section 3.6.3.3. The biorefinery would be designed and operated such that impact to the five wetlands is avoided. Therefore, no impacts to the wetlands on the proposed site would be expected as a result of the Proposed Action.

It is expected that mammals and birds would avoid the construction area. Any construction noise that may disturb birds would be limited to the immediate Project area. Mammals and birds would be able to find sufficient habitats for food and water in the surrounding areas during construction.

3.2.3.2 Railroad Corridor

Frontier has completed and submitted a rail corridor alternatives analysis to the MDEQ for the proposed rail corridor (Alternatives Analysis for Proposed Rail Corridor - Frontier Cellulosic Ethanol Facility, Frontier Renewable Resources, LLC; Kinross Township, Chippewa County, Michigan, AECOM 2010). The alternatives analysis included three potential routes for the rail line.

- **Route #1** – Route #1 would be constructed off of the existing railroad track to the west of the town of Kincheloe, and would continue to the north and east, passing through forested state lands. The route would cross the Gaines Highway to the west of the proposed Frontier facility and enter the site at its northwest corner.

- **Route #2** – Route #2 would connect to existing railway at a "dead end" that is located immediately to the west of the town of Kincheloe, just east of Kincheloe Drive. This route would then continue south and east, and follow along the north side of Tone Road/Highway M-80 to the east side of town, where it would turn north southeast of Duke's Lake. It would then enter the proposed Frontier ethanol facility from the south.

- **Route #3** – Route #3 would connect to the existing railway at the same "dead end" as Route #2, and would also primarily follow Tone Road/Highway M-80 to the east. The primary difference is that Route #3 would run along the south side of Tone road/M-80, instead of the north side, and would therefore require two crossings of the highway itself. Route #3 would also enter the Frontier facility from the south, the same as Route #2.

Route #3 would require construction of 2 highway crossings, 4 street crossings, and 4 driveway crossings. Route #3 would potentially block access and/or emergency egress from the Kinross Township Fire Department and the Chippewa County Correctional Facility. Approximately 4 buildings in Kinross would have to be removed or relocated to provide sufficient clearance for rail right of way. An underground natural gas pipeline would likely have to be relocated or rebuilt at a greater depth and an existing electric line would likely have to be relocated or rebuilt to provide clearance for rail cars. Finally, construction of Route #3 would require a substantial revision of the Kinross Charter Township downtown re-development plan.

Route #2 would require eight (8) city street crossings and one (1) crossing of the Gains Highway. Additionally, it would require crossing of nine (9) existing driveway entrances. Route #2 would otherwise mirror the potential impacts discussed above for Route #3.

Route #1 would require one (1) crossing of the Gains Highway north of Kinross. No buildings or utility corridors would be impacted. No other impacts would occur in Kinross. Route #1 would go through an area where wetlands are present. A 1,000 foot wide corridor was examined for rail bed location along Route #1.

Of the 15 wetlands identified within the proposed Route #1, it is anticipated that four wetlands would be affected by construction of a new railroad grade. These include Wetlands 1, 4, 5 and 6. Wetland 1 (approximately 41.8 acres) spans the entire width of the southern end of the proposed corridor, as well as beyond the corridor to the east and west. Wetlands 4, 5, and 6 (all less than 1 acre in size) lie directly to the north of Wetland 1, and would be skirted on their western edges by the proposed railroad right-of-way (ROW). The total proposed impact area for each wetland is estimated to be the following:

- Wetland 1 = 136,270 sq. ft. (3.13 ac)
- Wetland 4 = 22 sq. ft.
- Wetland 5 = 661 sq. ft.
- Wetland 6 = 6 sq. ft.

Wetland 1 has the greatest total impact area. In accordance with Section 404 of the Clean Water Act and Part 303 of NREPA, Act 451 of 1994, any impacts to wetlands may require a joint permit from the MDEQ and USACE. When a project total of greater than 0.33 acres of wetland impacts are anticipated, the MDEQ may impose compensatory wetland mitigation as a condition of the permit issuance. The purpose of compensatory wetland mitigation, commonly referred to as wetland mitigation, is the replacement of unavoidably lost wetland resources with created, or restored wetlands, with the goal of replacing as fully as possible the functions and public benefits of the lost wetland. In accordance with the administrative rules for Part 303, the MDEQ can consider wetland mitigation only after all of the following conditions are met:

- The wetland impacts are otherwise permit table under sections 30302 and 30311 of the act;
- No feasible and prudent alternative to avoid wetland impacts exists;
- An applicant has used all practical means to minimize impacts to wetlands. This may include the permanent protection of wetlands on the site not directly impacted by the proposed activity.

The amount of compensatory mitigation required by MDEQ depends on two factors: 1) which wetlands are under the jurisdiction of the MDEQ and 2) the type of wetland being impacted. State of Michigan wetland jurisdiction depends on connectivity/proximity to a lake, river or stream, proximity to the Great Lakes (not applicable to the Frontier wetlands), and being greater than 5 acres in size. Additionally, Michigan regulators have the authority to regulate wetlands less than 5 acres in size depending on wetland quality and value. Therefore, some or all of the wetlands within the proposed Frontier railroad corridor may be regulated.

The type of wetland impacted affects the amount of required compensatory mitigation in the following manner:

- Ratio of 5:1 (5 acres created/restored for every 1 acre impacted) is required for impact of rare or imperiled wetlands;
- Ratio of 2:1 for impact of forested wetlands;
- Ratio of 1.5:1 for all other wetlands.

For the purpose of estimating the amount of wetland mitigation that would be required, the following assumptions, determinations and calculations were made:

1. MDEQ would take regulatory jurisdiction of all wetlands proposed for impact;
2. There are no rare or imperiled wetlands present within the proposed railroad corridor (based on evaluation by AECOM);
3. The amount of forested and non-forested acres planned for impact are as follows:

Wetland Type	Estimated Impact Area (sq.ft.)
Shrub-Scrub	3,014
Open Water	25,085
Open Bog	2,663
Tamarack Swamp/Bog	105,508
Wet Meadow	689

According to the MDEQ's mitigation ratios, the following amount of required compensatory wetland mitigation would required.

Wetland Type	Estimated Impact Area (sq.ft.)	Required Ratio	Total Mitigation Area (ac)
Shrub-Scrub	3,014	1.5:1	**0.104**
Open Water	25,085	1.5:1	**1.737**
Open Bog	2,663	1.5:1	**0.092**
Tamarack Swamp/Bog	105,508	2.0:1	**4.84**
Wet Meadow	689	1.5:1	**0.02**
		Total =	**5.93**

In addition to the construction of new wetlands as a form of mitigation, the MDEQ will also allow restoration of existing impacted wetlands, as well as the purchase of established mitigation bank credits. Restoration of existing wetlands is preferred by MDEQ over the creation of new wetlands, while purchase of mitigation bank credits are the least preferred option. The option that Frontier and MDEQ would proceed with depends on factors such as the location, size and proximity of: impacted wetlands, available land for creation of wetlands, and existing mitigation banks.

As with all wetland delineations, permitting and mitigation, MDEQ will make the final determination regarding jurisdiction, locations of wetland boundaries, and permitting and mitigation requirements.

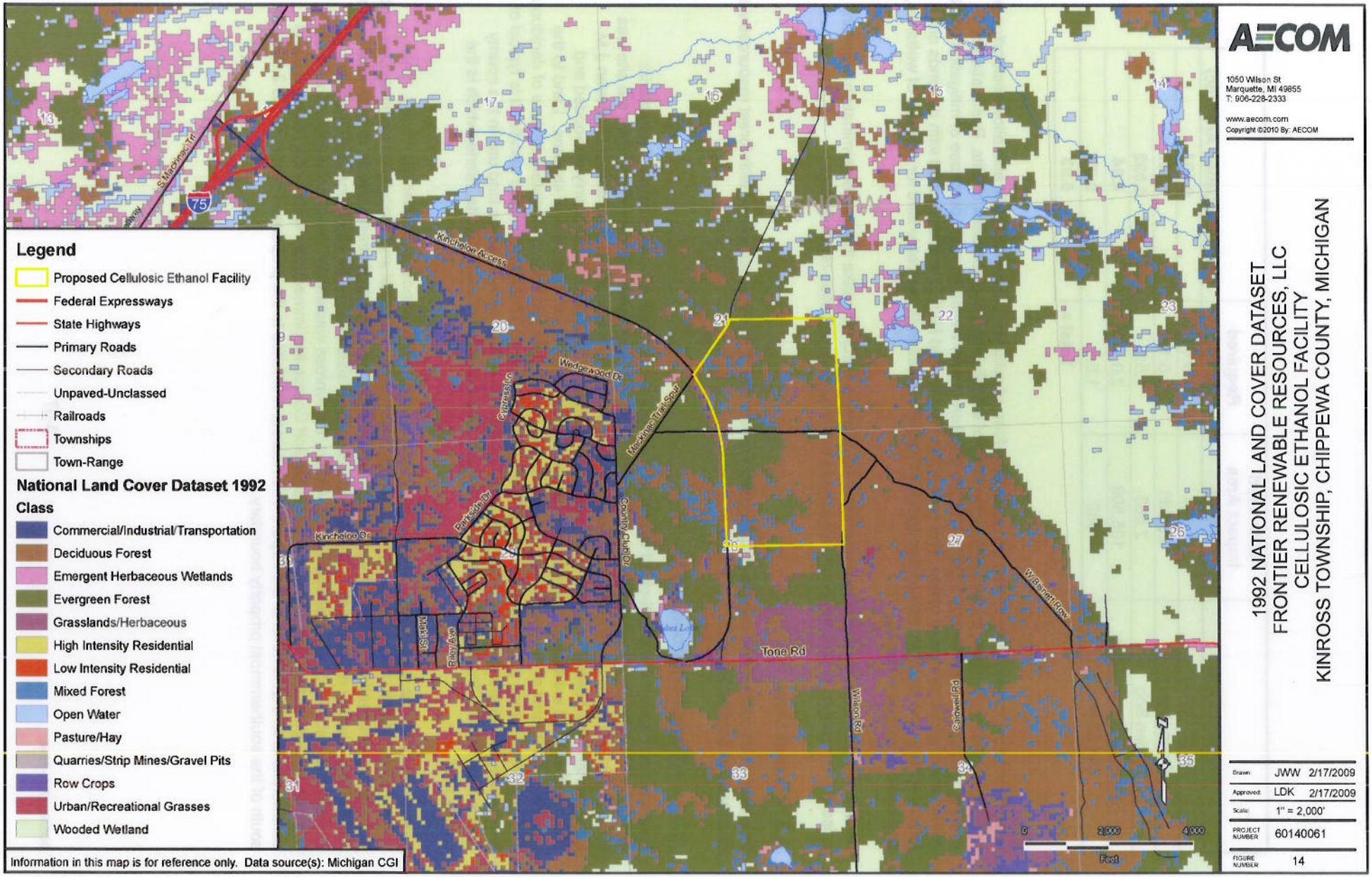
3.3 Land Use

This section discusses land use for the proposed Frontier site. Land use associated with forest resources was discussed in Section 3.1.

3.3.1 Affected Environment

As shown on Figure 14, the entirety of the Frontier project site consists of various types of forestland: deciduous, evergreen, mixed and wooded wetland. The 355-acre parcel of land proposed for the site was transferred from the State of Michigan effective March 5, 2009 in a land transfer agreement between J.M. Longyear and the State. The areas to the north and northeast of the site consist mainly of wooded and emergent wetland areas, with intermixed upland evergreen forest, ponds, lakes and streams. Land to the south and southeast of the project site is similar to the project site itself, with a consistent mixture of deciduous and evergreen forest, along with sparse areas of wooded wetland. This type of mixed woodland is typical of the majority of Chippewa County, with agriculture being the second most common land use in the county (Maps.com, 2008). The only city of significant size in Chippewa County is Sault Ste. Marie, which is the county seat.

Kinross occupies the land directly to the west and southwest of the proposed Frontier biorefinery. This unincorporated town consists of several residential, commercial, industrial and institutional facilities. Low- and high-density residential areas are present within and around the network of streets that lie directly west of the Frontier site. Nearby commercial, industrial and institutional sites include the Kincheloe and Chippewa Correctional Facilities, the Chippewa County Airport, the Kinross wastewater treatment plant and various commercial businesses. The Kincheloe Memorial Golf Course lies immediately west of the residential and commercial area that is north of the airport. The nearest residence to the proposed Frontier site is 2,600 feet south of the southernmost property boundary.



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1992 NATIONAL LAND COVER DATASET
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:	JWW	2/17/2009
Approved:	LDK	2/17/2009
Scale:	1" = 2,000'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	14	

3.3.2 Environmental Consequences of No Action Alternative

The No Action Alternative would have no impact to the land use on the proposed site.

3.3.3 Environmental Consequences of Proposed Action

Proposed Site

The proposed cellulosic ethanol biorefinery would be constructed on approximately 50 acres located in the southernmost 160 acres of the property. Approximately 10 to 15 acres of the property would be covered by buildings, structures, or other impervious surfaces such as roads. Additionally, approximately 15 acres of the site, the log yard would be converted to a gravel covered area for storage of whole logs. Other grading activities would be completed to create storm water drainage systems. No wetlands or sensitive receptors would be impacted by the on-site construction.

Construction of the on-site rail siding would result in clearing of forested land across the site to the wood yard with a loop around the south end of the site to the ethanol load-out area.

The construction of the rail spur would result in permanent clearing of forested land between the rail main line to the site along a corridor ranging from 100 to 160 feet wide by 2.7 miles long. Approximately 3.14 acres of existing wetland would be impacted by the construction of the rail corridor. The impacts to the wetlands would be mitigated as described in Section 3.5.3.2.

3.4 Cultural Resources

3.4.1 Affected Environment

In addition to NEPA, DOE is required to comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C § 470 et seq., as amended). Section 106 of NHPA and the implementing regulations, 36 CFR Part 800, require Federal agencies to take into account the effects of their undertakings on historic properties that are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP), which is the Nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed in the National Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior. The implementing regulations identify the criteria for evaluating the eligibility of properties for listing in the National Register (36 CFR § 60.4).

DOE has determined that the proposed Federal funding for the Frontier Project constitutes an undertaking under the NHPA. The remainder of this section discusses and documents DOE's compliance with NHPA's requirements

Given the location of the Frontier Project, DOE determined that Michigan's State Historic Preservation Office (SHPO) is a mandatory consulting party and initiated consultation with the SHPO on July 21, 2010 by submitting a letter describing the project along with an Application for Section 106 Review (which is contained in Appendix E). DOE described the Area of Potential Affects as "the 160 acre project site plus the rail corridor from the site to the existing rail line," and sought the SHPO's concurrence with its finding that "there are no know historic properties within the proposed project's Area of Potential Effects." DOE also informed the SHPO that the consultation correspondence would be included in the draft EA for the project, which would be provided to the SHPO for comment.

On August 4, 2010, the SHPO sent a letter to DOE (contained in Appendix E) stating that "[i]t appears that for this project there will be no historic properties affected in regard to above-ground resources," but that, given that several archaeological sites are known to exist in the project area, "an archaeological survey should be conducted and submitted to this office so that we may complete our review." In the Fall of 2010, Frontier completed a Phase I Archeological Survey (Survey) of the proposed project site and rail spur. (Phase I

Archaeological Investigation, Frontier Renewable Resources, Kinross Charter Township, Chippewa County, Michigan, AECOM October 2010). A copy of the Survey is contained in Appendix E.

Because the internal review of the Office of the State Archaeologist (OSA) determined that no listed or known eligible cultural resources where present in the APE above the ground surface, the Survey focused on buried, significant, and intact archaeological resources. Prior to initiating the Survey, the SHPO was consulted and concurred with the DOE's definition of the Area of Potential Effects (APE) as the 160 acres in the northeast quarter of Section 28 and the 2.5-mile-long railroad spur right of way (ROW). The APE consists of wooded and marshy, undeveloped lands.

Background research and records review was completed at the OSA in Lansing, Michigan on August 25, 2010 and September 8, 2010 to determine if any previous cultural or archeological surveys had been conducted in immediate area of the APE and specifically within the APE. The background research also determined what type of cultural resources where typically found in Chippewa County, in what context, and at what frequency. Based on the background research, current Michigan cultural resource survey work methods, and standard archeological survey practices, a predictive model was developed to guide the Survey field activities for the entire APE, using the following definitions:

- High-probability area (HPA) – less than or equal to 300 meters from surface water and 0-10% slopes.
- Moderate-probability area (MPA) – less than 300 meters from surface water and slopes greater than 10%.
- Low-probability area (LPA) - Disturbed previously (e.g., gravel or sand pits) or existing wetlands or slopes greater than 10%.

The Survey included a pedestrian survey in the APE, with shovel testing in locations defined as HPAs and MPAs for buried, significant, and intact archaeological resources. AECOM's predictive model eliminated from subsurface testing the LPAs in the APE. Almost the entire 160-acre parcel was defined as a MPA, except for a small portion in the northeast corner that was a LPA. Survey field work was completed on the APE in sections 28 and 30 on September 20-23, 2010. Shovel tests were excavated 50 meters apart along the first transect in the 160-acre parcel, which was along the south boundary of the parcel; no archaeological resources were found in any of the shovel test locations or identified on the ground surface. Therefore, the shovel-test interval was expanded to 100 meters throughout the remainder of the 160-acre parcel.

The western terminus of the proposed railroad spur was defined in the model as a HPA, ending at a LPA marshland. Therefore, AECOM's shovel-test interval was 15 meters apart along the proposed rail spur.

AECOM excavated a total of 73 shovel tests in the APE – 60 shovel tests in the 160-acre parcel and 13 at the west end of the proposed railroad spur. No cultural resources were encountered in any of the shovel tests. The only cultural resource observed during the Survey was a small surface scatter of miscellaneous transportation-related debris, such as modern oil filters.

The Survey report was submitted to the SHPO for review.

Beyond consultation with the Michigan SHPO, DOE has engaged in consultation and communication with numerous tribes in Michigan, Wisconsin, and Minnesota. Also, Frontier has represented that, over the past year, it has met with tribal representatives in the area of the proposed Frontier project—including an August 2010 meeting with the Inter-Tribal Council of Michigan (ITCM, which is a non-profit corporation located in Sault Ste. Marie, Michigan that represents eleven of the twelve Federally recognized tribes in Michigan, including all of the Federally-recognized tribes in Michigan's Upper Peninsula)—in order to gather information regarding tribal concerns about the project, including potential effects on cultural resources, and discuss those concerns. In addition to the representatives of the ITCM, representatives of the Sault Ste. Marie Tribe of Chippewa Indians, Hannahville Indian Community, and U.S. EPA Region 5 were present at the meeting.

On December 22, 2009, DOE's scoping letter was sent to the Sault St. Marie Tribe of Chippewa Indians and the Inter-Tribal Council of Michigan. On January 19, 2010, Darwin (Joe) McCoy, Tribal Chairman for the Sault

St. Marie Tribe of Chippewa Indians sent a letter in response to the notice (included in Appendix E) and indicated the tribe's interest in the project and the EA. As part of the letter, Chairman McCoy also inquired about the potential impact of the project on cultural resources and other natural resources within the 1836 Treaty of Washington ceded territory.

On July 22, 2010, DOE initiated consultation with all Federally recognized tribes in Michigan regarding the Section 106 NHPA process, including:

- Bay Mills Indian Community
- Grand Traverse Band of Ottawa and Chippewa Indians
- Hannahville Indian Community
- Keweenaw Bay Indian Community
- Lac Vieux Desert Band of Lake Superior Chippewa Indians
- Little River Band of Ottawa Indians
- Little Traverse Bay Band of Odawa Indians
- Match-e-be-nash-se-wish Band of Pottawatomi Indians
- Nottawaseppi Huron Band of the Potawatomi
- Pokagon Band of Potawatomi Indians
- Saginaw Chippewa Indian Tribe of Michigan
- Sault Ste. Marie Tribe of Chippewa Indians of Michigan

DOE also initiated consultation with the following Federally-recognized tribes in Minnesota and Wisconsin:

- Bad River Band of Lake Superior Chippewa
- Bois Forte Band of Chippewa
- Fond du Lac Band of Lake Superior Chippewa
- Grand Portage Band of Lake Superior Chippewa
- Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin
- Leech Lake Band of Ojibwe
- Mille Lacs Band of Ojibwe
- Minnesota Chippewa Tribe
- Red Cliff Band of Lake Superior Chippewa Indians
- Red Lake Band of Chippewa Indians of Minnesota
- Sokaogon Chippewa Community
- St. Croix Chippewa Indians of Wisconsin
- White Earth Band of Ojibwe

The DOE informed the tribes about the proposed project and solicited information from them about properties of traditional religious and cultural significance within the vicinity of the proposed facility and any concerns about the potential for the project to affect those properties. In all, DOE sent consultation letters to 25 tribes. Copies of the DOE's tribal consultation letters are contained in Appendix E.

The DOE received written responses from five tribes, copies of which are contained in Appendix E.

The Lac Vieux Desert Band (LVD) of the Lake Superior Chippewa Indians Ketegitigaaning Ojibwe Nation Tribal Historic Preservation office (THPO) responded that "[t]he LVD Tribal Historic Preservation Office has no interests documented at this time in the proposed project areas. LVD has conducted its database research, file research and find no sites within the project area at this time." The LVD THPO requested and was provided with a copy of the Survey for their information, review and analysis.

The Leach Lake Band of the Ojibwe THPO responded that "after careful consideration of our records, I have determined that the Leech Lake Band of the Ojibwe does not have any concerns regarding sites of religious or cultural importance in these areas."

The Bois Forte Band of the Chippewa THPO responded that it was "not aware of historic or cultural properties associated with the Band within the APE."

The Little River Band of the Ottawa Indians responded that "after a careful review of our information the Little River Band of Ottawa Indians has determined . . . that this project will not affect any religious, cultural or historic Little River Band of the Ottawa Indians sites of which we are currently aware."

The Little Traverse Bay Bands of Odawa Indians submitted a declaration signed by nine Tribal Council members in opposition to the Frontier Project based primarily on concerns about the potential impact of the project on the environment and the tribe's use of public lands in the 1836 treaty ceded territory "for hunting for subsistence and gathering of medicines." The declaration does not identify any particular properties of traditional religious and cultural significance within the vicinity of the proposed facility.

On February 22, 2011, DOE sent the Notice of Availability of the draft EA for public comment and review to all of the Federally recognized tribes in Michigan, Minnesota, and Wisconsin identified above. On February 22, 2011, DOE sent a hard copy of the draft EA to the Little Traverse Bay Bands of Odawa Indians along with a cover letter (included in Appendix E) stating that the DOE has attempted to address the tribe's concerns and comments, and inviting the tribe to provide any additional comments about the Frontier project during the comment period. Since the issuance of the draft EA, DOE has not received any additional comments or information from any of the tribes identified above regarding any properties of traditional religious and cultural significance within the vicinity of the proposed facility or any concerns about the potential for the project to affect any such properties.

With respect to the concerns expressed by the Little Traverse Bay Bands of Odawa Indians and the Sault St. Marie Tribe of Chippewa Indians about the potential impact of the project on tribal use of public lands in the ceded territory, DOE notes that this issue is beyond the purview of Section 106 of NHPA.

While the tribal responses to DOE's consultation letters received do not indicate the existence of any cultural resources in the APE that would be eligible for listing in the NRHP, DOE is continuing its consultation efforts with the Tribes by inviting any additional information relating to cultural resources in the APE that may be of significance as DOE works to complete its review in compliance with Section 106 of NHPA.

Further, as discussed in more detail elsewhere in the EA, the Frontier Project will not significantly impact tribal use of the 1836 treaty ceded territory because:

1. the project will not materially increase the amount of wood that would otherwise be harvested on public lands within the ceded territory;

2. any harvesting of wood for the project from Federal lands within the ceded territory can only occur after the Federal government has approved the bidding of such lands in compliance with applicable Federal laws, including NEPA;

3. the State of Michigan maintains a FSC and a SFI certification; therefore, any timber sales on state-owned lands within the ceded territory are conducted within the FSC and SFI standards and guidelines, which include consideration of potential impacts on tribal resources; and.

4. J.M. Longyear also maintains a FSC certification for their managed forest lands.

The DOE has determined that no NRHP-listed sites or known NHRP-eligible sites are located on the proposed project site or on the proposed rail corridor #1. A total of 30 listed sites are located in Chippewa County, most in Sault Ste. Marie. Sault Ste. Marie is approximately 18 miles north of the proposed Frontier site. The nearest NRHP listed site to the proposed Frontier site is the Kinross Township Hall and School, located at

7305 West Kinross Road, Kinross Township. This site is approximately 2 miles east of the proposed Frontier site.

On November 3, 2010, the SHPO issued a letter stating that based on its review of the Survey report and other information provided, "it is the opinion of the State Historic Preservation Officer (SHPO) that **no historic properties are affected** within the area of potential effects of this undertaking." A copy of the SHPO letter is contained in Appendix E.

3.4.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would have no impact on cultural resources in the project area.

3.4.3 Environmental Consequences of the Proposed Action

No cultural resources were identified within the APE. Cultural resources on Federal and State land and private forest lands would be protected by existing processes and procedures. The Proposed action would not have an impact on cultural resources.

3.5 Meteorology

This section discusses meteorology in the overall proposed Frontier project area.

3.5.1 Affected Environment

Meteorology for the eastern portion of the upper peninsula of Michigan features weather patterns with large ranges of temperatures between summer and winter which, is greatly influenced by Lake Superior. The temperatures in the eastern Upper Peninsula of Michigan are moderated by the so called lake effect, as this land lies directly south of Lake Superior. (Schaetzl, 2002).

Climate data for Kinross and the surrounding area, based upon data from Rudyard, Michigan, which is located approximately 13 miles southwest of Kinross, shows that average monthly mean temperature ranges from 14.3°F in January to 64.3°F in July. Winter months (December through February) are the coldest with average monthly low temperatures ranging from 5.5°F to 13.2°F and high temperatures ranging from 23.0°F to 28.1°F. The warmest months are the summer months of June through August. During those months average monthly temperature ranges from 59.6°F to 64.3°F and high temperatures range from 73°F to 77.2°F. Average annual precipitation is approximately 30.39 inches. January through March have the lowest precipitation rates with an average of 1.86, 0.99, and 1.59 inches, respectively, most of which is in the form of snowfall of 24.2, 12.9, and 11.5 inches (Midwestern Regional Climate Center, 2009).

Wind data from the Michigan Department of Environmental Quality (MDEQ) for Chippewa County International Airport located in Kincheloe approximately 2.5 miles southwest of the proposed biorefinery shows that the prevailing winds are from the northwest and southeast. (Figure 15, Chippewa County International Airport Wind Rose, MDEQ, 2008).

3.5.2 Environmental Consequences of the No Action Alternative

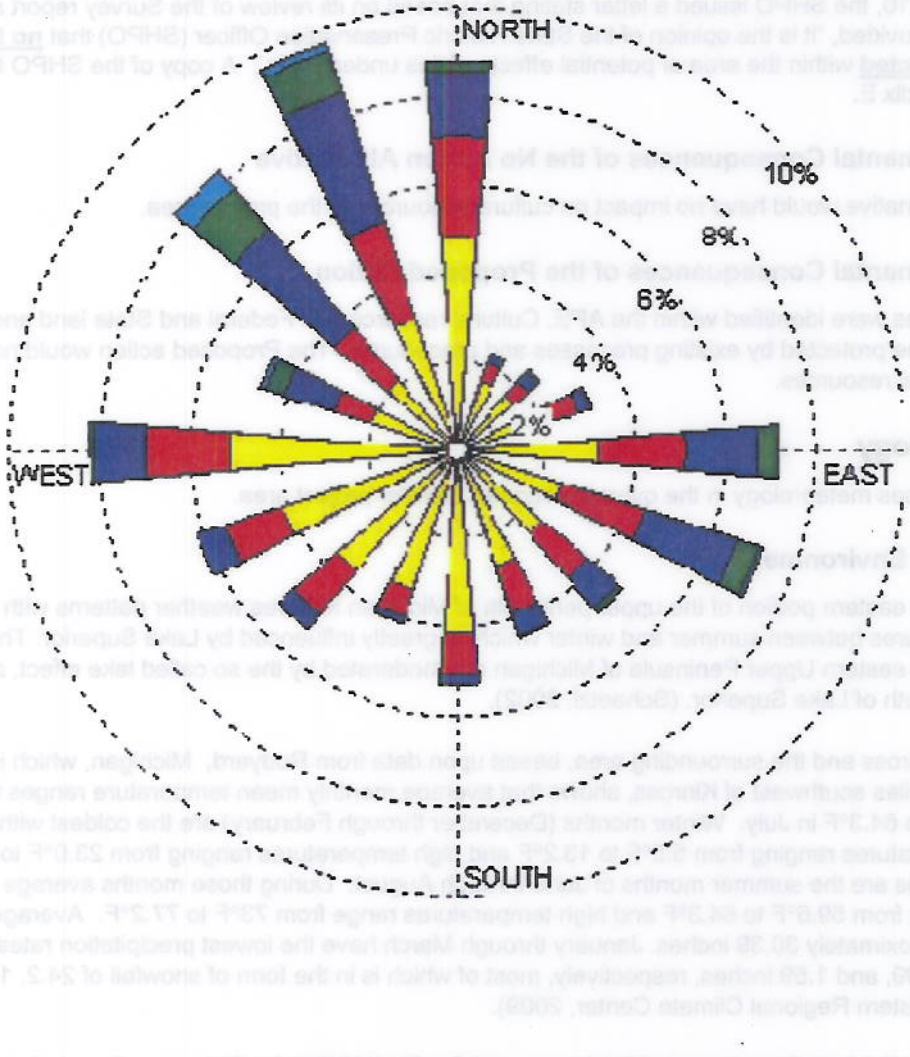
No aspect of the No Action Alternative would affect the climate or weather of the region.

3.5.3 Environmental Consequences of the Proposed Action

No aspect of the Proposed Action would affect the climate or weather of the region. No impacts to meteorology would be expected to occur under the Proposed Action due to the Frontier Project.

Severe weather, such as thunderstorms or snow storms, may temporarily impact operations by limiting delivery of supplies, impeding shipments of ethanol, or causing disruption of electrical or water service. These types of impacts would be expected to last for less than 24 hours but could extend for up to several days. Although these impacts may occur in any given year, operational planning would allow for normal operations

CHIPPEWA INTERNATIONAL AIRPORT – 2006



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WIND ROSE
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:	KLM 1/18/2011
Approved:	
Scale:	NA
PROJECT NUMBER	60140061
FIGURE NUMBER	15

to resume with minimal impacts. Frontier would modify its ERP, as necessary, to protect their employees and the public in the event of severe weather.

3.6 Air Quality

This section discusses air quality in the overall proposed Frontier project area.

3.6.1 Affected Environment

3.6.1.1 Ambient Air Quality

The Clean Air Act (CAA) required the USEPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. NAAQS include two types of air quality standards. Primary standards protect public, including the health of sensitive populations such as asthmatics, children and the elderly. Secondary standards protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (USEPA, 2009a). USEPA has established and Michigan has adopted NAAQS for seven principal pollutants, which are called "criteria pollutants".

Table 3-4 - National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[(1)]	None
	35 ppm (40 mg/m^3)	1-hour[(1)]	None
Lead	1.5 $\mu g/m^3$[(2)]	Quarterly Average	Same as Primary
Nitrogen Dioxide[9]	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)	Same as Primary
	0.1 ppm (188 $\mu g/m^3$)	1-hour	None
PM_{10}	150 $\mu g/m^3$	24-hour[(3)]	Same as Primary
$PM_{2.5}$	15.0 $\mu g/m^3$	Annual[(4)] (Arithmetic Mean)	Same as Primary
	35 $\mu g/m^3$	24-hour[(5)]	Same as Primary
Ozone	0.075 ppm (2008 std)	8-hour[(6)]	Same as Primary
	0.08 ppm (1997 std)	8-hour [(7)]	Same as Primary
	0.12 ppm	1-hour[(8)] (Applies only in limited areas)	Same as Primary
Sulfur Dioxide (SO_2)	0.03 ppm	Annual (Arithmetic Mean)	-------
	0.14 ppm	24-hour[(1)]	-------
	-------	3-hour[(1)]	0.5 ppm (1300 $\mu g/m^3$)
	0.075 ppm (196 $\mu g/m^3$)	1-hour	-------

Table obtained from USEPA, 2009a.

(1) Not to be exceeded more than once per year.

(2) Final rule signed October 15, 2008.

(3) Not to be exceeded more than once per year on average over 3 years.

(4) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

[5] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).
[6] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
[7] (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
[8] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas.
[9] The 1-hours NO_2 standard is based on the three year average of the 98th percentile of the annual distribution of the daily hourly maximum 1-hour concentrations.

Areas that meet the air quality standards for the criteria pollutants are designated as being in attainment. Areas that do not meet the air quality standard for one or more of the criteria pollutants may be subject to the formal rule-making process and designated as being in nonattainment for that standard. Chippewa County is in attainment for all criteria air pollutants (USEPA 2009b). The USEPA maintains a database of selected ambient air quality data. According to the USEPA Air Data County Air Quality Report for Chippewa County, Michigan, air quality data was only available for $PM_{2.5}$ (USEPA 2009c).

Table 3-5 - Chippewa County Ambient Air Quality Data

Pollutant	Averaging Period	Chippewa County Ambient Air Quality Data			
		2005	2006	2007-2008	
Particulate Matter less than 2.5 Micron ($PM_{2.5}$)	24-hour	28.3 $\mu g/m^3$	36.1 $\mu g/m^3$	No Data Available	Near U.S. average
	Annual	9.29 $\mu g/m^3$	8.99 $\mu g/m^3$	No Data Available	Near U.S. average

The MDEQ requires any new potential source of significant air emissions to acquire a permit to install permit prior to beginning construction. Table 3-6 lists the sources identified in the USEPA Envirofacts Database with air releases within 15 miles of the proposed biorefinery (USEPA 2009d).

Table 3-6 - Air Emission Sources within 15 miles of the Proposed Biorefinery

Source	Relative Location to Proposed Biorefinery	Description
American Fabricators 426 Dolan St. Kinross, MI 49752	2 miles southwest	Minor source, potential emissions less than 100 tons per year.
Chippewa Animal Clinic 1554 E 3 Mile Road Sault Ste. Marie, MI 49783	14 miles northeast	Minor source, potential emissions less than 100 tons per year.
Dafter Sanitary Landfill, Inc. 3962 West 12 Mile road Dafter, MI 49724	3.5 miles north-northwest	Potential emissions greater than 100 tons per year. Emissions of VOC's from landfill.

Source	Relative Location to Proposed Biorefinery	Description
Forestply Ind Inc. 436 Quay St. Kincheloe, MI 49788	2 miles southwest	Minor source, potential emissions less than 100 tons per year.
MI Department of Corrections Bldg 115 Kinross Heating Plant Kincheloe, MI 49788	2 miles southwest	Potential emissions greater than 100 tons per year. Facility heating plant.
Montgomery Aggregate Products 7151 South M-129 Sault Ste. Marie, MI 49783	9 miles north-northeast	Minor source, potential emissions less than 100 tons per year.
Montgomery Concrete 40 E 3 Mile Road Sault Ste. Marie, MI 49783	12 miles north-northeast	Minor source, potential emissions less than 100 tons per year.
Norris Contracting Inc. Portable Asphalt Plant Sault Ste. Marie, MI 49783	11 miles north-northeast	Minor source, potential emissions less than 100 tons per year.
Northern Sand and Gravel 1200 W 3 mile Road Sault Ste. Marie, MI 49783	12 miles north-northeast	Minor source, potential emissions less than 100 tons per year.
Olofsson Fabrication Services Inc. Bldg. 434 Dolan St. Kincheloe, MI 49788	2 miles southwest	Minor source, potential emissions less than 100 tons per year.
Payne and Dolan Inc. M 129 and 15 MI Road Junction Sault Ste. Marie, MI 49783	3.5 miles east-northeast	Minor source, potential emissions less than 100 tons per year.
Robinson Fence Co. Clegg Rd Rte 1 Pickford, MI 49774	10 miles south-southeast	Minor source, potential emissions less than 100 tons per year.
Sadler Motors, Inc. 3055 S Mackinac Trail Sault Ste. Marie, MI 49783	12.5 miles north-northeast	Minor source, potential emissions less than 100 tons per year.

A summary report regarding local air issues in the Sault Ste. Marie area prepared in part for the USEPA and MDEQ describes the two major sources listed in Table 3-6, Dafter Sanitary Landfill, a VOC source, and the Michigan Department of Corrections, a SO_2 and PM source (Potvin Air Management Consulting, 2006). The other sources are minor sources are not expected to contribute to air quality issues at the proposed project site.

3.6.1.2 Odor

Other than the Dafter Sanitary Landfill, Inc., the nearby sources as described above are expected to generate a minimal amount of odor associated with their operations. The Dafter Sanitary Landfill is 3.5 miles from the proposed site, so it would not be expected to contribute odors to the proposed project site.

3.6.1.3 Forest Sequestration of CO_2

Terrestrial carbon sequestration is the process through which CO_2 from the atmosphere is absorbed by trees, plants and crops through photosynthesis, and stored as carbon in biomass (tree trunks, branches, foliage and roots) and soils. The term "sinks" is also used to refer to forests, croplands, and grazing lands, and their ability

to sequester carbon. Agriculture and forestry activities can also release CO_2 to the atmosphere. Therefore, a carbon sink occurs when carbon sequestration is greater than carbon releases over some time period.

There are three general means by which forestry practices can reduce greenhouse gases:

1. avoiding emissions by maintaining existing carbon storage in trees and soils;
2. increasing carbon storage by, e.g., tree planting; and
3. substituting bio-based fuels and products for fossil fuels, such as coal and oil, and energy-intensive products that generate greater quantities of CO_2 when used.

Carbon sequestration rates vary by tree species, soil type, regional climate, topography and management practice. In the U.S., fairly well-established values for carbon sequestration rates are available for most tree species. Changes in forest management (e.g., lengthening the harvest-regeneration cycle) generally result in less carbon sequestration on a per acre basis.

Carbon accumulation in forests and soils eventually reaches a saturation point, beyond which additional sequestration is no longer possible. This happens, for example, when trees reach maturity, or when the organic matter in soils builds back up to original levels before losses occurred. Even after saturation, the trees would need to be sustained to maintain the accumulated carbon and prevent subsequent losses of carbon back to the atmosphere.

Table 3-7 - Representative Carbon Sequestration Rates and Saturation Periods for Key Forestry Practices

Activity	**Representative carbon sequestration rate in U.S.**(Metric tons of C per acre per year)	**Time over which sequestration may occur before saturating** (Assuming no disturbance, harvest or interruption of practice)	**References**
Afforestation [a)]	0.6 – 2.6 [b)]	90 – 120+ years	Birdsey 1996
Reforestation [c)]	0.3 – 2.1 [d)]	90 – 120+ years	Birdsey 1996
Changes in forest management	0.6 – 0.8 [e)]	If wood products included in accounting, saturation does not necessarily occur if C continuously flows into products	Row 1996
	0.2 [f)]		IPCC 2000

a) Values are for average management of forest after being established on previous croplands or pasture.
b) Values calculated over 120-year period. Low value is for spruce-fir forest type in Lake States; high value for Douglas Fir on Pacific Coast. Soil carbon accumulation included in estimate.
c) Values are for average management of forest established after clearcut harvest.
d) Values calculated over 120-year period. Low value is for Douglas Fir in Rocky Mountains; high value for Douglas Fir in Pacific Coast. No accumulation in soil carbon is assumed.
e) Select examples, calculated over 100 years. Low value represents change from 25-year to 50-year rotation for loblolly pines in Southeast; high value is change in management regime for Douglas Fir in Pacific Northwest. Carbon in wood products included.
f) Forest management here encompasses regeneration, fertilization, choice of species and reduced forest degradation. Average estimate here is not specific to U.S., but averaged over developed countries.
g) Any associated changes in emissions of methane (CH_4) nitrous oxide (N_2O) or fossil CO_2 are not included.

Afforestation is planting seeds or trees to make a forest on land which has not been a forest recently, or which has never been a forest. Reforestation is the reestablishment of a forest after removal, for example from a timber harvest.

3.6.2 Environmental Consequences of the No Action Alternative

3.6.2.1 Ambient Air Quality

The proposed property would remain undeveloped and the beneficial production of cellulosic ethanol would not occur. No changes in air quality would occur.

3.6.2.2 Odor

The proposed property would remain undeveloped, and the beneficial production of cellulosic ethanol would not occur. No changes in odor would occur.

3.6.2.3 Greenhouse Gases

Point Source GHG Analysis

The proposed property would remain undeveloped, and the beneficial production of cellulosic ethanol would not occur. The sequestration of approximately 30,000 tons of CO_2e due to reforestation and the reduction of up to 333,247 tons of biogenic CO_2e per year would not occur.

3.6.3 Environmental Consequences of the Proposed Action

Section 176(c) of the CAA (42 U.S.C. 7506(c)) requires any entity of the Federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable State Implementation Plan required under Section 110(a) of the CAA (42 U.S.C. 7410(a)) before the action is otherwise approved. In this context, conformity means that such Federal actions must be consistent with a State Implementation Plan's (SIP) purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards. Each Federal agency must determine that any action that is proposed by the agency and that is subject to the regulations implementing the conformity requirements will, in fact, conform to the applicable SIP before the action is taken. The proposed project is sponsored and supported by DOE and must therefore be reviewed for general conformity. Because the proposed project would be in an area that is in attainment for all criteria pollutants, it would meet the conformity requirements of the *Clean Air Act*.

The environmental impacts as a result of the Proposed Action due to the construction and operation of the Frontier project would be an increase in the amount of air pollutants emitted. As discussed in the paragraphs below, the increase in emissions would not cause or contribute to an exceedance of the NAAQS nor would the emissions of Toxic Air Contaminants (TACs) exceed existing Michigan standards.

Emissions during construction would consist primarily of fugitive dust generated by site grading and vehicles moving on the site and exhaust emissions from construction equipment and trucks. The primary risks from blowing dust particles relate to human health and human nuisance values. Fugitive dust can contribute to respiratory health problems and create an inhospitable working environment. Deposition on surfaces can be a nuisance to those living or working downwind. Dust emissions would be minimized by using appropriate fugitive dust control measures, such as road watering, temporary vegetative cover, or dust suppressants, as needed. Therefore, impacts to air quality during the construction phase of the project would be minor and temporary.

Potential emissions during operations would come from several sources. Fugitive dust would be generated by vehicle traffic hauling raw materials and finished products to and from the site. These emissions would be minimized by paving, enforcing a 10 mile per hour speed limit, and by maintaining the roads as needed. Fugitive dust would also be generated from the wood chip receiving, and lignin loadout operations and would be reduced by best operating practices such as unloading the wood chips inside the chipping building or the use of water to suppress dust on roads.

Trains bringing materials to and from the facility would not cause fugitive emissions. Emissions would be generated from combustion of fuel. However, each rail car would displace at least two trucks. Therefore, analysis of truck traffic and impacts represents the worst case scenario.

The fermentation and ethanol distillation systems would generate emissions of VOC and HAPs, including acetaldehyde, formaldehyde, and methanol. These pollutants would be controlled by venting the exhaust gases from these processes through wet scrubbers that would remove approximately 98% of the VOC and 75% of the HAPs. Ethanol storage and loadout operations would also generate emissions of VOC and HAPs. Storage tank emission would be controlled by use of floating roof design where required. Loadout emissions would be controlled by a flare.

Approximately 50 gpm of water would be evaporated from the process and discharged to the air. However, water vapor is not a pollutant and is not regulated by the MDEQ or USEPA.

The biomass boiler and generators would generate PM, PM_{10}, NO_X, SO_X, CO, VOC, and HAPs from combustion. The lignin dryer would generate PM, PM_{10}, CO, VOC, and HAPs from the drying operations. Table 3-8 summarizes the potential to emit from the Frontier Project.

Table 3-8 - Summary of the Frontier Project Potential to Emit

Pollutant	Frontier Renewable Resources
NO_X	218.1 tpy
VOC	83.2 tpy
CO	234 tpy
PM	90.1 tpy
PM_{10}	151.9 tpy
$PM_{2.5}$	141.5 tpy
SO_2	53.4 tpy
Acetaldehyde	1.5 tons/year
Total HAPs	20.3 tons/year

As noted in Section 3.3.1.1, the USEPA has established and the MDEQ has adopted under its SIP the NAAQS for criteria air pollutants. The NAAQS include two types of air quality standards. Primary standards protect public, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (USEPA, 2009A). The MDEQ requires new facilities that would have air pollutant emissions to acquire an air permit to construct prior to beginning construction for sources that are not exempt by MDEQ rules. The MNDRE issued an air permit for the proposed Frontier Project in 2010. Since that date, Frontier has revised the project plan to include use of a biomass CHP system. A modification application to the air permit would be required. The application has been submitted to the MDEQ for review.

Frontier completed a refined dispersion modeling analysis, for the modified project configuration, to determine if the net emissions increase from the proposed project would have a significant impact on ambient air quality. Significant impacts were modeled for PM_{10}, SO_2, and NO_2, and CO. As shown on Table 3-9 the revised NAAQS analysis demonstrated that the Frontier Project would not cause or contribute to an exceedance of the NAAQS. A VOC analysis is not included in this analysis because NAAQS have not been established for this pollutant.

Table 3-9 – Summary of Ambient Air Quality Impacts from the Frontier Project

Pollutant	Primary Standards	Averaging Times	Frontier Project Results
Nitrogen Dioxide	100 $\mu g/m^3$	Annual (Arithmetic Mean)	12.0 $\mu g/m^3$
Nitrogen Dioxide	188 $\mu g/m^3$	1-hour	148.5 $\mu g/m^3$
PM_{10}	150 $\mu g/m^3$	24-hour	50.4 $\mu g/m^3$
	50 $\mu g/m^3$	Annual	19.2 $\mu g/m^3$
$PM_{2.5}$	15.0 $\mu g/m^3$	Annual (Arithmetic Mean)	8.1 $\mu g/m^3$
	35 $\mu g/m^3$	24-hour	33.2 $\mu g/m^3$
Sulfur Oxides	78 $\mu g/m^3$	Annual (Arithmetic Mean)	7.5 $\mu g/m^3$
	364 $\mu g/m^3$	24-hour	68.0 $\mu g/m^3$
	1300 $\mu g/m^3$	3-hour	244.9 $\mu g/m^3$

Michigan requires that all facilities that emit Toxic Air Pollutants (TACs) complete an analysis to demonstrate compliance with the State rule that prohibits the emission of any TAC in excess of a rate that results in a maximum ambient impact which is more than a health-based screening level. Based on a combination of screening level analysis and refined modeling analysis, Frontier demonstrated compliance with the TAC requirements for the TACs listed in Table 3-10.

Table 3-10 - List of Toxic Air Contaminants Emitted

TAC Name	TAC Name	TAC Name
	Cadmium	Methylcyclohexane
1,1,2,2-Tetrachloroethane	Carbazole	Methylene Chloride
1,1,2-Trichloroethane	Carbon Disulfide	Molybdenum
1,1-Dichloroethane	Carbon Tetrachloride	2-Monochlorobiphenyl
1,2,3-Trimethylbenzene	Chlorine	Naphthalene
1,2,4-Trimethylbenzene	Chlorobenzene	Nickel
1,1,1-Trichloroethane	Chloroethane	2-Nitrophenol
1,2-Dibromoethene	Chloroform	4-Nitrophenol
1,2-Dichloroethane	Chromium	n-Nonane
1,2-Dichloropropane	Chromium (VI)	Octachlorodibenzo-p-dioxins, total
1,3,5-Trimethylbenzene	Chrysene	Octachlorodibenzofurans, total
1,3-Butadiene	Cobalt	n-Octane
1,3-Dichloropropene	Copper	n-Pentane
2-Chloronaphthalene	Crotonaldehyde	PAH
2-Chlorophenol	Cumene	Pentachlorobiphenyls, total
2-Methylnaphthalene	Cymene-p	Pentachlorodibenzo-p-dioxins, total
2,2,4-Trimethylpentane	Cyclopentane	Pentachlorodibenzofurans, total
2,3,7,8-Tetrachlorodibenzo-p-dioxin	Decachlorobiphenyl	Pentachlorophenol (PCP)
2,4-Dinitrophenol	Dibenzo(a,h) anthracene	Perchloroethylene
2,4-Dinitrotoluene	Di-n-Butyl Phthalate	Perylene
2,5-Dimethyl benzaldehyde	Dichlorobenzene	Phenanthrene
3-Methylchloranthrene	Dichlorobiphenyl	Phenol

TAC Name	TAC Name	TAC Name
4,6-Dinitro-2-methylphenol	Diethylphthalate	Phosphorus (yellow or white)
7,12-Dimethylbenz(a)anthracene	Dimethyl Sulfide	Potassium
Acenaphthene	Dioctyl phthalate	Propane
Acenaphthylene	Ethane	Propionaldehyde
Acetaldehyde	Ethylbenzene	Propylene dichloride
Acetone	Ethylene Dibromide	Pyrene
Acetophenone	Ethylene dichloride	Selenium
Acrolein	Fluoranthene	Silver
alpha-Pinene	Fluorene	Sodium
alpha-Terpineol	Formaldehyde	Strontium
Ammonia (SNCR)	Hexachlorobenzene	Styrene
Anthracene	Hexane	Tetrachlorobiphenyls, total
Antimony	Heptachlorobiphenyls, total	Tetrachlorodibenzo-p-dioxins, total
Arsenic	Heptachlorodibenzo-p-dioxins, total	2,3,7,8-Tetrachlorodibenzofuran
Barium	Heptachlorodibenzofurans, total	Tetrachlorodibenzofurans, total
Benzaldehyde	Hexachlorobiphenyls, total	Tetrachloroethane
Benzene	Hexachlorodibenzo-p-dioxins, total	Thallium
Benzo (a) anthracene	Hexachlorodibenzofurans, total	Tin
Benzo (a) pyrene	Hexanal	Titanium
Benzo(b) fluoranthene	Hydrogen chloride	o-Tolualdehyde
Benzo(e) pyrene	Indeno(1,2,3-cd) pyrene	p-Tolualdehyde
Benzo(g,h,i) perylene	Iron	Toluene
Benzo (k) fluoranthene	Isobutyraldehyde	2,4,4'-Trichlorobiphenyl
Benzoic acid	Isopropanol	Trichloroethylene
Berylium	Lead	Trichlorofluoromethane
beta-Pinene	Manganese	2,4,6-Trichlorophenol
Biphenyl	Mercury	Valeraldehyde
bis(2-Chloroisopropyl) ether	Methane	Vanadium
Bis(2-ethylhexyl)phthalate	Methanol	Vinyl Chloride
Bromomethane	Methyl bromide	o-Xylene
Butylbenzylphthalate	Methyl chloride	Xylenes (o,m,p)
Butane	Methyl ethyl ketone	Yttrium
Butyr/Isobutyraldehyde	Methyl Isobutyl Ketone	Zinc

The Michigan DEQ provided the following information regarding the NAAQS and TAC analyses:.

The applicable legal requirements were applied equally to all groups. The DEQ has confidence that the regulatory requirements of the permitting process ensure sufficient public health protection. These requirements include the NAAQS for criteria pollutants and the DEQ air toxics rules for the toxic air contaminants (TACs), both of which are designed to provide sufficient public health safeguards.

The NAAQS define the maximum concentration of criteria pollutants in the breathing zone and are designed to protect public health with an adequate margin of safety. The proposed criteria pollutant emissions from Frontier were modeled to determine the ambient air concentrations and ground-level impacts. The model results were evaluated and the impacts were found to be below the NAAQS.

In addition, TACs must meet the applicable AQD health-based screening levels. The screening levels are protective for the general population, including sensitive subgroups. They are applied with conservative assumptions regarding exposure to ensure that the nearby, relatively more impacted ambient air levels are not harmful. The maximum impacts occur at or very near the facility and decrease with increasing distance from the facility, ensuring that people further away are also unharmed.

3.6.3.1 Odor

This project would have potential odor sources including green biomass storage, lignin drying, and the fermentation system. The potential odors from green biomass storage would be from the degradation of the wood due to moisture and bacterial/fungal action. The Frontier Project would control these odors by minimizing the amount and duration of green wood chip storage. Under normal operations, green wood chips would be stored for less than 3 days which is not enough time for odors from degradation to become noticeable off-site.

The potential odors from lignin drying are VOCs. VOC emissions from lignin drying are directly related to the temperature in the dryer and moisture content of the lignin. Frontier would control odors from lignin drying by limiting the temperature of the dryer to approximately 185°F and the moisture content of the lignin to approximately 30%.

The potential odors from the fermentation system are VOCs. These compounds would be controlled using a wet scrubber similar to a conventional ethanol facility. The control system assures that VOCs and the associated odors would not be released into the atmosphere during normal operations.

The combination of pollution control equipment operation, operating procedures, and the distance to the nearest residence (2,600 feet south of the southernmost property boundary) would effectively manage odors from the biorefinery.

3.6.3.2 Greenhouse Gases

Point Source GHG Analysis

The Frontier Project would generate GHGs from the fuel combustion in boilers and the fermentation system. Combustion of biomass results in biogenic CO_2 emissions. Combustion of natural gas results in emissions of anthropogenic CO_2. CO_2 emissions from fermentation are biogenic sources of CO_2 emissions. Biogenic sources are natural sources of CO_2 and are typically considered part of the natural carbon cycle and, therefore, not an increase in global GHG emissions.

Table 3-11 summarizes the potential emissions of GHGs from the Frontier Project. Combustion emissions do not include the emergency generators.

Table 3-11 - Summary of Current Potential to Emit for Greenhouse Gases

Greenhouse Gases	Combustion (Anthropogenic)	Fermentation (Biogenic)	Total
CO_2	7,600 tons/year	458,484 tons/year	466,284 tons/year
Methane	36 tons/year	0 tons/year	36 tons/year
N_2O	0.6 tons/year	0 tons/year	0.6 tons/year

Emissions of combustion GHGs are a function of the amount of fuel combusted. The emissions of process related GHGs are a function of the amount of ethanol produced. Therefore, emissions of GHGs are not expected to be higher during start up or shut down conditions than during normal operations.

Life Cycle GHG Analysis

Michigan Technological University (MTU) completed a life cycle analysis for GHG emissions from the proposed Frontier Project using the most recent version of the SimaPro LCA program and database (Pre' Consultants v7.2, 2010). The analysis was conducted on a biomass harvest to ethanol end use basis. Emission of all greenhouse gases (CO_2, CH_4, N_2O, refrigerants, and solvents) were weighted according to their 100-year global warming potentials (GWPs) to arrive at the final GHG results. The LCA information was presented as CO_2 equivalent emission per gallon of ethanol produced (CO_2e/gal). Included in the analysis was:

1. Fuel and miscellaneous chemical (lubricants, hydraulic oil, etc) use for the harvest of wood;
2. Fuel and miscellaneous chemical use for transportation of wood from the harvest area to the proposed Frontier site;
3. Fuel and miscellaneous chemical use in the wood yard at the proposed Frontier site to handle, store and move the wood into the process;
4. GHG emissions for purchased electric power using a Michigan specific blend of power production and related GHG emission factors;
5. Fuel used in the ethanol production process;
6. Transport and use of process chemicals and yeast nutrients;
7. Transport of denaturant to the proposed Frontier site;
8. Transport of ethanol to the blending facility in Traverse City, MI; and
9. Transport and end use of the bark and spent lignin from the process.

The Frontier Project was modeled based on the production of 40 mgy of anhydrous ethanol (42.5 mgy denatured ethanol). The model assumed that all of the bark and 80% of the spent lignin was used for on-site steam production and electric power production. The remaining 20% of the spent lignin was assumed to be sold off-site as a fuel to power and/or steam production facilities to offset use of coal as a fuel. In accordance with current LCA practices biogenic CO_2e emissions were not included in the analysis.

The proposed Frontier Project yields a net reduction of CO_2e emissions of 1.34 lbs CO_2e/gal anhydrous ethanol or 26,822 tons per year.

Forest Sequestration of CO_2

The expectation is that the biomass for the Frontier project would be derived from existing, previously harvested forest resources and that existing agricultural land would not be converted to forest. The assumed harvest rotation and re-entry for the species of interest is assumed to be approximately 15 to 20 years. Natural regeneration of the forest would result in a net sequestration of approximately 30,000 tons of CO_2 per year.

3.7 Geology and Soils

This section discusses only the geology and soils on or related to the proposed project site and rail corridor. Due to the existing environmental review and protection processes for the harvest area discussed in Section 3.1, no impacts to geology and soils are expected to occur in the harvest areas for the feedstock.

3.7.1 Affected Environment

3.7.1.1 Geology

The ground surface of eastern Chippewa County was shaped by glacial processes during the Pliestocene age. The glacial drift of the Wisconsin Age is the youngest and most completely preserved of the deposits from at least four glacial advances during the Pliestocene. The deposits of Wisconsin age consist of moraine, outwash, and lacustrine deposits in eastern Chippewa County. Much of eastern Chippewa County was

covered by waters of glacial Lake Algonquin. This lake was an early stage of the modern great lakes system, and was present during the final retreat of the glacial ice from the area. Glacial deposits consist of till, outwash sand and gravel, lacustrine sand, gravel, and clay, and peat and muck.

At the project site, the glacial deposits have been mapped (Farrand and Bell, 1982) as coarse-textured glacial till and lacustrine sand and gravel. These deposits are described as:

> *Coarse-textured glacial till* – gray, grayish brown or reddish brown, non-sorted glacial debris; matrix is dominantly sandy clay loam, sandy loam, or loamy sand texture, locally resembles outwash except for sporadic occurrences of non-sorted clayey or silty lenses and lack of stratification; variable amounts of cobbles and boulders. Occurs as ground moraine, till plain or undifferentiated ground moraine-end moraine complexes.
>
> *Lacustrine sand and gravel* – pale brown to pale reddish brown, fine to medium sand, commonly including beds or lenses of small gravel, chiefly quartz sand, but gravel is rich in igneous and metamorphic rocks. Occurs chiefly as former beach and near-offshore littoral deposits of glacial Great Lakes, and may include intercalated lacustrine clay.

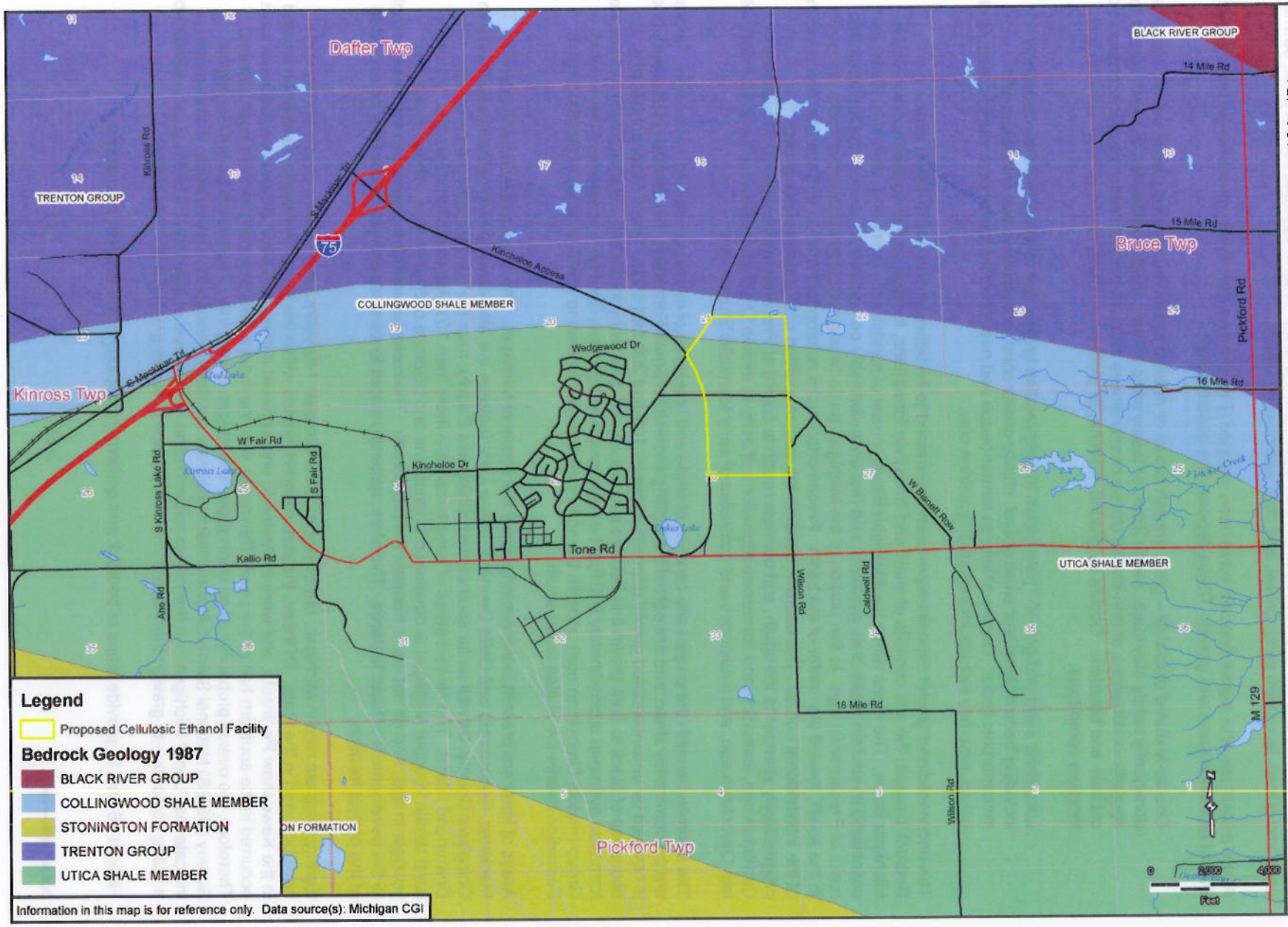
The unconsolidated glacial deposits have been determined to be between 100 and 200 feet thick. Bedrock beneath the site consists of shale and limestone formations, located on the northern portion of the Michigan Basin. The rocks within the Michigan Basin consist of sandstones, limestone, dolomite, shale, and associated evaporate rocks (salt, gypsum), and rest unconformably on crystalline igneous and metamorphic rocks of Precambrian age. In this portion of the Michigan Basin (eastern Chippewa County), rocks dip gently to the south, toward the center of the basin. Precambrian rocks outcrop to the north of Sault Ste. Marie, north of the international border. The bedrock beneath the eastern portion of Chippewa County becomes progressively younger to the south, and consists (north to south) of Precambrian basement, sandstones of Cambrian age, limestone and sandstone formations of early to middle Ordovician age, shale and limestone of late Ordovician age, and limestones and dolomites of early to middle Silurian age.

The bedrock beneath the project site consists of shale and limestone of middle to late Ordovician age. Rocks are predominantly shale, and are part of the Collingwood/Utica Shale Formation. No bedrock is exposed, and is covered by unconsolidated glacial deposits between 100 and 200 feet thick. These rocks consist of a sequence of black to dark brown thin-bedded bituminous and gray limey to dolomitic shales. Thickness of the formation averages approximately 250 feet beneath eastern Chippewa County. Limestone of the Trenton Group (middle Ordovician age) underlie the shales, and shaley limestone and limestone of the Stonington Formation overlie the shales to the south.

Areas of karst are present in the eastern Upper Peninsula of Michigan. These areas are located mainly in Mackinac, Schoolcraft, and Delta Counties. Some karst features are also developed in extreme southwestern Chippewa County, as well as far southeastern Chippewa County, near the eastern tip of the peninsula, near Drummond Island. The closest areas of karst terrain are more than 20 miles from the project site. All of the karst terrain in upper Michigan is developed in limestone and dolomite of Silurian age. These rocks are younger in age, and do not occur beneath the project site. The rocks beneath the project site are not favorable to the development of karst features. Therefore, hazards related to karst topography should not be expected at the project location.

Earthquakes are rare in Michigan, but do occur. Over the past 140 years, only about a dozen earthquakes have occurred in the state. Of these, the disturbances located within the Upper Peninsula have been located in the Keweenaw Peninsula, and were attributed to underground mining activities. Several earthquakes have occurred in the southern half of the Lower Peninsula, with the most recent occurring in 1994 near Lansing. Therefore, the overall probability of an earthquake in Michigan is very low. The United States Geological Survey (USGS) National Seismic Hazard Maps estimate the likely shaking for a given area. These maps indicate that Upper Michigan is in the lowest hazard rating, with a level of shaking of 0 to 4% g (acceleration of a falling object due to gravity) that have a 2-in-100 chance of shaking within a 50-year period.

Figures 16 and 17 provide maps of bedrock and quaternary geology of the Frontier project site.



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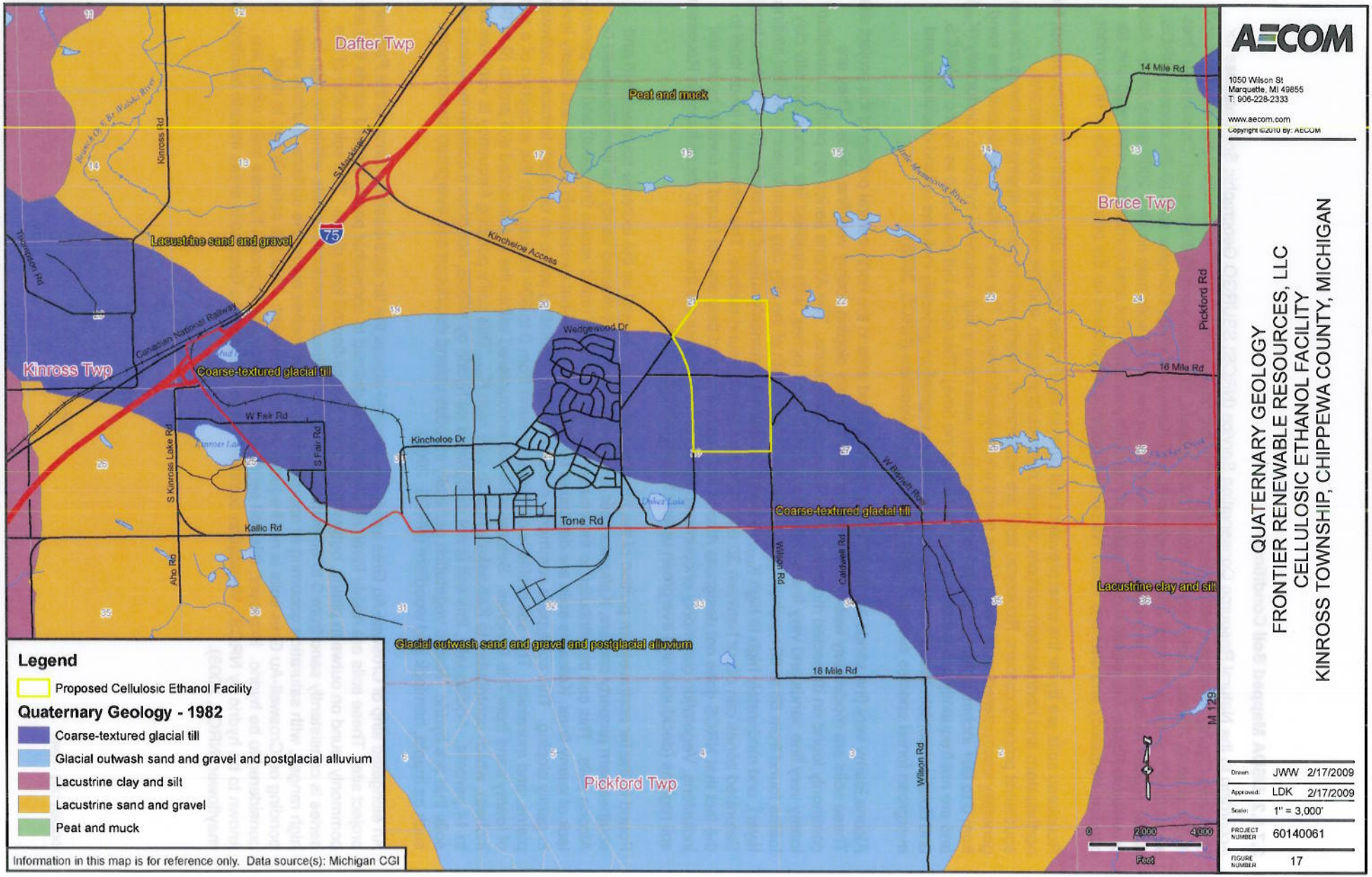
Scale:	1"=3,000'
PROJECT NUMBER	60140061
FIGURE NUMBER	16



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QUATERNARY GEOLOGY
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Scale:	1" = 3,000'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	17	

3.7.1.2 USDA Mapped Soil Conditions

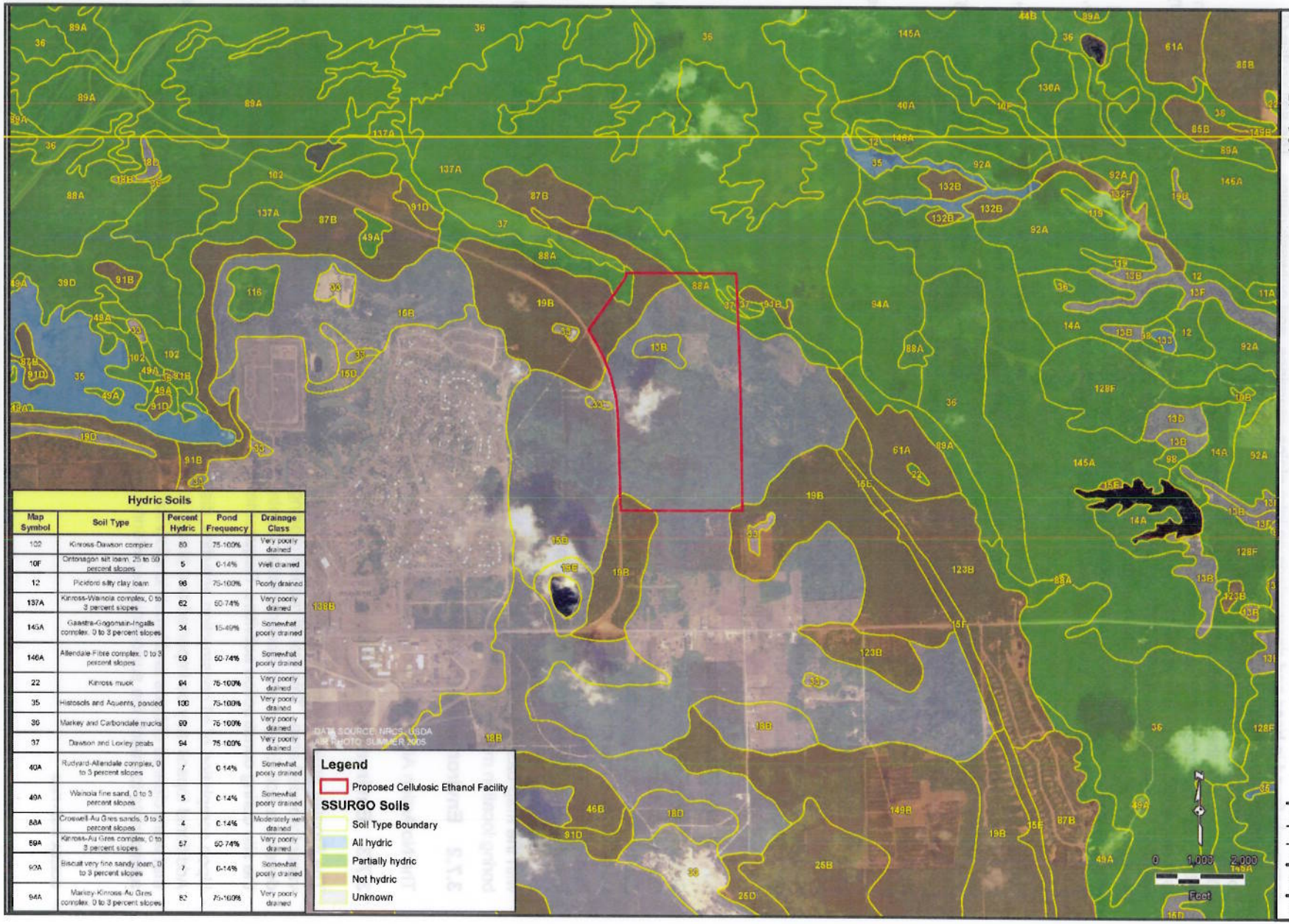
According to the Natural Resource Conservation Service (NRCS) SSURGO Geographic Soil Database for Chippewa County, Michigan, soil series' found within the project site boundaries include Rousseau fine sand (0-6% slopes), Alcona loamy very fine sand (0-6% slopes), Kalkaska sand (0-6% slopes), Croswell-Au Gres sands (0-3% slopes), Dawson and Loxley peats, and Kinross-Wainola Complex soils (0-3% slopes) (NRCS, 2008). Figure 18 depicts the project location overlain on the NRCS soils map and the 2005 aerial photo. Also provided in Figure 7 is a table indicating the percent of hydric soils that area contained in each map unit, its ponding frequency and drainage class. No prime farmlands are present on the proposed site or rail corridor.

Rousseau soils are by far the most prevalent soil type on the Frontier project site, covering all areas except the northeastern and northwestern corners, a small north-central region, and the extreme southeast and southwest property corners. Rousseau soils are well-drained, nearly level to gently sloping fine sands that are generally encountered on till-floored lake plains and outwash plains. The soil profile is consistently fine sand from 0 to 60+ inches below ground surface. Rousseau soils have a high saturated hydraulic conductivity (K_{sat}) and are not frequently subject to ponding (0-14% of the time). This soil is not described as hydric by NRCS, and does not contain inclusions of hydric soils. Native vegetation generally includes upland deciduous and evergreen forest species such as maple, hemlock and woodfern (NRCS, 2008).

Alcona loamy very fine sands are found solely in an isolated area in the north-central portion of the project site. These soils are moderately well-drained, nearly level to gently sloping, loamy very fine sands. They are commonly found on dissected moraines and till-floored lake plains. The Alcona series soil profile is stratified loamy very fine sands and very fine sandy loams from 0 to 55 inches, with stratified fine sands and silty clay loams found from 55 to 60+ inches. Due to the significant depth of the silty clay loam layers (potential limiting layer), and moderately high to high K_{sat}, Alcona soils are not commonly subject to ponding (0-14% of the time). Saturated zones can occur between 30 and 72 inches below ground surface. This information lends itself to the fact that NRCS does not designate Alcona soils as hydric, and they are not found to contain hydric soil inclusions. Vegetation commonly encountered in Alcona soil regions are the same to those found in Rousseau soil regions (deciduous and evergreen upland forest) (NRCS, 2008).

Found in the far northwestern portion of the Frontier project site, as well as the extreme southwestern and southeastern property corners, Kalkaska soils are an even more well-drained sandy soil than Rousseau or Alcona soils. This can be attributed to the courser texture of this soil (sand versus fine sand) and the general lack of loamy fines. Kalkaska soils are described by NRCS as somewhat excessively drained and nearly level to gently sloping. This soil type is commonly encountered in undulating areas on outwash terraces, outwash plains, and moraines. The soil profile is consistently sand from 0 to 60+ inches, with the exception of a zone of loamy sand from 7 to 9 inches. Saturation is not encountered within the documented soil profile (0 to 60 inches), which contributes to Kalkaska's high to very high K_{sat}. This soil's ponding frequency is very low at 0 to 14 percent. Additionally, this soil is not designated as hydric by NRCS, nor does it contain inclusions of soils that are hydric. Native vegetation generally includes upland deciduous and evergreen forest species such as maple, hemlock and woodfern (NRCS, 2008).

An elongated strip of Croswell-Au Gres sands are mapped across the far northeastern corner of the Frontier project site. These soils are nearly level, moderately well-drained to somewhat poorly drained sands that are commonly found on outwash plains, outwash terraces, and till-floored lake plains. The soil profile of this series is consistently sand from 0 to 60 inches. This soil's hydraulic conductivity falls within the high to very high ranges, with saturation occurring at approximately 6 to 42 inches below the surface. Surface water ponding on Croswell-Au Gres soils is not frequent at 0 to 14 percent. This soil series is not, in itself, considered to be hydric. However, this soil series can contain up to 4 percent Kinross soils, which are known to be hydric by NRCS. Vegetation common to the Croswell-Au Gres soils areas include hemlock and mayflower (NRCS, 2008).



Hydric Soils

Map Symbol	Soil Type	Percent Hydric	Pond Frequency	Drainage Class
102	Kinross-Dawson complex	80	75-100%	Very poorly drained
10F	Ontonagon silt loam, 25 to 60 percent slopes	5	0-14%	Well drained
12	Pickford silty clay loam	96	75-100%	Poorly drained
137A	Kinross-Wainola complex, 0 to 3 percent slopes	62	50-74%	Very poorly drained
145A	Gaastra-Gogomain-Ingalls complex, 0 to 3 percent slopes	34	15-49%	Somewhat poorly drained
146A	Allendale-Fibre complex, 0 to 3 percent slopes	50	50-74%	Somewhat poorly drained
22	Kinross muck	94	75-100%	Very poorly drained
35	Histosols and Aquents, ponded	100	75-100%	Very poorly drained
36	Markey and Carbondale mucks	90	75-100%	Very poorly drained
37	Dawson and Loxley peats	94	75-100%	Very poorly drained
40A	Rudyard-Allendale complex, 0 to 3 percent slopes	7	0-14%	Somewhat poorly drained
49A	Wainola fine sand, 0 to 3 percent slopes	5	0-14%	Somewhat poorly drained
88A	Croswell-Au Gres sands, 0 to 3 percent slopes	4	0-14%	Moderately well drained
89A	Kinross-Au Gres complex, 0 to 3 percent slopes	57	50-74%	Very poorly drained
92A	Biscuit very fine sandy loam, 0 to 3 percent slopes	7	0-14%	Somewhat poorly drained
94A	Markey-Kinross-Au Gres complex, 0 to 3 percent slopes	82	75-100%	Very poorly drained

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NRCS SOIL SURVEY MAP
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Approved:	LDK	2/13/2009
Scale:	1" = 2,000'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	18	

Dawson and Loxley peat soils can be found in the far northeastern corner of the project site, to the northeast of the Croswell-Au Gres soil area. These soils are nearly level, very poorly drained peat and muck. They are commonly found in bogs and depressions on lake plains, moraines, and outwash plains. The soil profile of the Dawson series has 18 inches of peat and muck overlying a fine sand layer from 19 to 60 inches. The Loxley portion of the soil series has a profile that contains peat from 0 to 10 inches, and muck from 10 to 60+ inches, with the difference between muck and peat being the level of decomposition that has occurred to the soil's organic matter (muck is more decomposed and does not have visible organic components such as roots, wood, etc.). The water table is commonly at the surface in both Dawson and Loxley soils, and they are both frequently ponded (75-100% of the time). Their hydraulic conductivity ranges from high to moderately high. Additionally, both of these soils are considered hydric by NRCS. Up to 4 percent of the Dawson and Loxley soil series can contain Kinross soils, which is also considered hydric. Vegetation found growing within these soils are typical of bog habitats and include spruce, leatherleaf and sphagnum (NRCS, 2008).

The extreme northeastern corner of the Frontier project site contains areas of Kinross-Wainola Complex soils, intermixed among the Dawson and Loxley soil areas. Kinross-Wainola soils are nearly level, somewhat to very poorly drained soils that are commonly found in depressions and drainageways on outwash plains, moraines, and till-floored lake plains. This soil series contains approximately 60 percent Kinross soils and 37 percent Wainola and other soils. The Kinross soil profile contains 5 inches of muck on top of sand that is consistent in texture and composition, and extends to 60+ inches below ground surface. Wainola soils are finer in texture (fine sands) and remain consistent from the surface to 60+ inches below the surface. Both soil types have high to very high hydraulic conductivity, and typically have a water depth from 18 to 0 inches below the surface. Kinross-Wainola complex soils are ponded 50 to 74 percent of the time. The Kinross portion of the soil complex is considered hydric by NRCS, and comprises approximately 60 percent of the map unit's area. Wainola soils are not listed as hydric. However, this soil series can also contain up to 4 percent Dawson soils, which are also considered hydric. Vegetation typically encountered in Kinross-Wainola soil regions include hemlock, cedar, mayflower and threeleaf goldthread (NRCS, 2008).

3.7.1.3 Site Subsurface Exploration

Subsurface exploration of the Frontier site was completed by U.P. Engineers and Architects (UPEA) from December 15 to 18, 2008. This included completion of a total of 16 borings that ranged from 30 to 100 feet in depth. Standard split-spoon samples were collected at 2.5-foot intervals from 0 to 10 feet below the ground surface (bgs), and at 5-foot intervals from 10 feet bgs to the boring end depth. All 16 borings were found to have consistent mixtures of medium to fine sands that were clean and uniform. Some of these sands were found to have traces of gravels, silts or clays, and in one location, organics (SB-2). The water table was not encountered in any of the borings, including the boring of 100-foot depth. These findings generally coincide with the map-based findings of Sections 2.4.1 and 2.4.2 above. The report, including soil boring logs and soil boring location maps, are provided in Appendix B.

3.7.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would not affect the geology and soils of the area.

3.7.3 Environmental Consequences of the Proposed Action

The Frontier project would include development of approximately 50 acres of the 355 acre site, currently vacant wooded area. This would require grading, excavating, and site development activities. Frontier would develop a Soil Erosion and Sedimentation Control Plan (SESC) to prevent excess erosion or degradation of the site during construction activities. Requirements of the SESC plan are discussed in Section 3.6.3.3.

Upon completion of all construction activities, disturbed areas would be seeded with native grass mix. Additional topsoil may be imported and placed to aid in the establishment of stable surface vegetation. Areas that were cleared of trees and brush to allow for construction will be stabilized, graded, and contoured as appropriate to match the surrounding environment and allowed to reforest naturally.

3.8 Water Resources

This section discusses only the water resources on or related to the proposed project site and rail corridor. Due to the existing environmental review and protection processes for the harvest area discussed in Section 3.1, no impacts to water resources are expected to occur in the harvest area for the feedstock.

3.8.1 Affected Environment

3.8.1.1 Groundwater

Groundwater in the Frontier project area is used for municipal, residential and agricultural purposes. Private wells are drilled into sand and gravel layers within the area's till and lacustrine deposits. Most wells are 80 to 120 feet deep, and obtain water from sand and gravel aquifers (Vanlier and Deutsch, 1958). Figure 19 provides the water table elevation of the glacial aquifer in the project area, as well as the locations of known private wells. As can be seen from this figure, the majority of local private wells are clustered in residential areas along Tone Road and to the west of the Frontier project site. The water table elevation in the project area ranges from 720 to 740 feet above sea level. The resulting depth to water table varies from >75 feet in the southern project area to 0-15 feet in the northern project area (MDEQ, 2006). Based on contour shape and configuration, it appears that groundwater flow is in a north to northeast direction across the project site. The highest nearby water table elevations occur near the intersection of Tone and Caldwell Roads (to the southeast of the project site). Water table elevations decrease in all directions from this location.

Based on this information and topographic map data, it appears that the glacially deposited hill that the project site occupies is a recharge area for groundwater. The lowland lacustrine deposits to the north are likely discharge areas to surface water features.

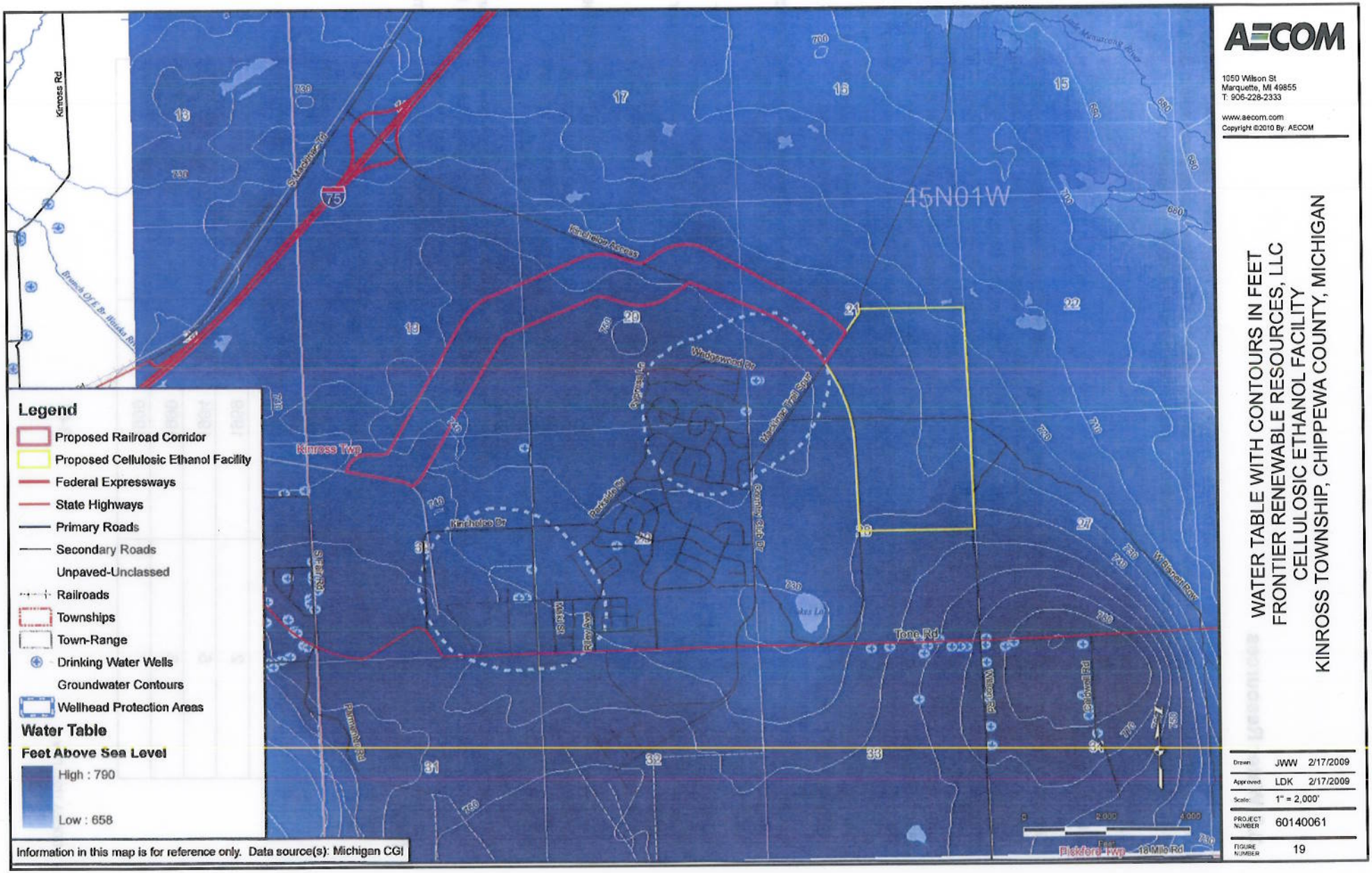
Additional groundwater aquifer information was obtained from the MDEQ's "Interactive Groundwater Map Viewer." According to MDEQ, the glacial aquifer yield at the project site ranges from 200 to 1,400 gallons per minute (gpm). Glacial transmissivity can range from 2,000 to 30,300 sq.ft./day. The indicated yield and transmissivity of the local bedrock aquifer are <10 gpm and <500 sq.ft./day, respectively (MDEQ, 2006).

Kinross's water distribution system serves the commercial and residential areas immediately to the west of the Frontier project site, as well as the Chippewa County Airport area. This system covers approximately four square miles and serves approximately 6,600 people. This includes approximately 5,300 prison inmates located at the Kinross State Correctional Facility and the Chippewa County correctional facility.

The township currently operates five (5) wells ranging in production from 450 gpm to 900 gpm and depths from 175 to 212 feet. The theoretical firm rated capacity of the system is approximately 2,300 gpm (wells 2, 5 and 6 combined) for a production capacity of 3.312 mgd. The MDEQ firm rated capacity (firm rated capacity as determined by the MDEQ is the maximum system production with the largest well out of service) is 2,000 gpm (wells 2, 5 and 7) or 2.88 mgd. Table 3-12 summarizes the existing wells currently on the system.

Table 3-12 - Existing Kinross Charter Township Well Data

Well Number	Year Constructed	Rated Capacity (GPM)
1	1959	450
2	1959	500
5	1964	900
6	1999	900
7	1999	600



AECOM
1050 Wilson St
Marquette, MI 49855
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www.aecom.com

WATER TABLE WITH CONTOURS IN FEET
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:	JWW	2/17/2009
Approved:	LDK	2/17/2009
Scale:	1" = 2,000'	
PROJECT NUMBER	60140061	
FIGURE NUMBER	19	

The township reported the annual maximum day condition occurred in 2001 in which 1.75 mgd was consumed. Current community water usage is approximately 1.2 mgd. The theoretical firm rated capacity of the system is approximately 2,300 gpm for a production capacity of 3.312 mgd. The MDEQ firm rated capacity (firm rated capacity as determined by the MDEQ is the maximum system production with the largest well out of service) is 2,000 gpm or 2.88 mgd. Using the firm rated capacity, an excess water system capacity of 1.68 mgd remains (AECOM, 2009).

Overall water quality is very high. In 2002, the Michigan American Water Works Association local chapter awarded the township the best tasting water in Michigan's Upper Peninsula. Hardness, as CaCO3, varies in the source well from 83 mg/L to 96 mg/L. Nitrate as N and Sulfates are present in nominal amounts. There are also trace amounts of constituents such as chloroform and Total Trihalomethanes presents as well.

Wellhead protection zones have been established through MDEQ for all five of the Kinross public supply wells. There are two separate zones established for each group of wells. The nearest wellhead protection zone is adjacent to the Frontier site's northwest property boundary. The locations of these zones are depicted on Figure 18. Two municipal wells were installed by the township in 1999 in the wellhead protection zone adjacent to the Frontier site.

Based on information from the MDEQ office in Newberry, Michigan, fourteen sites of contamination are present in the vicinity of Kinross, the majority of which are related to the former Kincheloe AFB. Two identified environmental sites (State ID#s 17000141 [Kinross Manufacturing] and 171000034 [Former Kincheloe AFB Landfill 01]) are approximately 1.5 miles west of the Frontier site. No other sites of contamination were identified north, east, or south within a 2 mile radius of the Frontier site.

Groundwater potentiometric surface maps from the MDEQ indicate that groundwater flows in an easterly to southeasterly flow direction at the former AFB. Kinross took into consideration the possibility of migration of contamination from sites 1700141 and 17100034 during installation of the two new municipal wells in 1999. Multiple sentinel wells are installed between these two contaminated sites and the new township wells to monitor potential groundwater contaminant migration in the township wells' pumping zone. The sentinel wells are monitored on an annual basis. According to Mr. Scott Schaefer MDEQ Newberry, the sentinel wells have never displayed contaminants which would threaten the water supply wells. According to Mr. Schaefer contamination from these sites is not expected to migrate to the municipal wells.

3.8.1.2 Surface Water

The majority of the Frontier project site is located within the Little Munuscong River watershed, with surface water drainage flowing towards the river and wetlands to the north and east. Small portions of the site near its southern end may drain to the south towards the Munuscong River, but they are unlikely to be significant in size. Both of these rivers flow to the east and drain into Munuscong Lake (the Saint Mary's River) approximately 10 miles to the east. The Little Munuscong River and Demoreaux Creek, a northern tributary of the Munuscong River, are classified as trout streams. Dukes Lake, located less than 0.5 miles to the south is also classified as a trout lake. The nearest portion of the Little Munuscong River, an unnamed tributary, lies approximately 0.7 miles to the northeast of the site. The nearest portion of the Munuscong River, Demoreaux Creek, is approximately 5 miles to the southeast (MDEQ, 2006).

The proposed Frontier project site does not have any naturally occurring water bodies. Neither the Frontier site or rail corridor is in a flood plain.

3.8.1.3 Storm Water

The southern two-thirds of the Frontier project site exist on an elongated glacial deposit that has a surface elevation approximately 8 to 10 feet higher than the northern one-third of the site. The majority of the site has clean, sandy soils that are conducive to high rates of surface water infiltration. The soils in the far northern portion generally have very low infiltration rates and are commonly subject to ponding (NRCS, 2008). As stated previously, it is likely that the majority of rainfall reaching the site would infiltrate into the higher, sandier

areas and then discharge in the lower, northern areas. During summer and fall months, significant amounts of surface water runoff may only occur during storm events that are relatively intense, or during prolonged storm events with high rainfall totals. Springtime runoff may be significant due to melting snow and/or rainfall events occurring when the ground surface is still frozen.

Table 3-13 provides a listing of soil types that may be encountered at the Frontier site, along with their corresponding NRCS hydrologic groups. These hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups (A, B, C, D) according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms (NRCS, 2008).

Table 3-13 - Hydrologic Soil Groups Occurring on the Frontier Site (NRCS, 2008)

Soil Series	Hydro Group	Description
Rousseau (15B)	A	High Infiltration Rate, Low Runoff Potential
Alcona (13B)	A	High Infiltration Rate, Low Runoff Potential
Kalkaska (19B)	A	High Infiltration Rate, Low Runoff Potential
Croswell-Au Gres (88A)	A, B	Moderate to High Infiltration Rate, Medium to Low Runoff Potential
Dawson & Loxley Peats (37)	A/D	High Infiltration Rate in Drained Areas (A), Very Slow Infiltration Rate in Undrained Areas (D)
Kinross-Wainola (137A)	A/D, B	High Infiltration Rate in Drained Areas (A), Very Slow to Moderate Infiltration Rate in Undrained Areas (B, D)

The rail corridor contains a mixture of soils described above and some wetland areas as described in Section 3.2. Stormwater from the rail corridor would likely flow into the wetland areas, or into the stormwater ditch adjacent to the Gaines Highway.

3.8.1.4 Wastewater

As the existing Frontier project site is currently undeveloped, no municipal sewer services have been extended into the area. However, Kinross provides sewage collection and treatment services to the residential and commercial area immediately to the west of the Frontier site. The township's wastewater treatment plant is located at the Department of Public Works on Kincheloe Drive west of Water Tower Drive. The treatment system includes removal of large materials with primary screens and a grit chamber, primary sedimentation tanks to remove suspended solids, two stages of trickling filters, chemical flocculent addition (ferric chloride), secondary sedimentation tanks to remove the flocculent following chemical addition and disinfection using chlorine following secondary sedimentation. The Kinross WWTP currently generates sludge through removal of suspended solids in two stages. The primary sedimentation tanks and secondary sedimentation tanks. BOD and COD are removed in the trickling filters.

The WWTP discharges to Hutton Creek under National Pollutant Discharge Elimination System (NPDES) permit #MI0057776 issued to Kinross. Kinross monitors the following parameters in their effluent to demonstrate compliance with the permit.

- Dissolved Oxygen – Quarterly
- BOD – Quarterly
- Suspended Solids – Quarterly
- pH – Quarterly
- Flow – Continuous

- Nitrogen, Ammonia Total – Quarterly
- Phosphorous, Total – Quarterly
- Copper – Biannually
- Residual Chlorine – Quarterly
- Mercury – Quarterly
- Fecal coliform – Quarterly

The existing WWTP underwent $4.5 million in major capital improvements in 1994. The WWTP is permitted by the MDEQ for treatment of a maximum daily flow of 1.1 mgd. At present, treatment of sewage at the WWTP averages 0.85 mgd, leaving an excess capacity of approximately 0.25 mgd. The peak hydraulic surge capacity of the facility is 2.5 mgd (UPEA, 2009). Due to diurnal variances, a significant amount of effluent is recycled to maintain filter efficiency. During these low flow periods, effluent discharge is reduced to increase recycled flows.

3.8.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would have no impact on water resources.

3.8.3 Environmental Consequences of the Proposed Action

3.8.3.1 Groundwater

Frontier would connect to Kinross's municipal water system for potable and process water. The anticipated water demand for the ethanol production capacity would be 150 gpm or 216,000 gpd (0.216 mgd), which would bring the average daily water demand (both municipal and Frontier demands) up to approximately 1.39 mgd. This demand is within the firm rated capacity of 2.88 mgd of the existing system without modification.

Under a maximum day demand scenario, an expected worst case condition of 1.75 mgd for the municipal water system plus the demand of the proposed Frontier biorefinery of 0.216 mgd equates to a total of 1.97 mgd. Thus, even on a peak demand day, the Kinross water system would have an excess capacity of approximately 900,000 gpd.

The existing municipal water sources and elevated water storage offer capacities adequate to serve Kinross Charter Township and Frontier's water demands through a twenty year projected planning period. The water system's five wells produce very high quality water at rates in excess of the current daily averages and in excess of the twenty year projected population water demands. The volume of elevated water storage and the production capacity would sufficiently provide potable water to the proposed Frontier biorefinery.

Preliminary water demand and water system requirements for the proposed Frontier biorefinery are detailed in *The Preliminary Engineering Report for Provision of Municipal Water and Wastewater Services to Frontier Renewable Resources, LLC Cellulosic Ethanol Production Facility*, AECOM, October 2009.

The only potential impacts to the surficial aquifer on-site are accidental releases of hazardous materials from biorefinery operations. The Frontier Project would have operational policies and procedures to manage and store such materials, so that accidental releases should not occur. If an accidental release should occur, the biorefinery would have an SPCC plan to contain, manage, and cleanup the release. These procedures are expected to minimize, to the extent possible, any potential impacts to the surficial aquifer.

Additional mitigation measures for preventing soil and ground water contamination include the development of both a construction SWPPP and an operational SWPPP, for construction and operation of the Frontier Project.

3.8.3.2 Surface Water

There is no naturally occurring surface water on the Frontier project site. Storm water from the project site would be conveyed to the Kinross storm sewer system. Surface water bodies associated with the proposed Frontier biorefinery's storm water collection system (retention or detention ponds, drainage ditches, etc.) may be located on the site.

Therefore, no impacts to surface water are expected as a result of the Proposed Action.

3.8.3.3 Wastewater

With the permitted effluent discharge limit of 1.1 mgd and the current average effluent discharge is 0.85 mgd, there is an excess treatment capacity of approximately 0.25 mgd available. The proposed Frontier biorefinery would discharge approximately 0.14 mgd to the WWTP. Therefore, the current WWTP has the capacity to treat the Frontier effluent without modification provided that the effluent is "Normal Sewage Strength". The remaining process water, about 50 gallon per minute, would be evaporated form the process evaporators or the lignin dryer.

Modifications to the force main system, including upgrades of two lift stations would likely need to be completed to support the flow from Frontier. Due to regional topography, minimum pipe slope requirements and pipe bury depth requirement, it does not appear feasible to convey wastewater from the Frontier site solely via gravity.

The expected wastewater characteristics will be at or below "Normal Sewage Strength" as defined by Kinross as wastewater exhibiting, at the maximum, the characteristics summarized in Table 3-14.

Table 3-14 – Expected Wastewater Effluent Characteristics

Biological Oxygen Demand (BOD) (mg/L)	Suspended Solids (SS) (mg/L)	Total Phosphorous (mg/L)	pH
315	270	8	6.5-9

Kinross will be responsible for monitoring and maintaining compliance with the terms and conditions of their discharge permit. Frontier would need a Significant Discharge Permit from Kinross for their discharge to the WWTP. The Significant Discharge permit would contain the requirements and limits for Frontier's discharge. Mascoma is collecting and analyzing wastewater generated at the Rome, New York pilot plant.

Mascoma Corporation will determine the strength and treatability of the process effluent at their pilot plant in Rome, New York to confirm the ability of the WWTP to adequately treat the Frontier effluent. If the Frontier biorefinery wastewater discharge exceeds allowable discharge rates, it may be necessary to construct an on-site pre-treatment or treatment plant to allow for reuse as service water or discharge as a permitted effluent. Frontier would not construct settling ponds or other surface water structures as part of pre-treatment system. Alternatively, it may be permissible to retain Frontier wastewater flows on-site in storage tanks for off-peak discharge to attenuate peaks and valleys in daily flow variations at the Kinross WWTP. This might assist Kinross with operation of the existing WWTP as they currently recirculate treated water to maintain proper operation.

The Frontier waste water would not be expected to be high in suspended solids due to the type of processes generating the waste water (i.e. no evaporative cooling towers). Rather the primary Frontier waste water constituents would be BOD and COD which would be treated in the Kinross WWTP trickling filters and not generate as much sludge as typical sanitary waste water. As a result, sludge generation would be expected to increase by less than 10% and would be within the design, operating conditions, and license of the exiting Kinross WWTP.

Preliminary wastewater system requirements for the proposed Frontier biorefinery are detailed in the *Preliminary Engineering Report for Provision of Municipal Water and Wastewater Services to Frontier Renewable Resources, LLC Cellulosic Ethanol Production Facility*, AECOM, October 2009.

3.8.3.4 Stormwater

Construction activities would require clearing, grubbing, grading and excavation on the proposed 50 acre biorefinery site and associated rail corridor, currently undeveloped wooded land. These construction activities would expose the soil to stormwater and have the potential to cause sedimentation in the drainage ditches, local tributary to the wetland and the wetland drain and onto South Access Road.

NREPA, 1994 PA 451, Part 91 Soil Erosion and Sedimentation Control require a permit application (including a SESC plan) for all earth change activities which disturb one or more acres of land, or if the earth change is within 500 feet of a lake or stream. A Notice of Coverage under NPDES is also required for disturbances over five acres. Since more than five acres of land would be disturbed for construction of the Frontier biorefinery, a SESC permit and a Notice of Coverage would be required. The Chippewa-East Mackinac Conservation District (CEMCD) is the permitting authority for the MDEQ under Part 91.

The construction contractor would be required to complete the permit application and SESC plan as required by Part 91 for submission to the CEMCD. The construction contractor would also be required to provide a State of Michigan certified storm water operator to inspect the construction activities one each week and 24 hours after a precipitation event to ensure that all soil erosion control measures are operating properly.

The SESC Plan would incorporate best management practices (BMPs) to prevent sedimentation impacts. These BMPs may include:

- Installation of silt fencing
- Installation of hay bales for sediment control
- Construction of temporary, storm water retention ponds
- Retention of vegetative cover where practical.

The proposed Frontier biorefinery would connect to Kinross's storm sewer system. The final design for the proposed Frontier biorefinery would include storm water control structures, drainage, and piping for connection to the Kinross system.

During operation of the Frontier biorefinery, discharge of storm water from the site would require a general permit for discharge of storm water per NPDES regulations. The MDEQ administers the NPDES program in the State of Michigan. General permits are available to facilities that have point source storm water discharges associated with industrial activities. A "point source" is defined as any discernible, confined, and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, or anything that conveys storm water into surface waters. In most cases, land graded to convey storm water off or across a piece of property would create a point source.

As part of the general permit, Frontier would develop a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would have three major components:

1. Identification of significant materials that exist at the permitted site and can contaminate storm water.
2. Measures to prevent storm water at the site from becoming contaminated with significant materials, and
3. Control of storm water that may have become contaminated through contact with significant materials at the site.

As required by the general permit, Frontier would have an MDEQ certified storm water operator to implement the SWPPP and to ensure the storm water control measures are effective.

During operation, the wood storage pile, haul roads, lignin storage pile and product load-out areas would be potential sources of contaminants to the surface and storm water. Haul roads on the site would be paved with concrete or asphalt to minimize potential for sediment generation. Road cleaning would be completed as necessary. Storm water control systems would be designed to control storm water run-off, allow sediments to settle out, and to eliminate soil erosion. The storm water ponds, such as storm water retention ponds would be equipped with manual overflow valves that are normally closed. This would allow inspection of the storm water before allowing discharge to occur. It would also allow the ponds to function as a final spill control measure in the event of a catastrophic release of ethanol or other hazardous material on-site. Frontier would manually open the valves during overflow conditions and discharge from the storm water ponds would flow to the Kinross storm water drain system.

3.9 Waste Management, Hazardous Materials and Genetically Modified Organisms

This section discusses only the waste management, hazardous materials and genetically modified organism resources on or related to the proposed project site. Since these types of materials would not be used off of the project site, no impacts due to these materials are expected to occur elsewhere.

3.9.1 Affected Environment

3.9.1.1 Solid and Hazardous Waste

Solid waste from the proposed Frontier site would be disposed at the Dafter Sanitary Landfill or the Elk Run Landfill. The Dafter Sanitary Landfill is located near the Village of Dafter in Chippewa County, on 12 Mile Road near Mackinac Trail. Dafter Sanitary Landfill is approximately 3.5 miles north of the proposed Frontier site. The landfill facility contains four landfill cells: A, B, C, and D. Cell A is closed, Cells B, C, and D are active. On February 12, 2004, the DEQ Waste and Hazardous Materials Division issued a new Construction Permit to the Dafter Sanitary Landfill that increased the total permitted waste capacity from 1,322,000 cubic yards to 5,312,000 cubic yards. The Dafter Sanitary Landfill receives approximately 72,000 cubic yards of mixed municipal and industrial solid waste per year. As of 2005, the remaining capacity of the landfill was approximately 4,108,000 cubic yards, enough for approximately 57 years.

If necessary, solid waste from the proposed Frontier facility could be disposed at the Elk Run Landfill (owned by Republic Services, Inc.) in Onaway, Michigan. The Elk Run Landfill is permitted to receive industrial waste including boiler fly ash. Elk Run received approximately 142,000 cubic yards of waste in 2009. According to Mr. Tom Moore, Republic Services, Inc. the landfill has approximately 15 to 20 years of existing capacity remaining at current disposal rates. However, their existing permit allows construction of an additional 18.3 acres of disposal cells, which is roughly double their current size.

3.9.1.2 Hazardous Materials

The following chemicals, additives & nutrients would be utilized and stored at the biorefinery:

- Four (4) – Ethanol Shift Tanks (35,000 gallons each)
- One (1) – Denaturant (gasoline) Tank (48,000 gallons)
- Two (2) – Product Storage Tanks (650,000 gallons each)
- 50% sodium hydroxide - Tank capacity 30,000-gallon based on a minimum of one-week storage with a maximum of 42 CIP cycles per week (5,000 gallons of 5% caustic per cycle)
- Sugar source received in liquid form as 50% solids, Tank capacity 20,000-gallons.
- Diammonium phosphate (DAP) would be received as a solid in pellet form and unloaded from palletized truck in 60-lb bags or supersacks.
- Solid DAP pellets would be diluted with water in one 500-gallon makedown tank to provide a 30% DAP solution.

- Aqua ammonia 10% - 35% as NH3 (21% - 72% as NH4OH).storage tank = 10,000 gallons.
- Magnesium sulfate received in liquid form as 25% solids. Tank capacity 20,000-gallons.
- Zinc sulfate received in liquid form as 25% solids. Tank capacity 20,000-gallons.
- Phosphoric acid received in 300-gallon tote bins provided by phosphoric acid supplier
- Antibiotics received in 55-gallon drums provided by antibiotics supplier

In addition to the chemicals identified above, the following chemicals will be needed. The quantities to be stored on-site will be determined during final design.

- Enzymes - for hydrolysis
- Phosphoric acid, if needed for pH adjustment
- Oxygen scavenger for removing oxygen from boiler feedwater
- Condensate treatment for neutralizing carbonate, bi-carbonate, and hydroxyl alkalinity
- Scale inhibitor to protect the boiler tubes
- Deposit control for evaporative condenser cooling
- Biocides for cooling water biological control

3.9.1.3 Genetically Modified Organisms

The intended organism for cellulosic ethanol production at the Frontier biorefinery would be *Saccharomyces cerevisiae*, commonly known as baker's or brewer's yeast, which has been genetically modified. *S. cerevisiae* is ubiquitous in nature, being present naturally on fruits and vegetables particularly those fruits with high levels of fermentable sugars. People come into contact with *S. cerevisiae* on a daily basis through the foods they eat and through inhalation. *S. cerevisiae* is not considered by the FDA or USEPA as a pathogenic microorganism.

The genetic modifications made to the *S. cerevisiae* proposed for use at the Frontier biorefinery involve the expression of several enzymes. The modifications allow the *S. cerevisiae* to ferment the xylose sugar generated from the pretreatment of the biomass. The yeast also expresses and secretes several enzymes that aid in the breakdown of the pretreated biomass. These biomass-degrading enzymes have similar, or in some cases, identical activities to enzymes that are already components of commercial products used in such industries as textile and pulp and paper.

GMO's used in non-health care related industries are regulated by the USEPA via the Toxic Substance Control Act (TSCA). The low-risk safety profile of the GMO that would be used at Frontier is such that regulatory compliance can be achieved by what is known as a "Tier I contained structure exemption". The GMO can be scaled-up to commercial use without a formal application and review by the USEPA if it meets several requirements, which include:

1. The recipient (host) organism must be on the acceptable list or organisms which have a long-history of safe use at large scale and have a benign safety profile,
2. The introduced genetic material must be well-characterized, limited in size, have a low probability of being transferred to other organisms, and free of certain sequences known to code for toxins, and
3. The use of the GMO will be in a "contained structure" which has been defined by the EPA.

3.9.2 Environmental Consequences of No Action Alternative

Under the No Action Alternative, no new waste materials would be generated and no hazardous materials would be stored on-site. No new hazardous materials or genetically modified organisms would be generated or used on-site.

3.9.3 Environmental Consequences of Proposed Action

3.9.3.1 Solid and Hazardous Waste

During construction Frontier would generate paper waste from office operations and construction debris. Construction debris would include, scrap metal, wood, paper, plastic products, and empty containers for construction supplies. Some waste concrete may also be generated. Frontier and its contractors would recycle their waste products to the extent practical. Construction debris that could not be recycled would be disposed in the Dafter Sanitary Landfill

The Frontier Project would generate approximately 25 tons per week of paper waste from office operations and non-hazardous solid wastes including scrap metal, wood, plastic products, paper from biorefinery operations, and empty containers (i.e., drums, totes, and boxes) (approximately 1300 tons per year). Frontier would also generate approximately 44 tons per day of ash from boiler operations. Frontier would recycle their non-hazardous waste products to the extent practical. Boiler ash may be beneficially used as a soil amendment, however, a market for the ash has not been identified. In the event the boiler ash cannot be beneficially used, it would be disposed in the Dafter Sanitary Landfill or the Elk Run Landfill. Both landfills are permitted to accept this waste stream.

At current waste disposal rates plus all of the solid waste from the Frontier project, the Dafter Sanitary Landfill would have an expected lifespan of approximately 39.5 years. If all of the Frontier solid waste was disposed at Elk Run, the existing capacity would be reduced to between 13.5 and 18 years. However, since their existing permit allows construction of an additional 18.3 acres of disposal cells, the actual lifespan of the landfill would be in excess of 30 years even with all Frontier waste being disposed at that location.

The expected lifespan of the Frontier facility would be 40 years. Therefore, sufficient landfill space already exists to handle the solid waste from Frontier without expansion.

The Frontier Project would be a small quantity generator of hazardous waste. The hazardous waste consists primarily of flammable liquids and laboratory chemicals. The hazardous wastes would be transported off-site by a licensed hazardous waste transportation company to a licensed hazardous waste treatment, storage, and disposal facility. The biorefinery would generate universal wastes including used oil, fluorescent and high intensity discharge (HID) light bulbs, and batteries. The universal wastes would be transported off-site by a licensed universal waste transportation company to a licensed disposal facility.

3.9.3.2 Hazardous Materials

The Frontier Project would store and use various hazardous materials. The storage tanks located outside would be designed and constructed with secondary containment structures sufficient to hold the contents of the largest tanks plus sufficient additional volume for rain fall. Tanks located inside the buildings may also be located in secondary containment if determined to be necessary for employee safety or protection of the environment. Each storage tank would be constructed using materials compatible with the chemical being stored

Frontier would develop appropriate spill response, pollution prevention, and ERPs to address the medical and environmental hazards associated with the Frontier Project. The plans would include, at a minimum, a Pollution Incident Prevention Plan (PIPP), Spill Prevention, Control and Countermeasure (SPCC) Plan, a Storm Water Pollution Prevention Plan (SWPPP), and an ERP. The plans would be completed in accordance with Federal and Michigan Occupational Safety and Health Administration (OSHA) and USEPA and MDEQ regulations and guidance. Spill equipment kits would be acquired as needed. Spill response training would be provided to employees working with the hazardous materials stored and used on-site. These measures would prevent impacts from spills of hazardous materials. Therefore, it is expected that the Proposed Action will have minimal to no impacts attributed to hazardous materials.

3.9.3.3 Genetically Modified Organisms

The GMO would be stored on-site in frozen vials of approximately 1.5 ml. Working stock vials may be made on-site by trained Frontier personnel. All vials would be stored in secure freezers on-site, and potentially at secure freezers in an off-site location.

Propagation of the GMOs would occur on-site in the laboratory and yeast propagation trains. The GMOs would be used in the fermentation process to ferment the xylose sugars to ethanol. The GMOs from fermentation would be deactivated (killed) in the fermentation process by heat. GMOs contained in water from cleaning operations of tanks and piping would also be killed by pumping the CIP water to the distillation system.

In the rare event of a catastrophic tank failure, site grading would be contoured to direct the bulk of the tank contents to an area with concrete barriers, enabling the sumping of much of the material to the beerwell, where it would be sent to distillation for inactivation. Remaining beer after sumping would be cleaned with chemical disinfectant application.

The proposed process configuration would prevent a release of GMO to the environment by deactivating the GMO in the distillation system. Industrial microorganisms in the environment are typically disadvantaged relative to native organisms. The GMO yeast in this process would likely be competitively disadvantaged, as the expression of the additional proteins provides a burden to rapid growth of the organism.

The Food and Drug Administration rates Brewer's Yeast extract as Generally Recognized as Safe (FDA, 1986). Furthermore, the National Institutes of Health in its Guidelines for Research Involving Recombinant DNA Molecules (DHHS, 1986) considers *S. cerevisiae* a safe organism. Most experiments involving *S. cerevisiae* have been exempted from the NIH Guidelines based on an analysis of safety. Finally, under the USEPA TSCA regulations, the proposed GMO is considered to be eligible for a Tier I exemption because *S. cerevisiae* is listed in and meets requirements specified in 40 CFR 725.420, the genetic material introduced into the GMO meets the criteria of 40 CFR 725.421 and the physical containment and control technologies employed in the Frontier biorefinery will meet the criteria under 40 CFR 725.422. Owing to the safety profile of the GMO, release of GMO due to catastrophic equipment failure would result in negligible impact to workers and the environment. Therefore, the Proposed Action is expected to have minimal to no impacts attributed to GMOs .

The genetically modified yeast is subject to the review and permitting process of the USDA through the Animal and Plant Health Inspection Service (APHIS), which regulates plant pests and pathogens. USDA has determined that *Saccharomyces cerevisiae* is not a plant pathogen. As required by law, an application covering use of the GMO, which expresses a limited number of well-defined, non-pathogenic genes, will be submitted to APHIS prior to commercial use.

In large scale fermentation operations the potential exists for contamination from external bacteria or wild yeast strains. As has been identified in the Mascoma pilot scale facility in Rome, NY, *Lactobacillus* bacteria are the most prevalent form of contamination. These organisms are commonly found in humans in the intestinal tract. *Lactobacillus* strains are used commercially for the production of yogurt, cheese and sourdough bread.

Infection prevention is necessary at all commercial scale fermentation operations (breweries, ethanol plants, etc) and is achieved by the use of aseptic processes for yeast and enzyme production and transfer, the use of clean water systems similar to the requirement of a municipality. Additional prevention comes in the form of frequent cleaning and sanitization as part of the program controlled batch cycle. This activity prevents the buildup of residual materials that could lead to a subsequent infection.

3.10 Hazard Review and Accident and Risk Analysis

This section discusses only the hazard review and risk analysis related to the proposed project site. Since no hazardous materials associated with the proposed project would be used off-site, no impacts due to these materials are expected to occur elsewhere.

3.10.1 Affected Environment

The proposed site is currently undeveloped land with no storage or use of hazardous materials. The surrounding community of Kinross contains residential, commercial and industrial properties. In addition, approximately 5,300 prison inmates are located at the Kinross State Correctional Facility and the Chippewa County correctional facility near the proposed site.

3.10.2 Environmental Consequences of No Action Alternative

The No Action Alternative would have no impact on hazards at the property or in the community.

3.10.3 Environmental Consequences of Proposed Action

As described in Section 3.7.3.1, the proposed biorefinery would store and handle various flammable liquids including ethanol and gasoline, and hazardous materials including acids and bases in liquid and solid form. Storage and handling of hazardous materials would have the potential for release to the environment. In the event of a catastrophic release of hazardous materials, the public could be affected.

As described in Section 3.7.5, Frontier would design the biorefinery using compatible storage tanks and appropriate secondary containment structures to prevent a release to the environment. Frontier would develop appropriate contingency plans for the proposed project site that would:

- Analyze the potential for spills or releases of ethanol, petroleum products, and other hazardous materials. This analysis includes spills or releases from equipment failures, human error, natural disasters, and intentional destructive acts;
- Outline steps to prevent releases or spills from occurring;
- Evaluate the potential impacts of releases should they occur; and
- Describe response actions that should be taken in the event of a release.

The plans would include, at a minimum, a PIPP, SPCC Plan, a SWPPP, and an ERP. Frontier would provide training to their personnel on the site specific spill prevention and response measures contained in the contingency plans. Frontier would meet with the local fire and emergency response providers to discuss potential emergencies, determine capabilities, and establish communication protocols and responsibilities.

3.11 Safety and Occupational Health

This section discusses only the safety and occupational health on or related to the proposed project site. Harvesting and transportation of forest resources would be completed by existing contractors using current safety practices. Therefore, there would be no expected change in off-site safety and occupational health issues.

3.11.1 Affected Environment

The Frontier Project would be located northeast of Kinross, Michigan. Emergency services in the area are provided by Kinross Police and Fire Departments. Both are within 5 miles of the proposed project site.

The fire protection systems for the Frontier Project would be designed to limit personal injury, loss of life, property loss, and biorefinery downtime from fire or explosion. The Frontier Project would have the following fire protection systems:

- Fire Hydrant/Hose Stations - Adequate numbers of fire hydrants and hose stations would be provided throughout the biorefinery to ensure sufficient coverage of the process areas. Water would be supplied from an aboveground fire fighting water system with a full capacity electric driven fire water pump and a full capacity natural gas powered fire water pump serving as a backup. Frontier would also incorporate provisions for a fire fighting foam system in the biorefinery design. The following would be protected with the foam system in case of a fire:

    1. Distillation facilities

    2. Ethanol dehydration facilities

    3. Ethanol loading station

- Storage tanks containing flammable materials would be designed and constructed in accordance with the National Fire Code.
- Operating and maintenance personnel would be trained to effectively deal with biorefinery emergencies involving fire, explosion, or accidental spills. Ongoing training would be administered to maintain the effectiveness of the on-site fire brigade.
- Local Fire Protection Service - The Frontier Project would also rely upon the local fire department or emergency response teams in the event of a serious fire. These local authorities would be made familiar with the layout of the ethanol facilities, the hazards of materials handled on the premises, places where personnel would normally work, and possible evacuation routes. A Fire Protection Plan for the biorefinery would be created and updated to detail the project information necessary to ensure that safe and effective fire fighting measures are used at the biorefinery.

In addition to the fire hydrants and foam systems, the biorefinery will be equipped with hand held fire extinguishers, temperature detectors, smoke detectors, and other fire detection devices as required by fire codes and the Chippewa County or the Office of the State Fire Marshal.

Occupational health services are provided by the War Memorial Hospital located in Sault Ste. Marie, Michigan approximately 19 miles from Kinross. The War Memorial Hospital has both occupational health and 24 hour emergency care capabilities. The War Memorial Hospital operates the ambulance service that services Kinross.

Chippewa County has an Emergency Preparedness Department. The Emergency Preparedness Department's role is to provide an organized and coordinated response to any natural or human-caused emergency which contains an actual or potential public health hazard, including communicable disease outbreaks, environmental sanitation hazards, emergencies involving toxic and hazardous materials and other chemical, biological and radiological incidents.

The Frontier Project would develop appropriate spill control, pollution prevention, and Emergency Response Plans (ERPs) for the biorefinery that describe planning and procedures to be followed in the event of an emergency including:

- Spills or releases of hazardous materials,
- Fire/Explosion,
- Tornadoes,
- Severe Weather,
- Medical Emergency, and
- Bomb Threat.

Frontier would also establish safety and emergency response procedures for construction activities, excavation and trenching, electrical, hazardous chemicals, hot work permits, fall prevention, proper equipment usage, confined space entry, fire protection and prevention, and hearing and respiratory protection for employees, contractors, and visitors.

3.11.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would have no affect on existing emergency response capabilities of Kinross and/or Chippewa County.

3.11.3 Environmental Consequences of the Proposed Action Alternative

The chemicals and chemical processes used to produce ethanol create a potential for health and safety hazards. The fermentation process does not involve analogous chemical reactions, so potential reactions are not an issue for this process. The hazards related to hazardous material storage and handling are further discussed in Section 3.7. However, in summary, the hazardous materials generally fall into two categories, flammable or corrosive. The ethanol and denaturant (gasoline) are flammable. Many of the process chemicals are corrosive, i.e. acids or bases.

Frontier would develop appropriate spill response, pollution prevention, and ERPs to address the medical and environmental hazards associated with the Frontier Project. The plans would include, at a minimum, a Pollution Incident Prevention Plan (PIPP), Spill Prevention, Control and Countermeasure (SPCC) Plan, a Storm Water Pollution Prevention Plan (SWPPP), and an ERP. The plans would be completed in accordance with Federal and Michigan Occupational Safety and Health Administration (OSHA) and USEPA and MDEQ regulations and guidance.

Frontier would also establish safety and emergency response procedures for construction activities, excavation and trenching, electrical, hazardous chemicals, hot work permits, fall prevention, proper equipment usage, confined space entry, fire protection and prevention, and hearing and respiratory protection for employees, contractors, and visitors.

The existing emergency response capabilities of Kinross and Chippewa County are expected to remain in place and available to the Frontier Project, if needed. Additional training may be required for local responders; however, the proposed action would not be expected to have an effect on the mission or capabilities of the Chippewa County Emergency Preparedness Department.

3.12 Infrastructure

This section discusses only the infrastructure on or related to the proposed project site. Harvesting and transportation of forest resources would be completed by existing contractors using existing infrastructure. Therefore, there would be no expected change in off-site infrastructure related to harvest and transportation of forest resources.

3.12.1 Affected Environment

Water would be obtained from the Kinross water system. As noted in Section 3.6, the MDEQ firm rated capacity of the Kinross system (firm rated capacity as determined by the MDEQ is the maximum system production with the largest well out of service) is 2,000 gpm or 2.88 mgd. Current community water usage is approximately 1.2 mgd with a peak summer usage of approximately 1.75 mgd. Using the firm rated capacity, an excess water system capacity of 1.68 mgd remains (AECOM, 2009). The water system does not currently extend to the proposed Frontier site.

Wastewater disposal would be through the Kinross WWTP via an existing force main. As noted in Section 3.6 with the permitted effluent discharge limit of 1.1 mgd and the current average effluent discharge of 0.85 MGD, there is an excess treatment capacity of approximately 0.25 mgd available at the Kinross WWTP. The existing force main system does not currently extend to the proposed Frontier site.

Natural gas is available via a 2-inch high pressure on site for supply via Kinross. The gas line is located west and adjacent to the proposed project site along the access road, see Figure 2.

Cloverland owns and operates the electric distribution system in and around the Kinross Charter Township. Cloverland would be the provider of the electric power to the proposed Frontier project. ATC owns the existing 69 kV electrical transmission line that runs approximately parallel to Interstate 75 from St. Ignace to Sault St. Marie.

3.12.2 Environmental Consequences of No Action Alternative

The No Action Alternative would have no affect on the infrastructure of Kinross and/or Chippewa County.

3.12.3 Environmental Consequences of Proposed Action

Frontier would use potable water at a proposed rate of 150 gallons per minute via a connection with the existing water main located to the west of the proposed site. A new 12-inch diameter water line would be constructed from the existing main to the proposed site. The main would be approximately 10,720 lineal feet long. No modifications would be required to the production well field or production system.

Municipal wastewater systems improvements at the very minimum will include construction of a lift station near the Frontier site and force main installation to connect the lift station to the municipal collection system. The anticipated total length of force main installation is 5,720 linear ft. No modifications will be required to the WWTP.

Due to Cloverland's acquisition of Edison Sault Electric Company in May 2010, Frontier would have two options for their power supply. Option #1 would be the construction of an approximately 2-mile long interconnect line from the ATC transmission line to the Frontier site. Option #2 would be to connect to the existing Cloverland electric infrastructure in Kinross. The options will be reviewed and one selected early in the final design stages of the project. The potential route for each option has not been determined. Additional environmental analysis may be required depending on the route selected. Cloverland would be responsible for that analysis. Cloverland would be responsible for completion of an environmental review, if any were required. DOE would participate in that review or complete additional NEPA review, as necessary.

The upgrade of the ATC 69kV transmission line is being completed independent of the proposed Frontier Project and is therefore not a connected action for this EA.

A new utility substation would be installed at the west edge of the Frontier property sized for the biorefinery requirements. This substation would be owned and maintained by Cloverland.

Temporary impacts would occur during construction of the various pipelines for water, wastewater, and natural gas. Wetlands and sensitive areas would be avoided, where possible, during construction to minimize the impacts. Mitigation would be completed for impacted wetlands in accordance with Michigan and the USACE regulations and permitting processes.

3.13 Noise

This section discusses only the noise on or related to the proposed project site and rail corridor.

3.13.1 Affected Environment

The Frontier site is currently wooded, non-residential property with a residential area located about 2000 feet to the south southwest. The Chippewa County International Airport is located in Kinross approximately 1-mile southwest of the proposed Frontier site.

Noise sources in rural areas are mostly from natural sources including insects, birds, mammals, and flowing water. Background noise levels in wilderness areas are about 35 dBA Day-Night Sound Level (L_{dn}). Cars and agricultural equipment provide additional noise in rural residential and agricultural areas.

Background noise levels are approximately 40 dBA in rural residential areas, 44-dBA in agricultural cropland with equipment operating and 51 dBA in a wooded residential area (EPA 1978).

Background noise levels in industrial areas typically range between 75 and 90 decibels (dB) and noise levels in wooded residential areas are approximately 50 dB (EPA 1978).

3.13.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would have no impact on noise from the proposed site.

3.13.3 Environmental Consequences of the Proposed Action

Noise would be generated continuously during normal operations related primarily to mechanical equipment operations. Much of the mechanical equipment at the site would be related to the raw material and product-handling operations, including debarking equipment, feed stock conveyors; production activities, including the cooling towers, and other equipment. Noise would also be generated by trucks and rail operations for the transport of raw materials and final product, as well as some industrial equipment (front-end loader, etc.) for on-site product movement.

Noise studies at ethanol plants in Minnesota have indicated that the equipment with the highest noise levels are the cooling towers (~80) dBA and the conveyor systems (~78 dBA). (APEC 2007). The readings were taken at 11 feet from each of the above sources. Noise levels from the Frontier Project are expected to be similar or less than a conventional ethanol plant because their equipment would be located inside a building.

Noise levels from adjacent sources are added using a logarithmic addition. Table 3-15 shows a simple way to add noise levels.

Table 3-15 - Addition of Decibels

Numerical difference between two noise levels [dBA]	Amount to be added to the higher of the two noise levels [dB or dBA]
0	3.0
1	2.5
2	2.0
3	1.8
4	1.5
5	1.2
6	1.0
7	0.8
8	0.6
9	0.5
10	0.4
11	0.3

Numerical difference between two noise levels [dBA]	Amount to be added to the higher of the two noise levels [dB or dBA]
12	0.3
13	0.2
14	0.1
15	0.1

Step 1: Determine the difference between the two levels and find the corresponding row in the left hand column.
Step 2: Find the number [dB or dBA] corresponding to this difference in the right hand column of the table.
Step 3: Add this number to the higher of the two decibel levels.

Source: Casella Undated

Using the above table, the logarithmic addition of the potential noise sources that will be present at the biorefinery gives a total predicted noise contribution of 82 dBA at 11 feet from the equipment.

Noise loss from the noise source to the nearest sensitive area (NSA) is calculated using the equation (Beranek et. al. 1992):

$SPL\ 2 = SPL\ 1 + 20\ Log_{10}(d_1/d_2)$.

Where:

SPL 2 is the sound pressure level at the NSA,
SPL 1 is the sound pressure level contribution from the noise source,
d_1 is the distance from the noise source that the reading was taken (11 feet), and
d_2 is the distance to the NSA.

Currently there are no residences on the subject property. The NSA is a residence located approximately 2,600 feet south of the southernmost property boundary. Therefore, the noise impact from the Frontier Project on the NSA is estimated to be 34.0 dBA. This noise level is within the normal background level for wooded residential areas.

A maximum of two trains per day are projected to arrive on-site. Noise from trains is dependent on many factors, including train speed and rail design. A diesel freight train would generate noise at approximately 88 dBA (Harris Miller Miller & Hanson Inc., Undated) measured at 50 feet from the tracks. This noise level would last for less than 30 minutes to allow transit from the CN mainline to the Frontier site. The train horn would generate approximately 100 dBA for a few seconds when crossing the Gaines Highway (90 dBA measured at 500 feet). The proposed rail corridor runs north of the Kinross Township and the penitentiary. At its closest approach, the rail corridor is on the opposite side of the Gaines Highway from the NSA is approximately 1,600 feet north. Therefore, the noise impact from train traffic going to the Frontier Project on the NSA is estimated to be 58.0 dBA which is approximately equivalent to a normal conversation. The noise level from the train whistle at the NSA would be 80 dBA, which is equivalent to a telephone dial tone.

A typical train would include more than 50 cars. Since each rail car equals approximately two trucks and the rail line follows the Gaines Highway, which would be the primary route for truck traffic. Truck traffic from diesel trucks generates approximately 90 dBA (Galen Carol, 2011), therefore no incremental increase in noise from trains is expected.

3.14 Aesthetics

This section discusses only the aesthetics on or related to the proposed project site. Harvesting and transportation of forest resources would be completed by existing contractors using existing techniques. Therefore, there would be no expected change in off-site aesthetics related to harvest and transportation of forest resources.

3.14.1 Affected Environment

The Frontier Project would be located in a relatively undeveloped wooded area approximately 2,600 feet from the nearest residence. The nearest residence to the proposed rail line would be approximately 1,700 feet to the south, southwest.

3.14.2 Environmental Consequences of the No Action Alternative

The No Action Alternative would have no impact on site aesthetics.

3.14.3 Environmental Consequences of Proposed Action

Wood yards and wood processing systems are common property uses and activities in the upper peninsula of Michigan. The proposed buildings and structures would be similar to other wood yards and processing facilities in the area.

The biorefinery would have three primary areas that have potential aesthetic affects:

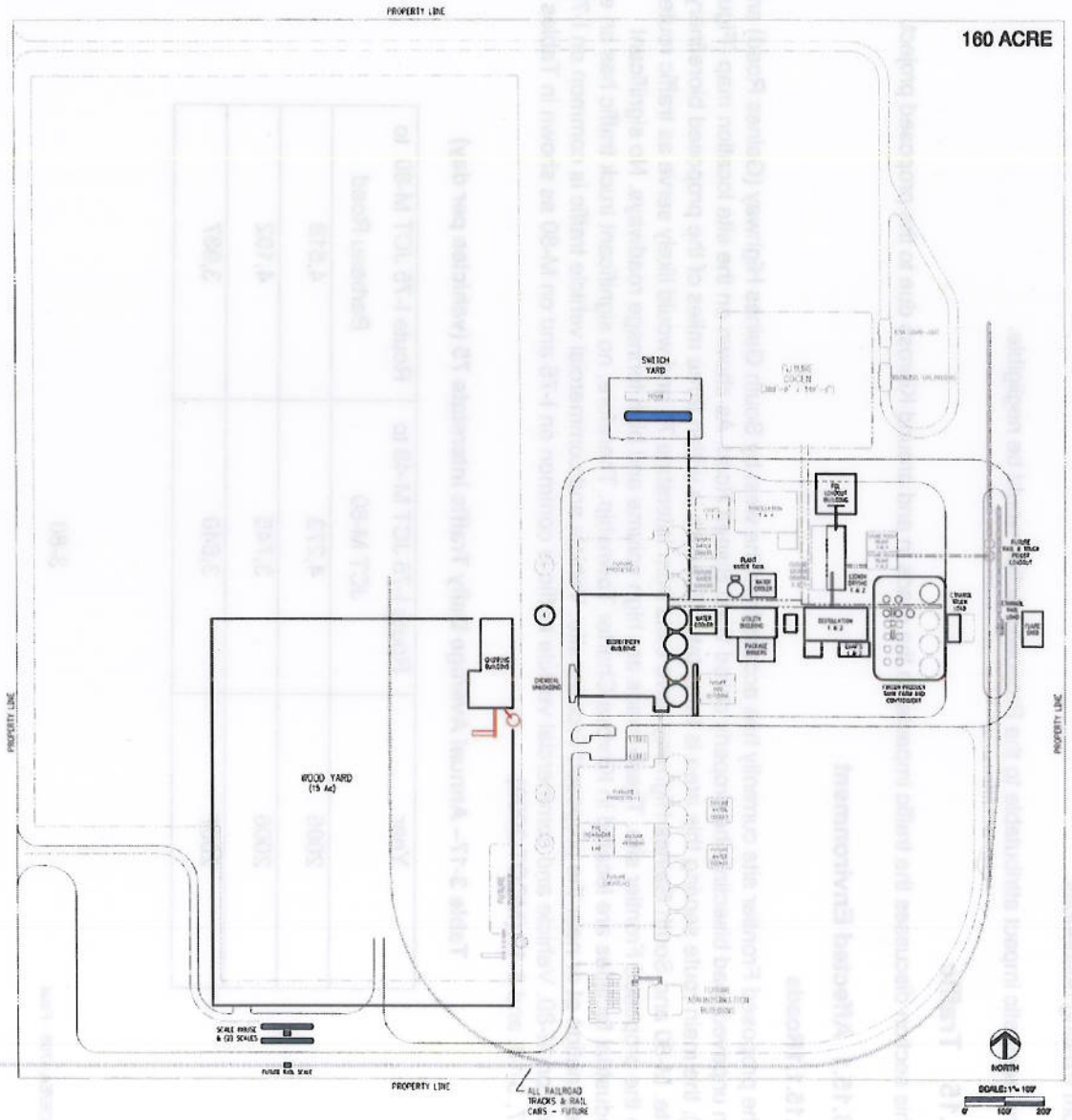
- Biomass receiving and storage;
- ethanol production; and
- ethanol storage tanks.

As shown on Figure 20, the biomass receiving and storage area would include a log storage yard, biomass processing building, biomass storage building, bark storage piles, associated handling equipment and a wood chip silo. The wood chip silo would be one of the tallest structures at 105 feet. The distillation tower would be approximately 125 feet tall. The ethanol production area would include the fermentation, distillation and dehydration buildings and structures.

Table 3-16 – Proposed Building Sizes

Building Information	Length (feet) E-W	Width (feet) N-S	Height (feet)
Chemical, Pretreatment, Lab and Fermentation Building.	100	127	50
Water Cooler Buildings	36	36	50
Utility Building	64	36	40
Biomass Boiler Building	125	100	50
Evaporator Building	45	45	90
Distillation Building	82	55	125
Drying Building	23	73	65

The ethanol storage tank farm would contain two large ethanol AST and five smaller ASTs. The large AST will be approximately 50 feet in diameter and 42 feet tall. A large potable water tank of approximately the same size and the large ethanol storage tank would be constructed on-site. The biomass boiler stack would be visible at 60 to 80 feet above grade.



FRONTIER SITE MASTER PLAN 2009

355 ACRE

RAASCH ASSOCIATES
ENGINEERS + ARCHITECTS

Item	Building Description	AREA	Building Dimensions	Number of Floors	Square Ft.
1	Chipping Building	100	220ft x69ftWx35'-6"H	1	17,600
2	Biorefinery Building	210-420	Sub Buildings below	See Below	See Below
2a	Pre-Treatment Building	210	90'Lx46'Wx115'H	2	4,370 per floor
2b	Primary Fermentation	300	95'Lx82'4"Wx58'H	1	6,798
2c	Primary Fermentation Penthouse	300	69'6Lx78.6"Wx51'H	1	5,388
2d	Extractive Facilities	300	92'Lx96'Wx36'-6"H	2	8,834 per floor
2e	Secondary Fermentation	300	265ft x67ftWx26'H	1	19,617
2f	Chemical Storage	420	189'Lx138'-6"Wx36H	1	25,312
6	Distillation Building	500	167'-8"x82'-9"x95H	2	14,000 per floor

Item	PERSONNEL DESCRIPTION	NO OF PERSONNEL	1st	2nd	3RD
1	PLANT MANAGER	1	1		
2	MAINTENANCE MANAGER	1	1		
3	PROCESS MANAGER/ENGINEER	1	1		
4	OPERATIONS MANAGER	1	1		
5	LAB MANAGER	1	1		
6	SAFETY MANAGER	1	1		
7	MAINTENANCE TECHNICIANS	8	4	2	2
8	MAINTENANCE - LUBE TECH	4	2	1	1
9	MAINTENANCE - YARD	1	1		
10	OPERATORS	16	8	4	4
11	LAB TECHNICIANS	2	1	1	
12	SCALE HOUSE	1	1		
13	ADMINISTRATION	6	6		
14	TOTAL PERSONNEL	44	27	10	7

Item	TRUCK CONTENTS	NO OF TRUCKS/DAY	DAYS/WEEK	TOTAL USAGE VOL/DAY	TOTAL STORAGE VOLUME	COMMENTS
1	CHIPS/LOGS (@ 25 tons/truck)	62	6	72,000 TPD	1 @ 174,000 cu ft	48' dia x 60' tall
2	BARK	6	6	72 BDTPD	direct to trucks	
3	ASH	0	6	26 BDTPD	shown as NG	tbd
4	FOLOUTBOUND	24	7	584.4 BDTPD	@ 40% solids	siding stock
5	Enzyme 1 (0.42 lb/gal)	1 per month	7	800 GPD	40,000 gallons	2 @ 16' dia x 16' tank
6	SUGAR SOURCE	1 per month	7	0 GPD	10,000 gallons	10' dia x 18' tank
7	AMMONIUM HYDROXIDE - UREA	1 per month	7	0 GPD	20,000 gallons	10' dia x 18' tank
8	Magnesium Sulfate Heptahydrate	1 per month	7	667 GPD	20,000 gallons	10' dia x 18' tank
9	Zinc Sulfate	1 per month	7	667 GPD	20,000 gallons	10' dia x 18' tank
10	POTASSIUM HYDROXIDE - KOH		7	7 GPD	10,000 gallons	10' dia x 18' tank
11	Sulfuric Acid - Clarifier	1 per month	7	tbd	10,000 gallons	10' dia x 18' tank
12	ANTI-FOAM - PROCESS	0	7	unknown	200 gal tote	vendor owned
13	ANTIBIOTIC	0	7	unknown	200 gal tote	vendor owned
14	COOLING SCALE CONTROL	0	7	unknown	mini-bulk	vendor owned
15	COOLING BIOCIDE 1	0	7	unknown	mini-bulk	vendor owned
16	COOLING BIOCIDE 2	0	7	unknown	mini-bulk	vendor owned
17	BOILER DEPOSIT CONTROL/DISP	0	7	unknown	mini-bulk	vendor owned
18	OXYGEN SCAVENGER	0	7	unknown	mini-bulk	vendor owned
19	DENATURANT	2 per week	8.2	1212 gallons	60,600 gallons	tank lasts 45+ days
20	ETHANOL (out bound 4500 gallons)	14	7	90,000 gallons	140,000 gallons	1,200,000 gal in tank
21						
22						
23	Additional nutrient feed rates are still to be determined from Rome Pilot plant					
24						
25						
26						
27						
28	TOTAL AVERAGE TRUCKS / DAY	165				

12

E	01/20/09	UPDATE FOR LOAN APP
D	01/13/09	FOR LOAN APPLICATION
C	01/13/09	FOR LOAN APPLICATION
B	01/06/09	ISSUED FOR REVIEW

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FRONTIER PLOT PLAN
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
KINROSS TOWNSHIP, CHIPPEWA COUNTY, MICHIGAN

Drawn:
Approved:
Scale:

PROJECT NUMBER 60140061

FIGURE NUMBER 20

A water vapor plume may be visible from the lignin dryer stack from varying distances, depending on weather conditions. The biorefinery would use dry cooling towers, so no vapor plume would be visible from them. No other visible emissions are expected.

The proposed biorefinery is expected to operate 24 hours per day, 7 days per week. Since production will be continuous, lighting will be required to support operations and to provide security. Lighting will consist of low-level lighting around exit areas and general outside areas, including ground-level operating areas, stairs, platforms, roadways, storage areas, and parking areas. The lighting will be provided for purposes of general operator access and safety under regular operating conditions.

Outdoor lights will be a combination of pole-mounted and structure-mounted lights. Spot lighting will be provided to illuminate operating equipment or access roadways where needed. This lighting is higher in intensity than general outside lighting, but will be limited to specific areas and usage as needed.

The proposed ethanol process buildings, fermenters, and storage tanks are not common to the existing surrounding area. However, the nearest structure, a residence, is approximately 0.5 miles away across heavily wooded terrain. Other residential areas are over 1.0 mile away to the west, also across heavily wooded terrain. Given the distance to the nearest building and the terrain, the biorefinery would not be readily visible.

The rail corridor is approximately 1,700 feet from the nearest residence across heavily wooded area. Therefore, although the rail line would parallel the Gaines highway, the rail line would not be readily visible from existing residences.

Any aesthetic impact attributable to the Proposed Action would be negligible.

3.15 Traffic

This section discusses the traffic impacts on the roads in and around Kinross due to the proposed project.

3.15.1 Affected Environment

3.15.1.1 Roads

The proposed Frontier site currently has access from the west by South Gaines Highway (Gaines Road) and an unpaved road bisecting the property called West Bisnett Road. As shown on the site location map (Figure 2), the main route serving this area is Interstate 75, which is within three miles of the proposed biorefinery site. M-80 and South Gaines Highway have exits from Interstate 75 and would likely serve as traffic routes to the proposed Frontier site. These roads are high volume and high tonnage roadways. No significant industrial facilities are located in Kinross Charter Township. Therefore, no significant truck traffic has an end destination at or near the proposed Frontier site. Vehicle and commercial vehicle traffic is common on I-75 and on M-80. Vehicle and commercial vehicle traffic is common on I-75 and on M-80 as shown in Tables 3-17, 3-18, and 3-19 (MDOT 2009).

Table 3-17– Annual Average Daily Traffic Interstate 75 (vehicles per day)

Year	Route I-75 JCT M-48 to JCT M-80	Route I-75 JCT M-80 to Barbeau Road
2005	4,273	4,518
2006	3,745	4,102
2007	3,640	3,987

Table 3-18 – Annual Average Daily Traffic State Highway M-80 (vehicles per day)

Year	Route M-80 JCT I-75 to Gaines Road	Route M-80 JCT 1-75 to JCT M-129
2005	2,873	1,868
2006	2,795	1,818
2007	3,033	1,918
2008	2,824	1,786

Table 3-19 – Commercial Annual Average Daily Traffic (vehicles per day)

Year	Route I-75 JCT M-48 to JCT M-80	Route I-75 JCT M-80 to Barbeau Road	Route M-80 JCT. I-75 to Gaines Road
2005	718	718	100
2006	650	650	100
2007	490	490	100

3.15.1.2 Rail Lines

An existing Canadian National Railway (CN) rail line runs southwest to northeast parallel to west side of I-75. An existing rail spur splits from the CN main line and crosses under I-75 at the Tone Road overpass. The existing spur runs east then south to the Kincheloe International Airport property.

3.15.2 Environmental Consequences of the No Action Alternative

3.15.2.1Traffic

The biorefinery would not be constructed and no change in traffic would occur.

3.15.3 Environmental Consequences of the Proposed Action

At the peak of construction, Frontier would employ approximately six people on-site full time. The sub-contractor labor force would be on average around 150 employees. It is expected that an average of 150 cars per day would be associated with construction staff. Truck traffic for deliveries is expected to be approximately 17 trucks per day with an average of 11 trucks per day. It is expected the traffic would use I-75 to the South Gaines Highway to access the site. This would be the shortest distance and would avoid all residential areas and businesses in Kinross. Construction would take approximately 12 to 14 months.

As a worst case scenario it is assumed all deliveries and shipments would occur by road. Due to the greater capacity of railcars it is expected the use of rail transportation would result in less impacts to the environment than worst case scenario analyzed in the EA.

On average the proposed Frontier biorefinery would receive approximately 2 trucks per day delivering sawmill chips, 77 log trucks per day delivering hardwood pulpwood logs to supply biomass material for normal operations. Other deliveries would be expected to require 4 to 6 trucks per week for miscellaneous chemicals and supplies. The proposed Frontier biorefinery also would have approximately 70 passenger vehicles arriving per day for employees and visitors. It is expected the most if not all of the traffic would use I-75 to the South Gaines Highway to access the site. This would generally be the shortest distance and would avoid all residential areas and businesses in Kinross.

Based on the traffic volumes shown in Section 3.14.1.1, the additional traffic on I-75 would be an increase of less than 1%. An additional 10 to 15 trucks per hour would use the Gaines Highway compared to current levels. This would be well below the design criteria for this high volume and high tonnage roadway.

Frontier anticipates that new turn lanes would need to be constructed on the Gaines Highway to allow safe access to the proposed site. This construction would result in a temporary disruption of traffic on the Gaines Highway that would last approximately one to two months until the turn lanes were completed. The turn lanes would be constructed within the existing right of way for the Gaines Highway.

3.16 Socioeconomics and Environmental Justice

This section discusses only the socioeconomics and environmental justice related to the proposed project site. Harvesting and transportation of forest resources would be completed by existing contractors. The overall regional socioeconomics will improve due to additional economic opportunities and no environmental justice issues associated with forest resource harvest and transportation are anticipated.

3.16.1 Affected Environment

Kinross Charter Township is not within any defined metropolitan statistical area. Kinross Charter Township has been experiencing growth greater than that of Chippewa County, the State of Michigan and the United States in recent years. The 2008 estimate of the population of Chippewa County and Kinross Charter Township was 38,971 and 8,797 individuals, respectively. This represented a population increase of 1.1% for the county and 8.1% for the township from 2000 to 2008 (estimate). The State of Michigan and the United States have experienced population increases of 6.5% and 6.0%, respectively in the same time period (US Bureau of Census, 2009).

Since 1980, Kinross Charter Township has increased the size of its' population by 364.7% compared to 8.0% increase for the State of Michigan as a whole. Chippewa County and the United States have increased their populations by 34.3% and 31.7%, respectively during the same time period. Table 3-20 (below) summarizes the population changes for Kinross Charter Township, Chippewa County, the State of Michigan and the United States.

The population of Kinross Charter Township is heavily influenced by its' prison population. For example, the 8,140 residents in Kinross Charter Township identified in the 2000 census, 4,535 were prisoners of the State of Michigan in five institutions located in Kinross Charter Township (Dorothy Johnson, Deputy Supervisor, Kinross Charter Township, Personal Communication, October 2, 2009). Although the five institutions have recently been reduced to two institutions (Kinross Charter Correctional Facility and Chippewa Correctional Facility), the number of prisoners within Kinross Charter Township has not been affected (Dorothy Johnson, Deputy Supervisor, Kinross Charter Township, Personal Communication, October 8, 2009). In addition, the prison population as a percentage of the total population has been consistent since 1980 (Dorothy Johnson, Deputy Supervisor, Kinross Charter Township, Personal Communication, October 8, 2009).

Table 3-20 - Population Changes for Kinross Charter Township, Chippewa County, Michigan and the United States 1980-2008

Political Unit	1980 Population	1990 Population	1980-1990 % Change	2000 Population	1990-2000 % Change	2008 Population	2000-2008 % Change	1980-2008 % Change
Kinross Charter Township	1,893	6,566	+246.9%	8,140	+30.0%	8,797	+8.1%	+364.7%
Chippewa County	29,029	34,604	+19.2%	38,543	+11.4%	38,971	+1.1%	+34.3%

Political Unit	1980 Population	1990 Population	1980-1990 % Change	2000 Population	1990-2000 % Change	2008 Population	2000-2008 % Change	1980-2008 % Change
Michigan	9,262,078	9,295,297	+0.4%	9,938,444	+6.9%	10,003,422	+6.5%	+8.0%
United States	226,545,805	248,709,873	+9.8%	281,421,906	+13.2%	298,362,973	+6.0%	+31.7%

Source: U.S. Bureau of Census; 2009

The home ownership rate of 52.9% for Kinross Charter Township was below the County, State and National averages of 74%, 73.8% and 66.2%, respectively. In addition, the property values for both the township and the county were below the State and National averages with median values of owner-occupied homes of $72,600 and $77,300 for Kinross Charter Township and Chippewa County, respectively compared to the State and National averages of $115,600 and $119,600, respectively.

Labor statistics are unavailable for either Kinross Charter Township or Chippewa County. However, occupational information is available for the Upper Peninsula of Michigan (Upper Peninsula. In 2009, there were approximately 116,000 jobs in the Upper Peninsula. The majority of the jobs were in office and administrative support, food preparation and serving and sales (U.S. Bureau of Labor Statistics, 2011).

There are over 1,400 forest products manufacturing facilities in Michigan with an additional 1,700 business unites related to forest product manufacturing. Currently the Michigan forest products industry has approximately 162,000 direct and indirect jobs and a $5.6 billion annual payroll. The direct sales from forest and forest related industries is approximately $13.8 billion in annual sales that yields approximately $51.8 billion (direct and indirect) economic impact to Michigan

The forest products industry has suffered as a direct result of the economic downturn in manufacturing. The direct result of this down turn has been the loss off over 20,000 jobs, $700 million in wages and over 300 individual businesses from the forest products industry. These numbers lag and therefore do not reflect the full impact of the 2009-2010 economic recession.

The median household incomes for Kinross Charter Township and Chippewa County of $36,525 and $34,464, respectively were below the State and National averages of $44,667 and $41,994, respectively. (US Bureau of Census, 2009 (2000 Census data)).

3.16.1.1 Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. "Fair treatment" means that no group, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the adverse environmental consequences resulting from industrial, municipal, or commercial operations or the execution of Federal, State, local, and tribal programs and policies.

In February 1994, President Clinton, issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 Fed. Reg. 7629 (1994)). This order directs Federal agencies to incorporate environmental justice as part of their missions. Federal agencies are specifically directed to identify and, as appropriate, to address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations.

The CEQ has issued guidance to Federal agencies to assist them with their NEPA procedures so that environmental justice concerns are effectively identified and addressed (CEQ, 1997). In this guidance, the Council encouraged Federal agencies to supplement the guidance with their own specific procedures tailored

to particular programs or activities of an agency. DOE has prepared a document titled Environmental Justice Strategy (DOE, May 2008). The guidance is based on Executive Order 12898 and the CEQ environmental justice guidance. Among other things, the DOE draft guidance states that even for actions that are at the low end of the sliding scale with respect to the significance of environmental impacts, some consideration (which could be qualitative) is needed to show that DOE considered environmental justice concerns. DOE needs to demonstrate that it considered apparent pathways or uses of resources that are unique to a minority of low-income community before determining that, even in light of these special pathways or practices, there are no disproportionately high and adverse impacts on the minority or low-income populations.

The racial make-up of Kinross Charter Township (including the prison population) is 64.6% white, 17.2% black, 11.3% American Indian and Alaska Native persons, 0.6% Asian, and 5.4% persons of more than one race (U.S. Bureau of Census, 2009 (2000 Census data)). In addition, 2.7% of the population also describe themselves as Latino decent. However, the racial components of Kinross Charter Township excluding the prison population likely mimics the racial make-up of Rudyard Schools (the school system serving the township) which is 69.2% white, 1.6% black, 26.7% American Indian and Alaska Native persons, 1.2% Asian and 1.25 Hispanic (Dorothy Johnson, Deputy Supervisor, Kinross Charter Township, Personal Communication, October 2, 2009).

The racial make-up of Chippewa County is 75.9% white, 5.5% black, 13.3% American Indian and Alaska Native persons, 0.5% Asian, and 4.4% persons of more than one race (U.S. Bureau of Census, 2009 (2000 Census data)). In addition, 1.6% of the population also describe themselves as Latino decent.

The harvest area for the biomass needed to support the proposed Frontier project is largely located within the area of the 1836 Treaty of Washington. Article 13 of the 1836 Treaty of Washington, along with the 2007 Inland Consent Decree provide the Tribes that are signatory to the 1836 Treaty of Washington the right to hunt, fish, and gather natural resources for personal use and subsistence on public lands and certain private forest lands that are required to be open to the public by law or other agreement. The 1836 Treaty of Washington does not provide for commercial harvest of forest resources or apply to private lands that are not otherwise required to be open to the public.

3.16.1.2 Socioeconomics

The poverty rates for individuals in Kinross Charter Township and Chippewa County are 16.4% and 12.8%, respectively. The poverty rate for Kinross Charter Township and Chippewa County exceed the State and National rates of 10.5% and 12.4%, respectively (U.S. Bureau of Census, 2009).

The employment rates for Kinross Charter Township and Chippewa County are 33.5% and 53.6%, respectively. The employment rate for Kinross Charter Township and Chippewa County are lower than the State and National rates of 64.6% and 63.9%, respectively (U.S. Bureau of Census, 2009).

While recent unemployment data for Kinross Charter Township was not available at the time of this assessment, the unemployment rate of 11.6% for Chippewa County exceeds the National unemployment rate of 9.7% but is below the State unemployment rate of 15.2% (U.S. Bureau of Labor Statistics, 2009 (August, 2009 data)). Table 3-21 (below) summarizes the poverty, labor force, and unemployment status for the Township, County, State, and Country.

Table -3-21 - Individual Poverty Status, Labor Force, and Unemployment for Kinross Charter Township, Chippewa County, Michigan, and the United States

Political Unit	Individual Poverty Status*	Labor Force* (percent)	Unemployment** (percent)
Kinross Charter Township	16.4%	33.5%	Not Available
Chippewa County	12.8%	53.6%	11.6%
Michigan	10.5%	64.6%	15.2%
United States	12.4%	63.9%	9.7%

*Source: US Bureau of Census (2000 data)

**Source: US Bureau of Labor Statistics (August, 2009 data)

3.16.2 Consequences of No Action Alternative

The No Action Alternative would have no impact on socioeconomics and/or environmental justice.

3.16.3 Consequences of Proposed Action

The construction personnel and permanent employees for the Frontier biorefinery are expected to come from existing skilled workers in the region. Frontier would employ approximately six people on-site full time. The sub-contractor labor force would be on average around 150 employees.

A total of approximately 50 full time employees would be required for biorefinery operation. Approximately an additional 700 additional jobs would be created in the manufacturing, agriculture, transportation, and timber industries in Michigan as a result of the Frontier Project (MEDC, 2011). At 2010 prices procurement of hardwood pulpwood alone would add between $35 and $40 million per year to the local economy. Purchases of other goods and services would add to that amount.

Because feedstock is within the sustainable tonnage of annual growth, the Frontier biorefinery would not be expected to put any other hardwood industry in the area at risk.

Based on the minority populations for Kinross Charter Township, Chippewa County, and the State of Michigan, no disproportionately high percentage of minority residents would be directly impacted by construction and operation of the proposed project. Additionally, the prison population would not be impacted to any greater or lesser degree than the local population.

The economic benefits of the biorefinery to the county which were discussed above would likely benefit the minority population of the area to some degree, either directly by offering new jobs or indirectly through secondary job creation and increased services from the increased tax revenue. Jobs created would include salaried positions in management and engineering, hourly jobs for operators and maintenance staff, as well as, independent contractor jobs including truck drivers and loggers, etc.

Frontier expects that the employees for the biorefinery will be hired from the local population. The local area has existing forest resource companies supply companies. Although, the Frontier Project would cause higher employment in these sectors, a large number of new residents moving to the Kinross area is not anticipated. Therefore, there would not be a need for additional schools or service infrastructure nor impacts to those facilities.

Kinross Charter Township and Chippewa County have a higher percentage of individuals below the poverty level than that of the general population of Michigan. However, the Frontier biorefinery and the associated rail corridor would be located away from any concentration of residences, its construction and operation would not adversely affect any economic subgroup. Therefore, no disproportionately high percentage of low income residents would be impacted by the Proposed Action. As has been shown in previous sections,

there are only minor adverse environmental impacts associated with the Proposed Action, and none of these impacts would disproportionately impact minority or low income populations. The economic benefits of the biorefinery to the county, which were discussed above, would likely also benefit those currently living below the poverty level to some degree, either directly by offering new jobs or indirectly through secondary job creation and increased services from the increased tax revenue.

Because the Frontier biorefinery would be located away from any concentration of residences or any areas where children would congregate, its construction and operation would not pose direct environmental health and safety risks to children in Kinross Charter Township or Chippewa County. There are only minor adverse environmental impacts associated with the Proposed Action and none of these minor impacts would create any environmental health and safety risks to children.

The harvest of timber within the boundaries of the lands ceded under the 1836 Treaty of Washington has been occurring for over one hundred years. As discuss in Section 3.1, the timber harvest for the Frontier project would essentially replace the harvest amounts that were used by the now closed (GP) Particle Board Mill at Gaylord, Michigan, the S. D. Warren pulp and paper mill at Muskegon and the Menasha mill in Otsego, Michigan. The Tribes who were signatories to the 1836 Treaty of Washington will retain their rights to hunt, fish or gather natural resources for personal use or subsistence on Federal and State forest lands and on certain private forest lands that have enrolled in state programs such as the Commercial Forest Program. No abrogation of the Tribes rights under the 1836 Treaty of Washington will occur as a result of the Frontier Project. Additionally, the practices and procedures established under FSC and SFI certification programs specifically implement plans that respect the rights of the Tribes.

3.17 The Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Council on Environmental Quality regulations require consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). Construction and operation of the facility would require short-term uses of land and other resources. Short-term use of the environment, as used here, is that used during the life of the project (estimated at 40 years), whereas long-term productivity refers to the period of time after the project has been decommissioned, the equipment removed, and the land reclaimed and stabilized. The short-term use of the project site for the proposed facility would not affect the long-term productivity of the area. If it is decided at some time in the future that the project has reached its useful life, the facility and foundations could be decommissioned and removed, and the site reclaimed and re-vegetated to resemble a similar habitat to the pre-disturbance conditions.

The environmental review processes and timber harvest practices established by the Forest Service and MDNR for Federal and State lands are designed to maintain a sustainable ecosystem. FSC and SFI certified forest resource companies, such as J.M. Longyear, are required to maintain a healthy and sustainable forest inventory. Finally, SFI certified procurement practices are designed to minimize the potential for over harvest of timber resources by non-certified resource owners through contractual and purchasing decisions by the end user (e.g. Frontier). Continued implementation of these practices and procedures will ensure the long term productivity of the forest resources through and beyond the lifespan of the proposed facility.

The proposed Frontier project would require use of approximately 300,000 gallons of water per day. This water would be extracted from existing water wells owned and operated by Kinross Township, used by Frontier and discharged to the Kinross waste water treatment facility. Chemicals would be used to treat the water before use and again at the waste water treatment plant. The Kinross water system is currently capable of providing the required amount of water without modification.

3.18 Irreversible and Irretrievable Commitments of Resources

The proposed project would not cause an irretrievable commitment of land required for construction and operation of the new facility. As noted in Section 3.17, the facility and foundations could be decommissioned and removed, and the site reclaimed and re-vegetated to resemble a similar habitat to the pre-disturbance conditions.

There would be an irreversible commitment of energy and construction materials used to construct the facility and utility lines. DOE would also have expended the finances associated with the funding for the proposed project.

The forest resources are currently growing at a rate that is greater than the current or planned harvest rate. Additionally, natural regeneration and some re-forestation will result in re-growth of the harvested forest lands to current conditions within the lifespan of the proposed facility. Thus, the proposed project will not result in an irreversible or irretrievable commitment of forest resources.

Construction of the rail spur would result in the irreversible filling of 3.14 acres of jurisdictional forested wetlands. Mitigation for the impacted wetlands would be completed by creation of new wetlands in a quantity greater than those filled.

The proposed Frontier project would require use of approximately 143.9 MMSCF/year of natural gas and 350,000 MWH of electricity for process operations. Since approximately 70% of the power production in Michigan is from non-renewable resources, the fuel used to produce the majority of the electric power for the proposed Frontier project would be irretrievable.

Approximately 50 gpm (0.076 mgd) of water would be evaporated from the process into the atmosphere. This water would eventually condense and return to the earth in the form of rainfall. However, this would not occur in the immediate area of Kinross. Therefore, this would be an irretrievable use of the resource.

3.19 Unavoidable Adverse Impacts

Construction and operation of the proposed facility would cause unavoidable emissions of some criteria air pollutants. However, air pollutant concentrations would not exceed significance thresholds established by the USEPA and MDEQ. Short-term adverse impacts from noise generated during the construction of the proposed facility would occur; however, activities would comply with all local noise ordinances. The need for construction materials, such as steel and concrete would be unavoidable, but would represent a small fraction of available materials. Traffic increases would occur on the Gaines Highway, but would be well within its capacity

Construction of the rail spur would result in the irreversible filling of 3.14 acres of jurisdictional forested wetlands. Mitigation for the impacted wetlands would be completed by creation of new wetlands in a quantity greater than those filled.

4.0 Cumulative Impacts

4.1 Existing and Reasonably Foreseeable Projects

The CEQ regulations implementing NEPA require the consideration of cumulative impacts as part of the process (40 CFR 1508.7):

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

This section analyzes potential cumulative impacts to selected resource areas described throughout Chapter 3. The effects associated with the proposed project are analyzed in combination for their incremental contribution to cumulative effects when added to impacts from other planned and reasonably foreseeable actions. For an affected resource area, each reasonably foreseeable future action, including the Proposed Action, adds an increment to the total (cumulative) impact. For this analysis, the past and present effects are accounted for in the existing baseline of the affected environment section of this EA.

The Frontier Project could eventually be developed to produce approximately 42.5 million gallons per year (mgy) of denatured ethanol (40 mgy of anhydrous ethanol) from about 1,540 bone dry short tons per day (BDTPD) of cellulosic materials consisting primarily of woody biomass (clean chips). Capacity expansion beyond 42.5 mgy is not a reasonably foreseeable action and is not addressed in this EA. As discussed previously, while the EA addresses a plant capacity of 42.5 mgy, and its potential environmental consequences and benefits, DOE is only proposing to fund the construction of a facility with the capacity of. 21.0 mgy denatured ethanol (20 mgy anhydrous ethanol).

The Upper Peninsula of Michigan has been an active location for logging, wood products facilities and paper mills for more than a century. The pulpwood logging and transportation infrastructure is well established throughout the supply area, and is expected to recover sufficiently to supply the whole logs and chips for the Frontier project.

One new forest products business company, the Gitchie Gumee Pellet Company (GGPC), began operations in Kinross Charter Township in June 2010. GGPC manufactures wood pellets for use as a fuel on the former Kincheloe air force base. GGPC has the capacity to manufacture up to 20,000 tons of wood pellets per year. GGPC uses a combination of wood waste, forest-thinning, and sawdust to produce their pellets. The proposed Frontier Project would not complete for these forest resources as their biomass requirements would be met through the use of green logs and/or green chips. Rather, it is likely that the increase market for hardwood in the region would make more wood waste and forest thinning available for GGPC. GGPC may also be a potential purchaser of excess lignin from the proposed Frontier Project. If GGPC were to modify their process to utilize green logs rather than wood waste, forest thinning, and sawdust, the available forest resource in excess of a sustainable harvest level within 150 miles of Kinross is sufficient to meet their needs.

One other cellulosic ethanol facility, the Alpena Prototype Biorefinery (APB), is under construction within 150 miles of the proposed Frontier site. The APB facility is being constructed by American Process, Inc. adjacent to the existing Decorative Panels, Incorporated facility in Alpena, Michigan. The APB project will use washwater rich in wood sugars from the DPI manufacturing process as the feedstock for the biorefinery. No additional forest resources will be harvested by Decorative Panels, Inc. to support the APB project.

5.0 References

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