UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT-EASTERN STATES
Northeastern States Field Office
626 E. Wisconsin Avenue, Suite 200
Milwaukee, Wisconsin 53202-4617

In Reply Refer to:
3110(030)
NEPA #DOI-BLM-ES-0030-2012-0013-EA

June 21, 2013

FED EX TRACKING NUMBER: 8689 7543 3195

Memorandum

To: Eastern States, State Director (ES-930)

From: Acting Field Manager

Subject: Recommendation to Offer Split-Estate Lands in Manistee County, Michigan for Competitive Oil and Gas Leasing.

By letter dated October 2, 2002, Expressions of Interest (EOIs 101, 102, and 103) for oil and gas leasing were filed with the Eastern States Office for lands totaling 208 acres in Brown and Dickson Townships in Manistee County, Michigan. All of the lands nominated under EOIs 101, 102, and 103 are private lands overlying 100% Federal minerals (except EOI-103 has 50% Federal minerals in Township 22 North, Section 23, Range 14 West, S½SW¼) and final action has been taken on these lands.

The Northeastern States Field Office (MFO) has prepared an Environmental Assessment (EA), Finding of No Significant Impact (FONSI) and a Decision Record addressing the split estate lands nominated under EOIs 101, 102, and 103 (attached). Based upon the EA, I recommend this Decision Record be approved, subject to the BLM lease notices and stipulations found in Appendix C of the EA, and the lands be offered for competitive oil and gas leasing.

Please return one copy of the signed FONSI and Decision Record to the NSFO for our records. We are retaining a copy of the EA for our records. If you have questions regarding this memorandum, please contact Theresa Bodus at (414) 297-4120 or by e-mail at tbodus@blm.gov.

3 Attachments:
1-Environmental Assessment
2-Finding of No Significant Impact
3-Decision Record

FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment

Expressions of Interest 101, 102, and 103

DOI-BLM-ES-030-2012-0013-EA

The proposed action is for the BLM to offer the federally owned oil and gas resources in Brown and Dickson Townships, Manistee County, Michigan (T. 22 N., R. 14 W. Sec. 3, part of the SE¼NE¼ described as: commencing at the E¼, Section 3, then N. 1°56'54" E. along the East section line a distance of 1362.14 feet to the N. 1/16 corner common to Sections 2 and 3 being a 2-inch iron pipe with brass cap, and the Point of Beginning, then N. 89°05'26"W. along the N. 1/16 line a distance of 400 feet, then S. 1°56'54"E. a distance of 139.36 feet, then S. 89°05'26"E. a distance of 400 feet, to the East section line, then N. 1°56'54"E. a distance of 139.36 feet to the Point of Beginning, containing 1.28 acres of land, more or less; Sec. 16, NE¼NW¼, N½SE¼NW¼, that part of NW¼NW¼ lying east of the east line of the Pere Marquette Railroad right-of-way, containing 69.40 acres, more or less; Sec. 23, S½SW¼; T. 22 N., R. 15 W., Sec. 24, S½SE¼SE¼; Sec. 25, NE¼NW¼) totaling 208 acres, on the next available Eastern States competitive oil and gas lease sale.

There are no surface disturbing activities proposed at the leasing stage. However, it is reasonable to expect the development of one well in the future. When an Application for Permit to Drill (APD) is proposed for these lands, a site specific NEPA document will analyze the effects of the development.

Based on the analysis of potential environmental impacts contained in the Environmental Assessment (DOI-BLM-ES-030-2012-0013-EA), and considering the significance criteria in 40 CFR 1508.27, I have determined that the proposed action will not have significant impacts on the human environment. Therefore, preparation of an environmental impact statement is not required prior to approving and implementing the proposed action.

Authorized Officer:

Tony J Herrell

Tony Herrell, Associate State Director
Eastern States Office

9-13-13

Date

Northeastern States Field Office
626 East Wisconsin Ave. Suite 200
Milwaukee, Wisconsin 53202-4617
414-297-4400
Fax 414-297-4409

DECISION RECORD

Environmental Assessment
DOI-BLM-ES-0030-2012-0013-EA
Expressions of Interest 101, 102, 103

It is my decision to allow the Proposed Action to be implemented as described in the EA of Expressions of Interest (EOIs) 101, 102, 103 (Michigan Meridian, Brown and Dickson Townships, T. 22 N., R. 14 W. Sec. 3, part of the SE¼NE¼ described as: commencing at the E¼, Section 3, then N. 1°56'54" E. along the East section line a distance of 1362.14 feet to the N. 1/16 corner common to Sections 2 and 3 being a 2-inch iron pipe with brass cap, and the Point of Beginning, then N. 89°05'26"W. along the N. 1/16 line a distance of 400 feet, then S. 1°56'54"E. a distance of 139.36 feet, then S. 89°05'26"E. a distance of 400 feet, to the East section line, then N. 1°56'54"E. a distance of 139.36 feet to the Point of Beginning, containing 1.28 acres of land, more or less; Sec. 16, NE¼NW¼, N½SE¼NW¼, that part of NW¼NW¼ lying east of the east line of the Pere Marquette Railroad right-of-way, containing 69.40 acres, more or less; Sec. 23, S½SW¼; T. 22 N., R. 15 W., Sec. 24, S½SE¼SE¼; Sec. 25, NE¼NW¼), totaling 208 acres. The EA and FONSI analyzed the selected alternative and found no significant impacts. Implementation of this decision will grant exclusive rights to the lessee to develop federally owned oil and gas resources, but does not authorize any drilling and associated activities or obligate the company to drill any wells on the lease.

Authorities: The authority for this decision is contained in the Mineral Leasing Act of 1920, as amended; the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Energy Policy Act of 2005.

Compliance and Monitoring: This decision does not authorize any ground-disturbing activities. A BLM-approved Application for Permit to Drill (APD), Surface Plan for Operations (SUPO), and a site-specific environmental assessment are required to authorize ground-disturbing actions.

Terms / Conditions / Stipulations: Any purchaser of a Federal oil and gas lease is required to comply with all applicable Federal, State, and local laws and regulations including obtaining all necessary permits required prior to the commencement of project activities.

PLAN CONFORMANCE AND CONSISTENCY:

The selected alternative is in conformance with the *Michigan Resource Management Plan* (Record of Decision signed on June 5, 1985).

Alternatives Considered: The EA considered two alternatives: the no action alternative and the proposed action, which is the alternative recommended.

Rationale for Decision: The proposed action alternative was selected because the policy of the BLM is to promote oil and gas development if it meets the guidelines and regulations set forth by the National Environmental Policy Act of 1969 and other subsequent laws and policies passed by the U.S. Congress and to make Federal minerals available for economically feasible development in an environmentally sound manner.

Protest/Appeal Language: In accordance with 43 CFR 4.411 and 4.413, any person whose interest is adversely affected by a final decision of the authorized officer may appeal the decision to the Interior Board of Land Appeals. The appeal must be filed within 30 days after the date the proposed decision becomes final or 30 days after receipt of the final decision. In accordance with 43 CFR 4.411 and 4.412, the appeal shall state clearly and concisely the reason(s) why the appellant thinks the final decision of the authorized officer is wrong.

Pursuant to 43 CFR 4.21(b) and 4.413(a), an appellant also may petition for a stay of the final decision pending appeal by filing a petition for stay along with the appeal within 30 days after the date the proposed decision becomes final or 30 days after receipt of the final decision.

The appeal and any petition for stay must be filed at the office of the authorized officer: Authorized Officer, BLM Eastern States Office, 7450 Boston Blvd., Springfield, VA 22153. **At this time, the BLM will not accept protests or appeals sent by electronic mail.** Within 15 days of filing the appeal and any petition for stay, the appellant also must serve a copy of the appeal, and any petition for stay, on any person named in the decision and listed at the end of the decision, and on the: Regional Solicitor, Northeast Region, U.S. Department of the Interior, One Gateway Center, Suite 612, Newton, MA 02458.

Pursuant to 43 CFR 4.21(b)(1), a petition for stay, if filed, must show sufficient justification based on the following standards:

(1) The relative harm to the parties if the stay is granted or denied;
(2) The likelihood of the appellant's success on the merits;
(3) The likelihood of immediate and irreparable harm if the stay is not granted; and,
(4) Whether the public interest favors granting the stay.

43 CFR 4.21(b)(2) provides that the appellant requesting a stay bears the burden of proof to demonstrate that a stay should be granted.

Authorized Officer:

_____ _____

Tony Herrell, Associate State Director Date
BLM Eastern States Office

United States Department of the Interior
Bureau of Land Management
Northeastern States Field Station
LLES003410

Environmental Assessment

NEPA #: DOI-BLM-ES-030-2012-0013-EA

Expressions of Interest 101, 102, and 103

Date: June 2013

Type of Action: Oil and Gas

Serial Number: MIES-051664, MIES-051665, MIES-051666

Location: Michigan Meridian, Brown and Dickson Townships, Manistee County, MI

T. 22 N., R. 14 W.

Sec. 3, part of the SE¼NE¼ described as: commencing at the E¼, Section 3, then N1°56'54" E along the East section line a distance of 1362.14 feet to the N 1/16 corner common to Sections 2 and 3 being a 2-inch iron pipe with brass cap, and the Point of Beginning, then N89°05'26"W along the N 1/16 line a distance of 400 feet, then S1°56'54"E a distance of 139.36 feet, then S89°05'26"E a distance of 400 feet, to the East section line, then N1°56'54"E a distance of 139.36 feet to the Point of Beginning, containing 1.28 acres of land, more or less;

Sec. 16, NE¼NW¼, N½SE¼NW¼, that part of NW¼NW¼ lying east of the east line of the Pere Marquette Railroad right-of-way, containing 69.40 acres, more or less;

Sec. 23, S½SW¼;

T. 22 N., R. 15 W.,

Sec. 24, S½SE¼SE¼;

Sec. 25, NE¼NW¼.

Project Acreage: 208 acres

Proponent Address: MCN Oil and Gas Company, later DTE Gas and Oil Company
c/o Atlas Energy Partners, LP
P.O. Box 1008
Traverse City, Michigan 49685-1008

Bureau of Land Management
Northeastern States Field Office
626 E. Wisconsin Ave., Suite 200
Milwaukee, WI 53202
414-297-4400 (phone)
414-297-4409 (fax)

BLM

Northeastern States Field Office

MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Contents

CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION 6
Purpose of the Proposed Action 6
Need for the Proposed Action 6
Management Objectives of the Action 6
Conformance with BLM Land Use Plan(s) 6
Relationship to Statutes, Regulations and Other Plans 6
Decision to Be Made 7
Scoping and Issues 7
Rationale for conducting external scoping 7
Process for conducting external scoping 7
Issues identified through internal and external scoping 7
CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION 7
Introduction 7
Location 8
Proposed Action 8
Connected Action – Drilling and Production 8
Site-Specific Applications for Permit to Drill (APDs) 8
Hydrocarbon Drilling Methods 8
Vertical Drilling 9
Well Completion 9
Production, Abandonment, and Site Reclamation 9
No-Action Alternative 9
CHAPTER 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT 9
Introduction 9
Air Quality 10
Climate Change 11
Cultural/Paleontology 11
Environmental Justice 13
Farmlands 14
Fish and Wildlife 14
Floodplains, Wetlands, and Riparian Zones 14

Geology/Mineral Resources/Energy Production....14
Hazardous Wastes....14
Invasive Species/Noxious Weeds....14
Native American Religious Concerns....15
Recreation....15
Socioeconomics....15
Soils....17
Sensitive Species....17
Vegetation....17
Visual Resources....17
Water Resources and Water Quality....18
Wild and Scenic Rivers and Wilderness....18
CHAPTER 4 – ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES....18
Introduction....18
Air Quality....19
Climate Change....19
Fish and Wildlife....20
Floodplains, Wetlands, and Riparian Zones....20
Geology/Mineral Resources/Energy Production....20
Hazardous Wastes....20
Invasive Species/Noxious Weeds....21
Recreation....21
Mitigation of Effects....22
Socioeconomics....22
Soils....23
Sensitive Species....24
Vegetation and Visual Resources....24
Cumulative Impacts to Vegetation and Visual Resources....24
Water Resources and Water Quality....24
PERSONS, GROUPS, AND AGENCIES CONSULTED....26
List of Persons, Agencies and Organizations Consulted....26
List of Preparers....29

CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION

Purpose of the Proposed Action

The purpose is to consider opportunities for private individuals or companies to explore and develop Federal oil and gas resources through a competitive leasing process. A federal oil and gas lease is a legal contract that grants exclusive rights to the lessee to develop federally owned oil and gas resources but does not authorize surface-disturbing activities or obligate the company to drill a well on the lease.

Need for the Proposed Action

The tracts considered for lease in this analysis were nominated by Expressions of Interest (EOIs) from private industry. The oil and gas leasing program managed by the Bureau of Land Management (BLM) encourages private exploration and development of domestic oil and gas reserves and the reduction of U.S. dependence on foreign sources of energy and is essential to meeting the nation's future needs for energy. The BLM's oil and gas leasing programs are codified under the authority of the Mineral Leasing Act of 1920, as amended, the Mineral Leasing Act for Acquired Lands of 1947, as amended, the Federal Land Policy and Management Act (FLPMA) of 1976, and the Energy Policy Act of 2005.

On October 2, 2002, the BLM Northeastern States Field Office (NSFO) received a request from the BLM Eastern States Office (ESO) for a National Environmental Policy Act (NEPA) analysis report on the lands described on the title page. These nominated lands are privately owned.

Management Objectives of the Action

Since the BLM does not manage the surface, the BLM's sole management objective is to make federal minerals available for economically feasible development in an environmentally sound manner.

Conformance with BLM Land Use Plan(s)

The proposed action and the no-action alternative described in Chapter 2 of this Environmental Assessment (EA) are in conformance with the existing *Michigan Resource Management Plan (RMP)*, available at the NSFO. This plan provides the basis for considering the proposed action and alternatives (43 CFR 1610.8). The *Michigan RMP* was developed with public participation and governmental coordination, and this EA provides the site-specific environmental analysis required by the *Michigan RMP* (Page 4, Section B.2.c.).

Relationship to Statutes, Regulations and Other Plans

This EA was prepared in accordance with the NEPA of 1969 and in compliance with all applicable laws and regulations, including Council on Environmental Quality (CEQ) regulations (40 C.F.R., Parts 1500-1508), U.S. Department of the Interior (DOI) requirements (Department Manual 516, Environmental Quality), the National Historic Preservation Act, the American Indian Religious Freedom Act, the Native American Graves Protection and Repatriation Act, Executive Order 13007 (Indian Sacred Sites), guidelines listed in BLM's NEPA Handbook, H-1790-1 , and/or other Federal statutes and executive orders. Any purchaser of a Federal oil and gas lease is required to comply with all applicable federal,

state, and local laws and regulations including obtaining all necessary permits required prior to the commencement of project activities.

Decision to Be Made

The decision to be made is whether to offer the federal oil and gas mineral estate for competitive leasing. The BLM's policy is to promote oil and gas development if it meets the guidelines and regulations set forth by the National Environmental Policy Act of 1969 and other subsequent laws and policies passed by the U.S. Congress.

Scoping and Issues

Rationale for conducting external scoping

The BLM and the Forest Service signed a memorandum of understanding in 2006 that establishes cooperative scoping of oil and gas leasing requests on private surface within the administrative boundaries of the Huron-Manistee National Forests (Bureau of Land Management and U.S. Forest Service, 2006). According to this MOU, the BLM and the Forest Service will jointly analyze proposed leasing on split-estate lands within the administrative boundaries of national forests and ensure consistency in stipulations between private and federal surface. The objective is to maintain consistency in the way leasing stipulations are applied on leases on both private and National Forest lands.

Process for conducting external scoping

In compliance with the MOU described above, the Forest Service has produced a list of standard notices and stipulations pertaining to the Huron-Manistee National Forests (HMNF) and maps showing no-surface-occupancy areas within the HMNF.

Issues identified through internal and external scoping

The proposed lease areas do not intersect any of the restricted areas identified by the Forest Service. Following are the issues that were identified through internal and external scoping:

1. The EOIs contain navigable waterways. In the National Forest, development must be kept at least 300 feet from navigable waterways.
2. The Decision Area contains a recreational trail that may be impacted by oil and gas development.

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

The NSFO has received Expressions of Interest (EOIs) to lease 208 acres of federal mineral estate for oil and gas development in Brown and Dickson Townships, Manistee County, Michigan (Figure 1, Appendix A). Issuance of a competitive lease or leases would give the lessee exclusive rights to explore and develop federal oil and gas minerals but would not authorize surface-disturbing activities or obligate the company to drill a well on the lease. A lease may be used to consolidate acreage to meet well spacing requirements, and a lease may be acquired for speculative value. The BLM will require applicants to

adhere to lease stipulations, which have been formulated while conducting this EA and are made part of the proposed action.

Location

The sites are located on private lands in the northwestern portion of Michigan's Lower Peninsula. A legal description of the requested parcel is found on the **title page**.

Proposed Action

The proposed action is to lease the nominated parcels. If approved, a lease or leases would be offered for competitive sale with stipulations and notices generated through this process and other consultations.

Connected Action – Drilling and Production

Site-Specific Applications for Permit to Drill (APDs)

The proposed nominations, if approved, would be offered for competitive sale with stipulations and notices generated through this process and other consultations. Once a lease is awarded, the successful bidder is required to submit an Application for Permit to Drill (APD) to the BLM before any ground disturbance is authorized. In an APD, an applicant identifies a proposed drill site and provides the BLM with specific details on how and when the applicant proposes to drill the well within the constraints of the lease document. Upon receipt of an APD, the BLM conducts an onsite inspection with the applicant and, if possible, the private landowner or the surface-managing agency. NEPA and Endangered Species Act requirements must also be met at the APD stage and, in cases with potential to affect Federally-listed or State-listed species, a site-specific biological assessment is written, including the results of any required biological surveys. This is submitted to the U.S. Fish and Wildlife Service (USFWS) and the Michigan Department of Natural Resources (MDNR) for consultation. The lessee would be required, as a condition of approval, to comply with the recommendations of these consultations.

This EA will analyze impacts to natural resources based on the Reasonably Foreseeable Development Scenario (RFDS) in Appendix B. The RFDS projects that one well pad will likely be constructed as a result of the proposed action. This pad may contain one or two wells and will likely disturb two acres for the duration of construction and one acre for the duration of production. *This scenario is provided strictly for the purpose of analysis and does not represent the BLM's decision or prediction as to a number of wells that may be permitted under the proposed lease.*

Hydrocarbon Drilling Methods

Oil and gas (hydrocarbon) wells are built in two phases – drilling the borehole and completing the well. Wells may be drilled vertically if the end of the well, or *bottom hole location*, is directly below the well pad, or directionally, if the well pad is not directly above the bottom hole location. For example, Federal minerals under a state park, where drilling is not permitted, can be accessed by directional drilling from a surface location outside of the park. The same method may be used to drill horizontally, with a wellbore extending up to several thousand feet through the hydrocarbon-producing rock formation. Horizontal drilling is unlikely in this case and will not be analyzed in this EA.

Vertical Drilling

Preparation for the drilling process includes construction of a road, drilling pad, and reserve pit. Constructed access roads normally have a running surface width of 25-30 feet, the length depending upon the well's location in relation to existing roads or highways. Land is cleared and graded for pad construction. If the well is productive, additional land may be affected by pipeline construction. According to the RFDS in Appendix B, **the total disturbed area for drilling a productive vertical well would be 3.7 acres.**

Drilling operations continue around the clock, and wells are generally drilled within 30 days. During well pad construction, topsoil is stockpiled for use during restoration activities. Further details on production can be found in the RFDS (Appendix B).

Well Completion

Wells in the area proposed for leasing are typically completed using hydraulic fracturing, in which water and chemicals are injected at high pressure into the producing formation in order to open fissures to allow the hydrocarbons to flow out. This process in a vertical well typically consumes on the order of 500,000 gallons of water.

Production, Abandonment, and Site Reclamation

Formation water production, along with the oil and/or gas, is expected during a well's productive life, and separation, dehydration and other production processing may be necessary. This processing may require construction of temporary facilities, both on- and off-site.

A notice in the proposed lease would encourage the use of non-invasive plant species during all restoration and stabilization activities. Final seed mixtures and plantings are determined by recommendations from the BLM with approval of the land owner.

No-Action Alternative

Under the No-Action Alternative, the request to offer the proposed tract for oil and gas lease would be denied.

CHAPTER 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT

Introduction

The Decision Area includes a one-mile buffer around the EOI, the distance within which directional drilling is likely to be viable, producing a total area of 11,500 acres (Figure 1, Appendix A). The Decision Area is divided into four separate areas.

The Decision Area is within the Northern Lakes and Forests Level-III ecoregion. It is within the Manistee Subbasin of the Northeastern Lake Michigan Basin, which drains to Lake Michigan. The Decision Area is within the administrative boundaries of the Huron-Manistee National Forest, though the areas proposed for lease are privately owned. Most of the Decision Area is directly accessible via improved roads or forestry roads.

Table 1. Technical Review.

Program	Reviewer	Signature	Date
Air Quality	Derek Strohl Natural Resources Specialist		6/20/13
Climate Change	Derek Strohl Natural Resources Specialist		6/20/13
Cultural/Paleontology	Jarrod Kellogg Cultural Resources Specialist		6/21/13
Environmental Justice	Kurt Wadzinski Planning & Environmental Coordinator		6/20/2013
Farmlands	Derek Strohl Natural Resources Specialist		6/20/13
Fish and Wildlife	Derek Strohl Natural Resources Specialist		6/20/13
Floodplains	Derek Strohl Natural Resources Specialist		6/20/13
Geology/Mineral Resources/Energy Production	~~Dave Lachance~~ Jeff Nolder Geologist	JN	6/20/13
Hazardous Wastes	Derek Strohl Natural Resources Specialist		6/20/13
Invasive Species/Noxious Weeds	Derek Strohl Natural Resources Specialist		6/20/13
Native American Religious Concerns	Jarrod Kellogg Cultural Resources Specialist		6/21/13
Recreation	Derek Strohl Natural Resources Specialist		6/20/13
Socioeconomics	Kurt Wadzinski Planning & Environmental Coordinator		6/20/2013
Soils	Derek Strohl Natural Resources Specialist		6/20/13
Sensitive Species	Derek Strohl Natural Resources Specialist		6/20/13
Vegetation	Derek Strohl Natural Resources Specialist		6/20/13
Visual Resources	Derek Strohl Natural Resources Specialist		6/20/13
Water Resources/Quality (Drinking, Surface & Ground)	Derek Strohl Natural Resources Specialist		6/20/13
Wetlands/Riparian Zones	Derek Strohl Natural Resources Specialist		6/20/13
Wild & Scenic Rivers	Derek Strohl Natural Resources Specialist		6/20/13
Wilderness	Derek Strohl Natural Resources Specialist		6/20/13

Air Quality

Manistee County meets the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), particulate matter ($PM_{2.5}$ and PM_{10}), and lead

(Pb). These are the primary pollutants that the U.S. Environmental Protection Agency (EPA) tracks nationwide.

Climate Change

The primary indicators of interest regarding climate change are emissions of greenhouse gases (GHG), primarily water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and a few other gases of lesser importance. These gases tend to trap heat from the sun in the Earth's atmosphere, leading to global warming. The various GHGs trap different amounts of heat and persist in the atmosphere for different amounts of time. Therefore, the various GHGs have different levels of potency in causing global warming per unit volume in the atmosphere. These potencies are normalized with respect to that of CO_2 and expressed in terms of *carbon dioxide equivalent*, or CO_2e. For example, one metric ton of methane, which is 21 times as potent as carbon dioxide, represents 21 metric tons of CO_2e. Carbon dioxide and CH_4 are the most abundant GHGs in terms of CO_2e.

Because these gases circulate freely throughout Earth's atmosphere, the appropriate Analysis Area for this resource is the entire globe. The largest component of global anthropogenic greenhouse gas emissions is carbon dioxide. Global anthropogenic carbon emissions reached about 7,000,000,000 metric tons per year in 2000 and about 9,000,000,000 metric tons per year in 2008 (Boden, et al, 2010). Oil and gas production is a major contributor of greenhouse gases. In 2006, natural gas production accounted for eight percent of global methane emissions, and oil production accounted for 0.5% of global methane emissions (URS Corporation, 2010). The impact of the proposed action on climate change will be discussed further in Chapter 4.

Cultural/Paleontology

Paleo-Indians first inhabited the Manistee County region at least 10,000 years ago; this is based on a spear point found in Grand Traverse County at the Skegemog Point site, one of the few Paleo-Indian sites found in Michigan's Lower Peninsula (National Park Service, 2013; Anderson, 2011). Excavations at the Point Arcadia Site, located in the northwestern corner of Manistee County, have yielded a small number of Paleo-Indian artifacts (Arcadia Historical Museum, 2013a). The area was sparsely settled until around 3000 BCE, and increased settlement began after 300 CE as the Hopewell Culture began to spread into Michigan from the South with its agriculture and mound construction. However, while the Hopewell influence reached north to modern Grand Traverse County, it was not as predominate as in southern Michigan (Fitting, 1978).

During initial European exploration of the area, the Pottawatomi, a people with a distinct Algonquin dialect, occupied the northwest corner of the Lower Peninsula. French explorers entered the region around 1640, naming Grand Traverse Bay in reference to the nine mile distance early travelers took by foot across the foot of the bay to the shore of Lake Michigan. While this early contact had little direct effect on Native tribes in the region, it coincided with Iroquoian expansion, forcing the Pottawatomi to move south and west across Lake Michigan. The Ottawa from the north, and later the Ojibwa from the south and east, then moved into the region and began trading furs with the French in the northern part of the Lower Peninsula by the 1670s. By the end of the Revolutionary War, the Ottawa occupied three villages along Grand Traverse Bay.

By the time of initial European exploration of the area, the Pottawatomi, a people with a distinct Algonquin dialect, occupied the northwest corner of the Lower Peninsula along with the Ottawa. French exploration in the region began in earnest around 1640, with exploration around the Manistee-Ludington region occurring in the 1670s (Grand Traverse County, 2006). While the early European contact little direct effect on Native tribes in the region, Iroquois attempts to expand their hunting grounds and seize more fur-rich territory forced the Pottawatomi to move south and west across Lake Michigan (Stone & Chaput, 1978). The Ottawa from the north, and later the Ojibwa from the south and east, moved into the region and began trading furs with the French in the northern part of the Lower Peninsula by the 1670s. The Point Arcadia site was occupied by Native Americans until at least the 1860s, with hunting, trapping, farming, and basket making being some of the main activities (Arcadia Historical Museum, 2013b).

The end of the Revolutionary War brought significant changes to the Native inhabitants of modern day Michigan. Although the British were officially expelled from the area, several frontier posts remained, which coupled with American influence brought a peak to fur trading in the region. However, unlike the British who gave the Native Americans a more favorable status, the United States viewed the Native Americans of Michigan as a conquered people. This situation was exacerbated by the conclusion of the War of 1812, which all but eliminated British influence and allowed the United States to more freely deal with Native Americans as seen fit. A series of treaties between 1814 and 1825 resulted in the ceding of most of Michigan to the United States (Stone & Chaput, 1978). The Treaty of 1836 ceded all remaining land in the Lower Peninsula, as well as the eastern half of the Upper Peninsula, to the United States. This treaty also established a combined reservation for both the Ojibwa and Ottawa tribes along the Grand Traverse Bay (Kappler, 1904). This reservation, albeit in a smaller form, exists today as the Grand Traverse Indian Reservation, which includes The Grand Traverse Bay Band of Chippewa and Ojibwa Indians. The Band also includes a number of Pottawatomi Indians.

Small settler's villages began to pop up along the Lake Michigan coast during the 1830s, including one at the mouth of the Manistee River near the modern day town of Manistee. With the cession of the Lower Peninsula in 1836 and the creation of the state of Michigan the following year, American settlement increased. Manistee County was formally organized in 1855 with Manistee as the county seat. Timber and farming became the major industries in the northern portion of the Lower Peninsula, with a pier being built near Arcadia to ship lumber and other goods across the lake by 1866. By the 1870s, the Lower Peninsula, thanks primarily to forests in the north, would help make Michigan the leading supplier of lumber in the United States for over twenty years (Whitney, 1987). Later industry, including fishing, furniture manufacturing, and more lumber mills were established by 1900. However, with the turn of the new century, industrial revenue began to decline in Manistee County. In 1953, the Arcadia Furniture Factory, the largest single factory in Manistee County, closed (Arcadia Historical Museum, 2013c). Today, the primary industries in Manistee County are agriculture and tourism.

EOI-102 contains the remains of Camp Brethren, a Civilian Conservation Corps (CCC) camp that operated from 1934 to 1941. The remains of at least two structures, a possible mechanic shop and a washroom, were evident during a site visit conducted in October 2012. Photos of the camp during its existence show several structures to be along the shoreline of Lake Eleanor to the immediate south; however, no

remains at this location were observed because of vegetation and the presence of a local park. A line of at least eight trees were cut to resemble posts approximately 3.5' high were also located to the north of the camp, but their age was indeterminable. The visible structures appear to be within the park boundaries, and consequently the land would most likely be designated NSO.

Manistee County has 16 historic properties listed on the National Register of Historic Places. None are prehistoric in nature, and all are historic structures with the exception of the S.S. *City of Milwaukee*, a retired lake ferry (National Park Service, 2013). As waterway margins were the preferred location of prehistoric settlement, it is expected that the probability of Native American sites being near the Manistee River and its tributaries would be high. Because of the intensity of the lumber and related industries, there is also a high potential for historic sites located in any woodlands, including that in and around proposed EOIs.

The BLM will consider potential cultural resources with each APD submitted under any lease(s) pursuant to this EOI. This would require a complete cultural resources survey and records search to determine if any historic properties are present. In particular, a determination of eligibility for the remains of Camp Brethren will have to be conducted. No further analysis is currently warranted.

Paleontology

Michigan's Lower Peninsula is comprised primarily of sedimentary rock deposited from a shallow sea during the Paleozoic Era. Fossils of brachiopods, trilobites, crinoids, and corals are found throughout Michigan from this period. Whale fossils have also been discovered a few sites in Michigan, the closest being in Mesick, approximately twenty miles to the southwest of the study area. Pleistocene fossils, from the period after the last glacial retreat, are also found throughout Michigan, most notably in the form of mastodons.

No known paleontological localities are located in or immediately adjacent to the current proposed EOI. If the lease is approved, a paleontological records search will be required, as well as a report detailing the likelihood of finding fossils. No further analysis is currently warranted.

Environmental Justice

Executive Order 12898 (1994) formally requires federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs agencies to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority or low-income populations.

The project area is located in a rural area in a county with a large retiree population and an economy that is reliant on recreational users, tourists, and summer vacationers. According to the RFDS, potential drilling within the project area is not anticipated to involve more than one or two wells. The proposed action will not create disproportionately high and adverse human health or environmental effects on minority populations and low-income populations, including tribal populations. No further analysis is warranted for Environmental Justice factors on this project.

Farmlands

The Decision Area contains 350 acres of land classified as *prime farmland* and 50 acres classified as *prime farmland if drained* (Figure 2, Appendix A). These lands are almost entirely associated with EOIs 101 and 103, with a few acres associated with the small, northern parcel of EOI 102.

Fish and Wildlife

The Decision Area consists mostly of forests, wetlands, and cleared fields (See **Floodplains, Wetlands, and Riparian Zones** and **Vegetation** sections below). The Decision Area harbors populations of diverse types of wildlife, including deer, grouse, rabbit, turkey, beaver, nesting birds, reptiles and amphibians, fish, and insects.

Floodplains, Wetlands, and Riparian Zones

The Decision Area contains 4,340 acres of wetlands. Roughly half of these wetlands are forested wetlands, and the remainder is composed of marshes, bogs, open water, and shrubby wetlands. Most of the wetland acreage is associated with the Manistee River or its tributaries, Bear Creek, Chicken Creek, and Podunk Creek. Other wetlands scattered throughout the Decision Area range in size from under an acre to 25 acres.

Geology/Mineral Resources/Energy Production

Michigan's Southern Peninsula is entirely underlain by the Michigan Basin, a structural depression within the Earth's crust that is filled with sedimentary rocks of various ages. The exploration and development of oil and gas resources within the Michigan Basin has occurred continuously since 1925. Currently recognized oil and gas plays within the Michigan Basin are the Mid-Michigan Rift-Related Structures, Mid-Michigan Rift Reactivation-Related Structures, Niagaran Pinnacle Reefs, Shallow Salt-Related Structures, the Antrim Shale, and the Collingwood Shale. Horizontal drilling using hydraulic fracturing methods is commonly used to extract the minerals in Antrim shale formations. The BLM has not identified specific exploration targets underlying the lands being evaluated in this EA. However, based upon the available data and exploration and development activity, the Antrim Shale would be the most likely play to be explored and developed on the lands being evaluated in this EA.

Hazardous Wastes

The Michigan Department of Environmental Quality's Environmental Mapper (Michigan Department of Environmental Quality, 2012) shows three open leaking underground storage tanks in the Decision Area, all within the small community of Brethren, which overlaps EOI 102.

Invasive Species/Noxious Weeds

Many invasive species are present in and around the Decision Area and throughout Michigan and the Midwest. The Michigan Natural Resources and Environmental Protection Act 451 of 1994, Sections 324.41301-324.41325 regulate activities that may spread invasive species in Michigan. The Emerald ash borer (*Agrilus planipennis*) is widespread throughout Lower Michigan most often by people moving infested wood and wood products. All of Lower Michigan is under a quarantine that restricts the movement of wood and wood products to locations outside the quarantined area. The southwestern portion of the Decision Area has a population of feral pigs.

Many noxious weeds are spread by land-disturbing activities and by vehicle traffic. These species tend to be more abundant in areas with high road density. Roadsides throughout the Decision Area are likely locations for invasive species, since cars often spread seeds and other plant parts. The most likely locations for most of these species are in and around areas disturbed by road construction and land clearing.

Native American Religious Concerns

The BLM sent letters on May 1, 2013, to twelve Indian Tribes that have a known connection to the Decision Area, asking whether they can identify any concerns that would need special consideration with respect to the proposed action. No responses to these inquiries have been received by the BLM to date. The BLM's responsibility is limited to the area of surface disturbance if or when a proposal for development is submitted. The BLM would consider potential Native American religious concerns with each APD that is submitted under any lease(s) that would be approved pursuant to this EOI. No further analysis is warranted at this time.

Recreation

The Decision Area includes roughly 4,000 acres of public land that is open to recreational use. Most of this consists of the Manistee National Forest, and there is a 40-acre parcel of state-owned land just west of Brethren, in the Decision Area associated with EOI 102. A 70-acre parcel in Brethren may once have been part of the National Forest but appears to be a municipal park, including a historic Civilian Conservation Corps camp (See **Cultural/Paleontology**). Two public trails go through the area associated with EOI 103 (Figure 3, Appendix A), including three miles of the North Country National Scenic Trail, open for hiking, and four miles of a snowmobile trail called M120. The Manistee River, including the three miles inside the Decision Area, is a trout stream. An additional four miles of Bear Creek, an unnamed tributary to Bear Creek, and Boswell Creek are trout streams. The Manistee River is a popular paddling destination. Clarence Lake (11 acres), Lake Eleanor (14 acres), Dickson Lake (23 acres), and Center Lake (eight acres) are within the EOI 102 Decision Area. Clarence, Dickson, and Center Lakes are surrounded by private land and may or may not be accessible to the public. Lake Eleanor, in the middle of the EOI 102 Decision Area, is accessible via a municipal park in Brethren, which also has a basketball court, playground equipment, picnic areas, and public restrooms.

Socioeconomics

Manistee County is located in the northwestern portion of Lower Michigan, borders Lake Michigan to the west and the following counties: Benzie (north), Wexford (east), Mason (south), Benzie (west), Lake (southeast), and Grand Traverse (northeast). Manistee County is 542.15 square miles, with a population density of approximately 45 persons per square mile, significantly lower than that for the state as a whole (174). Its estimated population in 2012 was 24,672 a 0.2% decrease from the 2010 census (U.S. Census Bureau, 2013). The county seat is located in Manistee, in the southwestern part of the county. The project area encompasses several small isolated parcels in the central part of the county totaling 208 acres, and a one-mile buffer around each of these parcels, for a grand total of about 11,500 acres.

The distribution of population in Manistee County is 90.1% White, 3.1% Black, 2.7% Hispanic or Latino, 2.2% Native American or Alaska Native, 1.8% Two or More Races, 0.3% Asian, and 0.1% Native Hawaiian

or Pacific Islander. 81.3% of Manistee County residents are 18 years of age or older, with 21.1% aged 65 years or older; the state of Michigan has a population 18 years of age and older of 76.8%, with 14.1% aged 65 or older (U.S. Census Bureau, 2013).

In 2011, there were 15,649 housing units in the county with a homeownership rate from 2007-2011 of 80.2%, which is about 7% higher than the state as a whole. The median value of these owner-occupied homes was $120,000 for the period 2007-2011, much lower than that of the state ($137,300) (U.S. Census Bureau, 2013). 22.3% of housing units were categorized as "for seasonal, recreational, or occasional use," a much higher amount than for the United States as a nation (3.7%) (U.S. Department of Commerce, 2012b).

For the period 2007-2011, median household income was $41,169 for Manistee County, about $2,000 higher than for the state. Approximately 15% of persons lived below the poverty level, slightly lower than the 15.7% statewide that live below the poverty level. In 2011, 41.1% of Manistee County households received some form of Social Security payment, over 29% of households received retirement income, and 16% of households received benefits from the Supplemental Nutrition Assistance Program (SNAP); all of these totals are above the national averages for these respective categories (U.S. Department of Commerce, 2012c). 87.1% of the county population 25 years of age and over graduated from high school, slightly below the state average of 88.4%. Almost 18% of county residents 25 years of age and older have a bachelor's degree compared to 25.3% for Michigan as a whole. About 4% of residents speak a foreign language in the home; in total, about 9% of Michigan residents speak a foreign language in the home (U.S. Census Bureau, 2013).

The seasonally adjusted unemployment rate for Manistee County was 12.1% in February 2013, about a .5% decrease from the 12.6% rate in February 2012 and about 3% higher than Michigan's seasonally adjusted unemployment rate of 8.8% for February 2013. However, it is evident that employment in Manistee County increases during the tourist season from late spring to fall, as the rate fluctuated between 9.6% in April 2012 and 8.2% in October 2012. This pattern also held during the previous three years (U.S. Department of Labor, 2013).

Between 2001 and 2011, only the government sector gained employment (wage and salary jobs and proprietors), adding 149 total jobs during this period. Non-services-related industries decreased employment (-790), led by manufacturing (-632) and construction (-258); however, mining, forestry, fisheries, and related activities, and farming all had small gains in employment. Services-related industries also decreased employment overall, losing 187 total jobs, led by accommodation and food services (-230) and retail trade (-190); real estate and rental and leasing (+159) and arts, entertainment and recreation (+77) added the most total jobs in this sector from 2001-2011 (figures for the health care and social services industry were not known for this period). In 2011, government employed the most people in the county (2,915), followed by the retail trade (1,191) and manufacturing (856) (U.S. Department of Labor, 2012).

The mining industry increased employment for the period 2001-2011, adding 55 wage and salary jobs and proprietors during that time, for a total of 222. Mining and mining-related employment represents

around 2% of the total employment in the county. The average annual wage for mining industry jobs in Manistee County in 2011 was $32,697, well below the average annual wage for U.S. residents employed in the mining industry ($97,237) (U.S. Department of Labor, 2012).

Demographically, Manistee County is less affluent, has less college-educated residents, is more homogenous and much older than the average county in the state of Michigan.

Soils

Most of the Decision Area is dominated by nearly level or gently rolling soil types. The Decision Area contains 820 acres of land mapped in soil types that typically have slopes greater than 12 degrees (Figure 2, Appendix A).

Sensitive Species

Four species are listed on the USFWS list of endangered species known to occur in Manistee County, Michigan (U.S. Fish and Wildlife Service, 2012), as of January 4, 2013. Two of them, Pitcher's thistle (*Cirsium pitcheri*) and piping plover (*Charadrius melodus*), dwell on dunes and beaches, respectively, and are clearly not present in the Decision Area. The remaining two may be present in the Decision Area:

- Indiana bat (*Myotis sodalis*), an endangered mammal species whose summer habitat includes wooded stream corridors and woodlands within a few miles of streams
- Eastern massasauga (*Sistrurus catenatus*), a candidate snake species that uses various open and shrubby wetland habitats and nearby uplands

There are also 33 additional State-listed species that have been reported in Manistee County and that may be present in the EOI (Michigan Department of Natural Resources, 2013). Several of these species dwell primarily in wetland habitats, and a few of them dwell on dunes, which are not present in the Decision Area.

Vegetation

The National Forest lands within the Decision Area include 580 acres of aspen, 250 acres of lowland hardwoods, 2,400 acres of upland hardwoods, 520 acres of upland conifers, 150 acres of lowland conifers, 190 acres of shrubby vegetation, and 300 acres of open vegetation. Cursory interpretation of aerial photos on the non-National Forest lands reveals 140 acres of pine plantation, 1,000 acres of open vegetation, including some croplands, and the remainder in various forested vegetation types.

Visual Resources

Most of the Decision Area is undeveloped forest, but the Decision Area is broadly accessible by improved roads. As described in the **Vegetation** section, both private and public lands within the Decision Area include large patches of cultivated vegetation, such as pine plantations, regenerating aspens, croplands, and old fields. A small urban area makes up the unincorporated community of Brethren.

Water Resources and Water Quality

Wetlands are described in the **Floodplains, Wetlands, and Riparian Zones** section above. Lakes in the Decision Area are described in the **Recreation** section. The Decision Area contains 56 water wells. Most of these are in the vicinity of Brethren. Forty-seven of these wells have water less than 100 feet below the surface, and only one of them taps a water table deeper than 200 feet below the surface.

Wild and Scenic Rivers and Wilderness

The Decision Area includes three miles of the Manistee River, a designated National Scenic River (Figure 3, Appendix A).

CHAPTER 4 – ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

Introduction

This chapter assesses potential consequences associated with direct, indirect, and cumulative effects of the Proposed Action. As detailed in the RFDS (Appendix B), the proposed action would result in two acres of disturbance for the duration of construction and one acre of disturbance to be maintained for the duration of production. The No-Action Alternative, which would be to withhold the Federal minerals from leasing, would have no impacts on resources.

General Direct Impacts on All Resources:
The action of leasing the nominated parcels would, in and of itself, have no direct impact on resources. Any potential effects on resources from the sale of leases would occur during lease exploration and development activities. At the time of this review, it is unknown whether a particular lease parcel would be sold and a lease issued.

General Indirect Impacts on All Resources:
Oil and gas exploration and development activities such as construction, drilling, production, infrastructure installation, vehicle traffic and reclamation are indirect impacts of leasing and production of federal minerals on the nominated parcels in the Proposed Action. It is unknown when, where, how, or if future surface disturbing activities associated with oil and gas exploration and development such as well sites, roads, facilities, and associated infrastructure would be proposed. It is also not known how many wells, if any, would be drilled and/or completed, the types of technologies and equipment that would be used, and the types of infrastructure needed, for production of oil and gas. Thus, the types, magnitude and duration of potential impacts cannot be precisely quantified at this time, and would vary according to many factors. The potential impacts from exploration and development activities would be analyzed after receipt of an APD or sundry notice.

General Cumulative Impacts on All Resources:
Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions regardless of what agency or person undertakes such other actions (40 CFR 1508.7). The ability to assess the potential cumulative impacts at

the leasing stage for this project is limited for many resources due to the lack of site specific information for potential future activities. Upon receipt of an APD for any of the lease parcels addressed in this document, more site-specific planning would be conducted in which the ability to assess contributions to cumulative impacts in a more detailed manner would be greater due to the availability of more refined site-specific information about proposed activities.

Air Quality

Air quality modeling is directed under an MOU between the Departments of the Interior and Agriculture and the U.S. Environmental Protection Agency. This MOU directs that air quality modeling will be conducted for actions that meet certain geographic or emissions-related criteria:

- Creation of a substantial increase in emissions,
- Material contribution to potential adverse cumulative air quality impacts,
- Class I or sensitive Class II Areas,
- Non-attainment or maintenance area,
- Area expected to exceed National Ambient Air Quality Standards (NAAQS) or Prevention of Significant Deterioration (PSD) increment.

The proposed action is not expected to produce amounts of any of these pollutants in excess of *de minimis* amounts, which are defined by the U.S. Environmental Protection Agency (2011) as maximum amounts that will not threaten a state's efforts to attain or maintain conformity with the National Ambient Air Quality Standards (NAAQS). Trucks using temporary roads are expected to create dust, depending on the volume of traffic, rainy or dry weather conditions, and the operators' efforts to suppress dust by wetting the roads. If an operator hauls water to a drill pad instead of obtaining the water from a dedicated well, then there will be an increase in truck traffic roughly in proportion to the volume of water used.

Climate Change

Many aspects of oil and gas production emit greenhouse gases (GHG). The primary aspects include the following:

- Fossil fuel combustion for construction and operation of oil and gas facilities – vehicles driving to and from production sites, engines that drive drill rigs, etc. These produce CO_2 in quantities that vary depending on the age, types, and conditions of the equipment as well as the targeted formation, locations of wells with respect to processing facilities and pipelines, and other site-specific factors.
- Fugitive methane – methane that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global methane emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 CFR 98, to estimate and report their methane emissions to the EPA (U.S. Environmental Protection Agency, 2013).
- Combustion of produced oil and gas – it is expected that drilling will produce marketable quantities of oil and/or gas. Most of these products will be used for energy, and the combustion

of the oil and/or gas would release CO_2 into the atmosphere. Fossil fuel combustion is the largest source of global CO_2.

In recent years, many states and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. Links to statewide GHG emissions inventories are available (U.S. Environmental Protection Agency, 2012) as well as guidelines for estimating project-specific GHG emissions (U.S. Environmental Protection Agency, 2013). A GHG emissions estimate will be conducted at the APD phase.

Many oil and gas operators are already participating in Natural Gas STAR, a voluntary EPA program that identifies sources of fugitive methane and seeks to minimize fugitive methane through careful tuning of existing equipment and technology upgrades. The BLM would encourage operators to participate in this voluntary program.

Fish and Wildlife

The proposed action could potentially result in the clearing of two acres of land, which may include either forested or open habitat. Impacted areas would be reclaimed at the end of their use as well pads or construction areas. The area impacted by clearing a forest is typically larger than just the area cleared. Clearing a corridor for a road or pipeline separates a block of forest into smaller blocks, a process called *fragmentation*. A fragmented forest contains far less useful habitat than an equally-sized block of continuous forest. This is due in part to the fact that many species will not cross the open corridors, where they are more susceptible to predation than in the forest. A closely related concept to fragmentation is *edge effects*, which refers to the differences in climate, predation exposure, and other factors that exist up to 100 meters into a forest from the edge. Edge effects increase the area impacted beyond just the area directly disturbed.

Floodplains, Wetlands, and Riparian Zones

Operators proposing to drill will be required to verify the absence of wetlands or to take steps to avoid impacting them, in compliance with Executive Order 11990, the Clean Water Act, and state law. A lease stipulation (see Appendix B) will prohibit surface occupancy in wetlands. This will prevent direct filling of wetlands without necessarily preventing access to minerals under the wetlands, as wells could potentially be directionally drilled from upland locations. The BLM will closely analyze areas proposed for drilling in APDs, since regional wetland inventories often do not capture small wetlands.

Geology/Mineral Resources/Energy Production

The Antrim Shale is the only formation that is likely to be impacted by the proposed action.

Hazardous Wastes

Drilling introduces various chemicals into the environment that become waste products after use. These include drilling and completion fluids, which may contain heavy metals, hydrochloric acid, hydrocarbons, and brine. These materials are typically stored temporarily on-site. Michigan regulations require that field fluid wastes be injected into underground formations that are isolated from freshwater by impervious strata. These wastes are exempt from the Federal definition of hazardous waste and are referred to as *special wastes* by the EPA. Under certain circumstances, wastes may be

disposed of in the annular spaces between strings of casing. Also, brines that are rich in calcium and that contain minimal concentrations of hydrogen sulfide and a few aromatic hydrocarbons may be used for ice and dust control and road stabilization (Michigan Department of Environmental Quality, 2013b). Environmental impacts to the Decision Area may occur under several circumstances. Chemicals may be spilled or leaked from a temporary storage facility or container used for transportation. Chemicals may contaminate groundwater resources in the event of improper design, construction, or use of an injection well intended for disposal of wastes. Surface introduction of restricted amounts of hydrogen sulfide and hydrocarbons may occur in the event that the state of Michigan permits the surface spreading of brines, as provided for in the state of Michigan's regulations.

Invasive Species/Noxious Weeds

Construction of roads, well pads, pipelines, and other structures associated with oil and gas development can be expected to spread invasive species and/or noxious weeds in two general ways. First, increased vehicle traffic may carry seeds, plant parts, or other live organisms that may become established within the Decision Area. This could introduce new species from outside the Decision Area or from one part of the Decision Area to another. The risk of such propagation may be estimated in terms of the area disturbed, the volume of vehicle traffic, and the presence of invasive species in locations along the routes that traffic uses on the way to and within the Decision Area. While the last two variables would be unreasonable to attempt to quantify without site-specific analysis, we may consider various scenarios of infestation. The two acres described in the RFDS would be susceptible to direct infestation by non-native, invasive plant species that thrive in disturbed conditions. However, many of these species are able to propagate into undisturbed areas, and large areas of otherwise intact habitat could be infested by plant parts that are introduced into the Decision Area on equipment and vehicles. Therefore, it is possible that far more than the directly-disturbed area of land could be infested in non-native, invasive plant species as a result of the disturbance.

The second way that oil and gas development may result in the propagation of invasive species is by creating open corridors and forest edges that are highly susceptible to edge-loving species. Where the forest canopy is broken, invasive species that thrive in sunny conditions may thrive. This will likely not be a major factor in this situation, since the high proportion of cleared, agricultural land in the Decision Area makes it unlikely that an operator would choose to drill in a forest. The BLM would incorporate appropriate BMPs (Wisconsin Council on Forestry, 2012) as conditions of approval into permits to drill in order to prevent the introduction or spread of invasive species into affected areas.

Recreation

Well construction, operation, and, eventually, abandonment will create noise and change views in ways that will make the area less attractive to people who desire solitude and natural surroundings. Also, the noise from construction will drive away game animals.

Noise that is generated by construction or operation is naturally damped as it travels through an environment, and the nature of the environment through which it travels, such as open air, buildings, or woods, determines the rate at which noise is damped. Finally, the time during which the woods are

disturbed with noise affects the value of the impact, since hunters and wildlife are present and/or active at some times of the year more than at others.

Construction equipment generates between 70 and 115 decibels (dB) (Bureau of Land Management, 1998), and a forest may damp noise by five to 20 dB per 100 feet. Hunters or game animals are unlikely to tolerate noise above 40 dB. Using these figures, the affected radius with respect to hunting around construction operation would range from 150 feet to 1500 feet (0.28 mile). The damping effect of the woods would be at its highest during summer, when leaves aid in damping the sound, or in winter under thick snow cover. The areas to be affected by these minimum and maximum radii are, respectively, 1.6 acres and 160 acres per point source of the described construction noises.

These noises are expected to continue non-stop for 30 days for each well that is constructed. The time of year of construction has a critical effect on the value of the disruption. For example, noise created at the height of a hunting season would impact the hunting in the affected area. It may also force animals to move to other, nearby areas, making them easier for hunters to target and improving hunting success. If the noise were created outside of a hunting season, the animals may reacclimate to the site and behave naturally by the time hunting begins, and hunters may not even be aware of the disturbance if they do not see the well(s).

Mitigation of Effects

As the BLM receives and processes APDs, the BLM, in consultation with MDNR, operators, and other parties, will seek to minimize auditory or visual impacts on recreational resources in the Decision Area, such as the trails of the North Country National Scenic Trail and the various lakes, streams, and rivers, through simple, reasonable measures, such as restricting construction to certain times of year or requiring the preservation of plants that provide visual screening.

Socioeconomics

Local economic effects of leasing federal minerals for oil and gas exploration, development, and production are influenced by the number of acres leased and estimated levels of production.

The acres leased, number of wells drilled, and level of production all influence local employment, income, and public revenues (indicators of economic impacts).

Federal oil and gas leases generate a one-time lease bonus bid as well as annual rents. The minimum competitive lease bid is $2.00 per acre. If parcels do not receive the minimum bid they may be leased later as noncompetitive leases that don't generate bonus bids.

Lease rental is $1.50 per acre per year for the first five years and $2.00 per acre per year thereafter. Typically, oil and gas leases expire after 10 years unless held by production. During the lease period annual lease rents continue until one or more wells are drilled that result in production and associated royalties.

For the state of Michigan in 2010, average wellhead prices were $74.91 per barrel (bbl.) for crude oil and $3.79 per thousand cubic feet (MCF) for natural gas. Statewide average output per producing well was 1.652 bbls. of crude oil and 12,891 MCF for natural gas from 3,885 producing crude oil wells and 10,253

producing natural gas wells, respectively. In 2010, the state of Michigan ranked 17th in crude oil production and 16th in natural gas production in the United States. As of 2010, Manistee County was the fifth-highest oil and gas producing county in Michigan, accounting for 4.21% of all state production (Independent Petroleum Association of America, 2012).

Federal revenues from oil and gas production disbursed to the state of Michigan between 2007 and 2012 averaged $645,363 per year (U.S. Department of Interior, 2013a). From this amount, revenues are disbursed to each local county of production. These revenues help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

In 2012, Manistee County received $83,302 in payments directly related to oil and gas production on federal lands (U.S. Department of Interior, 2013b). Additionally, a severance tax is levied by the state of Michigan on each barrel of crude oil or each thousand cubic feet of natural gas produced. In 2010, Michigan received over $57 million in severance taxes from all oil and gas produced in the state (Independent Petroleum Association of America, 2012) and some of this money was disbursed to each county.

The proposed action and the associated RFDS indicate that a total of one to two wells could potentially be drilled on these parcels. If the lease is sold and it leads to actual well drilling and economic production, it would likely bring very small revenues in the form of royalty payments, severance taxes, and rent monies to the United States, the state of Michigan, and Manistee County. Economic production would provide wages and salaries to employees, maintenance staff, and contractors who are employed in drilling wells, and sales to area hotels, restaurants, and other businesses that serve drillers for the duration of drilling and similar construction-related benefits later as wells are abandoned and sites restored.

Exploration, drilling and production could create an inconvenience to people living adjacent to leases and for visitors and recreational users due to increased traffic and traffic delays, and light, noise and visual impacts. This could be especially noticeable in rural areas where oil and gas development has not occurred previously. The amount of inconvenience could depend on the activity affected, traffic patterns within the area, noise and light levels, length of time and season these activities occur, etc. In addition, competition for housing could occur in some communities. Considering the limited potential production on the proposed parcels, cumulatively, the proposed action should have a minimal effect upon the lives of local residents and visitors.

Soils

Because permitted well pads could be scattered at various locations throughout the Decision Area, it is impossible to determine how much disturbance would take place on steep slopes and potentially highly erodible soils. If an operator were to apply for a permit to drill on a slope greater than 10 percent or on a soil unit with a severe erosion hazard, the BLM would incorporate soil-conserving BMPs as conditions

of approval into the drilling permit. The Michigan DNR and DEQ have compiled a guide to using BMPs to prevent erosion (Michigan Department of Natural Resources and Michigan Department of Environmental Quality, 2009). The Michigan water quality BMPs address several activities that are common in oil and gas drilling, such as building temporary roads and clearing land. The BLM would require the use of appropriate BMPs, through consultation with the MDNR, as conditions of approval for APDs.

Sensitive Species

Since stipulations will prohibit surface occupancy in wetlands, habitat-related impacts to species that dwell in wetlands are not expected to result from the proposed action. Lessees would be required to conduct surveys of areas that may contain endangered species and to adhere to the recommendations provided by the Fish and Wildlife Service for avoiding and minimizing impacts to species.

Vegetation and Visual Resources

Impacts for vegetation and visual resources are combined because the primary visual quality of the Decision Area is defined by the vegetation or the industrial activities that replace the vegetation. A well in an agricultural area would be visible from throughout the field, resulting in an industrial element being present in an otherwise agricultural setting. If a well were to be constructed in a forested area, it would be visible from only a short distance due to the forest cover. If we assume that the two-acre well pad construction site is roughly square-shaped and that the well pad will be visible from up to 100 feet into the forest, then the well pad would convert two acres of forest to an industrial appearance. If a well were productive, the well pad would then be reduced in size, and the area no longer in use would be restored with native vegetation or other vegetation appropriate for screening and other site-specific needs.

Cumulative Impacts to Vegetation and Visual Resources

Most of the forested stands in the Decision Area are prescribed to be harvested within the foreseeable future. Well construction in a forest would have a greater impact than the impact of selective or clear-cut logging, described as follows:

- Complete vegetation removal – while prescribed forestry practices leave selected trees as well as shrubs and herbaceous vegetation, well pad construction would result in total clearing.
- Retention of cleared areas – while clearcut areas would be allowed, under normal forestry use, to regenerate or would be actively planted, well pads would be maintained in a cleared state for the duration of construction or for the well's life.

Water Resources and Water Quality

Construction of well pads produces water quality impacts similar to those from other types of construction, such as increased total suspended solids downstream of the sites. Lakes, streams, and wetlands will be protected from direct impacts by lease stipulations, and the same Best Management Practices that are applied to protect potentially highly erodible soils will be used to protect surface waters from runoff.

Some of the water that is used in hydrofracture remains in the producing formation, and some of that water returns to the surface, where it can be disposed of or treated and reused. Water that returns to the surface, known as *produced water* or *frack water*, must be treated for reuse or injected into deep disposal wells.

Both hydrofracture and deep-well disposal take place in formations thousands of feet below the lowest potable water, making contamination of potable water supplies unlikely (Abdalla, 2012). Fluids have been found not to migrate such long distances through single fractures, but it is feasible that multiple fractures may permit migration over longer distances (Mooney, 2011). Likewise, natural fissures in the bedrock may allow fluids to travel toward potable water supplies. Fractures may also connect to existing wells, allowing contaminants to travel through the wells' annular spaces to fresh water aquifers. These spaces are sealed with cement, and failure of these cement seals is considered to be an important vulnerability in well construction and permitting.

There is anecdotal evidence of fracking chemicals contaminating drinking water wells (Lustgarten, 2011), and there are studies demonstrating that horizontal drilling in shale gas formations does not contaminate them (Boyer, 2012). The U.S. EPA is planning to conduct a study of the issue (U.S. Environmental Protection Agency, 2011), and the BLM will continue to consider ongoing scientific evidence as it becomes available throughout the APD process.

As described in Chapter 2, drilling and completion phases consume quantities of water that are regulated by the State of Michigan. Anyone wishing to withdraw water at a rate of more than 70 gallons per minute must use the online *Water Withdrawal Assessment Tool* (Institute of Water Research, 2012) and obtain a registration for the withdrawal. Depending on the need and local availability of groundwater, water would likely be obtained from a well or be delivered from a remote source by a pipeline or trucks. The volume of water required would depend on the completion methods used and depth of the oil/gas well, and the impacts of using a certain volume of water would depend upon the aquifer characteristics and the aquifer's proximity to surface water resources.

PERSONS, GROUPS, AND AGENCIES CONSULTED

Consultation and Coordination

List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
U.S. Department of Agriculture, Forest Service, Manistee National Forest	Lease stipulations and restricted areas in Manistee National Forest	See **Appendix C - Stipulations**.
Brian D. Conway, State Historic Preservation Officer	Antiquities Act, Section 106 of the National Historic Preservation Act, 36 CFR 800 (as amended)	No response, assumes no concerns or issues at this time.
Kurt Perron, Chairman Bay Mills Indian Community 12140 West Lakeshore Drive Brimley, MI 49715	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Alan Shively, Chairman Lac Vieux Desert Band of Lake Superior Chippewa Indians P.O. Box 249 Watersmeet, MI 49969	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Aaron Payment, Chairman Sault Ste. Marie Tribe of Chippewa Indians 523 Ashmun St. Sault Ste. Marie, MI 49783	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders	No response, assumes no concerns or issues at this time.
Dexter McNamara, Chairman	36 CFR 800 (as amended), The	No response, assumes no concerns or

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Little Traverse Bay Bands of Odawa Indians 7500 Odawa Circle Harbor Springs, MI 49740	National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	issues at this time.
Alvin Pedwaydon, Chairman Grand Traverse Band of Ottawa & Chippewa Indians 2605 N. West Bay Shore Dr. Peshawbestown MI 49682-9275	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Kenneth Meshigaud, Chairman Hannahville Indian Community N14911 Hannahville B-1 Rd. Wilson MI 49896	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders	No response, assumes no concerns or issues at this time.
Homer Mandoka, Tribal Council Chairperson Nottawaseppi Huron Band of Potawatomi 2221 1-½ Mile Road Fulton, MI 49052	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
D.K. Sprague, Chairman Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians PO Box 218 Dorr, MI 49323	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other	No response, assumes no concerns or issues at this time.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
	statutes and executive orders.	
Matthew Wesaw, Mekko Pokagon Band of Potawatomi Indians 58620 Sink Road, Box 180 Dowagiac, MI 49047	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Warren Swartz, Jr., President Keweenaw Bay Indian Community 16429 Beartown Rd. Baraga, MI 49908	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	BLM received letter from Tribe dated June 18, 2013 stating no properties of interest regarding religious or cultural sites, but Tribe wishes to be notified if artifacts or human remains are discovered.
Dennis Kequom, Chief Saginaw Chippewa Indian Tribe 7070 East Broadway Road Mt. Pleasant, MI 48858	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Larry Romanelli, Tribal Ogema Little River Band of Ottawa Indians 375 River Street Manistee, MI 49660	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.

List of Preparers

BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Derek Strohl	Natural Resources Specialist	Air Quality, Climate Change, Prime and Unique Farmlands, Fish and Wildlife, Floodplains, Hazardous Wastes, Invasive Species/Noxious Weeds, Recreation, Soils, Sensitive Species, Vegetation, Visual Resources, Water Resources/Quality (Drinking/Surface/Ground), Wetland/Riparian Zones, Wild and Scenic Rivers, and Wilderness; Preparer
Jarrod Kellogg	Archeologist	Cultural Resources, Paleontology, Native American Religious Concerns
Kurt Wadzinski	Planning and Environmental Coordinator	Environmental Justice, Socioeconomics; Editor
Jeff Nolder	Geologist	Geology/Mineral Resources/Energy Production

Preparer — June 20, 2013 — Date

Kurt J. Wadzinski — Planning & Environmental Coordinator — June 20, 2013 — Date

Assistant Field Manager, Natural Resources — 21 JUN 2013 — Date

REFERENCES

Abdalla, C., et al. (2012). *Water's journey through the shale gas drilling and production processes in the Mid-Atlantic Region*. State College, PA: The Pennsylvania State University Cooperative Extension. Retrieved from http://pubs.cas.psu.edu/FreePubs/PDFs/ee0023.pdf.

Anderson, L. (2011, December 11). Traverse Corridor: A prehistoric crossroads. *Traverse City Record-Eagle*. Retrieved from http://record-eagle.com/local/x1181957070/Traverse-Corridor-A-prehistoric-crossroads.

Arcadia Historical Museum. (2013a). *Museum building tour*: *Early Indian artifacts.* Retrieved from http://www.arcadiami.com/Tours/Museumtour/tourprehistory2012.htm.

Arcadia Historical Museum. (2013b). *Native Americans in Arcadia*. Retrieved from http://www.arcadiami.com/History/indianhst.htm.

Arcadia Historical Museum. (2013c). *Timeline for the Arcadia, Michigan area. Arcadia timeline: Factory period*. Retrieved from http://www.arcadiami.com/Timeline/timelinefactorytown.htm.

Bellinger, S. & Lintemuth, R. (1991). *Michigan oil and gas story: County by county*; Mount Pleasant, MI: Michigan Oil and Gas News.

Boden, T. A., Marland, G., & Andres, R. J. (2010). *Global, regional, and national fossil-fuel CO_2 emissions*. U.S. Department of Energy. Oak Ridge, TN: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory. doi 10.3334/CDIAC/00001_V2010.

Boyer, E. W., et al. (2012). *The Impact of Marcellus gas drilling on rural drinking water supplies*. The Center for Rural Pennsylvania. Retrieved from www.rural.palegislature.us/documents/reports/Marcellus_and_drinking_water_2012.pdf.

Bureau of Land Management. (1985). *Michigan resource management plan*. Milwaukee District Office, Milwaukee, WI.

Bureau of Land Management. (1998). *Mosquito Creek Lake draft planning analysis/Environmental assessment*. Milwaukee District Office, Milwaukee, WI.

Dolton, G. (1995). Michigan Basin Province (063). In Gautier, D., Dolton, G., Takahashi, K., and Varnes, K., (Eds.), *1995 national assessment of United States oil and gas resources--Results, methodology, and supporting data*. U.S. Geological Survey Digital Data Series DDS-30.

Fitting, James E. (1978). "Regional Cultural Development, 300 BC to AD 1000." In *Handbook of North American Indians, Vol. 15: Northeast*. Bruce G. Trigger, ed. Washington, D.C.: Smithsonian Institute.

Grand Traverse County, Michigan. (2006). *History of Grand Traverse County*. Retrieved from http://www.co.grand-traverse.mi.us/Welcome/history_of_grand_traverse_county.htm.

Independent Petroleum Association of America. (2012). Michigan. In F. J. Lawrence (Ed.), *2011-2012 IPAA oil & gas producing industry in your state, Vol. 81* (pp. 65-66). Washington, DC: Independent Petroleum Association of America. Retrieved from http://www.ipaa.org/.

Institute of Water Research. (2012). *Michigan's water withdrawal assessment tool*. Retrieved from http://www.miwwat.org/.

Kappler, C. J. (Ed.). (1904). Treaty with the Ottawa, etc. 1836. In *Indian Affairs: Laws and Treaties, Vol. II, Indian Treaties*. Washington, DC: Government Printing Office. Retrieved from http://digital.library.okstate.edu/kappler/Vol2/treaties/ott0450.htm#mn2.

Lustgarten, A. (2011). *Scientific study links flammable drinking water to fracking*. New York: ProPublica, Inc. Retrieved from http://www.propublica.org/article/scientific-study-links-flammable-drinking-water-to-fracking.

Michigan Department of Environmental Quality. (2013a). *Environmental mapper*. Retrieved from http://www.mcgi.state.mi.us/environmentalmapper/.

Michigan Department of Environmental Quality. (2013b). *Michigan's oil and gas regulations*. Retrieved from http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231-9245--,00.html.

Michigan Department of Environmental Quality. (2013c). *Water well viewer*. East Lansing, MI: Michigan State University Remote Sensing & GIS Research and Outreach Services. Retrieved from http://wellviewer.rsgis.msu.edu/.

Michigan Department of Environmental Quality. (2013d). *GeoWebFace*. Retrieved from http://ww2.deq.state.mi.us/GeoWebFace/#.

Michigan Department of Natural Resources and Michigan Department of Environmental Quality. (2009). *Sustainable soil and water quality practices on forest land*. IC4011. Lansing, MI. Retrieved from http://michigan.gov/documents/dnr/IC4011_SustainableSoilAndWaterQualityPracticesOnForestLand_268417_7.pdf.

Mooney, C. (2011). The truth about fracking. *Scientific American*. *305*(5), 80-85.

National Park Service. (2012). *Skegemog Point site*. National Register of Historic Places. Retrieved from http://nrhp.focus.nps.gov/natreg/docs/Download.html.

National Park Service. (2013). *Manistee County*. National Register of Historic Places. Retrieved from http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome.

Stone, L. M., & Chaput, D. (1978). History of the Upper Great Lakes area. In B. G. Trigger (Ed.), *Handbook of North American Indians, Vol. 15: Northeast* (pp. 602-609). Washington, DC: Smithsonian Institute.

URS Corporation. (2010). *Climate change supplementary information report, Montana, North*

Dakota and South Dakota Bureau of Land Management. Denver, CO. Retrieved from http://www.blm.gov/mt/st/en/prog/energy/oil_and_gas/leasing/leasingEAs.html.

U. S. Census Bureau. (2013). *Manistee County quick facts from the U.S. Census Bureau*. Retrieved from http://quickfacts.census.gov/qfd/states/26/26101.html.

U. S. Department of Commerce. (2012a). *Manistee County, Michigan employment by industry, 2001-2011*. Table CA25N. Washington, DC: Bureau of Economic Analysis, Regional Economic Information System. Retrieved from http://www.bea.gov/national/index.htm#gdp.

U.S. Department of Commerce. (2012b). *Housing characteristics, 2011 – Manistee County, Michigan*. Washington, DC: Census Bureau, American Community Survey Office. Retrieved from http://www.census.gov/acs/www/.

U.S. Department of Commerce. (2012c). *Number of households receiving earnings, by source, 2011 – Manistee County, Michigan*. Washington, DC: Census Bureau, American Community Survey Office. Retrieved from http://www.census.gov/acs/www/.

U.S. Department of Interior. (2013a). *Disbursements since inception 1982 – current*. Office of Natural Resources Revenue Statistical Information. Retrieved from http://statistics.onrr.gov/Information.aspx.

U.S. Department of Interior. (2013b). *Payments in Lieu of Taxes (PILT) – County payments*. Retrieved from http://www.doi.gov/pilt/county-payments.cfm.

U.S. Department of Labor. (2012). *Quarterly census of employment and wages*. Washington, DC: Bureau of Labor Statistics. Retrieved from http://www.bls.gov/cew/cewbultn11.htm.

U. S. Department of Labor. (2013). *Local area unemployment statistics*. Washington, DC: Bureau of Labor Statistics. Retrieved from http://www.bls.gov/lau/.

U.S. Environmental Protection Agency. (2012). *Climate change – Regulatory initiatives*. Retrieved from http://www.epa.gov/climatechange/emissions/subpart/w.html.

U.S. Fish and Wildlife Service. (2013). *Michigan county distribution of federally-listed threatened, endangered, proposed, and candidate species*. Retrieved from http://www.fws.gov/midwest/endangered/lists/michigan-cty.html.

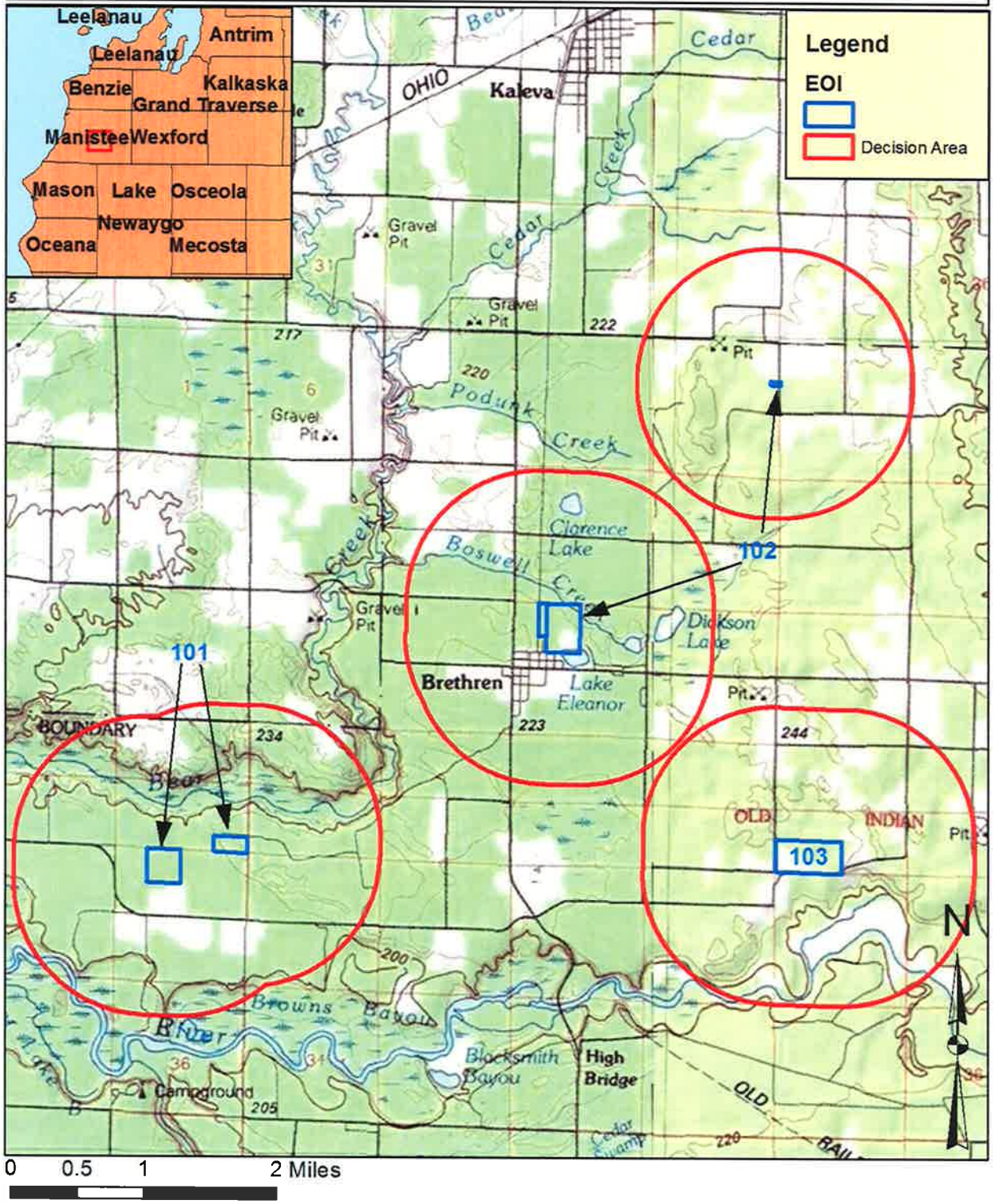
U.S. Geological Survey. (1983). *Buckley 7 1/2' topographic quadrangle*, scale 1:24,000 (Provisional Edition).

Whitney, G. G. (1987). An ecological history of the Great Lakes Forest of Michigan. *Journal of Ecology, 75*(3), 667-684.

Wisconsin Council on Forestry. (2012). *Invasive species best management practices*. Retrieved from http://council.wisconsinforestry.org/invasives/.

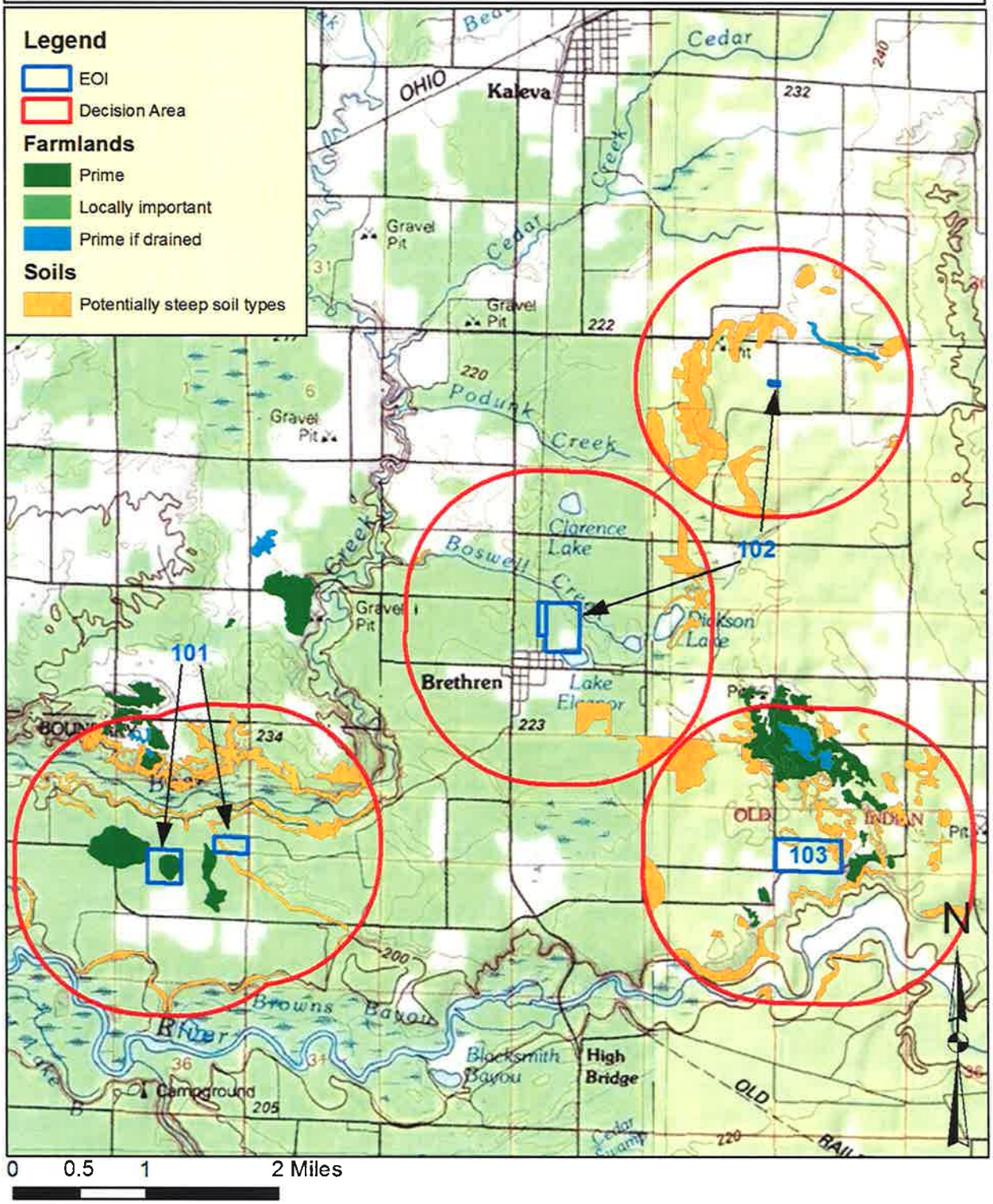
APPENDIX A – Figures

Figure 1. Locations of EOIs and Decision Area.



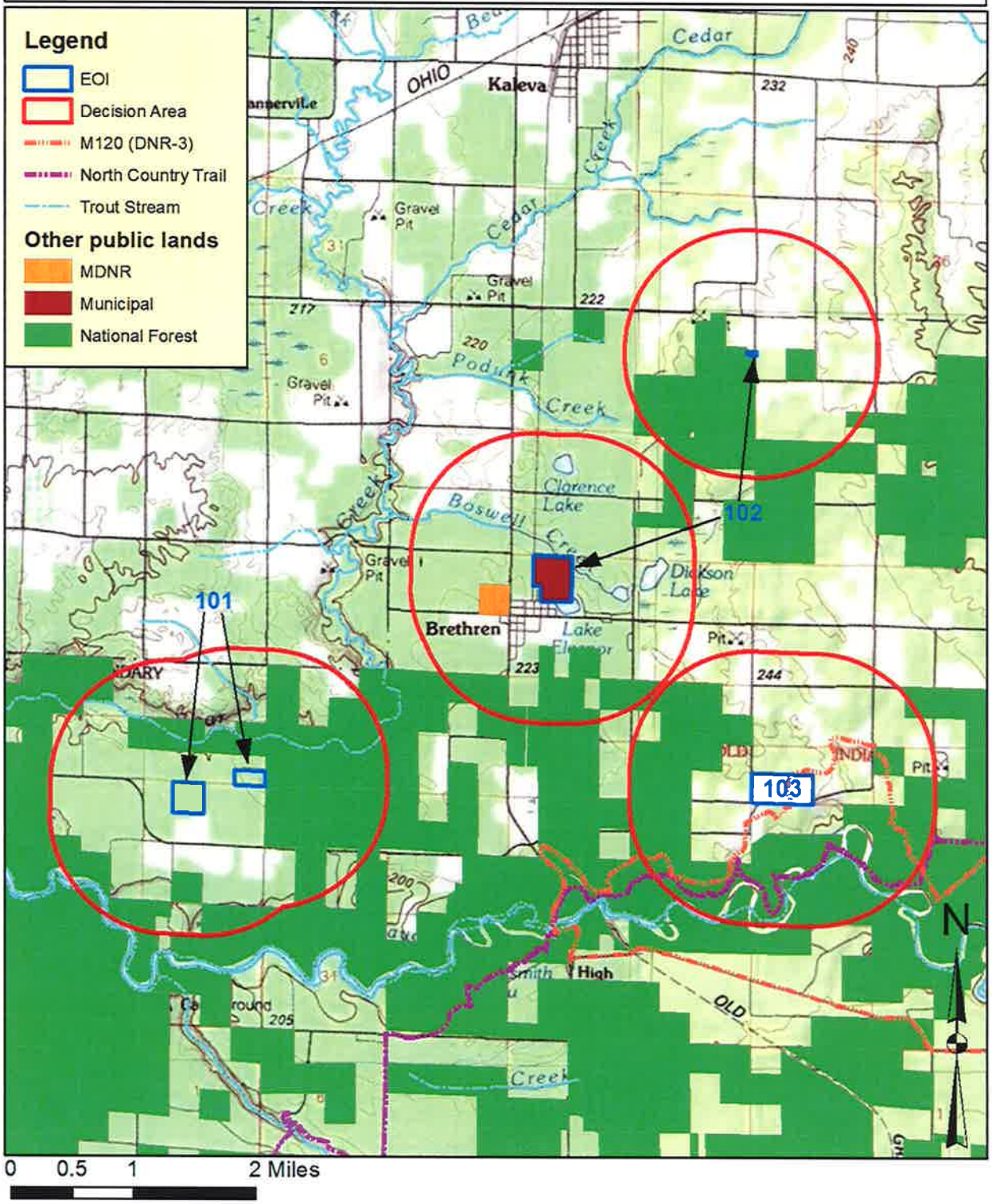
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 2. Prime and unique farmlands and steep soils.



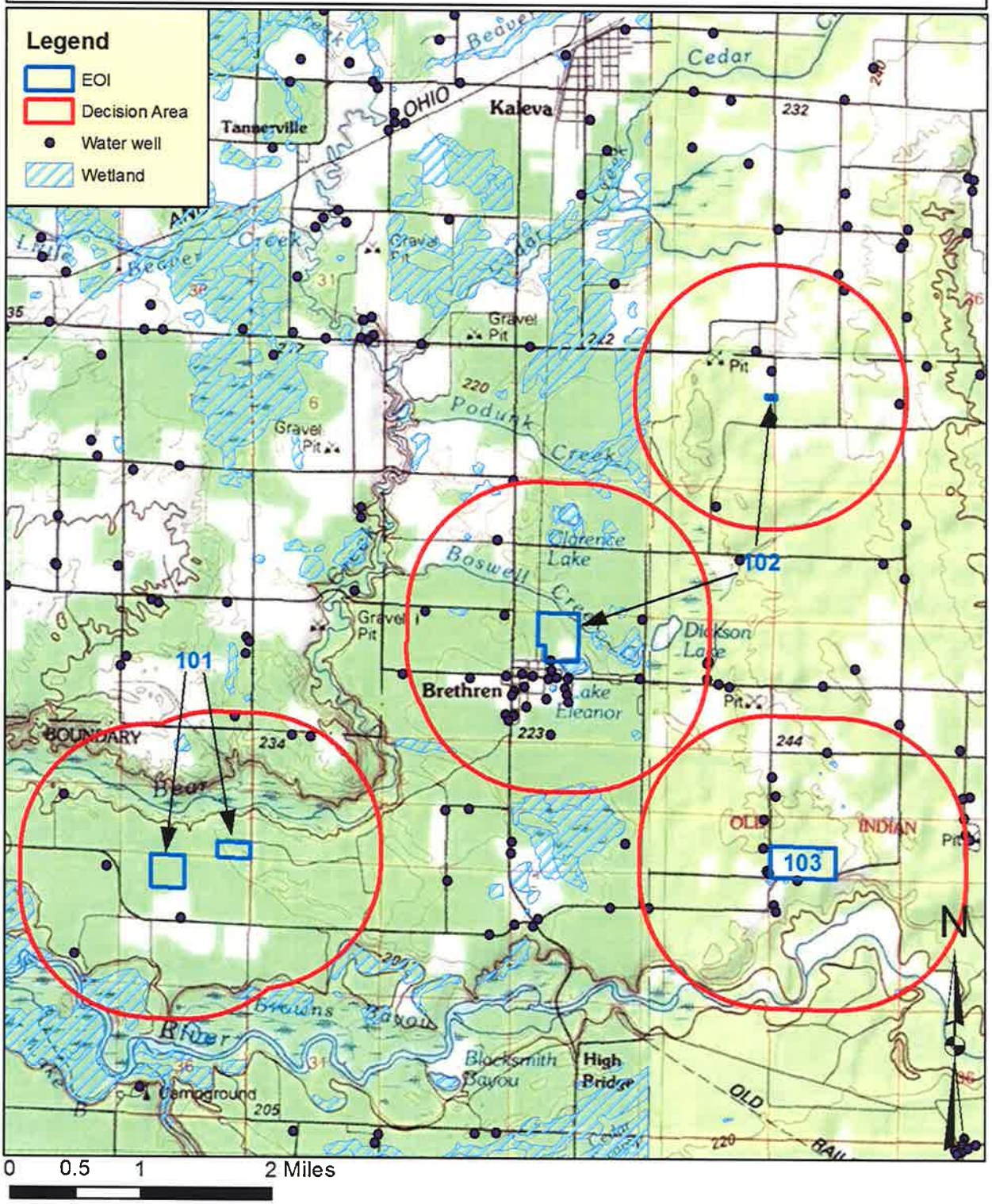
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 3. Selected recreational areas



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 4. Wetlands and water wells



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

APPENDIX B – Reasonably Foreseeable Development Scenario

I. Summary

The Reasonably Foreseeable Development Scenario (RFDS) for the approximately 11,500 acre analysis area indicates that, if leases issue, one well pad of 1.5 acres and an access road of ¼ mile may be built on or adjacent to the federal leaseholds, thus 2 acres would be disturbed as a result of this action. The pad and road could support two wells. There is currently no land disturbance as a result of oil and gas operations in the analysis area.

The federal mineral estate would be included in a spacing unit approved by the State of Michigan after the type of well and its production, if any, is determined. Such a unit would be at least 80 acres and could increase if a horizontal well is drilled. The only known productive formation near the properties is the Late Devonian Antrim Shale. No hydrocarbon production has been established in the vicinity of the tracts and it is considered unlikely that any other formations will produce commercial quantities of oil and gas. Few exploratory tests have been conducted near the tracts.

Long-term disturbance of 1acre would occur if production is established. The initial production period would be about 10 years.

II. Introduction

A "Reasonably Foreseeable Development Scenario" (RFDS) is a projection of oil and gas exploration, development, production, and reclamation activity. The RFDS projects oil and gas activity in a defined area for a specified period of time, based on the best available information and data. This RFDS was prepared in response to Expressions of Interest (EOI) 101, 102 and 103, submitted by MCN Oil and Gas Company by lease offers MIES 51664, 51665 and 51666, respectively. MCN Oil and Gas Company later became DTE Gas and Oil Company, a subsidiary of DTE Energy. DTE Gas and Oil was recently acquired (as DTE Gas Resources) by Atlas Energy Partners, LP.

The RFDS provides a baseline for conducting the required National Environmental Policy Act (NEPA) analysis before leasing can take place. This analysis will address potential interference with other surface uses and potential conflicts with surface resources. The federal government owns 100% of the mineral estate associated with all of the properties with the exception of EOI-103 which has 50% federal minerals in Township 22 North, Section 23, Range 14 West, S½SW¼. Private parties own the surface. Any proposed oil and gas operations on the leased area would require compliance with federal and state laws, regulations, and policies, as well as coordination with surface owners. Should a well be drilled directionally from a location off the lease, evidence of landowner permission for surface use would be required.

Information regarding the wells and the drilling results used in this RFDS can be seen at the website created by the Michigan Department of Environmental Quality, Office of Geological Survey: http://ww2.deq.state.mi.us/GeoWebFace/#

Proposed Action: The Bureau of Land Management (BLM), the agency responsible for federal mineral leasing, is proposing to offer federal oil and gas leases to satisfy federal policy regarding requests from private individuals or companies to explore for and establish production from unleased federal minerals.

The lease sale would be conducted by competitive bidding with the amount of bonus bid per acre offered by the prospective lessee determining the owner of the lease. The term of a federal lease is ten years; if after that time the lessee has not established production, the lease expires. If a lease operator establishes production, the lease remains in effect until the lease no longer produces in paying quantities. The lease operator must make annual rental payments of $1.50 per acre for the first five years of the lease term and $2.00 per acre thereafter. Royalty on the value of the production is 12.5%. Before any surface-disturbing activities related to oil and gas development may begin, the lessee or lease operator must establish or furnish proof of a performance bond to ensure compliance with all lease terms, including proper plugging, abandonment, and reclamation.

Any well drilled and completed as a result of lease issuance would be drilled from private surface into federal minerals; however, Federal law requires analysis under NEPA.

III. Description of Geology

Location and General Geology: The tracts are located in central Manistee County, all within three miles of the village of Brethren. All are within the Manistee River watershed. The tracts are covered by up to 600 feet of glacial material, the surfaces of which consist of moraine and/or sand and gravel of glacial lakes. At the base of the glacial material are the Coldwater and Ellsworth shales of Late Devonian age. The properties range in elevation from about 900 feet atop a moraine in the northeastern part of the area to about 700 feet in a stream valley to the southwest.

The region is situated within the northwestern quadrant of the Michigan Basin, a roughly circular sedimentary basin that encompasses the Lower Peninsula, the eastern portion of the Upper Peninsula, and parts of adjacent states. The sediments may reach up to almost 5 kilometers in depth near Saginaw, roughly the center of the basin, but are estimated here to be somewhat less than three kilometers thick. Beneath the sedimentary section are crystalline basement rocks of the Granite-Rhyolite Province.

Economic Geology: Oil, natural gas and gas condensate of the Northern Michigan Reef Trend reservoirs have been produced in Manistee County since 1973. The reefs, known as pinnacle reefs because of their great heights relative to the size of their bases, were formed by a combination of stromatoporoids and corals. The reefs range in area from a few square feet to many acres. They formed in a subsiding basin in warm, shallow waters, but their growth rates kept up with sedimentation rates, allowing them to reach heights of up to hundreds of feet. Reefs also formed along the flanks of the main trend, but shallower reefs were flushed of hydrocarbons by groundwater and deeper reefs were plugged by salt and did not form hydrocarbon reservoirs. The federal properties are in the deeper, salt-plugged portion of the trend. The nearest reef production is approximately five miles to the west of the Section 25 tract.

The Antrim Shale, an organic shale formation which underlies the Ellsworth Shale, is the only productive formation in the area. The production nearest the federal properties is in T. 22 N., R. 15 E., Section 14, about 2 miles north of the Section 24 property.

IV. Past and Present Oil and Gas Exploration Activity

Geophysical Exploration:

The reef trend was discovered using high resolution seismic surveying equipment that was not generally available until the late 1960s. Prior to that time, a few reefs were discovered by chance or the use of gravity surveys. Both seismic and gravity surveys are still used today, but the equipment and interpretive programs are far more sophisticated than those available in the 1960s. Exact locations of survey grids around the property are not known, but it is likely that all roads in the area have been geophysical survey routes many times. No survey routes are known to have accessed the federal mineral tracts.

Geophysical surveys are also used to identify subtle structural features that may indicate enhanced natural fractures in the Antrim Shale.

Exploratory drilling: Exploration in the area increased greatly after appropriate geophysical tools became available. The presence of the reefs had been known from chance drilling encounters and gravity surveys, but the reefs could not be detected with any degree of certainty. Only two reef tests were drilled within one mile of any of the tracts; both were dry and abandoned with no shows in the target zone. The only productive Niagaran reef wells in the area lie about 5 miles west of the westernmost federal properties.

Antrim production in the area has also been limited to lands north and west of the federal properties. These wells, when drilled vertically, typically have an initial production potential of 100 Mcf/d (thousand cubic feet of gas per day) or less, from depths of about 1600 feet.

The federal tracts have been leased several times in the past, beginning in 1968, but no exploratory drilling has occurred. Lands managed by the Manistee National Forest in this area have also been leased in the past and some are currently under lease, but no operations have been proposed for them.

V. Past and Present Oil and Gas Development Activity

Development and production has not occurred within the analysis area, with the few exploratory tests within the area dry and abandoned. The nearest any production has occurred is two miles north of the federal property in Section 24, from the Antrim Shale, the only likely exploration target in the area.

VI. Oil and Gas Occurrence Potential

The only hydrocarbon source in the area known to have occurrence potential is the Antrim Shale. It has not been tested in the analysis area.

VII. Oil and Gas Development Potential

The Antrim Shale, the only likely hydrocarbon source, produces dry gas from vertical wells at low volumes and pressures. Horizontal drilling techniques, used elsewhere in the Antrim and in other shale reservoirs to increase production rates, have been permitted by the state north and west of the analysis area, but the permits expired without operations. Such techniques may not be applicable to the Antrim in this area due to the depth of the reservoir (roughly 1100 feet below the glacial till) and the necessity of drilling pilot holes for the horizontal segments. Vertical wells that produce from the Antrim would be less expensive per well, but would require far more wells to be drilled, completed and serviced. The minimum required spacing for an Antrim well in Manistee County is eighty acres.

Oil and gas have been developed in the county since 1973, but in the analysis area no gas transmission infrastructure exists. Natural gas economics have changed markedly due to the development of unconventional reservoirs, primarily shale, in other basins. The increased availability of natural gas from these sources has reduced the unit price of natural gas to levels that are unlikely to support Antrim development in an area with neither existing infrastructure nor high-volume production.

VIII. RFD Baseline Scenario Assumptions and Discussion

The federal minerals in this area, most of which are associated with land managed by the Forest Service, have been offered for lease several times since 1968. No operations resulted, even in times of high natural gas prices, largely due to lack of drilling success in the Northern Michigan reef play on adjacent private ownership.

Development of the Antrim Shale in the 1980s led to renewed interest in the area, but the properties appear to be on the fringe of the productive portion of the Antrim Shale. Current prices of natural gas are not likely to support systematic development of Antrim Shale gas resources that are outside of the existing transmission infrastructure. The properties may be of interest to companies active in the Antrim play in the area to add to their reserve base, or to speculators anticipating a rise in natural gas prices.

If the properties are leased, it is probable that at least one test will be drilled to evaluate the properties. It is assumed that any drilling will take place from a single well pad located either on the surface of the tract or adjacent private land. The pad is unlikely to exceed 1.5 acres and any access road will be less than ¼ mile long, resulting in a total disturbed area of 2 acres. Plastic-lined pits will be used to collect drill cuttings. Return water from hydrofracture operations will be collected in steel tanks and disposed at sites designated in the drilling plan and approved by the state. Drilling water will be taken from a water well drilled in the pad. After all drilling is completed, 1 acre of the well pad will be reclaimed and the site will remain until the well ceases production. If no production is established or when production ceases, the entire site will be reclaimed to state standards and the surface owners' wishes.

IX. Surface Disturbance Due to Oil and Gas Activity on All Lands

In the approximately 11,500 acre analysis area, 2 reef wells have been drilled from 2 surface locations. Using 2.5 acres as a reasonable average surface disturbance per location, a total of 5 acres has been disturbed as a result of oil and gas activity. Should a lease issue, an additional short-term disturbance of 2 acres could result, and a long-term disturbance of up to one acre could result if production is established.

APPENDIX C – Stipulations and Notices

Notices

1. Surface disturbance will be limited to that necessary for reasonable, safe and prudent extraction of the oil and gas. Measures will be implemented to minimize erosion and sedimentation. Road and stream crossings will be planned so as to eliminate stream crossings whenever practical.
2. Lands adjacent to the proposed lease are in the Manistee National Forest. Processing of proposed surface use plans of operation on National Forest System lands includes site-specific analysis to determine effects to threatened, endangered, or sensitive species. This analysis may require surveys for certain plants and/or animals. Depending upon the species of concern, it may be necessary to survey through spring, summer, and fall. The extent of required surveys could delay permit issuance. Operators are encouraged to submit proposals as soon as possible to facilitate the scheduling of necessary survey work.
3. Portions of this lease parcel have had occurrences of certain threatened, endangered, or sensitive species or communities. At the time a drilling permit application or other request for surface use is filed, a site-specific review will be done to determine potential effects to these species. Depending upon the findings of the site-specific review, additional operating constraints, such as seasonal restrictions or re-location of the proposed wellsite, may be necessary to mitigate effects to threatened, endangered, or sensitive species or communities.
4. A cultural resources Phase I survey will be required prior at the time an Application for Permit to Drill/Notice of Staking is submitted. Cultural Resource surveys may also be required prior to the start of subsequent well operations which involve additional surface disturbance. Mitigation measures or movement of planned ground disturbance may be necessary to avoid adverse effects to cultural resources. The need and requirements for mitigation or alterations will be based on consultation between the lessee, Bureau of Land Management, the Michigan State Historic Preservation Office, and the Advisory Council on Historic Preservation.
5. Any approved APD may require a Discovery Plan for accidental archaeological discoveries that occur during ground disturbing activities that were detected during initial surveys. This may include consultation between the Bureau of Land Management, Michigan State Historic Preservation Office, and the Advisory Council on Historic Properties.

No Surface Occupancy Stipulation

No surface occupancy will be permitted within 300 feet of a navigable waterway.

Purpose: Protect surface water quality.

Exception: The BLM may grant exceptions for use of existing roadways and utility rights-of-way. Exceptions must be made in writing by the BLM.

Waiver/modification: No waivers or modifications will be made to this stipulation.

Controlled Surface Use Stipulation

On all portions of the lease, surface use must meet these performance measures:

a. Operator shall delineate soil types with *severe* erosion rating within area to be disturbed,
b. Operator shall prepare soil management plan identifying BMPs and other practices to be employed to minimize erosion, including storm contingency plan, topsoil stockpiling location(s), and road designs. Plan must be approved by BLM.

This stipulation affects the entire lease.

Purpose: Protect soil resources.

Exception: The BLM may grant exceptions to this stipulation in cases of trenching through existing utility rights-of-way and utilization without expansion of existing roads.

Modification: No modifications may be made to this stipulation.

Waiver: No waivers may be made to this stipulation.

Controlled Surface Use Stipulation

Surface occupancy on the entire lease is subject to the following:

> Operator shall delineate, within area to be disturbed, infestations of non-native, invasive plant species, including any species that is listed in *A Field Identification Guide to Invasive Plants in Michigan's Natural Communities* (Borland, et al, 2009). Operator shall preparation an invasive species control plan for approval by the BLM. Guides to the use of recommended best management practices for controlling the spread of invasive plant species are available from the Michigan Natural Features Inventory at http://mnfi.anr.msu.edu/. Many of the same practices that are employed for preventing soil erosion also function to prevent the spread of invasive species.

Purpose: Protecting native vegetation communities, agricultural production, and timber resources.

Exception/modification/waiver: No exceptions, modifications, or waivers will be made to this stipulation.