Final Environmental Assessment and Notice of Wetland Involvement for the Construction and Operation of a Proposed Cellulosic Biorefinery, Mascoma Corporation, Kinross Charter Township, Michigan

DOE/EA 1705

Appendix B – Wetland Delineation Reports

AECOM

Proposed Railroad Corridor Wetland Boundary Delineation Report

Provided as Supplement to:
Frontier Cellulosic Ethanol Facility
Environmental Assessment
Kinross Township
Chippewa County, Michigan

AECOM Project No. 13375001
October 20, 2009

Prepared by:
AECOM Environment

Linda Hansen, P.E.
Project Engineer
(906) 231-7130

Patrick Kilkenny
Assistant Project Scientist
(906) 226-4822

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1.0 Introduction

Frontier Renewable Resources, LLC (Frontier) retained AECOM Environment (AECOM) to complete a wetland boundary delineation within a corridor of land that is contiguous to the site of their proposed cellulosic ethanol facility located near the community of Kincheloe, Michigan. This corridor is the proposed location for the construction of a new railroad spur that will be used for the transportation of raw materials into the site. This wetland delineation and report are being completed for use in future environmental permitting, as well as for inclusion in an overall Environmental Assessment (EA) that is being conducted to evaluate potential impacts of construction and operation of the entire ethanol facility.

This wetland boundary delineation was completed with the following tasks and goals in mind:

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

This report presents the resulting data and conclusions associated with these tasks and goals.

2.0 Site Description

The Frontier railroad corridor can most easily be described by splitting it into two sections: the section that lies entirely north of the Kincheloe Access Road (North Section), and the section that extends south from Kincheloe Access Road to the existing railroad track (South Section).

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

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

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

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

3.0 Literature Review

Prior to the on-site field investigation, AECOM completed a review of available map data in order to obtain information on general site characteristics, and to identify potential wetland areas for field investigation. Items reviewed included the USGS topographic quadrangle map, 2005 aerial photo, the Natural Resource Conservation Service (NRCS) soil survey map and the National Wetland Inventory (NWI) map.

3.1 USGS Topographic Map

The proposed Frontier railroad corridor boundaries are indicated over a USGS topographic map in the attached Figure 1. Wetlands are indicated in these lower areas in the South Section of the corridor as well as along the northern edge of the North Section.

3.2 Aerial Photo

The proposed location of the Frontier rail corridor is indicated over a 2005 aerial photo in the attached Figure 2. The source of the photo is the U.S. Department of Agriculture National Agriculture Imagery Program (NAIP). Figures 5.1 through 5.6, that include the wetland delineation results, were prepared from Spring 2009 aerial photos prepared for Frontier. These photos have greater clarity because they were photographed using 1-meter resolution.

Beginning at the southern end of the South Section, the aerial photos indicate deciduous forest areas that abruptly transition to coniferous forest. To the north of this more coniferous area, a large swamp or marsh is evident that contains a few small islands of upland that are populated with pine trees. Continuing to the north, the swamp then transitions to a partially forested area that may be a bog. On the northern boundary of the bog is an east-west running dirt road. Continuing north from this road are relatively contiguous deciduous and coniferous forests, with a few exceptions for road openings and small meadows.

This forest regime appears to continue northward to the Kincheloe Access Road. The photos of the North Section show deciduous forest on its western and far eastern ends, with a pine plantation extending in between. A large bog or swamp is also visible that extends across the north boundary of the North Section.

3.3 NRCS Soils Map

A portion of the NRCS soils map for Chippewa County, Michigan is attached to this report as Figure 3. Using color coding, this map indicates which soil series are hydric with a blue coloration and “partially hydric” with a green coloration. Partially hydric soils (soils that have hydric inclusions) and hydric soils are mapped in both the North Section and South Section of the corridor. The predominant partially hydric and hydric soil types that are present in the North Section are Croswell-Au Gres sands (88A), and Dawson and Loxley peats (37).

The three partially hydric and hydric soil types mapped in the north half of the South Section are Wainola fine sand, 0-3% (49A), Kinross-Wainola complex soils (137A) and Udorthents (116). Udorthents are typically soils that have been disturbed through man-made causes. Partially hydric soils that are mapped in the south half of the South Section of the corridor include Kinross-Wainola complex soils (137A), Kinross-Dawson complex (102), Wainola fine sand (49A) and Markey and Carbondale mucks (36). Bordering these soils to the south is a soil type indicated to be "all hydric" in blue. This soil type is Histosols & Aquents, ponded (35). This soil map unit is typically associated with marshes, and is known to have standing water throughout the year. Histosols and Aquents themselves are an order and suborder (respectively) of soil types, and represent groups of several similar soil series'.

By definition, areas containing partially hydric or hydric soils are the most likely to contain wetlands, as they are regularly saturated near or above the surface and contain specific soil features that result from repeated saturation.

3.4 NWI Map

An NWI map of the investigation area is provided as Figure 4. The NWI map indicates the presence of various types of wetlands throughout the proposed railroad corridor area. These include scrub-shrub wetlands that are mapped in both the North and South, forested wetlands mapped along the western boundary of the South Section, and an emergent wetland that reaches across the far southern end of the South Section.

Scrub-shrub wetlands are characterized by a dominance of shrubby vegetation and a general lack of mature trees. Alternatively, forested wetlands are characterized by a dominance of mature deciduous or evergreen trees, and a significantly lower presence of shrubby or herbaceous vegetation. Emergent wetlands are characterized by regular hydrologic inundation, and a dominance of emergent herbaceous vegetation such as cattails, iris and sweet flag.

It should be noted that, on an NWI map, areas lacking mapped wetlands do not automatically imply a lack of wetland presence in the field. NWI maps are created through the use of several data sets, and are most often not field verified. Therefore, NWI maps are best used as an indication of where wetlands *might* be, instead of as an indication of where they *are*.

4.0 Methodology

On August 31st to September 3rd, 2009, AECOM completed wetland boundary delineations within the Frontier rail corridor project investigation area utilizing the U.S. Army Corps of Engineers (COE) 1987 Wetland Delineation Methodology, and methods outlined in the Michigan Department of Environmental Quality's (MDEQ) Wetland Identification Manual. The COE methodology requires that, under normal circumstances, hydric soils, wetland hydrology, and hydrophytic vegetation must be present for an area to be defined as a wetland. The method outlined in the MDEQ manual states that only two parameters, wetland vegetation and wetland hydrology, are required to confirm the presence of wetlands under Michigan law.

AECOM completed upland and wetland determination plot sets or transects along the boundaries of wetlands delineated at the site. A set of two determination plots (one on each side of the boundary) was used for most wetland areas, while a transect of three plots was used in areas where small strips of upland existed between wetlands. In this scenario, the "WET" or "UP" plot that was completed twice was assigned an "a" or "b" to distinguish between the two.

In all cases, wetland plot locations were marked with labeled pin flags, and wetland boundaries were marked with pink wetland ribbon. Boundary point and data plot locations were surveyed using a sub-meter Trimble® GeoXT™ GPS surveying unit. Routine On-Site Determination Forms were completed for each plot location, and are included in the Appendix. The locations of delineated wetland boundaries and determination plots are indicated in the attached Figures 5.1 through 5.6.

The locations of photos taken on site were also surveyed and are indicated on Figures 5.1 to 5.6. These photos are provided in the photo log included in the Appendix.

5.0 Results

In total, AECOM identified and delineated 15 wetlands within the proposed Frontier rail corridor investigation area. Their locations and sizes are depicted in the attached Figures 5.1 through 5.6. These wetlands varied in vegetative and hydrologic characteristics, and were present in several locations throughout the corridor.

In order to more quickly characterize each of the 15 wetlands that were identified, brief descriptions are provided below for each that include the wetland ID number, size, location, a general description and apparent source of hydrology. Information collected from data plots can be found on the Routine On-Site Determination forms that are attached to this report in the Appendix. These forms describe dominant vegetation, hydrologic and soil observations, as well as the mapped soil type (as indicated by NRCS) at the plot location.

Wetland 1

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

It should be noted that Wetland 1 extends considerably to the east and west outside of the proposed Frontier rail corridor, and that relocation of the corridor in these directions will not likely result in avoidance of the wetland.

An additional observation made by AECOM was that, in addition to the natural hydrology most likely supplied by intersection with the water table, Wetland 1 also receives water from the discharge of the Kinross Township wastewater treatment plant.

Wetland 2

Wetland 2 is approximately 1.75 acres in size, and is located directly north of Wetland 1 along the western corridor boundary. This wetland is separated from Wetland 1 by a sandy dirt road that runs east to west across the proposed rail corridor. Upon observation of the soil, hydrologic and vegetative characteristics of Wetland 2, it is obvious that Wetland 2 was at one time an extension or part of Wetland 1, and has only become separated due to placement of the dirt road. Wetland 2 continues to have the characteristic peat mat (approximately one foot deep), and black spruce-tamarack mixture similar to Wetland 1. Labrador tea and leatherleaf (*Chamaedaphne calyculata* – OBL) are dominant within the shrub layer of Wetland 2, along with a

few other species typical of wet meadows such as Canada bluejoint (*Calamagrostis Canadensis* – OBL). Mottled sandy soils were present immediately below the 1-foot layer of peat and organics. The source of hydrology for Wetland 2 appears to be primarily from intersection with the water table, although runoff from ground surface slopes to the east may also contribute, especially during spring snow melt.

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

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

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

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

Wetland 9

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

Wetland 10

Wetland 10 is located north of wetland 2 along the western corridor boundary where the corridor bends slightly toward the northeast. When looking at Figure 5.3, it appears that this wetland is comprised of two separate areas. These two areas are actually connected on the west side of the corridor boundary (outside of the investigation area), and are part of one continuous wetland. The total area that Wetland 10 occupies within the corridor boundaries is 0.33 acres. This wetland is a mixture of alder thickets and meadow-like openings that support patches of sphagnum and various herbaceous species. Prevalent species identified within Wetland 10 included speckled alder, blue flag iris, red maple and low bush blueberry (*Vaccinium angustifolium* – FACU). Soil and hydrologic conditions typical of Wetland 10 were approximately 8 inches of peat and organics over low-chroma sands, with saturation occurring up to the surface. As the entire soil profile (from 0 to 16 inches) was saturated at this location, it was again indicative of wetland hydrology being supported by connectivity to the groundwater table.

Wetland 11

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

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

Wetlands 12, 13 & 14

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

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

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

Wetland 15

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

6.0 Anticipated Impacts

As the width of the actual railroad spur to be constructed will be much less than the width of the investigation area, it will be possible to avoid the majority of wetlands identified by AECOM. The only exception to this may be Wetland 1 as it spans the entire width of the southern end of the proposed corridor, as well as beyond the corridor to the east and west. Ground surface impacts, by area, will be minimal compared to the overall size and extensiveness of Wetland 1. However, caution will need to be used when planning the size and number of culverts and/or bridges, so that the hydrologic regime of the wetland is not significantly altered.

7.0 Summary

Based on our observation of August 31st to September 3rd, 2009, and utilizing the COE wetland delineation methodology with regard to the MDEQ definition of a wetland, it is the opinion of AECOM that all 15 delineated wetlands are jurisdictional under state and/or federal law. In accordance with Section 404 of the Clean Water Act and Part 303 of the Natural Resources and Environmental Protection Act (NREPA), Act 451 of 1994, any impacts to these wetlands may require a permit from the MDEQ and/or COE. Please note that, as with all wetland delineations, these agencies make final determinations regarding jurisdiction and the locations of wetland boundaries. Boundary verifications (completed by MDEQ) are recommended whenever impacts are anticipated within or near identified wetlands.

Figures

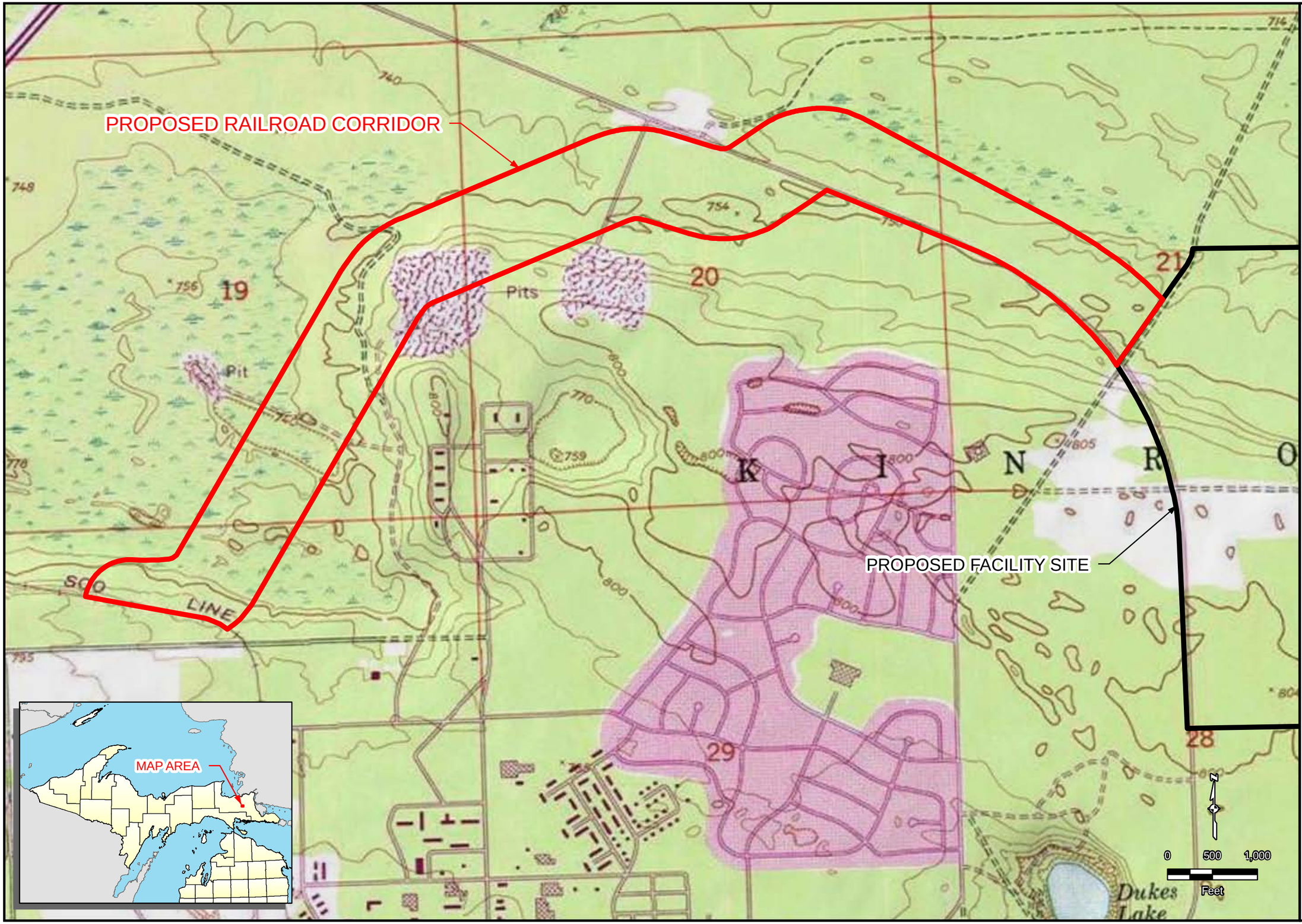
Figure 1 – Site Location Map

Figure 2 –Site Location Map with 2009 Aerial Photo

Figure 3 – NRCS Soil Survey Map

Figure 4 – National Wetlands Inventory Map

Figures 5.1 to 5.6 – Field Delineated Wetland Boundaries and Photo Points



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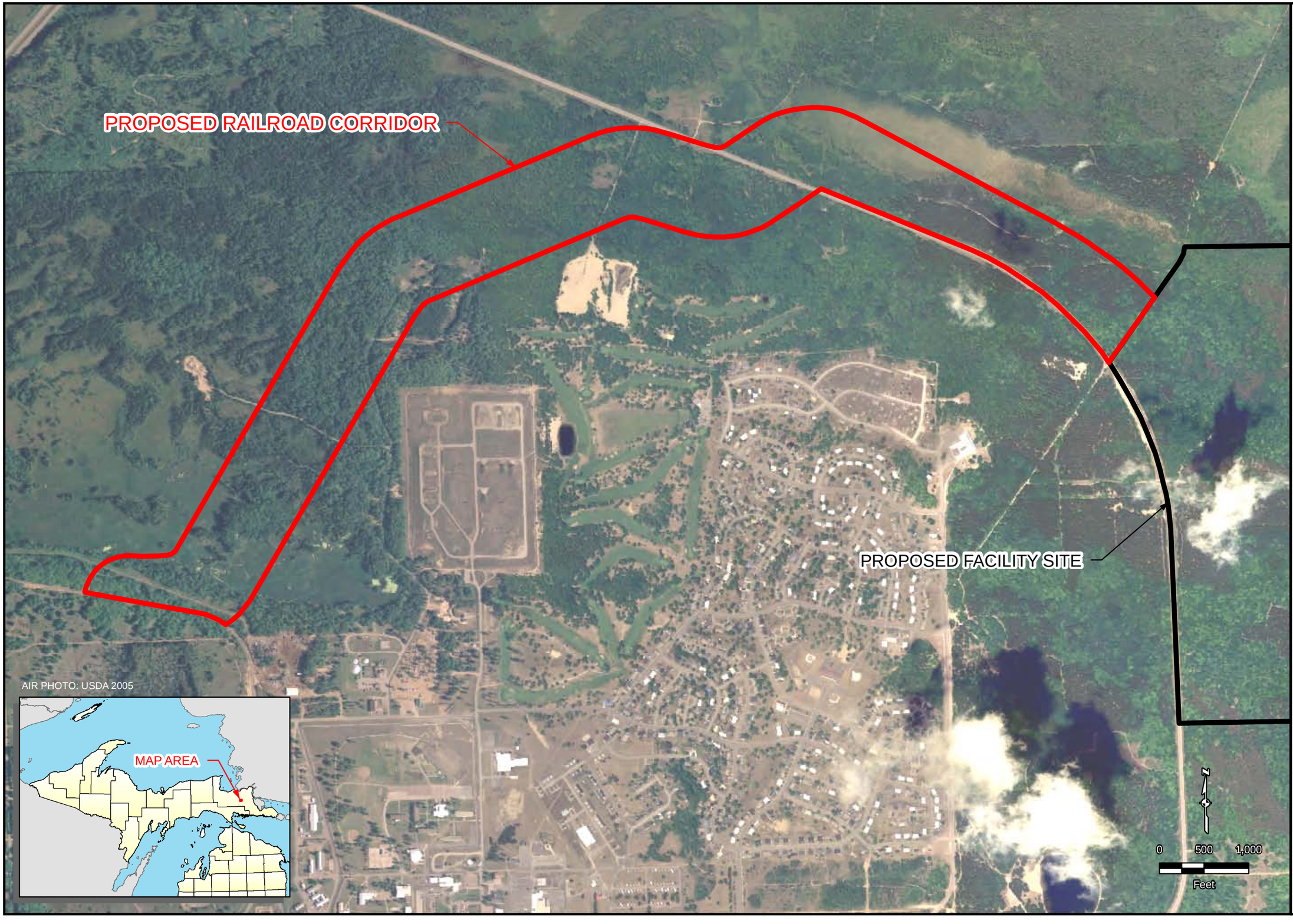
SITE LOCATION MAP
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	1	



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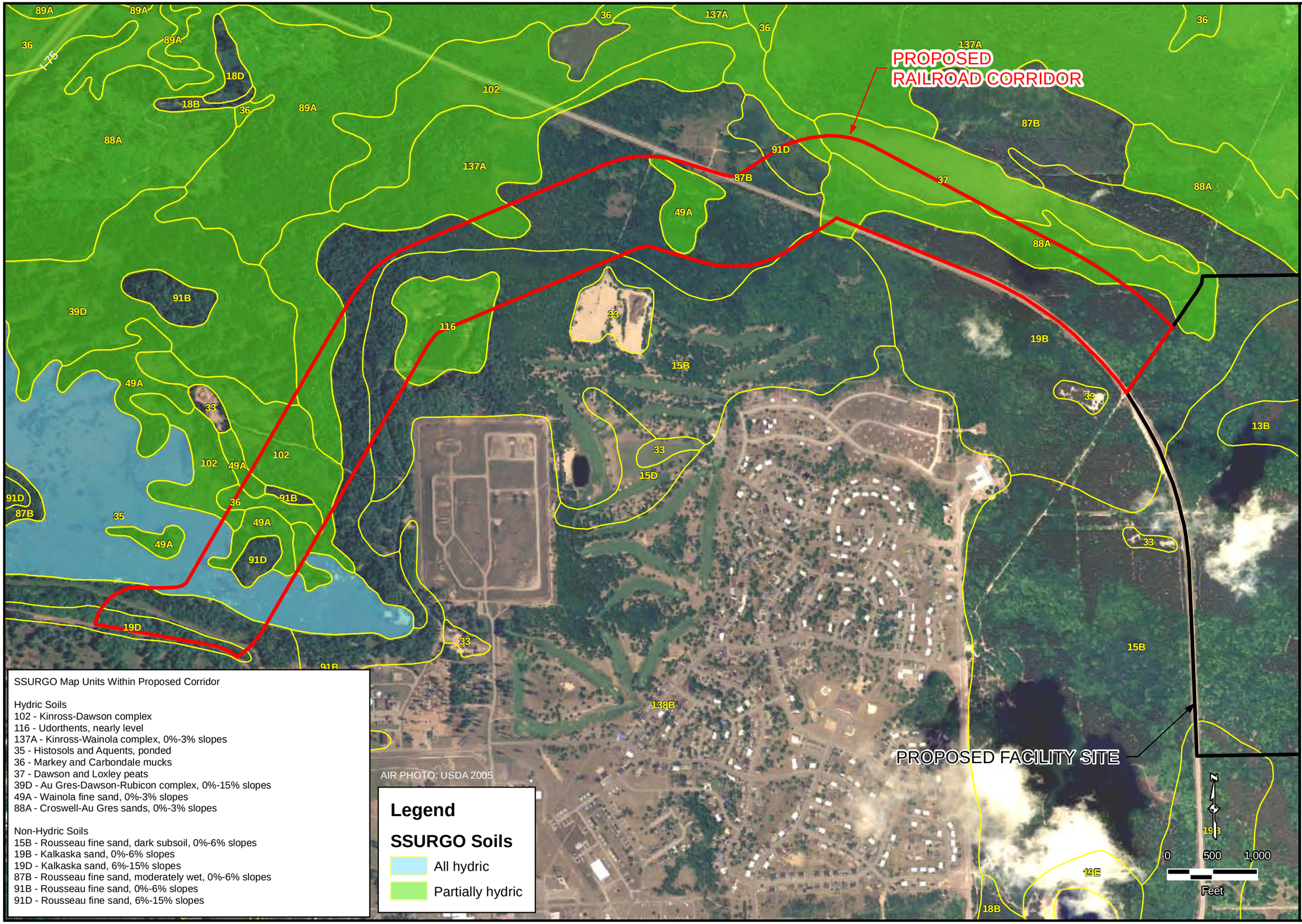
SITE LOCATION MAP WITH 2005 AERIAL PHOTO
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	2	



SSURGO Map Units Within Proposed Corridor

Hydric Soils
102 - Kinross-Dawson complex
116 - Udorthents, nearly level
137A - Kinross-Wainola complex, 0%-3% slopes
35 - Histosols and Aquents, ponded
36 - Markey and Carbondale mucks
37 - Dawson and Loxley peats
39D - Au Gres-Dawson-Rubicon complex, 0%-15% slopes
49A - Wainola fine sand, 0%-3% slopes
88A - Croswell-Au Gres sands, 0%-3% slopes

Non-Hydric Soils
15B - Rousseau fine sand, dark subsoil, 0%-6% slopes
19B - Kalkaska sand, 0%-6% slopes
19D - Kalkaska sand, 6%-15% slopes
87B - Rousseau fine sand, moderately wet, 0%-6% slopes
91B - Rousseau fine sand, 0%-6% slopes
91D - Rousseau fine sand, 6%-15% slopes

AIR PHOTO: USDA 2005

Legend

SSURGO Soils

- All hydric
- Partially hydric

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NRCS SOIL SURVEY MAP
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

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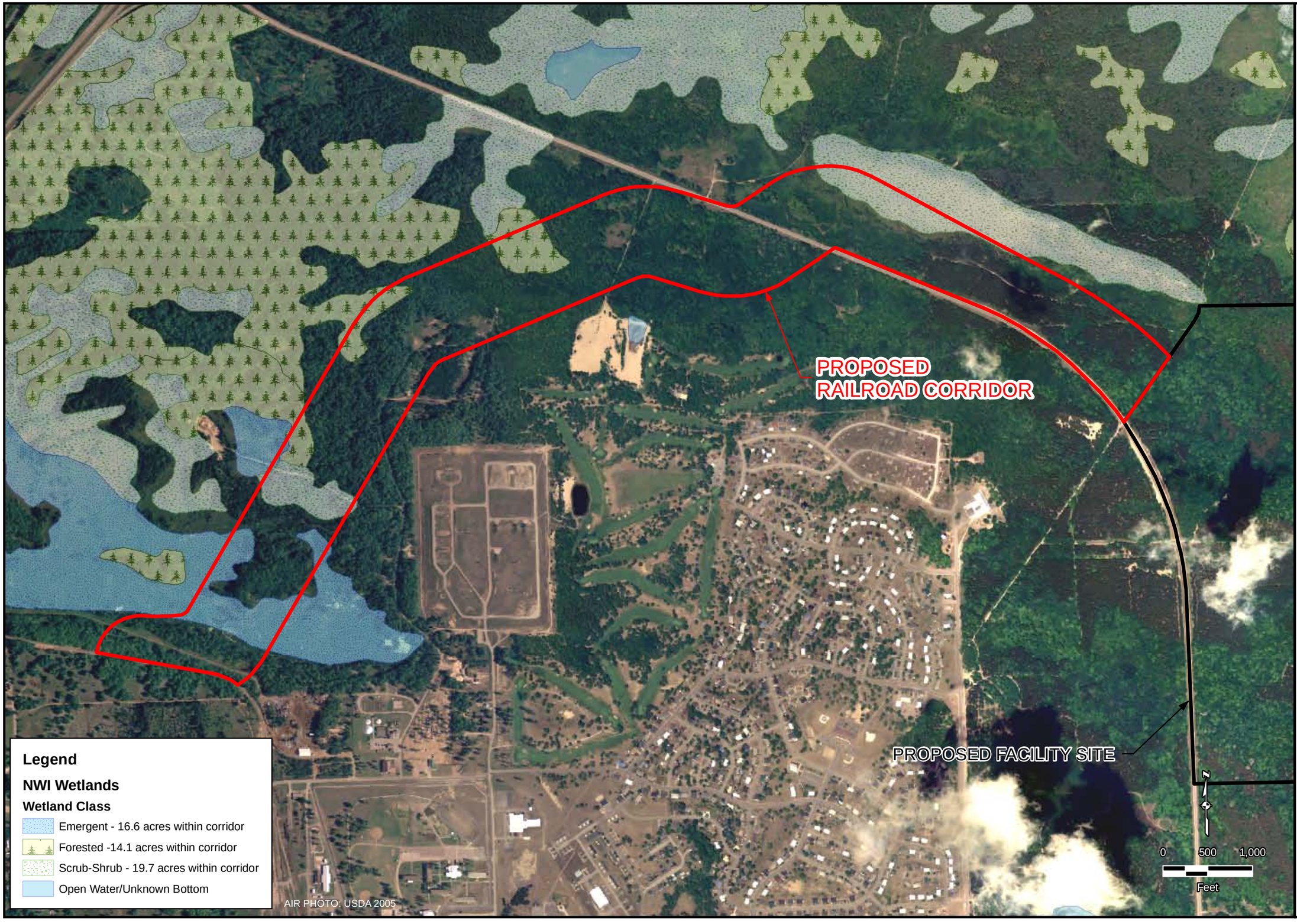
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	3	



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NATIONAL WETLAND INVENTORY MAP
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
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PROJECT NUMBER	13375-001	
FIGURE NUMBER	4	

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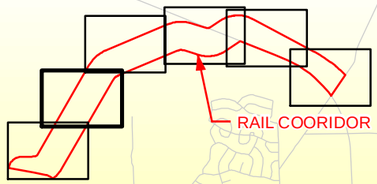
DELINEATED WETLANDS AND PHOTO LOCATIONS
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	5.1	

Map area shown in bold.



Legend

- Wetland Data Plot
- Photo Location
- Wetland Continues Beyond Investigation Area
- Delineated Wetland
- Proposed Railroad Cooridor
- Wetland boundaries delineated using GIS data only. Area inaccessible by foot due to deep water.

WETLAND 14
PLOT 12 WET
21
PLOT 12 UP
WETLAND 15
WETLAND 4
PLOT 4 WET B
PLOT 4 UP
PLOT 4 WET
12
WETLAND 3
PLOT 5 UP
PLOT 5 WET
13B
PLOT 5 WET B
13A
WETLAND 5
11
WETLAND 2
PLOT 3 WET B
PLOT 3 UP
PLOT 3 WET A
10
WETLAND 6
WETLAND 7
WETLAND 1
PLOT 2 WET B
7
6
PLOT 2 UP
PLOT 2 WET A
5

N

0 100 200
Feet

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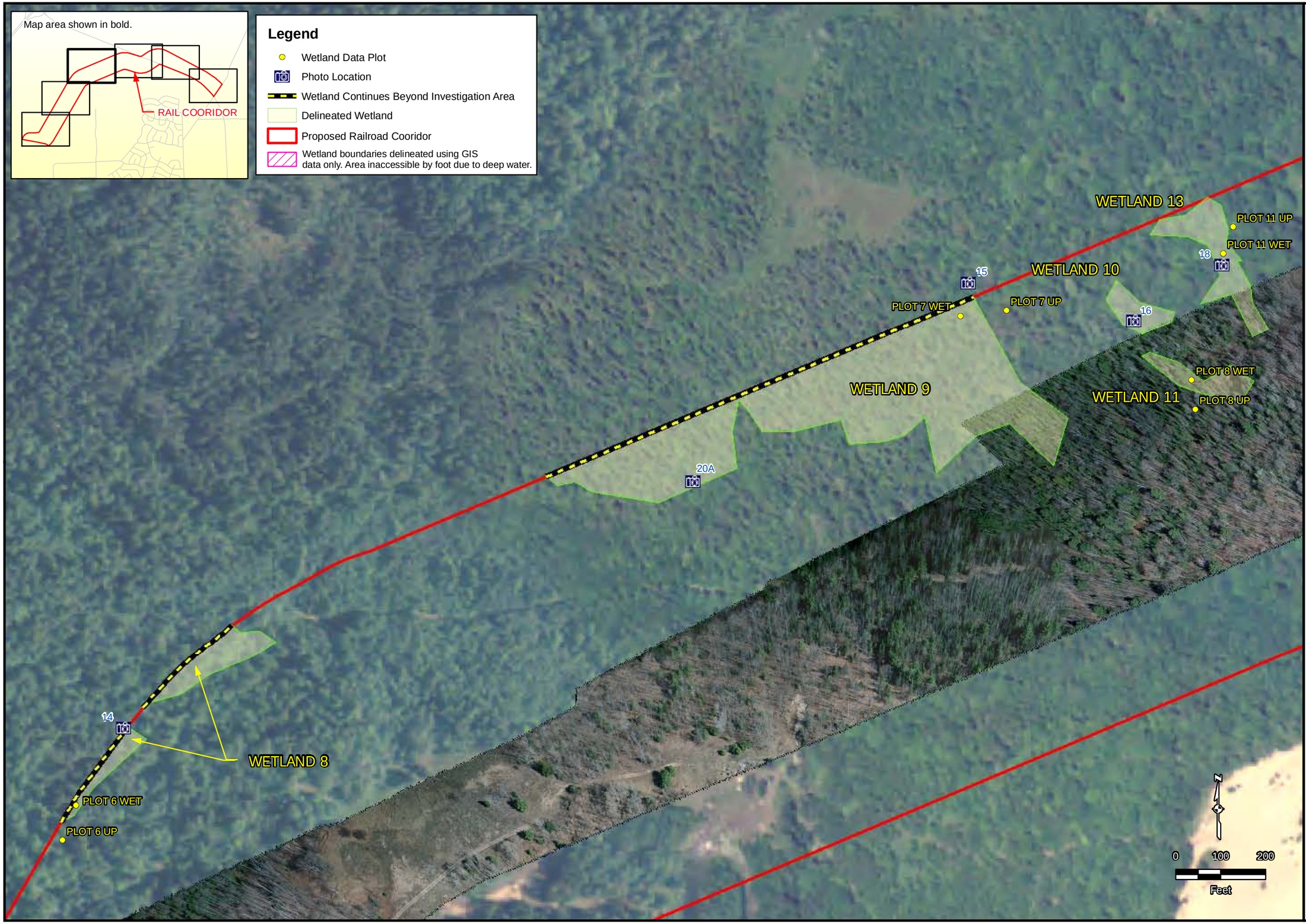
DELINEATED WETLANDS AND PHOTO LOCATIONS
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	5.2	



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DELINEATED WETLANDS AND PHOTO LOCATIONS
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	5.3	

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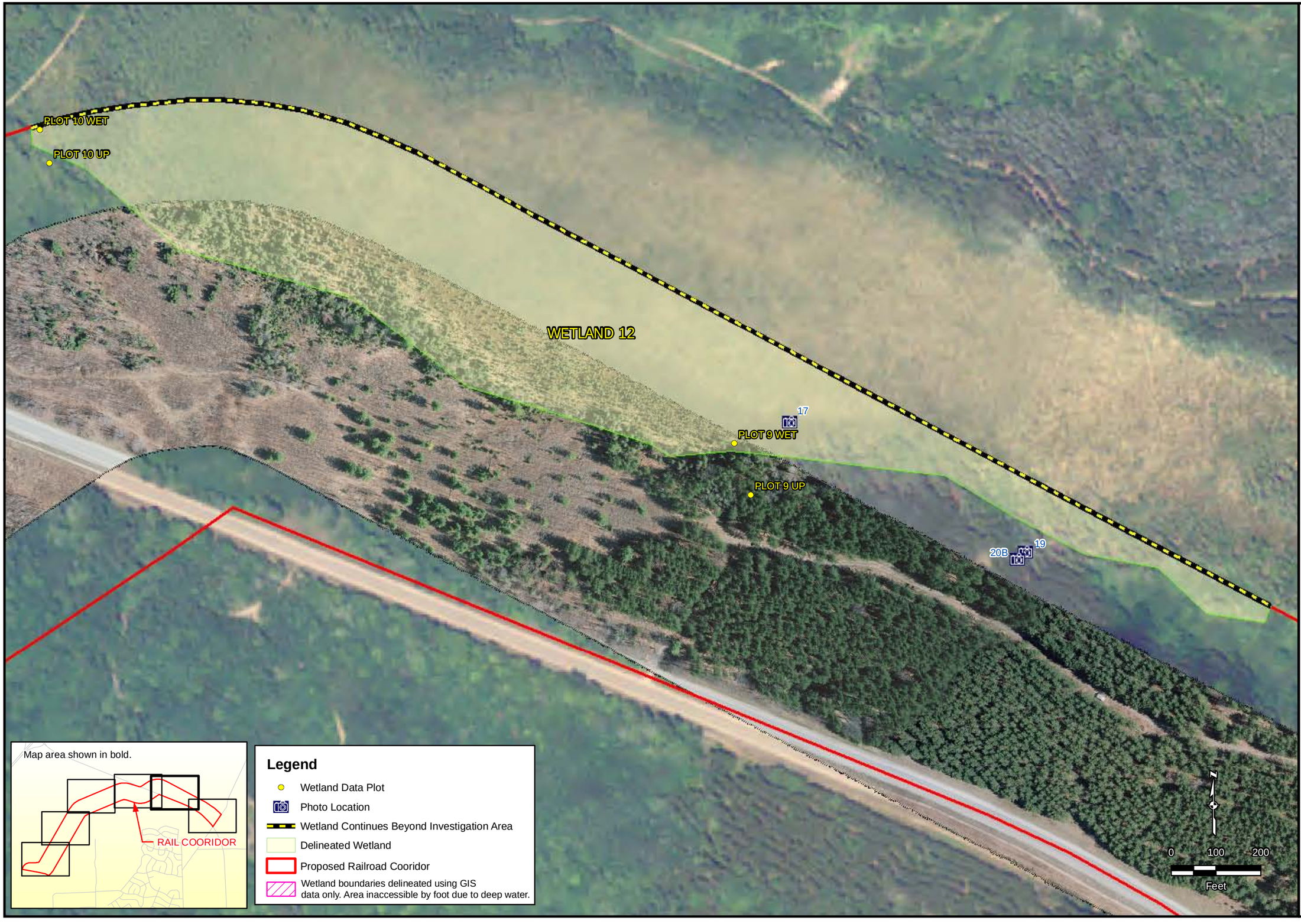
DELINEATED WETLANDS AND PHOTO LOCATIONS
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	5.4	



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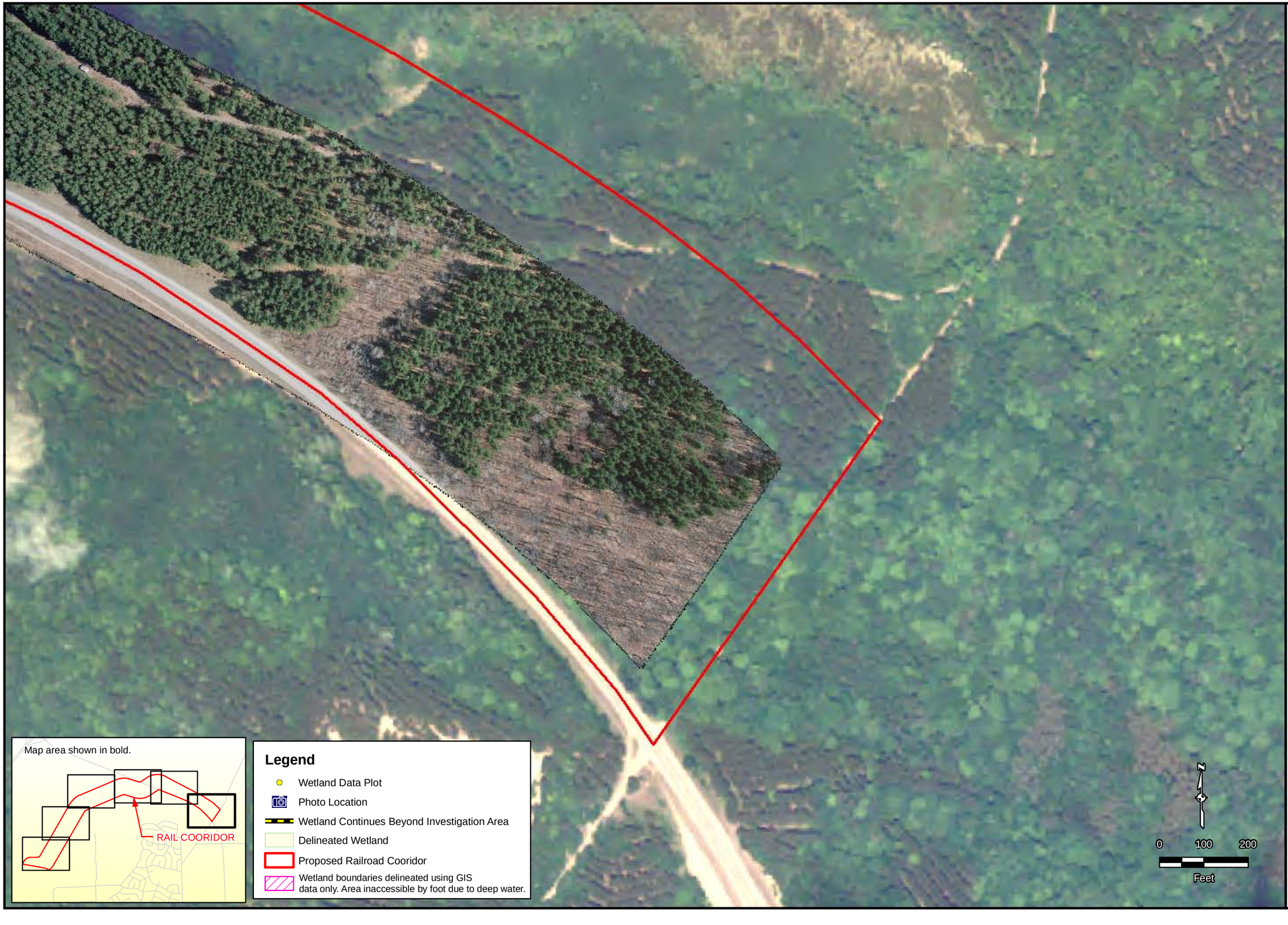
DELINEATED WETLANDS AND PHOTO LOCATIONS
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	5.5	



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DELINEATED WETLANDS AND PHOTO LOCATIONS
FRONTIER RENEWABLE RESOURCES, LLC
PROPOSED RAILROAD CORRIDOR
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	10/21/2009
Approved:	LDH	10/21/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001	
FIGURE NUMBER	5.6	

Appendix A

Routine On-Site Wetland Determination Forms

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 8/31/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 1 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Populus tremuloides*	SH 5%	FAC	9. *Picea mariana*	TR 10%	FACW
2. ***Pteridium aquilinum***	**HB 50%**	**FACU**	10. ***Picea mariana***	**SH 20%**	**FACW**
3. *Quercus ellipsoidalis*	SH 10%	NI	11.		
4. ***Vaccinium angustifolium***	**SH 20%**	**FACU**	12.		
5. *Populus tremuloides*	TR 10%	FAC	13.		
6. ***Gaultheria procumbens***	**HB 70%**	**FACU**	14.		
7. ***Acer rubrum***	**TR 30%**	**FAC**	15.		
8. ***Acer rubrum***	**SH 20%**	**FAC**	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50 %

Remarks: Located on upland slope above cattail swamp.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kalkaska Sand

Drainage Class: Somewhat excessively drained

Field Observations

Taxonomy (Subgroup): Typic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	1	7.5YR 2.5/2			Organics
6-12	2	7.5YR 5/1			Sand
12-16+	3	7.5YR 4/6			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: small amounts of sand mixed with organics in horizion 1.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Sandy upland area, higher topography than cattail swamp.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 8/31/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 1 Wet

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Typha latifolia***	**HB 40%**	**OBL**	9. *Acer rubrum*	TR 10%	FAC
2. *Abies balsamea*	TR 10%	FACW	10. ***Acer rubrum***	**SH 40%**	**FAC**
3. ***Calamagrostis canadensis***	**HB 60%**	**OBL**	11.		
4. ***Dryopteris carthusinana***	**HB 20%**	**FACW-**	12.		
5. *Populus tremuloides*	TR 10%	FAC	13.		
6. ***Vaccinium angustifolium***	**SH 20%**	**FACU**	14.		
7. *Vaccinium angustifolium*	SH 10%	FACU	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 60 %

Remarks: Plot located on edge of emergent (cattail) wetland and forested upland area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 5 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: High organic matting in top layer of soil.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kalkaska Sand

Drainage Class: Somewhat excessively drained

Field Observations

Taxonomy (Subgroup): Typic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	1	7.5YR 2.5/1			Organics/Peat
8-16	2	7.5YR 4/3			Sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
x Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
__ Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Field characterized as a Histic Epipedon - NRCS indicator A2

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)		
Wetland Hydrology Present?	(Yes)	No			(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland?	(Yes) No

Remarks: Very large cattail swamp, see NWI layer and aerial photo.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 8/31/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 2 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Pteridium aquilinum***	**HB 70 %**	**FACU**	9.		
2. ***Picea mariana***	**TR 20%**	**FACW**	10.		
3. ***Gaultheria procumbens***	**HB 20%**	**FACU**	11.		
4. ***Acer rubrum***	**TR 25%**	**FAC**	12.		
5. ***Pinus resinosa***	**TR 25%**	**FACU**	13.		
6. ***Vaccinium angustifolium***	**SH 20%**	**FACU**	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 33 %

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Dawson Complex

Drainage Class: Very Poorly Drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Terric Borosaprists (Dawson)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 2.5/1			Organics
2-4	2	7.5YR 4/1			Sand
4-9	3	7.5YR 5/4			Sand
9-16+	4	7.5 YR 4/6			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Sandy upland area, higher topography than cattail swamp.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 8/31/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 2 WET-A

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Osmunda regalis***	**HB 40%**	**OBL**	9.		
2. ***Abies balsamea***	**TR 40%**	**FACW**	10.		
3. ***Pteridium aquilinum****	**HB 40%**	**FACU**	11.		
4. ***Acer rubrum***	**SH 20%**	**FAC**	12.		
5. *Sambucus canadensis*	SH 5%	FACW-	13.		
6. ***Ledum groenladicum***	**SH 25%**	**OBL**	14.		
7. ***Ilex verticillata***	**SH 40%**	**FACW+**	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 83 %

Remarks: *Bracken located on adjacent upland slope.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 12 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Dawson Complex

Drainage Class: Very Poorly Drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Terric Borosaprists (Dawson)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-10	1	7.5YR 2.5/1			peat
10-14	2	5 YR 2.5/2			mucky peat
14-16+	3	7.5 YR 5/1	7.5 YR 5/4-5/6	few, prominent	sand

Hydric Soils Indicators:

- __ Histosol
- x Histic Epipedon
- __ Sulfidic Odor
- __ Aquic Moisture Regime
- __ Reducing Conditions
- __ Gleyed or Low-Chroma Colors
- __ Concretions
- __ High Organic Content in Surface Layer in Sandy Soils
- __ Organic Streaking in Sandy Soils
- __ Listed on Local Hydric Soils List
- __ Listed on National Hydric Soils List
- __ Other (Explain in Remarks)

Remarks: NRCS indicator A2

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks: Sphagnum bog transitioning into cattail swamp in some areas.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 8/31/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 2 WET-B

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Sphagnum sp.***	**HB 80%**	**OBL**	9.		
2. ***Ledum groenladicum***	**SH 20%**	**OBL**	10.		
3. *Maianthemum canadense*	HB 5%	FAC	11.		
4. *Cornus canadensis*	HB 10%	FAC	12.		
5. ***Picea mariana***	**TR 70%**	**FACW**	13.		
6. *Acer rubrum*	SH 5%	FAC	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Plot located on edge of sphagnum bog.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 12 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Dawson Complex

Drainage Class: Very Poorly Drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Terric Borosaprists (Dawson)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	1	7.5YR 2.5/1			peat
4-14	2	7.5 YR 5/1	7.5 YR 7/1	few, distinct	sand
14-16+	3	7.5 YR 2.5/2			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Sandy Redox - NRCS Indicator S5

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetlands 1 & 2
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 3 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Pteridium aquilinum***	**HB 20 %**	**FACU**	9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 0 %

Remarks: Plot Location is upland dirt roadside between bog areas.

HYDROLOGY

__ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

__ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Dawson Complex

Drainage Class: Very Poorly Drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Terric Borosaprists (Dawson)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	10 YR 4/4			sand
3-16+	2	10 YR 5/6			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Sandy upland area, higher topography than cattail swamp.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor
Applicant/Owner: Mascoma
Investigator: PMK/LDK

Date: 9/1/2009
County: Chippewa
State: MI

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID: Wetland 1
Transect ID:
Plot ID: Plot 3 WET-A

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. *Larix laricina*	SH 10%	FACW
2. *Picea mariana*	TR 10%	FACW
3. *Pinus banksiana*	TR 10%	FACU
4. ***Larix laricina***	**TR 25%**	**FACW**
5. ***Pinus resinosa***	**TR 20%**	**FACU**
6. *Betula papyrifera*	SH 5%	FACU+
7. ***Ledum groenladicum***	**SH 70%**	**OBL**
8. ***Ilex verticillata***	**SH 20%**	**FACW+**

Dominant Plant Species	Stratum	Indicator
9. *Picea mariana*	SH 5%	FACW
10. *Carex sterilis*	HB 2%	OBL
11. *Scirpus cyperinus*	HB 2%	OBL
12. ***Sphagnum sp.***	**HB 100%**	**OBL**
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 80 %

Remarks: Plot located on edge of shrub-scrub swamp.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
__ Stream, Lake or Tide Gauge
__ Aerial Photographs
__ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 1 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:
Primary Indicators:
____ Inundated
_x_ Saturated in Upper 12 inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
____ Oxidized Root Channels in Upper 12 inches
____ Water -Stained Leaves
____ Local Soil Survey Data
____ FAC-Neutral Test
____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Dawson Complex

Drainage Class: Very Poorly Drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Terric Borosaprists (Dawson)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-16+	1	7.5YR 2.5/1			peat

Hydric Soils Indicators:

- x Histosol
- __ Histic Epipedon
- __ Sulfidic Odor
- __ Aquic Moisture Regime
- __ Reducing Conditions
- x Gleyed or Low-Chroma Colors
- __ Concretions
- __ High Organic Content in Surface Layer in Sandy Soils
- __ Organic Streaking in Sandy Soils
- __ Listed on Local Hydric Soils List
- __ Listed on National Hydric Soils List
- __ Other (Explain in Remarks)

Remarks: NRCS indicator A1

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 2
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 3 WET-B

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Sphagnum sp.***	**HB 90%**	**OBL**	9. ***Pinus banksiana***	**TR 20%**	**FACU**
2. *Ledum groenladicum*	SH 10%	OBL	10. *Pinus resinosa*	TR 10%	FACU
3. *Cornus alternifolia*	SH 2%	FAC-	11. *Vaccinium angustifolium*	SH 15%	FACU
4. *Pteridium aquilinum*	HB 5%	FACU	12.		
5. *Calamagrostis canadensis*	HB 2%	OBL	13.		
6. *Gaultheria procumbens*	HB 5%	FACU	14.		
7. **Chamaedaphne calyculata**	**HB 20%**	**OBL**	15.		
8. ***Picea mariana***	**TR 30%**	**FACW**	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75 %

Remarks: Plot located in shrub-scrub / bog area on opposite side of road from plot 3 WET A.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 6 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- _x_ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Dawson Complex

Drainage Class: Very Poorly Drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Terric Borosaprists (Dawson)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	1	7.5YR 2.5/1			peat/moss
12-16+	2	7.5 YR 5/1	7.5 YR 6/6	few, faint	sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
x Histic Epipedon	x High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: NRCS indicator A2

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetlands 3 & 4
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 4 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Cornus canadensis*	HB 15%	FAC	9. *Pinus strobus*	TR 5%	FACU
2. *Gaultheria procumbens*	HB 15%	FACU	10.		
3. ***Abies balsamea***	**TR 20%**	**FACW**	11.		
4. *Pteridium aquilinum*	HB 10%	FACU	12.		
5. *Vaccinium angustifolium*	SH 10%	FACU	13.		
6. ***Acer Rubrum***	**TR 20%**	**FAC**	14.		
7. ***Picea mariana***	**TR 20%**	**FACW**	15.		
8. *Betula papyrifera*	TR 5%	FACU	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Plot located in upland hump between wetland depressional areas.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 2.5/1			Organics/Silt
2-14	2	7.5YR 5/1			Sand
14-16	3	7.5YR 2.5/3			Consolidated Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Upland area located between two wetland depressions.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 3
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 4 WET-A

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Calamagrostis canadensis***	**HB 40%**	**OBL**	9.		
2. ***Typha latifolia***	**HB 25%**	**OBL**	10.		
3. ***Scirpus cyperinus***	**HB 20%**	**OBL**	11.		
4. ***Sphagnum sp.***	**HB 60%**	**OBL**	12.		
5. *Salix interior*	SH 15%	OBL	13.		
6. *Iris versicolor*	HB 5%	OBL	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Sphagnum moss filled depression located in upland area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 15 in.

Depth to Saturated Soil: 1 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	7.5YR 2.5/3			Peat
5-9	2	7.5YR 2.5/1			Muck
9-14	3	7.5YR 4/1			Sand
14-16	4	7.5YR 2.5/2			Sand to Consolidated Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Low chroma colors throughout layers.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 4
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 4 WET-B

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Sphagnum sp.***	**HB 30%**	**OBL**	9. *Pinus strobus*	TR 5%	FACU
2. *Trientalis borealis*	HB 10%	FAC+	10.		
3. *Populus deltoides*	TR 2%	FAC+	11.		
4. *Cornus canadensis*	HB 5%	FAC-	12.		
5. ***Cornus sericea***	**SH 20%**	**FACW**	13.		
6. *Vaccinium angustifolium*	SH 10%	FACU	14.		
7. ***Acer rubrum***	**TR 50%**	**FAC**	15.		
8. ***Betula papyrifera***	**TR 20%**	**FACU**	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) **75** %

Remarks: Small wetland depression located within upland forested area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/2			Moss/Peat/Organics
3-16	2	7.5YR 5/1			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
x High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Upper layer 0-3" high in organic content.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 5
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 5 WET-A

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Calamagrostis canadensis***	**HB 30%**	**OBL**	9.		
2. ***Iris versicolor***	**HB 20%**	**OBL**	10.		
3. ***Vaccinium angustifolium***	**SH 30%**	**FACU**	11.		
4. ***Pinus strobus***	**TR 20%**	**FACU**	12.		
5. ***Acer rubrum***	**TR 30%**	**FAC**	13.		
6. *Betula papyrifera*	TR 10%	FACU	14.		
7. *Sphagnum sp.*	HB 10%	OBL	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) **60** %

Remarks: Weland depression/pocket located within forested upland area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 12 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	1	7.5YR 2.5/1			Organics
4-10	2	7.5YR 4/1			Sand
10-16	3	7.5YR 5/1	7.5YR 5/4	Few/Prominent	Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
x Concretions
__ High Organic Content in Surface Layer in Sandy Soils
x Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Mottles and organic streaking within sandy soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 6
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 5 WET-B

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Iris versicolor***	**HB 20%**	**OBL**	9. ***Sphagnum sp.***	**HB 50%**	**OBL**
2. ***Calamagrostis canadensis***	**HB 30%**	**OBL**	10.		
3. ***Alnus incana***	**SH 20%**	**OBL**	11.		
4. *Populus tremuloides*	SH 5%	FACU	12.		
5. *Pinus strobus*	TR 10%	FACU	13.		
6. ***Populus tremuloides***	**TR 20%**	**FACU**	14.		
7. ***Acer rubrum***	**TR 20%**	**FAC**	15.		
8. *Abies balsamea*	TR 5%	FACW	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 83 %

Remarks: Weland depression/pocket located within forested upland area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 12 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/1			Organics
3-12	2	7.5YR 5/1			Sand
12-16	3	7.5YR 2.5/2			Consolidated Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
x Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Oxidized rhizospheres in horizon 2.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetlands 5, 6 & 7
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 5 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Pteridium aquilinum***	**HB 60%**	**FACU**	9.		
2. ***Vaccinium angustifolium***	**SH 20%**	**FACU**	10.		
3. ***Abies balsamea***	**TR 30%**	**FACW**	11.		
4. *Betula papyrifera*	TR 10%	FACU	12.		
5. ***Pinus strobus***	**TR 20%**	**FACU**	13.		
6. ***Acer rubrum***	**TR 25%**	**FAC**	14.		
7. *Hammamelis virginiana*	SH 5%	FACU	15.		
8. *Quercus rubra*	TR 5%	FACU	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 40 %

Remarks: Heavily forested area with intersperced small wetlands.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/1			Organics
3-16	2	7.5YR 4/1			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 8
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 6 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Sphagnum sp.***	**HB 80%**	**OBL**	9.		
2. ***Alnus incana***	**SH 30%**	**OBL**	10.		
3. *Iris versicolor*	HB 5%	OBL	11.		
4. *Pteridium aquilinum*	HB 5%	FACU	12.		
5. ***Acer rubrum***	**TR 30%**	**FAC**	13.		
6. *Vaccinium angustifolium*	SH 10%	FACU	14.		
7. ***Pinus strobus***	**TR 30%**	**FACU**	15.		
8. *Betula papyrifera*	TR 5%	FACU	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75 %

Remarks: Alder/bog area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Field Observations
Taxonomy (Subgroup): Entic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	1	7.5YR 2.5/1			moss/peat
9-16	2	7.5YR 5/1			sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	x Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Organic streaking in horizon 2. Low chroma colors in horizion 1 and 2.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor
Applicant/Owner: Mascoma
Investigator: PMK/LDK

Date: 9/1/2009
County: Chippewa
State: MI

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID: Wetland 8
Transect ID:
Plot ID: Plot 6 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. ***Pteridium aquilinum***	**HB 70%**	**FACU**
2. *Huperzia Lucidula*	HB 10%	FAC+
3. *Acer rubrum*	SH 10%	FAC
4. ***Acer rubrum***	**TR 20%**	**FAC**
5. ***Pinus strobus***	**TR 30%**	**FACU**
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 33 %

Remarks: Located adjacent to and upslope from Plot 6 WET.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
__ Stream, Lake or Tide Gauge
__ Aerial Photographs
__ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:
Primary Indicators:
____ Inundated
____ Saturated in Upper 12 inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
____ Oxidized Root Channels in Upper 12 inches
____ Water -Stained Leaves
____ Local Soil Survey Data
____ FAC-Neutral Test
____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Field Observations
Taxonomy (Subgroup): Entic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 3/1			Organics/Sand
2-14	2	7.5YR 5/2			Sand
14-16	3	7.5YR 2.5/2			Sand to Consolidated Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 9
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 7 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Abies balsamea***	**TR 30%**	**FACW**	9. ***Sphagnum sp.***	**HB 20%**	**OBL**
2. ***Calamagrostis canadensis***	**HB 20%**	**OBL**	10. *Picea mariana*	TR 10%	FACW
3. *Iris versicolor*	HB 5%	OBL	11.		
4. ***Acer rubrum***	**TR 40%**	**FAC**	12.		
5. *Acer rubrum*	SH 5%	FAC	13.		
6. ***Betula papyrifera***	**TR 20%**	**FACU**	14.		
7. *Pteridium aquilinum*	HB 15%	FACU	15.		
8. *Cornus canadensis*	HB 10%	FACW	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 80 %

Remarks: Wetland is forested mix of alder, balsam, spruce, maple with rolling transistion area along the edge.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 1/2 - 1 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- x Inundated
- ___ Saturated in Upper 12 inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 inches
- ___ Water -Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Field Observations
Taxonomy (Subgroup): Entic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	1	7.5YR 2.5/1			Organics/Sandy loam
6-16	2	7.5YR 6/2			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Soils contains low chroma colors.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 9
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 7 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Abies balsamea***	**TR 30%**	**FACW**	9.		
2. *Pteridium aquilinum*	HB 10%	FACU	10.		
3. ***Acer rubrum***	**TR 30%**	**FAC**	11.		
4. *Cornus canadensis*	HB 5%	FACW-	12.		
5. ***Populus tremuloides***	**TR 20%**	**FACU**	13.		
6. ***Abies balsamea***	**SH 20%**	**FACW**	14.		
7. *Acer rubrum*	SH 5%	FAC	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75 %

Remarks: Upland area with mature balsam fir and thin understory.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Taxonomy (Subgroup): Entic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/1			Organics
3-12	2	7.5YR 6/2			Sand
12-16	3	7.5YR 3/3			Sand to Consolidated Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: No organic streaking in sandy soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 11
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 8 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Sphagnum sp.***	**HB 90%**	**OBL**	9.		
2. *Calamagrostis canadensis*	HB 5%	OBL	10.		
3. *Acer rubrum*	SH 15%	FAC	11.		
4. *Abies balsamea*	TR 10%	FACW	12.		
5. ***Acer rubrum***	**TR 30%**	**FAC**	13.		
6. *Betula papyrifera*	SH 10%	FACU	14.		
7. *Pinus strobus*	TR 15%	FACU	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Sphagnum sp. filled depression within heavily forested area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 8 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Taxonomy (Subgroup): Entic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	1	7.5YR 2.5/1			Peat/Moss
6-16	2	7.5YR 5/1			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: No organic streaking in sandy soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/1/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 11
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 8 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Cornus canadensis*	HB 2%	FACW-	9.		
2. *Maianthemum canadense*	HB 10%	FAC	10.		
3. *Pteridium aquilinum*	HB 10%	FACU	11.		
4. *Abies balsamea*	SH 15%	FACW	12.		
5. ***Abies balsamea***	**TR 25%**	**FACW**	13.		
6. ***Acer rubrum***	**TR 25%**	**FAC**	14.		
7. ***Populus tremuloides***	**TR 25%**	**FACU**	15.		
8. *Betula papyrifera*	TR 10%	FACU	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Forested area consisting mainly of Balsam Fir and Red Maple.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Field Observations
Taxonomy (Subgroup): Entic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 5/1			Organics
2-16	2	7.5YR 5/1			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: No organic streaking in sandy soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/2/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 12
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Sphagnum sp.***	**HB 90%**	**OBL**	9. ***Vaccinium angustifolium***	**SH 20%**	**FACU**
2. ***Calamagrostis canadensis***	**HB 30%**	**OBL**	10. *Gaultheria hispioula*	HB 5%	FACW
3. *Ilex verticillata*	SH 15%	FACW+	11. *Osumunda cinnamomea*	HB 2%	FACW
4. *Salix exigua*	SH 10%	OBL	12. *Picea mariana*	SH 10%	FACW
5. ***Picea mariana***	**TR 20%**	**FACW**	13.		
6. *Cornus canadensis*	HB 2%	FACW	14.		
7. *Betula papyrifera*	SH 15%	FACU	15.		
8. *Acer rubrum*	SH 5%	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75 %

Remarks: Plot located on the edge of a sphagnum bog.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0-12 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Dawson and Loxley Peats

Drainage Class: Very poorly drained

Field Observations

Taxonomy (Subgroup): Terric Borosaprists (Dawson)
Dysic Typic Borosaprists (Loxley)

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	1	7.5YR 2.5/2 - 2.5/1			Moss/Peat-Mucky Peat
6-14	2	7.5YR 6/1			Sand
14-16	3	7.5YR 3/3			Sand to Consolidated Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Horizon 1 contains 6" of Moss/Peat.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/2/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 12
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Pteridium aquilinum*	HB 10%	FACU	9.		
2. *Populus deltoides*	SH 5%	FAC+	10.		
3. *Quercus rubra*	SH 5%	FACU	11.		
4. ***Pinus resinosa***	**TR 60%**	**FACU**	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 0 %

Remarks: Large red pine stand adjacent to large wetland bog.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres Sands, 0-3% slopes

Drainage Class: Moderately well drained to Somewhat poorly drained

Field Observations
Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): Typic Endoaquods (Au Gres)
Oxyaquic Haplorthods (Croswell)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 2.5/1			Organics
2-16	2	7.5YR 5/2			Sand

Hydric Soils Indicators:

- __ Histosol
- __ Histic Epipedon
- __ Sulfidic Odor
- __ Aquic Moisture Regime
- __ Reducing Conditions
- __ Gleyed or Low-Chroma Colors
- __ Concretions
- __ High Organic Content in Surface Layer in Sandy Soils
- __ Organic Streaking in Sandy Soils
- __ Listed on Local Hydric Soils List
- __ Listed on National Hydric Soils List
- __ Other (Explain in Remarks)

Remarks: No organic streaking in sand.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/2/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 12
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 10 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Sphagnum sp.***	**HB 80%**	**OBL**	9. ***Abies balsamea***	**TR 20%**	**FACW**
2. ***Calamagrostis canadensis***	**HB 40%**	**OBL**	10. *Picea mariana*	TR 10%	FACW
3. ***Rubus pubescens***	**HB 20%**	**FACW+**	11. *Chamaedaphne calculata*	HB 5%	OBL
4. *Osumunda cinnamomea*	HB 5%	FACW	12. ***Acer rubrum***	**TR 20%**	**FAC**
5. *Carex stricta*	HB 5%	OBL	13.		
6. ***Betula papyrifera***	**SH 20%**	**FACU**	14.		
7. ***Acer rubrum***	**SH 30%**	**FAC**	15.		
8. *Salix nigra*	SH 10%	OBL	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 85 %

Remarks: Located near the edge of a sphagnum bog.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 3 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Dawson Complex

Drainage Class: Very Poorly Drained

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Terric Borosaprists (Dawson)

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	7.5YR 2.5/1			Moss/Peat
5-16	2	7.5YR 5/1			Sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	x Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Organic streaking in horizon 2. Low chroma colors in horizons 1 and 2.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor
Applicant/Owner: Mascoma
Investigator: PMK/LDK

Date: 9/2/2009
County: Chippewa
State: MI

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID: Wetland 12
Transect ID:
Plot ID: Plot 10 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Vaccinium angustifolium***	**SH 60%**	**FACU**	9.		
2. ***Pteridium aquilinum***	**HB 60%**	**FACU**	10.		
3. ***Acer rubrum***	**SH 30%**	**FAC**	11.		
4. ***Abies balsamea***	**TR 30%**	**FACW**	12.		
5. ***Populus tremuloides***	**TR 25%**	**FACU**	13.		
6. *Quercus rubra*	SH 5%	FACU	14.		
7. ***Acer rubrum***	**TR 30%**	**FAC**	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50 %

Remarks: Located within a bracken fern meadow.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
__ Stream, Lake or Tide Gauge
__ Aerial Photographs
__ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:
Primary Indicators:
____ Inundated
____ Saturated in Upper 12 inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
____ Oxidized Root Channels in Upper 12 inches
____ Water -Stained Leaves
____ Local Soil Survey Data
____ FAC-Neutral Test
____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand

Drainage Class: Well drained

Taxonomy (Subgroup): Entic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	1	7.5YR 2.5/1			Organics/Loam
4-10	2	7.5YR 4/1			Sand
10-16	3	7.5YR 4/6			Sand to Consolidated Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: No organic streaking within sand layers.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/2/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 13
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 11 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Acer rubrum***	**TR 70%**	**FAC**	9.		
2. *Osumunda cinnamomea*	HB 5%	FACW	10.		
3. *Calamagrostis canadensis*	HB 15%	OBL	11.		
4. *Ciburnum lentago*	SH 5%	FAC+	12.		
5. ***Pinus strobus***	**TR 20%**	**FACU**	13.		
6. ***Populus tremuloides***	**TR 20%**	**FACU**	14.		
7. ***Sphagnum sp.***	**HB 20%**	**OBL**	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50 %

Remarks: Forested wetland depression.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Taxonomy (Subgroup): Entic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	1	7.5YR 2.5/1			Organics/Loam
4-9	2	7.5YR 3/1			Sand
9-16	3	10YR 3/3			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
x Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Organic streaking within sand layers.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/2/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 13
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 11 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Pteridium aquilinum***	**HB 60%**	**FACU**	9.		
2. ***Prunus virginiana***	**SH 20%**	**FAC-**	10.		
3. ***Populus grandidentata***	**SH 70%**	**FACU**	11.		
4. *Corylus cornuta*	SH 10%	FACU	12.		
5. ***Fragaria sp.***	**HB 20%**	**FACU**	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 0 %

Remarks: Plot located in upland aspen stand.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau Fine Sand, moderately wet

Drainage Class: Moderately well drained

Taxonomy (Subgroup): Entic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-1	1	7.5YR 2.5/1			Organics
1-3	2	7.5YR 4/1			Sand
3-16	3	7.5YR 5/8			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: No organic streaking within sand layers.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/3/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 14
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 12 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Prunus virginiana***	**SH 20%**	**FAC-**	9.		
2. ***Alnus incana***	**SH 40%**	**OBL**	10.		
3. ***Calamagrostis canadensis***	**HB 60%**	**OBL**	11.		
4. ***Sphagnum Sp.***	**HB 90%**	**OBL**	12.		
5. *Iris versicolor*	HB 10%	OBL	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75 %

Remarks: Wetland depression surrounded by large pine stand.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 6 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	1	7.5YR 2.5/1			Peat/Muck
4-16	2	7.5YR 4/1			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Peat/Muck in horizon 1.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Railroad Spur Cooridor	Date: 9/3/2009
Applicant/Owner: Mascoma	County: Chippewa
Investigator: PMK/LDK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 14
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID:
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 12 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ***Vaccinium angustifolium***	**SH 20%**	**FACU**	9.		
2. *Acer rubrum*	SH 5%	FAC	10.		
3. *Gaultheria procumbens*	HB 15%	FACU	11.		
4. ***Pteridium aquilinum***	**HB 60%**	**FACU**	12.		
5. ***Pinus strobus***	**TR 50%**	**FACU**	13.		
6. ***Picea mariana***	**TR 20%**	**FACW**	14.		
7. *Quercus rubra*	SH 5%	FACU	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 25 %

Remarks: Wetland depression surrounded by large pine stand.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola Complex

Drainage Class: Somewhat to very poorly drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods (Kinross)
Typic Endoaquods (Wainola)

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-1	1	7.5YR 2.5/1			Loamy Sand/Sand
1-10	2	7.5YR 4/1			Sand
10-16	3	7.5YR 4/6			Sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

Appendix B

Photo Log

PHOTO LOG
Wetland Delineation
Proposed Frontier Railroad Corridor
8/30/09 – 9/3/09

Photo 1 – Taken facing northwest on two-track road near transmission line corridor, immediately north of the existing railroad grade.

Photo 2 – Taken facing north from southernmost boundary of Wetland 1. Note cattail stand and pine-inhabited upland “island” in far back, right.

Photo 3 – Photo taken facing north along southern boundary of Wetland 1, approximately 500 feet to the East of photo 1.

Photo 4 – Photo taken facing north near the northeast boundary of an upland “peninsula” within Wetland 1. Note the transition to a wooded wetland of mature black spruce and balsam fir.

Photo 5 – Taken in northern portion of Wetland 1 facing west. This area is a small strip of wetland located between two upland ridges. Winterberry and cinnamon fern were prevalent here.

Photo 6 – Taken facing southwest within the northern portion of Wetland 1.
Note extensive mat of sphagnum moss and mature black spruce.

Photo 7 – Photo taken facing northwest near Plot 2 WET-B.
Prevalence of sphagnum and black spruce continues here.

Photo 8 – Taken facing southeast near the northern portion of Wetland 1.
Here, wetland and transitional wetland/upland continues outside of the rail corridor boundary.

Photo 10 – **(Photo 9 omitted.)** Taken facing south at far northern boundary of Wetland 1.

Photo 11 – Photo taken facing north along western corridor boundary within Wetland 2.

Photo 12 – Photo taken in center of Wetland 3 facing southwest. This wetland is located in a small ground surface depression that predominantly vegetated with Canada bluejoint.

Photo 13A – Taken facing northwest near center of Wetland 7. Note the vegetative similarity of this wetland those shown in photos 12 and 13.

Photo 13B – Taken facing north near center of Wetland 5.

Photo 14 – Photo taken facing southwest along western corridor boundary within Wetland 8.

Photo 15 – Photo taken along northwest boundary of Wetland 9 facing north. Note depressions with darkened leaves and organic matter from frequent inundation.

Photo 16 – Photo of Wetland 10 taken facing northeast.

Photo 17 – Photo of Wetland 12 taken facing north. This portion of Wetland 12 is a black spruce and tamarack swamp similar to the northern portions of Wetland 1.

Photo 18 – Photo of Wetland 13 taken facing east.

Photo 19 – Photo of red pine forest, taken facing north towards Wetland 12. The edge of the wetland can be seen in the far background of this photo.

Photo 20A – Photo taken facing south in southern portion of Wetland 9.

Photo 20B – Photo taken in red pine forest near photo 19, facing south.

Photo 21 – Photo taken facing southeast in Wetland 14.

Wetland Boundary Delineation Report
Provided as Supplement to:
Frontier Cellulosic Ethanol Facility Environmental Assessment
Kinross Township
Chippewa County, Michigan

AECOM Project No. 13375001

August, 2009

Prepared by:
AECOM Environment

Linda Kersten	Patrick Kilkenny
Project Engineer	Assistant Project Scientist
(906) 231-7130	(906) 226-4822

Contents

1.0 INTRODUCTION

Frontier Renewable Resources, LLC (Frontier) retained AECOM Environment (AECOM) to complete a wetland boundary delineation on approximately 355 acres to assist with their planning of a proposed cellulosic ethanol facility in Kinross Township, Michigan. This delineation was completed to support an Environmental Assessment (EA) that is being conducted to evaluate potential impacts of construction and operation of the proposed facility. The wetland boundary delineation was completed with the following tasks and goals in mind:

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

This report presents the resulting data and conclusions associated with these tasks and goals.

2.0 SITE DESCRIPTION

The delineation area consisted of approximately 355 acres located in the Southeast ¼ and the Eastern ½ of the Southwest ¼ of Section 21, T45N, R1W and the Northeast ¼ of Section 28, T45N, R1W, Kinross Township, Chippewa County, Michigan. The site location and proposed boundaries are indicated on portions of the United States Geological Survey (USGS) topographic maps entitled "Dafter, Pickford NW, Rudyard, and Kinross, Michigan" provided as Figure 1 – Site Location Map. The site boundaries are also indicated over the 2005 aerial photo on the attached Figure 2 – Site Location Map with 2005 Aerial Photo.

The Frontier site as a whole is bordered by the Kincheloe Access Road on its entire western side, the Mackinac Trail Spur on its northwestern boundary, and undeveloped woodlands and wetlands on its remaining boundaries. The West Bisnett Right-of-Way (ROW) is a combination gravel and "two-track" road that runs east to west through the center of the Frontier site, separating the four northern forty-acre parcels from the four southern forty-acre parcels. This road connects to a series of other two-track roads and all terrain vehicle (ATV) trails that run in a network throughout the project site. Use of the property for ATV and dirt bike recreation is popular, and is demonstrated by the presence of a small dirt bike track that is located in the northeast portion of the site. To the south of the track are a few cleared areas with scattered trees and meadows that was at one time a homestead site. It was also apparent during AECOM's field investigation that this property has been commonly used for deer hunting. Several deer stands, blinds and cleared shooting lanes were observed throughout the site.

The Frontier project site is most easily characterized by referring to the southern two-thirds and northern third of the site separately. The southern two-thirds of the site has nearly level to gently sloping ground surface topography, consistently sandy soils and upland forested areas. These upland forests are by majority hardwood, but a few evergreen stands exist in the central and northeastern portions. Overstory tree species common to the hardwood areas include red oak, pin oak, red maple, sugar maple and quaking aspen. Serviceberry and beaked hazelnut were some of the species most common to the understory. The evergreen stands consisted of row-planted red pine, white spruce and/or balsam fir. As the Frontier site has been owned by the State of Michigan for several years, these woodlands show evidence of recent forest management. Selective harvesting appears to be most prevalent, where relatively mature trees can be found interspersed among mid- to new-growth trees (saplings).

This high, sandy, southern "plateau" of sorts transitions to mesic and lowland areas in the north via a distinct bluff. This bluff has slopes ranging from approximately 6 to 15%, and runs in a northwest to southeast

direction across the site. Continuing to the north of the bluff, ground surface slopes become nearly level with slopes rarely exceeding 2 to 3%. However, in the northernmost portion of the site, the ground surface begins to show a slight undulation that is characteristic of former lake bed areas. Areas such as these include dune-swale complexes, which are relatively common in the Great Lakes region. The presence of former lake bed is further reinforced by the fact that soils in these areas are generally sandy.

Similar to the southern portion of the site, the majority of the northern portion is forested with a combination of hardwood and evergreen trees. In this case however, the evergreen trees are intermixed throughout, rather than occurring in a few patchy stands. Vegetation in mesic and upland areas is similar to that occurring in the southern half of the site, with mature red pine being very common on upland "humps." There are also a few mesic areas where mature eastern hemlock is dominant. Low, wetland areas in the northeastern portion of the site are generally tamarack swamps that support a mixture of tamarack, black spruce, white birch and leatherleaf. Sphagnum moss and snowberry are also common on ground surfaces in these areas. These swamp areas appear to be hydrologically supported by an elongated drainage system that reaches across the far northern portion of the site. This drainage system appears to originate from a large shrub swamp that is located just off of the western property corner.

3.0 LITERATURE REVIEW

Prior to on-site field investigation, AECOM completed a review of available map data in order to obtain information on general site characteristics, and to identify potential wetland areas for field investigation. Items reviewed included the USGS topographic map, 2005 aerial photo, the Natural Resource Conservation Service (NRCS) soils map and the National Wetland Inventory (NWI) map.

3.1 USGS Topographic Map

The Frontier site's boundaries are indicated over a USGS topographic map in the attached Figure 1. The map indicates that the southern two-thirds of the project site are located on the top of a large, elongated hill that has a surface elevation approximately 8 to 10 feet higher than the ground surface in the northern one-third of the project site. Wetlands and a pond are indicated just outside of the site's northern boundaries; however they do not extend into the site. Ground surface contours in the northwestern portion of the site identify the presence of the drainage system extending from west to the northeast.

3.2 Aerial Photo

The project site boundaries are indicated over the 2005 National Agriculture Imagery Program (NAIP) aerial photo in the attached Figure 2. The aerial photo indicates the presence of dense, continuous deciduous and evergreen forests over the majority of the project site. A small cleared area exists in the north-central portion of the site that appears to be barren and/or grass upland. An elongated "strip" of wetlands appears to be present that crosses the northeast corner of the site and extends to the north and west outside of the project boundaries. Additional wetland areas are visible outside of, but adjacent to, the project boundaries to the northeast, north and northwest. This includes a small pond/open-water wetland just off of the northeast site boundary.

3.3 NRCS Soils Map

A portion of the NRCS soils map for Chippewa County, Michigan is also attached to this report as Figure 3. Using color coding, this map indicates which soil series are hydric with a blue coloration and "partially hydric" with a green coloration. Partially hydric soils (soils that have hydric inclusions) are present in the far northwestern and northeastern portions of the Frontier site. These include Croswell-Au Gres sands (88A), Dawson and Loxley peats (37), and Kinross-Wainola complex soils (137A). These areas are the most likely to contain wetlands as, by definition, hydric soils are regularly saturated near the surface and contain specific soil features that result from repeated saturation.

The central and southern portions of the site are less likely to contain wetlands as the mapped soil types are not hydric, and the ground surface elevation is significantly higher than in the lower, hydric soil areas. Table 1.0, below, presents a summary of characteristics for each of the soil types mapped within the Frontier project boundaries. These characteristics include: primary soil texture of near-surface horizons, typical ground surface slope, drainage classification, percent hydric soil inclusions and where each soil type can be found on site.

Table 1.0 – Site Soils Characteristics

Soil Name	Primary Texture	Slope %	Drainage Class	% Hydric	Portion of Site
Croswell-Au Gres sands (88A)	sand	0-3	MWD	4	NW and NE Corners of Site
Dawson and Loxley peats (37)	peat, muck	0-2	VPD	90	Far NE Corner
Kinross-Wainola complex soils (137A)	muck, sand	0-2	VPD	62	Far NE Corner
Rousseau fine sand (15B)	fine sand	0-6	WD	0	Majority of Site Except Far Northern Areas
Kalkaska sand (19B)	sand	0-6	ED	0	NW Portion of Site, Extreme SW & SE Corners
Alcona loamy very fine sand (13B)	loamy v. fine sand	0-6	MWD	0	Isolated Area in North-central Portion of Site

Drainage Class Key:

ED = Excessively Drained; WD = Well Drained; MWD = Moderately Well Drained; VPD = Very Poorly Drained.

3.4 NWI Map

The NWI map indicates the presence of scrub-shrub and forested wetlands in the far northeastern corner of the project site. It also indicates an elongated scrub-shrub wetland just outside of the far northwestern property corner. Scrub-shrub wetlands are characterized by a dominance of shrubby vegetation and a general lack of mature trees. Alternatively, forested wetlands are characterized by a dominance of mature deciduous or evergreen trees, and a significantly lower presence of shrubby or herbaceous vegetation.

An NWI map of the investigation area is provided as Figure 4.

4.0 METHODOLOGY

On April 27th to May 1st and June 1st through 4th, 2009, AECOM completed wetland boundary delineations within the Frontier project site utilizing the U.S. Army Corps of Engineers (COE) 1987 Wetland Delineation Methodology, and methods outlined in the Michigan Department of Environmental Quality's (MDEQ) Wetland Identification Manual. The COE methodology requires that, under normal circumstances, hydric soils, wetland hydrology, and hydrophytic vegetation must be present for an area to be defined as a wetland. The method outlined in the MDEQ manual states that only two parameters, wetland vegetation and wetland hydrology, are required to confirm the presence of wetlands under Michigan law.

AECOM completed upland and wetland determination plots in transects through wetland and upland areas, as well as along wetland boundaries. A set of two determination plots (one on each side of the boundary)

was used for smaller or more narrow wetland areas, rather than entire transects with 3 or more data plot locations. Transects were labeled alphanumerically, with the number being the transaction number, and the letter representing the individual plot. For example: Transect 1, Plot C (completed in an upland) would be labeled "1C-UP." Or, Transect 4, Plot D (completed in a wetland) would be labeled "4D-WET." After wetland boundary locations were determined, the boundaries were staked and/or flagged, with each point labeled as "B-1, B-2, B-3…etc.," with B representing "Boundary." In most cases, survey lathe only (tied with pink wetland ribbon) was used to stake the boundary points. In some areas, such as where boundaries formed relatively straight lines (no curves or corners), wetland flagging in trees or on shrubs was alternated with staking. Boundary point names were written on the stakes and/or ribbon, as well as entered into the Trimble® GeoXT™ GPS surveying unit used to survey boundary and data plot locations. Routine On-Site Determination Forms of data plot information are included in the Appendix. The delineated wetland boundaries and determination plot locations are indicated in the attached Figures 5 through 11. For future reference, Table 2.0 below provides a list of data plot names and their GPS coordinate locations.

Table 2.0 – Data Plot GPS Coordinates

Plot Name	Northing	Easting
1A-WET	556703.112	26897373.484
1B-UP	556395.563	26897329.804
1C-WET	556248.603	26897392.176
1D-WET	555961.391	26897389.414
1E-UP	555713.726	26897291.804
2A-WET	556825.115	26897035.367
2B-UP	556532.601	26897107.567
2D-WET	556068.608	26896931.464
2E-UP	556014.408	26896909.085
3A-WET	556643.903	26896145.285
3B-UP	556603.953	26896177.797
4A-WET	556604.245	26896562.981
4B-UP	556576.029	26896567.151
5A-WET	556341.449	26896745.291
5B-UP	556286.266	26896700.041
6-UP	555642.906	26897392.958
6-WET	555618.707	26897440.576
7-UP	555610.367	26897368.732
7-WET	555540.491	26897371.637
8-UP	556680.338	26895736.793
8-WET	556622.562	26895715.082
9A-WET	556625.523	26895057.490
9B-UP	556588.584	26895051.203
9C-WET	556547.860	26895025.822
9D-UP	556526.429	26895042.936
9E-WET	556496.918	26895007.881
9F-UP	556444.623	26895049.568

*Coordinates provided in NAD 1983 Michigan State Plane North, International Feet.

In areas that appeared to be totally devoid of wetlands (entirely upland), transects were walked in north-to-south and east-to-west directions along the boundaries of each 40-acre parcel, and through their centers. In this way, AECOM ensured that all portions of the site were examined for the presence of wetlands.

The attached photo log provides photos of each wetland identified by AECOM. Also included are photos taken while walking transects through upland areas, and during general site inspection. These photos are

included in order to provide some characterization of the upland areas, as well as to support the determination that no wetlands are present within them.

5.0 RESULTS

In total, AECOM identified and delineated five wetlands within the Frontier project investigation area. Their relative sizes and locations are depicted in the attached Figures 5 through 11. Wetlands were encountered within the two northernmost 40-acre parcels only. **No wetlands were encountered within the rest of the project site. This includes the southern two-thirds of the project site (four southernmost 40-acre parcels).**

Wetland 1

At approximately 13.7 acres in size, Wetland 1 is the largest and most extensive wetland found on the Frontier site. This wetland occupies areas nearest the northern project site boundary, and extends from the western site boundary to the eastern site boundary. The western half of this wetland can best be described as an elongated swale or drainage course. This drainage course contained standing water during both site visits in April and June, and likely obtains its hydrology from interconnection with the water table and/or surface connection with large wetlands to the west of the site. Given that the ground surface generally slopes to the east and northeast in this area, it is likely that water in this drainage course flows east towards the largest portion of Wetland 1 during rainfall events. This western portion of the wetland appears to be part of a dune-swale complex type setting that continues to the north. Data plots 3A-WET, 8-WET and 9A-WET were completed within this portion of Wetland 1. Some of the dominant vegetative species observed at these locations included red maple (*Acer rubrum* - FAC), black spruce (*Picea mariana* – FACW), balsam fir (*Abies balsamea* - FACW) and various sphagnum (*Sphagnum spp*. – OBL) and sedge species (*Carex spp.* – FAC to OBL). Soils encountered in the western half of Wetland 1 were found to be sands, silts and/or cobbles with muck or peat surface horizons. The predominant soil type mapped by NRCS in the western half of Wetland 1 is Kalkaska sand.

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

A few small, isolated upland areas were included in Wetland 1 as it was the opinion of AECOM that their size and extent were not significant, and did not warrant their identification and separation from the wetland. Currently, the proposed Frontier project development plan does not call for any impact to the wetland or lands near the wetland, and therefore issues such as mitigation ratios are not a concern. Currently the delineated boundaries are serving as guidance for avoidance of impact only.

Wetland 2

Wetland 2 is approximately 0.15 acres in size, and is located just south of the far western end of Wetland 1 (see Figure 6). This wetland exists in a relatively small, near-circular depression, and is separated from Wetland 1 by an elongated sandy ridge. The lowest ground surface elevation of this wetland is approximately the same as the lowest portions of Wetland 1, making it likely that the two wetlands are hydrologically connected via seepage through the sandy ridge. Data plot 9C-WET was completed within this small, wooded wetland. Dominant hydrophytic vegetation present included yellow birch (*Betula alleghaniensis* – FAC), balsam fir and red maple. Sphagnum moss was also present in the most saturated portions of the wetland. Standing water was observed at 2 inches below ground surface in a 16-inch deep soil pit, with saturation occurring up to the surface. Soils from 0 to 5 inches below ground surface were found to be 7.5 YR 2.5/2 mucky silts. Soils from 5 to 16 inches below gorund surface were found to be 7.5 YR 5/1 sands that had a significant amount of organic streaking. The mapped soil type in this location is Croswell-Au Gres sands.

Wetland 3

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

Wetland 4

Wetland 4 is the smallest of the wetlands documented on the Frontier site, and is approximately 917 square feet in size. This wetland is located along the eastern site boundary, immediately to the south of Wetland 1. Similar to Wetlands 2 and 3, Wetland 4 is located in a sandy depression that is wooded and is separated from adjacent wetlands by elongated sandy ridges. Data plot 6-WET was completed within this wetland. Dominant vegetation included red maple, black spruce and quaking aspen (Populus tremuloides – FAC). Sphagnum moss was also present in the most saturated areas of this wetland. Soil saturation was evident at the ground surface, and free water was observed in a 16-inch soil pit at 3 inches below the surface. Soils present at this location included 7.5 YR 2.5/1 loam with organics from 0 to 6 inches below the surface, and 7.5 YR 5/3 sand with common, distinct 7.5 YR 5/6 mottling from 6 to 16 inches. The mapped soil types in the area of Wetland 4 are Croswell-Au Gres sands. It should be noted that Wetland 4 extends past the eastern frontier project boundary.

Wetland 5

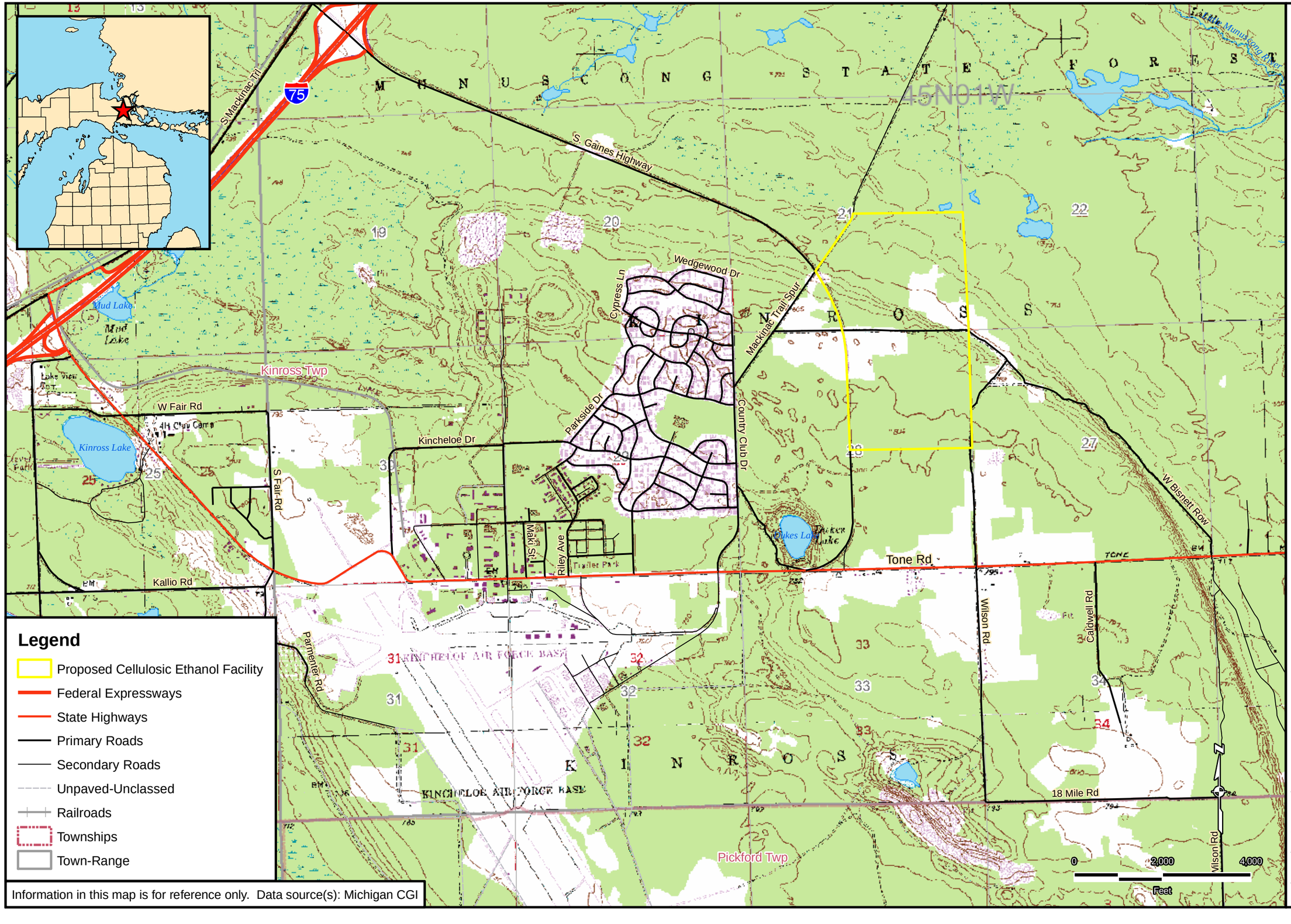
Wetland 5 is located immediately to the south of Wetland 4 and is approximately 0.35 acres in size. This wetland is also located in a sandy depression, but is more spread out and irregular shaped than Wetlands 2, 3 and 4. Data plot 7-WET was completed within the boundaries of Wetland 5. Here, vegetation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

6.0 ANTICIPATED IMPACTS

At the time of this wetland delineation report, Frontier is proposing construction of the cellulosic ethanol facility in the four southernmost 40-acre parcels of the property. No wetlands were identified within this 160-acre area. Frontier plans to use this delineation to assist with the design layout of their proposed facility and minimize wetland impact.

7.0 SUMMARY

Based on our observation of April 27th to May 1st and June 1st through 4th, 2009, and utilizing the COE wetland delineation methodology with regard to the MDEQ definition of a wetland, it is the opinion of AECOM that all 5 delineated wetlands are jurisdictional under state and federal law. In accordance with Section 404 of the Clean Water Act and Part 303 of the Natural Resources and Environmental Protection Act (NREPA), Act 451 of 1994, any impacts to these wetlands may require a permit from the MDEQ and/or COE. Please note that, as with all wetland delineations, these agencies make final determinations regarding jurisdiction and the locations of wetland boundaries. Boundary verifications (completed by MDEQ) are recommended whenever impacts are anticipated within or near identified wetlands.



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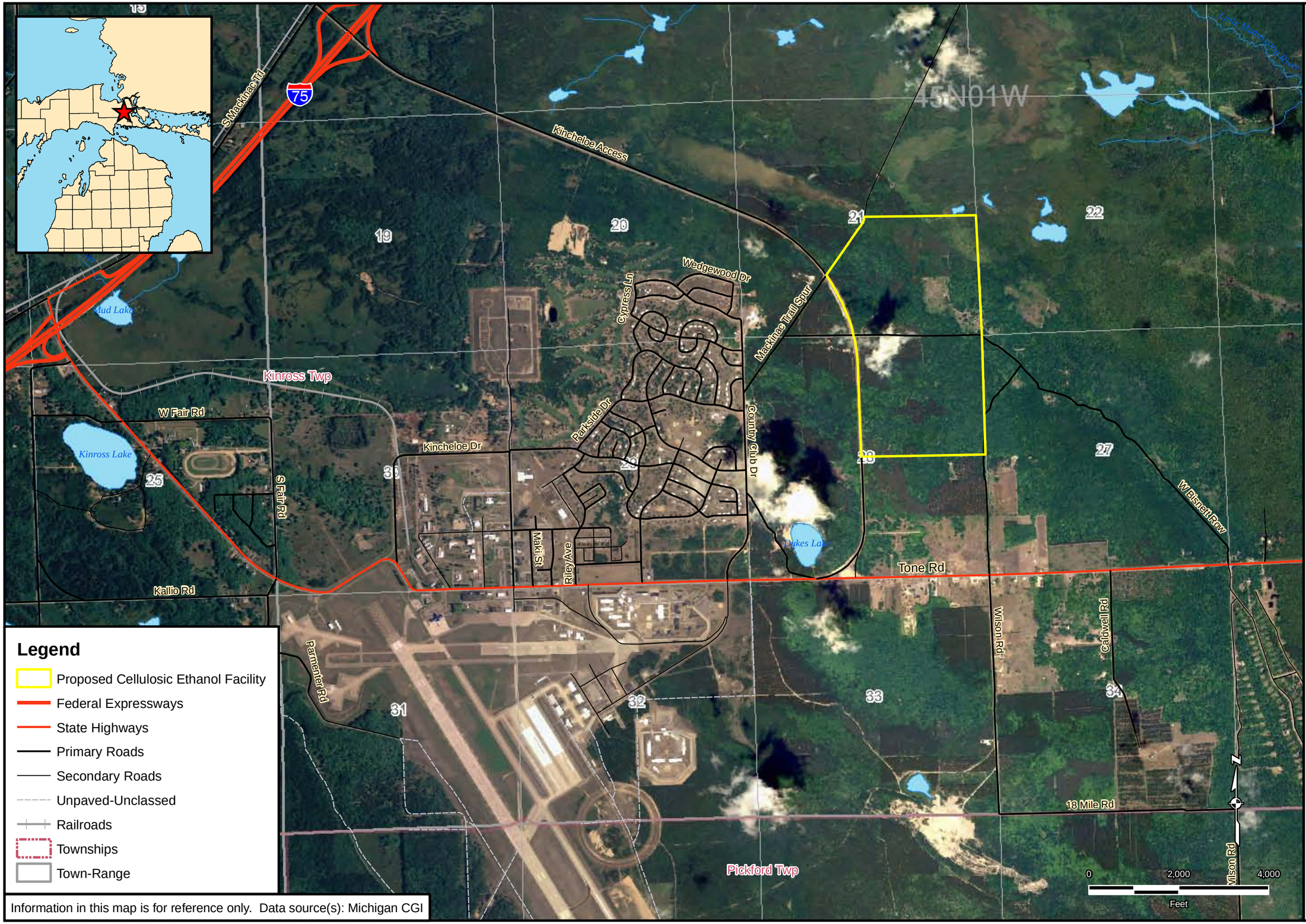
SITE LOCATION MAP
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

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



Legend

- Proposed Cellulosic Ethanol Facility
- Federal Expressways
- State Highways
- Primary Roads
- Secondary Roads
- Unpaved-Unclassed
- Railroads
- Townships
- Town-Range

Information in this map is for reference only. Data source(s): Michigan CGI

SITE LOCATION MAP WITH 2005 AERIAL PHOTO
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

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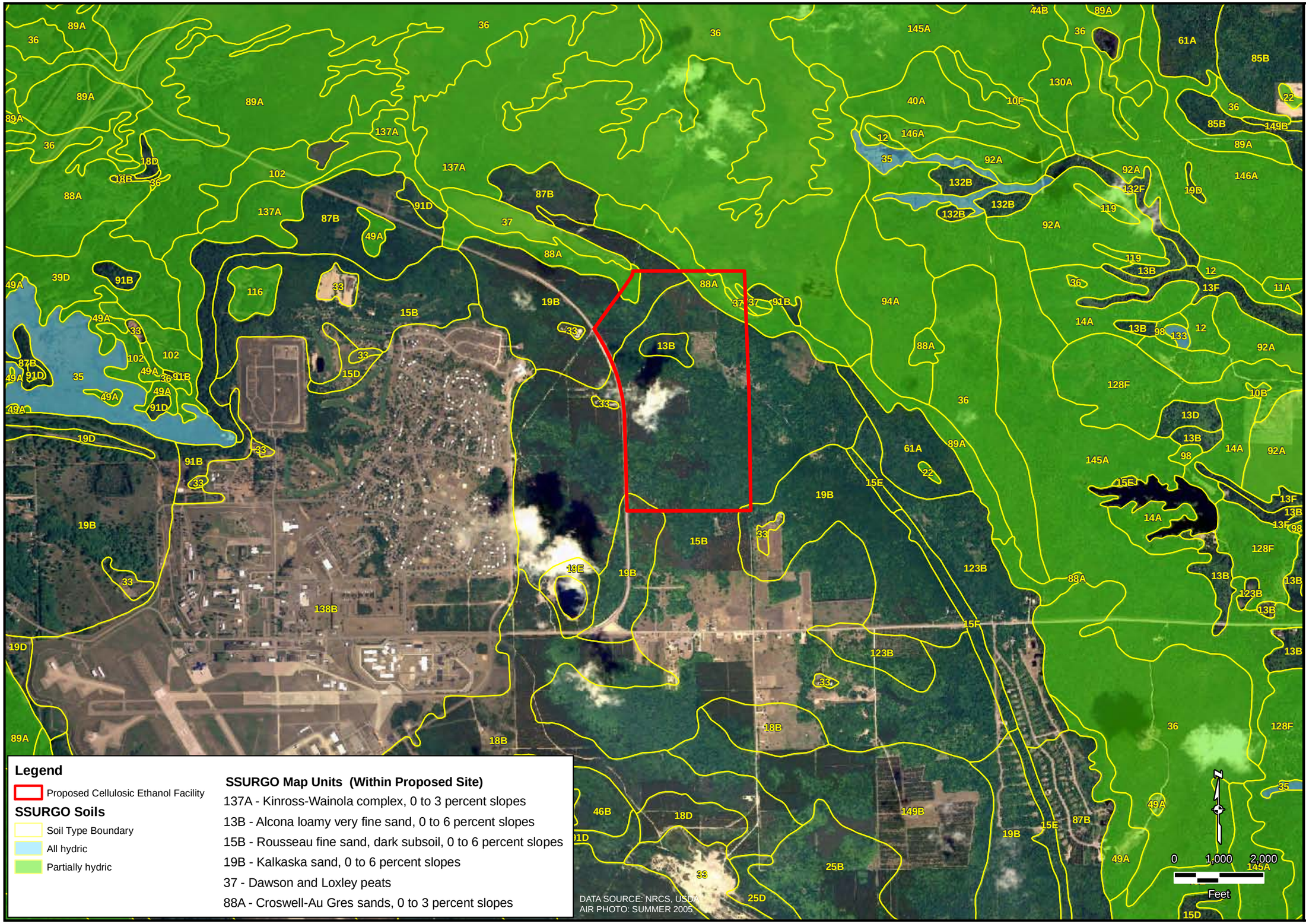
Drawn:	JWW	2/17/2009
Approved:	LDK	2/17/2009
Scale:	1" = 2,000'	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	2	



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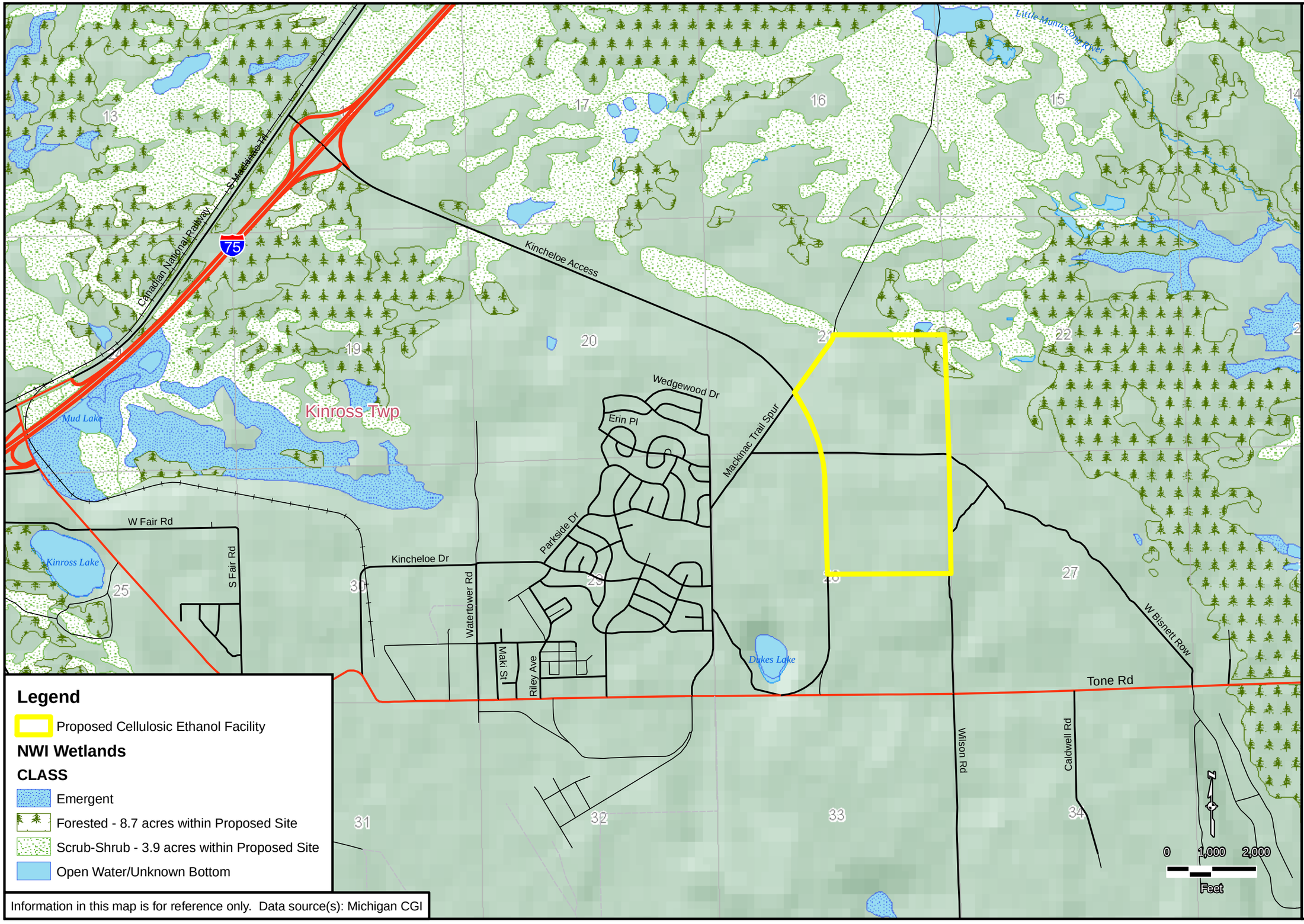
NRCS SOIL SURVEY MAP
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	3	



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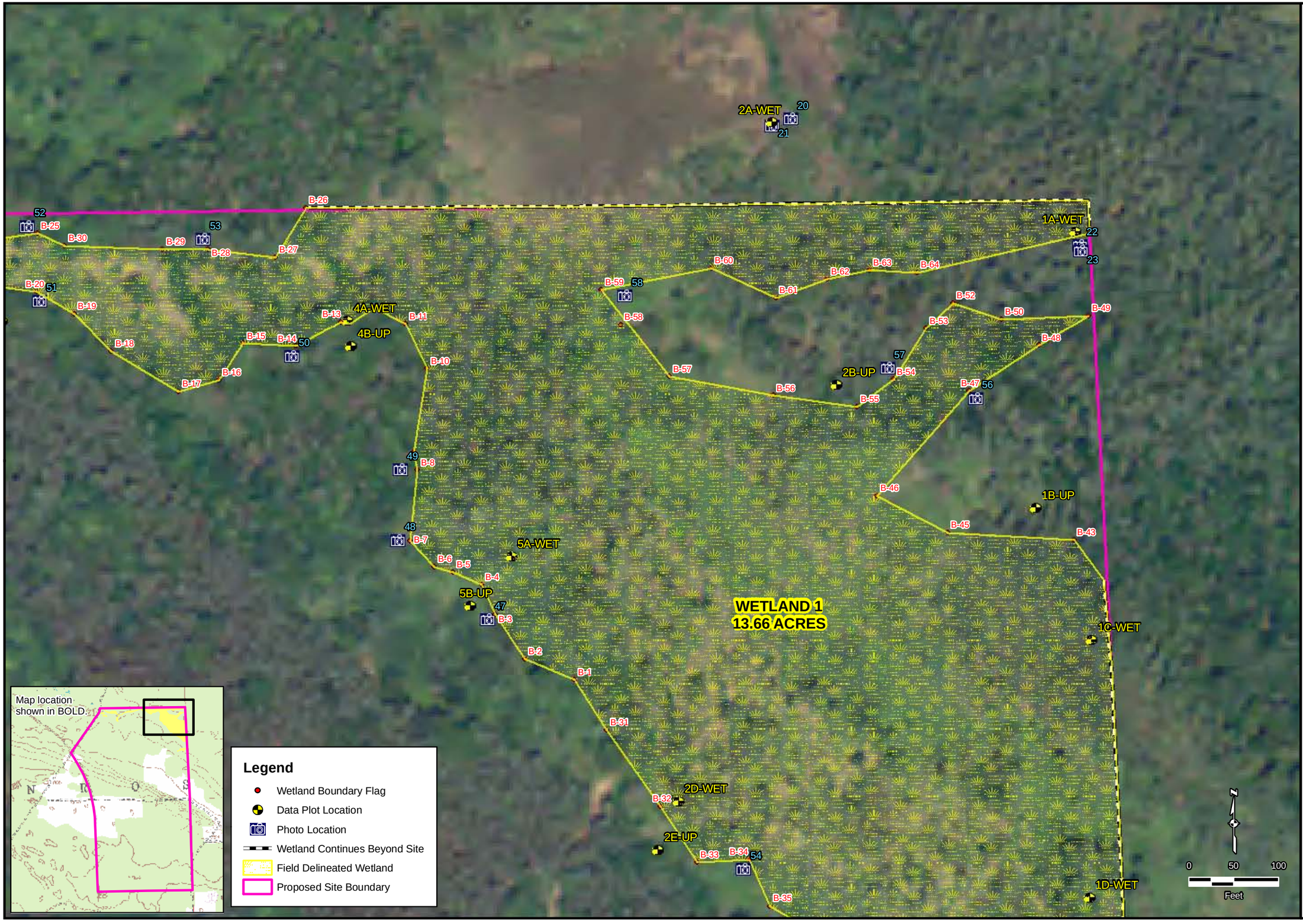
NATIONAL WETLANDS INVENTORY
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLULOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	JWW	2/17/2009
Approved:	LDK	2/17/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	4	



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FIELD DELINEATED WETLANDS AND PHOTO POINTS
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLUOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	5	

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FIELD DELINEATED WETLANDS AND PHOTO POINTS
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLUOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	6	

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FIELD DELINEATED WETLANDS AND PHOTO POINTS
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FRONTIER RENEWABLE RESOURCES, LLC
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CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	7	

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FIELD DELINEATED WETLANDS AND PHOTO POINTS
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FRONTIER RENEWABLE RESOURCES, LLC
CELLUOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	8	

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WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLUOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	9	

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FIELD DELINEATED WETLANDS AND PHOTO POINTS
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLUOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	10	

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FIELD DELINEATED WETLANDS AND PHOTO POINTS
WETLAND DELINEATION REPORT
FRONTIER RENEWABLE RESOURCES, LLC
CELLUOSIC ETHANOL FACILITY
CHIPPEWA COUNTY, MICHIGAN

Drawn:	SJE	6/25/2009
Approved:	LDK	6/25/2009
Scale:	AS SHOWN	
PROJECT NUMBER	13375-001-0100	
FIGURE NUMBER	11	

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/28/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 1
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 1A WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Picea marina*	TR 60%	FACW	9.		
2. *Abies balsamea*	TR 1%	FACW	10.		
3. *Acer rubrum*	TR 1%	FAC	11.		
4. *Pteridium aquilinum*	HB 2%	FACU	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Ground surface is varying ridges and depressions;bracken fern and red maple on high rolling tops

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 12 in.

Depth to Saturated Soil: 9 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- _x_ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola complex, 0 to 3 percent slopes

Drainage Class: Very poorly drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	7.5YR 2.5/1			silty/organics
5-15	2	7.5YR 5/2			sand
15-16	3	7.5YR 2.5/3			sand to consolidated sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	x High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	x Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Organics and silt in top 5."

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/28/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 1
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 1 B UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Picea marina*	TR 20%	FACW	9.		
2. *Picea marina*	SH 5%	FACW	10.		
3. *Pteridium aquilinum*	TR 100%	FACU	11.		
4. *Betula papyrifera*	TR 2%	FACU+	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50 %

Remarks: Area of consistently higher land, but still contains black spruce on wetland fringe.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 16+ in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola complex, 0 to 3 percent slopes

Drainage Class: Very poorly drained

Taxonomy (Subgroup): Typic Endoaquods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/1			organics
3-15	2	7.5YR 7/2			sand
15-16	3	7.5YR 2.5/3			sand to consolidated sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	x Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	Yes	(No)		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? Yes (No)

Remarks: Vegetation and soils are borderline wetland. However, predominance of bracken fern seems to indicate a lack of repeated saturation within 1' of the surface.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/28/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 1
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 1C WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Chamaedaphne calyculata*	SH 80%	OBL	9.		
2. *Larix laricina*	TR 5%	FACW	10.		
3. *Picea marina*	TR 2%	FACW	11.		
4. *Betula papyrifera*	TR 2%	FACU+	12.		
5. *Acer rubrum*	TR 0.5%	FAC	13.		
6. *Sphagnum sp.*	HB 100%	OBL	14.		
7. *Calamagrostis canadensis*	HB 5%	OBL	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Surface saturated bog/marsh area near eastern investigation boundary. Dominated by Tamarac, balsam fir and black spruce.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 1 in.

Depth to Free Water in Pit: surface in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- x Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Dawson and Loxley peats

Drainage Class: Very poorly drained

Taxonomy (Subgroup): Terric/Typic Borosaprists

Field Observations
Confirm Mapped Type? (Yes) No

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/1			moss
3-16	2	7.5YR 2.5/1			peat/muck

Hydric Soils Indicators:

- x Histosol
- __ Histic Epipedon
- __ Sulfidic Odor
- __ Aquic Moisture Regime
- __ Reducing Conditions
- x Gleyed or Low-Chroma Colors
- __ Concretions
- __ High Organic Content in Surface Layer in Sandy Soils
- __ Organic Streaking in Sandy Soils
- x Listed on Local Hydric Soils List
- __ Listed on National Hydric Soils List
- x Other (Explain in Remarks)

Remarks: Deep peat/muck/moss layers in soil pit.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources
Applicant/Owner: Mascoma/JM Longyear
Investigator: LDK, PK

Date: 4/29/2009
County: Chippewa
State: MI

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID: Wetland 1
Transect ID: 1
Plot ID: Plot 1D WET

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. *Populus tremuloides*	TR 20%	FAC
2. *Abies balsamea*	TR 10%	FACW
3. *Abies balsamea*	SH 40%	FACW
4. *Acer rubrum*	TR 20%	FAC
5. *Pinus strobus*	TR 20%	FACU
6. *Pteridium aquilinum*	HB 90%	FACU
7. *Thuja occidentalis*	TR 5%	FACW
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 60 %

Remarks: Rolling terrain within definite wetland area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 15 in.

Depth to Saturated Soil: 6 in.

Wetland Hydrology Indicators:
Primary Indicators:
____ Inundated
__x__ Saturated in Upper 12 inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
____ Oxidized Root Channels in Upper 12 inches
____ Water -Stained Leaves
____ Local Soil Survey Data
____ FAC-Neutral Test
____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Dawson and Loxley peats

Drainage Class: Very poorly drained

Taxonomy (Subgroup): Terric/Typic Borosaprists

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/1			organics
3-5	2	7.5YR 5/1			sand
5-9	3	7.5YR 5/2			sand
9-16	4	7.5YR 5/2	7.5YR 4/4	common/distinct	sand

Hydric Soils Indicators:

__ Histosol	x Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	x Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Concretions within upper 9"

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks: Rolling area withing large wetland. Soils, vegetation, and hydrology all indicate wetland.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 1
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 1E UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Pteridium aquilinum*	HB 80%	FACU	9.		
2. *Abies balsamea*	TR 10%	FACW	10.		
3. *Picea marina*	TR 80%	FACW	11.		
4. *Lycopodium obscurum*	HB 5%	FACU	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50 %

Remarks: Slight hillside adjacent to wetland. Ground surface elevated 3-4' higher than wetland.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 16 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations
Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 2.5/1			organics
2-6	2	7.5YR 5/3			sand
6-15	3	7.5YR 3/3			sand
15-16	4	7.5YR 3/3			consolidated sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Upland area located within large wetland area.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/28/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 2
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 2A WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Aster spp.*	HB 40%	FACW*	9.		
2. *Sphagnum sp.*	HB 90%	OBL	10.		
3. *Rubus idaeus*	SH 10%	FACW-	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Edge of relatively large bog/open water wetland. *Aster species difficult to identify as it was early in the season. Assun aster novae-angliae (FACW).

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 10 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola complex, 0 to 3 percent slopes

Drainage Class: Very poorly drained

Taxonomy (Subgroup): Typic Endoaquods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	1	7.5 YR 3/1			loamy sand w/ organics
8-10	2	7.5 YR 4/1			sand
10-16+	3	7.5 YR 5/1			sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	x Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 2
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 2B UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Pteridium aquilinum*	HB 70%	FACU	9.		
2. *Picea marina*	TR 70%	FACW	10.		
3. *Cornus stolonifera*	SH 5%	FACW	11.		
4. *Acer rubrum*	TR 5%	FAC	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50 %

Remarks: Large, rolling upland area between wetlands.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kinross-Wainola complex, 0 to 3 percent slopes

Drainage Class: Very poorly drained

Taxonomy (Subgroup): Typic Endoaquods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5 YR 2.5/1			organics & sandy loam
2-4	2	7.5 YR 4/1			sand
4-12	3	7.5 YR 5/2			consolidated sand
12-16+	4	5 YR 3/4			consolidated sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Dry, sandy soils in upland area. Sand referred to as consolidated is very dry, dense and compacted.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 2
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 2D WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Thuja occidentalis*	TR 25%	FACW	9.		
2. *Picea marina*	TR 10%	FACW	10.		
3. *Sphagnum sp.*	HB 100%	OBL	11.		
4. *Abies balsamea*	TR 15%	FACW	12.		
5. *Gaultheria hispidula*	HB 2%	FACW	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Peaty area with mature cedars.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 12 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	7.5 YR 2.5/1			peat
5-6	2	7.5 YR 2.5/1			muck
6-16+	3	7.5 YR 4/3			loamy sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Large upland area sloping into large wetland. Peat transitions to muck - layer 2 inches short of black histic.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 2
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 2E UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Pteridium aquilinum*	HB 80%	FACU	9.		
2. *Picea marina*	TR 70%	FACW	10.		
3. *Quercus rubra*	TR 5%	FACU	11.		
4. *Acer rubrum*	TR 5%	FAC	12.		
5. *Gaultheria procumbens*	HB 5%	FACU	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50 %

Remarks: Upland slope adjacent (south) to wetland.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations
Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 2.5/2			organics
2-3	2	7.5YR 2.5/1			loamy sand
3-9	3	7.5YR 5/3			sand
9-16	4	7.5YR 5/6			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Large upland area sloping into large wetland.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 3
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 3A WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer rubrum*	TR 20%	FAC	9.		
2. *Picea marina*	TR 20%	FACW	10.		
3. *Sphagnum sp.*	HB 100%	OBL	11.		
4. *Abies balsamea*	TR 20%	FACW	12.		
5. *Cornus racemosa*	SH 40%	FACW-	13.		
6. *Carex stricta*	HB 70%	OBL	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Marshy area near northern boundary. Upland areas exist to the north and south. Early in season- hard to determine ex carex species.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: surface in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-10	1	7.5 YR 2.5/1			organics/peat
10-16+	2	--			rock/cobbles

Hydric Soils Indicators:

__ Histosol	__ Concretions
x Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 3
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 3B UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer rubrum*	TR 20%	FAC	9.		
2. *Pteridium aquilinum*	HB 90%	FACU	10.		
3. *Piscea mariana*	TR 20%	FACW	11.		
4. *Abies balsamea*	TR 60%	FACW	12.		
5. *Abies balsamea*	SH 20%	FACW	13.		
6. *Dendrolycopodium*			14.		
7. *obscurum*	HB 30%	FACU	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Very large, rolling upland area located south of plot 3A WET.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water 0 in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5 YR 2.5/1			organics
2-15	2	7.5 YR 5/3			sand
15-16+	3	7.5 YR 5/8			sand/consolidated sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 4
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 4A WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Larix laricina*	TR 15%	FACW	9.		
2. *Pteridium aquilinum*	HB 10%	FACU	10.		
3. *Piscea mariana*	TR 30%	FACW	11.		
4. *Abies balsamea*	TR 50%	FACW	12.		
5. *Dendrolycopodium obscrum*	HB 5%	FACU	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Swamp/open water wetland edge.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 12 in.

Depth to Saturated Soil: 5-Apr in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5 YR 2.5/1			organics
2-14	2	7.5 YR 5/2			sand
14-16+	3	7.5 YR 3/3			sand

Hydric Soils Indicators:

- __ Histosol
- __ Histic Epipedon
- __ Sulfidic Odor
- __ Aquic Moisture Regime
- __ Reducing Conditions
- x Gleyed or Low-Chroma Colors
- __ Concretions
- __ High Organic Content in Surface Layer in Sandy Soils
- __ Organic Streaking in Sandy Soils
- __ Listed on Local Hydric Soils List
- __ Listed on National Hydric Soils List
- __ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 4
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 4B UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Dendrolycopodium obscurum*	HB 10%	FACU	9.		
2. *Pteridium aquilinum*	HB 20%	FACU	10.		
3. *Piscea mariana*	TR 30%	FACW	11.		
4. *Abies balsamea*	TR 40%	FACW	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Rolling upland edge- balsam/red maple forest.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5 YR 2.5/1			organics
3-16+	2	7.5 YR 5/2			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 5
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 5A WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Larix larcinia*	TR 10%	FACW	9.		
2. *Acer rubrum*	TR 20%	FAC	10.		
3. *Piscea mariana*	SH 15%	FACW	11.		
4. *Abies balsamea*	SH 10%	FACW	12.		
5. *Sphagnum sp.*	HB 90%	FACW	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Tamarack/balsam/black spruce area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 1 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-1	1	7.5 YR 2.5/1			organics
1-16+	2	7.5 YR 5/1			sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 4/29/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 5
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 5B UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer rubrum*	TR 10%	FAC	9.		
2. *Pteridium aquilinum*	HB 100%	FACU	10.		
3. *Piscea mariana*	SH 5%	FACW	11.		
4. *Abies balsamea*	SH 5%	FACW	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 0 %

Remarks: Clearing with young red maple and bracken fern.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 15 in.

Depth to Saturated Soil: 8* in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: *Saturation may be due to the fact that it is early spring and the proximity of the plot to the wetland. Dominance of bracken fern indicates that saturation within the upper 12" is not long-lasting.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5 YR 2.5/1			organics
2-3	2	7.5 YR 5/2			sand
3-16+	3	7.5 YR 5/3			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: *Organic layer is not peat like nearby wetland area- mostly needles, etc. Although first 3 inches is low in chroma, the s profile does not meet LRR "M" hydric indicator for sand.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/2/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 2
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 6
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 6 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Trientalis borealis*	HB 20%	FAC+	9.		
2. *Maianthemum canadense*	HB 15%	FAC	10.		
3. *Picea glauca*	TR 20%	FACU	11.		
4. *Abies balsamea*	TR 40%	FACW	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Clearing with young red maple and bracken fern.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	5 YR 3/1			sand
5-10	2	7.5 YR 5/3			sand
10-16+	3	2.5 YR 3/6			sand/consolidated sand

Hydric Soils Indicators:

- __ Histosol
- __ Histic Epipedon
- __ Sulfidic Odor
- __ Aquic Moisture Regime
- __ Reducing Conditions
- x Gleyed or Low-Chroma Colors
- __ Concretions
- __ High Organic Content in Surface Layer in Sandy Soils
- __ Organic Streaking in Sandy Soils
- __ Listed on Local Hydric Soils List
- __ Listed on National Hydric Soils List
- __ Other (Explain in Remarks)

Remarks: Although first 5 inches is low in chroma, the soil profile does not meet LRR "M" hydric indicator for sand.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/2/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 2
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 6
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 6 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Maianthemum canadense*	HB 5%	FAC	9.		
2. *Acer rubrum*	TR 30%	FAC	10.		
3. *Populus tremuloides*	TR 10%	FAC	11.		
4. *Abies balsamea*	TR 10%	FACW	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Shallow wooded depression.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 3 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	1	7.5 YR 2.5/1			loam with organics
6-16+	2	7.5 YR 5/3	7.5 YR 5/6	few, distinct	sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Mottling in upper 12 inches.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/2/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 3
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 7
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 7 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Trientalis borealis*	HB 15%	FAC+	9.		
2. *Cornus canadensis*	HB 30%	FACW-	10.		
3. *Picea glauca*	TR 50%	FACU	11.		
4. *Abies balsamea*	TR 50%	FACW	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Upland area adjacent to wetland that is a few feet higher in elevation.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: none in.

Depth to Saturated Soil: none in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau fine sand, dark subsoil
0 to 6 percent slopes

Drainage Class: Well drained
Field Observations
Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): Entic Haplorthods

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-1	1	7.5 YR 2.5/1			organics
1-5	2	7.5 YR 5/1			sand
5-16+	3	7.5 YR 5/6			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Although first 5 inches is low in chroma, the soil profile does not meet LRR "M" hydric indicator for sand.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/2/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 3
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 7
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 7 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Corylus cornuta*	SH 30%	UPL	9.		
2. *Acer rubrum*	TR 30%	FAC	10.		
3. *Viola sororia*	HB 70%	FACW	11.		
4. *Trientalis borealis*	HB 5%	FAC+	12.		
5. *Piscea mariana*	TR 15%	FACW	13.		
6. *Carex pensylvanica*	HB 10%	NI	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Elongated swale-like depression.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 10 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Rousseau fine sand, dark subsoil
0 to 6 percent slopes

Drainage Class: Well drained
Field Observations
Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): Entic Haplorthods

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-0.5	1	7.5 YR 2.5/1			sandy loam
0.5-16+	2	5 YR 5/1	7.5 YR 5/6	many, prominent	sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Mottling/redox features in upper 12 inches. Meets NRCS Hydric Criteria S5 - Sandy Redox.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 8
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 8 UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Pteridium aquilinum*	HB 30%	FACU	9.		
2. *Betula papyrifera*	TR 10%	FACU+	10.		
3. *Pinus resinosa*	TR 30%	FACU	11.		
4. *Quercus rubra*	TR 20%	FACU	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 0 %

Remarks: Plot location is elevated approximately 3-4' above wetland plot.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: Soil is composed mostly of dry sand.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kalkaska sand, 0 to 6 percent slopes

Drainage Class: Somewhat excessively drained

Taxonomy (Subgroup): Typic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 4/1			sand with organics
3-8	2	7.5YR 4/2			sand
8-16	3	7.5YR 5/6			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Dry sandy soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Plot located in dry, sandy upland area.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 8
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 8 WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Iris versicolor*	HB 5%	OBL	9.		
2. *Sphagnum sp.*	HB 10%	OBL	10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: This portion of wetland is mainly devoid of vegetation. Wetland area located off of NW corner of site.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 1 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Kalkaska sand, 0 to 6 percent slopes

Drainage Class: Somewhat excessively drained

Taxonomy (Subgroup): Typic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	7.5YR 2.5/1			Muck/Organics
4-16+	2	7.5YR 3/1			Silt

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Meets NRCS Hydric Indicator F1 - Loamy mucky mineral.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 9
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9A WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Sphagnum sp.*	HB 5%	OBL	9.		
2. *Abies balsamea*	TR 30%	FACW	10.		
3. *Acer rubrum*	TR 20%	FAC	11.		
4. *Betula alleghaniensis*	TR 10%	FAC	12.		
5. *Tsuga canadensis*	TR 10%	FACU	13.		
6. *Populus tremuloides*	TR 10%	FAC	14.		
7. *Iris versicolor*	HB 5%	OBL	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Elongated wetland drainage on the western end of wetland 1.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 0.5 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	1	7.5YR 2.5/1			organics and muck
6-16	2	7.5YR 3/3			sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	__ Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Mucky soils with organics in upper 6". Meets Sandy Mucky Mineral Hydric Indicator? (S1)

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? (Yes) No

Remarks: Plot located in western end of wetland 1.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 9
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9B UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Trientalis borealis*	HB 2%	FAC+	9.		
2. *Maianthemum canadense*	HB 5%	FAC	10.		
3. *Populus tremuloides*	TR 10%	FAC	11.		
4. *Abies balsamea*	TR 80%	FACW	12.		
5. *Acer rubrum*	TR 10%	FAC	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Upland area with rolling/varying terrain and elevation. Very apparent upland area.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 14 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: Soil is composed of mostly sand.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	1	7.5YR 3/1			organics and loam
2-16	2	7.rYR 5/1			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Dry sandy soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Plot located in dry, sandy upland area with rolling terrain.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 2
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 9
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9C WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Sphagnum sp.*	HB 20%	OBL	9.		
2. *Abies balsamea*	TR 20%	FACW	10.		
3. *Acer rubrum*	TR 40%	FAC	11.		
4. *Betula alleghaniensis*	TR 20%	FAC	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Wetland depression area adjacent to wetlands 1 and 3.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 2 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	7.5YR 2.5/2			silt and organics
5-16+	2	7.5YR 5/1			sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	x Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
x Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Organic streaking in sand layer (5-16").

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Unknown	Is this Sampling Point within a Wetland? (Yes) No

Remarks: Plot located in wetland 2.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 2
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 9
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9D UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Gaultheria procumbens*	HB 5%	FACU	9.		
2. *Maianthemum canadense*	HB 20%	FAC	10.		
3. *Dendrolycopodium obscurum*	HB 5%	FACU	11.		
4. *Abies balsamea*	TR 50%	FACW	12.		
5. *Acer rubrum*	TR 20%	FAC	13.		
6. *Betula alleghaniensis*	TR 10%	FAC	14.		
7. *Tsuga canadensis*	TR 10%	FACU	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Upland area with rolling/varying terrain and elevation. Area located between wetlands 2 and 3.

HYDROLOGY

__ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

__ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: Soil is composed of mostly silt and sand.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	1	7.5YR 2.5/1			organics and silt
5-10	2	7.5YR 4/1			sand
10-16	3	7.5YR 4/6			sand to consolidated sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
x Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Dry sand and silt soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Plot located in dry, sandy upland area with rolling terrain.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 3
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 9
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9E WET

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Maianthemum canadense*	HB 20%	FAC	9.		
2. *Abies balsamea*	TR 5%	FACW	10.		
3. *Acer rubrum*	TR 40%	FAC	11.		
4. *Betula alleghaniensis*	TR 20%	FAC	12.		
5. *Sphagnum sp.*	HB 90%	OBL	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100 %

Remarks: Wetland depression area adjacent to wetlands 1, 2 and 3.

HYDROLOGY

__ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

__ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 1 in.

Depth to Saturated Soil: surface in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- __x__ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	1	7.5YR 2.5/1			mucky loam
3-16+	2	7.5YR 4/1			sand

Hydric Soils Indicators:

__ Histosol	__ Concretions
__ Histic Epipedon	__ High Organic Content in Surface Layer in Sandy Soils
__ Sulfidic Odor	x Organic Streaking in Sandy Soils
__ Aquic Moisture Regime	__ Listed on Local Hydric Soils List
__ Reducing Conditions	__ Listed on National Hydric Soils List
__ Gleyed or Low-Chroma Colors	__ Other (Explain in Remarks)

Remarks: Organic streaking in sand layer (3-16"). Meets NRCS indicator S1.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No Unknown

Is this Sampling Point within a Wetland? (Circle) (Yes) No

Remarks: Plot located in wetland 3.

Approved by HOUSACE 3/92
WSJ2-X

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Frontier Renewable Resources	Date: 6/3/2009
Applicant/Owner: Mascoma/JM Longyear	County: Chippewa
Investigator: LDK, PK	State: MI
Do Normal Circumstances exist on the site? (Yes) No	Community ID: Wetland 3
Is the site significantly disturbed (Atypical Situation)? Yes (No)	Transect ID: 9
Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Plot ID: Plot 9F UP

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Pteridium aquilinum*	HB 15%	FACU	9.		
2. *Trientalis borealis*	HB 20%	FAC+	10.		
3. *Maianthemum canadense*	HB 15%	FAC	11.		
4. *Populus tremuloides*	SH 10%	FAC	12.		
5. *Abies balsamea*	TR 5%	FACW	13.		
6. *Quercus rubra*	TR 20%	FACU	14.		
7. *Acer rubrum*	TR 20%	FAC	15.		
8. *Betula alleghaniensis*	SH 15%	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 66 %

Remarks: Plot located south of wetland 3.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- __ Stream, Lake or Tide Gauge
- __ Aerial Photographs
- __ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: none in.

Depth to Free Water in Pit: 0 in.

Depth to Saturated Soil: 0 in.

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water -Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: Soil is composed mostly of dry sand.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

SOILS

Map Unit Name
(Series and Phase): Croswell-Au Gres sands, 0 to 3 percent slopes

Drainage Class: Moderately well drained

Field Observations

Taxonomy (Subgroup): Typic Endoaquods/ Oxyaquic Haplorthods

Confirm Mapped Type? Yes (No)

Profile Description:

Depth (Inches)	Horizon	Matrix Color Munsell Moist	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	1	7.5YR 3/1			loamy organics
4-16	2	7.5YR 4/2			sand

Hydric Soils Indicators:

__ Histosol
__ Histic Epipedon
__ Sulfidic Odor
__ Aquic Moisture Regime
__ Reducing Conditions
__ Gleyed or Low-Chroma Colors
__ Concretions
__ High Organic Content in Surface Layer in Sandy Soils
__ Organic Streaking in Sandy Soils
__ Listed on Local Hydric Soils List
__ Listed on National Hydric Soils List
__ Other (Explain in Remarks)

Remarks: Dry sandy soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No) Unknown

Is this Sampling Point within a Wetland? (Circle) Yes (No)

Remarks: Plot located in dry, sandy upland area with rolling terrain.

Approved by HOUSACE 3/92
WSJ2-X

PH-1 – Facing Northeast

PH-2 – Facing Southwest

PH-3 – Facing Southeast

PH-4 – Facing West

PH-5 – Facing East

PH-6 – Facing West

PH-7 – Facing South

PH-8 – Facing North

PH-9 – Facing North

PH-10 – Facing South

PH-14 – Facing East

PH-15 – Facing South

PH-16 – Facing Northwest

PH-17 – Facing South

PH-18 – Facing West

PH-19 – Facing East

PH-20 – Facing West

PH-21 – Facing North

PH-22 – Facing East

PH-23 – Facing North

PH-25 – Facing North

PH-26 – Facing West

PH-27 – Facing North

PH-28 – Facing Northwest

PH-29 – Facing North

PH-30 – Facing North

PH-31 – Facing East

PH-32 – Facing South

PH-33 – Facing South

PH-34 – Facing Southeast

PH-35 – Facing West

PH-36 – Facing East

PH-37 – Facing West

PH-38 – Facing South

PH-39 – Facing East

PH-40 – Facing North

PH-41 – Facing Southeast

PH-42 – Facing North

PH-43 – Facing Southwest

PH-44 – Facing East

PH-45 – Facing Southwest

PH-47 – Facing North (B-3)

PH-48 – Facing North (B-7)

PH-49 – Facing Northeast (B-8)

PH-50 – Facing East Northeast (B-14)

PH-51 – Facing North (B-20)

PH-52 – Facing South (B-25)

PH-53 – Facing South (B-28)

PH-54 – Facing Northeast (B-34)

PH-55 – Facing Northeast (B-41)

PH-56 – Facing South (B-47)

PH-57 – Facing Southeast (B-54)

PH-58 – Facing Northwest (B-59)

Plot 6 WET – Facing East

Plot 7 WET – Facing East

Plot 8 WET – Facing West Southwest

Plot 9A WET – Facing Northeast

Plot 9C WET – Facing Southwest

Plot 9E WET – Facing North

Photo Log Summary:

Photo Points 1-19, 22-35 and 38-45 indicate the lack of wetland hydrology, vegetation and soils in their respective areas. These photo points were collected using the transect method of wetland investigation/delineation.

Photo Points 20 and 21 show extensive wetland areas extending north and west past the investigation area.

Photo Points 36 and 37 show extensive wetland areas extending north and west past the investigation area.

Photo Points 47-58 show individual points throughout the flagged boundary (B-#) between wetland and upland areas.

Plot 6 WET - Plot 9E WET show individual plots within wetlands 2 and 3. These wetlands are located in the northwest corner of the site, and are non contiguous with wetlands 1, 4 and 5.