

# **Savage and Savage** *Environmental*

*practical solutions for environmental issues*

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August 12, 2010

Mike Rodine  
Noble Energy, Inc.  
804 Grand Avenue  
Platteville, Colorado 80651

## **RE: Noble Energy Boulter G14-19 and G14-29 Drill Sites Wetland Delineation**

Dear Mr. Rodine:

Savage and Savage conducted a wetland delineation at the Boulter G14-19 and G14-29 proposed drill sites on August 9, 2010. The proposed well sites are located in a pasture south of Weld County Road 46 and east of Weld County Road 45 in Weld County, Colorado. The site lies within the NW $\frac{1}{4}$ NW $\frac{1}{4}$  of Section 14, Township 4 North, Range 65 West of the 6<sup>th</sup> Prime Meridian, Weld County, Colorado.

Based on the proposed locations of the wells, these sites are constrained by the presence of wetlands. The pasture to the immediate east of the area investigated is topographically elevated (and owned by Mr. Boulter) and there is only a small area of wetlands at the southwest corner of this fenced pasture. If this pasture is within the drilling window, there should be no constraints due to wetlands.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael S. Savage". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Michael S. Savage  
Principal

**NOBLE ENERGY PRODUCTION, INC.  
BOULTER G14-19 AND G14-29 WELLS  
WATERS OF THE UNITED STATES IDENTIFICATION  
AND WETLAND DELINEATION  
WELD COUNTY, COLORADO**



Prepared by: Savage and Savage, Inc.  
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August 2010

## TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1.
STUDY METHODS	1.
PROJECT DESCRIPTION	2.
SITE DESCRIPTION	2.
RESULTS/CONCLUSION	4.
LITERATURE CITED	5.
FIGURES	6.
APPENDIX	10.

## FIGURES

1. Noble Energy Boulter G14-19 and G14-29 Drill Site General Location Map
2. Sample Point 004 – Looking South
3. Noble Energy Boulter G14-19 and G14-29 Drill Sites Wetland Delineation

## APPENDIX

U.S. Army Corps of Engineers Great Plains – Interim Version Data Sheets

## INTRODUCTION

Savage and Savage conducted a wetland delineation within the area proposed for drilling the Boulter G14-19 and G14-29 wells for Noble Energy Production, Inc. on August 9, 2010. The proposed well sites are located in a pasture south of Weld County Road 46 and east of Weld County Road 45 in Weld County, Colorado (Figure 1.). From Denver, the site is accessed by traveling north on U.S. Highway 85 to Weld County Road 44, east on Weld County Road 44 for six miles to Weld County Road 45, then north on Weld County Road 45 for one mile to Weld County Road 46. The proposed drill sites are located approximately 0.3 miles east of the intersection, to the south in the pasture. The latitude of the center of the project site is 40.3185 degrees North and longitude is 104.635 degrees West. The average elevation of the project site is 4690 feet. The site lies within the NW $\frac{1}{4}$ NW $\frac{1}{4}$  of Section 14, Township 4 North, Range 65 West of the 6<sup>th</sup> Prime Meridian, Weld County, Colorado.

## STUDY METHODS

A wetland delineation was conducted within the proposed drill site windows in accordance with the requirements of the U.S. Army Corps of Engineers Wetlands Delineation Manual and Interim Supplement (USACE, 1987, 2008). To determine the areas subject to Corps jurisdiction, three criteria were evaluated: (1) evidence of a hydrologic regime reflecting saturation or periodic inundation by surface or ground water of sufficient duration and frequency, (2) soils which are considered hydric by classification or field characteristics indicating anaerobic conditions, and (3) a prevalence of vegetation typically adapted to areas of wetland hydrology and soils.

At four sample points within the pasture the three wetland criteria were evaluated. Dominant individual plant species were identified, and their wetland indicator status was assessed (USFWS, 1988). Evidence of the hydrologic regime was collected and evaluated. Soil test pits were dug using a core auger to at least 20 inches. Soil horizons were inspected and described using texture, soil color (Munsell, 1992), and moisture.



Two soils map units are found in the area of the proposed drill sites. According to the Soil Survey of Weld County, Southern Part, aquoll and aquept soils (map unit 4) are located within and immediately adjacent to the broad swale. This map unit is found within depressions in smooth plains and along the bottoms of natural drainageways throughout Weld County. They are deep, poorly drained soils that have formed in recent alluvium. Aquolls have a dark colored surface layer and make up about 55 percent of the unit. Aquepts, which make up about 25 percent of the soil unit, have a lighter colored surface layer. Surface layers are often yellowish brown silty clay, underlain by silty clay. About 20 percent are soils that are well drained and soils that have sandstone or shale within 48 inches of the surface. Aquoll and aquept soils are defined by the U.S. Army Corps of Engineers as hydric. On-site observation of soils at sample points 001, 002, and 004 within the swale of the project area confirmed the presence of this map unit.

The soil map unit above the perimeters of the broad swale consists of Valent sand (map unit 70) (USDA, 1980). This map unit is a deep, excessively drained soil formed in aeolian deposits on the plains. Typically, the surface layer of Valent soil is brown sand about six inches thick. The underlying material is brown sand to sixty inches. This soil unit is not defined as a hydric soil by the U.S. Army Corps of Engineers Wetlands Delineation Manual (USACE, 1987). Sample point 003 contained soil similar in character to the Valent sand, yet still exhibiting some transitional characteristics of the adjacent aquoll and aquept soils.

Vegetation within the project area was dominated by inland saltgrass, meadow foxtail, three-square, and clover. The first three species are considered indicative of hydrophytic or wetland conditions (Figure 2). Vegetation immediately adjacent to the swale, and outside the influence of seasonal ground and surface water, contained a mix of inland saltgrass and mesic and xeric pasture species including western wheatgrass and Rocky Mountain beeplant.

## RESULTS/CONCLUSION

Savage and Savage conducted a wetland delineation within the area proposed for drilling the Boulter G14-19 and G14-29 wells for Noble Energy Production, Inc. on August 9, 2010. This delineation was conducted in order to determine the presence and extent of wetlands in and adjacent to the proposed drill sites, access road, and any ancillary sites.

The entire broad swale was determined to contain wetlands extending to and slightly up the slopes at the perimeter of the broad swale. Except for areas where the topography was elevated by at least 0.75 feet (predominantly the east and south perimeters of the pasture, and a small area immediately south of Weld County Road 46 in the center of the project area), the project site was concluded to be wetlands as defined by the Corps of Engineers. The proposed locations for the drill sites were within the boundaries of wetlands. The project boundaries of the wetlands are identified on Figure 3.

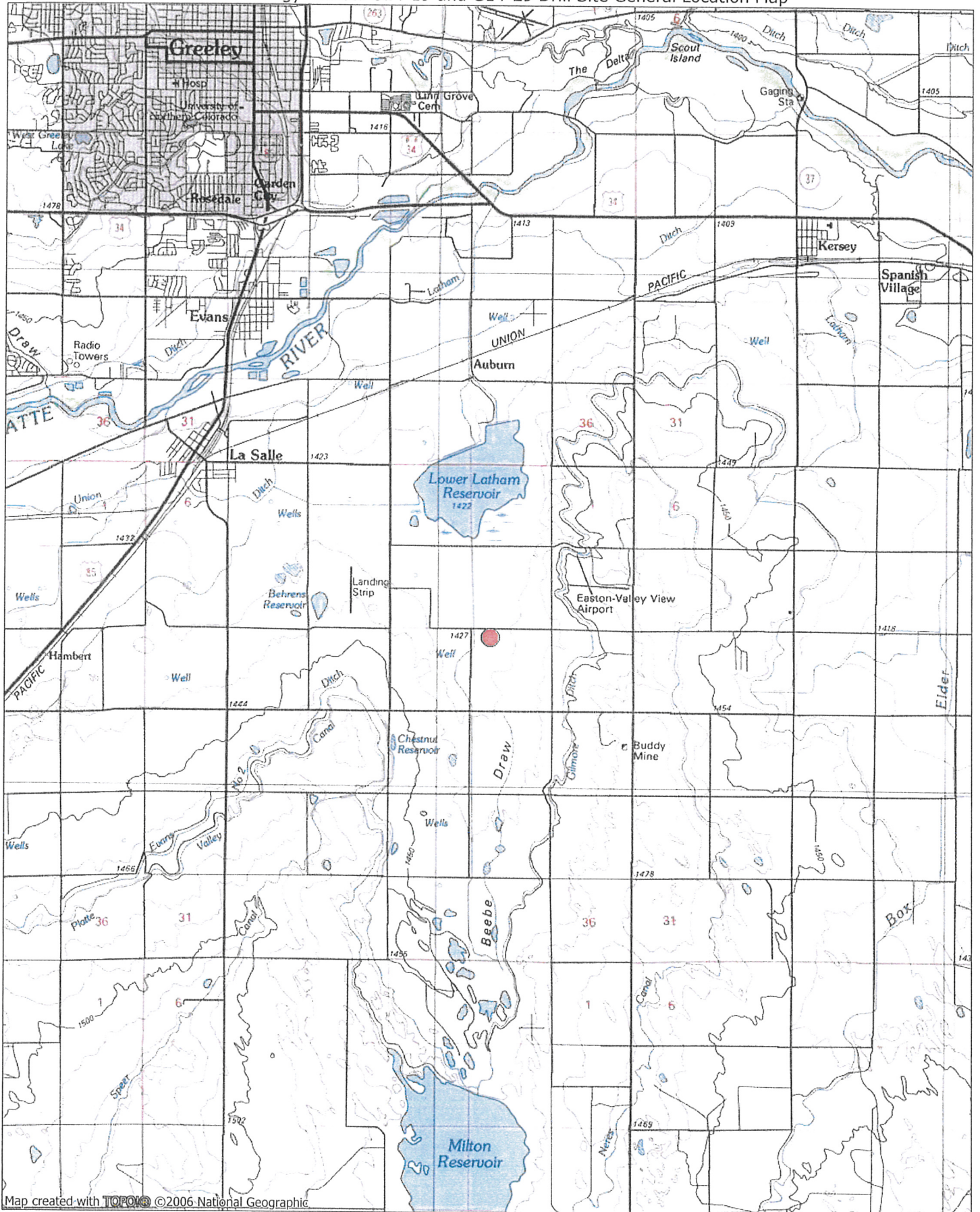
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- Munshower, Frank F. 1991. Perennial Grasses for Revegetation of Disturbed Lands in the Northern Great Plains and the Intermountain Region. Reclamation Research Unit, Montana State University, Bozeman, Montana.
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## FIGURES



Noble Energy Boulder G14-19 and G14-29 Drill Site General Location Map



Map created with TOPOIG ©2006 National Geographic



0.0 0.5 1.0 1.5 2.0 2.5 3.0 miles  
0 1 2 3 4 5 km

TN MN  
9 1/2°  
08/10/10





Figure 2. – Sample Point 004 - Looking South





Noble Energy Boulder G14-19 and G14-29 Drill Sites Wetland Delineation



## APPENDIX



# WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: BOULDER G14-29, G14-19 City/County: WELD Sampling Date: Aug 9, 2010  
 Applicant/Owner: NORVE ENERGY State: CO Sampling Point: 001  
 Investigator(s): MS SAVAGE / E.A. SAVAGE Section, Township, Range: S14, T4N, R65W  
 Landform (hillslope, terrace, etc.): BROAD SWALE Local relief (concave, convex, none): concave Slope (%): < 1%  
 Subregion (LRR): \_\_\_\_\_ Lat: 40.3185° Long: -104.635° Datum: \_\_\_\_\_  
 Soil Map Unit Name: AQUOLLS & AQULEPS, FLOODED NWI classification: HYDRIC  
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No \_\_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes X No \_\_\_\_\_  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes <u>X</u> No _____	
Welland Hydrology Present? Yes <u>X</u> No _____	
Remarks: <u>150' SOUTH OF E-W BOUNDARY FENCE (CRAG)</u> <u>72' WEST OF N-S BOUNDARY FENCE</u> <u>LOCATED AT EDGE OF SWALE BOTTOM AND EDGE OF VEGETATION CHANGE</u>	

## VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>N/A</u> )	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>75%</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
= Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species <u>15</u> x 1 = <u>15</u> FACW species <u>1</u> x 2 = <u>2</u> FAC species <u>30</u> x 3 = <u>90</u> FACU species <u>20</u> x 4 = <u>80</u> UPL species _____ x 5 = _____ Column Totals: <u>67</u> (A) <u>187</u> (B) Prevalence Index = B/A = <u>187/67 = 2.8</u>
Sapling/Shrub Stratum (Plot size: <u>N/A</u> )				
1. _____				
2. _____				
3. _____				
4. _____				
5. _____				
= Total Cover				
Herb Stratum (Plot size: <u>10' X 10'</u> )				Hydrophytic Vegetation Indicators: <u>X</u> Dominance Test is >50% <u>X</u> Prevalence Index is ≤3.0 <sup>1</sup> _____ Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) _____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and welland hydrology must be present, unless disturbed or problematic.
1. <u>Scirpus americanus</u>	<u>15</u>	<u>Y</u>	<u>OBL</u>	
2. <u>Dactylis spicata</u>	<u>20</u>	<u>Y</u>	<u>NE/FAC</u>	
3. <u>Plantago major</u>	<u>10</u>	<u>Y</u>	<u>FAC</u>	
4. <u>Trifolium repens</u>	<u>20</u>	<u>Y</u>	<u>FACU</u>	
5. <u>Hordeum jubatum</u>	<u>&lt; 1%</u>	<u>N</u>	<u>FACW</u>	
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
= Total Cover <u>65</u>				
Woody Vine Stratum (Plot size: <u>N/A</u> )				Hydrophytic Vegetation Present? Yes <u>X</u> No _____
1. _____				
2. _____				
= Total Cover				
% Bare Ground in Herb Stratum <u>20</u>				
Remarks: <u>SWALE PASTURE, GRAZED ACTIVELY</u>				

## SOIL

Sampling Point: 001

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		
0-10"	5YR 3/1	98	N/A				CLAY WASH	
10-22±"	2.5Y 4/1	95	5YR 5/6	5%	MOTTLE		CLAY	

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> 1 cm Muck (A9) (LRR I, J)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Dark Surface (S7) (LRR G)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Mucky Mineral (F1)	<input type="checkbox"/> High Plains Depressions (F16)
<input type="checkbox"/> Stratified Layers (A5) (LRR F)	<input checked="" type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> (LRR H outside of MLRA 72 & 73)
<input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Reduced Vertic (F18)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Redox Depressions (F8)	<sup>3</sup> Indicators of hydrophytic vegetation and
<input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)	<input type="checkbox"/> High Plains Depressions (F16)	wetland hydrology must be present,
<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	<input type="checkbox"/> (MLRA 72 & 73 of LRR H)	unless disturbed or problematic.

Restrictive Layer (if present):

Type: \_\_\_\_\_

Depth (inches): \_\_\_\_\_

Hydric Soil Present? Yes ☒ No ☐

Remarks:

## HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Salt Crust (B11)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Invertebrates (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> (where tilled)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> (where not tilled)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)

Secondary Indicators (minimum of two required)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): \_\_\_\_\_

Water Table Present? Yes ☐ No ☒ Depth (inches): \_\_\_\_\_

Saturation Present? Yes ☐ No ☒ Depth (inches): \_\_\_\_\_

(Includes capillary fringe)

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: BOULDER G14-29, G14-19 City/County: WELD Sampling Date: 002  
 Applicant/Owner: NOBLE ENERGY State: CO Sampling Point: AUG 9, 2010  
 Investigator(s): MS SAVAGE / E A SAVAGE Section, Township, Range: S14, T4N, R6SW  
 Landform (hillslope, terrace, etc.): BROAD SWALE EDGE Local relief (concave, convex, none): concave Slope (%): <1%  
 Subregion (LRR): \_\_\_\_\_ Lat: 40.3185° Long: -104.635° Datum: \_\_\_\_\_  
 Soil Map Unit Name: AQUOUS & AQUIC, FLOODED NWI classification: HYDRIC  
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No \_\_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes X No \_\_\_\_\_  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes <u>X</u> No _____	
Wetland Hydrology Present? Yes <u>X</u> No _____	
Remarks: <u>150' S OF E-W FENCE</u> <u>50' W OF N-S FENCE</u> <u>TRANSITIONAL AREA BTW WETLAND / UPLAND</u>	

## VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>N/A</u> )	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>67%</u> (A/B)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
= Total Cover				
Sapling/Shrub Stratum (Plot size: <u>N/A</u> )				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
= Total Cover				
Herb Stratum (Plot size: <u>10'x10'</u> )				
1. <u>Distichlis spicata</u>	<u>30</u>	<u>Y</u>	<u>NT(FAC)</u>	
2. <u>Hordeum jubatum</u>	<u>10</u>	<u>Y</u>	<u>FACW</u>	
3. <u>Agropyron smithii</u>	<u>25</u>	<u>Y</u>	<u>FACU</u>	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
= Total Cover				
Woody Vine Stratum (Plot size: <u>N/A</u> )				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
= Total Cover				
% Bare Ground in Herb Stratum <u>20</u>				
Remarks: _____				

## SOIL

Sampling Point: 002

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		
0-12"	5YR 4/1	95	5YR 5/6	2	MOTTLES		LOAM	
12-21 1/2"	5YR 4/1	98	5YR 5/6	2	MOTTLES		CLAY LOAM	

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> 1 cm Muck (A9) (LRR I, J)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Stripped Matrix (S6)	<input checked="" type="checkbox"/> Dark Surface (S7) (LRR G)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Mucky Mineral (F1)	<input type="checkbox"/> High Plains Depressions (F16)
<input type="checkbox"/> Stratified Layers (A5) (LRR F)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> (LRR H outside of MLRA 72 & 73)
<input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Reduced Vertic (F18)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Redox Depressions (F8)	<sup>3</sup> Indicators of hydrophytic vegetation and
<input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)	<input type="checkbox"/> High Plains Depressions (F16)	wetland hydrology must be present,
<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	(MLRA 72 & 73 of LRR H)	unless disturbed or problematic.

Restrictive Layer (if present):

Type: \_\_\_\_\_

Depth (inches): \_\_\_\_\_

Hydric Soil Present? Yes ☒ No ☐

Remarks:

## HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Salt Crust (B11)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Invertebrates (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	(where tilled)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> (where not tilled)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input checked="" type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)

Secondary Indicators (minimum of two required)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): \_\_\_\_\_

Water Table Present? Yes ☐ No ☒ Depth (inches): \_\_\_\_\_

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): \_\_\_\_\_

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: EVIDENCE OF HYDROLOGY DURING GROWING SEASON, BASED ON TOPOGRAPHIC POSITION,





## SOIL

Sampling Point: 003

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>		
0-3"	5YR 3/1	98	NONE			LOAM	
3-8"	5YR 4/1	98	NONE			LOAM	
8-20"	5YR 4/1	98%	NONE			CLAY LOAM	

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> 1 cm Muck (A9) (LRR I, J)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Dark Surface (S7) (LRR G)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Mucky Mineral (F1)	<input type="checkbox"/> High Plains Depressions (F16)
<input type="checkbox"/> Stratified Layers (A5) (LRR F)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> (LRR H outside of MLRA 72 & 73)
<input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Reduced Vertic (F18)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Redox Depressions (F8)	<sup>3</sup> Indicators of hydrophytic vegetation and
<input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)	<input type="checkbox"/> High Plains Depressions (F16)	wetland hydrology must be present,
<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	<input type="checkbox"/> (MLRA 72 & 73 of LRR H)	unless disturbed or problematic.

Restrictive Layer (if present):

Type: \_\_\_\_\_

Depth (inches): \_\_\_\_\_

Hydric Soil Present? Yes \_\_\_\_\_ No X

Remarks: TRANSITIONAL BUT INSUFFICIENT HYDRIC SOIL INDICATORS TO CLASSIFY AS WETLAND SOIL

## HYDROLOGY

Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required; check all that apply)		Secondary Indicators (minimum of two required)	
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Salt Crust (B11)	<input type="checkbox"/> Surface Soil Cracks (B6)	
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Invertebrates (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Drainage Patterns (B10)	
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> (where tilled)	
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> (where not tilled)	<input type="checkbox"/> Crayfish Burrows (C8)	
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)	
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)	
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> FAC-Neutral Test (D5)	
<input type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)	
Field Observations:			
Surface Water Present? Yes _____ No <u>X</u>	Depth (inches): _____	Wetland Hydrology Present? Yes _____ No <u>X</u>	
Water Table Present? Yes _____ No <u>X</u>	Depth (inches): _____		
Saturation Present? Yes _____ No <u>X</u>	Depth (inches): _____		
(includes capillary fringe)			
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:			
Remarks:			

# WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: BOULDER G14-19, G14-29 City/County: WAB Sampling Date: AUG 9, 2010  
 Applicant/Owner: NOBUE ENERGY State: CO Sampling Point: 004  
 Investigator(s): MS SAVAGE / EA SAVAGE Section, Township, Range: S14, TAN, R65W  
 Landform (hill/slope, terrace, etc.): TO EAST SIDE OF SWALE Local relief (concave, convex, none): concave Slope (%): 1%  
 Subregion (LRR): \_\_\_\_\_ Lat: 40.3185° Long: -104.635° Datum: \_\_\_\_\_  
 Soil Map Unit Name: AQUICLS & AQUICPTS, FLOODED NWI classification: HYDRIC  
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No \_\_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes X No \_\_\_\_\_  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present?	Yes <u>X</u> No _____	
Wetland Hydrology Present?	Yes <u>X</u> No _____	
Remarks: <u>TOPOGRAPHIC BROAD SWALE BELOW IRRIGATED FIELDS.</u> <u>SAMPLE POINT @ PROPOSED DRILLING LOCATION</u>		

## VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>N/A</u> )	Absolute % Cover	Dominant Species?	Indicator Status	<b>Dominance Test worksheet:</b> Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100%</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
_____ = Total Cover				<b>Prevalence Index worksheet:</b> Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
<b>Sapling/Shrub Stratum (Plot size: <u>N/A</u>)</b> 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ _____ = Total Cover				
<b>Herb Stratum (Plot size: <u>10' x 10'</u>)</b> 1. <u>Scirpus americana</u> <u>25</u> <u>Y</u> <u>OBL</u> 2. <u>Distichlis spicata</u> <u>35</u> <u>Y</u> <u>MF/FAC</u> 3. <u>Urt. frax</u> <u>10</u> <u>N</u> <u>FAC</u> 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ _____ = Total Cover				
<b>Woody Vine Stratum (Plot size: <u>N/A</u>)</b> 1. _____ 2. _____ _____ = Total Cover				
% Bare Ground in Herb Stratum <u>15</u> _____ = Total Cover				
Remarks: _____				<b>Hydrophytic Vegetation Indicators:</b> <u>X</u> Dominance Test is >50% _____ Prevalence Index is ≤3.0 <sup>1</sup> _____ Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) _____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic. <b>Hydrophytic Vegetation Present?</b> Yes <u>X</u> No _____

## SOIL

Sampling Point: 004

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>		
0-3"	2.5/N	98	NONE			SANDY CLAY	MOIST
3-20"	2YR 3/2	95	5YR 5/8	2		SANDY LOAM	MOIST → SATURATED

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Stratified Layers (A5) (LRR F) <input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12) <input type="checkbox"/> Sandy Mucky Mineral (S1) <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	<input checked="" type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input checked="" type="checkbox"/> Loamy Mucky Mineral (F1) <input checked="" type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8) <input type="checkbox"/> High Plains Depressions (F16) (MLRA 72 & 73 of LRR H)	<b>Indicators for Problematic Hydric Soils<sup>3</sup>:</b> <input type="checkbox"/> 1 cm Muck (A9) (LRR I, J) <input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H) <input type="checkbox"/> Dark Surface (S7) (LRR G) <input type="checkbox"/> High Plains Depressions (F16) (LRR H outside of MLRA 72 & 73) <input type="checkbox"/> Reduced Vertic (F18) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Other (Explain in Remarks) <sup>3</sup> Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.
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Restrictive Layer (if present):  
 Type: \_\_\_\_\_  
 Depth (inches): \_\_\_\_\_

Hydric Soil Present? Yes ☒ No \_\_\_\_\_

Remarks:

## HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Salt Crust (B11) <input type="checkbox"/> Aquatic Invertebrates (B13) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) (where not tilled) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks)	<b>Secondary Indicators (minimum of two required)</b> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) (where tilled) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)
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Field Observations:

Surface Water Present?	Yes _____ No <input checked="" type="checkbox"/>	Depth (inches): _____
Water Table Present?	Yes _____ No _____	Depth (inches): _____
Saturation Present?	Yes <input checked="" type="checkbox"/> No _____	Depth (inches): 15"

(Includes capillary fringe)

Wetland Hydrology Present? Yes ☒ No \_\_\_\_\_

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: