Pinyon Environmental, Inc.
Corporate Headquarters
3222 South Vance Street, Suite 200, Lakewood, CO 80227
T: 303.980.5200 F: 303.980.0089
www.pinyon-env.com

Biological Resource Technical Memorandum

Date:	November 15, 2022
To:	Craig Lamacraft, Denver Water
From:	Becky Burink, Biologist, Pinyon Environmental, Inc.
Subject:	Denver International Airport/E-470 Pipeline Project

Introduction

Denver Water has contracted with Pinyon Environmental, Inc., (Pinyon), to complete preliminary raptor bird surveys, black-tailed prairie dog (*Cynomys ludovicianus*) mapping, and a waters of the United States (WOTUS) delineation (which included non-wetland waters and wetlands), for the Denver International Airport/E-470 Pipeline project. Design for this approximate six-mile waterline pipeline will be conducted in the future and Denver Water plans to go to construction next year (2023). As such, Denver Water contracted Pinyon to perform a preliminary raptor bird survey and WOTUS/wetland delineation to understand the potential for constraints from these resources, and to help avoid and minimize impacts to these resources during the design process. This Biological Resources Technical Memorandum (tech memo) has been prepared to address existing conditions regarding the following federal and state regulations or policies:

- *Migratory Bird Treaty Act (MBTA)*: Protects birds, their active nests, and their eggs (except for pigeons, starlings, and some other non-native birds). The U.S. Fish and Wildlife Service (USFWS) administers these requirements.

- *Section 404 of the Clean Water Act (CWA)*: Regulates WOTUS, which include wetlands and non-wetland waters. Impacts to these features requires authorization from the U.S. Army Corps of Engineers (USACE).

Project Location

The project is located within the portions of Denver and Adams Counties, Colorado. The project location is shown in Figure 1 and described below in Table 1.

Table 1. Project Location

County	Denver/Adams
U.S. Geological Survey (USGS) 7.5-Minute Quadrangle	Denver International Airport (USGS, 2022a) and Mile High Lakes (USGS, 2022b)
Section, Township, and Range (6th Principal Meridian)	Sections 1, 11, 12, 13, 22, 23, and 24, Township 2 South, Range 66 West; Sections 5 and 6, Township 2 South, Range 65 West
Approximate Average Elevation of the Study area (feet above mean sea level)	Approximately 5,170 to 5,330
Approximate Center Location of the Study Area (Decimal Degrees, World Geodetic System [WGS] 84)	39.865879°, -104.754014° 39.904215°, -104.682701°

Methodology

Prior to the site visit, Pinyon conducted a desktop analysis using aerial imagery, Colorado Parks and Wildlife (CPW) Species Activity Mapping data, USFWS National Wetlands Inventory Mapper, USGS 7.5-Minute Quadrangle Maps, USGS National Hydrography Dataset, and other existing data sources to identify potential biological resources at the project (Google Earth Pro, 2022; CPW, 2022; USFWS, 2022; USGS, 2022a; USGS 2022b; USGS, 2020).

Following the desktop review, Pinyon biologists Becky Burink and Haley Stratton visited the site October 27 and 28, 2022, to assess the study area for potential raptors and raptor nests, black-tailed prairie dog colonies, and WOTUS. Pinyon was provided with the boundaries where the maximum extent of project impacts is anticipated to occur (Figure 1 and Figure 2). This area is further referred to in this memorandum as the "study area". The study area was evaluated by vehicle and on foot on existing roads within the study area. Notes and photographs were taken to record field conditions. A Photographic Log is attached.

Wetlands were delineated in accordance with the 1987 USACE Wetland Delineation Manual and the 2010 *USACE Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0)* (Environmental Laboratory, 1987; USACE, 2010). The boundaries of the ordinary high water mark (OHWM) were identified in accordance with the 2014 USACE *A Guide to Ordinary High Water Mark Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Region of the United States* (USACE, 2014). Sampling points (SP) were placed in representative wetland and upland locations, and the data was recorded in the wetland determination data forms (Figure 2; Attachment).

Results

General Habitat and Vegetation Description

The study area includes approximately six miles of proposed pipeline and a 100-foot buffer on both sides of the proposed pipeline. The area immediately surrounding the proposed alignment is primarily agricultural or property of the Denver International Airport (Photos 1 and 2 in Photographic Log). A majority of the alignment generally parallels existing transportation right-of-way (ROW). Due to the presence of the roadway and the use of the surrounding area, natural vegetation, soils, and hydrology have likely been altered by past filling, grading, and improvement activities in the past.

The study area was primarily characterized by disturbed upland roadside habitat and landscaped areas, as well as the paved roadside itself. The upland roadside habitat consisted of agricultural vegetation and herbaceous

species such as sand dropseed (*Sporobolus cryptandrus*), smooth brome (*Bromus inermis*), prickly lettuce (*Lactuca serriola*), and kochia (*Bassia scoparia*) (Photo 3 in Photographic Log). Scattered cottonwood (*Populus deltoides*) and Russian olive (*Elaeagnus angustifolia*) trees were also noted.

One wetland system, Wetland 1 (WL-1), located along Third Creek, was mapped within the study area, and is discussed further below (Figure 2, Photos 4-6 in Photographic Log, Appendix A).

Raptors and Migratory Birds

Migratory birds (including raptors), their nests, and their eggs are protected by the MBTA, with the exception of a few non-native species. Bald Eagles (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*) are provided with further protection by the Bald and Golden Eagle Protection Act. In Colorado, most migratory bird nesting and rearing activities occur between April 1 and August 31, but raptors may nest as early as February 15; eagles can nest even earlier. These dates are guidelines and nesting birds are always protected.

No raptor nests were noted within the study area. However, several raptors were observed soaring above and foraging in the study area, including five Northern Harriers (*Circus hudsonius*) and two Red-tailed Hawks (*Buteo jamaicenisis*) (Photo 7 in Photographic Log). Potential nesting raptor habitat (e.g., large deciduous trees) was present within 0.5 mile of the study area, but no raptor nests (active or inactive) were noted during the site visit. However, it is possible that nesting raptors may have been undetected, as it was not feasible to survey every tree within 0.5 mile of the study area due to property access constraints.

Non-raptor migratory bird nests, namely Cliff Swallow (*Petrochelidon pyrrhonota*) nests, were observed lining concrete box culverts within the study area (Photo 8 in Photographic Log). Like raptors, Cliff Swallows are protected by the MBTA.

Black-tailed Prairie Dogs and Burrowing Owls

Black-tailed prairie dogs are a state species of special concern and create burrows that provide habitat for Western Burrowing Owls (*Athene cunicularia*). Burrowing Owls are a state-listed threatened species and are federally protected by the MBTA. Five black-tailed prairie dog colonies were mapped within the study area during the site visit (Figure 2). Review of aerial photographs indicated the potential presence of prairie dog colonies along some areas of the proposed alignment (Figure 2). However, active agricultural activities in and near the project area appear to have displaced some of those colonies, and many of the burrows visible via aerial imagery that appear to be prairie dog burrows were found to be anthills, as confirmed during the site reconnaissance. Black-tailed prairie dog colonies may expand or shrink prior to the start of project activities, and Burrowing Owls may use old prairie dog burrows as well as dig their own nearby. No Burrowing Owls were observed during the site visit. However, surveys were conducted outside of the Burrowing Owl nesting season (March 15 through October 31) and Burrowing Owls have the potential to be present in these colonies during the nesting season.

Aquatic Resources

Eagle's Run, and two unnamed ditches are located in the northeastern section of the study area (Figure 2, page 1 and 2). These features are visible via aerial imagery, topographic imagery, and the NWI (Google Earth, 2022; USFWS, 2022). Eagle's Run and the two unnamed ditches both extend under East 114th Avenue within the study area. No OHWM and no open water were identified for these features within the study area during the site visit.

Third Creek and its associated wetland (WL-1) were mapped within the study area on both the east and west sides of West Cargo Road (Figure 2, page 3; Photos 4-6 in Photographic Log; Appendix A). Third Creek is a perennial stream, with a defined OHWM, that flows toward the northwest through the study area, ultimately

discharging into the South Platte River, a traditional navigable water (TNW), approximately eight miles northwest of the study area (USGS, 2020). Third Creek was flowing during the time of the site visit. and had a variable width of between 5 and 7 feet within the study area.

WL-1 was observed to be a palustrine emergent (PEM) wetland dominated in the herbaceous stratum by narrowleaf cattail (*Typhus angustifolia*), an obligate wetland species. Other common herbaceous plants associated with WL-1 included softstem bulrush (*Schoenoplectus tabernaemontanii*), an obligate wetland species. The wetland hydric soil indicator observed was Hydrogen Sulfide (A4). The hydrology indicators observed were Surface Water (A1), High Water Table (A2), Saturation (A3), and Hydrogen Sulfide Odor (C1). Sampling Point 1 (SP-1) was completed in WL-1 (Appendix A). Sampling Points 2 and 3 (SP-2 and SP-3) were upland pits dug west and east of West Cargo Road, respectively (Appendix A).

Conclusions and Recommendations

Pinyon has completed this Biological Resources Technical Memo for the proposed Denver International Airport/E-470 Pipeline in City and County of Denver, Colorado. The study area was assessed for the presence of biological resources including raptor and raptor nests, black-tailed prairie dog colonies, and WOTUS (including non-wetland waters and wetlands).

Raptors and Migratory Birds

Several raptors were observed foraging within the study area. Additionally, raptors may use large, deciduous trees noted within 0.5 mile of the study area for nesting, roosting, or foraging. Non-raptor birds may use shrubs and grasses in and adjacent to the study area for nesting. Therefore, due to the potential for MBTA constraints, Pinyon recommends that future development follow MBTA nest survey guidelines during the nesting season. The Colorado Department of Transportation (CDOT) has developed a specification (Section 240: Protection of Migratory Birds Biological Work Performed by the Contractor's Biologist), which addresses a contractor's responsibilities to avoid impacts to migratory birds. Pinyon recommends that Denver Water consider including this specification into the project plans and specifications to address migratory bird protection during construction. Prior to construction activities commencing during the nesting season, a survey for raptors and other migratory birds is recommended to identify nests and limit the potential for incidental take. If nests are identified, coordination with the USFWS or CPW may be required.

If construction activity is planned to take place during the migratory bird nesting season, and within 50 feet of active nests (e.g. the Third Creek culvert), Pinyon recommends removal of Cliff Swallow nests prior to construction, and prior to bird nesting activities, and continued monitoring and removal of inactive nests from these culverts throughout construction – this can be in accordance with the above-cited 240 specification. If nests are found to be active, construction activity within 50 feet of the active nests should cease until nesting activities are completed, to avoid incidental take of protected Swallows. Note that Cliff Swallow nesting activities may take several weeks to months, depending on the number of swallows that are able to lay eggs. Alternatively, should construction activity take place outside of the migratory bird nesting season (between September 1 and March 31), then no further action regarding migratory birds is needed.

Black-tailed Prairie Dogs

Black-tailed prairie dog burrows are present in the study area, which provide suitable nesting habitat for Burrowing Owls. With regards to prairie dogs, it is likely that the prairie dogs can be humanly "passively relocated" from the proposed work areas prior to construction.

Passive relocation involves creating an exclusion zone (i.e., silt fence) to encourage prairie dogs to vacate their burrows and leave the site prior to earth-work disturbances. Potential options include:

Consider Creating an Exclusion Zone

- A rectangular shaped prairie dog exclusion zone should be created around the prairie dog town. One side of the rectangle should consist of the roadway, and the other three sides should be created by installing black, opaque silt fencing material.

- The silt fences should be installed at least 24 inches above the ground to create a visual barrier for prairie dogs and buried at least six inches into native soils.

- The two sides of silt fencing that are perpendicular to the highway should be 30 feet long. This distance effectively limits the field of view of the prairie dogs and encourages them to vacate the exclusion zone in the desired direction away from the roadway (and the proposed construction limits). If the limits of disturbance exceed 30 feet from the highway, then additional exclusion zones should be constructed in increments of 30 feet. However, each additional exclusion zone should only be constructed after the passive relocation process, as described below, is completed in the preceding exclusion zone and final clearance in the preceding exclusion zone is provided.

- The silt fence that parallels the highway should extend the length of the prairie dog town.

- Prairie dogs may create holes in the silt fence by clawing and chewing at the fabric. Therefore, proper installation of the silt fence and proper maintenance should be conducted to prevent the passage of light along the bottom edge, along seams, or through holes in the fabric. Holes in the fabric may be patched with duct tape and seams may be reworked or sealed with tape.

- Another rectangular silt fence area should be installed parallel to the highway and five feet from the exclusion zone to further reduce prairie dog sight distance and encourage individuals to vacate the area.

Light Ground Disturbance

- To encourage passive relocation of the prairie dogs, light ground-disturbing activities should be performed in the exclusion zone at least once a day. Ground-disturbing activities should consist of disking or grading to a depth of up to six inches. A ground disturbance depth of six inches will disturb burrow entrances but will not bury any animals within burrows. The soil should not be compacted or tamped down because this may prevent animals from escaping collapsed burrows and cause them to be buried alive.

- Between 12 to 24 hours after light ground-disturbing activities, the entire exclusion zone should be visually inspected during a single site visit for any evidence of active prairie dogs that have not yet vacated the exclusion zone. Evidence of active prairie dogs include: a prairie dog, a prairie dog burrow entrance that has been repaired/re-excavated or show signs of digging, a hole in the ground that is greater than two inches in diameter at the entrance/opening (late season pups will likely fit an opening of this size), or fresh scat on the ground surface. Any burrows not clearly inactive should be treated as active.

- Light ground disturbances should be repeated daily until a visual inspection 12 to 24 hours later results in no evidence of prairie dog activity within the exclusion zone. At this point, a qualified biologist must re-survey the area within 24 hours of the ground disturbance to provide a final clearance for the exclusion zone. After final clearance has been obtained, heavy construction work should commence in the work zone within 24 hours of the ground-disturbing activity and continue daily until all construction work has been completed in the work zone.

- If prairie dogs continue to occupy the exclusion zone after five days of light ground disturbances, a qualified biologist should conduct a survey of the exclusion zone. The qualified biologist should coordinate with the

project team to discuss alternative control options to manage the remaining prairie dogs within the exclusion zone.

Burrowing Owls

Burrowing Owls are a state-threatened species and are also protected under the MBTA. Therefore, Burrowing Owl surveys should be completed prior to construction activities between March 15 to October 31 in or near black-tailed prairie dog colonies, as outlined in CPWs Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls (CPW, 2021). If active Burrowing Owl nests are found during the surveys, work should be avoided within 660 feet of the active nest (CPW, 2021). Note that it could take several months for Burrowing Owls to complete their nesting cycle. Alternatively, should construction activity take place outside of the Burrowing Owl nesting season (between November 1 and March 14), then no further action regarding Burrowing Owls is needed.

Aquatic Resources

Three non-wetland waters (Eagle's Run and two unnamed ditches) were identified in the study area. These features did not have a defined OHWM during the site visit, and are likely not under the jurisdiction of the USACE; however, only the USACE has the authority to make jurisdictional determinations. To determine whether these features would require a Section 404 permit for impact, the project can submit an Approved Jurisdictional Determination (JD) request to the USACE. Third Creek and its associated wetland complex (WL-1) were delineated within the study area. Third Creek has a downstream connection to the South Platte River, a TNW, and is likely under the jurisdiction of the USACE. Therefore, these features, if impacted, would require authorization under Section 404 of the CWA. Pinyon recommends the project avoid impacts to potential WOTUS, if practicable. If it is not feasible to avoid impacts to potential WOTUS, Section 404 authorization would be required.

The amount and type of impacts will determine the level of Section 404 Permit required (Individual Permit or Nationwide Permit). Given the anticipated small footprint of potential impacts, it is likely the project would be authorized under a Nationwide Permit 58 (Utility Line Activities for Water and Other Substances). This Nationwide Permit may not require notification (i.e., Pre-construction Notification) to the USACE, so long as certain thresholds are not exceeded. Those include 1) impacts at each crossing must result in less than 1/10 of an acre; 2) no impacts to federally listed species can occur; and 3) no adverse impacts to resources eligible to the National Register of Historic Places as defined by Section 106 of the National Historic Preservation Act can occur. Pinyon recommends that Denver Water evaluate impacts to these resources during design to evaluate if any of these thresholds are exceeded. Additional evaluation, such as habitat assessments for federally listed species and cultural resources, may need to be conducted.

If impacts to potential WOTUS cannot be avoided, Pinyon recommends minimizing the footprint of temporary and/or permanent impacts to the maximum extent practicable and returning areas to pre-construction contours after construction. It is recommended the project follow stormwater best management practices (BMPs) to minimize indirect impacts to these features.

Limitations

This technical memorandum was prepared by Pinyon, at the request of and for the sole benefit of Denver Water, or any entity controlling, controlled by, or under common control with Denver Water. The conclusions and recommendations offered in this technical memorandum are based on the data obtained from a limited number of assessments, within a prescribed study area as described in the text. Soil, hydrologic, vegetation, biological and ecological conditions typically vary even over short distances, by season, by elevation, and by meteorological conditions. Thus, the nature and extent of variations outside this biological investigation may

not become evident except through further investigation. It is possible that ecological conditions may change from those observed, particularly over time.

Attachments

Figure 1. Project Location
Figure 2. Biological Resources
Photographic Log
Wetland Determination Data Forms

References

CPW, 2021. "Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls," Colorado Parks and Wildlife. Available at: https://cpw.state.co.us/Documents/WildlifeSpecies/LivingWithWildlife/Recommended-Survey-Protocol-Burrowing-Owls.pdf. Accessed October 2022.

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USFWS, 2022. "National Wetlands Inventory," Wetlands Mapper. Available at: https://www.fws.gov/wetlands/data/mapper.html. Assessed, November 2022.

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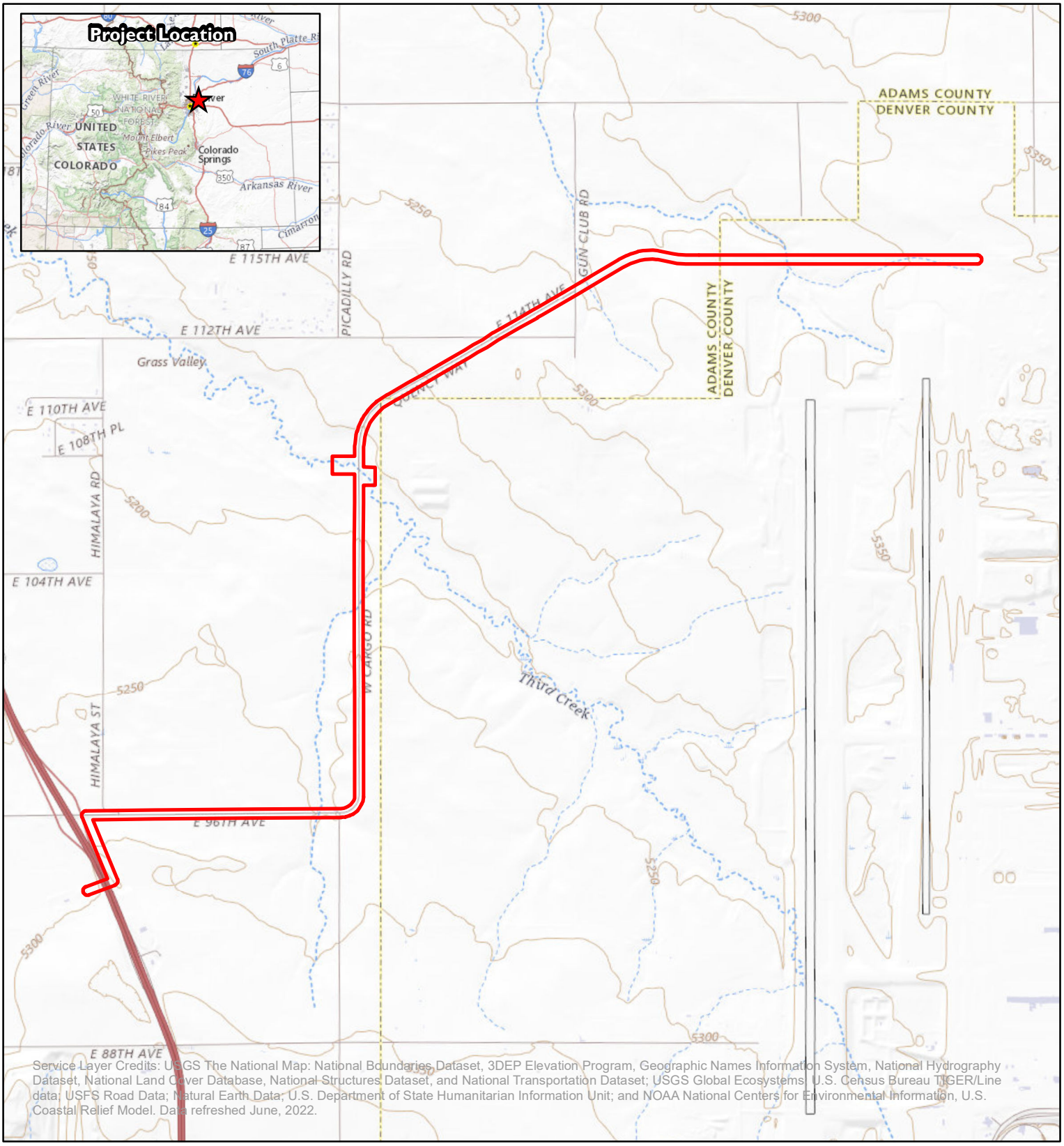
USGS, 2022b. "7.5-Minute Topographic Map, Mile High Lakes, Colorado," United States Geological Survey, 2022.



Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed June, 2022.

Legend

Study Area

0 1,500 3,000

Feet

Pinyon Environmental, Inc.

PROJECT LOCATION

Denver International Airport/E-470
Pipeline Project
Denver and Adams County, Colorado

Site Location: S 1, 11, 12, 13, 22, 23, and 24, T2S, R66W; S 5 and 6, T2S, R65W; 6th Principal Meridian	Drawn By: MJS	Figure 1
Pinyon Project Number: 1/22-0848-01.001	Reviewed By: BB	Date: 11/8/2022

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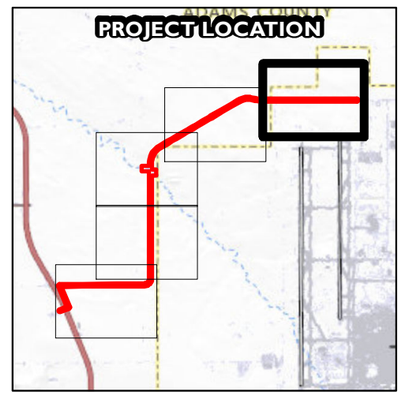

Legend

Study Area

0 250 500 Feet

Pinyon Environmental, Inc.

BIOLOGICAL RESOURCES
Denver International Airport/E-470
Pipeline Project
Denver and Adams County, Colorado

Site Location: S 1, 11, 12, 13, 22, 23, and 24, T2S, R66W; S 5 and 6, T2S, R65W; 6th Principal Meridian	Drawn By: MJS	Figure: 2; page 1 of 5
Pinyon Project Number: 1/22-0848-01.001	Reviewed By: BB	Date: 11/16/2022

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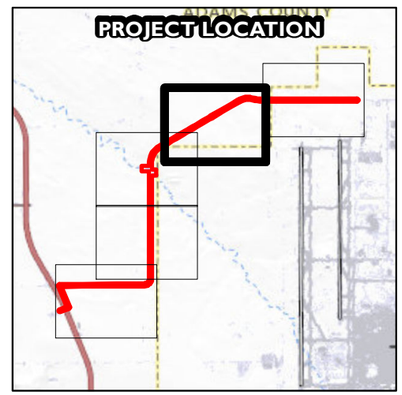

Legend

Study Area

0 250 500 Feet

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Denver International Airport/E-470
Pipeline Project
Denver and Adams County, Colorado

Site Location: S 1, 11, 12, 13, 22, 23, and 24, T2S, R66W; S 5 and 6, T2S, R65W; 6th Principal Meridian

Pinyon Project Number: 1/22-0848-01.001

Drawn By: MJS | Figure: 2; page 2 of 5

Reviewed By: BB | Date: 11/16/2022

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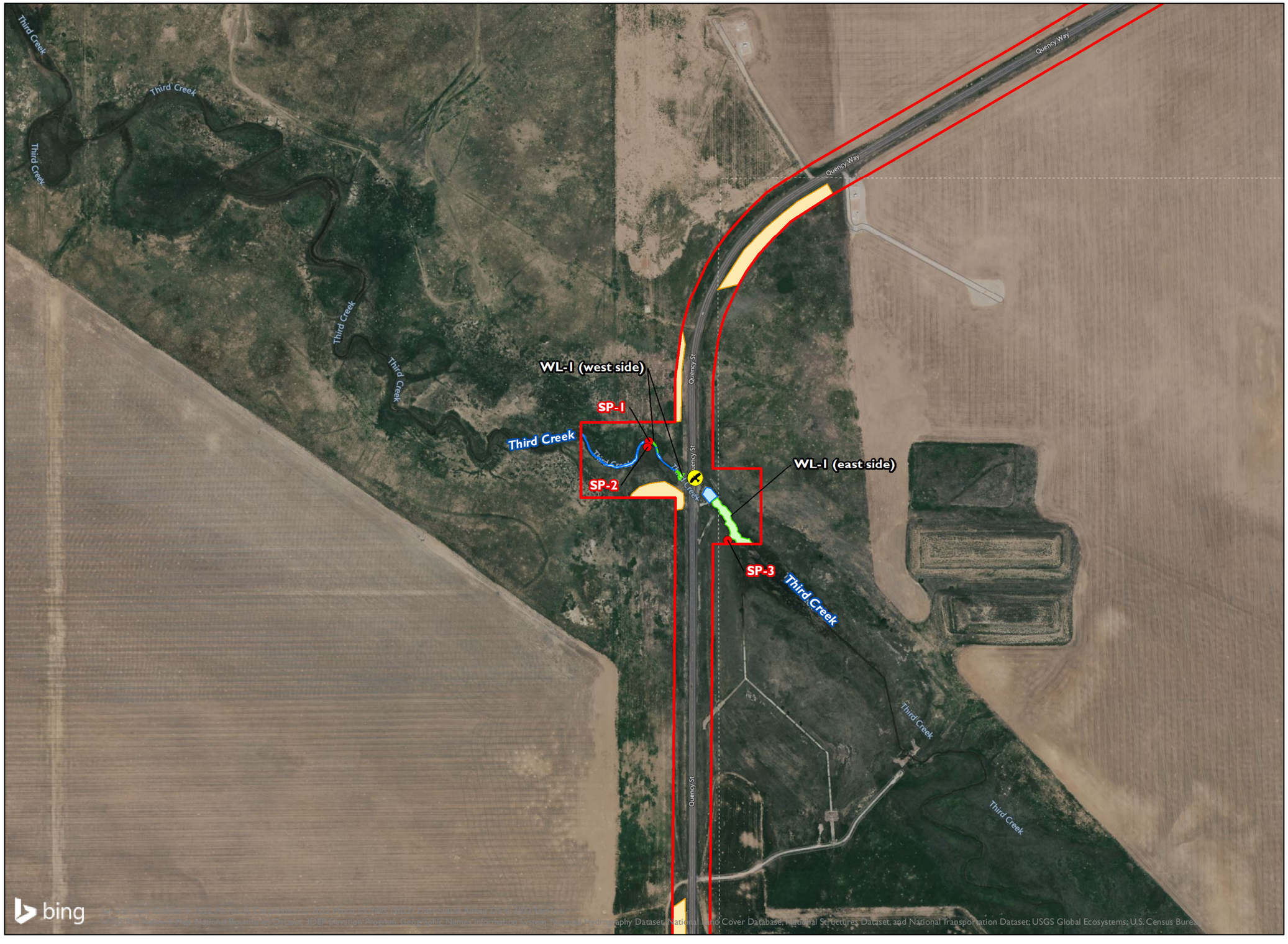

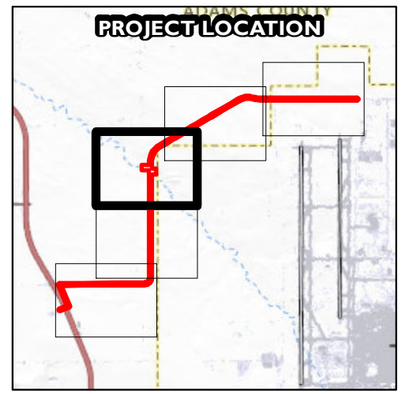

Legend

- Study Area
- SamplingPoint
- Cliff Swallow Nests
- Wetlands
- Non-Wetland Waters
- Black-tailed Prairie Dog Area

0 250 500 Feet

Pinyon Environmental, Inc.

BIOLOGICAL RESOURCES
Denver International Airport/E-470
Pipeline Project
Denver and Adams County, Colorado

Site Location: S 1, 11, 12, 13, 22, 23, and 24, T2S, R66W; S 5 and 6, T2S, R65W; 6th Principal Meridian	Drawn By: MJS	Figure: 2; page 3 of 5
Pinyon Project Number: 1/22-0848-01.001	Reviewed By: BB	Date: 11/16/2022

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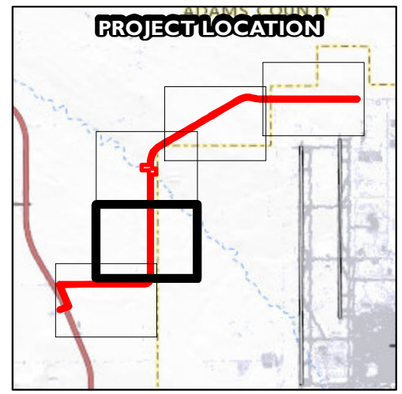

Legend

- Study Area
- Cliff Swallow Nests
- Black-tailed Prairie Dog Area

0 250 500 Feet

Pinyon Environmental, Inc.

BIOLOGICAL RESOURCES

Denver International Airport/E-470
Pipeline Project
Denver and Adams County, Colorado

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Pinyon Project Number: 1/22-0848-01.001	Reviewed By: BB	Date: 11/16/2022

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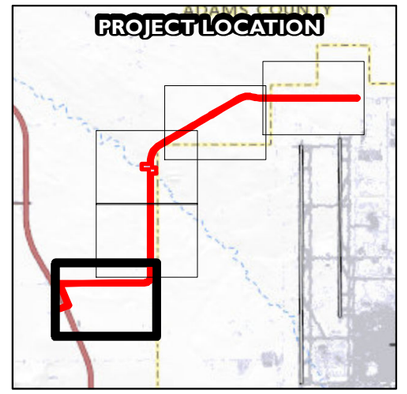

Legend

- Study Area
- Black-tailed Prairie Dog Area

0 250 500 Feet

Pinyon Environmental, Inc.

BIOLOGICAL RESOURCES

Denver International Airport/E-470
Pipeline Project
Denver and Adams County, Colorado

Site Location: S 1, 11, 12, 13, 22, 23, and 24, T2S, R66W; S 5 and 6, T2S, R65W; 6th Principal Meridian	Drawn By: MJS	Figure: 2; page 5 of 5
Pinyon Project Number: 1/22-0848-01.001	Reviewed By: BB	Date: 11/16/2022

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Photo 1. The study area included both sides of mowed Right-of-Way (ROW) bordered by agricultural fields. Photo taken facing east.

Photo 2. Facing south towards the Denver International Airport property border at the north end of the study area.

Photo 3. General vegetation in the study area includes sand dropseed (*Sporobolus cryptandrus*), annual sunflower (*Helianthus annuus*), Russian thistle (*Salsola tragus*), and smooth brome (*Bromus tectorum*). Photo taken in the southern portion of the study area, facing east.

Photo 4. Wetland 1 (WL-1) east of West Cargo Road along Third Creek. Photo taken facing west.

Photo 5. WL-1 west of West Cargo Road along Third Creek, facing east.

Photo 6. WL-1 west of West Cargo Road along Third Creek, facing northwest. Sampling Points 1 and 2 taken nearby.

Photo 7. One of the five Northern Harriers (*Circus hudsonius*) observed in the study area. Two Red-tailed Hawks (*Buteo jamaicensis*) were also observed during field surveys.

Photo 8. Cliff Swallow (*Petrochelidon pyrrhonota*) nests lined the box culvert along Third Creek. Photo taken in west entrance to culvert, facing east.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Denver International Airport/E-470 Pipeline Project City/County: Denver/Denver and Adams County Sampling Date: 10/28/22

Applicant/Owner: Denver Water State: CO Sampling Point: SP-1

Investigator(s): HBS, RGB, Pinyon Environmental, Inc. Section, Township, Range: S12 T2S R66W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Western Great Plains (LRR G) Lat: 39.892316 Long: -104.733016 Datum: WGS84

Soil Map Unit Name: Arvada loam, 0 to 3 percent slopes NWI classification: Rp1EM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation N, Soil N, or Hydrology N 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 ✔	No ____	**Is the Sampled Area within a Wetland?** Yes ✔ No ____
Hydric Soil Present?	Yes ✔	No ____	
Wetland Hydrology Present?	Yes ✔	No ____	

Remarks:
SP-1 passes as a wetland. SP-1 is patchy wetland along steep, incised banks of Third Creek.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 Ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus deltoides	2	N	FAC
2.			
3.			
4.			
	2 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 Ft radius)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 Ft radius)			
1. Typha latifolia	80	Y	OBL
2. Schoenoplectus tabernaemontanii	10	N	OBL
3. Schoenoplectus pungens	10	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15 Ft radius)			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

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 = ____

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation (All dominants are FACW and/or OBL.)

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No ____

Remarks:
SP-1 passes rapid test for hydrophytic vegetation.

D5 - FAC Neutral Test for hydrology. Drop all FAC, cross examine all other dominants. If > 50% remaining are FACW to OBL, then YES to D5.

SOIL

Sampling Point: SP-1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20"	10YR2/1	48	10YR4/6	2	C	M	Loam	Mottled, prominent redox present
0-20"	10YR4/3	50					Sandy loam	No redox

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

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

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✔ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No ___

Remarks:

SP-1 passes for hydric soil with Hydrogen Sulfide (A4). SP-1 soil has a high content of organic matter.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ✔ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ✔ No ___ Depth (inches): 0-1" deep

Water Table Present? Yes ✔ No ___ Depth (inches): 0-20"

Saturation Present? (includes capillary fringe) Yes ✔ No ___ Depth (inches): 0-20"

Wetland Hydrology Present? Yes ✔ No ___

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

Remarks:

SP-1 passes for wetland hydrology with Surface Water (A1), High Water Table (A2), Saturation (A3), Hydrogen Sulfide Odor (C1), and the FAC-Neutral Test (D5). Surface water was present in small puddles 0-1" deep near test pit. Test pit filled with water from water table almost immediately.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Denver International Airport/E-470 Pipeline Project City/County: Denver/Adams County Sampling Date: 10/28/22

Applicant/Owner: Denver Water State: CO Sampling Point: SP-2

Investigator(s): HBS, RGB, Pinyon Environmental, Inc. Section, Township, Range: S12 T2S R66W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): Western Great Plains Lat: 39.892238 Long: -104.733048 Datum: WGS84

Soil Map Unit Name: Arvada loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation N, Soil N, or Hydrology N 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 _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:
SP-2 is upland pit associated with SP-1 wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 Ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus deltoides	2	N	FAC
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 Ft radius)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 Ft radius)			
1. Bromus inermis	100	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15 Ft radius)			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	2	x 3 =	0
FACU species	0	x 4 =	0
UPL species	100	x 5 =	500
Column Totals:	0 (A)		506 (B)

Prevalence Index = B/A = 4.96

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50% (All dominants are FACW and/or OBL.)

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks:
SP-2 does not pass for hydrophytic vegetation.

D5 - FAC Neutral Test for hydrology. Drop all FAC, cross examine all other dominants. If > 50% remaining are FACW to OBL, then YES to D5.

SOIL

Sampling Point: SP-2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10"	10YR4/4	100					Loam	No redox

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

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

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Compaction

Depth (inches): 10"

Hydric Soil Present? Yes _____ No ✔

Remarks:

No hydric soil indicators noted. SP-2 does not pass for hydric soil. Refusal at 10" due to compaction.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

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:

No hydrology indicators noted. SP-2 does not pass for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Denver International Airport/E-470 Pipeline Project City/County: Denver/Denver and Adams County Sampling Date: 10/28/22

Applicant/Owner: Denver Water State: CO Sampling Point: SP-3

Investigator(s): HBS, RGB, Pinyon Environmental, Inc. Section, Township, Range: S12 T2S R66W

Landform (hillslope, terrace, etc.): None Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Western Great Plains Lat: 39.890866 Long: -104.731541 Datum: WGS84

Soil Map Unit Name: Arvada loam, 0 to 3 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation N, Soil N, or Hydrology N 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 ✔	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

SP-3 is negative test pit near Third Creek wetland along east side of road. While the dense willows of SP-3 pass for hydrophytic vegetation, SP-3 does not pass for soils or hydrology. Therefore, the willows represented by SP-3 are not a wetland.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 Ft radius)			
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 Ft radius)			
1. Salix exigua	80	Y	FACW
2.			
3.			
4.			
5.			
	80 = Total Cover		
Herb Stratum (Plot size: 5 Ft radius)			
1. Panicum virgatum	93	Y	FAC
2. Asclepias speciosa	5	N	FAC
3. Cirsium arvense	2	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15 Ft radius)			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

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 = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50% (All dominants are FACW and/or OBL.)

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks:

D5 - FAC Neutral Test for hydrology. Drop all FAC, cross examine all other dominants. If > 50% remaining are FACW to OBL, then YES to D5.

SP-3 passes Dominance Test for hydrophytic vegetation.

SOIL

Sampling Point: SP-3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8"	10YR4/2	100						No redox

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

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

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

No indicators noted. SP-3 does not pass for hydric soil.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

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:

No indicators noted. SP-3 does not pass for wetland hydrology.