



APPENDIX B

Wetland Finding

*For the C-470 Corridor
Revised Environmental Assessment*

June 2015

Submitted To:
CDOT Region 1
2000 S. Holly Street
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1.0 INTRODUCTION

The following is a wetland finding for the C-470 Corridor Revised Environmental Assessment (EA) (Project # NH4701-103 (14222) and has been written in compliance with Executive Order 11990, "Protection of Wetlands", and is in accordance with 23 CFR 771, 23 CFR 777, and Technical Advisory T6640.8A.

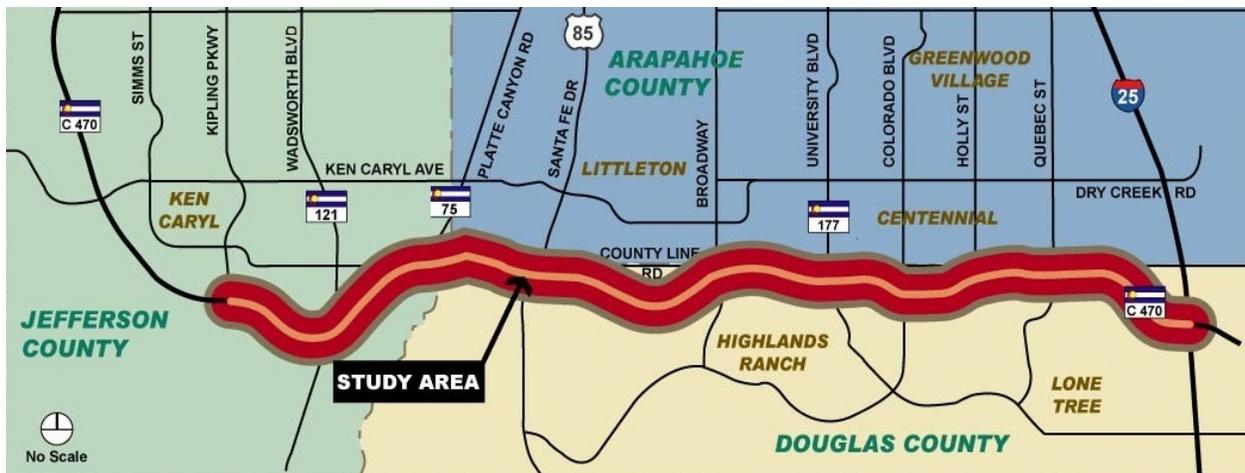
1.1 Project Location

The wetland study corridor for this project includes C-470 between Kipling Parkway (MP 12.449) and I-25 (MP 26.195). The study corridor is shown on Figure 1. The study corridor is located on the Parker, Highlands Ranch, and Littleton USGS quadrangles. The study corridor is located within the following sections, townships, and ranges:

- T6S, R67W, Sections 3, 4, 5, and 6
- T6S, R68W, Sections 1,2,3,4,5,and 6
- T5S, R68W, Section 31
- T5S, R69W, Section 36
- T6S, R69W, Sections 1, 2, and 3

The study corridor is located in Jefferson, Douglas, and Arapahoe counties.

Figure 1. C-470 Study Corridor



1.2 Project Description

The Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) have initiated the Revised EA for the 13-mile portion of C-470 between Kipling Parkway and Interstate 25 (I-25) to address congestion and delay, and to improve travel time reliability for C-470 users. The Proposed Action in the 2013 Revised EA differs slightly from the Express Lanes alternative identified in the previous EA that was approved by CDOT and FHWA in 2006.

Conceptual design plans have been prepared for the revised EA. Therefore, the wetland impacts identified in this document are preliminary and will change during the design-build process. The impacts identified in this document should be reduced during final design as opportunities for avoidance and minimization are identified. Mitigation described in this document is also preliminary and should be considered a conceptual description of mitigation for project wetland impacts.

The proposed action or preferred alternative described in this EA will result in impacts to jurisdictional and non-jurisdictional wetlands from the construction of new lanes, expansion of existing bridge capacity, increasing culvert size and installation of new culverts, increasing capacity of existing stormwater detention ponds and constructing new stormwater ponds, and upgrading and building new stormwater outfalls. Streams in the corridor will also be impacted by these roadway improvements. Indirect impacts will result from shading resulting from larger bridge decks, water quality impacted from increase in impervious surface and chemical applications during winter storms, and hydrology changes from increase in impervious surface, increased stormwater detention, and new or replacement outfalls.

The preliminary permanent and temporary wetland impacts presented on conceptual design plans are provided in Appendix A.

1.3 Project Alternatives

In addition to the No-Action Alternative, one action alternative, referred to as the Proposed Action, was evaluated in the EA.

The existing C-470 freeway includes two general purpose lanes in each direction with a depressed median, resulting in a typical cross section approximately 110 feet wide. This width expands near grade-separated interchanges to include off-ramps, on-ramps, and in some cases, auxiliary lanes. In the No-Action Alternative, this configuration would remain unchanged, but would receive maintenance as needed to maintain the safety and functionality of the existing four-lane freeway.

The Proposed Action would add two tolled Managed Express Lanes in each direction, expanding the four-lane freeway to an eight-lane freeway. To aid motorists in merging onto or off of the highway, auxiliary lanes will be provided between closely spaced interchanges (e.g., one mile apart). The typical cross-section will vary from 154 feet without auxiliary lanes to 174 feet in areas with auxiliary lanes. The Proposed Action does not include any new interchanges or any major interchange modifications. However, it adds new direct-connect ramps carrying northbound and southbound I-25 traffic into the westbound C-470 express lanes without having to merge across other lanes of traffic on westbound C-470.

Relative to wetlands, a key feature of the Proposed Action is that it would demolish and replace two parallel bridges that carry C-470 traffic over the South Platte River. Geometric improvements to C-470 alignment result in the need to replace these two old bridges, which cross over the highest-functioning wetlands found in the project area.

To minimize impacts to wetlands and other natural resources, the Proposed Action was developed to fit primarily within the existing right-of-way. The conceptual design process did consider avoidance and minimization of wetland impacts. Where possible, wetlands were avoided through steeping slopes and widening to the inside of the existing roadway. Perpendicular alignment of bridge structures shortened the bridges and reduced wetland and stream impacts. New and upgraded stormwater detention facilities will capture additional runoff and pollutants that have degraded some of the corridor wetlands and streams. Temporary impacts to wetlands were difficult to minimize at this stage of design because construction easements and other details have not yet been finalized for the project. The design-build phase of the project will provide more opportunities to avoid and minimize impacts to wetlands.

2.0 WETLANDS

Robert Belford, Senior Biologist with Wilson & Company, conducted a wetland delineation of the study corridor in accordance with U.S. Army Corps of Engineers (USACE) wetland definitions on July 2, 3, 17, 22, and 27, 2013. Wetlands were delineated using the procedures outlined in the “1987 Corps of Engineers Wetland Delineation” and the “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region” (USACE 2010). The study area for wetlands is defined as the area within the existing CDOT C-470 right of way between Kipling Boulevard and I-25.

The weather during the 2013 field review was generally sunny with scattered afternoon clouds. Temperatures ranged from the upper 80s to middle 90s. No precipitation occurred during the field visits.

Wetland delineations were completed in January 2015 in response to design changes that added or enlarged existing stormwater detention facilities outside the 2013 Wetland Study Area. These delineations were also completed by Robert Belford, now a Senior Biologist with ENERCON.

The January 2015 wetland delineation was completed during an abnormally warm period that had highs reaching the low 70s under generally sunny skies. Wetland data collection during January is not typically initiated because of the dormant plants and frozen soils. Therefore, this wetland delineation was initiated with the assumption that some soils and plant data may not be available to the delineator. This assumption was verified in the field, as some wetland sites had frozen soils and desiccated plants. Plants were present at each site that could be identified by species for the wetland determination form. While in locations with frozen soils, the delineator noted when the soil profile condition and indicators could not be documented on the data form.

All study area wetlands were delineated with a handheld GPS unit that collects data to sub-meter accuracy. All dominant plants were recorded and the wetland indicator status was determined by sourcing the “2012 Great Plains National Wetland Plant List” (USACE 2012). All plant, soil, and hydrology data were recorded on the USACE Great Plains Region Data Forms.

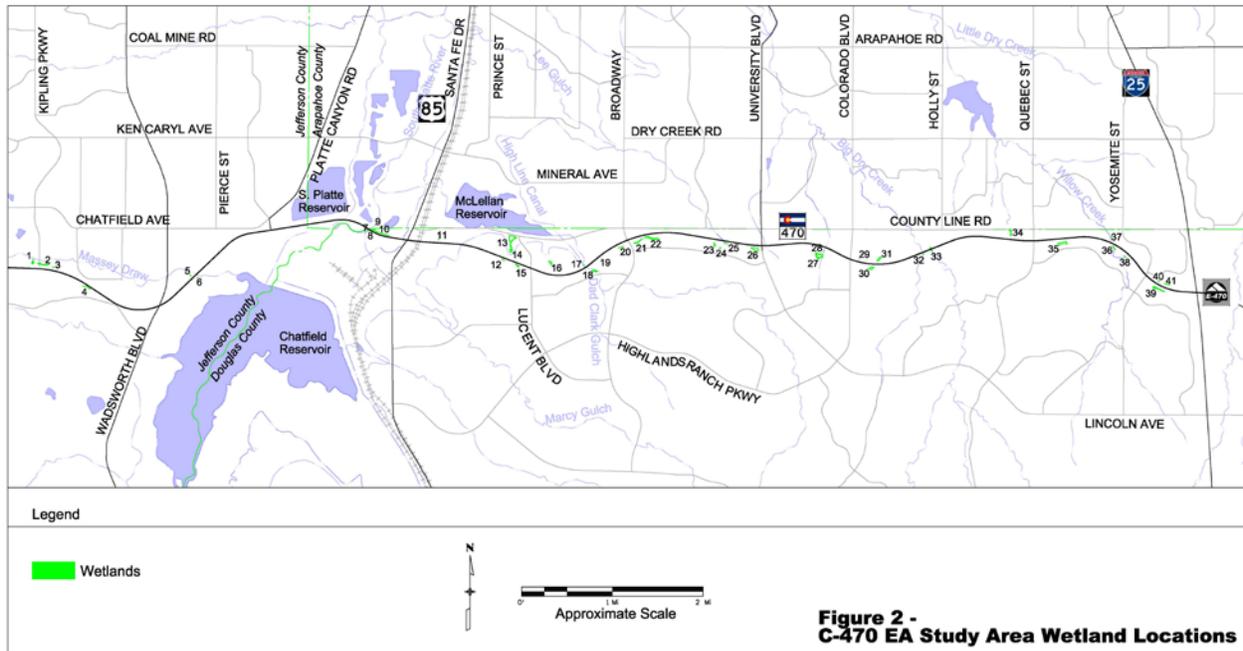


2.1 Description of Wetlands

The study area wetlands encompass a total of 12.7 acres. The wetlands identified in this section include both jurisdictional and non-jurisdictional wetlands. A U.S. Army Corps of Engineers (USACE) jurisdictional determination has not been completed for study area wetlands. The wetlands present in the study area were present along river and stream corridors, and also at detention ponds, drainage basins, and roadside depressions.

Figure 2 shows the location of the wetlands. Representative wetland photographs are provided in Appendix B.

Figure 2. C-470 EA Study Area Wetland Locations



Using the standard wetland classification system (Cowardin et al. 1979) the wetland areas in the study area are classified as:

- palustrine emergent (PEM)
- palustrine scrub/shrub (PSS)
- combination of palustrine emergent and palustrine scrub/shrub (PEM/PSS).

The PEM/PSS wetland areas are composed of equal parts PEM and PSS attributes. Wetland vegetation mostly occurs along narrow overbank areas along study area streams and in existing stormwater drainage basins. The drainage basin and roadside wetland features are not likely to be jurisdictional; but the preliminary or final jurisdictional designation will need to be completed by USACE.

2.2 Study Area Wetlands

The following section identifies the 41 wetland areas that were delineated in the study area, totaling 12.7 acres. Table 1 lists wetlands by location from west to east.

Each wetland in Table 1 is categorized by size range strictly to provide an overview of the size distribution. About half (20) of the 41 project area wetlands are smaller than one tenth of an acre. Another 30% (12) of the wetlands range in size from 0.1 to 0.5 acre, and the final 20% (9 wetlands) are in the size range of a half-acre up to 1.3 acres.

The jurisdictional and non-jurisdictional determinations identified in this document are not based on input from the USACE. Jurisdictional status was determined by connectivity to streams in corridor.

Summed by type, the 12.7 total wetland acres are comprised of 36% PEM, 34% PEM/PSS, and 30% PSS.

The following descriptions identify size, location, dominant vegetation, soil characteristics, and hydrological indicators for each wetland area. The wetland areas are identified in geographic order from west to east, consistent with the numbering of wetland areas on Figure 2.

The abbreviations OBL and FACW in the following descriptions refer to indicator status codes for obligate (OBL), meaning that the plant occurs only in wetlands, or facultative wetland (FACW), meaning that the plant usually occurs in wetlands but may also occur in non-wetland areas.

Wetland Area 1 (0.29 acre)

Wetland Area 1 is located on the west side of Kipling Boulevard along Massey Draw.

Dominant Vegetation:

Sandbar willow (*Salix exigua*) – OBL

Reed canary grass (*Phalaris arundinacea*) – OBL

Sedge (*Carex sp.*) – OBL/FACW

Soils: Soils consist of a silty loam texture with minimal organic content.

Hydrology: Soils are saturated in the 2 – 6 inch soil profile. The drainage does convey higher flows during precipitation events as drift deposits were observed.

Table 1. Summary of Project Area Wetlands within C-470 Right of Way

ID	Association	Type	Jurisdictional ¹	Size in Acres		
				Less than 0.1 acre	0.1 to 0.5 acre	0.5 to 1.3 acre(s)
1	Massey Draw	PSS	yes		0.29	
2	Massey Draw	PSS	yes			0.61
3	Massey Draw	PEM	yes	0.05		
4	Massey Draw	PSS	yes		0.18	
5	Massey Draw	PEM/PSS	yes	0.02		
6	Massey Draw	PEM/PSS	yes	0.01		
7	South Platte R.	PSS	yes	0.07		
8	South Platte R.	PSS	yes	0.05		
9	South Platte R.	PEM/PSS	yes	0.002		
10	South Platte R.	PEM/PSS	yes		0.44	
11	Erickson Blvd.	PEM	no	0.02		
12	Lucent Blvd.	PEM	no	0.05		
13	Lucent Blvd.	PEM	no			0.84
14	Lucent Blvd.	PEM	no		0.43	
15	Lucent Blvd.	PEM	no		0.23	
16	E. of Lucent	PSS	no		0.49	
17	Broadway	PEM	yes	0.06		
18	Dad Clark Gulch	PEM	yes		0.14	
19	Broadway	PEM	no	0.005		
20	Broadway	PEM	no	0.09		
21	Broadway	PEM/PSS	no		0.42	
22	Broadway	PEM/PSS	no			1.08
23	University	PSS	no		0.26	
24	University	PEM	no	0.06		
25	University	PEM	no	0.07		
26	University	PEM/PSS	no			1.23
27	East of U.	PEM/PSS	no			1.17
28	East of U.	PEM	no	0.02		
29	Colorado-Holly	PSS	no	0.007		
30	Colorado-Holly	PEM	no			0.59
31	Colorado-Holly	PEM	no			0.65
32	Big Dry Creek	PSS	yes		0.29	
33	Big Dry Creek	PSS	yes	0.08		
34	Quebec St.	PSS	no		0.41	
35	East of Quebec St.	PEM	no			1.29
36	Willow Creek	PSS	yes		0.11	
37	Willow Creek	PSS	yes	0.02		
38	Willow Creek	PSS	yes	0.04		
39	Yosemite St.	PSS	no			0.71
40	Yosemite St.	PSS	no	0.03		
41	Yosemite St.	PSS	no	0.09		

¹ The jurisdictional identification is based on the wetland connection to a stream, not on a preliminary or final determination from the USACE. The USACE is the agency responsible for a jurisdictional determination. Potentially jurisdiction wetlands are shaded in green and total approximately 2.5 of the 12.6 total acres in the project area.



Wetland Area 2 (0.61 acre)

Wetland Area 2 is located on the east side of Kipling Boulevard along Massey Draw.

Dominant Vegetation:

Sandbar willow – OBL

Common cattail (*Typha angustifolia*) – OBL

Soft-stemmed bulrush - (*Scirpus validus*) – OBL

Soils: Soils consist of a silty loam texture with a distinct depleted matrix.

Hydrology: Soils are saturated in the 2 – 4 inch soil profile. The drainage is a perennial stream that has flows dependent on precipitation events. Sediment deposits were observed along the banks of the stream that were significantly higher than current flows.

Wetland Area 3 (0.05 acre)

Wetland Area 3 is located on the east side of Kipling Boulevard along a drainage that discharges to Massey Draw.

Dominant Vegetation: Common cattail – OBL

Soils: Soils consist of a silty loam texture with a distinct depleted matrix.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile. Drift deposits were observed in the wetlands. This drainage did not have water currently and likely only conveys flows during precipitation events.

Wetland Area 4 (0.18 acre)

Wetland Area 4 is located along C-470 eastbound between Kipling Boulevard and Wadsworth Boulevard. It is located along a drainage that conveys flows during precipitation events.

Dominant Vegetation: Sandbar willow – OBL; Reed canary grass – OBL

Soils: The soils consist of a coarse loam texture with minimal organic content.

Hydrology: Soils are saturated in the 5 – 6 inch soil profile. Drift deposits were observed in the wetlands.

Wetland Area 5 (0.02 acre)

Wetland Area 5 is located just west of Wadsworth Boulevard. It is associated with Massey Draw that flows under C-470.

Dominant Vegetation:

Sandbar willow – OBL

Reed canary grass – OBL

Baltic rush (*Juncus arcticus*) – FACW

Redtop (*Agrostis alba*) – FACW

Soils: Soils consist of a silty loam texture and a depleted matrix.



Hydrology: Soils are saturated in the 1 – 4 inch soil profile. Sediment and drift deposits were observed in and adjacent to the wetland.

Wetland Area 6 (0.01 acre)

Wetland Area 6 is an extension of the overbank Wetland Area 5 located along Massey Draw.

Dominant Vegetation:

Sandbar willow – OBL
Baltic rush – FACW
Redtop – FACW
Reed canary grass – OBL

Soils: Soils consist of a silty loam texture and a depleted matrix.

Hydrology: Soils are saturated in the 1 – 2 inch soil profile. Drift deposits were observed in and adjacent to the wetland.

Wetland Area 7 (0.07 acre)

Wetland Area 7 is located on the west bank of the South Platte River and is located upstream and downstream of the C-470 Bridge at this location.

Dominant Vegetation:

Sandbar willow – OBL
Baltic Rush – FACW
Nebraska sedge (*Carex nebrascensis*) – OBL

Soils: Soils consist of a sandy/silty loam texture with a depleted dark surface.

Hydrology: Soils are saturated within the one inch of the soil surface. Drift and sediment deposits were observed in and adjacent to the wetland.

Wetland Area 8 (0.05 acre)

Wetland Area 8 is located on the east bank of the South Platte River. It extends both upstream and downstream of the C-470 Bridge at this location.

Dominant Vegetation: Sandbar willow – OBL; Baltic rush – FACW

Soils: Soils consist of a sandy/silty loam texture with a depleted matrix.

Hydrology: Soils are saturated within one-inch of the soil surface. Drift and sediment deposits were observed along the wetland edge.

Wetland Area 9 (0.002 acre)

Wetland Area 9 is located on the northeast bank of the South Platte River. The wetland area is located downstream of the C-470 Bridge. This wetland area was delineated in January 2015 and was being considered as the location for a stormwater outfall.

Dominant Vegetation: Sandbar willow – OBL; Baltic rush – FACW

Soils: Soils consist of a sandy loam texture with a depleted matrix.



Hydrology: Saturated soils were present within one-inch of the soil surface. Sediment and drift deposits were also present.

Wetland Area 10 (0.44 acre)

Wetland Area 10 is located along a drainage that is east of the South Platte River and is located on the north side of C-470. This drainage flows into the South Platte River.

Dominant Vegetation:

Sandbar willow – OBL
Common Cattail – OBL
Nebraska sedge – OBL
Reed canary grass - OBL
Watercress (*Nasturtium officinal*) – OBL

Soils: Soils consist of a sandy loam texture with a depleted matrix.

Hydrology: Soils are saturated within one inch of the soil surface.

Wetland Area 11 (0.02 acre)

Wetland Area 11, located on the northwest corner of Erickson Boulevard, is a small drainage ditch or basin.

Dominant Vegetation: Common Cattail – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 5 – 7 inch soil profile.

Wetland Area 12 (0.05 acre)

Wetland Area 12 is located along eastbound C-470 along the Lucent Boulevard exit. The wetland is associated with a drainage feature.

Dominant Vegetation: *Narrow-leaf cattail* (*Typha latifolia*) – OBL

Soils: Soils consist of a sandy loam texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 13 (0.84 acre)

Wetland Area 13 appears to be an older detention basin that is located adjacent to Lucent Boulevard and is north of C-470. Vegetated wetland was located around the edge of the pond, with open water present for the most of the wetland acreage.

Dominant Vegetation: Common Cattail – OBL

Soils: This site was delineated in January 2015 when soils were frozen. Therefore, no soil data was collected.

Hydrology: Soils appeared to be saturated at the surface. Surface water was also noted in the wetland area.

Wetland Area 14 (0.43 acre)

Wetland Area 14 is an older detention basin that is located adjacent to Wetland Area 13. The two basins are connected and appear to be the same age based on the condition of the vegetation.

Dominant Vegetation: Common Cattail – OBL; Sandbar Willow – OBL

Soils: This site was delineated in January 2015 when soils were frozen. Therefore, no soil data was collected.

Hydrology: Soils appear to be saturated at the surface. Some surface water was also noted in the wetland area.

Wetland Area 15 (0.23 acre)

Wetland Area 15 is located at the C-470 eastbound Lucent Boulevard exit. The wetland is a detention pond that is located between the exit ramp and C-470.

Dominant Vegetation:

Narrow-leaf cattail – OBL
Nebraska sedge – OBL
Reed Canary Grass – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 2 – 3 inch soil profile. Sediment deposits were observed in the wetland.

Wetland Area 16 (0.49 acre)

Wetland Area 16 is located along westbound C-470 east of the Lucent Boulevard exit. This wetland is a detention pond located in an area bordered by commercial buildings.

Dominant Vegetation:

Sandbar willow – OBL
Reed canary grass – OBL
Horsetail (*Equisetum hyemale L.*) – FACW

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 5 – 6 inch soil profile.

Wetland Area 17 (0.06 acre)

Wetland 17 is located on westbound C-470 before the Broadway exit. The wetland area is a detention basin and receives hydrology via a large culvert that is installed under C-470.

Dominant Vegetation: Sandbar willow – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 18 (0.14 acre)

Wetland 18 is located on or adjacent to Dad Clark Gulch. It appears to be a detention facility that is supported by a culvert that is installed under Plaza Drive.

Dominant Vegetation: Sandbar willow – OBL; Nebraska Sedge – OBL

Soils: Soils consist of a silty loam texture with a depleted matrix.

Hydrology: Soils are saturated in the top one-inch of the soil profile.

Wetland Area 19 (0.005 acre)

Wetland Area 19 is located adjacent to eastbound C-470 before the Broadway Exit. It is a small “ditch” wetland.

Dominant Vegetation: Narrow-leaf cattail – OBL

Soils: Soils consist of silty-loam texture.

Hydrology: Soils were saturated within the top 4-5 inches of the surface.

Wetland Area 20 (0.08 acre)

Wetland Area 20 is located adjacent to the C-470 Broadway exit ramp. The wetland is associated with ditch or drainage area adjacent to the exit ramp.

Dominant Vegetation: Reed canary grass – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 5 – 6 inch soil profile.

Wetland Area 21 (0.42 acre)

Wetland Area 21 is located adjacent to the Broadway eastbound C-470 ramp. The wetland is associated with a drainage feature that appears to receive sufficient hydrology to support woody vegetation.

Dominant Vegetation: Sandbar willow – OBL; Knotted rush – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 1 – 3 inch soil profile.

Wetland Area 22 (1.08 acre)

Wetland Area 22 is connected to Wetland Area 22.

Dominant Vegetation: Sandbar willow – OBL

Soils: Soils consist of a silty textures with a gleyed matrix.

Hydrology: Soils are saturated in the 1-3 inch soil profile.



Wetland Area 23 (0.26 acre)

Wetland Area 23 is a detention basin located adjacent to eastbound C-470 near University Boulevard. This wetland area was delineated in January 2015.

Dominant Vegetation: Sandbar Willow – OBL

Soils: The soils were frozen when this wetland delineation was completed in January 2015. Therefore, no soils data was collected.

Hydrology: The soils at this site appear to be seasonally saturated in response to stormwater runoff. Drift lines and sediment deposits were noted in the January 2015 fieldwork.

Wetland Area 24 (0.06 acre)

Wetland Area 24 is a small detention basin located adjacent to a school. A small outfall is located on the feature.

Dominant Vegetation: Common cattail – OBL

Soils: The soils were frozen when the wetland delineation was completed in January 2015. Therefore, no soils data was collected.

Hydrology: The soils at the site appear to be seasonally saturated in response to stormwater runoff. Some surface water was noted in the feature.

Wetland Area 25 (0.07 acre)

Wetland Area 25 is located along eastbound C-470 between Broadway and University Boulevard.

Dominant Vegetation: Narrow-leaf cattail – OBL

Soils: Soils consist of a silty texture.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile.

Wetland Area 26 (1.23 acres)

Wetland Area 26 is located on eastbound C-470 at the University Boulevard Interchange. It is a drainage basin that collects run-off from the roadway and adjacent commercial development.

Dominant Vegetation:

Sandbar willow – OBL

Narrow-leaf cattail – OBL

Baltic rush – FACW

Cloaked bulrush (*Scirpus pallidis*) – OBL

Soils: Soils consist of a silty texture with a depleted matrix.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile.

Wetland Area 27 (1.17 acre)

Wetland Area 27 is located along eastbound C-470 between University Boulevard and Colorado Boulevard. The feature is a drainage basin that collects stormwater runoff from adjacent residential development. This feature was delineated in January 2015.

Dominant Vegetation: Sandbar willow – OBL; Reed canary grass – OBL

Soils: The soils were frozen when the delineation was conducted in January 2015. Therefore, no soils data was collected.

Hydrology: Soils appear to be seasonally saturated during episodes of storm runoff. Drift deposits were noted during January 2015 fieldwork.

Wetland Area 28 (0.02 acre)

Wetland area 28 is located adjacent to Wetland Area 28. The feature is outlet area associated with Wetland Area 27.

Dominant Vegetation: Sandbar willow – OBL

Soils: Soils were frozen during the January 2015 fieldwork.

Hydrology: Drift deposits and sediment deposits were observed.

Wetland Area 29 (0.007 acre)

Wetland Area 29 is located on westbound C-470 at Colorado Boulevard.

Dominant Vegetation: Narrow-leaf cattail – OBL

Soils: Soils consist of a silty texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 30 (0.59 acre)

Wetland Area 30 is located along eastbound C-470 between Colorado Boulevard and Holly Street. It is a large detention facility that captures run-off from adjacent commercial and residential development.

Dominant Vegetation:

Sandbar willow – OBL

Reed canary grass – OBL

Narrow-leaf cattail – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 31 (0.65 acre)

Wetland Area 31 is a drainage basin located along westbound C-470 between Colorado and Holly Street. The feature is supported by a culvert that is installed under C-470. This feature was delineated in January 2015.

Dominant Vegetation:

Sandbar Willow – OBL
Nebraska sedge – OBL
Reed canary grass – OBL

Soils: Soils were frozen in January 2015. Therefore no soils data was collected.

Hydrology: Soils appeared saturated in the top 1-2 inches as some surface water was observed in the wetland area. Drift deposits were observed in the feature.

Wetland Area 32 (0.29 acre)

Wetland Area 32 is located along eastbound C-470 near Holly Street.

Dominant Vegetation:

Nebraska sedge – OBL
Baltic rush – FACW
Watercress – OBL
Reed canary grass – OBL

Soils: Soils consist of a silty texture with a depleted matrix.

Hydrology: Soils are saturated in the upper one-inch soil profile.

Wetland Area 33 (0.08 acre)

Wetland Area 33 is associated with Big Dry Creek that flows under east and west bound C-470. It is located along the banks of Big Dry Creek and is connected to the riparian floodplain of the creek. These wetlands are “overbank” features that form along the edge of stream banks in this region.

Dominant Vegetation:

Sandbar willow – OBL
Nebraska sedge – OBL
Baltic rush – FACW
Reed canary grass – OBL

Soils: Soils in the wetland areas consist of silty to sandy loam texture. A depleted matrix was observed in some of the soils.

Hydrology: Soils are generally saturated in the 3 – 4 inch soil profile. Drift and sediment deposits were observed within and adjacent to the wetlands.

Wetland Area 34 (0.41 acre)

Wetland Area 34 is associated with a detention pond located along westbound C-470 near Quebec Street.

Dominant Vegetation:

Sandbar willow – OBL
Reed canary grass – OBL
Narrow-leaf cattail – OBL



Soils: Soils in the wetland consist of a sandy loam texture. A depleted matrix was observed in the soils.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 35 (1.29 acres)

Wetland Area 35 is associated with a detention pond located along eastbound C-470 near Quebec Street. The feature was delineated in January 2015.

Dominant Vegetation: Common cattail – OBL; Reed canary grass – OBL

Soils: Soils were frozen in January 2015. Therefore, no soils data was collected.

Hydrology: Soils are seasonally flooded during stormwater runoff. Drift deposits were observed. Some surface saturation was also observed in the feature.

Wetland Area 36 (0.11 acre)

Wetland Area 36 is located along eastbound C-470 at Willow Creek. It is associated with a narrow strip of the riparian vegetation zone along the stream.

Dominant Vegetation:

Sandbar willow – OBL

Reed canary grass – OBL

Baltic rush – FACW

Soils: Soils in the wetland consist of a sandy loam texture.

Hydrology: Soils are saturated in the 1-2 inch soil profile.

Wetland Area 37 (0.02 acre)

Wetland Area 37 is located along westbound C-470 at Willow Creek. It is associated with the narrow riparian corridor along Willow Creek.

Dominant Vegetation:

Sandbar willow – OBL

Reed canary grass – OBL

Common three-square (*Schoenoplectus pungens*) – OBL

Soils: Soils in the wetland consist of a silty loam texture.

Hydrology: Soils are saturated in the 1 – 2 inch soil profile.

Wetland Area 38 (0.04 acre)

Wetland Area 38 is located along eastbound C-470 at Willow Creek. It is located along the northeast bank of Willow Creek.

Dominant Vegetation:

Sandbar willow – OBL

Reed Canary grass – OBL

Horsetail – FACW

Common three-square – OBL



Soils: Soils in the wetland consist of a silty texture. A depleted matrix was observed in the soils.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile. Drift deposits were observed in the wetland.

Wetland Area 39 (0.71 acre)

Wetland Area 39 is a detention basin located east of Yosemite Street. The wetland is adjacent to eastbound C-470. This feature was delineated in January 2015.

Dominant Vegetation: Reed canary grass – OBL: Narrow-leaf cattail – OBL

Soils: Soils were frozen during the January 2015 field study. Therefore, no soils data was collected.

Hydrology: Soils appear to have some surface saturation. Drift deposits were observed in the wetland area.

Wetland Area 40 (0.03 acre)

Wetland Area 40 is a narrow drainage feature located along westbound C-47 near Yosemite Street. The feature was delineated in January 2015.

Dominant Vegetation: Reed canary grass – OBL

Soils: Soils were frozen during the January 2015 field study. Therefore, no soils data was collected.

Hydrology: Soils were visually saturated. Some drift deposits were observed.

Wetland Area 41 (0.09 acre)

Wetland Area 41 is a narrow drainage feature connected to Wetland Area 40. The feature was delineated in January 2015.

Dominant Vegetation: Reed canary grass – OBL

Soils: Soils were frozen during the January 2015 field study. Therefore, no soils data was collected.

Hydrology: Some saturation in the soils was observed. Drift deposits were also observed.

3.0 WETLAND FUNCTION

FACWet is an assessment tool for rating wetland conditions through evaluation of ecological stressors that drive wetland functions. Each variable is rated on a scale of 0.0 to 1.0. This tool was used to evaluate the impacted wetlands that occur along the South Platte River, Big Dry Creek, and Willow Creek. In addition, all of the impacted wetlands associated with stormwater detention facilities and minor roadside depressions were evaluated together in one FACWet assessment. These wetlands were all primarily supported by stormwater and had identical characteristics that are evaluated in the FACWet analysis. The results of the analysis were as follows:



- South Platte River wetlands 0.78 (high end of functioning)
- Big Dry Creek wetlands 0.75 (high end of functioning)
- Willow Creek wetlands 0.71 (low end of functioning)
- Non-jurisdictional wetlands 0.60 (low end/impaired)

The completed FACWet version 3.0 worksheets for these wetlands are provided in Appendix C.

4.0 WETLAND IMPACTS

Table 2 identifies the permanent and temporary impacts at each mapped wetland in the study corridor. The wetlands are presented from west to east in the table. These impacts are preliminary because the roadway design completed for this revised EA is conceptual.

Table 2. C-470 Preliminary Wetland Impacts Based on Conceptual Design

#	Association	Jurisdictional	FACWET Score	Permanent Impacts (Acres)	Temporary Impacts (Acres)
4	Massey Draw		0.60	0.18	
7	South Platte River	Yes	0.78	0.03	
8	South Platte River	Yes		0.02	
10	South Platte River	Yes		0.02*	0.3*
12	Lucent Blvd.		0.60	0.04	
15	Lucent Blvd.			0.07	
19	Broadway			0.0001	
20	Broadway			0.01	
21	Broadway				0.18
22	Broadway			0.01	0.63
23	University Blvd.			0.13	
25	University Blvd.			0.01	
26	University Blvd.			0.14	
31	Colorado to Holly			0.004	
33	Big Dry Creek	Yes	0.75	0.03	
36	Willow Creek	Yes	0.71	0.002	
39	Yosemite Street		0.60	0.11	
40	Yosemite Street			0.02	
41	Yosemite Street			0.09	
Total Jurisdictional*			5 wetlands	0.102*	0.3*
Total Non-Jurisdictional			14 wetlands	0.8141	0.81
Overall Totals			19 wetlands	0.9161	1.11

* Wetland 10 is possibly jurisdictional, but assumed so, subject to USACE determination



Table 1 indicated that approximately 12.7 acres of wetlands had been identified within CDOT right-of-way along the 13.75-mile C-470 project corridor. A total of 0.91 acre of permanent impacts and 1.11 acres of temporary impacts were identified during the revised EA conceptual design process. Impacts to five jurisdictional wetlands would total approximately one-tenth of one-acre. These potential jurisdictional wetlands are identified with green shading in Table 2.

Direct impacts to wetlands were determined by overlaying conceptual roadway design onto wetlands. If any of the roadway design that includes cut –and-fill areas and installation of concrete or other materials were placed in wetlands it was considered a direct permanent impact. Indirect impacts also were included as permanent impacts where increases in the bridge decking resulted in a larger shadow that could result in the loss of wetland vegetation.

Temporary impacts were calculated based on the potential exposure of soil, buffers for construction access, and temporary removal of vegetation. Since the design was only conceptual during this National Environmental Policy Act process, temporary impacts will change during the design-build process.

Indirect impacts to corridor wetlands and streams that are not quantifiable will result from the increase in impervious surface from C-470 roadway improvements. Increases in impervious surfaces result in larger sediment releases, and increases runoff that contributes to erosion and transport of pollutants to wetlands and streams. The indirect impacts resulting from the roadway construction activities could include increases in sedimentation and erosion, resulting in temporary indirect impacts to corridor wetlands and streams. With larger road surfaces, an increase in winter traction sanding and deicing could contaminate wetlands via increased impervious surface runoff.

4.1 Other Waters of the U.S.

The proposed C-470 Project will cross other waters of the U.S. as defined by the USACE. The USACE typically will claim jurisdiction on any river or stream that is shown as a blue line on a topographical map. These regulated streams can be perennial, intermittent, or ephemeral. Within the study area the following streams and rivers will be defined as jurisdictional by the USACE:

- South Platte River
- Massey Draw
- Dad Clark Gulch
- Lee Gulch
- Big Dry Creek
- Willow Creek

These streams will be under USACE regulatory jurisdiction for any proposed actions within their ordinary high water mark (OHWM). No permanent or temporary impacts to these streams were identified during the conceptual design phase of this project.

However, impacts to these streams will likely be identified during the C-470 design-build process.

4.2 Permitting

The study area jurisdictional wetlands and streams will be subject to USACE Section 404 permitting. Permitting will likely be completed under a Nationwide (NWP) 14 for Transportation Projects. The NWP 14 will be completed during the design-build phase of the project when final impacts are calculated for the project.

5.0 WETLAND MITIGATION

The C-470 Proposed Action will result in 0.91 acre of permanent impacts to wetlands. This total includes both jurisdictional and non-jurisdictional wetlands. Impacts to jurisdictional and non-jurisdictional wetlands will be required to be mitigated at a 1:1 ratio.

Two mitigation options were considered for permanent impacts to study area wetlands. These included onsite mitigation and purchase of wetland mitigation bank credits from a USACE approved mitigation bank. Since this project was only at the conceptual design phase, this discussion of potential mitigation should be considered preliminary and subject to change during the design-build phase of the project.

Onsite mitigation opportunities are limited in the corridor, as they are primarily focused on the perennial streams and stormwater detention ponds found in the corridor. Most of the potential stream sites would not present good mitigation opportunities because the riparian wetland habitats are in good condition. Therefore, stream mitigation sites were eliminated from consideration.

Since onsite mitigation is not viable, the 0.91 acre of permanent wetland impacts will be mitigated through the purchase of wetland mitigation bank credits. This option represents the best solution for the required wetland mitigation.

Temporary impacts to wetlands and other waters of the U.S. will also be mitigated. During development of the design-build plans, wetland scientists will work closely with project engineers to avoid and minimize impacts to wetlands and waters of the U.S. In addition the following wetland mitigation commitments are typically implemented for CDOT projects:

- In designated temporary work areas within wetlands and riparian areas, shrubs (primarily willows) will be trimmed to the ground level (not grubbed), and then covered with a geo-textile fabric and an additional layer of straw. These areas (including wetlands) will then be covered with a minimum of 2 feet of clean fill. As soon as possible, all temporary fill will be removed to an upland location. This will protect riparian shrub rootstock and wetland seed banks. If possible, temporary fill of wetlands will occur during periods when plants are dormant or toward the end of the growing season.

- Wetland areas not temporarily impacted by the project will be protected from construction activities by temporary and/or construction limit fencing.
- Sediment control measures will be installed where needed to prevent sediment filling wetlands.
- Fertilizers or hydro-mulching will not be allowed within 50 feet of a wetland.
- All disturbed areas will be revegetated with native grass and forb species. Seed, mulch, and mulch tackifier will be applied in phases throughout construction.
- Where permanent seeding operations are not feasible because of seasonal constraints (e.g., summer and winter months), disturbed areas will have mulch and mulch tackifier applied to prevent erosion.
- A stormwater management plan will be developed with best management practices to minimize adverse effects to water quality.
- Erosion bales, erosion logs, silt fence, or other sediment control devices will be used as sediment barriers and filters adjacent to wetlands, surface waterways, and at inlets where appropriate.
- Construction staging areas will be located at a distance of greater than 50 feet from adjacent stream/riparian areas to avoid disturbance to existing vegetation, avoid point source discharges, and to prevent spills from entering the aquatic ecosystem (including concrete washout).
- Temporary impacts to waters of the U.S. and adjacent habitat will be reclaimed with native plants and shrubs. In addition, this project will likely require a Senate Bill 40 (SB 40) Certification from Colorado Parks and Wildlife (part of the Colorado Department of Natural Resources), to protect riparian habitat.

6.0 CONCLUSION

Out of 12.7 acres of wetlands delineated on CDOT right-of-way in the C-470 project area, the Proposed Action is expected to have 0.91 acre of permanent impacts and 1.11 acres of temporary impacts. Extensive efforts were undertaken in conceptual design to avoid wetland areas and to minimize impacts. CDOT will mitigate for these impacts in accordance with its “no net loss” policy and will undertake various Best Management Practices (temporary and permanent) to minimize adverse effects to wetlands. Alternatives to the Proposed Action were screened out based on ability to meet project purpose and need, so the Revised EA addresses only the Proposed Action and the No-Action Alternative.

Based on the above considerations, it is determined that there is no practicable alternative to the proposed new construction in wetlands and that the Proposed Action

includes all practicable measures to minimize harm to wetlands which may result from such use.

7.0 REFERENCES

Cowardin, Lewis M., Virginia Carter, Frances C. Golet, and Edward T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Department of the Interior, U.S. Fish and Wildlife Service, FWS/OBS – 79/31.

Lichvar, R.W. 2012. *The National Wetland Plant List*. ERDC/CRREL TR-12-11. Hanover, NH: U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region*.



APPENDIX A
Wetland Impacts on Conceptual Design Plans



Wetland Exhibit 1

Wetland Area: 0.2936 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



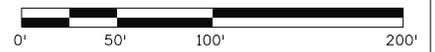
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 2

Wetland Area: 0.6084 Acres

Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



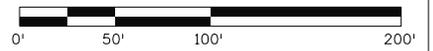
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 3

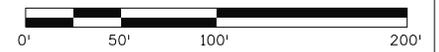
Wetland Area: 0.0536 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend

- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibit 4

Wetland Area: 0.1802 Acres

Permanent Impact Area: 0.1802 Acres Temporary Impact Area: 0.0 Acres



Legend



Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 4

Wetland Area: 0.1802 Acres

Permanent Impact Area: 0.1125 Acres Temporary Impact Area: 0.0677 Acres



Legend



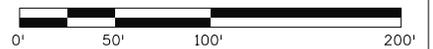
Temporary Wetland Impact



Permanent Wetland Impact



Unimpacted Wetland Area



Wetland Exhibit 5

Total Wetland Area: 0.0230 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



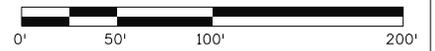
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 6

Total Wetland Area: 0.0135 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



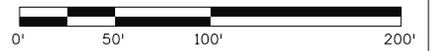
Temporary Wetland Impact



Unimpacted Wetland Area



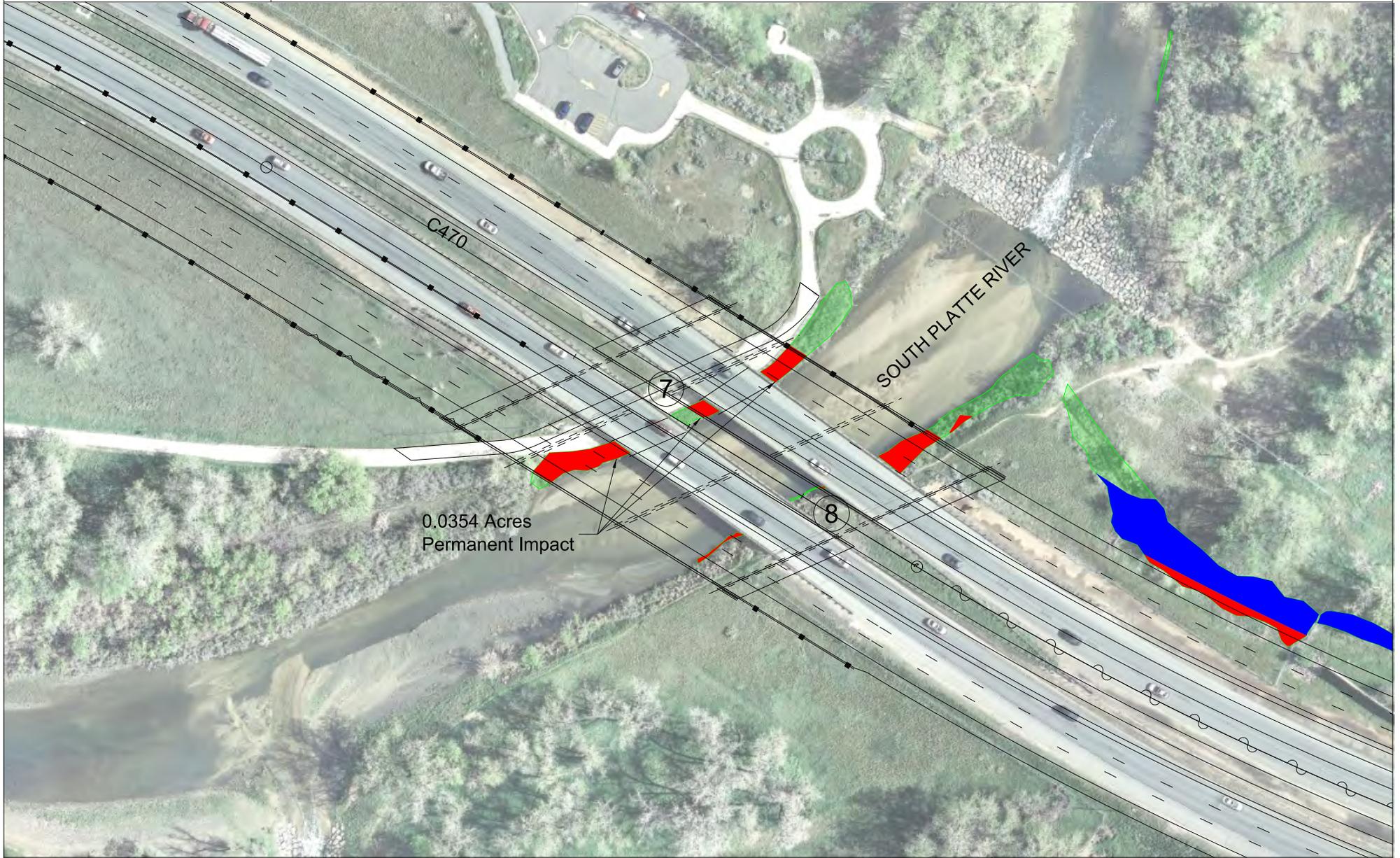
Permanent Wetland Impact



Wetland Exhibit 7

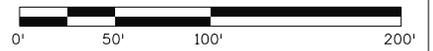
Total Wetland Area: 0.0660 Acres

Permanent Impact Area: 0.0354 Acres Temporary Impact Area: 0.0 Acres



Legend

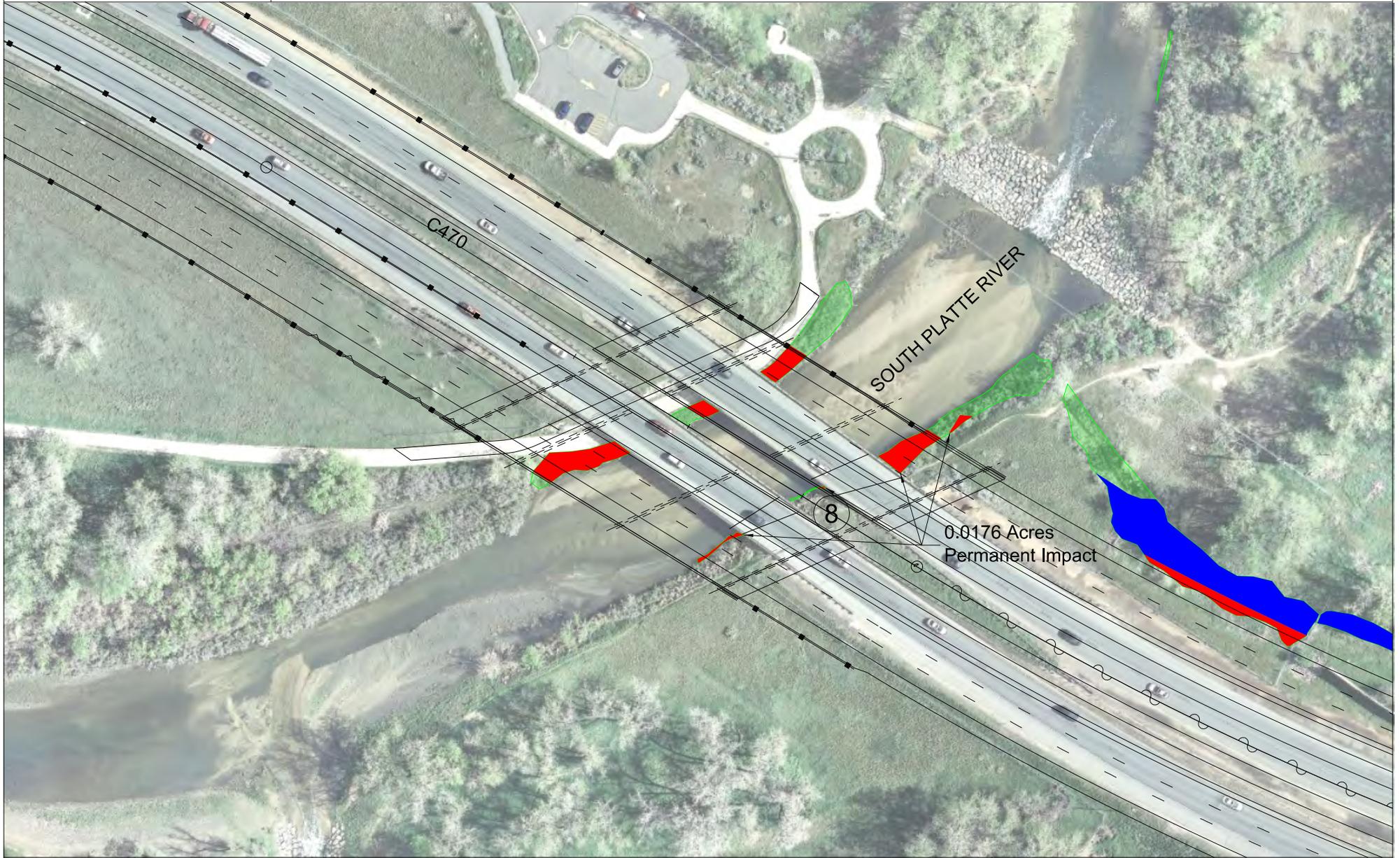
- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibit 8

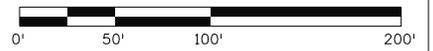
Total Wetland Area: 0.0516 Acres

Permanent Impact Area: 0.0176 Acres Temporary Impact Area: 0.0 Acres



Legend

- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibit 9

Total Wetland Area: 0.0023 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



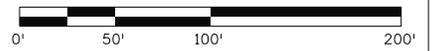
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 10

Total Wetland Area: 0.4392 Acres

Permanent Impact Area: 0.0199 Acres Temporary Impact Area: 0.3314 Acres



Legend



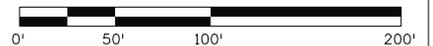
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 11

Total Wetland Area: 0.0160 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



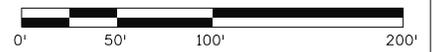
Temporary Wetland Impact



Unimpacted Wetland Area



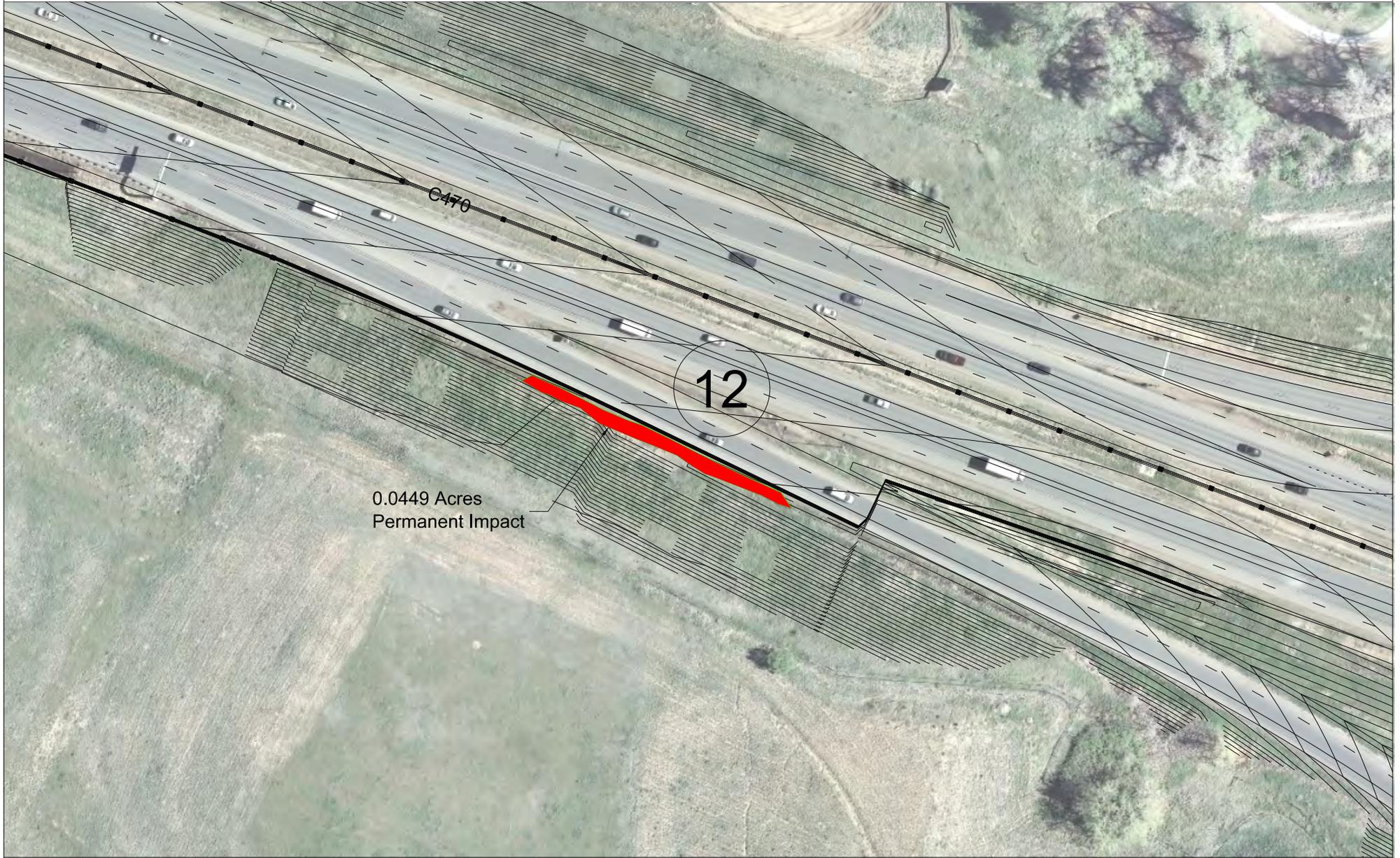
Permanent Wetland Impact



Wetland Exhibit 12

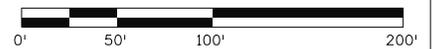
Total Wetland Area: 0.0449 Acres

Permanent Impact Area: 0.0449 Acres Temporary Impact Area: 0.0 Acres



Legend

- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibits
13 & 14

Total Wetland Area: 1.270 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend

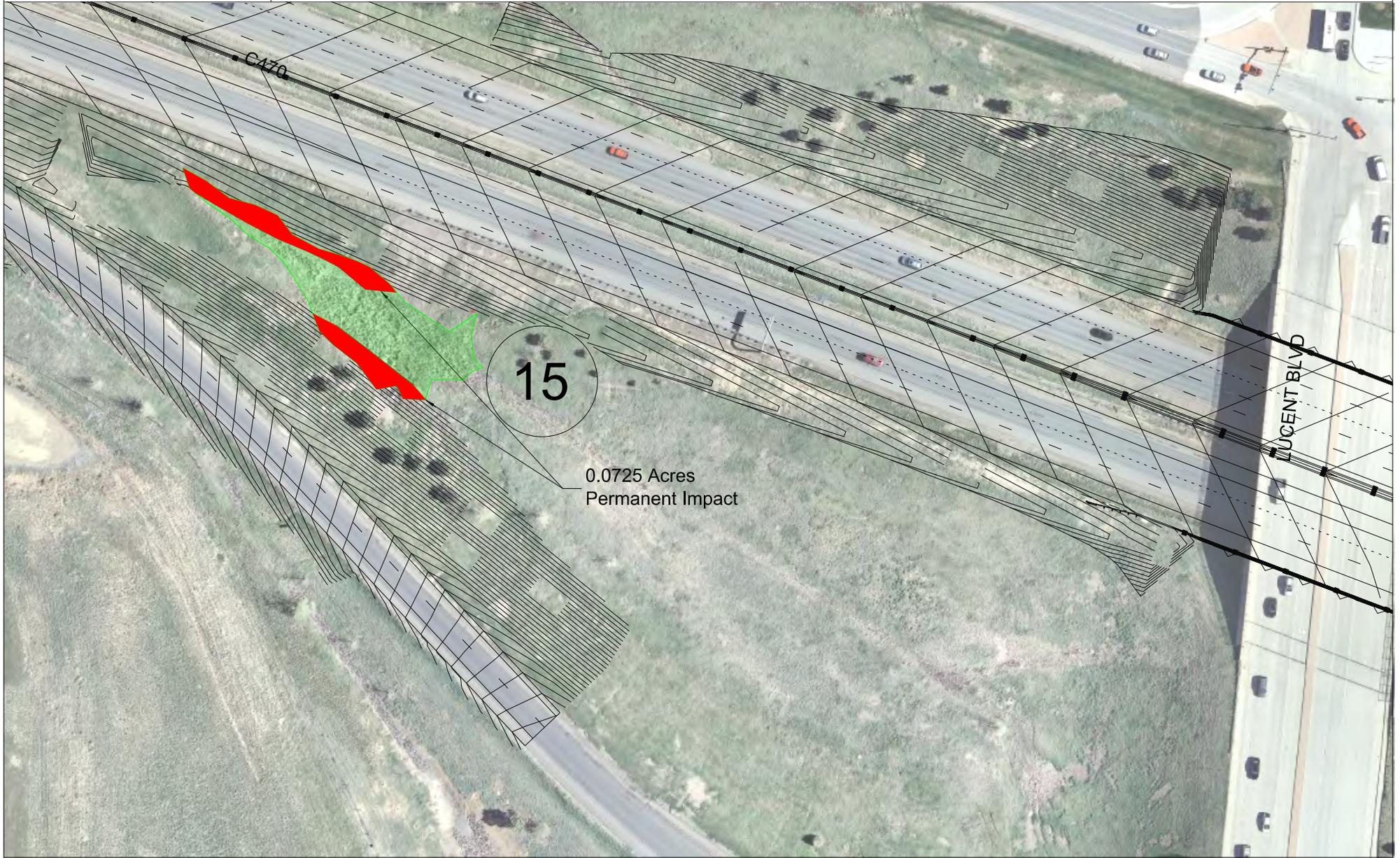
- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibit 15

Total Wetland Area: 0.2290 Acres

Permanent Impact Area: 0.0725 Acres Temporary Impact Area: 0.0 Acres



Legend



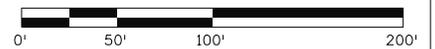
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 16

Total Wetland Area: 0.4883 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



PLUM VALLEY LN

16

C470 WB OFF RAMP
TO LUCENT BLVD

Legend



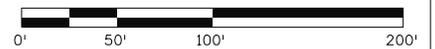
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 17

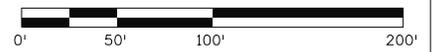
Total Wetland Area: 0.0582 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend

- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibit 18

Total Wetland Area: 0.1396 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



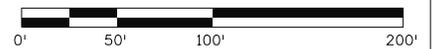
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 19

Total Wetland Area: 0.0051 Acres

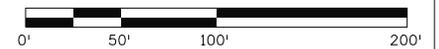
Permanent Impact Area: 0.0001 Acres Temporary Impact Area: 0.0 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact

■ Unimpacted Wetland Area



Wetland Exhibit 20

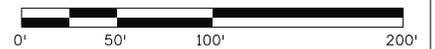
Total Wetland Area: 0.0887 Acres

Permanent Impact Area: 0.0117 Acres Temporary Impact Area: 0.0 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact
- Unimpacted Wetland Area



Wetland Exhibit 21

Total Wetland Area: 0.4253 Acres
Permanent Impact Area: 0.0 Acres

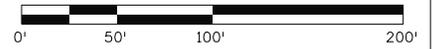
Temporary Impact Area: 0.1843 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact

Unimpacted Wetland Area



Wetland Exhibit 22

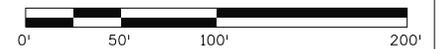
Total Wetland Area: 1.086Acres

Permanent Impact Area: 0.0129 Acres Temporary Impact Area: 0.6377 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact
- Unimpacted Wetland Area



Wetland Exhibit 23

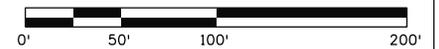
Total Wetland Area: 0.2609 Acres

Permanent Impact Area: 0.1338 Acres Temporary Impact Area: 0.0 Acres



Legend

- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibit 23

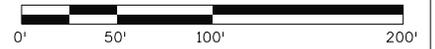
Total Wetland Area: 0.2609 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.1338 Acres



- Legend
- Temporary Wetland Impact
 - Permanent Wetland Impact

Unimpacted Wetland Area



Wetland Exhibit 24

Total Wetland Area: 0.0606 Acres
Permanent Impact Area: 0.0 Acres

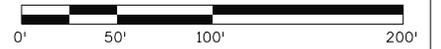
Temporary Impact Area: 0.0 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact

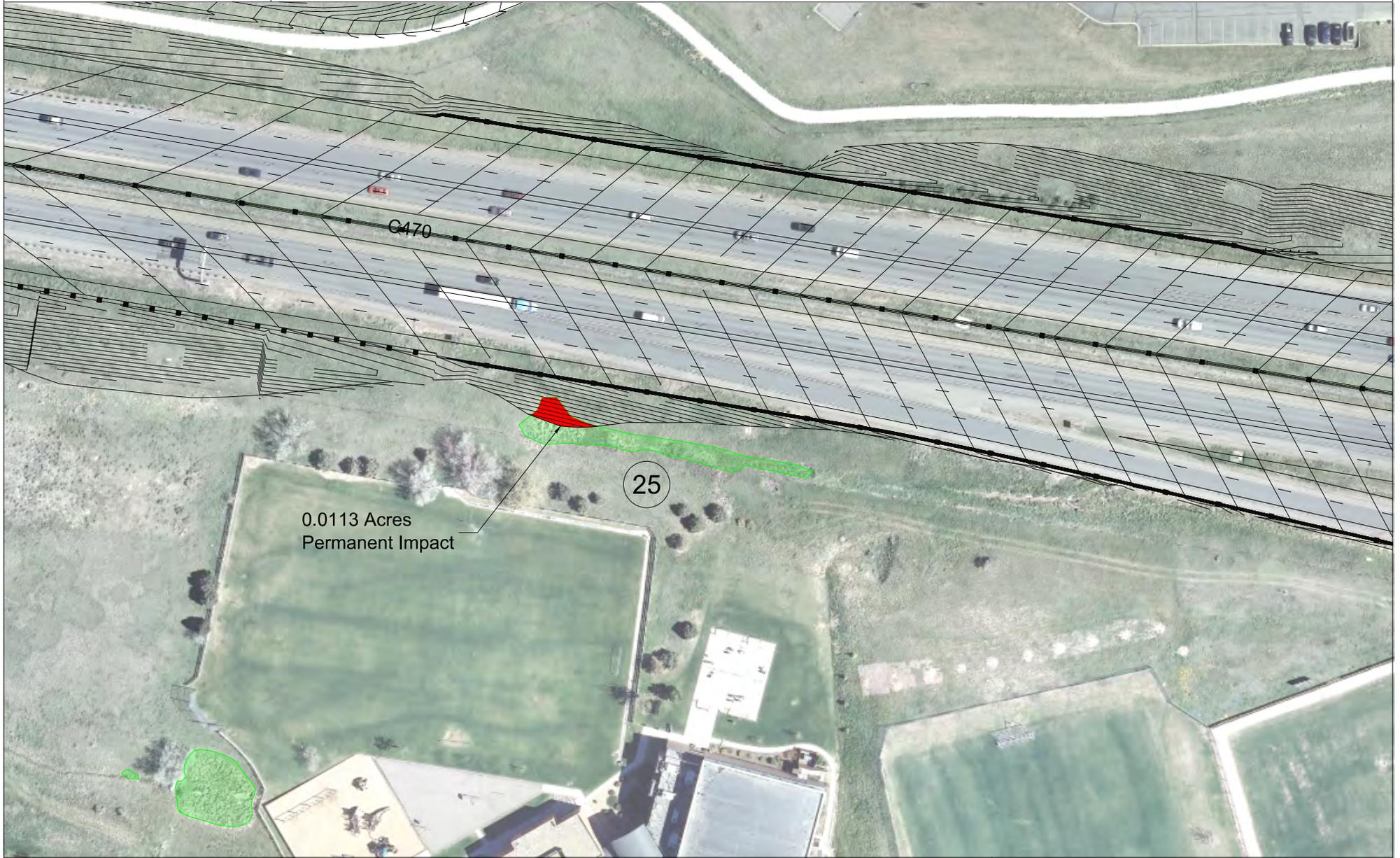
Unimpacted Wetland Area



Wetland Exhibit 25

Total Wetland Area: 0.0708 Acres

Permanent Impact Area: 0.0113 Acres Temporary Impact Area: 0.0 Acres



Legend



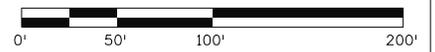
Temporary Wetland Impact



Unimpacted Wetland Area

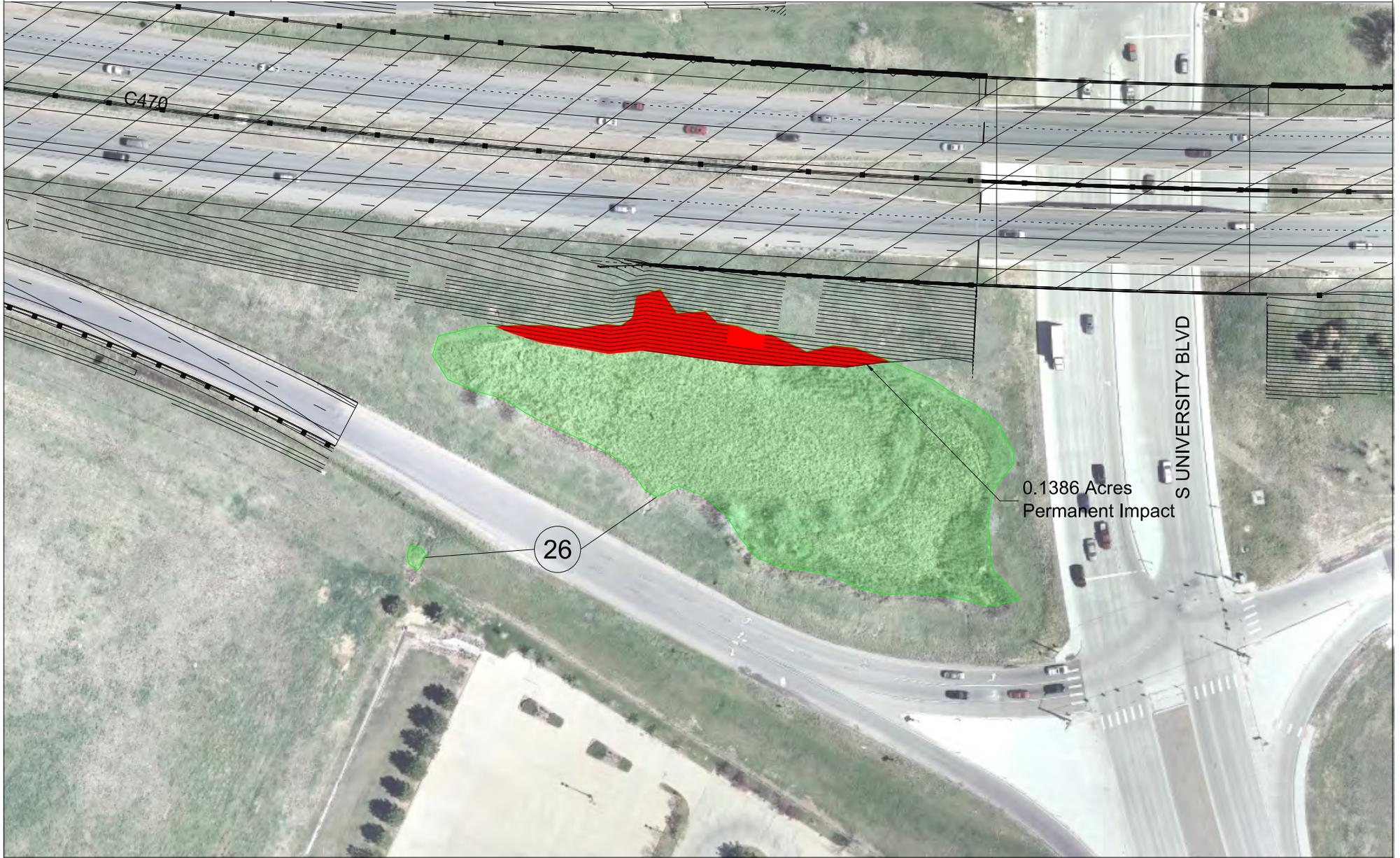


Permanent Wetland Impact



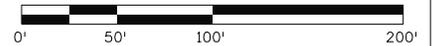
Wetland Exhibit 26

Total Wetland Area: 1.230 Acres
Permanent Impact Area: 0.1386 Acres Temporary Impact Area: 0.0 Acres



Legend

- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibits
27 & 28

Total Wetland Area: 1.199 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



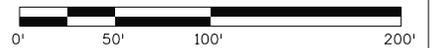
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 29

Total Wetland Area: 0.007 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



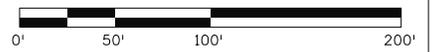
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 30

Total Wetland Area: 0.5863 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



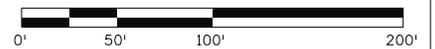
Temporary Wetland Impact



Permanent Wetland Impact



Unimpacted Wetland Area



Wetland Exhibit 31

Total Wetland Area: 0.6450 Acres

Permanent Impact Area: 0.0044 Acres Temporary Impact Area: 0.0 Acres



Legend



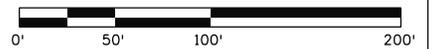
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 31

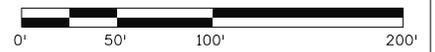
Total Wetland Area: 0.6450 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0044 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact
- Unimpacted Wetland Area



Wetland Exhibit 32

Total Wetland Area: 0.0286 Acres
Permanent Impact Area: 0.0 Acres

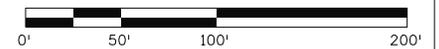
Temporary Impact Area: 0.0 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact

■ Unimpacted Wetland Area



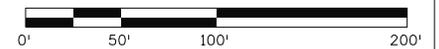
Wetland Exhibit 33

Total Wetland Area: 0.0802 Acres
Permanent Impact Area: 0.0346 Acres Temporary Impact Area: 0.0 Acres



Legend

- | | | | |
|---|--------------------------|---|-------------------------|
|  | Temporary Wetland Impact |  | Unimpacted Wetland Area |
|  | Permanent Wetland Impact | | |



Wetland Exhibit 34

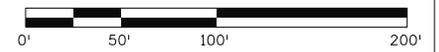
Total Wetland Area: 0.4082 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact
- Unimpacted Wetland Area



Wetland Exhibit 35

Total Wetland Area: 1.292 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



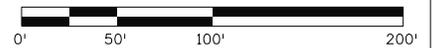
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 36

Total Wetland Area: 0.1125 Acres

Permanent Impact Area: 0.0020 Acres Temporary Impact Area: 0.0 Acres



Legend



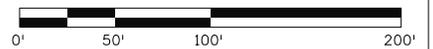
Temporary Wetland Impact



Unimpacted Wetland Area



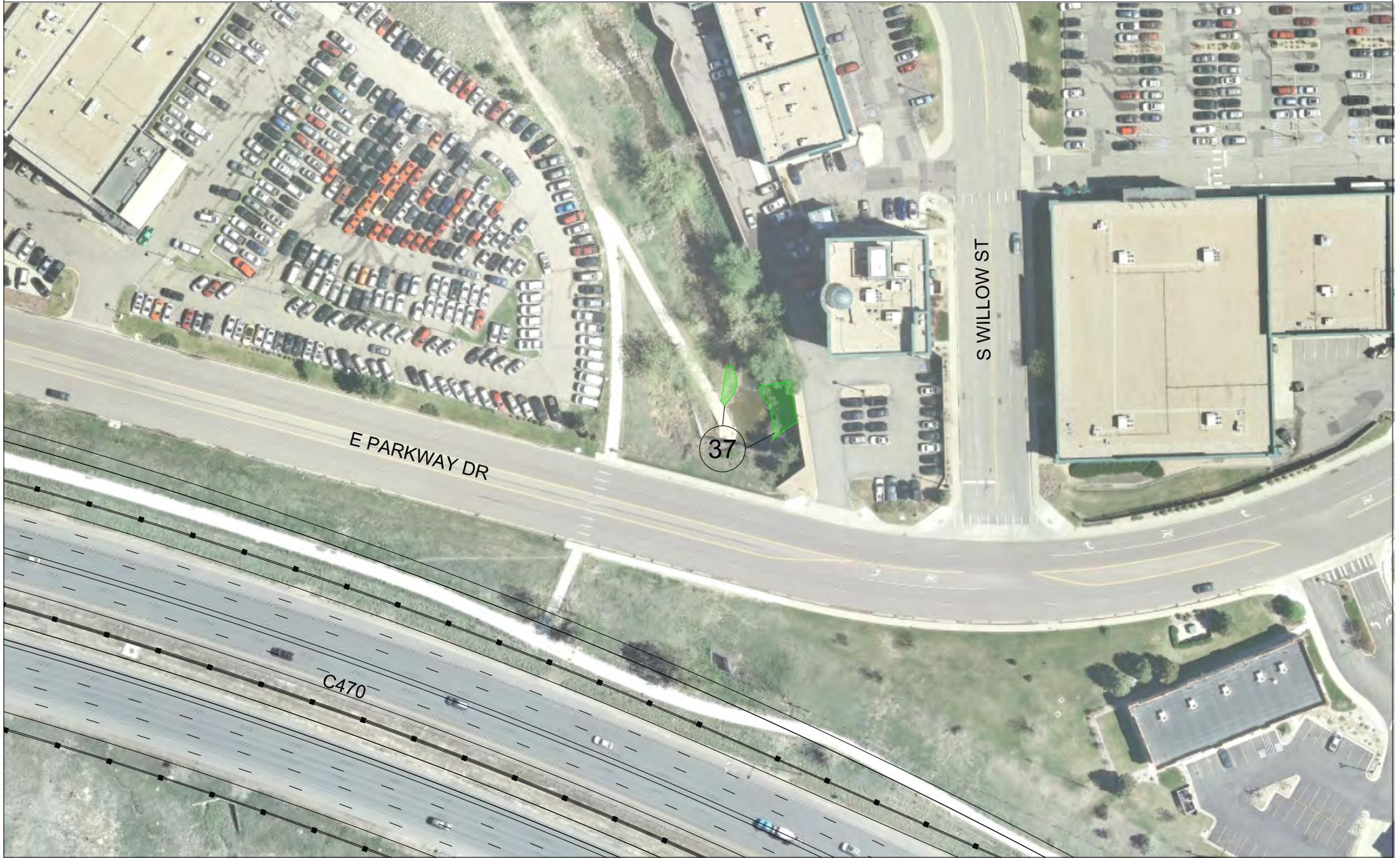
Permanent Wetland Impact



Wetland Exhibit 37

Total Wetland Area: 0.0212 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



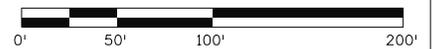
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



Wetland Exhibit 38

Total Wetland Area: 0.0443 Acres
Permanent Impact Area: 0.0 Acres

Temporary Impact Area: 0.0 Acres



Legend



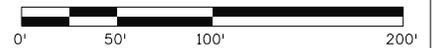
Temporary Wetland Impact



Unimpacted Wetland Area



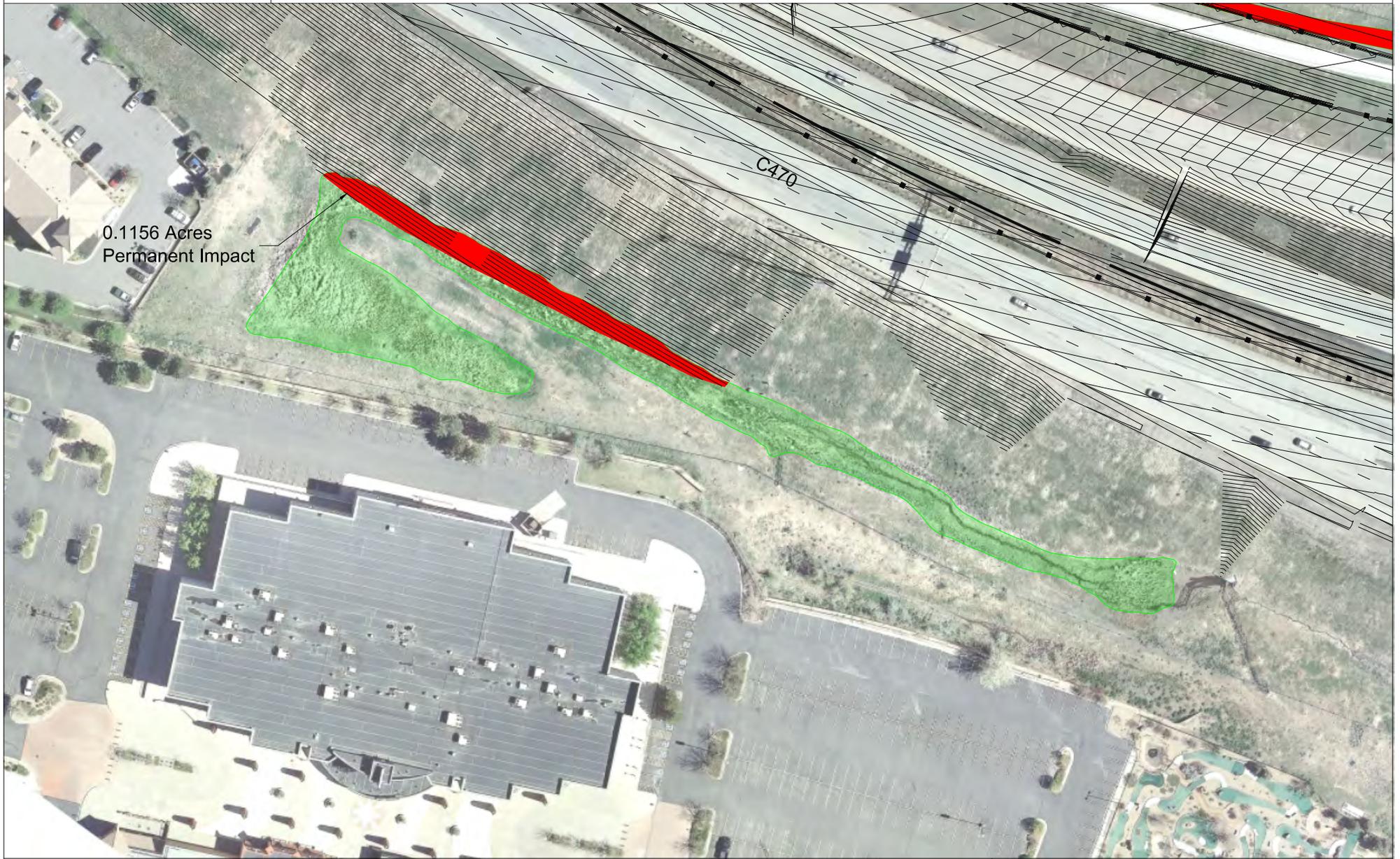
Permanent Wetland Impact



Wetland Exhibit 39

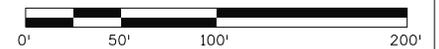
Total Wetland Area: 0.7070 Acres

Permanent Impact Area: 0.1156 Acres Temporary Impact Area: 0.0 Acres



Legend

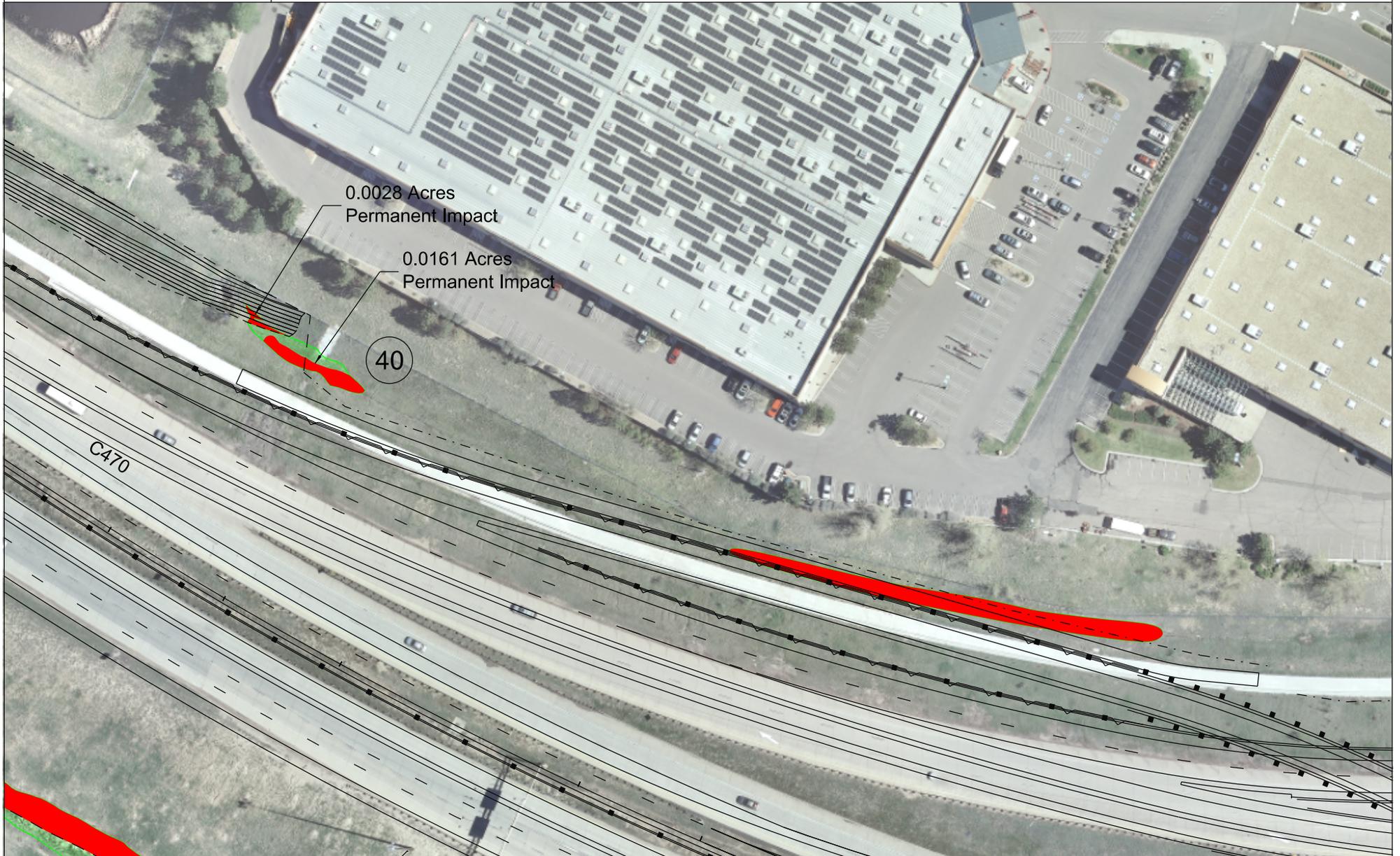
- Temporary Wetland Impact
- Permanent Wetland Impact
- Unimpacted Wetland Area



Wetland Exhibit 40

Total Wetland Area: 0.0316 Acres

Permanent Impact Area: 0.0189 Acres Temporary Impact Area: 0.0 Acres



Legend



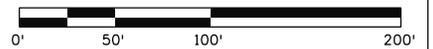
Temporary Wetland Impact



Unimpacted Wetland Area



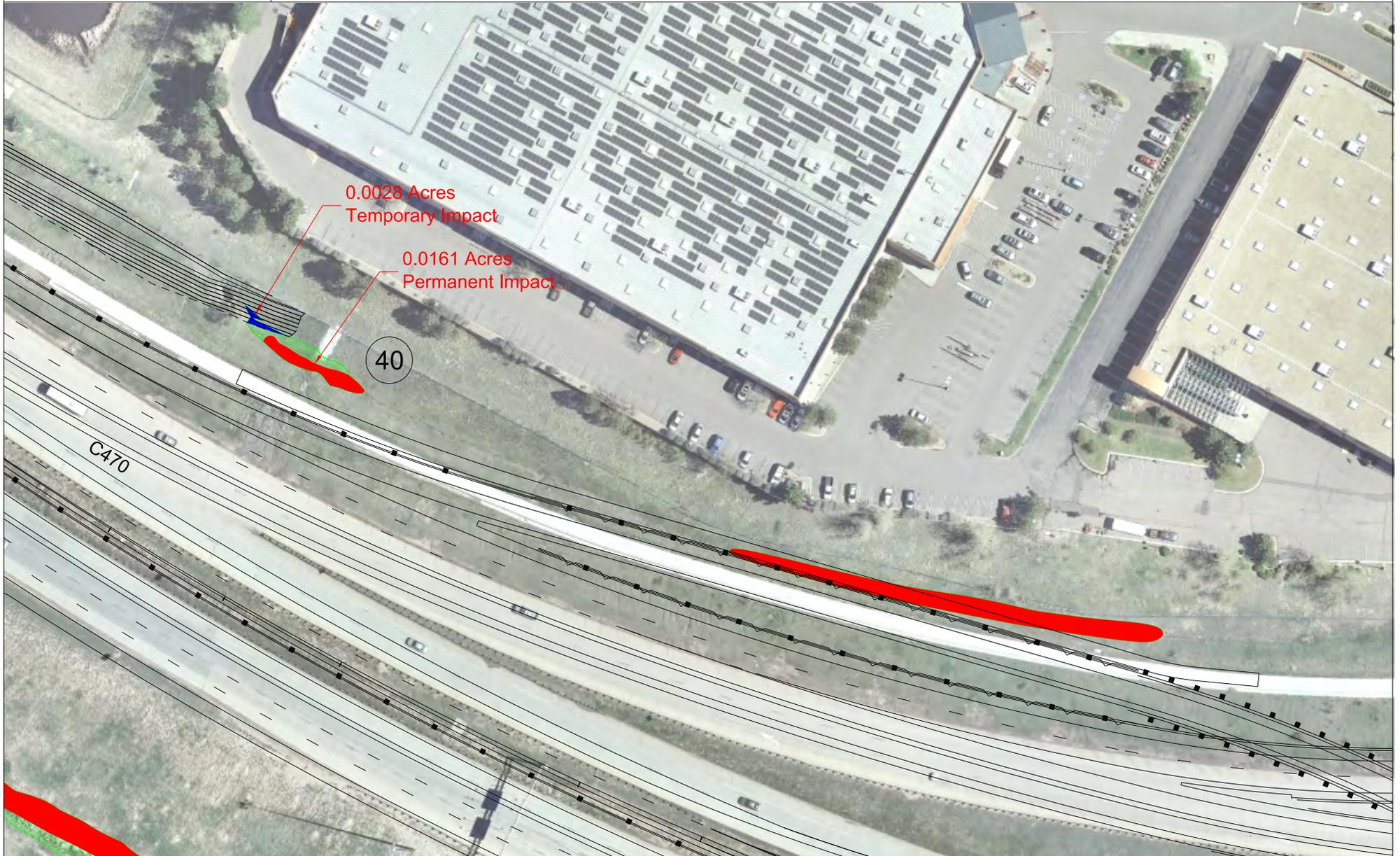
Permanent Wetland Impact



Wetland Exhibit 40

Total Wetland Area: 0.0316 Acres

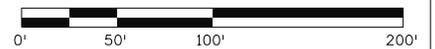
Permanent Impact Area: 0.0161 Acres Temporary Impact Area: 0.0028 Acres



Legend

- Temporary Wetland Impact
- Permanent Wetland Impact

Unimpacted Wetland Area

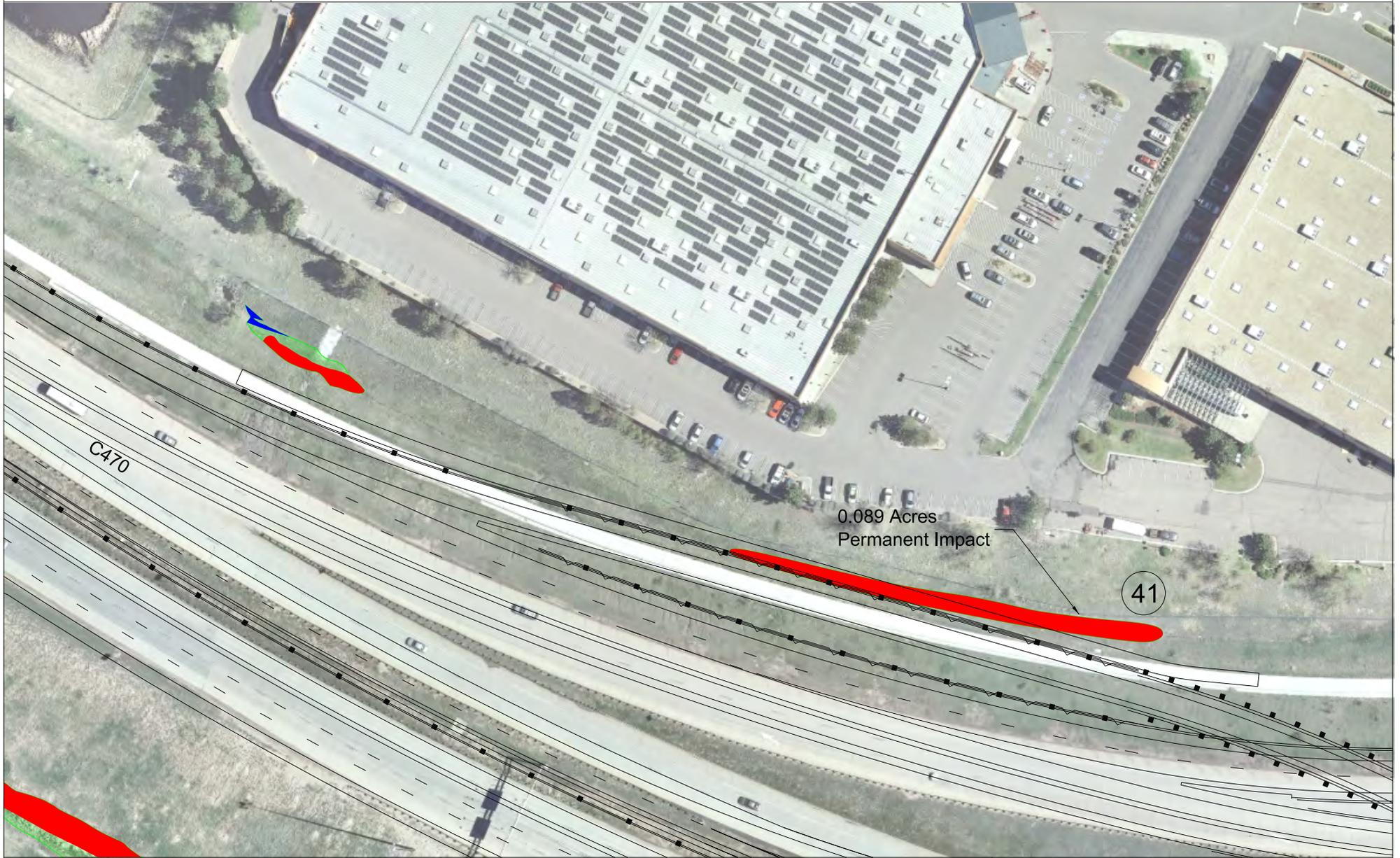


Wetland Exhibit 41

Total Wetland Area: 0.089 Acres

Permanent Impact Area: 0.089 Acres

Temporary Impact Area: 0.0 Acres



Legend



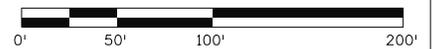
Temporary Wetland Impact



Unimpacted Wetland Area



Permanent Wetland Impact



APPENDIX B
Representative Wetland Photographs



Photographs C-470 EA Revision Wetland Delineation



Photograph 1- Willow Creek overbank wetlands at the eastbound C-470 Bridge.



Photograph 2- Willow Creek wetlands downstream of C-470 Bridge.



Photograph 3- Big Dry Creek wetland and riparian communities.



Photograph 4 – South Platte River Bridge wetland and riparian communities on southeast side of the bridge.



Photograph 5 – Northeast side of South Platte River Bridge. Narrow strip of riparian and wetlands are present along river bank.



Photograph 6 – Northwest side of South Platte River Bridge. Wetlands present along shore and bank of the river.



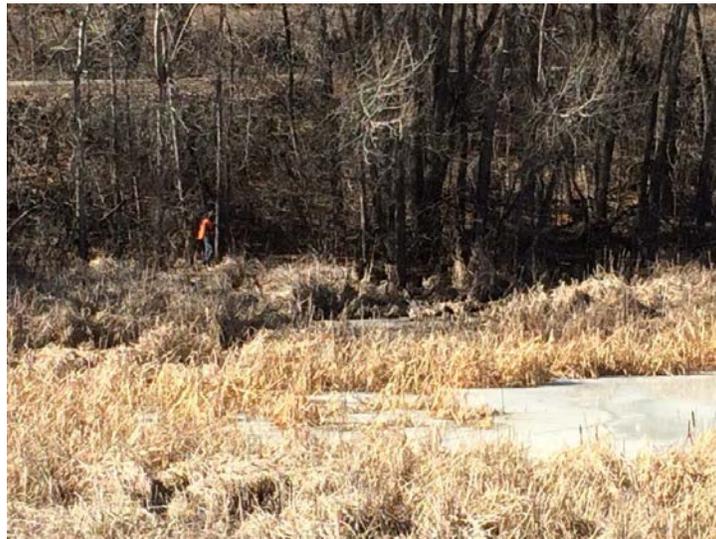
Photograph 7 – Massey Draw wetlands near Kipling Parkway



Photograph 8 – Detention pond wetlands near eastbound interchange to Lucent Boulevard. This wetland is representative of other larger detention pond and roadway created wetlands in the study corridor



Photograph 9 – Detention Pond Site delineated in January 2015



Photograph 10 – Detention Pond Site near Lucent Boulevard. Delineated in January 2015

APPENDIX C FACWet Data Sheet



ADMINISTRATIVE CHARACTERIZATION

General Information		Date of Evaluation: 4/14/15	
Site Name or ID: C-470 Project	Project Name: C-470 Revised EA		
404 or Other Permit Application #:	Applicant Name: Douglas County		
Evaluator Name(s): Robert Belford	Evaluator's professional position and organization: Senior Biologist ENERCON		
Location Information:			
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):	Geographic Datum Used (NAD 83): NAD83	Elevation: 5,400 feet	
Location Information: C-470 South Platte River Bridge			
Associated stream/water body name: South Platte River	Stream Order: 2		
USGS Quadrangle Map: Highlands Ranch	Map Scale: (Circle one) 1:24,000 1:100,000 Other 1:		
Sub basin Name (8 digit HUC): 10190003	Wetland Ownership: Private		
Project Information:			
This evaluation is being performed at: <input checked="" type="checkbox"/> Project Wetland <input type="checkbox"/> Mitigation Site (Check applicable box)		Purpose of Evaluation (check all applicable): <input checked="" type="checkbox"/> Potentially Impacted Wetlands <input type="checkbox"/> Mitigation; Pre-construction <input type="checkbox"/> Mitigation; Post-construction <input type="checkbox"/> Monitoring <input type="checkbox"/> Other (Describe)	
Intent of Project: (Check all applicable) <input type="checkbox"/> Restoration <input type="checkbox"/> Enhancement <input type="checkbox"/> Creation			
Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	.50 ac. <input checked="" type="checkbox"/> Measured <input type="checkbox"/> Estimated	GPS wetland Polygons near C-470 S. Platte River Bridge	
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	.5 miles of S. Platte River <input type="checkbox"/> Measured <input type="checkbox"/> Estimated	ac.	ac.
	<input type="checkbox"/> Measured <input type="checkbox"/> Estimated	ac.	ac.
Characteristics or Method used for AA boundary determination:	The AA includes all of the S. Platte River River bank and adjacent wetlands near the C-470 S. Platte River Bridge.		

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- | | |
|--|--|
| <input type="checkbox"/> Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).

<input type="checkbox"/> Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.

<input type="checkbox"/> Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.

<input type="checkbox"/> The wetland is a habitat oasis in an otherwise dry or urbanized landscape?

<input type="checkbox"/> Federally threatened or endangered species are KNOWN to occur in the AA? List Below.

<hr/> | <input type="checkbox"/> Federally threatened or endangered species are SUSPECTED to occur in the AA?

<hr/>
<input type="checkbox"/> Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?

<input type="checkbox"/> The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?

<input checked="" type="checkbox"/> Other special concerns (please describe) |
|--|--|

Located adjacent to Chaffield R

HYDROGEOMORPHIC SETTING

- AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
If the above is checked, please describe the original wetland type if discernable using the table below.
- AA wetland was created from an upland setting.

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	Water source	<u>Surface flow</u>	Groundwater	Precipitation	Unknown	
	Hydrodynamics	<u>Unidirectional</u>	Vertical	Bi-directional		
	Wetland Gradient	<u>0 - 2%</u>	2-4%	4-10%	>10%	
	# Surface Inlets	<u>over-bank</u>	0	1	2	3
	# Surface Outlets		0	1	2	3
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	The wetlands occur in a riverine setting. South Platte River is a second order stream. The wetlands are present along the banks of the stream and adjacent drainages.				
HGM class	<u>Riverine</u>	Slope	Depressional	Lacustrine		
Historical Conditions						
Previous wetland typology	Water source	Surface flow	Groundwater	Precipitation	Unknown	
	Hydrodynamics	Unidirectional	Vertical			
	Geomorphic Setting (Narrative Description)					
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine	

Notes (include information on the AA's HGM subclass and regional subclass):

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline all existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.
2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

	✓	Stressors	Comments/description
Stressors = artificial barriers		Major Highway	
	✓	Secondary Highway	C-470
		Tertiary Roadway	
		Railroad	
	✓	Bike Path	
		Urban Development	
		Agricultural Development	
		Artificial Water Body	
		Fence	
		Ditch or Aqueduct	
	✓	Aquatic Organism Barriers	Crack dam on S. Platte downstream from C-470 Bridge

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	B Highly Functioning	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	C Functioning	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.7 - 0.6	D Functioning Impaired	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	F Non-functioning	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	0.85
SV 1.2 Score	0.72

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score 0.78

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have $\geq 5m$ of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

0.8 SV 2.1 - Buffer Condition Score

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	<i>Reference Standard</i>	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	<i>Highly Functioning</i>	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispersed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	<i>Functioning</i>	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate disturbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	<i>Functioning Impaired</i>	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	<i>Non-functioning</i>	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

65 Percent of AA with Buffer

.77 SV 2.2 - Buffer Extent

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	<i>Reference Standard</i>	90 - 100% of AA with Buffer
<0.9 - 0.8	<i>Highly Functioning</i>	70-90% of AA with Buffer
<0.8 - 0.7	<i>Functioning</i>	51-69% of AA with Buffer
<0.7 - 0.6	<i>Functioning Impaired</i>	26-50% of AA with Buffer
<0.6	<i>Non-functioning</i>	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

Buffer Width (m)	15	18	21	12	15	22	32	30	20
Line #	1	2	3	4	5	6	7	8	Avg. Buffer Width (m)

.70 SV 2.3 - Average Buffer Width Score

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	Reference Standard	Average Buffer width is 190-250m
<0.9 - 0.8	Highly Functioning	Average Buffer width is 101-189m
<0.8 - 0.7	Functioning	Average Buffer width is 31-100m
<0.7 - 0.6	Functioning Impaired	Average Buffer width is 6-30m
<0.6	Non-functioning	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

.88 SV 2.4 - Surrounding Land Use Score

Catalog and characterize land use changes in the surrounding landscape and score.

Stressors = Land Use Changes	Stressors	Comments/description	
	<input checked="" type="checkbox"/>	Industrial/commercial	
	<input type="checkbox"/>	Urban	
	<input type="checkbox"/>	Residential	
	<input type="checkbox"/>	Rural	
	<input type="checkbox"/>	Dryland Farming	
	<input type="checkbox"/>	Intensive Agriculture	
	<input type="checkbox"/>	Orchards or Nurseries	
	<input type="checkbox"/>	Livestock Grazing	
	<input checked="" type="checkbox"/>	Transportation Corridor	
	<input checked="" type="checkbox"/>	Urban Parklands	
	<input type="checkbox"/>	Dams/impoundments	
	<input type="checkbox"/>	Artificial Water body	
	<input type="checkbox"/>	Physical Resource Extraction	
<input type="checkbox"/>	Biological Resource Extraction		

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	B Highly Functioning	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	C Functioning	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	D Functioning Impaired	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	F Non-functioning	The Surrounding Landscape is essentially completely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score (Lowest score) **.70** + Surrounding Land Use **.88**) ÷ 2 = Variable 2 Score **.79**

Variable 3: Water Source

This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✓	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
✓	Dams	Check dam and Chattfield R. Dam
	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
	Point Source (urban, ind., ag.)	
	Non-point Source	
	Increased Drainage Area	
	Storm Drain/Urban Runoff	
✓	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	A Reference Standard	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	B Highly Functioning	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	C Functioning	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	D Functioning Impaired	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or
<0.6	F Non-functioning	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score

0.78

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity *within* the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, in most cases the Water Source variable score will define the upper limit Water Distribution score. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

✓	Stressors	Comments/description
✓	Alteration of Water Source	Chattfield Reservoir Dam constricts water flows
	Ditches	
	Ponding/Impoundment	
	Culverts	
✓	Road Grades	C-470
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Enlarged Channel	
✓	Artificial Banks/Shoreline	Kip-kap at C-470 S. Platte R. Bridge
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	A Reference Standard	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	B Highly Functioning	Less than 10% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	C Functioning	Between 10 and 33% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	D Functioning Impaired	33 to 66% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	F Non-functioning	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score 0.79

Variable 5: Water Outflow

This variable is concerned with **down-gradient** hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability to support down-gradient habitats in a manner consistent with their HGM (regional) subclass.

Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, **in most cases the Water Source variable score will define the upper limit Water Outflow score.**

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

✓	Stressors	Comments/description
✓	Alteration of Water Source	Chatfield Reservoir Dam
	Ditches	
	Dikes/Levees	
✓	Road Grades	C-470
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Artificial Stream Banks	
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	B Highly Functioning	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	C Functioning	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	D Functioning Impaired	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	F Non-functioning	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score

0.80

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e., small in size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, **do not** include these resultant effects of geomorphic change; rather focus on the physical impacts **within the footprint** of the alteration **within the AA** – For example, the width and depth of a ditch or the size of a levee **within the AA** would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof shear, and sedimentation which can be significant but not immediately obvious.

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓	Stressors	Comments
✓	Dredging/Excavation/Mining	
✓	Fill, including dikes, road grades, etc	C-470 S. Platte R. Bridge
	Grading	
	Compaction	
	Plowing/Disking	
	Excessive Sedimentation	
	Dumping	
	Hoof Shear/Pugging	
	Aggregate or Mineral Mining	
	Sand Accumulation	
	Channel Instability/Over Widening	
	Excessive Bank Erosion	
	Channelization	
	Reconfigured Stream Channels	
✓	Artificial Banks/Shoreline	Rip-rap at C-470 S. Platte River Bridge
	Beaver Dam Removal	
	Substrate Embeddedness	
	Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	B Highly Functioning	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	C Functioning	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	D Functioning Impaired	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	F Non-functioning	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

**Variable 6
Score**

0.80

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
-If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✓	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			0.72
	Agricultural Runoff			
	Septic/Sewage	✓		
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List	✓		
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion			0.75
	Excessive Deposition	✓		
	Fine Sediment Plumes	✓		
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			0.75
	Nearby Industrial Sites			
	Road Drainage/Runoff	✓		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✓		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List	✓		
	Metal staining on rocks and veg.			
SV 7.4 Temperature	Excessive Temperature Regime			0.80
	Lack of Shading			
	Reservoir/Power Plant Discharge	✓	Below Churchill Dam	
	Industrial Discharge			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.5 Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation			0.80
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stress indicators not present or trivial.
<0.9 - 0.8	B Highly Functioning	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	C Functioning	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	D Functioning Impaired	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	F Non-functioning	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)		Sedimentation/ Turbidity		Toxic contamination/ pH		Temperature		Soil chemistry/ Redox potential		Sum of Sub-variable Scores
.72	+	.75	+	.75	+	.80	+	.80	=	3.82

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules	
		Single Factor	Composite Score
1.0 - 0.9	A Reference Standard	No single factor scores < 0.9	The factor scores sum > 4.5
<0.9 - 0.8	B Highly Functioning	Any single factor scores ≥ 0.8 but < 0.9	The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	C Functioning	Any single factor scores ≥ 7.0 but < 0.8	The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	D Functioning Impaired	Any single factor scores ≥ 0.6 but <0.7	The factor scores sum >3.0 but ≤3.5
< 0.6	F Non-functioning	Any single factor scores < 0.6	The factor scores sum < 3.0

Variable 7 Score

.75

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

- Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
- Do not score vegetation layers that would not normally be present in the wetland type being assessed.
- Estimate and record the current coverage of each vegetation layer at the top of the table.
- Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
- Enter the percent cover values as decimals in the row of the stressor table labeled "Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
- Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
- Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
- Multiply each layer's *Reference Percent Cover of Layer* score by its Veg. Layer Sub-variable scores and enter the products in the labeled cells. These are the weighted sub-variable scores. Individually sum the *Reference Percent Cover of Layer* and *Weighted Sub-variables scores*.
- Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

Current % Coverage of Layer	Vegetation Layers				Comments
	1%	60%	35%		
Stressor	Tree	Shrub	Herb	Aquatic	
Noxious Weeds		✓	✓		
Exotic/Invasive spp.					
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering		✓	✓		
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer	0.01%	+ .60%	+ .35%	+ []	= .96%
	x	x	x	x	
Veg. Layer Sub-variable Score	.72	.80	.80	[]	
Weighted Sub-variable Score	.007	+ .48	+ .28	+ []	= 0.77

See sub-variable scoring guidelines on following page

Variable 8 Score

0.80

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	0.78
	Variable 2:	Contributing Area (CA)	0.79
Hydrology	Variable 3:	Water Source (Source)	0.78
	Variable 4:	Water Distribution (Dist)	0.79
	Variable 5:	Water Outflow (Outflow)	0.80
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	0.80
	Variable 7:	Chemical Environment (Chem)	0.75
	Variable 8:	Vegetation Structure and Complexity (Veg)	0.80

Functional Capacity Indices

Function 1 -- Support of Characteristic Wildlife Habitat

$$V1_{connect} + V2_{CA} + (2 \times V8_{veg}) = 0.78 + 0.79 + 1.6 = 3.17 \div 4 = 0.79$$

Function 2 -- Support of Characteristic Fish/aquatic Habitat

$$(3 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem} = 2.34 + 1.58 + 1.6 + .80 + .75 = 7.07 \div 9 = 0.78$$

Function 3 -- Flood Attenuation

$$V2_{CA} + (2 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V8_{veg} = 0.79 + 1.56 + 1.58 + 1.6 + .80 + .80 = 7.13 \div 9 = 0.79$$

Function 4 -- Short- and Long-term Water Storage

$$V3_{source} + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} = 0.78 + 1.58 + 1.6 + .80 = 4.76 \div 6 = 0.79$$

Function 5 -- Nutrient/Toxicant Removal

$$(2 \times V2_{CA}) + (2 \times V4_{dist}) + V6_{geom} + V7_{chem} = 1.58 + 1.58 + .80 + .75 = 4.71 \div 6 = 0.78$$

Function 6 -- Sediment Retention/Shoreline Stabilization

$$V2_{CA} + (2 \times V6_{geom}) + (2 \times V8_{veg}) = 0.79 + 1.6 + 1.6 = 3.99 \div 5 = 0.79$$

Function 7 -- Production Export/Food Chain Support

$$V1_{connect} + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem} + (2 \times V8_{veg}) = 0.78 + 1.6 + .80 + .75 + 1.6 = 5.53 \div 7 = 0.79$$

Sum of Individual FCI Scores **5.51**

Divide by the Number of Functions Scored $\div 7$

Composite FCI Score 0.78

ADMINISTRATIVE CHARACTERIZATION

General Information		Date of Evaluation: 4/14/15
Site Name or ID: C-470 Project	Project Name: C-470 Revised EA	
404 or Other Permit Application #:	Applicant Name: Douglas County	
Evaluator Name(s): Robert Belford	Evaluator's professional position and organization: Senior Biologist ENERCON	

Location Information:			
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):		Geographic Datum Used (NAD 83):	NAD83
		Elevation	5,300 feet
Location Information:	C-470 Big Dry Creek Bridge Crossing		
Associated stream/water body name:	Big Dry Creek	Stream Order:	1
USGS Quadrangle Map:	Littleton	Map Scale: (Circle one)	1:24,000 1:100,000 Other 1:
Sub basin Name (8 digit HUC):	10190003	Wetland Ownership:	Private

Project Information:		Purpose of Evaluation (check all applicable): <input checked="" type="checkbox"/> Potentially Impacted Wetlands <input type="checkbox"/> Mitigation; Pre-construction <input type="checkbox"/> Mitigation; Post-construction <input type="checkbox"/> Monitoring <input type="checkbox"/> Other (Describe)
This evaluation is being performed at: (Check applicable box)	<input checked="" type="checkbox"/> Project Wetland <input type="checkbox"/> Mitigation Site	

Intent of Project: (Check all applicable) Restoration Enhancement Creation

Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	0.37 ac.	<input checked="" type="checkbox"/> Measured GPS				
		<input type="checkbox"/> Estimated				
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	0.50 ac.	<input type="checkbox"/> Measured	ac.	ac.	ac.	ac.
		<input checked="" type="checkbox"/> Estimated	ac.	ac.	ac.	ac.

Characteristics or Method used for AA boundary determination: **Expanded the wetland area in the AA to cover wetland area on the downstream side of the Big Dry Creek C-470 Bridge wetland area.**

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- | | |
|--|--|
| <input type="checkbox"/> Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).

<input type="checkbox"/> Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.

<input type="checkbox"/> Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.

<input type="checkbox"/> The wetland is a habitat oasis in an otherwise dry or urbanized landscape?

<input type="checkbox"/> Federally threatened or endangered species are KNOWN to occur in the AA? List Below.

<hr/> | <input type="checkbox"/> Federally threatened or endangered species are SUSPECTED to occur in the AA?

<hr/>
<hr/> <input type="checkbox"/> Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?

<input type="checkbox"/> The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?

<input type="checkbox"/> Other special concerns (please describe)

<hr/> |
|--|--|

HYDROGEOMORPHIC SETTING

- AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
If the above is checked, please describe the original wetland type if discernable using the table below.
- AA wetland was created from an upland setting.

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	Water source	<u>Surface flow</u>	Groundwater	Precipitation	Unknown	
	Hydrodynamics	<u>Unidirectional</u>	Vertical	Bi-directional		
	Wetland Gradient	<u>0 - 2%</u>	2-4%	4-10%	>10%	
	# Surface Inlets	<u>Over-bank</u>	0	1	2	3 >3
	# Surface Outlets		0	1	2	3 >3
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	The wetlands occur in a riverine setting. Big Dry Creek is a first order stream. Wetlands are present along banks of stream.				
HGM class	<u>Riverine</u>	Slope	Depressional	Lacustrine		

Historical Conditions

Previous wetland typology	Water source	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Notes (include information on the AA's HGM subclass and regional subclass):

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

US FWS habitat classification according as reported in Cowardin et al. (1979).

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Riverine	Palustrine	EM/SS	Cobble - Gravel	E	—	—
Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	Examples Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Semi-Perm. flooded(F); Intermittently exposed(G); Artificially flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permanent(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Scale: 1 sq. =

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features.

See figure 33 in wetland finding Appendix A

Variable 1: Habitat Connectivity

The Habitat Connectivity Variable is described by two sub-variables – Neighboring Wetland and Riparian Habitat Loss and Barriers to Migration and Dispersal. These sub-variables were treated as independent variables in FACWet Version 2.0. The merging of these variables makes their structure more consistent with that of other composite variables in FACWet. The new variable configuration also makes this landscape variable more accurately reflect the interactions amongst aquatic habitats in Colorado's agricultural and urbanized landscapes, which have a naturally low density of wetlands. The two Habitat Connectivity Sub-variables are scored in exactly the same manner as their FACWet 2.0 counterparts, as described below. The Habitat Connectivity Variable score is simply the arithmetic average of the two sub-variable scores which is entered on the second page of the Variable 1 data form. If there is little or no wetland or riparian habitat in the Habitat Connectivity Envelope (defined below), then Sub-variable 1.1 is not scored.

SV 1.1 - Neighboring Wetland and Riparian Habitat Loss (Do not score if few or no wetlands naturally exist in the HCE)

This sub-variable is a measure of how isolated from other naturally-occurring wetlands or riparian habitat the AA has become as the result of habitat destruction. To score this sub-variable, estimate the percent of naturally-occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within the 500-meter-wide belt surrounding the AA. This zone is called the Habitat Connectivity Envelope (HCE). In most cases the evaluator must use best professional judgment to estimate the amount of natural wetland loss. Historical photographs, National Wetland Inventory (NWI) maps, hydric soil maps can be helpful in making these determinations. Floodplain maps are especially valuable in river-dominated regions, such as the Front Range urban corridor. Evaluation of landforms and habitat patterns in the context of perceivable land use change is used to steer estimates of the amount of wetland loss within the HCE.

Rules for Scoring:

1. On the aerial photo, create a 500 m perimeter around the AA.
2. The area within this perimeter is the **Habitat Connectivity Envelope (HCE)**.
3. Within the HCE, outline the current extent of naturally occurring wetland and riparian habitat. Do not include habitats such as excavated ponds or reservoir induced fringe wetlands.
4. Outline the historical extent of wetland and riparian habitats (i.e., existing natural wetlands plus those that have been destroyed).
 - Use your knowledge of the history of the area and evident land use change to identify where habitat losses have occurred. Additional research can be utilized to increase the accuracy of this estimate including consideration of floodplain maps, historical aerial photographs, soil maps, etc.
5. Calculate the area of existing and historical wetlands. Divide the area of existing wetland by the total amount of existing and historical wetland and riparian habitat, and determine the variable score using the guidelines below. Enter sub-variable score at the bottom of p.2 of the Habitat Connectivity data form.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats
<0.9 - 0.8	B Highly Functioning	More than 80% of historical wetland habitat area within the HCE is still present (less than 20% of habitat area lost).
<0.8 - 0.7	C Functioning	80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% of habitat area lost).
<0.7 - 0.6	D Functioning Impaired	Less than 60 to 25% of historical wetland habitat area within the HCE is still present (more than 40 to 75% of habitat area lost).
<0.6	F Non-functioning	Less than 25% of the historical wetland habitat area within the HCE still in existence (more than 70% of habitat lost).

Notes:

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline all existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.
2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers	✓	Stressors	Comments/description
		Major Highway	
	✓	Secondary Highway	C-470
		Tertiary Roadway	
		Railroad	
		Bike Path	
	✓	Urban Development	
		Agricultural Development	
		Artificial Water Body	
		Fence	
		Ditch or Aqueduct	
	✓	Aquatic Organism Barriers	Check dam on upstream side of bridge

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	B Highly Functioning	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	C Functioning	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of surrounding wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.7 - 0.6	D Functioning Impaired	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	F Non-functioning	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	0.72
SV 1.2 Score	0.70

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score

0.71

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have $\geq 5m$ of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

75 SV 2.1 - Buffer Condition Score

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	Reference Standard	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	Highly Functioning	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispersed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	Functioning	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate disturbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	Functioning Impaired	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	Non-functioning	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

70 Percent of AA with Buffer

80 SV 2.2 - Buffer Extent

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	Reference Standard	90 - 100% of AA with Buffer
<0.9 - 0.8	Highly Functioning	70-90% of AA with Buffer
<0.8 - 0.7	Functioning	51-69% of AA with Buffer
<0.7 - 0.6	Functioning Impaired	26-50% of AA with Buffer
<0.6	Non-functioning	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

Buffer Width (m)	18	19	21	11	9	15	20	22	17	Avg. Buffer Width (m)
Line #	1	2	3	4	5	6	7	8		

SV 2.3 - Average Buffer Width Score

0.68

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	Reference Standard	Average Buffer width is 190-250m
<0.9 - 0.8	Highly Functioning	Average Buffer width is 101-189m
<0.8 - 0.7	Functioning	Average Buffer width is 31-100m
<0.7 - 0.6	Functioning Impaired	Average Buffer width is 6-30m
<0.6	Non-functioning	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

SV 2.4 - Surrounding Land Use Score

Catalog and characterize land use changes in the surrounding landscape and score.

0.72

Stressors = Land Use Changes	Stressors	Comments/description	
	<input type="checkbox"/>	Industrial/commercial	
	<input checked="" type="checkbox"/>	Urban	
	<input checked="" type="checkbox"/>	Residential	
	<input type="checkbox"/>	Rural	
	<input type="checkbox"/>	Dryland Farming	
	<input type="checkbox"/>	Intensive Agriculture	
	<input type="checkbox"/>	Orchards or Nurseries	
	<input type="checkbox"/>	Livestock Grazing	
	<input checked="" type="checkbox"/>	Transportation Corridor	
	<input type="checkbox"/>	Urban Parklands	
	<input checked="" type="checkbox"/>	Dams/impoundments	Check dam on upstream side of bridge
	<input type="checkbox"/>	Artificial Water body	
	<input type="checkbox"/>	Physical Resource Extraction	
	<input type="checkbox"/>	Biological Resource Extraction	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	B Highly Functioning	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	C Functioning	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	D Functioning Impaired	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	F Non-functioning	The Surrounding Landscape is essentially completely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score
(Lowest score)

Surrounding
Land Use

$$(0.68 + 0.72) \div 2 = \text{Variable 2 Score } 0.70$$

Variable 3: Water Source

This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✓	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
✓	Dams	Check dam
	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
	Point Source (urban, ind., ag.)	
	Non-point Source	
✓	Increased Drainage Area	Commercial and residential
	Storm Drain/Urban Runoff	
✓	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	A Reference Standard	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	B Highly Functioning	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	C Functioning	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	D Functioning Impaired	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or
<0.6	F Non-functioning	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score

0.77

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity **within** the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, **in most cases the Water Source variable score will define the upper limit Water Distribution score**. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

✓	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Ponding/Impoundment	
	Culverts	
✓	Road Grades	Bridge
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Enlarged Channel	
✓	Artificial Banks/Shoreline	At bridge piers and check dam
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	A Reference Standard	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	B Highly Functioning	Less than 10% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	C Functioning	Between 10 and 33% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	D Functioning Impaired	33 to 66% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	F Non-functioning	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score 0.76

Variable 5: Water Outflow

This variable is concerned with **down-gradient hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA**. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability to support down-gradient habitats in a manner consistent with their HGM (regional) subclass.

Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, **in most cases the Water Source variable score will define the upper limit Water Outflow score.**

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

<input checked="" type="checkbox"/>	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Dikes/Levees	
<input checked="" type="checkbox"/>	Road Grades	C-470
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
<input checked="" type="checkbox"/>	Artificial Stream Banks	At check dam - concrete anchor into banks
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	B Highly Functioning	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	C Functioning	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	D Functioning Impaired	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	F Non-functioning	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score

.75

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e., small is size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, **do not** include these resultant effects of geomorphic change; rather focus on the physical impacts within the footprint of the alteration within the AA – For example, the width and depth of a ditch or the size of a levee within the AA would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof shear, and sedimentation which can be significant but not immediately obvious.

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓	Stressors	Comments
✓	Dredging/Excavation/Mining	
✓	Fill, including dikes, road grades, etc	Bridge at C-470
✓	Grading	C-470
	Compaction	
	Plowing/Disking	
	Excessive Sedimentation	
	Dumping	
	Hoof Shear/Pugging	
	Aggregate or Mineral Mining	
	Sand Accumulation	
	Channel Instability/Over Widening	
	Excessive Bank Erosion	
	Channelization	
	Reconfigured Stream Channels	
✓	Artificial Banks/Shoreline	At check dam
	Beaver Dam Removal	
	Substrate Embeddedness	
	Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	B Highly Functioning	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	C Functioning	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	D Functioning Impaired	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	F Non-functioning	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

Variable 6
Score

0.77

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
-If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✓	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			0.72
	Agricultural Runoff			
	Septic/Sewage	✓	Golf Course on SW side of bridge	
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List	✓		
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion	✓	Incised channel	0.75
	Excessive Deposition	✓	From Urban runoff	
	Fine Sediment Plumes			
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			0.75
	Nearby Industrial Sites			
	Road Drainage/Runoff	✓		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✓		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List	✓		
	Metal staining on rocks and veg.			
SV 7.4 Temperature	Excessive Temperature Regime			0.80
	Lack of Shading			
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
SV 7.5 Soil chemistry/ Redox potential	CDPHE Impairment/TMDL List			0.80
	Unnatural Saturation/Desaturation			
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stress indicators not present or trivial.
<0.9 - 0.8	B Highly Functioning	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	C Functioning	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	D Functioning Impaired	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	F Non-functioning	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)	+	Sedimentation/ Turbidity	+	Toxic contamination/ pH	+	Temperature	+	Soil chemistry/ Redox potential	=	Sum of Sub-variable Scores
.72		.75		.75		.80		.80		3.82

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules	
		Single Factor	Composite Score
1.0 - 0.9	A Reference Standard	No single factor scores < 0.9	The factor scores sum > 4.5
<0.9 - 0.8	B Highly Functioning	Any single factor scores ≥ 0.8 but < 0.9	The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	C Functioning	Any single factor scores ≥ 7.0 but < 0.8	The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	D Functioning Impaired	Any single factor scores ≥ 0.6 but <0.7	The factor scores sum >3.0 but ≤3.5
< 0.6	F Non-functioning	Any single factor scores < 0.6	The factor scores sum < 3.0

Variable 7 Score

.75

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

- Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
- Do not score vegetation layers that would not normally be present in the wetland type being assessed.
- Estimate and record the current coverage of each vegetation layer at the top of the table.
- Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
- Enter the percent cover values as decimals in the row of the stressor table labeled "Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
- Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
- Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
- Multiply each layer's Reference Percent Cover of Layer score by its Veg. Layer Sub-variable scores and enter the products in the labeled cells. These are the weighted sub-variable scores. Individually sum the Reference Percent Cover of Layer and Weighted Sub-variables scores.
- Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

Current % Coverage of Layer	Vegetation Layers				Comments
	Tree	Shrub	Herb	Aquatic	
Stressor					
Noxious Weeds	✓	✓			
Exotic/Invasive spp.					
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer	.3	+	.55	+	.30	+		=	.88
Veg. Layer Sub-variable Score	.60	x	.80	x	.80	x		÷	
Weighted Sub-variable Score	0.02	+	0.44	+	0.24	+		=	.70

See sub-variable scoring guidelines on following page

Variable 8 Score

.79

Variable 8: Vegetation Structure and Complexity p. 2

Sub-variable 8 Scoring Guidelines:

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A <i>Reference Standard</i>	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	B <i>Highly Functioning</i>	Stressors present at intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as high as 33% for a given attribute if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	C <i>Functioning</i>	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structural complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% for a given attribute if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	D <i>Functioning Impaired</i>	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% of a given attribute if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	F <i>Non-functioning</i>	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	.71
	Variable 2:	Contributing Area (CA)	.70
Hydrology	Variable 3:	Water Source (Source)	.77
	Variable 4:	Water Distribution (Dist)	.76
	Variable 5:	Water Outflow (Outflow)	.75
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	.77
	Variable 7:	Chemical Environment (Chem)	.75
	Variable 8:	Vegetation Structure and Complexity (Veg)	.79

Functional Capacity Indices

Function 1 -- Support of Characteristic Wildlife Habitat

$$V1_{connect} + V2_{CA} + (2 \times V8_{veg}) + \text{[Crossed]} + \text{[Crossed]} + \text{[Crossed]} = 2.99 \div 4 = .74$$

Function 2 -- Support of Characteristic Fish/aquatic Habitat

$$(3 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem} + \text{[Crossed]} = 6.85 \div 9 = .76$$

Function 3 -- Flood Attenuation

$$V2_{CA} + (2 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V8_{veg} = 6.82 \div 9 = .75$$

Function 4 -- Short- and Long-term Water Storage

$$V3_{source} + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + \text{[Crossed]} + \text{[Crossed]} = 4.56 \div 6 = .76$$

Function 5 -- Nutrient/Toxicant Removal

$$(2 \times V2_{CA}) + (2 \times V4_{dist}) + V6_{geom} + V7_{chem} + \text{[Crossed]} + \text{[Crossed]} = 4.44 \div 6 = .74$$

Function 6 -- Sediment Retention/Shoreline Stabilization

$$V2_{CA} + (2 \times V6_{geom}) + (2 \times V8_{veg}) + \text{[Crossed]} + \text{[Crossed]} + \text{[Crossed]} = 3.82 \div 5 = .76$$

Function 7 -- Production Export/Food Chain Support

$$V1_{connect} + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem} + (2 \times V8_{veg}) + \text{[Crossed]} = 5.31 \div 7 = .75$$

Sum of Individual FCI Scores **5.26**

Divide by the Number of Functions Scored $\div 7$

Composite FCI Score .75

ADMINISTRATIVE CHARACTERIZATION

General Information		Date of Evaluation: 4/14/15	
Site Name or ID: C-470 Project	Project Name: C-470 Revised EA		
404 or Other Permit Application #:	Applicant Name: Douglas County		
Evaluator Name(s): Robert Belford	Evaluator's professional position and organization: Senior Biologist ENERCON		
Location Information:			
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):	Geographic Datum Used (NAD 83): NAD 83	Elevation: ~ 300 feet	
Location Information: C-470 Willow Creek Bridge Crossing			
Associated stream/water body name: Willow Creek	Stream Order: 1		
USGS Quadrangle Map: Parker	Map Scale: (Circle one) 1:24,000 1:100,000 Other 1:		
Sub basin Name (8 digit HUC): 10190003	Wetland Ownership: Private		
Project Information:			
This evaluation is being performed at: (Check applicable box) <input checked="" type="checkbox"/> Project Wetland <input type="checkbox"/> Mitigation Site		Purpose of Evaluation (check all applicable): <input checked="" type="checkbox"/> Potentially Impacted Wetlands <input type="checkbox"/> Mitigation; Pre-construction <input type="checkbox"/> Mitigation; Post-construction <input type="checkbox"/> Monitoring <input type="checkbox"/> Other (Describe)	
Intent of Project: (Check all applicable) <input type="checkbox"/> Restoration <input type="checkbox"/> Enhancement <input type="checkbox"/> Creation			
Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	0.17 ac.	<input checked="" type="checkbox"/> Measured <input type="checkbox"/> Estimated	GPS
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	.50 ac.	Measured	ac. ac. ac. ac.
		<input checked="" type="checkbox"/> Estimated	ac. ac. ac. ac.
Characteristics or Method used for AA boundary determination:	AA includes riparian habitat connected to 0.17 ac delineated wetland on the upstream side of the C-470 Willow Creek Bridge.		

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- | | |
|--|--|
| <input type="checkbox"/> Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).

<input type="checkbox"/> Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.

<input type="checkbox"/> Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.

<input type="checkbox"/> The wetland is a habitat oasis in an otherwise dry or urbanized landscape?

<input type="checkbox"/> Federally threatened or endangered species are KNOWN to occur in the AA? List Below.

<hr/> | <input type="checkbox"/> Federally threatened or endangered species are SUSPECTED to occur in the AA?

<hr/>
<hr/>
<input type="checkbox"/> Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?

<input type="checkbox"/> The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?

<input type="checkbox"/> Other special concerns (please describe) |
|--|--|

HYDROGEOMORPHIC SETTING

- AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
If the above is checked, please describe the original wetland type if discernable using the table below.
- AA wetland was created from an upland setting.

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	Water source	<u>Surface flow</u>	Groundwater	Precipitation	Unknown	
	Hydrodynamics	<u>Unidirectional</u>	Vertical	Bi-directional		
	Wetland Gradient	<u>0-2%</u>	2-4%	4-10%	>10%	
	# Surface Inlets	<u>Over-bank</u>	0	1	2	3
	# Surface Outlets		0	1	2	3
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	The wetland occurs in a riverine setting. Willow Creek is a first order stream. Wetlands are present along banks of stream.				
HGM class	<u>Riverine</u>	Slope	Depressional	Lacustrine		

Historical Conditions

Previous wetland typology	Water source	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Notes (include information on the AA's HGM subclass and regional subclass):

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

US FWS habitat classification according as reported in Cowardin et al. (1979).

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Riverine	Palustrine	EM/SS	Cobble-Gravel	E	—	—
Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	Examples Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Semi-Perm. flooded(F); Intermittently exposed(G); Artificially flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permanent(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features.

Scale: 1 sq. =

See figures 36, 37, and 38 in Appendix A

Variable 1: Habitat Connectivity

The Habitat Connectivity Variable is described by two sub-variables – Neighboring Wetland and Riparian Habitat Loss and Barriers to Migration and Dispersal. These sub-variables were treated as independent variables in FACWet Version 2.0. The merging of these variables makes their structure more consistent with that of other composite variables in FACWet. The new variable configuration also makes this landscape variable more accurately reflect the interactions amongst aquatic habitats in Colorado's agricultural and urbanized landscapes, which have a naturally low density of wetlands. The two Habitat Connectivity Sub-variables are scored in exactly the same manner as their FACWet 2.0 counterparts, as described below. The Habitat Connectivity Variable score is simply the arithmetic average of the two sub-variable scores which is entered on the second page of the Variable 1 data form. If there is little or no wetland or riparian habitat in the Habitat Connectivity Envelope (defined below), then Sub-variable 1.1 is not scored.

SV 1.1 - Neighboring Wetland and Riparian Habitat Loss

(Do not score if few or no wetlands naturally exist in the HCE)

This sub-variable is a measure of how isolated from other naturally-occurring wetlands or riparian habitat the AA has become as the result of habitat destruction. To score this sub-variable, estimate the percent of naturally-occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within the 500-meter-wide belt surrounding the AA. This zone is called the Habitat Connectivity Envelope (HCE). In most cases the evaluator must use best professional judgment to estimate the amount of natural wetland loss. Historical photographs, National Wetland Inventory (NWI) maps, hydric soil maps can be helpful in making these determinations. Floodplain maps are especially valuable in river-dominated regions, such as the Front Range urban corridor. Evaluation of landforms and habitat patterns in the context of perceivable land use change is used to steer estimates of the amount of wetland loss within the HCE.

Rules for Scoring:

1. On the aerial photo, create a 500 m perimeter around the AA.
2. The area within this perimeter is the **Habitat Connectivity Envelope (HCE)**.
3. Within the HCE, outline the current extent of naturally occurring wetland and riparian habitat. Do not include habitats such as excavated ponds or reservoir induced fringe wetlands.
4. Outline the historical extent of wetland and riparian habitats (i.e., existing natural wetlands plus those that have been destroyed).
 - Use your knowledge of the history of the area and evident land use change to identify where habitat losses have occurred. Additional research can be utilized to increase the accuracy of this estimate including consideration of floodplain maps, historical aerial photographs, soil maps, etc.
5. Calculate the area of existing and historical wetlands. Divide the area of existing wetland by the total amount of existing and historical wetland and riparian habitat, and determine the variable score using the guidelines below. Enter sub-variable score at the bottom of p.2 of the Habitat Connectivity data form.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats
<0.9 - 0.8	B Highly Functioning	More than 80% of historical wetland habitat area within the HCE is still present (less than 20% of habitat area lost).
<0.8 - 0.7	C Functioning	80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% of habitat area lost).
<0.7 - 0.6	D Functioning Impaired	Less than 60 to 25% of historical wetland habitat area within the HCE is still present (more than 40 to 75% of habitat area lost).
<0.6	F Non-functioning	Less than 25% of the historical wetland habitat area within the HCE still in existence (more than 70% of habitat lost).

Notes:

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline all existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.
2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers	<input checked="" type="checkbox"/>	Stressors	Comments/description
	<input type="checkbox"/>	Major Highway	
	<input checked="" type="checkbox"/>	Secondary Highway	
	<input type="checkbox"/>	Tertiary Roadway	
	<input type="checkbox"/>	Railroad	
	<input checked="" type="checkbox"/>	Bike Path	Extends under C-470 bridge
	<input checked="" type="checkbox"/>	Urban Development	
	<input type="checkbox"/>	Agricultural Development	
	<input type="checkbox"/>	Artificial Water Body	
	<input type="checkbox"/>	Fence	
	<input type="checkbox"/>	Ditch or Aqueduct	
	<input type="checkbox"/>	Aquatic Organism Barriers	
	<input type="checkbox"/>		

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A <i>Reference Standard</i>	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	B <i>Highly Functioning</i>	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	C <i>Functioning</i>	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.7 - 0.6	D <i>Functioning Impaired</i>	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	F <i>Non-functioning</i>	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	.74
SV 1.2 Score	.75

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score

.74

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have ≥5m of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

72 SV 2.1 - Buffer Condition Score

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	<i>Reference Standard</i>	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	<i>Highly Functioning</i>	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispersed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	<i>Functioning</i>	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate disturbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	<i>Functioning Impaired</i>	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	<i>Non-functioning</i>	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

60% Percent of AA with Buffer

72 SV 2.2 - Buffer Extent

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	<i>Reference Standard</i>	90 - 100% of AA with Buffer
<0.9 - 0.8	<i>Highly Functioning</i>	70-90% of AA with Buffer
<0.8 - 0.7	<i>Functioning</i>	51-69% of AA with Buffer
<0.7 - 0.6	<i>Functioning Impaired</i>	26-50% of AA with Buffer
<0.6	<i>Non-functioning</i>	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

Buffer Width (m)	12	11	13	12	14	15	16	18	14
Line #	1	2	3	4	5	6	7	8	Avg. Buffer Width (m)

.63 SV 2.3 - Average Buffer Width Score

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	Reference Standard	Average Buffer width is 190-250m
<0.9 - 0.8	Highly Functioning	Average Buffer width is 101-189m
<0.8 - 0.7	Functioning	Average Buffer width is 31-100m
<0.7 - 0.6	Functioning Impaired	Average Buffer width is 6-30m
<0.6	Non-functioning	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

.68 SV 2.4 - Surrounding Land Use Score

Catalog and characterize land use changes in the surrounding landscape and score.

Stressors = Land Use Changes	Stressors	Comments/description	
	<input checked="" type="checkbox"/>	Industrial/commercial	
	<input checked="" type="checkbox"/>	Urban	
	<input checked="" type="checkbox"/>	Residential	
	<input type="checkbox"/>	Rural	
	<input type="checkbox"/>	Dryland Farming	
	<input type="checkbox"/>	Intensive Agriculture	
	<input type="checkbox"/>	Orchards or Nurseries	
	<input type="checkbox"/>	Livestock Grazing	
	<input checked="" type="checkbox"/>	Transportation Corridor	
	<input checked="" type="checkbox"/>	Urban Parklands	
	<input type="checkbox"/>	Dams/impoundments	
	<input type="checkbox"/>	Artificial Water body	
	<input type="checkbox"/>	Physical Resource Extraction	
<input type="checkbox"/>	Biological Resource Extraction		

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	B Highly Functioning	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	C Functioning	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	D Functioning Impaired	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	F Non-functioning	The Surrounding Landscape is essentially completely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score (Lowest score) **.63** + Surrounding Land Use **.68**) ÷ 2 = Variable 2 Score **.65**

Variable 3: Water Source

This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✓	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
	Dams	
	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
	Point Source (urban, ind., ag.)	
	Non-point Source	
✓	Increased Drainage Area	
✓	Storm Drain/Urban Runoff	
✓	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	A <i>Reference Standard</i>	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	B <i>Highly Functioning</i>	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	C <i>Functioning</i>	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	D <i>Functioning Impaired</i>	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or
<0.6	F <i>Non-functioning</i>	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score

.70

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity within the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, in most cases the Water Source variable score will define the upper limit Water Distribution score. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

✓	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Ponding/Impoundment	
	Culverts	
✓	Road Grades	C-470
	Channel Incision/Entrenchment	
✓	Hardened/Engineered Channel	
	Enlarged Channel	
✓	Artificial Banks/Shoreline	At C-470 Bridge
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	A Reference Standard	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	B Highly Functioning	Less than 10% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	C Functioning	Between 10 and 33% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	D Functioning Impaired	33 to 66% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	F Non-functioning	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score

.71

Variable 5: Water Outflow

This variable is concerned with **down-gradient** hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability to support down-gradient habitats in a manner consistent with their HGM (regional) subclass.

Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, **in most cases the Water Source variable score will define the upper limit Water Outflow score.**

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

✓	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Dikes/Levees	
✓	Road Grades	
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
✓	Artificial Stream Banks	C-470 Bridge
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	B Highly Functioning	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	C Functioning	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	D Functioning Impaired	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	F Non-functioning	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score

.70

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e. small is size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, **do not** include these resultant effects of geomorphic change; rather focus on the physical impacts **within the footprint of the alteration within the AA** – For example, the width and depth of a ditch or the size of a levee **within the AA** would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof shear, and sedimentation which can be significant but not immediately obvious.

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓	Stressors	Comments
✓	Dredging/Excavation/Mining	
✓	Fill, including dikes, road grades, etc	C-470
	Grading	
	Compaction	
	Plowing/Disking	
	Excessive Sedimentation	
	Dumping	
	Hoof Shear/Pugging	
	Aggregate or Mineral Mining	
	Sand Accumulation	
	Channel Instability/Over Widening	
	Excessive Bank Erosion	
	Channelization	
✓	Reconfigured Stream Channels	At C-470 Bridge
✓	Artificial Banks/Shoreline	C-470 Bridge
	Beaver Dam Removal	
	Substrate Embeddedness	
	Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	B Highly Functioning	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	C Functioning	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	D Functioning Impaired	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	F Non-functioning	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

Variable 6
Score

.72

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
-If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✓	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			.72
	Agricultural Runoff			
	Septic/Sewage			
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List	✓		
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion			.74
	Excessive Deposition			
	Fine Sediment Plumes	✓		
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
CDPHE Impairment/TMDL List				
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			.74
	Nearby Industrial Sites			
	Road Drainage/Runoff	✓		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✓		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List			
	Metal staining on rocks and veg.			
SV 7.4 Temperature	Excessive Temperature Regime			.73
	Lack of Shading	✓		
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
CDPHE Impairment/TMDL List				
SV 7.5 Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation			.73
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stress indicators not present or trivial.
<0.9 - 0.8	B Highly Functioning	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	C Functioning	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	D Functioning Impaired	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	F Non-functioning	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)	Sedimentation/ Turbidity	Toxic contamination/ pH	Temperature	Soil chemistry/ Redox potential	Sum of Sub-variable Scores					
<div style="border: 1px solid black; padding: 5px; display: inline-block;">.72</div>	+	<div style="border: 1px solid black; padding: 5px; display: inline-block;">.74</div>	+	<div style="border: 1px solid black; padding: 5px; display: inline-block;">.74</div>	+	<div style="border: 1px solid black; padding: 5px; display: inline-block;">.73</div>	+	<div style="border: 1px solid black; padding: 5px; display: inline-block;">.73</div>	=	<div style="border: 1px solid black; padding: 5px; display: inline-block;">3.66</div>

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules		
		Single Factor		Composite Score
1.0 - 0.9	A Reference Standard	No single factor scores < 0.9		The factor scores sum > 4.5
<0.9 - 0.8	B Highly Functioning	Any single factor scores ≥ 0.8 but < 0.9		The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	C Functioning	Any single factor scores ≥ 7.0 but < 0.8		The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	D Functioning Impaired	Any single factor scores ≥ 0.6 but <0.7		The factor scores sum >3.0 but ≤3.5
< 0.6	F Non-functioning	Any single factor scores < 0.6		The factor scores sum < 3.0

Variable 7 Score

.74

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

- Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
- Do not score vegetation layers that would not normally be present in the wetland type being assessed.
- Estimate and record the current coverage of each vegetation layer at the top of the table.
- Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
- Enter the percent cover values as decimals in the row of the stressor table labeled "Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
- Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
- Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
- Multiply each layer's *Reference Percent Cover of Layer* score by its Veg. Layer Sub-variable scores and enter the products in the labeled cells. These are the weighted sub-variable scores. Individually sum the *Reference Percent Cover of Layer* and *Weighted Sub-variables scores*.
- Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

Current % Coverage of Layer	Vegetation Layers				Comments
	1%	40%	35%		
Stressor	Tree	Shrub	Herb	Aquatic	
Noxious Weeds		✓	✓		
Exotic/Invasive spp.			✓		
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer	.01	+	.40	+	.35	+		=	.76
	x		x		x		x		
Veg. Layer Sub-variable Score	.72		.78		.78				
Weighted Sub-variable Score	.007	+	.31	+	.27	+		=	.58

See sub-variable scoring guidelines on following page

Variable 8 Score

.76

Variable 8: Vegetation Structure and Complexity p. 2

Sub-variable 8 Scoring Guidelines:

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A <i>Reference Standard</i>	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	B <i>Highly Functioning</i>	Stressors present at intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as high as 33% for a given attribute if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	C <i>Functioning</i>	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structural complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% for a given attribute if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	D <i>Functioning Impaired</i>	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% of a given attribute if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	F <i>Non-functioning</i>	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	.74
	Variable 2:	Contributing Area (CA)	.65
Hydrology	Variable 3:	Water Source (Source)	.70
	Variable 4:	Water Distribution (Dist)	.71
	Variable 5:	Water Outflow (Outflow)	.70
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	.72
	Variable 7:	Chemical Environment (Chem)	.74
	Variable 8:	Vegetation Structure and Complexity (Veg)	.76

Functional Capacity Indices

Function	Equation	Total Functional Points	FCI
Function 1 -- Support of Characteristic Wildlife Habitat	$V1_{connect} + V2_{CA} + (2 \times V8_{veg})$	2.91	.72
Function 2 -- Support of Characteristic Fish/aquatic Habitat	$(3 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem}$	6.38	.70
Function 3 -- Flood Attenuation	$V2_{CA} + (2 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V8_{veg}$	6.35	.70
Function 4 -- Short- and Long-term Water Storage	$V3_{source} + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom}$	4.24	.70
Function 5 -- Nutrient/Toxicant Removal	$(2 \times V2_{CA}) + (2 \times V4_{dist}) + V6_{geom} + V7_{chem}$	4.18	.69
Function 6 -- Sediment Retention/Shoreline Stabilization	$V2_{CA} + (2 \times V6_{geom}) + (2 \times V8_{veg})$	3.61	.72
Function 7 -- Production Export/Food Chain Support	$V1_{connect} + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem} + (2 \times V8_{veg})$	5.12	.73
Sum of Individual FCI Scores		4.96	

Divide by the Number of Functions Scored ÷ 7

Composite FCI Score .71

ADMINISTRATIVE CHARACTERIZATION

General Information		Date of Evaluation: 4/14/15				
Site Name or ID: C-470 Project	Project Name: C-470 Revised EA					
404 or Other Permit Application #:	Applicant Name: Douglas County					
Evaluator Name(s): Robert Belford	Evaluator's professional position and organization: Senior Biologist EMERCON					
Location Information:						
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):	Geographic Datum Used (NAD 83): NAD83		Elevation: 5,200 +/-			
Location Information:	Non-jurisdictional wetlands along C-470 Revised EA Study Corridor					
Associated stream/water body name:	Non-Jurisdictional wetlands along C-470 Corridor - Stormwater	Stream Order:	N/A			
USGS Quadrangle Map: Parker, Highlands Ranch, Littleton	Map Scale: (Circle one)	<input type="radio"/> 1:24,000	<input type="radio"/> 1:100,000			
Sub basin Name (8 digit HUC): 10190003	Wetland Ownership:	Private				
Project Information:						
This evaluation is being performed at: (Check applicable box)	<input checked="" type="checkbox"/> Project Wetland <input type="checkbox"/> Mitigation Site	Purpose of Evaluation (check all applicable):	<input checked="" type="checkbox"/> Potentially Impacted Wetlands <input type="checkbox"/> Mitigation; Pre-construction <input type="checkbox"/> Mitigation; Post-construction <input type="checkbox"/> Monitoring <input type="checkbox"/> Other (Describe)			
Intent of Project: (Check all applicable)	<input type="checkbox"/> Restoration	<input type="checkbox"/> Enhancement	<input type="checkbox"/> Creation			
Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	10.20 ac.	<input checked="" type="checkbox"/> Measured GPS	<input type="checkbox"/> Estimated			
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	ac.	Measured	ac.	ac.	ac.	ac.
		Estimated	ac.	ac.	ac.	ac.
Characteristics or Method used for AA boundary determination:	Only wetland area mapped in delineation. This FACWet covers all of the non-jurisdictional wetlands along corridor.					

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- | | |
|--|---|
| <input type="checkbox"/> Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).

<input type="checkbox"/> Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.

<input type="checkbox"/> Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.

<input type="checkbox"/> The wetland is a habitat oasis in an otherwise dry or urbanized landscape?

<input type="checkbox"/> Federally threatened or endangered species are KNOWN to occur in the AA? List Below.

<hr/> | <input type="checkbox"/> Federally threatened or endangered species are SUSPECTED to occur in the AA?

<hr/>
<hr/> <input type="checkbox"/> Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?

<input type="checkbox"/> The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?

<input type="checkbox"/> Other special concerns (please describe) |
|--|---|

HYDROGEOMORPHIC SETTING

- AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
If the above is checked, please describe the original wetland type if discernable using the table below.
- AA wetland was created from an upland setting. (*Detention Pond etc.*)

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	Water source	Surface flow	Groundwater	<u>Precipitation</u>	Unknown	
	Hydrodynamics	Unidirectional	Vertical	<u>Bi-directional</u>		
	Wetland Gradient	0 - 2%	<u>2-4%</u>	4-10%	>10%	
	# Surface Inlets	Over-bank	0	① - ②	3 >3	
	# Surface Outlets		0	① - ②	3 >3	
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	<i>These wetlands were created from stormwater detention facilities + roadside depressions. This wetlands are primarily created by stormwater</i>				
	HGM class	Riverine	Slope	<u>Depressional</u>	Lacustrine	

Historical Conditions

Previous wetland typology	Water source	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Notes (include information on the AA's HGM subclass and regional subclass):

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

US FWS habitat classification according as reported in Cowardin et al. (1979).

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Palustrine	Palustrine	EM-SS	Sand / Mud	A		
Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	Examples Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Semi-Perm. flooded(F); Intermittently exposed(G); Artificially flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permenant(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features.

Scale: 1 sq. =

See Appendix A

Variable 1: Habitat Connectivity

The Habitat Connectivity Variable is described by two sub-variables – Neighboring Wetland and Riparian Habitat Loss and Barriers to Migration and Dispersal. These sub-variables were treated as independent variables in FACWet Version 2.0. The merging of these variables makes their structure more consistent with that of other composite variables in FACWet. The new variable configuration also makes this landscape variable more accurately reflect the interactions amongst aquatic habitats in Colorado's agricultural and urbanized landscapes, which have a naturally low density of wetlands. The two Habitat Connectivity Sub-variables are scored in exactly the same manner as their FACWet 2.0 counterparts, as described below. The Habitat Connectivity Variable score is simply the arithmetic average of the two sub-variable scores which is entered on the second page of the Variable 1 data form. If there is little or no wetland or riparian habitat in the Habitat Connectivity Envelope (defined below), then Sub-variable 1.1 is not scored.

SV 1.1 - Neighboring Wetland and Riparian Habitat Loss (Do not score if few or no wetlands naturally exist in the HCE)

This sub-variable is a measure of how isolated from other naturally-occurring wetlands or riparian habitat the AA has become as the result of habitat destruction. To score this sub-variable, estimate the percent of naturally-occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within the 500-meter-wide belt surrounding the AA. This zone is called the Habitat Connectivity Envelope (HCE). In most cases the evaluator must use best professional judgment to estimate the amount of natural wetland loss. Historical photographs, National Wetland Inventory (NWI) maps, hydric soil maps can be helpful in making these determinations. Floodplain maps are especially valuable in river-dominated regions, such as the Front Range urban corridor. Evaluation of landforms and habitat patterns in the context of perceivable land use change is used to steer estimates of the amount of wetland loss within the HCE.

Rules for Scoring:

1. On the aerial photo, create a 500 m perimeter around the AA.
2. The area within this perimeter is the **Habitat Connectivity Envelope (HCE)**.
3. Within the HCE, outline the current extent of naturally occurring wetland and riparian habitat. Do not include habitats such as excavated ponds or reservoir induced fringe wetlands.
4. Outline the historical extent of wetland and riparian habitats (i.e., existing natural wetlands plus those that have been destroyed).

- Use your knowledge of the history of the area and evident land use change to identify where habitat losses have occurred. Additional research can be utilized to increase the accuracy of this estimate including consideration of floodplain maps, historical aerial photographs, soil maps, etc.

5. Calculate the area of existing and historical wetlands. Divide the area of existing wetland by the total amount of existing and historical wetland and riparian habitat, and determine the variable score using the guidelines below. Enter sub-variable score at the bottom of p.2 of the Habitat Connectivity data form.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats
<0.9 - 0.8	B Highly Functioning	More than 80% of historical wetland habitat area within the HCE is still present (less than 20% of habitat area lost).
<0.8 - 0.7	C Functioning	80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% of habitat area lost).
<0.7 - 0.6	D Functioning Impaired	Less than 60 to 25% of historical wetland habitat area within the HCE is still present (more than 40 to 75% of habitat area lost).
<0.6	F Non-functioning	Less than 25% of the historical wetland habitat area within the HCE still in existence (more than 70% of habitat lost).

Notes:

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline all existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.
2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers	✓	Stressors	Comments/description
		Major Highway	
	✓	Secondary Highway	
		Tertiary Roadway	
		Railroad	
	✓	Bike Path	
	✓	Urban Development	
		Agricultural Development	
	✓	Artificial Water Body	
		Fence	
		Ditch or Aqueduct	
		Aquatic Organism Barriers	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A <i>Reference Standard</i>	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	B <i>Highly Functioning</i>	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	C <i>Functioning</i>	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian
<0.7 - 0.6	D <i>Functioning Impaired</i>	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	F <i>Non-functioning</i>	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	.70
SV 1.2 Score	.70

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score .70

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have $\geq 5m$ of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

59 SV 2.1 - Buffer Condition Score

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	<i>Reference Standard</i>	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	<i>Highly Functioning</i>	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispersed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	<i>Functioning</i>	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate disturbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	<i>Functioning Impaired</i>	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	<i>Non-functioning</i>	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

20 Percent of AA with Buffer

59 SV 2.2 - Buffer Extent

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	<i>Reference Standard</i>	90 - 100% of AA with Buffer
<0.9 - 0.8	<i>Highly Functioning</i>	70-90% of AA with Buffer
<0.8 - 0.7	<i>Functioning</i>	51-69% of AA with Buffer
<0.7 - 0.6	<i>Functioning Impaired</i>	26-50% of AA with Buffer
<0.6	<i>Non-functioning</i>	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

Buffer Width (m)

Line #

5	5	5	5	5	5	5	5	5
1	2	3	4	5	6	7	8	Avg. Buffer Width (m)

.58

SV 2.3 - Average Buffer Width Score

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	Reference Standard	Average Buffer width is 190-250m
<0.9 - 0.8	Highly Functioning	Average Buffer width is 101-189m
<0.8 - 0.7	Functioning	Average Buffer width is 31-100m
<0.7 - 0.6	Functioning Impaired	Average Buffer width is 6-30m
<0.6	Non-functioning	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

.58

SV 2.4 - Surrounding Land Use Score

Catalog and characterize land use changes in the surrounding landscape and score.

Stressors = Land Use Changes	<input checked="" type="checkbox"/> Stressors	Comments/description
	<input checked="" type="checkbox"/> Industrial/commercial	
	<input checked="" type="checkbox"/> Urban	
	<input checked="" type="checkbox"/> Residential	
	<input type="checkbox"/> Rural	
	<input type="checkbox"/> Dryland Farming	
	<input type="checkbox"/> Intensive Agriculture	
	<input type="checkbox"/> Orchards or Nurseries	
	<input type="checkbox"/> Livestock Grazing	
	<input checked="" type="checkbox"/> Transportation Corridor	
	<input checked="" type="checkbox"/> Urban Parklands	
	<input type="checkbox"/> Dams/impoundments	
	<input checked="" type="checkbox"/> Artificial Water body	
	<input type="checkbox"/> Physical Resource Extraction	
<input type="checkbox"/> Biological Resource Extraction		

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	B Highly Functioning	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	C Functioning	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	D Functioning Impaired	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	F Non-functioning	The Surrounding Landscape is essentially completely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score
(Lowest score)

Surrounding
Land Use

(**.58** + **.58**) ÷ 2 = Variable 2 Score **.58**

Variable 3: Water Source

This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✓	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
	Dams	
	Diversions	
	Groundwater pumping	
✓	Draw-downs	
	Culverts or Constrictions	
✓	Point Source (urban, ind., ag.)	
✓	Non-point Source	
	Increased Drainage Area	
✓	Storm Drain/Urban Runoff	
	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
✓	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	A Reference Standard	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	B Highly Functioning	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	C Functioning	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	D Functioning Impaired	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. Wetlands with actively managed or wholly artificial hydrology will usually score in this range or
<0.6	F Non-functioning	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score

.60

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity *within* the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, in most cases the Water Source variable score will define the upper limit Water Distribution score. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

<input checked="" type="checkbox"/>	Stressors	Comments/description
<input checked="" type="checkbox"/>	Alteration of Water Source	
<input type="checkbox"/>	Ditches	
<input checked="" type="checkbox"/>	Ponding/Impoundment	
<input type="checkbox"/>	Culverts	
<input type="checkbox"/>	Road Grades	
<input type="checkbox"/>	Channel Incision/Entrenchment	
<input type="checkbox"/>	Hardened/Engineered Channel	
<input type="checkbox"/>	Enlarged Channel	
<input type="checkbox"/>	Artificial Banks/Shoreline	
<input type="checkbox"/>	Weirs	
<input checked="" type="checkbox"/>	Dikes/Levees/Berms	
<input type="checkbox"/>	Diversions	
<input checked="" type="checkbox"/>	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	A <i>Reference Standard</i>	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	B <i>Highly Functioning</i>	Less than 10% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	C <i>Functioning</i>	Between 10 and 33% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	D <i>Functioning Impaired</i>	33 to 66% of the AA is affected by <i>in situ</i> hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	F <i>Non-functioning</i>	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score

.60

Variable 5: Water Outflow

This variable is concerned with **down-gradient** hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability to support down-gradient habitats in a manner consistent with their HGM (regional) subclass.

Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, in most cases the Water Source variable score will define the upper limit Water Outflow score.

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

✓ Stressors	Comments/description
✓ Alteration of Water Source	
Ditches	
Dikes/Levees	
Road Grades	
✓ Culverts	
Diversion	
✓ Constrictions	
Channel Incision/Entrenchment	
✓ Hardened/Engineered Channel	
Artificial Stream Banks	
Weirs	
Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	B Highly Functioning	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	C Functioning	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	D Functioning Impaired	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	F Non-functioning	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score

0.58

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e. small is size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, **do not** include these resultant effects of geomorphic change; rather focus on the physical impacts **within the footprint** of the alteration **within the AA** – For example, the width and depth of a ditch or the size of a levee **within the AA** would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof shear, and sedimentation which can be significant but not immediately obvious.

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓	Stressors	Comments
✓	Dredging/Excavation/Mining	
✓	Fill, including dikes, road grades, etc	
✓	Grading	
	Compaction	
	Plowing/Disking	
	Excessive Sedimentation	
	Dumping	
	Hoof Shear/Pugging	
	Aggregate or Mineral Mining	
	Sand Accumulation	
	Channel Instability/Over Widening	
	Excessive Bank Erosion	
	Channelization	
	Reconfigured Stream Channels	
	Artificial Banks/Shoreline	
	Beaver Dam Removal	
	Substrate Embeddedness	
	Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	B Highly Functioning	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	C Functioning	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	D Functioning Impaired	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	F Non-functioning	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

**Variable 6
Score**

.60

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
-If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✓	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			.60
	Agricultural Runoff			
	Septic/Sewage	✓		
	Excessive Algae or Aquatic Veg.	✓		
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion			.58
	Excessive Deposition	✓		
	Fine Sediment Plumes			
	Agricultural Runoff			
	Excessive Turbidity	✓		
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			.60
	Nearby Industrial Sites			
	Road Drainage/Runoff	✓		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✓		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List			
Metal staining on rocks and veg.				
SV 7.4 Temperature	Excessive Temperature Regime	✓		.58
	Lack of Shading	✓		
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
CDPHE Impairment/TMDL List				
SV 7.5 Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation	✓		.60
	Mechanical Soil Disturbance	•		
	Dumping/introduced Soil	✓		
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	A Reference Standard	Stress indicators not present or trivial.
<0.9 - 0.8	B Highly Functioning	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	C Functioning	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	D Functioning Impaired	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	F Non-functioning	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)	+	Sedimentation/ Turbidity	+	Toxic contamination/ pH	+	Temperature	+	Soil chemistry/ Redox potential	=	Sum of Sub-variable Scores
.60		.58		.60		.58		.60		2.96

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules	
		Single Factor	Composite Score
1.0 - 0.9	A Reference Standard	No single factor scores < 0.9	The factor scores sum > 4.5
<0.9 - 0.8	B Highly Functioning	Any single factor scores ≥ 0.8 but < 0.9	The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	C Functioning	Any single factor scores ≥ 7.0 but < 0.8	The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	D Functioning Impaired	Any single factor scores ≥ 0.6 but <0.7	The factor scores sum >3.0 but ≤3.5
< 0.6	F Non-functioning	Any single factor scores < 0.6	The factor scores sum < 3.0

Variable 7 Score

.58

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

- Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
- Do not score vegetation layers that would not normally be present in the wetland type being assessed.
- Estimate and record the current coverage of each vegetation layer at the top of the table.
- Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
- Enter the percent cover values as decimals in the row of the stressor table labeled "Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
- Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
- Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
- Multiply each layer's *Reference Percent Cover of Layer* score by its Veg. Layer Sub-variable scores and enter the products in the labeled cells. These are the weighted sub-variable scores. Individually sum the *Reference Percent Cover of Layer* and *Weighted Sub-variables scores*.
- Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

Current % Coverage of Layer	Vegetation Layers				Comments
	Tree	Shrub	Herb	Aquatic	
		20%	65%		
Stressor	Tree	Shrub	Herb	Aquatic	
Noxious Weeds					
Exotic/Invasive spp.					
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer		+	.20	+	.65	+		=	.85
	x		x		x		x		
Veg. Layer Sub-variable Score			.65		.63				
Weighted Sub-variable Score		+	.13	+	.40	+		=	.53

See sub-variable scoring guidelines on following page

Variable 8 Score

.62

Variable 8: Vegetation Structure and Complexity p. 2

Sub-variable 8 Scoring Guidelines:

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	A <i>Reference Standard</i>	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	B <i>Highly Functioning</i>	Stressors present at intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as high as 33% for a given attribute if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	C <i>Functioning</i>	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structural complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% for a given attribute if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	D <i>Functioning Impaired</i>	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% of a given attribute if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	F <i>Non-functioning</i>	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	.70
	Variable 2:	Contributing Area (CA)	.58
Hydrology	Variable 3:	Water Source (Source)	.60
	Variable 4:	Water Distribution (Dist)	.60
	Variable 5:	Water Outflow (Outflow)	.58
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	.60
	Variable 7:	Chemical Environment (Chem)	.58
	Variable 8:	Vegetation Structure and Complexity (Veg)	.62

Functional Capacity Indices

Function 1 -- Support of Characteristic Wildlife Habitat

$$V1_{connect} + V2_{CA} + (2 \times V8_{veg}) = 0.70 + 0.58 + 1.24 = 2.52 \div 4 = 0.63$$

Function 2 -- Support of Characteristic Fish/aquatic Habitat

$$(3 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem} = 1.8 + 1.2 + 1.16 + 0.60 + 0.58 = 5.34 \div 9 = 0.59$$

Function 3 -- Flood Attenuation

$$V2_{CA} + (2 \times V3_{source}) + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} + V8_{veg} = 0.58 + 1.2 + 1.2 + 1.16 + 0.60 + 0.62 = 5.36 \div 9 = 0.59$$

Function 4 -- Short- and Long-term Water Storage

$$V3_{source} + (2 \times V4_{dist}) + (2 \times V5_{outflow}) + V6_{geom} = 0.60 + 1.2 + 1.16 + 0.60 = 3.56 \div 6 = 0.59$$

Function 5 -- Nutrient/Toxicant Removal

$$(2 \times V2_{CA}) + (2 \times V4_{dist}) + V6_{geom} + V7_{chem} = 1.16 + 1.2 + 0.60 + 0.58 = 3.54 \div 6 = 0.59$$

Function 6 -- Sediment Retention/Shoreline Stabilization

$$V2_{CA} + (2 \times V6_{geom}) + (2 \times V8_{veg}) = 0.58 + 1.2 + 1.24 = 3.02 \div 5 = 0.60$$

Function 7 -- Production Export/Food Chain Support

$$V1_{connect} + (2 \times V5_{outflow}) + V6_{geom} + V7_{chem} + (2 \times V8_{veg}) = 0.70 + 1.16 + 0.60 + 0.58 + 1.24 = 4.28 \div 7 = 0.61$$

Sum of Individual FCI Scores ~~4.2~~ 4.2

Divide by the Number of Functions Scored $\div 7$

Composite FCI Score .60