July 2013 version

ENVIRONMENTAL ASSESSMENT WORKSHEET

This Environmental Assessment Worksheet (EAW) form and EAW Guidelines are available at the Environmental Quality Board's website at:
http://www.eqb.state.mn.us/EnvRevGuidanceDocuments.htm. The EAW form provides information about a project that may have the potential for significant environmental effects. The EAW Guidelines provide additional detail and resources for completing the EAW form.
Cumulative potential effects can either be addressed under each applicable EAW Item, or can be addresses collectively under EAW Item 19.
Note to reviewers: Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS.

1. **Project title:** Afton Alps Trout Brook Stream Restoration

2. **Proposer:**
Contact person: Wiley Buck, Great River Greening
Title: Program Manager
Address: 35 W Water St
City, State, ZIP: St Paul, MN 55107
Phone: 651-272-3981
Fax:
Email: wbuck@greatrivergreening.org

3. **RGU**
Contact person: Matt Moore
Title: Administrator, South Washington WD
Address: 2302 Tower Drive
City, State, ZIP: Woodbury, MN 55125
Phone: 651-714-3729
Fax: 651-714-3721
Email: mmoore@ci.woodbury.mn.us

4. **Reason for EAW Preparation:** (check one)

Required:	Discretionary:
☐ EIS Scoping	☐ Citizen petition
X Mandatory EAW	☐ RGU discretion
	☐ Proposer initiated

If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s):

The proposed project will realign more than 500 feet of a stream. Therefore, the EAW is mandatory under MN Rules 4410.4300, subpart 26 Stream Diversion.

5. **Project Location:**
County: Washington County
City/Township: Denmark
PLS Location (¼, ¼, Section, Township, Range): NW ¼ of Section 3, Township 27N, Range 20W
Watershed (81 major watershed scale): 37. St. Croix River-Stillwater
USGS HUC 8: 807030005, Lower St. Croix
GPS Coordinates: 44.854467, -92.790698
Tax Parcel Number: 0302720130001

At a minimum attach each of the following to the EAW:

- County map showing the general location of the project (Figure 1);
- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable) (Figure 2); and
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan. (Appendix A).

Figures:

Figure 1 – Project Location Map
Figure 2 – USGS Quadrangle Map
Figure 3 – Site Overview
Figure 4 – Denmark Township Zoning Map
Figure 5 – FEMA FIRM Map
Figure 6 – Surficial Geology Map
Figure 7 – NRCS Soils Map, National Wetlands Inventory
Figure 8 – County Well Index Locations
Figure 9 – MPCA WIMN Results

Appendices:

Appendix A – Design Plans (70 percent)
Appendix B – USDA Soil Survey
Appendix C – Wetland Delineation Report
Appendix D – Wetland Conservation Act Notice of Decision
Appendix E – DNR Natural Heritage Information Service (NHIS) Review
Appendix F – SHPO Correspondence

6. Project Description:

a. Provide the brief project summary to be published in the *EQB Monitor*, (approximately 50 words).

Great River Greening seeks to improve approximately 1,400 linear feet of Trout Brook, a stream in Washington County, to restore natural stream geomorphology, improve overall ecological function, and enhance trout habitat. Trout Brook will be remeandered on the Afton Alps site privately owned by Vail Resorts Management Company (Vail). The project will also include construction of a rock riffle to provide trout passage through an existing culvert located within the Vail property. The project also includes floodplain creation and reconnection improvements upstream within the Minnesota Department of Natural Resources Afton State Park property, adjacent to Afton Alps. Construction is anticipated to be completed no later than September 15, 2018. Minor associated infrastructure improvements will also be completed to maintain current functionality of the Vail property.

b. Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities.

Project Background:
Great River Greening (GRG), in cooperation with Minnesota Department of Natural Resources (MNDNR), South Washington Watershed District (SWWD), and Vail Properties is proposing stream restoration of approximately 1,130 linear feet of Trout Brook to a realigned route approximately 1,400 feet long as shown in Figures 1 and 2. Previous studies and management plans have identified this segment of Trout Brook as a top priority for improvement, citing it as the "most degraded reach" of the Trout Brook watershed.

The project seeks to improve the Trout Brook corridor for both biological and resort-related functions. Trout Brook will be re-meandered at the Afton Alps site privately owned by Vail using peer-reviewed natural stream restoration design standards, with construction to be completed by September 2018. The segment to be realigned is currently a linear ditch with limited habitat and a history of sediment accumulation that requires ongoing maintenance. This proposed realignment of Trout Brook will incorporate a two-stage channel. The larger flood channel would be similar in dimension to the corridor of the current ditch. Within the larger channel, a smaller meandering channel will be constructed with habitat features such as riffles, pools, large wood, overhanging banks, and native riparian vegetation. Minor infrastructure improvements will also be completed nearby, including the improvement of a culvert which will allow sediment to move through the project area more effectively.

In 2012, SWWD conducted a geomorphic and feasibility reconnaissance examining channel stability, sediment sources and sinks and potential restoration solutions for the lower segment (Inter-Fluve

2012). Since that time, the Minnesota DNR has conducted both geomorphic and fisheries investigations to support restoration at the site, including the survey of similar locations in both Trout Brook and Brown's Creek that may serve as references for the design of this project. Concept designs for this remeander project were completed in 2014 and presented to stakeholders for input and comment. The landowner (Vail) is interested in potential reconfiguration of the existing parking layout (due to the new route of Trout Brook) to a more efficient arrangement, reducing its maintenance requirements within the channel (currently cuased by frequent sediment, and an overall improvement in the function of Trout Brook. Together with GRG, SWWD, and MNDNR, the project is intended to accomplish improvements to stream functions in Afton State Park and in Afton Alps in addition to the recreational functions through the Afton Alps property.

Proposed Project Elements (See Figure 3):

- Channel Restoration – This design calls for construction of an approximately 1,375-foot long two-stage channel to replace an existing ditch that is approximately 1,130 feet long. The new flood channel would be similar in dimension to the corridor of the current ditch, but would be located south of the current alignment, on the opposite side of an existing gravel parking lot. Within the new channel, a smaller meandering channel will be constructed with habitat features such as riffles, pools, large wood, overhanging banks and native riparian vegetation.

- Infrastructure Improvements – Minor modifications to the routing of vehicles and skiers within the project area will occur as a result of the realigned channel. A new culvert will be constructed at the downstream end of the remeander to replace an existing culvert located nearby the Afton Alps visitor center, allowing the continued passage of vehicle traffic through the site. The existing upstream culvert will be made fish-passable through the construction of a downstream riffle, creating a backwater and wet crossing at the existing culvert. Additionally, two 10-feet-wide pedestrian bridges will be constructed over the remeandered channel to facilitate skier and pedestrian movements to existing visitor facilities (See Appendix A).
- Culvert Design – The new east (downstream) culvert is sized to accommodate the bankfull channel geometry and eliminate backwater. A minimum width of at least 18 feet was required to fit the bankfull channel width and provide a small bench for terrestrial species connectivity. Nevertheless, a larger width was necessary to provide enough hydraulic capacity to eliminate backwater. The vertical height of the culvert is sized to incorporate natural channel bed material in the bottom to promote fish passage.
- Upstream Floodplain Improvements – Additional floodplain capacity and space for stream meandering will be created at two sites in Afton State Park.

Project Design:
The current proposed project includes the following main components as shown in Appendix A:

- Relocation of a portion of the channel downstream of the Alps chalet and visitor center, including a two-stage channel with meandering bankfull channel within a confined floodplain area. Wood from trees removed by construction will be salvaged to create in-stream cover, define channel boundaries, force deeper pools and constrict the channel where needed.
- Creation of a fish passage at the existing culvert upstream of the visitors' center (at approximately Station 35+50) through downstream riffle construction
- Construction of a proposed crossing at the downstream end of the re-meandered segment of stream (Station 21+50 on the new alignment), effectively replacing the current culvert closer to the visitors' cetner. To provide stream continuity through the site,

the proposed downstream crossing is designed as a partially buried box culvert to allow for a natural channel bottom.

- Excavation of floodplain material and meander introduction upstream of the ski area within Afton State Park. This involves excavation of a 40-foot wide floodplain area and possible movement of the channel to create mild meanders at two different locations.
- Planting recommendations, wood/habitat design, and management recommendations for the existing channel that will remain in place between the new fish passage and the realigned channel (shown in Appendix A as the area from Station 31+00 to 35+00).

Construction Sequencing (May 2018-September 2018)

1. Install all erosion and sediment control items.
2. Relocate existing natural gas and communication utilities.
3. Excavate new channel and floodplain. Place spoils in stockpile area. Install silt fence around perimeter and seed sediment.
4. Install helical piers for pedestrian bridges.
5. Complete upstream floodplain and channel work, salvaging wood from area.
6. Install streambed substrate and large wood in new channel.
7. Revegetate new channel and floodplain.
8. Install new wet crossing and new bridge.
9. Install new riffle.
10. Allow new channel and floodplain to revegetate for at least 3 months.
11. Remove temporary berms to activate flow in new channel.
12. Fill existing channel with spoils from excavated channel.

c. Project magnitude:

Total Project Acreage	11.0 acres
Linear project length	1,400 feet
Number and type of residential units	0
Commercial building area (in square feet)	0
Industrial building area (in square feet)	0
Institutional building area (in square feet)	0
Other uses – specify (in square feet)	0
Structure height(s)	0

d. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

The purpose of the project is to improve water quality and ecology within the lower reach of the Trout Brook. The landowner of the Afton Alps property, Vail Resorts Management Company, is interested in potential reconfiguration of the existing parking layout, reduce the frequent sediment deposition within the channel that requires maintenance, return of trout to the stream, and as an overall improvement in the function and aesthetics of Trout Brook. SWWD and MNDNR's goal is to improve stream habitat to support a sustainable population of brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*). GRG seeks to provide long-term educational opportunities and together with Vail, SWWD, and the MNDNR, they endeavor to accomplish the improvements to both stream and ski functions through the property.

e. Are future stages of this development including development on any other property planned or likely to happen? ☐ Yes X No

If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

f. Is this project a subsequent stage of an earlier project? ☐ Yes X No
If yes, briefly describe the past development, timeline and any past environmental review.

7. **Cover types:** Estimate the acreage of the site with each of the following cover types before and after development:

	Before	After		Before	After
Wetlands	2.439 acres	2.535 acres	Lawn/landscaping	0.30 acres	0.10 acres
Deep water/streams	0.344 acres	0.642 acres	Impervious surface	0.20 acres	0.20 acres
Wooded/forest	0.20 acres	0.20 acres	Stormwater Pond	0	0
Brush/Grassland	0	0	Other (describe)		
Cropland	0	0			
			TOTAL		

8. **Permits and approvals required:** List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. *All of these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rules, Chapter 4410.3100.*

Unit of Government	Type of Application	Status
U.S. Army Corps of Engineers	Section 404 of Clean Water Act	To be submitted
MN Department of Natural Resources	Public Waters Work Permit	To be submitted
MN Pollution Control Agency	NPDES/SDS Stormwater General Permit	To be submitted
Washington County	Conditional Use Permit	To be submitted
Washington County	Grading & Filling Shoreland Alteration Permit	To be submitted
South Washington Watershed district	Wetland Conservation Act Permit Boundary or Type	Approved on Nov. 7, 2017 (See Appendix D)

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos. 9-18, or the RGU can address all cumulative potential effects in response to EAW Item No. 19. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 19

9. **Land use:**

a. Describe:

i. Existing land use of the site as well as areas adjacent to and near the site, including parks, trails, prime or unique farmlands.

Afton Alps is a ski and golf resort with ski and snowboard runs, a golf course, and related guest and maintenance facilities in the northeast corner of Denmark Township. The resort borders Afton State Park to the north, east, and south. The project is located along Trout Brook immediately south of side of Afton Alps guest services buildings and offices and between parking areas.

The remeander area mostly abuts the fringe of large gravel parking lot and resort driveways. The remeander is partially situated at the base of a several ski runs and at the toe of a hillslope.

ii. Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.

The *Denmark Township 2030 Comprehensive Plan* (adopted 2011) identifies the study area as Parks and Open Space in an existing land use map and is zoned Rural-Residential. 2030 planned land use shows the study area as rural-residential.

SWWD has a *Trout Brook Management Plan* (2009, completed for Lower St. Croix WMO before the WMO was assumed by SWWD). The plan identifies the study area as an entrenched channel, confining the stream and providing poor habitat. Management recommendations in the plan state "improving the reach of Trout Brook through Afton Alps is essential to improving this resource. The reach is the most degraded reach of the system," i.e. the Trout Brook watershed.

An Inter-Fluve 2012 concept design report *Trout Brook Watershed Improvements Afton Alps* completed for SWWD identified a stream remeander concept within Afton Alps.

iii. Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.

The project site is zoned rural-residential by Denmark Township. The area is designated as a Shoreland Management District by Denmark Township and Washington County (See Figure 4). Trout Brook is subject the Washington County Development Code Chapter 6: Shoreland Management Regulations as a Tributary Stream. The portion of the project in Afton State Park is in land designated as a Conservancy use.

Most of the project is within 100-Year Floodplain (Zone A) on FEMA Flood Insurance Rate map Number 2716C0431E, effective 2/3/2010 (See Figure 5). Therefore, the project is subject to Washington County Development Code Chapter 9.

b. Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.

The Trout Brook improvements are intended for the enhancement of both biological and resort-related functions and is compatible with the existing land uses and zoning of the area. No changes will be made to nearby land uses, zoning, or plans.

c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 9b above.

Two ski-passable pedestrian bridges will be added over the realigned stream to mitigate against the new obstacle to typical user movements within the ski area. The bridges will use helical anchors to minimize impacts to adjacent wetlands and floodplain. See Plans in Appendix A.

10. Geology, soils and topography/land forms:

a. Geology - Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.

Three rock units are mapped beneath the study area: Jordan Sandstone, St. Lawrence Formation, and Tunnel City Group. These are all medium to fine grained sandstone or siltstone conducive to the requirements of the project. Surficial geology of the area is shown in Figure 6.

b. Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 11.b.ii.

According to the NRCS (SCS) soil classifications, the project area and its surroundings are primarily comprised of Chaska silt loam and Dorenton-Rock outcrop complex as shown in Figure 7. Chaska silt loam has a slope of 0-2 percent is poorly drained and prone to flooding. Dorenton-Rock outcrop complex has a slope of 25-65 percent is well drained and is not prone to flooding. See Web Soil Survey Report in Appendix B.

Soil excavated from the proposed channel will be stockpiled on-site for approximately 3 months, to allow the newly constructed channel to vegetate. The stockpile will be seeded with temporary cover vegetation and be contained by silt fence. At the end of the three month vegetation period, the soil will be used to fill the existing channel, as the newly constructed channel is brought on-line.

NOTE: For silica sand projects, the EAW must include a hydrogeologic investigation assessing the potential groundwater and surface water effects and geologic conditions that could create an increased risk of potentially significant effects on groundwater and surface water. Descriptions of water resources and potential effects from the project in EAW Item 11 must be consistent with the geology, soils and topography/land forms and potential effects described in EAW Item 10.

11. Water resources:

a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.

i. Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.

Trout Brook runs through the project area. It is not a designated trout stream per Minnesota Rules 6264.0050. It is a designated DNR Public Water. It is a perennial stream and incised within a straightened channel within the project area. Trout Brook is listed on the current MPCA 303d Impaired Waters (2012 last approved list and draft 2018 list) list as an impaired water because of *E. coli* pollutant. The Trout Brook reach also suffers from sediment loading from runoff from surface parking lots and roads.

Several degraded, narrow bench wetlands are present adjacent to Trout Brook's incised channel. Additional wetlands are present along the proposed remeander area. These wetlands are indicative of a high water table within the valley of Trout Brook. Wetlands within the project area were identified during a wetland delineation completed for this project and summarized in Table 1 below. See Appendix C for the Wetland Delineation Report.

Table 1 - Wetlands in Project Area

WETLAND ID & LAT/LONG°	WETLAND TYPE Circular 39 Observed Cowardin Class Eggers & Reed (Quality Rating)	WETLAND AREA
Wetland A 44.858030/ -92.790278	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.295 ac 12,866 sf
Wetland B 44.857471/ -92.788203	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.200 ac 8,710 sf
Wetland C 44.857578/ -92.786278	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.028ac 1,239sf
Wetland D1 44.856667 -92785225	Type 7 PFO1B Hardwood Swamp (Medium Quality)	0.039 ac 1,685 sf
Wetland D2 44.856795 -92.786222	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.441 ac 19,207 sf
Wetland D3 44.856743 -92.785928	Type 3 PEMC Shallow Marsh (Medium Quality)	0.095 ac 4,121sf
Wetland E 44.857451 -92.784542	Type 2/3 PEMB Fresh Wet Meadow/Shallow Marsh (Low Quality)	0.126 ac 5,477 sf
Wetland F 44.857959 -92.78471	Type 3 PEMC Shallow Marsh (Low Quality)	0.028 ac 1,239 sf

ii. Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.

Groundwater is at or near the surface in much of the project area. The project is not located near a Minnesota Department of Health (MDH) wellhead protection area.

Multiple wells are located near the site according to the MDH Minnesota Well Index as shown in Figure 8: 457206, 207992, 698186, 249848, and 795481 being the five wells located within 500 feet of the site. These wells are primarily used for commercial and irrigation purposes.

b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.

i. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.
2) If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system.
3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges.

One wastewater pipe runs from the visitor facilities south across Trout Brook along the underside of an existing pedestrian bridge. The bridge and the wastewater pipe are not anticipated to be moved or disturbed as part of this project.

ii. Stormwater - Describe the quantity and quality of stormwater runoff at the site prior to and post construction. Include the routes and receiving water bodies for runoff from the site (major downstream water bodies as well as the immediate receiving waters). Discuss any environmental effects from stormwater discharges. Describe stormwater pollution prevention plans including temporary and permanent runoff controls and potential BMP site locations to manage or treat stormwater runoff. Identify specific erosion control, sedimentation control or stabilization measures to address soil limitations during and after project construction.

All stormwater at the project site is received by Trout Brook, which flows to the nearby St. Croix River. A large majority of the surrounding area is pervious land except for an existing gravel parking lot. No difference to stormwater quantity is expected post-construction.

Erosion control measures will be employed during the remeandering of the stream to prevent unwanted erosion. The floodplain reconnections and remeandering of the stream will reduce sedimentation and the need for frequent maintenance to remove sediment from Trout Brook within the Afton Alps property.

The project could enable stormwater improvements quality post-construction. Best Management Practices (BMP) included as part of parking lot improvements such as small infiltration ditches and/or rain gardens may reduce total suspended solids (TSS) and suspended chemical inflows to Trout Brook.

iii. Water appropriation - Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the

wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation.

Subsurface exploration indicates dewatering may be required for parts of this project. Dewatering may be needed to allow for excavation of the proposed channel bed. Where Dewatering is necessary, the Contractor shall be responsible for providing a plan and obtaining a Water Appropriation Permit from the Department of Natural Resources (DNR), if required. The contractor shall not discharge groundwater directly to existing drainageways or culverts without permission from the Owner and Engineer. The Contractor shall construct suitable holding basins and bale check systems, as may be required by the agencies. Discharging water into sanitary sewer will not be allowed, except as permitted by the Owner. The Contractor will be responsible for installation, operation, and maintenance of a flow measurement device. Dewatering may include, but is not limited to, pumps, wells, well points, sumps, temporary pipelines for water disposal, rock or gravel placement, or any combination. Water will be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system. Diversion of the main channel stream may be required. Any diversion structures shall be constructed and maintained in such a manner as to not allow erosion. Thorough erosion control measures will be in place as the stream bed is remeandered. No alterations will be made to existing municipal water infrastructure.

iv. Surface Waters

a) Wetlands - Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed, and identify those probable locations.

Approximately 0.074 acres of wetland will be impacted by filling of wetlands on shallow benches next to the existing, straightened channel of Trout Brook. Additionally, approximately 0.491 acres of wetland will be excavated for the construction of the remeandered two-stage channel. Avoidance of the wetlands in the straightened channel was not possible. Avoidance of the wetlands within remeander areas was considered. However, these wetlands are located in a shallow swale that occupies much of the historic channel alignment of Trout Brook. Additionally, the two-stage channel will create approximately 0.661 acres of wetland within its floodplain in addition to the new channel area.

b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features.

The purpose of the project is to alter a surface water – Trout Brook – from a degraded straightened channel to a naturalized meandered system. The impacts of the project would be positive for water quality, sediment management, and fish habitat. The current channel does not include any floodplain connectivity, woody habitat, or significant riparian vegetation/buffer. The proposed meander includes all of these elements, which will improve water quality within the reach and downstream, based on similar floodplain reconnection projects completed within Minnesota and around the United States. Woody habitat is shown to have a significant impact on improving the macrobiotic activity within streams. The inclusion of significant wood within the project design will provide ecological uplift to the stream. The current straightened channel is ineffective in maintaining sediment transport continuity through the Afton Alps site, resulting in deposition on gravel substrate and the need for frequent channel maintenance. The proposed channel has been analyzed and modeled within HEC-RAS so that the design is anticipated to provide sediment continuity through the site, maintaining the geomorphology as intended and eliminating maintenance needs. Finally, the proposed project will include significant fish habitat, including pools, riffles, and large wood to support healthy trout populations in the future.

Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

A Stormwater Pollution Prevention Plan will identify means to control temporary construction disturbance associated with the project. The project is not anticipated to negatively impact the channel water quality and/or degrade it below existing conditions.

12. Contamination/Hazardous Materials/Wastes:

a. Pre-project site conditions - Describe existing contamination or potential environmental hazards on or in close proximity to the project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.

The MPCA's *What's in My Neighborhood* database indicates several petroleum cleanups one have occurred within the Afton Alps property. There are no active cleanup sites and all previous sites have received site closure letters from MPCA (See Figure 9).

Utilities will be relocated during the course of project construction. These utilities include underground natural gas and communication lines.

b. Project related generation/storage of solid wastes - Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to

avoid, minimize or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.

No project related generation of solid wastes is expected for the project. Excavated soils will be disposed of onsite and any waste for project materials such as erosion control materials or plant packaging will be disposed of through existing trash hauling companies as a responsibility of the contractor.

c. Project related use/storage of hazardous materials - Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any above or below ground tanks to store petroleum or other materials. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.

Equipment using petroleum fuels, oils, and lubricants and other hazardous materials will be used during project construction and is the most likely source of hazardous or toxic materials to impact the project. No storage of any chemicals or hazardous materials would occur onsite. Equipment will be inspected daily for leaks and petroleum contamination and refueling will occur away from surface waters.

Accidental releases of these materials could occur. A spill could result in surface contamination of soils and groundwater. The contractor would be required to prepare a Spill Prevention and Response Plan that would address measures to avoid and minimize spills or releases of hazardous materials or petroleum products during construction. Spills would be reported to the MPCA Duty Officer.

d. Project related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.

There is no hazardous waste generation proposed or anticipated for this project.

13. Fish, wildlife, plant communities, and sensitive ecological resources (rare features):

a. Describe fish and wildlife resources as well as habitats and vegetation on or in near the site.

In-stream habitat within the Afton Alps property has been negatively impacted by channelization of the stream. Sedimentation, scouring, and high stream velocity during storm event results from this more pipe-like stream than a natural stream with pools, connections to floodplains, natural substrates such as overhanging vegetation and wood, and sediment flow. Additionally, existing culverts within the property act as fish barriers since the stream has eroded down from where the stream substrate was when the culverts were installed. The stream degradation reduces the number of microhabitats suitable for trout and other aquatic wildlife.

Most of the Afton Alps property within the project area is mowed or otherwise maintained for ski resort purposes.

Habitat in the floodplain creation areas is typical of the woodland community within Afton State Park. Common wildlife includes deer, fox, badgers, thirteen-lined ground squirrel, turkeys, gray and fox squirrels.

b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA-____) and/or correspondence number (ERDB #20180223) from which the data were obtained and attach the Natural Heritage letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

NHIS letter ERDB#20180223 and related attachments are in Appendix E.

Ecologically Significant Areas
Portions of the project boundary are within areas the Minnesota Biological Survey (MBS) has identified as Sites of Moderate Biodiversity Significance. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as Moderate contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.

The project boundary is also within the following DNR Native Plant Communities: White Pine – Sugar Maple – Basswood Forest (Cold Slope), which is considered critically imperiled in Minnesota, and Oak – (Red Maple) Woodland, which is considered uncommon but not rare.

State-listed Species
Plants:
• Kitten-tails (Besseya bullii), a state-listed threatened plant, has been documented in the vicinity of the proposed project.
• Bloody beard lichen (Usnea mutabilis), a state-listed threatened species, and red beard lichen (Usnea rubicunda), a state-listed species of special concern, have been documented growing near the top of a large north-facing sandstone outcrop adjacent to Trout Brook.

Birds:
• The Henslow's Sparrow (Ammodramus henslowii), a state-listed endangered bird species, has been documented in the vicinity of the project area. This species nests on the ground in uncultivated grasslands and old fields with standing, dead vegetation and a substantial litter layer. Given the project boundary does not include the appropriate habitat, impacts are not anticipated.

• The Bell's Vireo, (Vireo bellii), a state listed bird species of special concern, has been documented in the vicinity of the project. In Minnesota, Bell's Vireo prefers shrub thickets within or bordering open habitats such as grasslands or wetlands.
• Red-shouldered Hawks (Buteo lineatus), a state-listed species of special concern, have been documented during the breeding season in the vicinity of the project. This species requires large, contiguous forest tracts interspersed with wetlands and prefers lowland woods and river bottoms.

Reptiles:
• The gopher snake (Pituophis catenifer), a state-listed species of special concern, and eastern hognose snake (Heterodon platirhinos), a Species in Greatest Conservation Need as identified in Minnesota's State Wildlife Action Plan, have been documented in the vicinity of the proposed project and may be encountered on site.

Federally Protected Species
• Several federally and state-listed mussels, as well as state-listed fish and amphibians, have been documented in the St. Croix River in the vicinity of the proposed project. These species are particularly vulnerable to deterioration in water quality, especially increased siltation. As Trout Brook flows into the St. Croix, is important stringent erosion prevention and sediment control practices be implemented and maintained throughout the duration of the project.
• The northern long-eared bat (Myotis septentrionalis), federally listed as threatened and state-listed as special concern, can be found throughout Minnesota. During the winter this species hibernates in caves and mines, and during the active season (approximately April-October) it roosts underneath bark, in cavities, or in crevices of both live and dead trees
• The rusty patched bumble bee (Bombus affinis), a federally-listed endangered species, was documented in the vicinity of the proposed project. The rusty patched bumble bee typically occurs in grasslands and urban gardens with flowering plants from April through October. This species nests underground in abandoned rodent cavities or in clumps of grasses.

c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.

Plant communities within the stream remeander area are largely disturbed through frequent mowing, impervious surface runoff, or other disturbance. Erosion control measures discussed in item 11 will help to limit invasive spread. Additionally, the cut areas of the remeander will be allowed to revegetate for three months after seeding with native stabilization mixes prior to connecting the stream through the new alignment.

The two upstream reaches within Afton State Park will reconnect floodplain connections lost from degradation of the Trout Brook channel. The floodplain will be excavated at two sites along a total of approximately 525 linear feet of the stream. Trees will be removed from the sites and approximately 200 cubic yards of material will be excavated to reconnect floodplains at these sites. The clearing in the floodplain connection areas will remove a thick understory of buckthorn and reseeded with native vegetation. Trees cleared for the floodplain excavation and access will be using in the stream remeander construction and buckthorn will be disposed. Excess soils with invasive seeds will be disposed permanently within the filled channel area after the remeandered portion of the stream is reconnected. The sites will be reseeded using Minnesota Standard Seed Mix 33-261 (Stormwater South & West). Access to the sites will require some tree and brush clearing to create a 15-20 feet corridor for construction equipment passage along a temporary access. The temporary access will use an existing trail for much of its alignment. Construction

equipment will include a light dump truck and small excavator to limit any rutting within the access corridor. Construction is expected to be completed within three working days.

d. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to fish, wildlife, plant communities, and sensitive ecological resources.

The project will avoid impacts to north facing outcrops to avoid impacts to state-listed lichens. Tree clearing will not occur during northern long-eared bat pup rearing season in June and July. Erosion control materials will exclude plastic netting to avoid entanglement of small animals.

The project will follow MDNR Operational Order 113 Invasive Species Prevention and Management and Operational Order #59 Pesticides and Pest Control. The new channel will be built off-line from the current stream, which will minimize impacts to fish species downstream as well as within the current channel. The project is intended to restore native wetland and riparian species and restore access for trout to upper reaches of Trout Brook.

14. Historic properties:

Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

According to the Minnesota Historical Society's State Historic Preservation Office letter dated September 8, 2017, "no properties listed in the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this project." This letter is included in Appendix F.

15. Visual:

Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

The project area is located at the base of long ski slopes and surrounded by state park land. The Lower Saint Croix National Scenic Riverway is approximately 2,600 feet east of (and outside) of the EAW study area, but natural areas are contiguous to the Scenic Riverway. It's a scenic area and the scenic views and vistas are part of the draw for resort. The proposed project will enhance the natural scenery of the area by installing natural meandering channel where a straightened, incised channel currently exists. Additionally, water quality and riparian habitat improvements will include native plantings to further enhance the area for people and wildlife.

16. Air:

a. Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants, and any greenhouse gases. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.

No stationary source emissions would be created as part of this project.

b. Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g. traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.

Likely construction equipment for the project would include excavators, skid-steers, bulldozers, and dump trucks. These could have temporary negative impacts on air quality, but impacts will be temporary. Engines and exhaust systems on construction equipment will be in good working order and maintained on a regular basis during construction.

c. Dust and odors - Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 16a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.

Construction activities will create dust and odors temporarily during the construction phase of the project. Construction phasing will be used to limit the amount of area being worked on at any one time. .

17. Noise:

Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

The project is located within private property owned by Vail Resorts. The project will be constructed after ski season is complete and construction noise would occur during the daytime hours. Noise would be similar to maintenance activity typically conducted at adjacent properties, including Afton State Park.

1) The existing noise levels at the ski resort would likely be different in the winter months compared to the summer months and would be consistent of a for profit recreational area. Reduced vehicle traffic, snow-making, and chair lift noise occurs throughout the summer and it is not expected that construction noise would exceed the winter ambient noise.
2) Nearby sensitive noise receptors are located at the ski resort's hotels and lodges as well as nearby rural residential houses. The nearest house is located approximately 1200 feet southwest of the proposed improvements.
3) Noise generated from construction activities will be temporary to both wildlife and humans within proximity of the project sites. The completed project is not anticipated to increase noise levels above existing ambient noise levels meaning no impacts from noise are anticipated.
4) Construction will be restricted to daytime hours to eliminate noise impacts at night.

18. Transportation:

a. Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3)

estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.

The proposed project is not a transportation project and will not generate the need for additional parking spaces, any additional daily traffic or peak hour traffic. Afton Alps is a regional recreation source and traffic generation sources are expected to remain the same after the project would be completed. There is no transit serving the site.

b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system. *If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW.* Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 *(available at: http://www.dot.state.mn.us/accessmanagement/resources.html)* or a similar local guidance,

No project-related traffic congestion is expected.

c. Identify measures that will be taken to minimize or mitigate project related transportation effects.

There are no transportation effects expected.

19. Cumulative potential effects: (Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

The proposed project intent is to improve water quality and trout habitat for Trout Brook. The reach of Trout Brook within Afton Alps is the most degraded reach in the Trout Brook watershed. Improvements to this reach will improve the overall watershed and help guide future decisions for stream improvements in Washington County and the region. The timeline for these anticipated benefits to come to fruition could be five to ten years before the full effects are realized.

b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

Afton Alps is considering parking lot improvements to the large gravel lot adjacent to the proposed remeander. Parking lot improvements would include stormwater quality improvements and mitigation for any floodplain impacts. The parking lot improvements could be completed as soon as the summer of 2018, but no design is complete at this time.

c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

Cumulative effects are anticipated to be beneficial to the water quality and habitat of the trout stream improve wildlife habitat in the area. No signification negative cumulative effects would occur because of the project.

20. Other potential environmental effects: If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

All potential environmental effects have been addressed.

RGU CERTIFICATION. *(The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)*

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW ~~are~~ being sent to the entire EQB distribution list.

Signature _____ Date 12/20/2017

Title ADMINISTRATOR

FIGURES

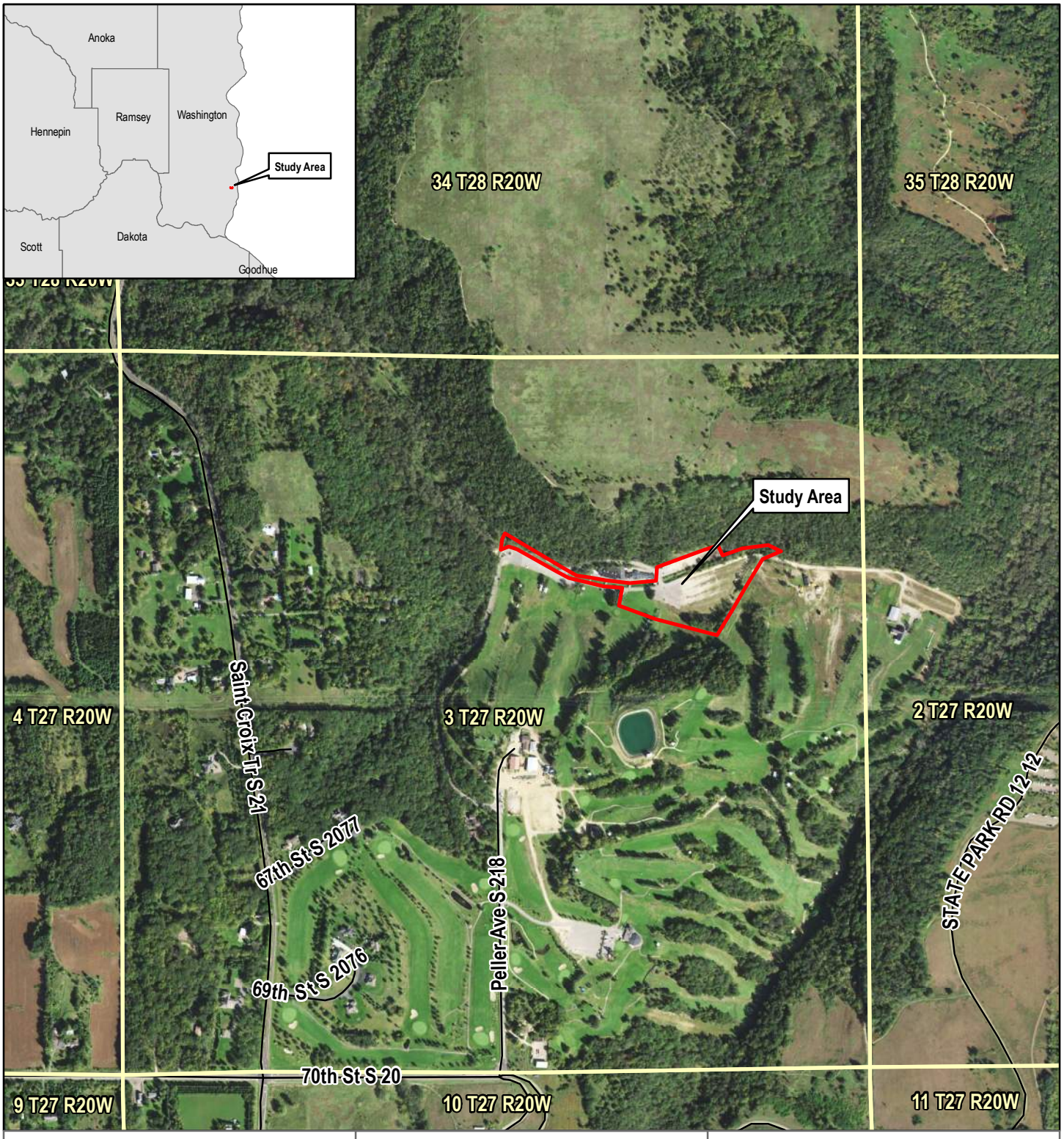


FIGURE 1

Afton Alps
Trout Brook Stream Restoration

Location Map

Denmark Township, MN

EAW Study Area
Sections

0 500 1,000
Feet

N
W E
S

inter·fluve

HRGreen

J:\2017\170327\GIS\MXD\EAW\Location Map.mxd

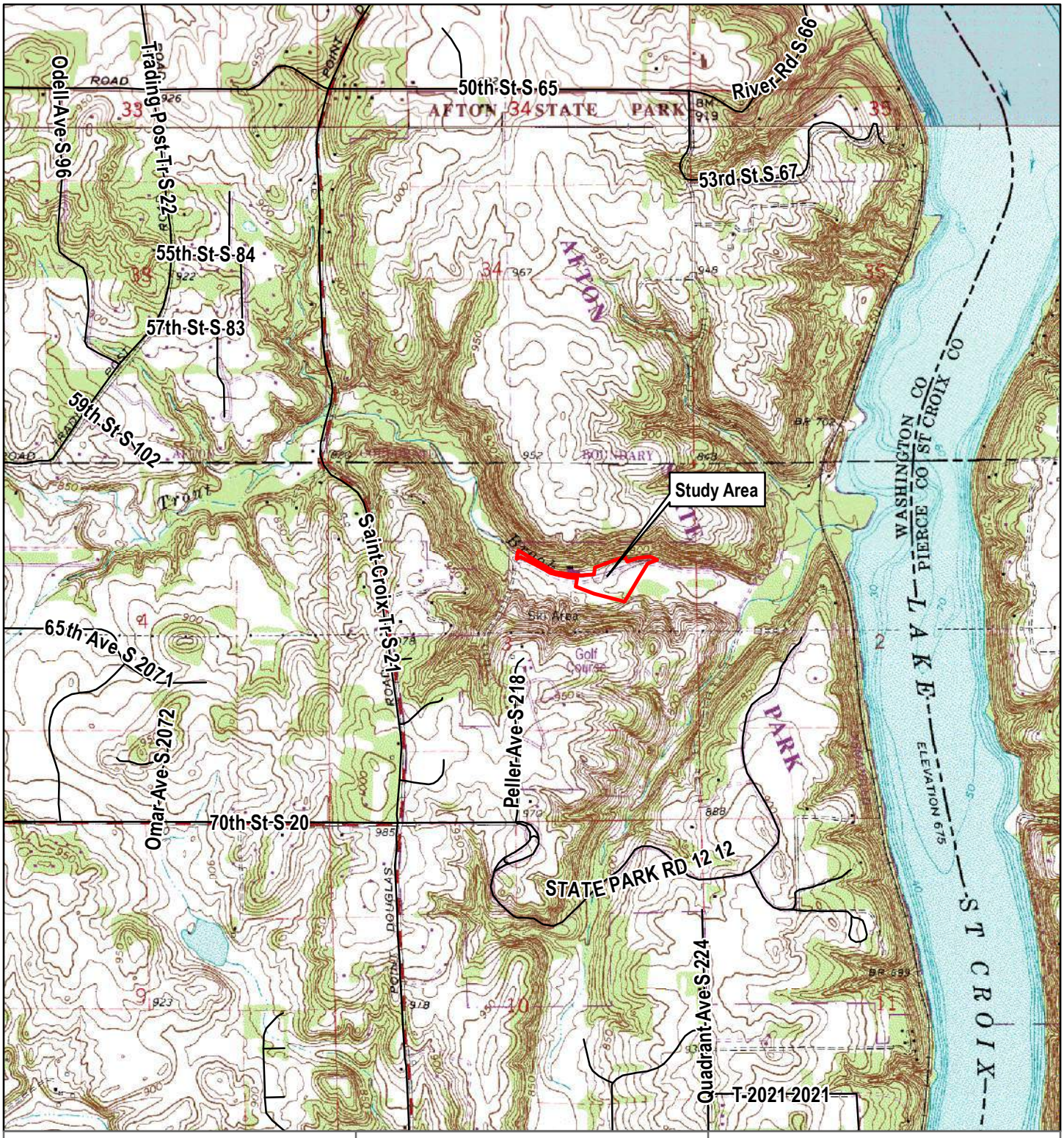


FIGURE 2

Afton Alps
Trout Brook Stream Restoration

USGS Quadrangle

Denmark Township, MN

EAW Study Area

0 1,000 2,000
Feet

N
W E
S

inter-fluve

HRGreen

J:\2017\170327\GIS\MXD\EAW\USGS Quad Map.mxd

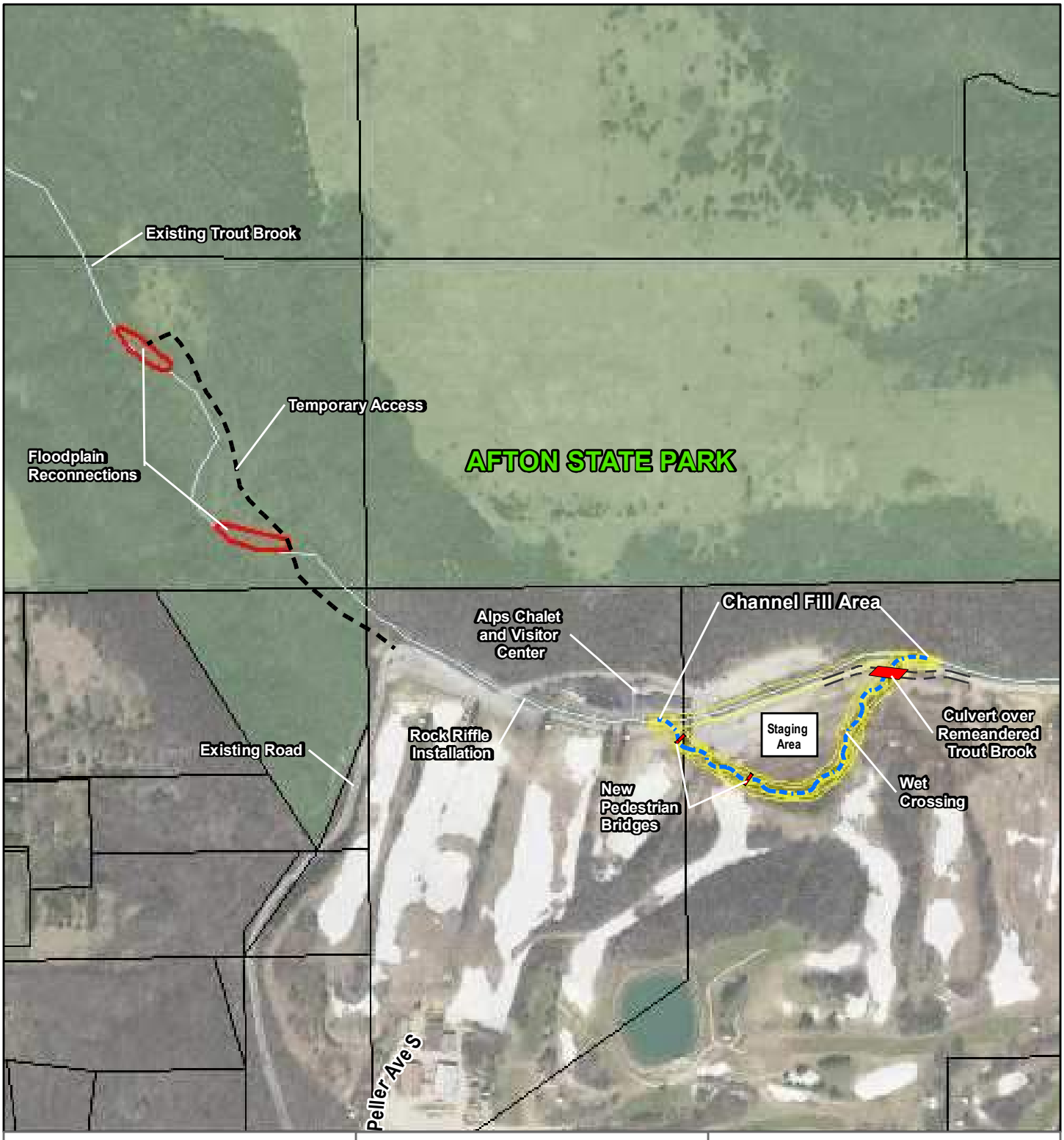


FIGURE 3

Afton Alps
Trout Brook Stream Restoration

PROJECT OVERVIEW

Denmark Township, MN

- New Bridges
- Remeander Alignment
- Temporary Access
- Floodplain Reconnections
- Existing Trout Brook
- Parcels
- Afton State Park

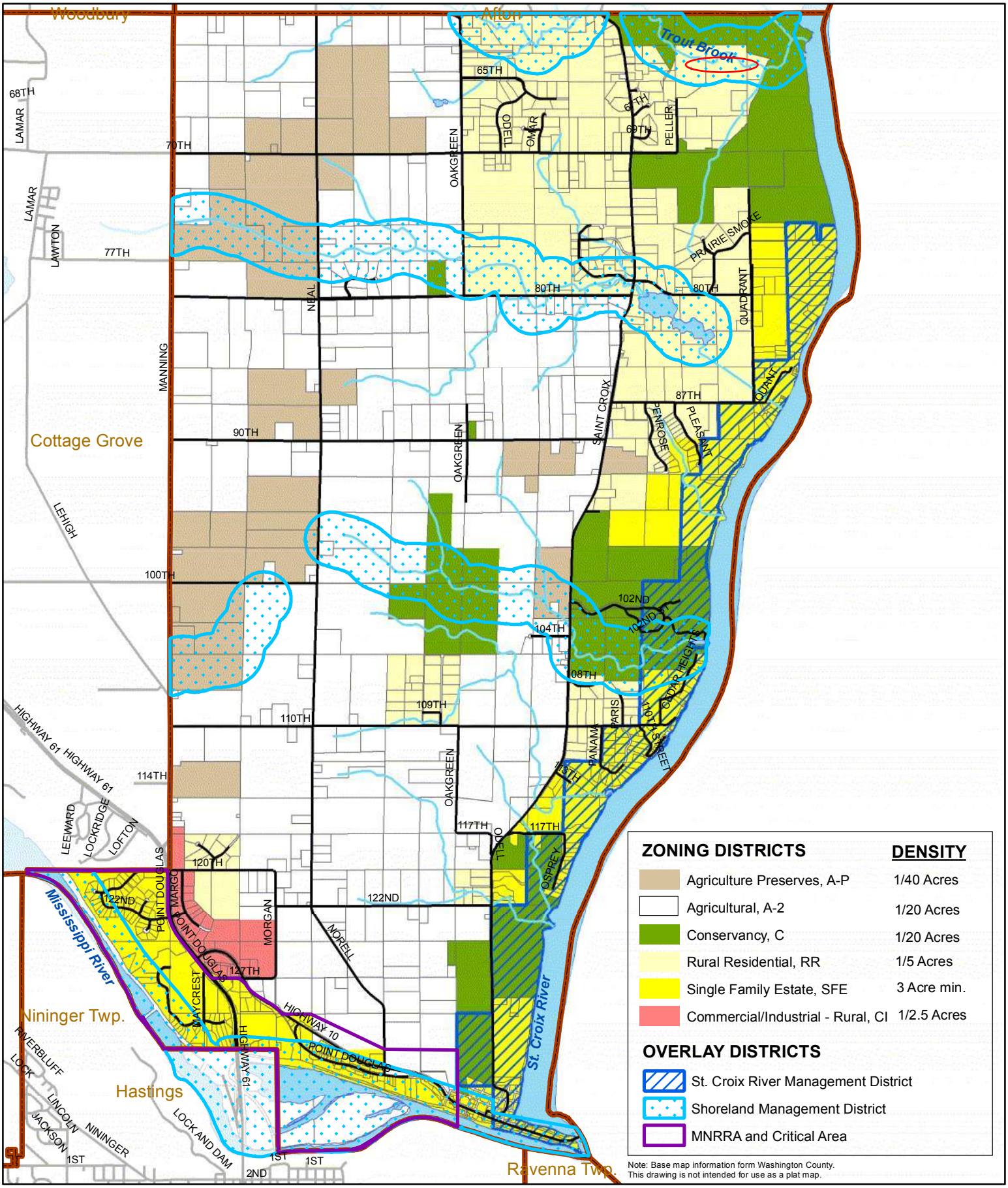
0 250 500
Feet

N
W E
S

inter·fluve

HRGreen

FIGURE 4



ZONING DISTRICTS

	DENSITY
Agriculture Preserves, A-P	1/40 Acres
Agricultural, A-2	1/20 Acres
Conservancy, C	1/20 Acres
Rural Residential, RR	1/5 Acres
Single Family Estate, SFE	3 Acre min.
Commercial/Industrial - Rural, CI	1/2.5 Acres

OVERLAY DISTRICTS

- St. Croix River Management District
- Shoreland Management District
- MNRRA and Critical Area

Note: Base map information form Washington County.
This drawing is not intended for use as a plat map.

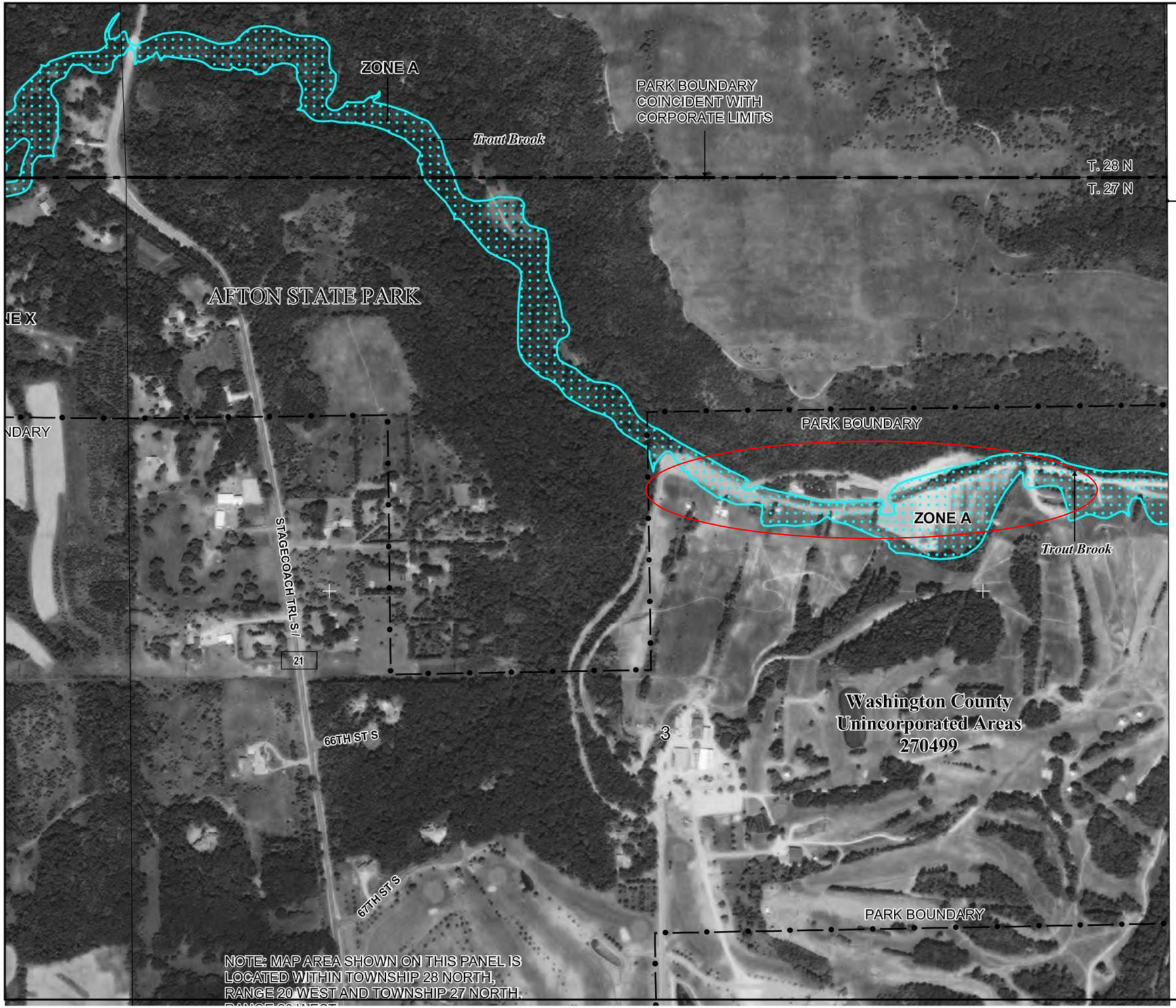
Denmark Township Zoning Map

Adopted October 3, 2011

0 0.5 1 2 Miles

TKDA
ENGINEERS • ARCHITECTS • PLANNERS

FIGURE 5



MAP SCALE 1" = 500'

250 0 500 1000 FEET

METE

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0431E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, MINNESOTA
AND INCORPORATED AREAS

PANEL 431 OF 456

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AFTON, CITY OF	275226	0431	E
WASHINGTON COUNTY	270499	0431	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
27163C0431E
EFFECTIVE DATE
FEBRUARY 3, 2010

Federal Emergency Management Agency

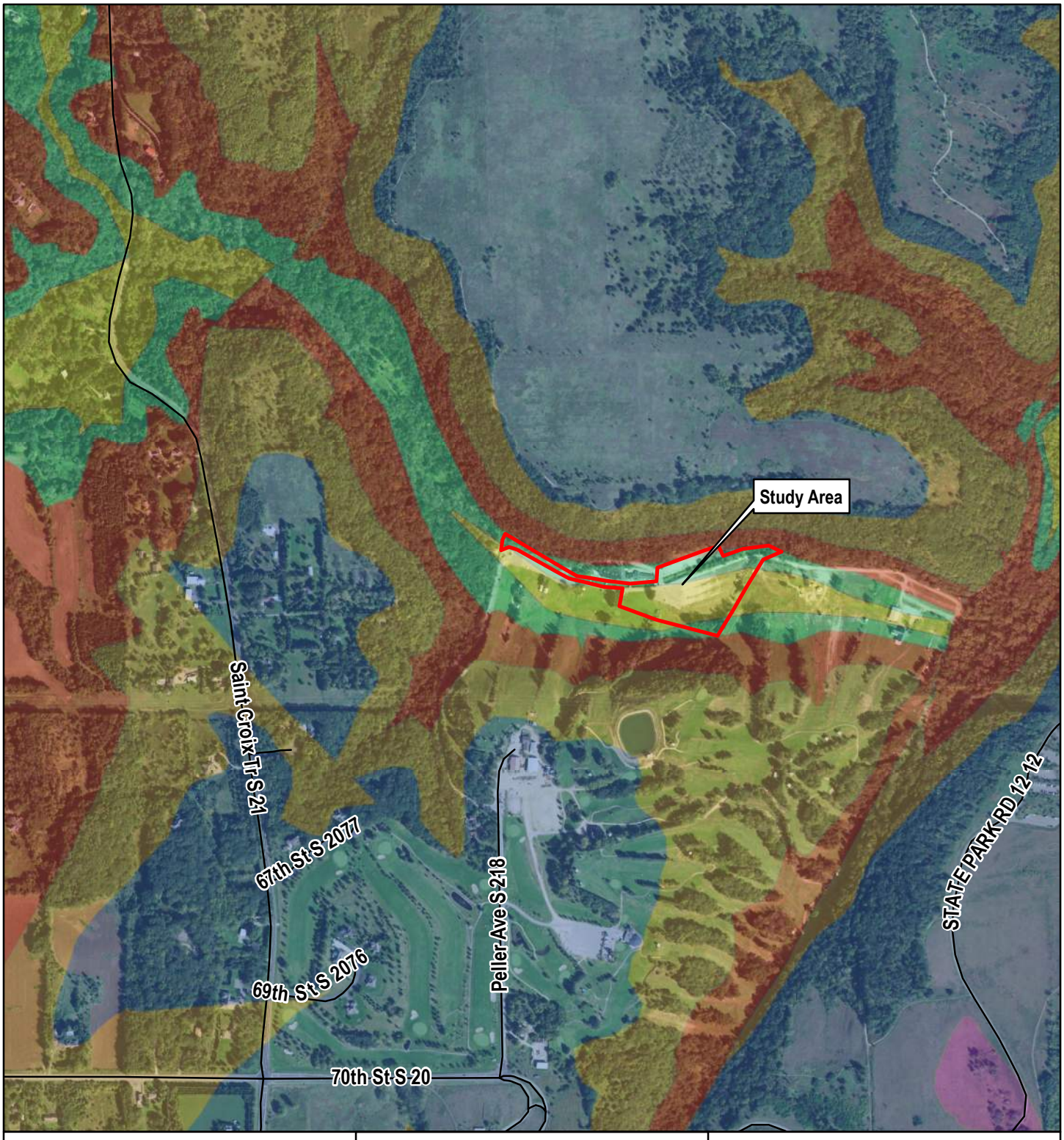


FIGURE 6

Afton Alps
Trout Brook Stream Restoration

Surficial Geology Map

Denmark Township, MN

- EAW Study Area
- Decorah Shale
- Jordan Sandstone
- Mt. Simon Sandstone
- Oneota Dolomite
- Shakopee Formation
- St. Lawrence Formation
- St. Peter Sandstone
- Tunnel City Group

Geologic Data retrieved from Minnesota Geospatial Information Office

0 500 1,000
Feet

N
W E
S

inter·fluve

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\EAW\Geology.mxd

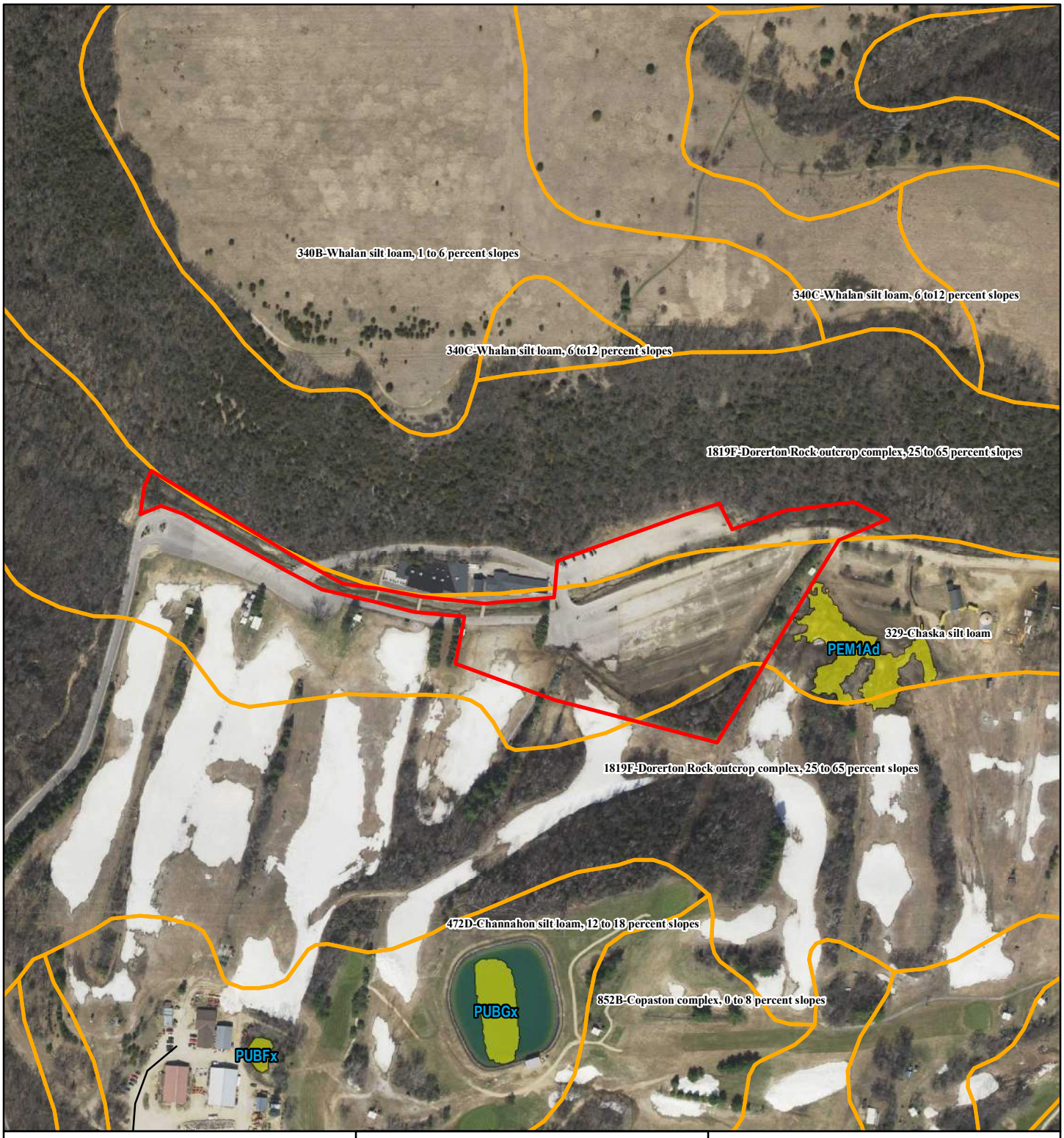


FIGURE 7

Afton Alps
Trout Brook Stream Restoration

USDA Soils/East Central NWI

Denmark Township, MN

EAW Study Area
NRCS Soil Map Units
East Central Minnesota NWI

0 225 450 Feet

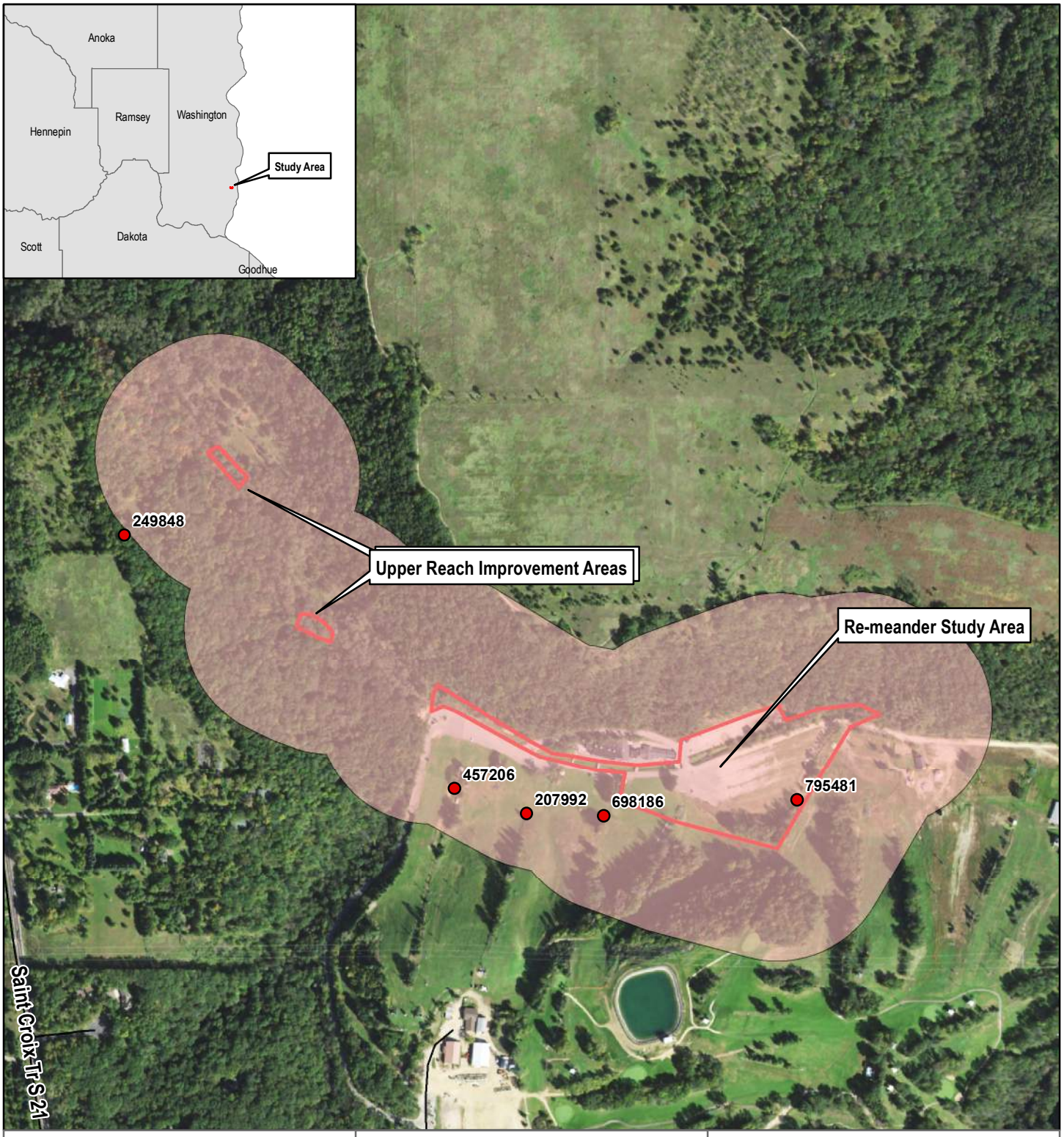
N
W E
S

inter·fluve

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\EAW\SoilsNWI.mxd

FIGURE 8



Afton Alps
Trout Brook Re-Meander

Well Index Map

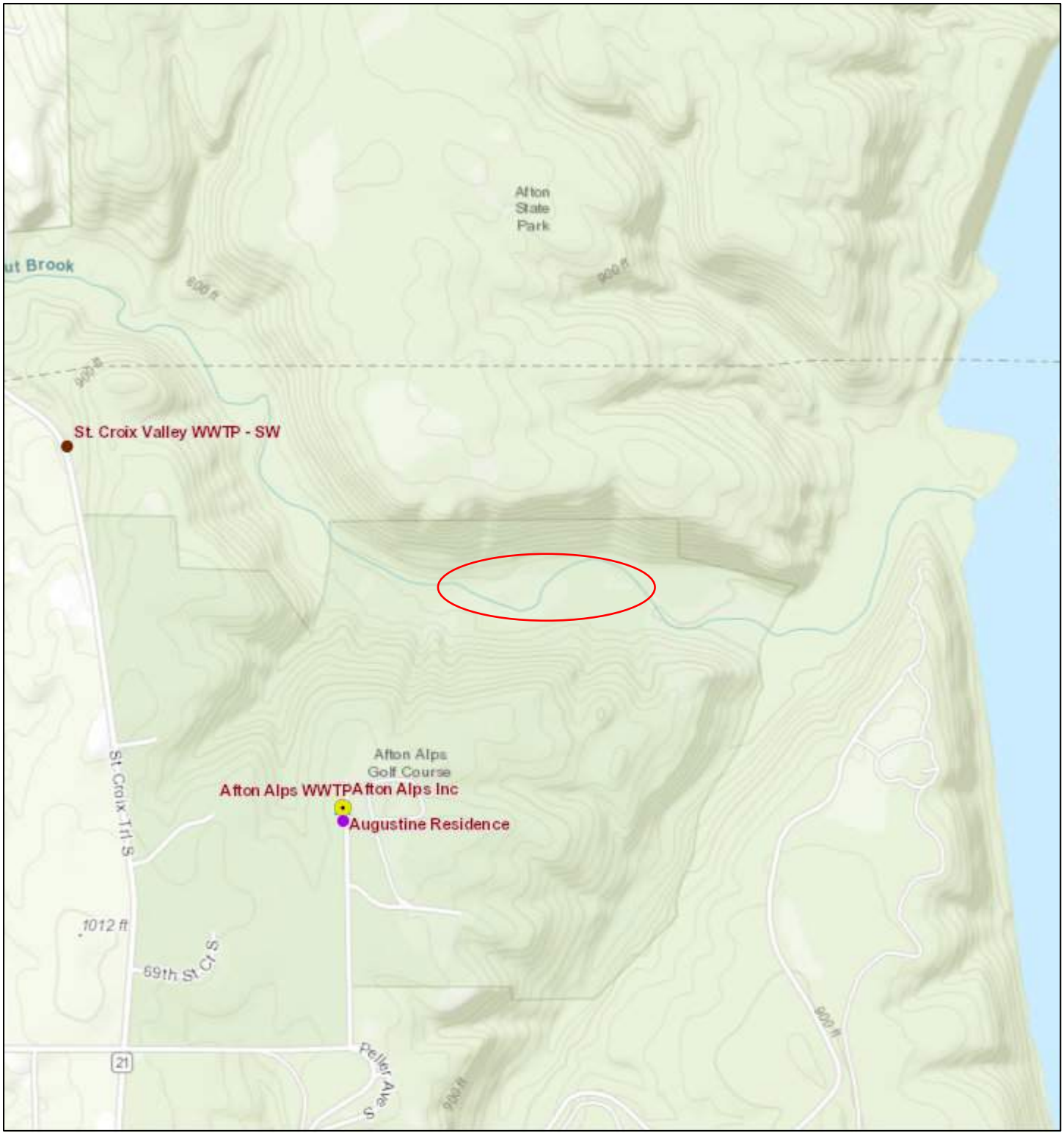
Denmark Township, MN

MWI Wells
500' Radius
EAW Study Area

N
W E
S

HRGreen

FIGURE 9



December 5, 2017

1:18,056

0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

MPCA Sites

- Multiple Programs
- Air Quality
- Environmental Review
- Feedlots
- Hazardous Waste
- Investigation and Cleanup
- Pollution Prevention
- Solid Waste
- Stormwater
- SSTS
- Tanks
- Water Quality

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

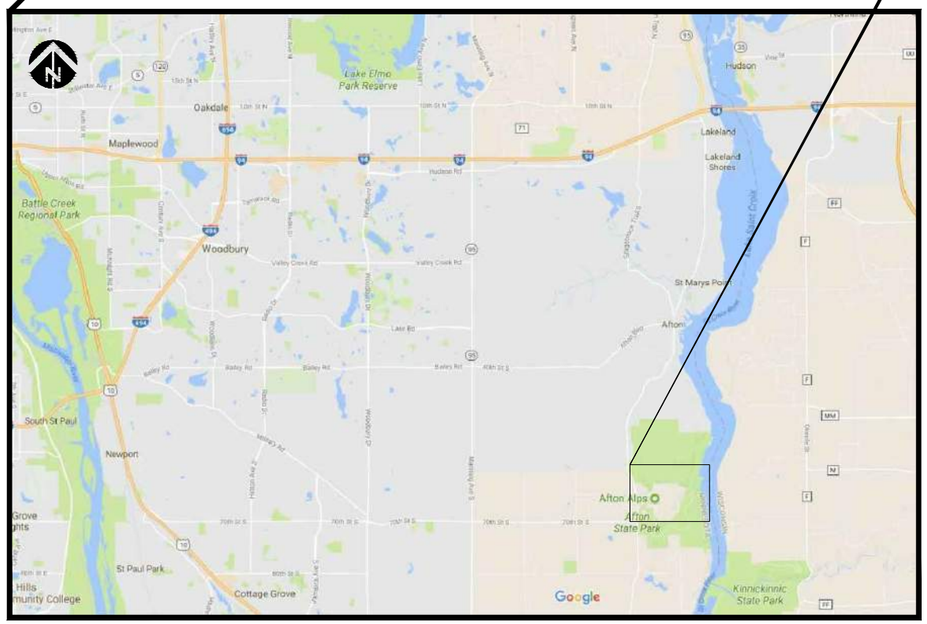
APPENDIX A: DESIGN PLANS (70 PERCENT)

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING

70% DESIGN

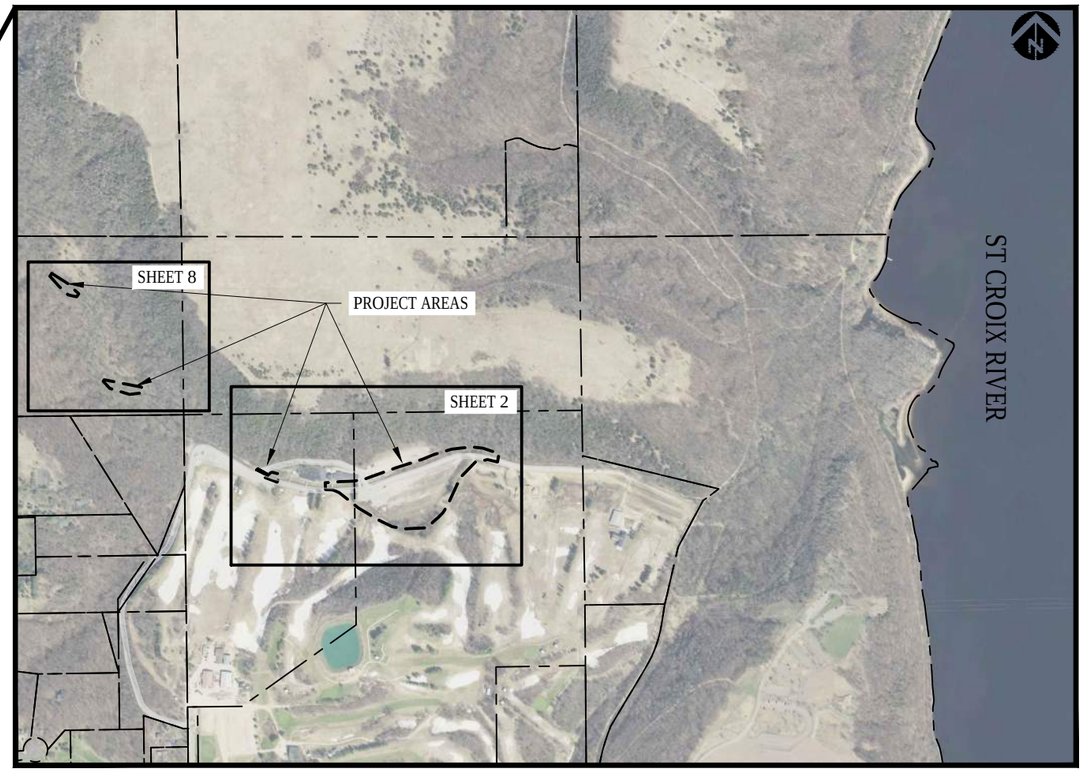
STATE MAP - MINNESOTA

NOT TO SCALE



VICINITY MAP

NOT TO SCALE



SITE MAP

SCALE 1" = 1000'

SHEET INDEX

NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter-fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: DRAFT
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

PROJECT LOCATION &
SHEET INDEX

SHEET
1 OF 23

PLAN LEGEND

- EXISTING CHANNEL ALIGNMENT
- NEW CHANNEL ALIGNMENT
- PROPERTY BOUNDARIES
- EXISTING ROADS
- LIMITS OF DISTURBANCE
- FO — EXISTING FIBER OPTIC LINE
- GAS — EXISTING EXCEL GAS
- EXISTING AFTON TELECOM/PA LINE
- TELE — EXISTING QWEST TELECOM LINE
- PLP — EXISTING PARKING LOT POWER, 4 #6 ALUM. WIRES
- SNOW — EXISTING SNOW MAKING POWER, 480 V 3 PHASE, 500
- STAGING AREA
- NEW BRIDGE
- NEW WET CROSSING
- TEMPORARY BERM
- TEMPORARY STOCKPILE
- SILT FENCE

0 120 240
SCALE IN FEET

PROPERTY BOUNDARY

SHEET 3

SHEET 4

SHEET 7

TEMPORARY STOCKPILE GRADED TO 15 FT DEPTH WITH 3:1 SLOPES

EXISTING ALIGNMENT

SILT FENCE

TEMPORARY BERM TO REMAIN IN PLACE DURING CHANNEL CONSTRUCTION

NEW BRIDGE, DETAILS. SEE SHEET C1

WET CROSSING, DETAILS TO BE INCLUDED IN FUTURE SUBMITTALS

STAGING AREA

EXISTING ROAD

FLOW

LIMITS OF DISTURBANCE

NEW ALIGNMENT

SUGGESTED CONSTRUCTION SEQUENCING

1. INSTALL ALL EROSION AND SEDIMENT CONTROL ITEMS.
2. EXCAVATE NEW CHANNEL AND FLOODPLAIN. PLACE SPOILS IN STOCKPILE AREA. INSTALL SILT FENCE AROUND PERIMETER AND SEED SEDIMENT.
3. COMPLETE UPSTREAM FLOODPLAIN AND CHANNEL WORK, SALVAGING WOOD FROM AREA.
4. INSTALL STREAMBED SUBSTRATE AND LARGE WOOD IN NEW CHANNEL.
5. REVEGETATE NEW CHANNEL AND FLOODPLAIN.
6. INSTALL NEW WET CROSSING AND NEW BRIDGE.
7. INSTALL NEW RIFFLE.
8. ALLOW NEW CHANNEL AND FLOODPLAIN TO REVEGETATE FOR AT LEAST 3 MONTHS.
9. REMOVE TEMPORARY BERMS TO ACTIVATE FLOW IN NEW CHANNEL.
10. FILL EXISTING CHANNEL WITH SPOILS.

NOTES:

ALL UTILITY LOCATIONS ARE APPROXIMATE.

CONTRACTOR MUST ALLOW 24/7 ACCESS TO THE PARKING LOT LOCATED EAST OF THE PROJECT SITE.

CONSTRUCTION SEQUENCING OUTLINES GENERAL PLAN. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature:
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

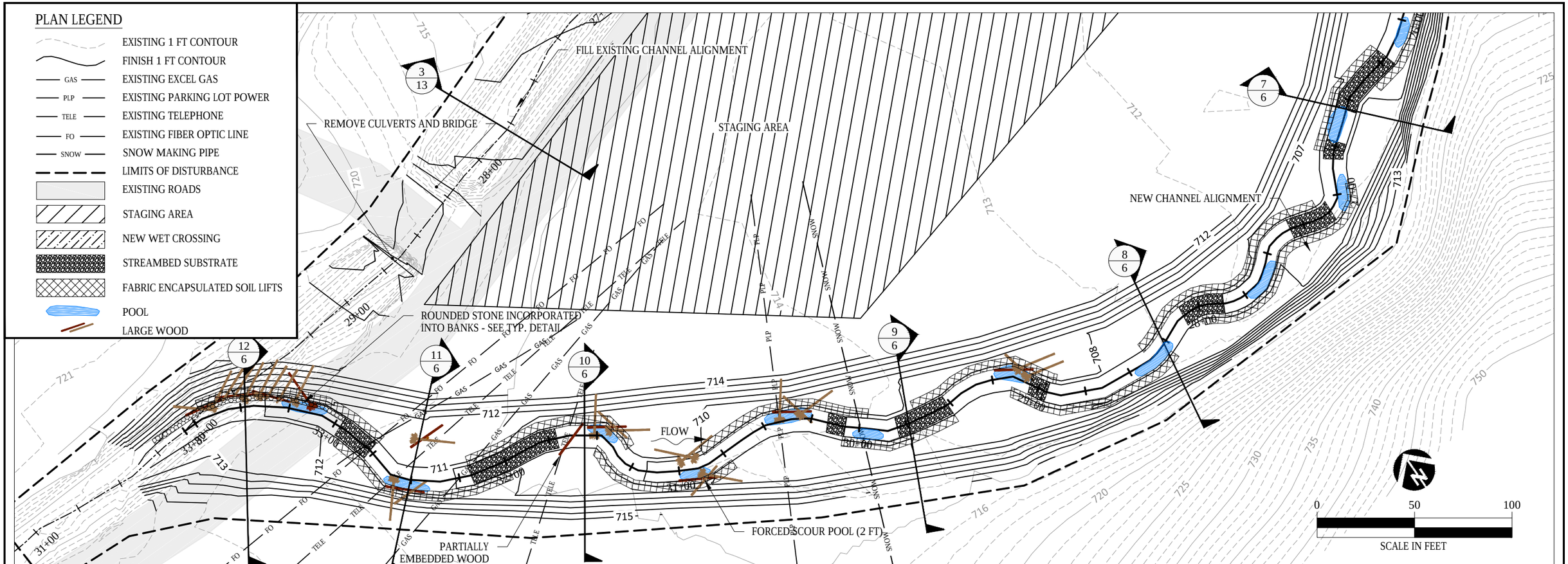
DRAFT

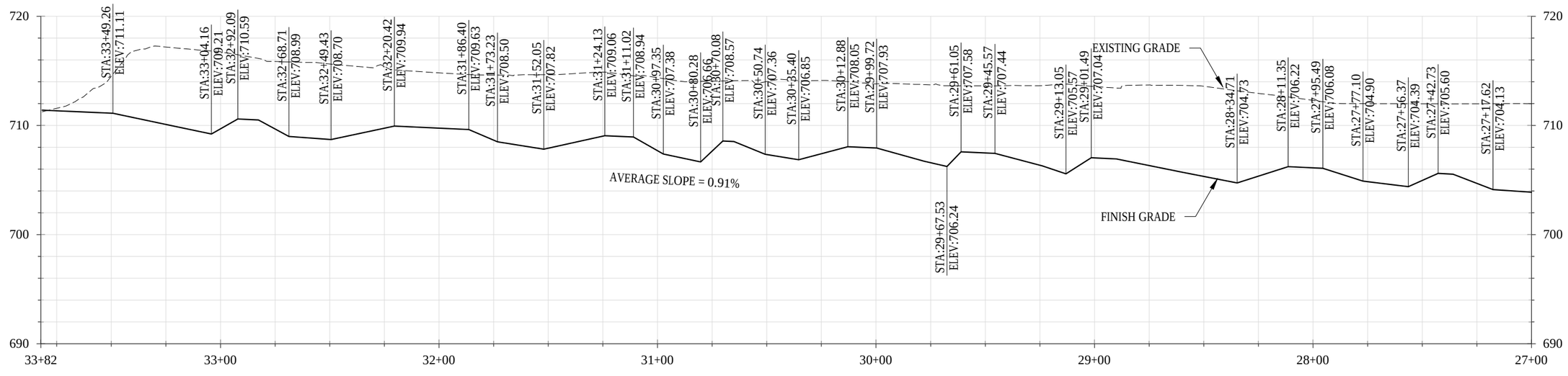
SITE PLAN & CONSTRUCTION SEQUENCING 1 OF 2

SHEET 2 OF 23

PLAN LEGEND

- EXISTING 1 FT CONTOUR
- FINISH 1 FT CONTOUR
- GAS — EXISTING EXCEL GAS
- PLP — EXISTING PARKING LOT POWER
- TELE — EXISTING TELEPHONE
- FO — EXISTING FIBER OPTIC LINE
- SNOW — SNOW MAKING PIPE
- LIMITS OF DISTURBANCE
- EXISTING ROADS
- STAGING AREA
- NEW WET CROSSING
- STREAMBED SUBSTRATE
- FABRIC ENCAPSULATED SOIL LIFTS
- POOL
- LARGE WOOD





NO.	DATE	REVISION DESCRIPTION

DRAWN	DESIGNED	CHECKED
BL,CP	MM,BL	JG
APPROVED	DATE	PROJECT
JK	12/5/2017	17-04-13

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

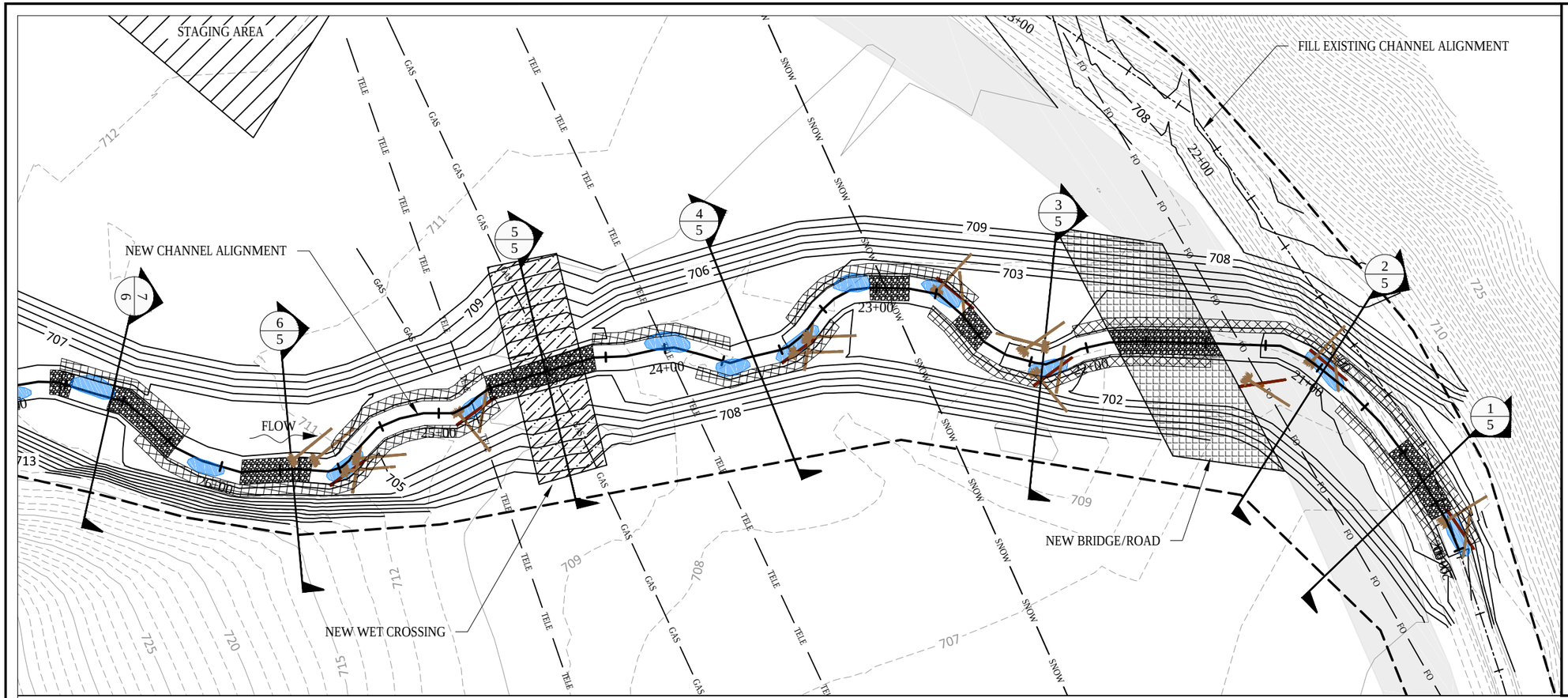
inter-fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: DRAFT
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

PLAN & PROFILE 2 OF 5

SHEET
4 OF 23

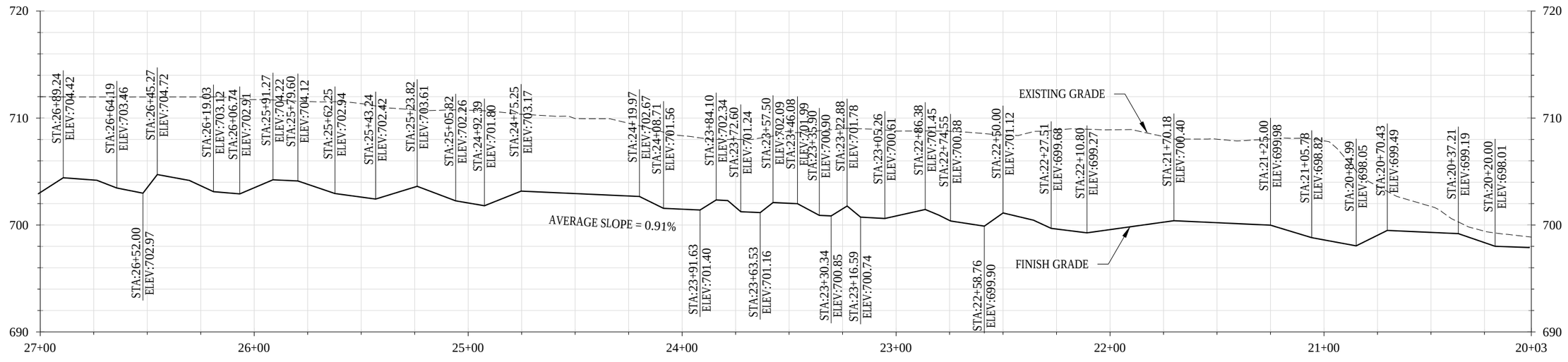


PLAN LEGEND

- EXISTING 1 FT CONTOUR
- FINISH 1 FT CONTOUR
- GAS — EXISTING EXCEL GAS
- PLP — EXISTING PARKING LOT POWER
- TELE — EXISTING TELEPHONE
- FO — EXISTING FIBER OPTIC LINE
- SNOW — SNOW MAKING PIPE
- LIMITS OF DISTURBANCE
- EXISTING ROADS
- STAGING AREA
- NEW BRIDGE
- NEW WET CROSSING
- STREAMBED SUBSTRATE
- FABRIC ENCAPSULATED SOIL LIFTS
- POOL
- LARGE WOOD

0 50 100

SCALE IN FEET



NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter-fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

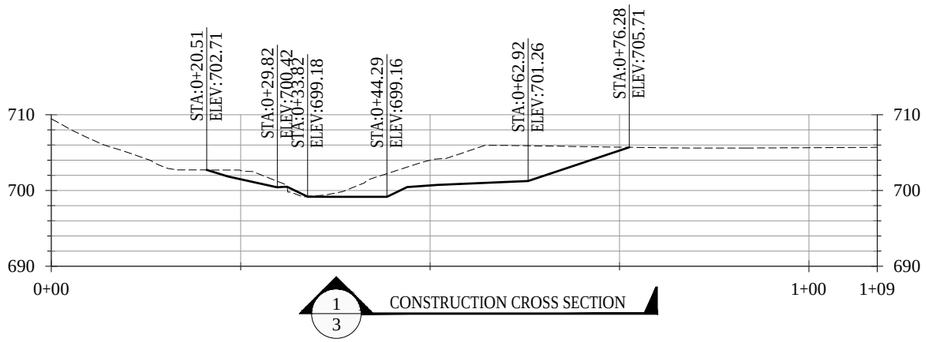
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature:
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

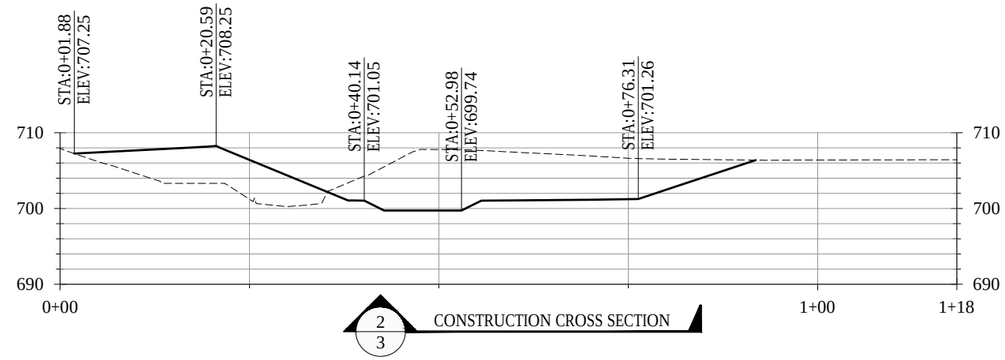
DRAFT

PLAN & PROFILE 1 OF 5

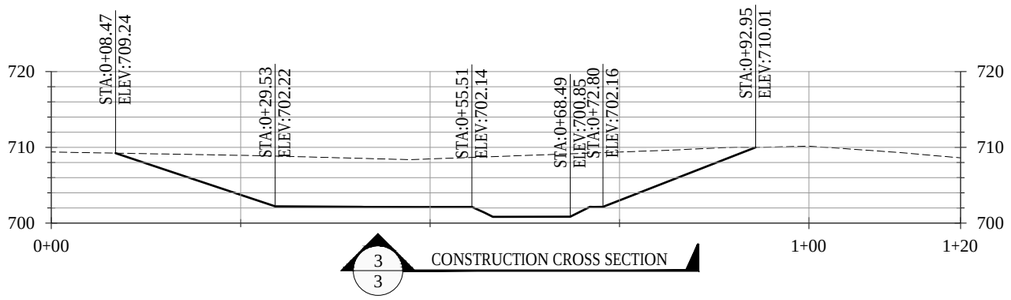
SHEET
3 OF 23



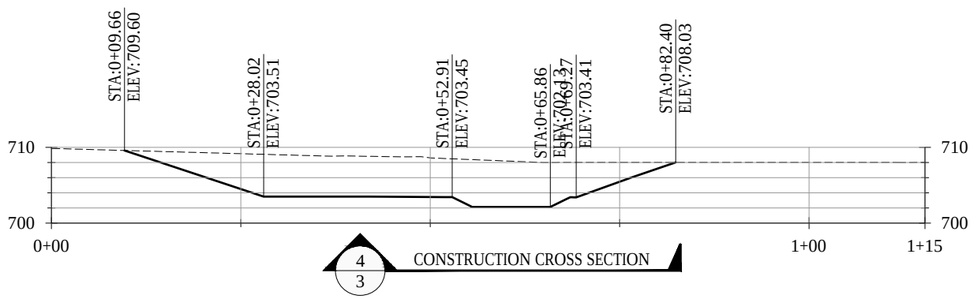
1/3 CONSTRUCTION CROSS SECTION



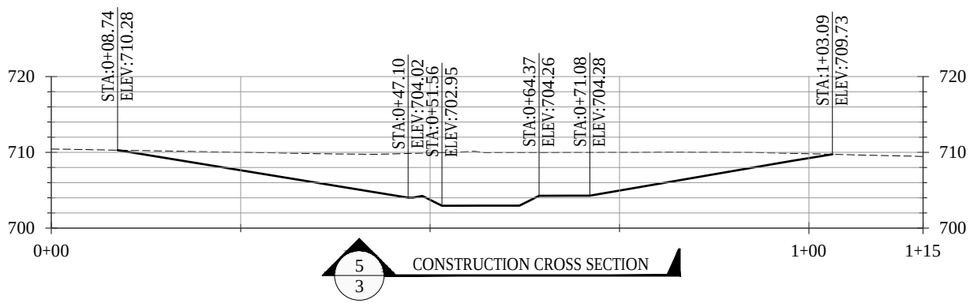
2/3 CONSTRUCTION CROSS SECTION



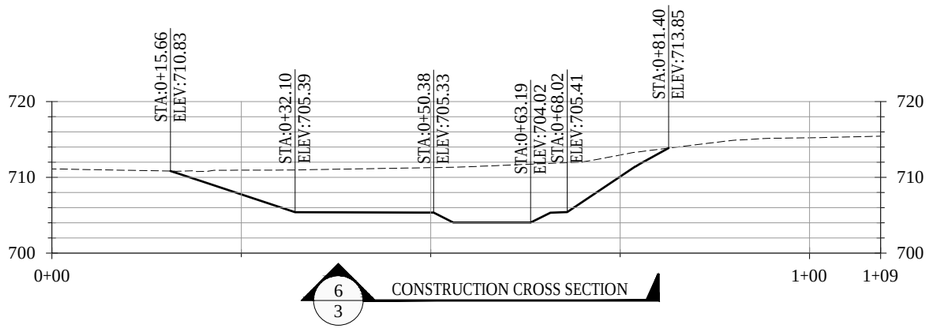
3/3 CONSTRUCTION CROSS SECTION



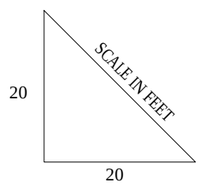
4/3 CONSTRUCTION CROSS SECTION



5/3 CONSTRUCTION CROSS SECTION



6/3 CONSTRUCTION CROSS SECTION



NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

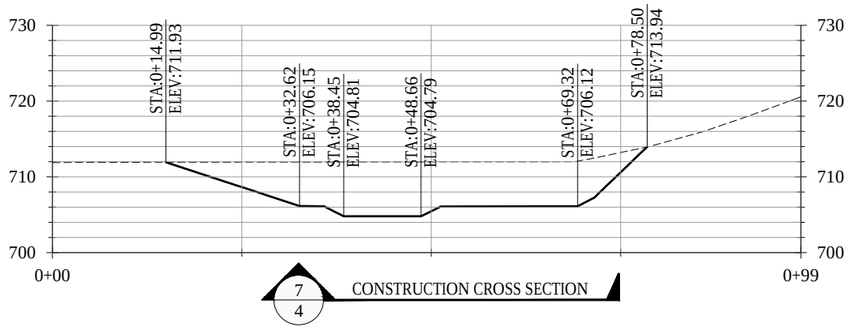
inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the state of Minnesota.

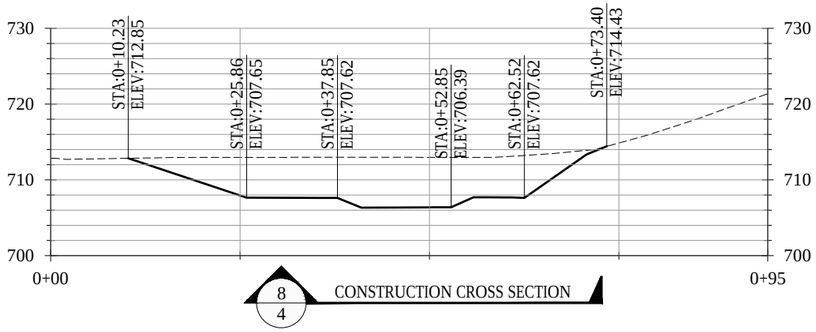
Signature: DRAFT
Typed or Printed Name: JONATHON KOSA
Date: 12/5/17 License Number: XXXXX

CONSTRUCTION CROSS SECTIONS 1 OF 4

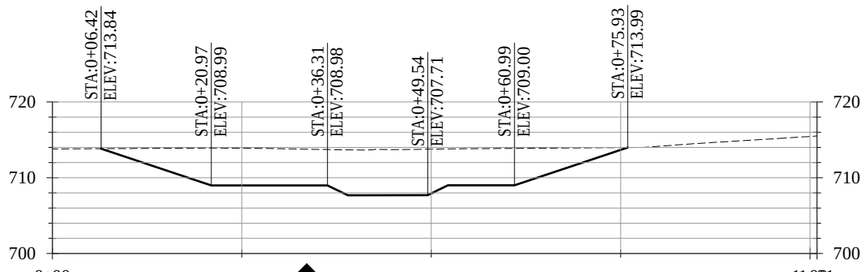
SHEET
5 OF 23



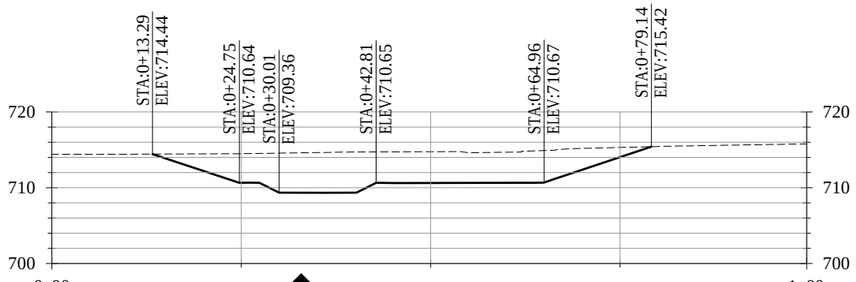
7
4
CONSTRUCTION CROSS SECTION



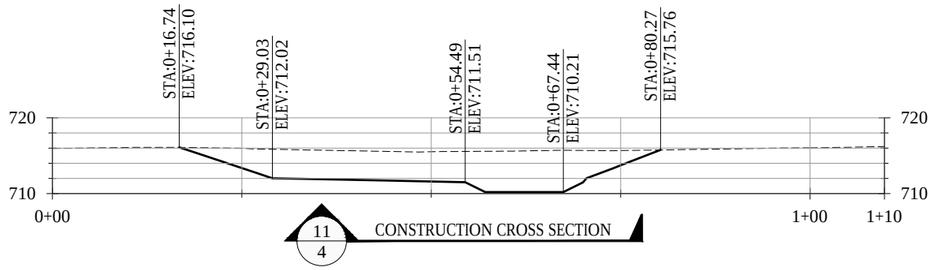
8
4
CONSTRUCTION CROSS SECTION



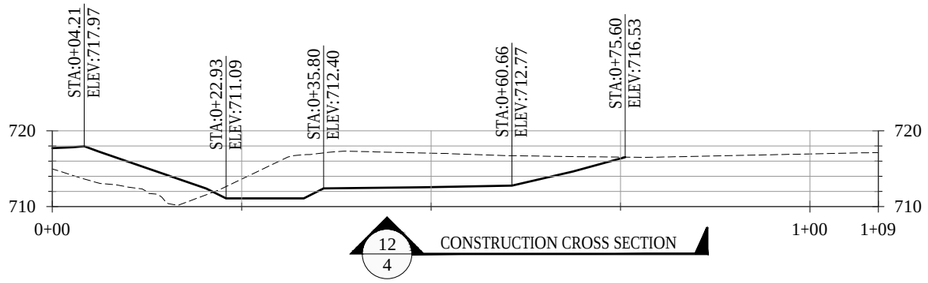
9
4
CONSTRUCTION CROSS SECTION



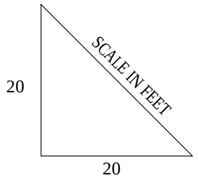
10
4
CONSTRUCTION CROSS SECTION



11
4
CONSTRUCTION CROSS SECTION



12
4
CONSTRUCTION CROSS SECTION



NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature:
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

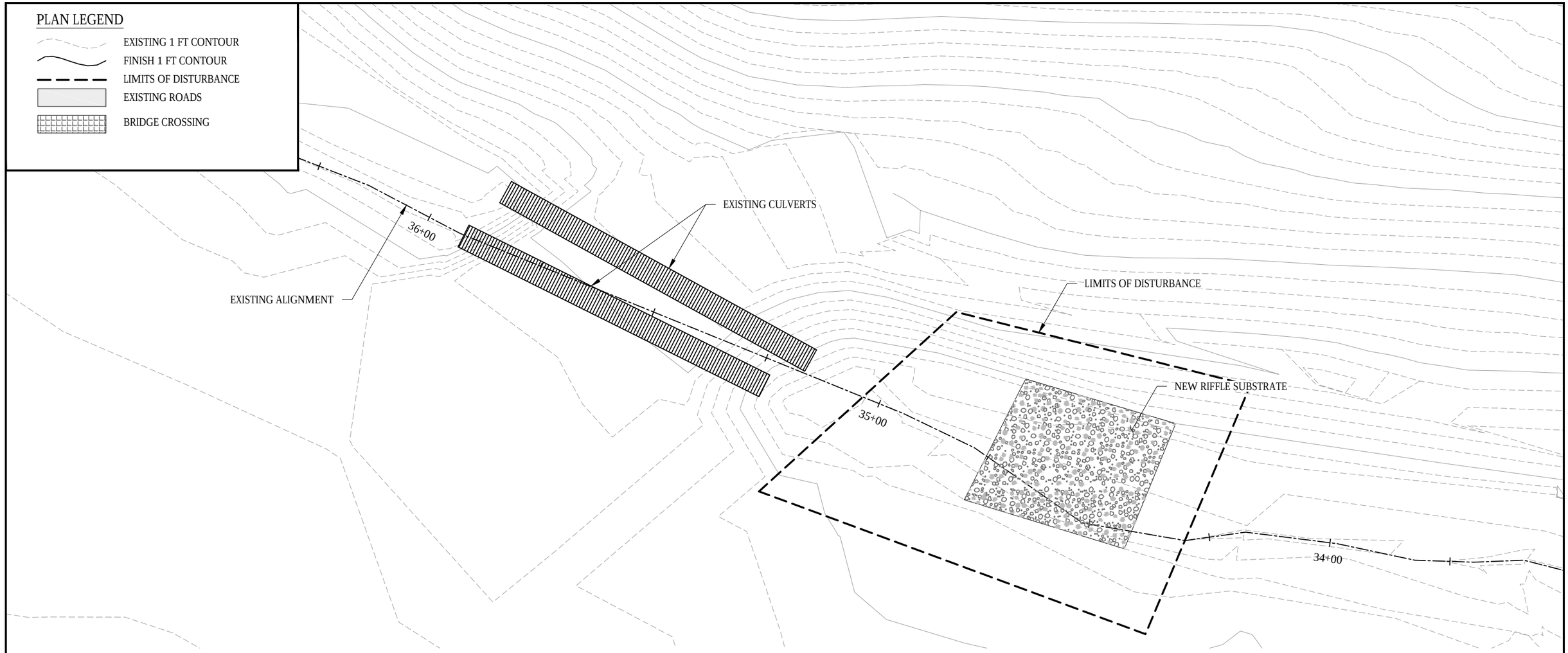
DRAFT

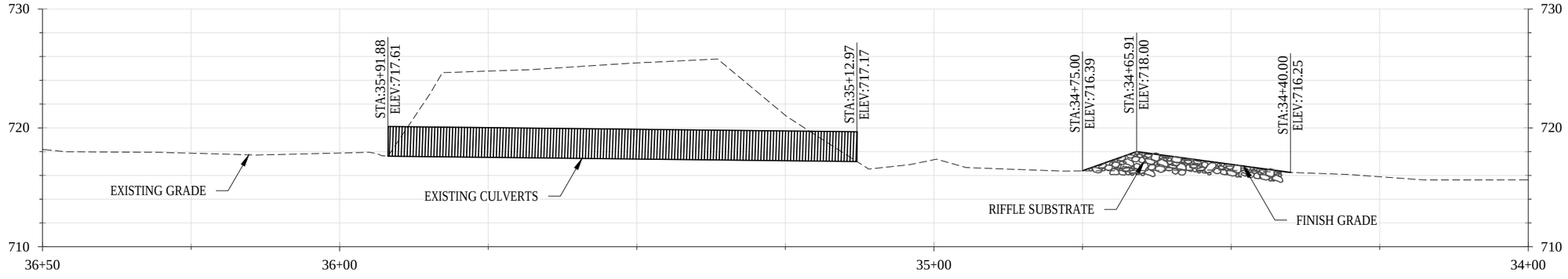
CONSTRUCTION CROSS SECTIONS 2 OF 4

SHEET
6 OF 23

PLAN LEGEND

- EXISTING 1 FT CONTOUR
- FINISH 1 FT CONTOUR
- LIMITS OF DISTURBANCE
- EXISTING ROADS
- BRIDGE CROSSING





NO.	DATE	REVISION DESCRIPTION

DRAWN	DESIGNED	CHECKED
BL,CP	MM,BL	JG
APPROVED	DATE	PROJECT
JK	12/5/2017	17-04-13

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: _____
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

DRAFT

FISH PASSAGE RIFFLE

SHEET
7 OF 23

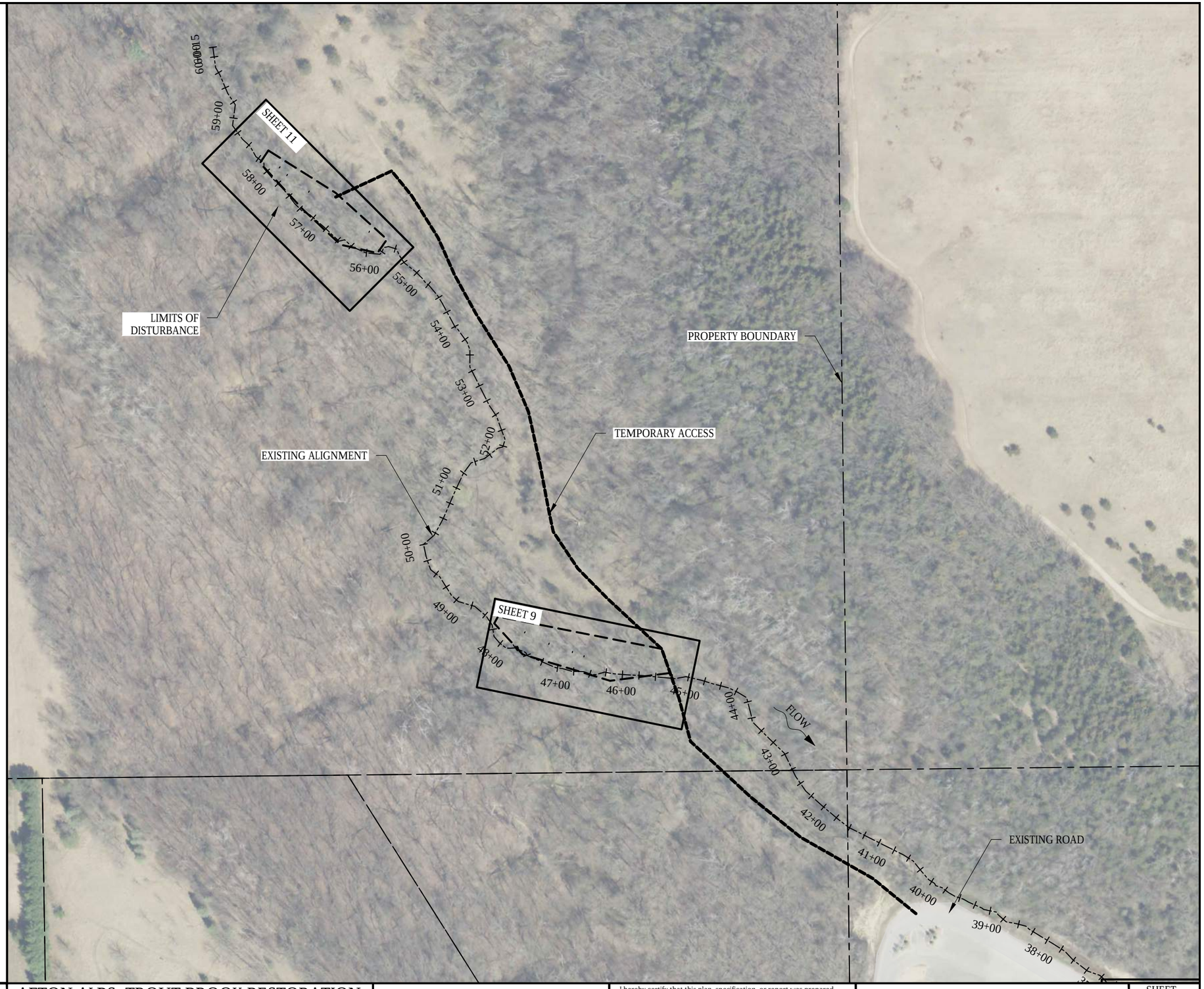
PLAN LEGEND

- EXISTING CHANNEL ALIGNMENT
- NEW CHANNEL ALIGNMENT
- PROPERTY BOUNDARIES
- TEMPORARY ACCESS ROUTE
- LIMITS OF DISTURBANCE

N

0 150 300

SCALE IN FEET



NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

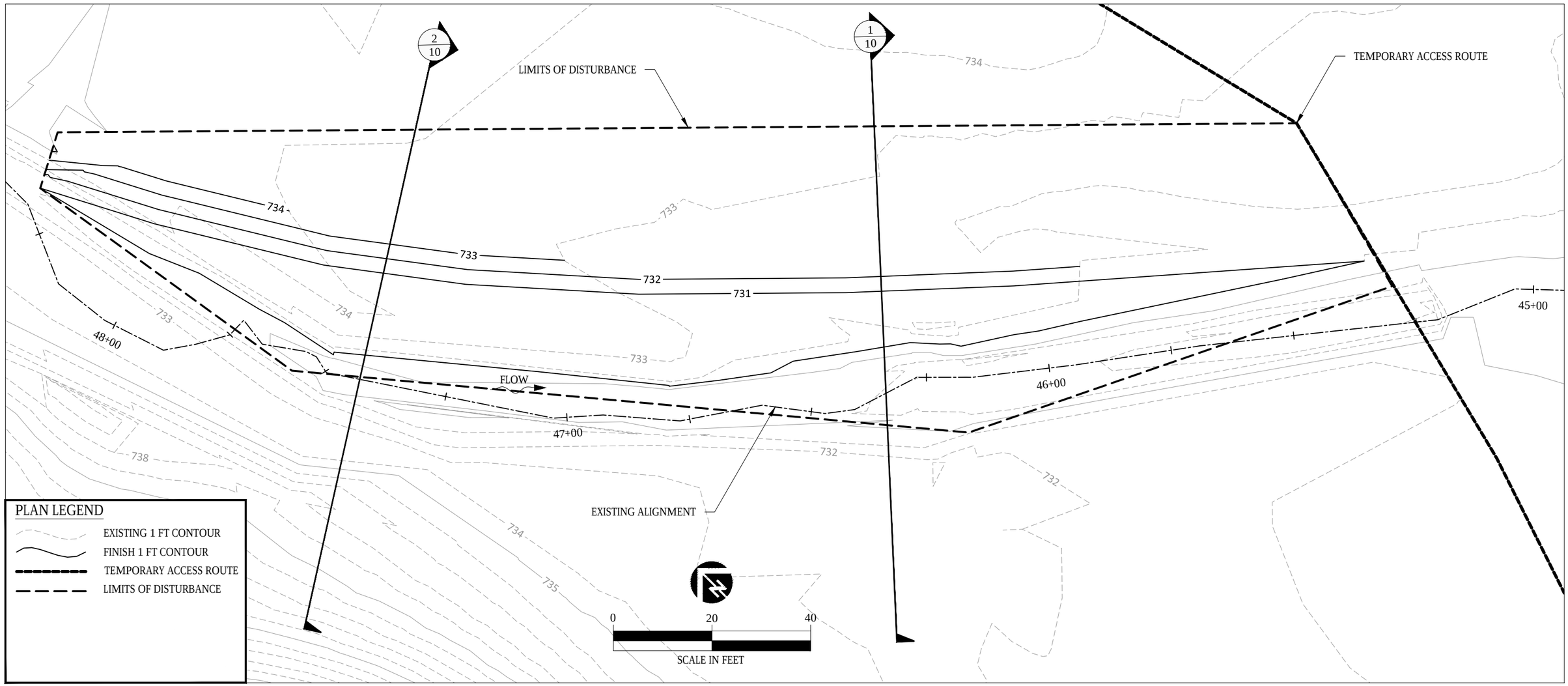
DRAFT

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: _____
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

SITE PLAN & CONSTRUCION SEQUENCING 2 OF 2

SHEET 8 OF 23



NO.	DATE	REVISION DESCRIPTION

DRAWN	DESIGNED	CHECKED
BL,CP	MM,BL	JG
APPROVED	DATE	PROJECT
JK	12/5/2017	17-04-13

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

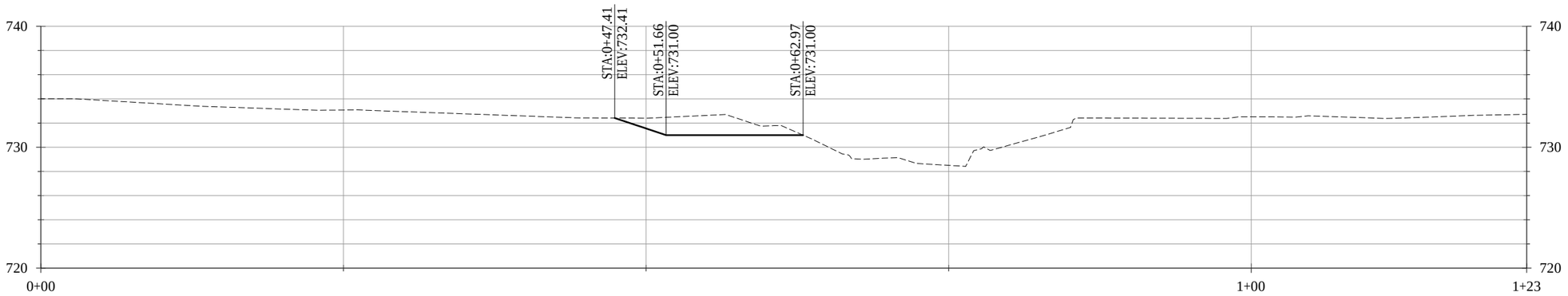
DRAFT

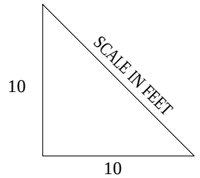
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: _____
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

PLAN 4 OF 5

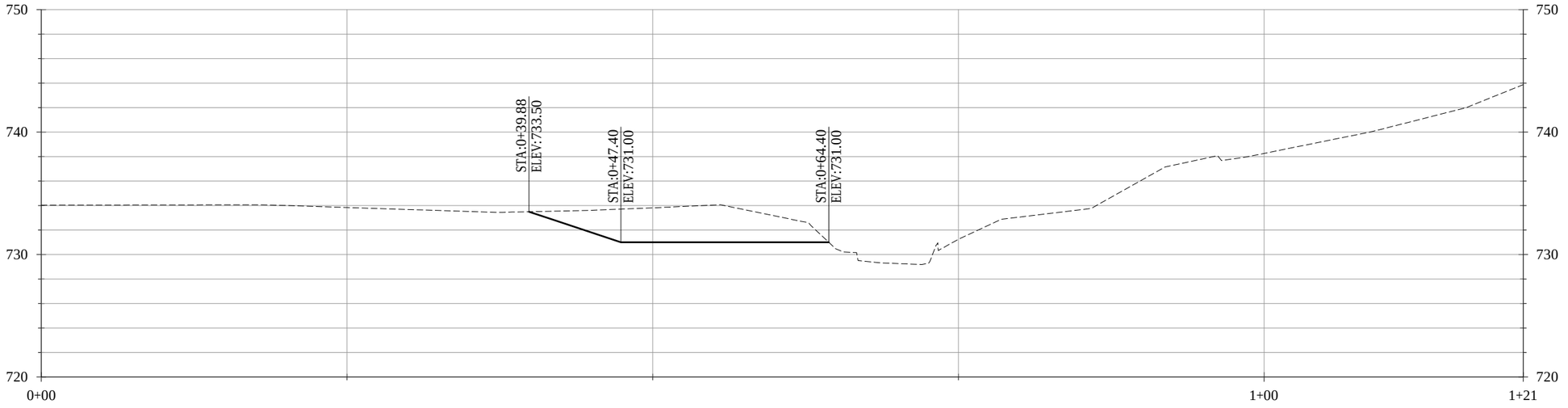
SHEET
9 OF 23





1
9

CONSTRUCTION CROSS SECTION



2
9

CONSTRUCTION CROSS SECTION

NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

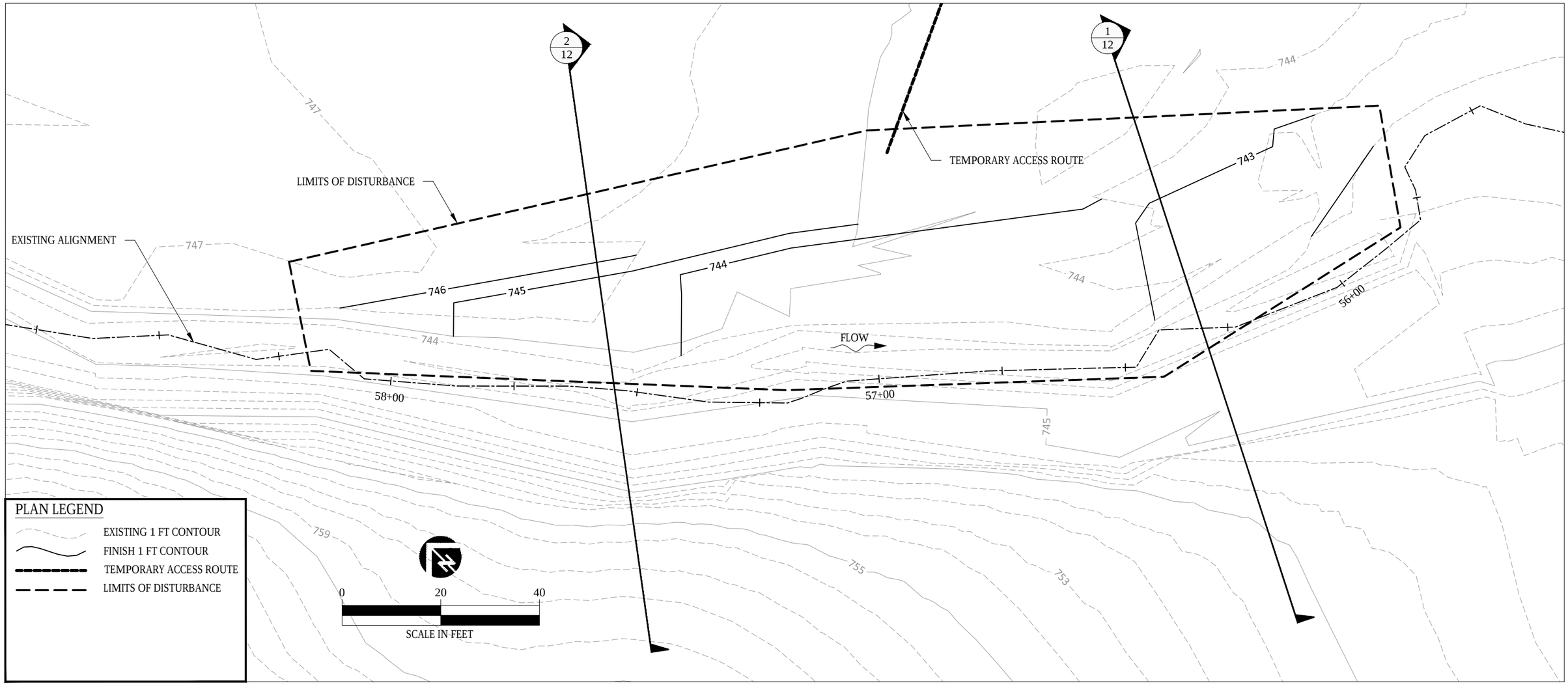
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: _____
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

DRAFT

CONSTRUCTION CROSS SECTIONS 3 OF 4

SHEET
10 OF 23



NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

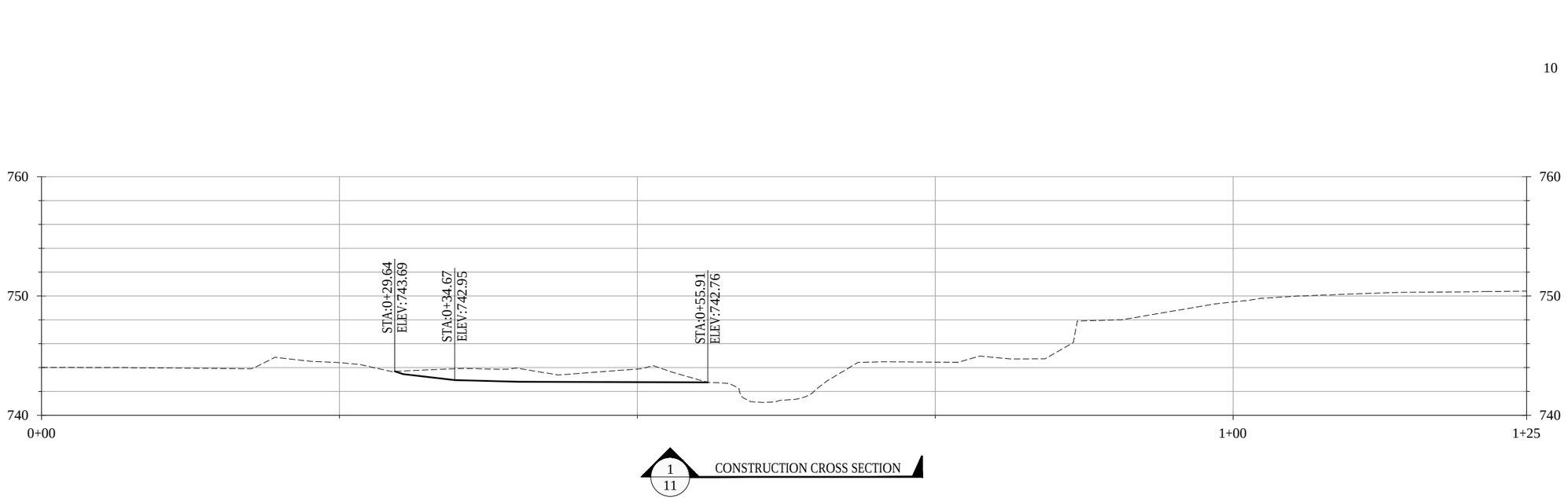
Signature: DRAFT

Typed or Printed Name: JONATHON KOSA

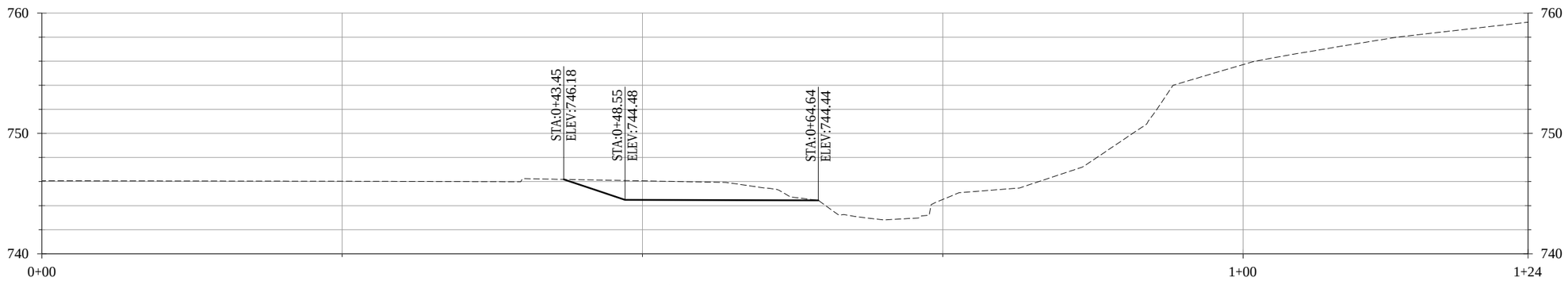
Date: 12/5/17 License Number: XXXXX

PLAN 5 OF 5

SHEET
11 OF 23



1
11
CONSTRUCTION CROSS SECTION



2
11
CONSTRUCTION CROSS SECTION

NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

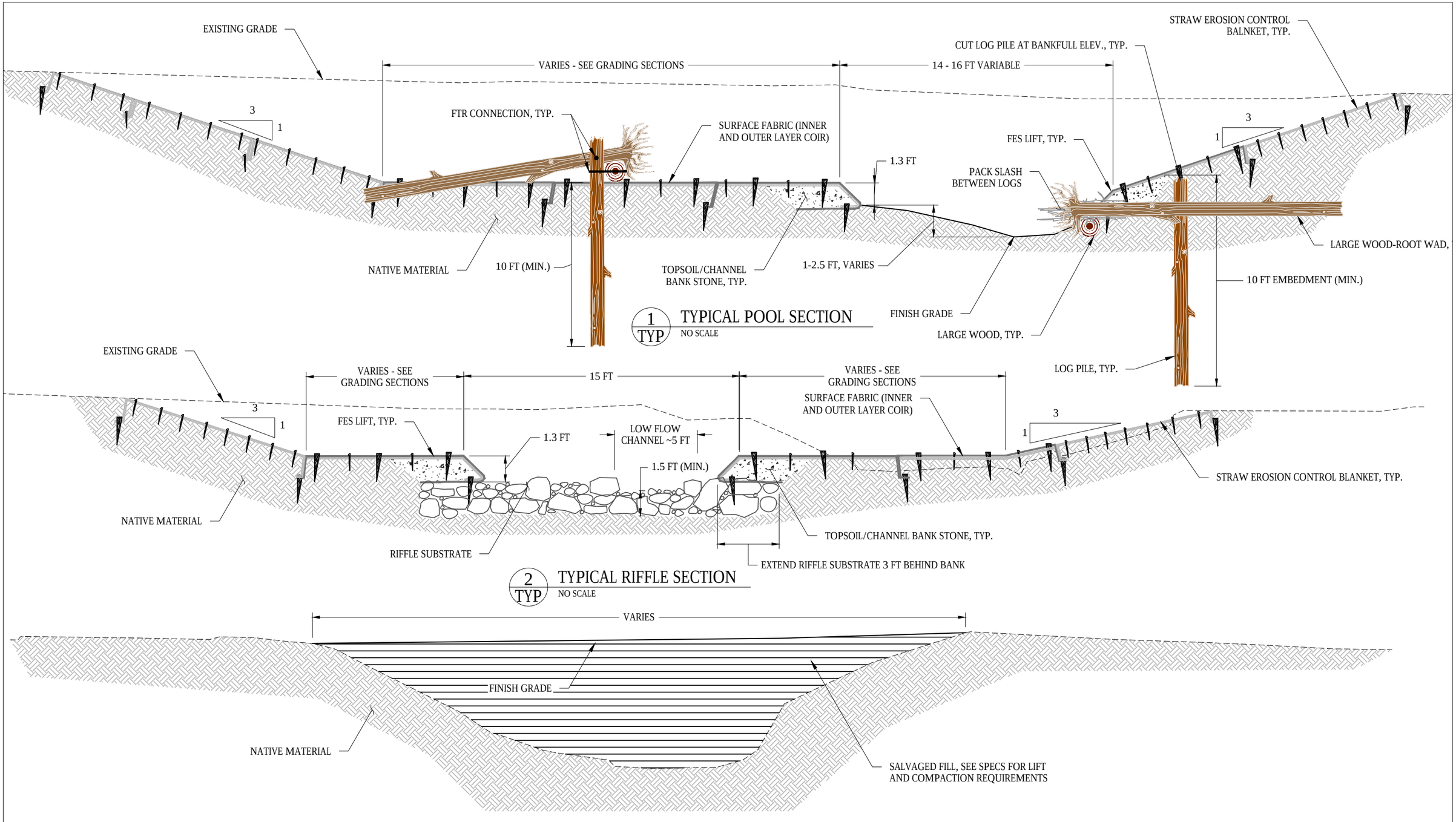
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature:
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

DRAFT

CONSTRUCTION CROSS SECTIONS 4 OF 4

SHEET
12 OF 23



NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the state of Minnesota.

Signature: _____
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

DRAFT

TYPICAL SECTIONS

SHEET
13 OF 23

RIGGING

RIGGING FOR PILE TESTING SHALL CONFORM TO THE TENSION SCALE MANUFACTURER'S RECOMMENDATIONS.

CHOKERS, CABLES AND AND SHACKLES SHALL HAVE MINIMUM WORKING LOAD RATING OF 12 TONS. FITTINGS SHALL BE SIZED ACCORDINGLY.

TESTING

TESTING OF PILES SHALL BE PERFORMED IN THE PRESENCE OF THE ENGINEER. UP TO FOUR LOAD TESTS SHALL BE APPLIED TO EACH TESTED PILE. EACH OF THE FOUR LOAD TESTS SHALL BE APPLIED TO THE PILE WITH A DIFFERENT INSTALLED DEPTH.

EACH PILE TEST SHALL HAVE UPWARD LOAD GRADUALLY INCREASED AND AS CLOSELY ALIGNED TO AXIS OF PILE AS POSSIBLE. RECORD THE PILE DIAMETER, EMBEDMENT DEPTH AND MAXIMUM FORCE REQUIRED TO MOVE THE PILE VERTICALLY APPROXIMATELY 1 INCH. THEN DRIVE THE PILE TO A NEW DEPTH TO BE DETERMINED BY THE CONTRACTOR'S ENGINEER IN CONSULTATION WITH THE ENGINEER. APPLY NEW LOAD AND RECORD MAX FORCE THAT CAUSES THE PILE TO MOVE VERTICALLY 1 INCH. REPEAT FOR THIRD AND FOURTH TEST.

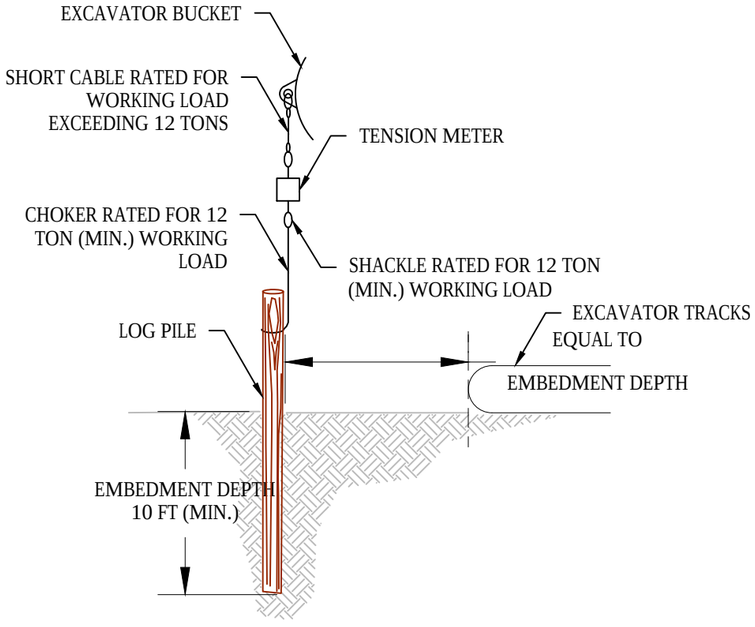
PROOF TESTS SHALL BE MADE AT UP TO FOUR EMBEDMENT DEPTHS FOR EACH PILE. DEPTHS SHALL BE DETERMINED IN THE FIELD. AS A GUIDELINE, TEST EMBEDMENT DEPTHS MAY INCLUDE 8 FT, 10 FT, 12 FT, AND 14 FT. TESTS AT 12 FT AND 14 FT WILL ONLY BE REQUIRED IF PILES MUST BE DRIVEN DEEPER THAN 10 FT TO ACHIEVE TARGET PULLOUT RESISTANCE. SEE NOTE BELOW.

EXCAVATOR CONDUCTING PULL OUT LOADING SHALL BE POSITIONED NO CLOSER THAN EMBEDMENT DEPTH OF PILE, IF POSSIBLE. IF A CLOSER POSITIONING IS REQUIRED, EXCAVATOR SHALL BE NO CLOSER THAN THAT REQUIRED TO GENERATE DESIRED LOADING WITH DISTANCE FROM PILE NOTED IN THE TEST RECORD. LIMIT COMPRESSIVE LOADING OF THE TRACKS ON THE GROUND BY DRIVING THE EXCAVATOR ONTO LOGS LAID ON THE GROUND TO DISTRIBUTE THE WEIGHT OVER A LARGER AREA.

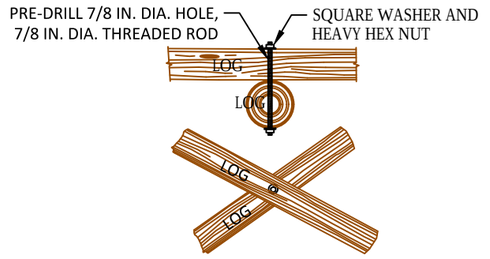
PULL OUT RESISTANCE READING SHALL BE COMPARED AGAINST EXCAVATOR MAX LIFT OFFSET TABLE.

UP TO 10% OF PRODUCTION PILINGS SHALL BE PROOF TESTED. IF RESULTS VARY MORE THAN 50% THEN IT SHOULD BE ANTICIPATED THAT UP TO 25% OF THE PRODUCTION PILINGS SHALL BE PROOF TESTED.

PILE EMBEDMENT DEPTH SPECIFIED IN THESE DRAWINGS MAY BE INCREASED, AT NO ADDITIONAL COST, PENDING COMPARISON OF PULL OUT TEST RESULTS TO AN ASSUMED RAW PULLOUT RESISTANCE OF 15,000 POUNDS. IF TESTING REVEALS FIELD PULLOUT RESISTANCE VALUES THAT ARE LESS THAN THE ASSUMED VALUES, PILES MAY BE REQUIRED TO BE DRIVEN UP TO 5 FT DEEPER THAN INDICATED. ENGINEER WILL DETERMINE WHETHER THE NUMBER OF PILES MAY BE REDUCED IF TESTING YIELDS VALUES THAT EXCEED ASSUMED VALUES, BASED ON EVALUATION OF VERTICAL PULLOUT AND LATERAL BRACING OBJECTIVES AT EACH LOCATION.



1 TYP — TYPICAL SECTION LOG PULL OUT TEST
NOT TO SCALE



2 TYP — TYPICAL DETAIL LOG-LOG CONNECTIONS
NOT TO SCALE

BOLTED CONNECTION NOTES

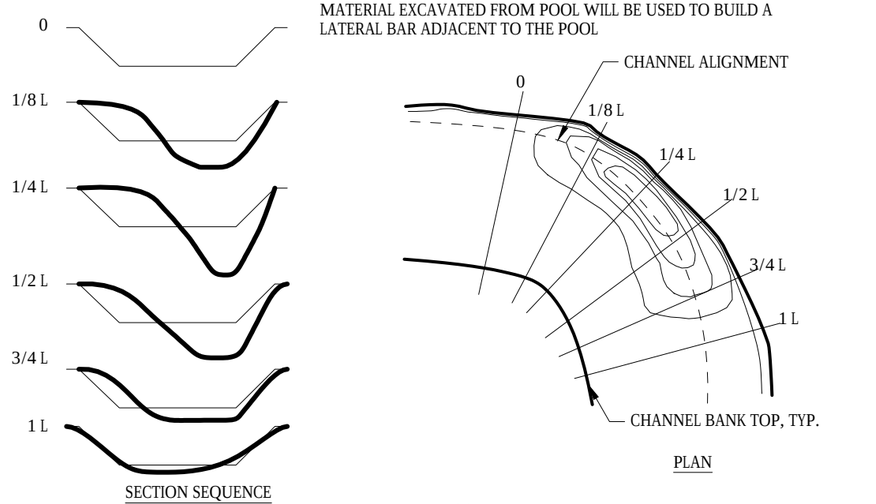
PIN LOGS TO LOGS
1. DRILL 7/8" DIA HOLE THROUGH LOGS.
2. INSERT 7/8" DIA THREADED ROD.
3. INSTALL STEEL PLATES AND HEAVY HEX NUTS. SECURE NUTS BY CHISELING THREADS OR MUSHROOMING EXPOSED ENDS OF ROD.
4. FILE OR GRIND OFF SHARP EDGES

CHANNEL GRADING DETAIL NOTES:

CONTOUR INTERVAL = 0.5 FT

L = LENGTH OF CHANNEL BEND FROM START TO END OF RADIUS ALONG CHANNEL CENTERLINE, AS DEFINED BY THE ENGINEER AT THE TIME OF CONSTRUCTION

MATERIAL EXCAVATED FROM POOL WILL BE USED TO BUILD A LATERAL BAR ADJACENT TO THE POOL



3 TYP — TYPICAL DETAIL POOL GRADING
NOT TO SCALE

NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

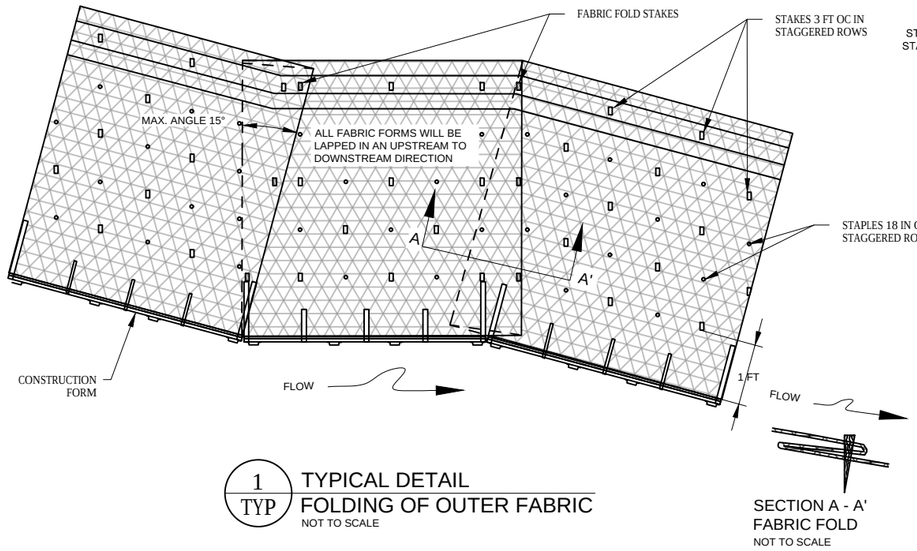
AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.
Signature: DRAFT
Typed or Printed Name: JONATHON KOSA
Date: 12/5/17 License Number: XXXXX

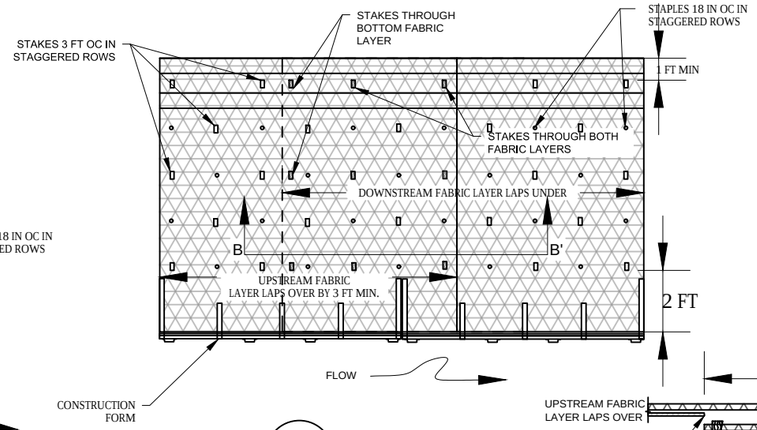
TYPICAL DETAILS POOL CONSTRUCTION AND LOG CONNECTIONS

SHEET 14 OF 23

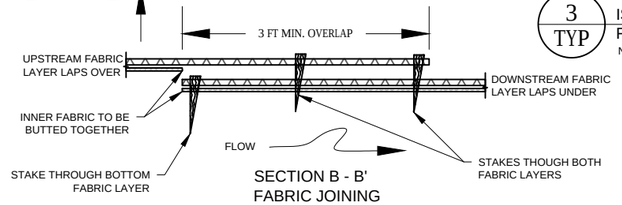


1 TYP — TYPICAL DETAIL FOLDING OF OUTER FABRIC
NOT TO SCALE

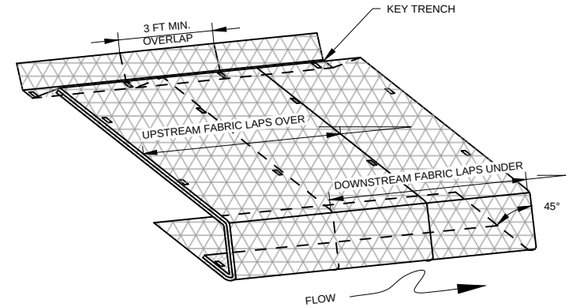
SECTION A - A'
FABRIC FOLD
NOT TO SCALE



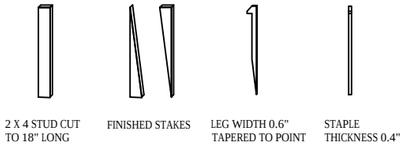
2 TYP — TYPICAL DETAIL FABRIC JOINING
NOT TO SCALE



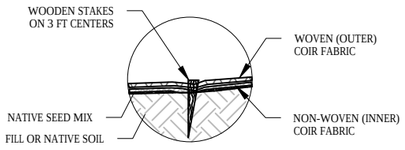
SECTION B - B'
FABRIC JOINING
NOT TO SCALE



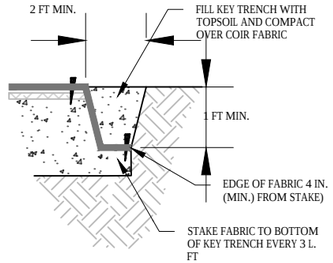
3 TYP — ISOMETRIC DETAIL FABRIC JOINING
NOT TO SCALE



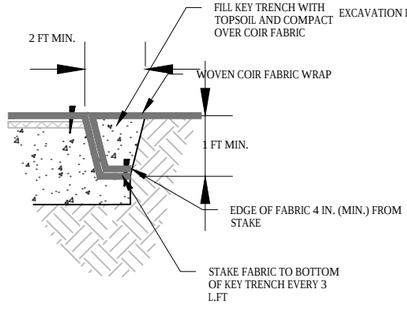
4 TYP — WOODEN STAKE AND STAPLES FABRICATING DETAIL
NOT TO SCALE



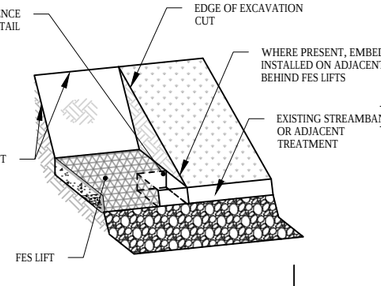
5 TYP — TOE DETAIL BIODEGRADABLE FABRICS AND STAKES
NOT TO SCALE

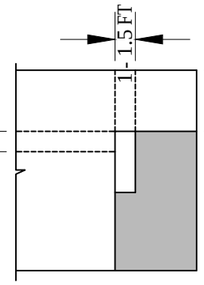


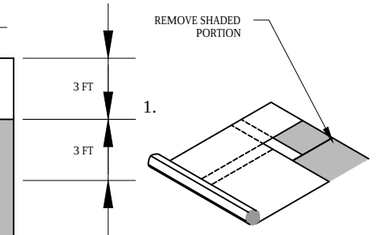
6 TYP — KEY TRENCH DETAIL TERMINATION TRENCH
NOT TO SCALE

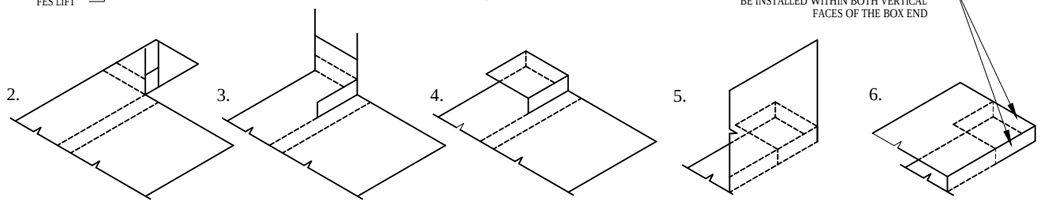


7 TYP — KEY TRENCH DETAIL TRANSITION TRENCH
NOT TO SCALE









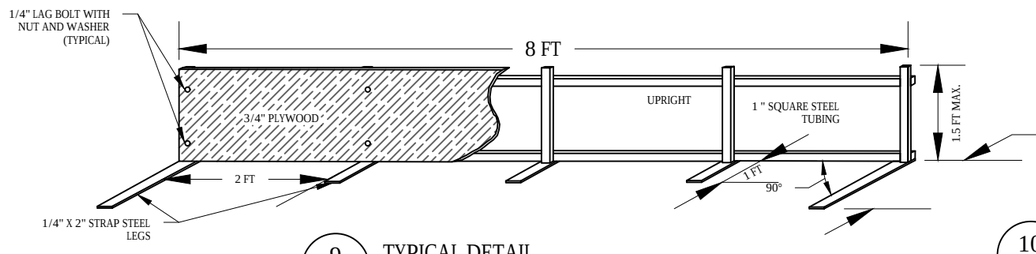
8 TYP — SUGGESTED CONSTRUCTION SEQUENCE FES LIFT - BOX ENDS
NOT TO SCALE

GENERAL NOTES ON SECURING COIR FABRIC

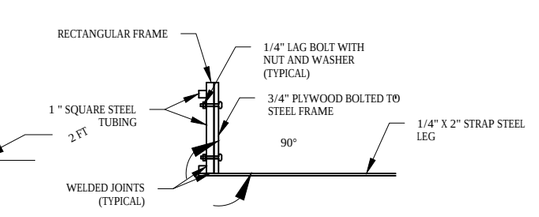
1. SECURE THE OUTER FABRIC (WOVEN, WHERE APPLICABLE), WITH A WOODEN STAKE THROUGH THE FABRIC ON 3 FT CENTERS (SEE DETAIL VIEW 2)
NOTE: THE HOLES FOR STAKES SHALL NOT BE PRECUT. ALLOW THE STAKE TO BREAK THE MINIMUM NUMBER OF STRANDS AS IT IS BEING DRIVEN IN. DRIVE STAKES SO THAT 2" TO 3" OF THE TOP OF THE STAKE IS LEFT EXPOSED.

2. OUTER FABRIC ENDS SHALL BE JOINED BY LAPPING THE UPSTREAM PIECE OF FABRIC OVER THE DOWNSTREAM PIECE AS SHOWN IN SECTION B-B. OVERLAPS SHALL BE A MINIMUM OF 3 FT, INNER FABRIC ENDS SHALL BE BUTTED TOGETHER, NOT OVERLAPPED. OVERLAPS SHALL BE STAGGERED FROM LIFT TO LIFT BY A MINIMUM OF 15 FT.

3. STAKE AND STAPLE SPACING IS DEFINED IN SPECIFICATIONS FOR FES LIFT AND SURFACE FABRIC.



9 TYP — TYPICAL DETAIL STREAM BANK CONSTRUCTION FORM - FES LIFT
NOT TO SCALE



10 TYP — TYPICAL DETAIL STREAM BANK CONSTRUCTION FORM - FES LIFT
NOT TO SCALE

NO.	DATE	REVISION DESCRIPTION

DRAWN	DESIGNED	CHECKED
BL,CP	MM,BL	JG
APPROVED	DATE	PROJECT
JK	12/5/2017	17-04-13

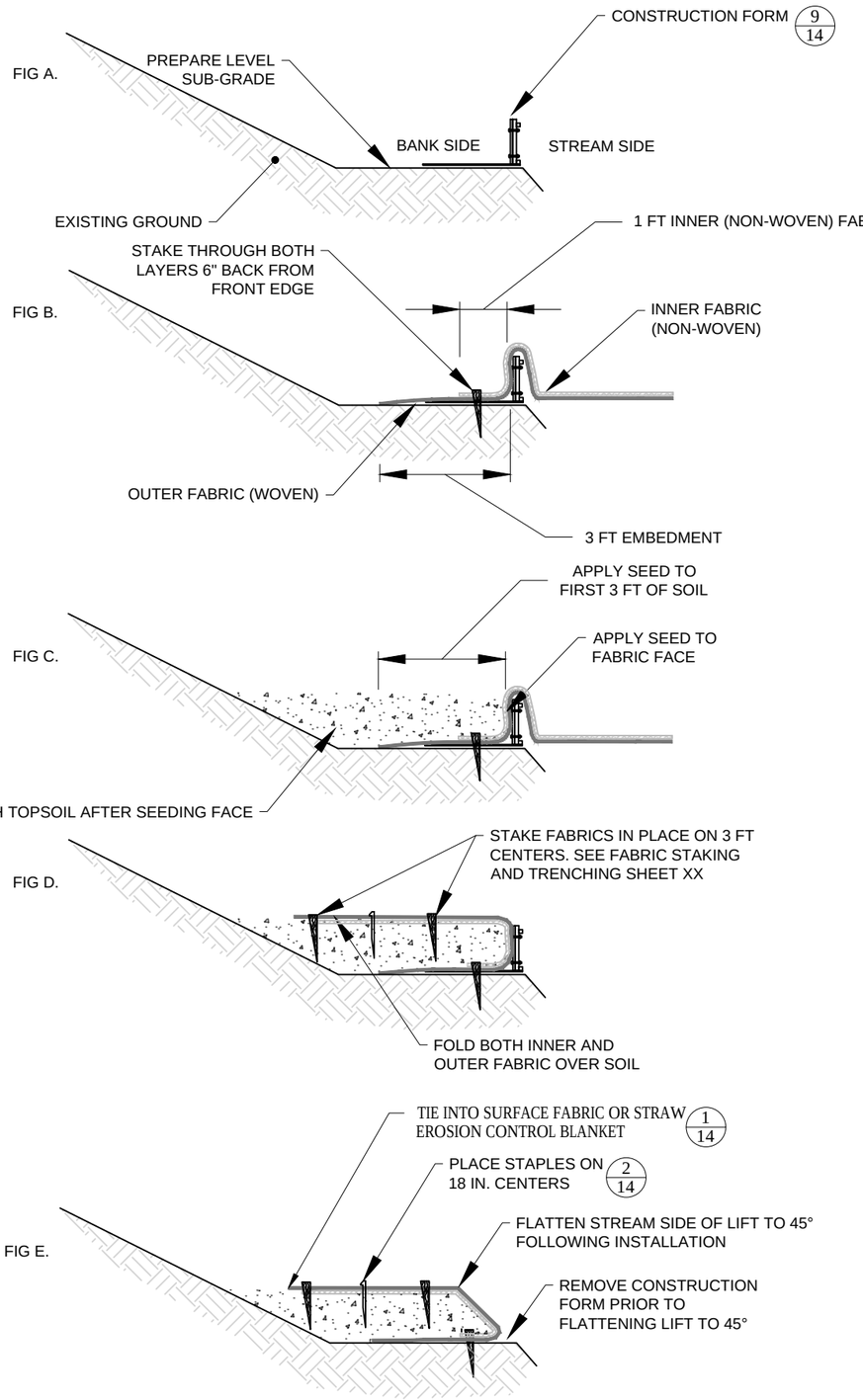
AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.
Signature: DRAFT
Typed or Printed Name: JONATHON KUSA
Date: 12/5/17 License Number: XXXXX

TYPICAL DETAILS FES LIFTS

SHEET
15 OF 23



GENERAL INSTRUCTIONS FOR FABRIC ENCAPSULATED LIFTS

1. BANKS MAY BE CONSTRUCTED IN EITHER AN UPSTREAM OR DOWNSTREAM DIRECTION, AS LONG AS THE FABRIC IS OVERLAPPED IN THE PROPER DIRECTION.
2. PLACE A SERIES OF THREE OR MORE FORMS ON THE GROUND SO THAT THE FORMS FOLLOW THE PROPOSED STREAM BANK ALIGNMENT. BUTT THE ENDS OF THE FORMS TIGHTLY TOGETHER.
3. UNROLL THE OUTER FABRIC PARALLEL TO THE LONG AXIS OF THE CHANNEL AND POSITION IT SO THAT 3 FEET EXTENDS FOR EMBEDMENT ON THE BANK SIDE OF THE FORMS (FIG B), AND A MINIMUM 3 FEET EXTENDS LENGTHWISE BEYOND THE LAST FORM FOR OVERLAP. DRAPE THE REMAINDER OF THE FABRIC OVER THE TOP OF THE FORMS ON THE STREAM SIDE (FIG B).
4. UNROLL THE INNER FABRIC OVER THE TOP OF THE WOVEN COIR FABRIC (FIG B) AND POSITION IT SO THAT AT LEAST 1 FOOT OF THE INNER FABRIC EXTENDS AS AN EMBEDMENT LENGTH ON THE BANK SIDE OF THE FORMS (FIG C). DRAPE THE REMAINDER OF THE FABRIC OVER THE TOP OF THE FORMS ON THE STREAM SIDE AND ALIGN THE LONG EDGES OF THE FABRICS. STRETCH AND PULL THE FABRIC LAYERS TO REMOVE WRINKLES.
5. APPLY NATIVE SEED MIX TO INNER FABRIC ALONG VERTICAL EDGE OF LIFT (FIG C). PLACE TOPSOIL/CHANNEL BANK STONE OVER THE FABRIC ON THE BANK SIDE OF THE FORMS. LEVEL THE FILL AND COMPACT TO 85-90 PERCENT RELATIVE COMPACTION (FIG C).
6. APPLY NATIVE SEED MIX TO TOP OF FILL (FIG C).
7. FOLD THE LOOSE ENDS OF THE TWO COIR FABRIC LAYERS BACK OVER THE COMPACTED FILL MATERIAL AND STRETCH TIGHTLY TO REMOVE WRINKLES (FIG D). SECURE WITH WOODEN STAKES 1 PER 3 L.F. ALONG THE BACK EDGE AND INTO UNDISTURBED SOIL.
8. REMOVE THE FORMS FROM THE FRONT OF THE COMPLETED LIFTS (FIG. 2). LEAVE THE LAST FORM IN PLACE AT THE END OF THE NEWLY CONSTRUCTED LIFT (FIG. 2).
9. WHERE THE TOP OF THE LIFT MEETS THE GROUND SURFACE, EXCAVATE A KEY TRENCH 1 FOOT DEEP ALONG THE EDGE OF THE OUTER FABRIC LAYER, PARALLEL TO THE FORMS. SEED ENTIRE AREA OF TOP LIFT. SECURE FABRIC IN THE TRENCH WITH WOODEN STAKES, 3 FT O.C. TO TRANSITION TO EITHER SURFACE FABRIC OR STRAW EROSION CONTROL BLANKET.
10. SUPPLEMENT LIFT STAKING WITH ADDITIONAL WOODEN STAPLES ON 18" CENTERS EXCEPT WHERE WOODEN STAKES HAVE ALREADY BEEN PLACED.

SUGGESTED SEQUENCE FOR PLACEMENT OF FORMS

PROFILE VIEW LOOKING INTO BANK

FIG 1. PLACE A ROW OF CONSTRUCTION FORMS ALONG DESIRED CHANNEL ALIGNMENT FOR FIRST FES LIFT.

FIG 2. CONSTRUCT FES LIFTS ALONG LENGTH OF FIRST SET OF FORMS AND THEN BEGIN PLACEMENT OF FORMS AND CONSTRUCTION OF SECOND LIFT.

NO.	DATE	REVISION DESCRIPTION

BL,CP	MM,BL	JG
DRAWN	DESIGNED	CHECKED
JK	12/5/2017	17-04-13
APPROVED	DATE	PROJECT

AFTON ALPS, TROUT BROOK RESTORATION
GREAT RIVER GREENING
WASHINGTON COUNTY, MN

inter·fluve
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

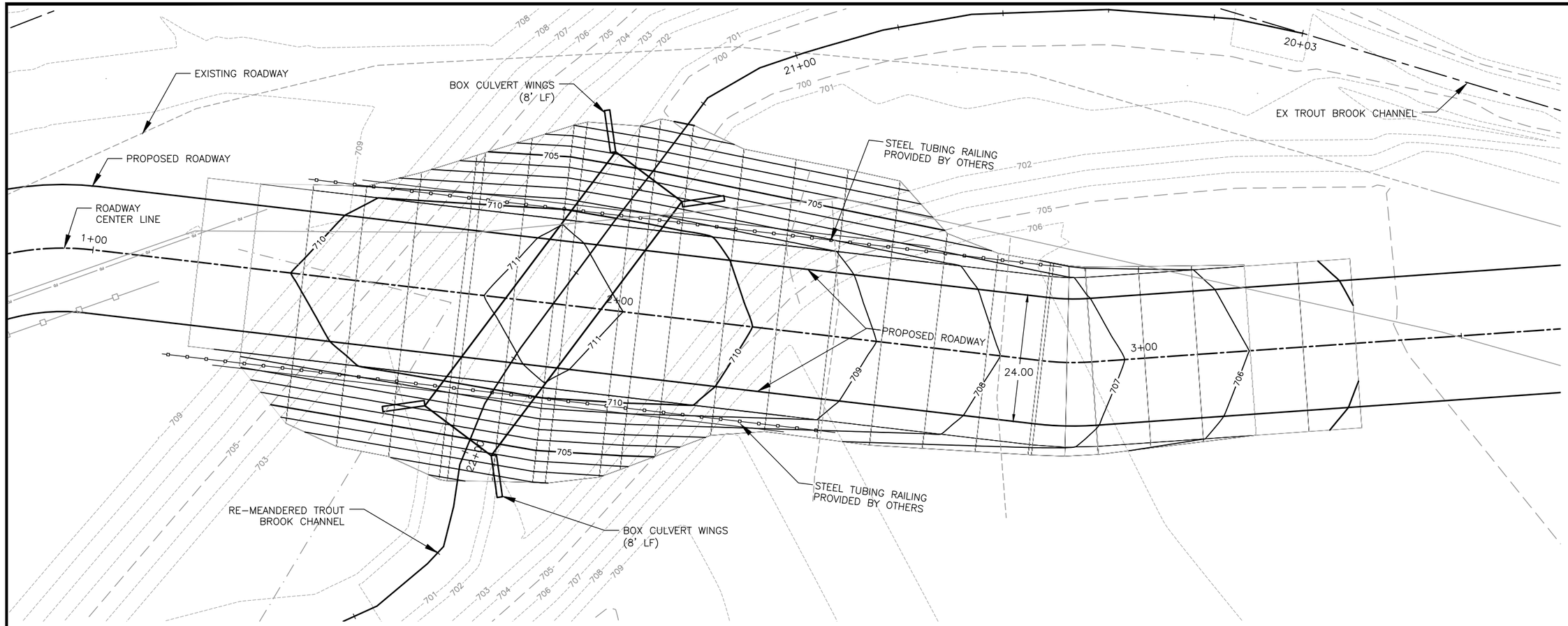
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: _____
Typed or Printed Name: JONATHON KOSA
Date: 12/5/17 License Number: XXXXX

DRAFT

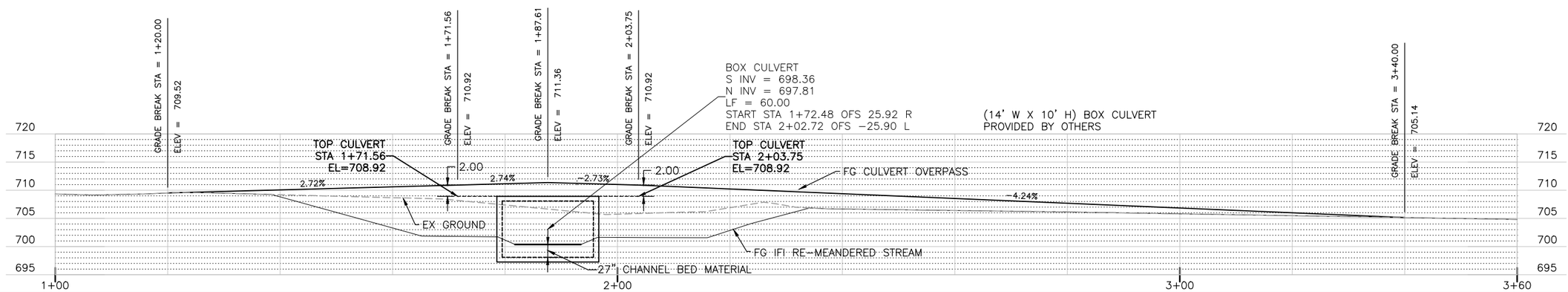
TYPICAL DETAILS FES LIFTS

SHEET
16 OF 23



NOTES:

1. CONTOURS SHOWN IN GRAY REFLECT THE EX CONTOURS MODIFIED FOR THE PLANNED CHANNEL RE-MEANDERING.



PRELIMINARY

NOT FOR CONSTRUCTION

DRAWN BY: JJC JOB DATE: 2017
APPROVED: JRH JOB NUMBER: 170327
CAD DATE: 12/5/2017 6:41:20 PM
CAD FILE: J:\2017\170327\CAD\Dwgs\C\C1.dwg

NO.	DATE	BY	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE:

DATE: 11-30-2017 JORDAN R HOREJSI REG. NO. 52241

HRGreen.com

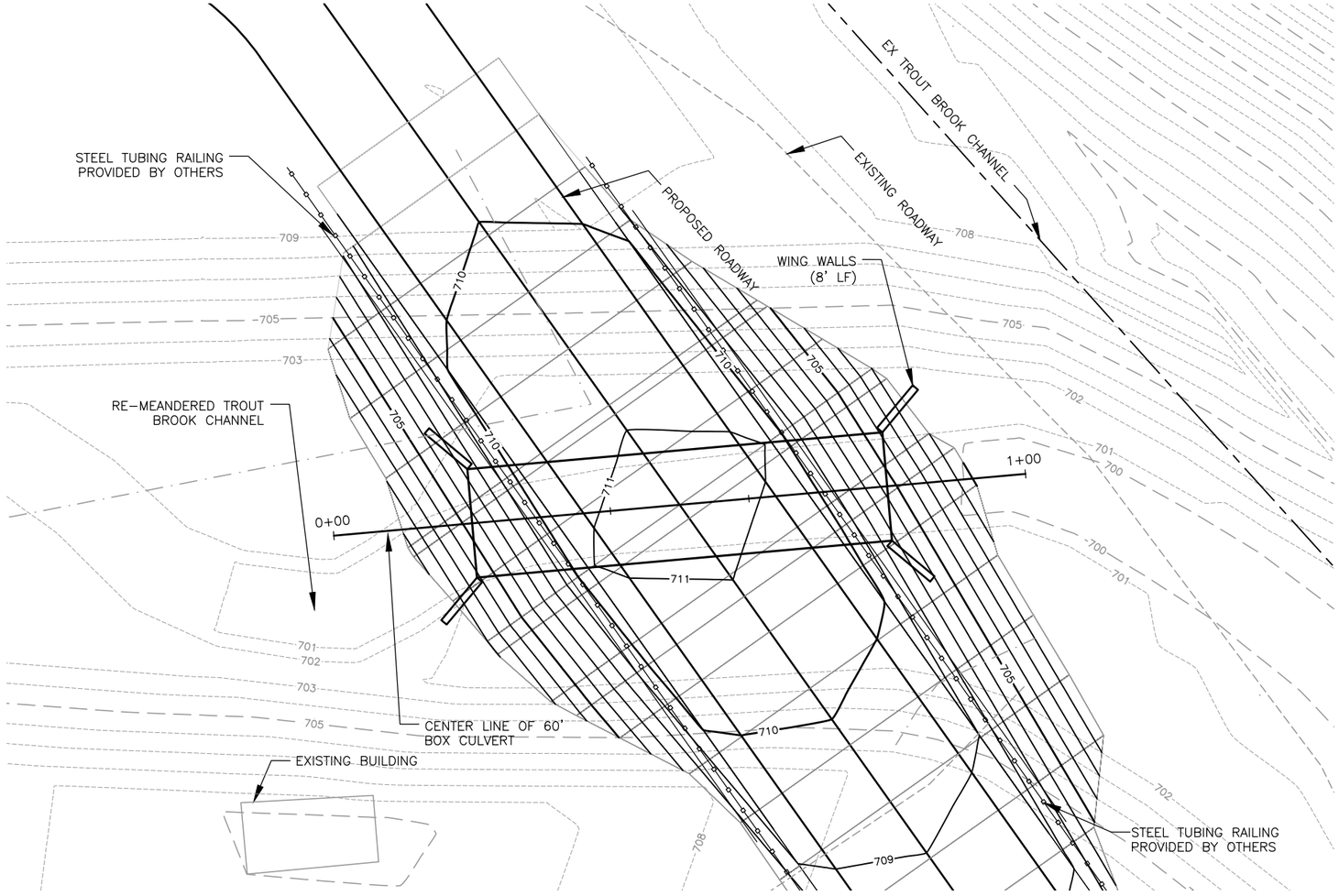
HRGreen

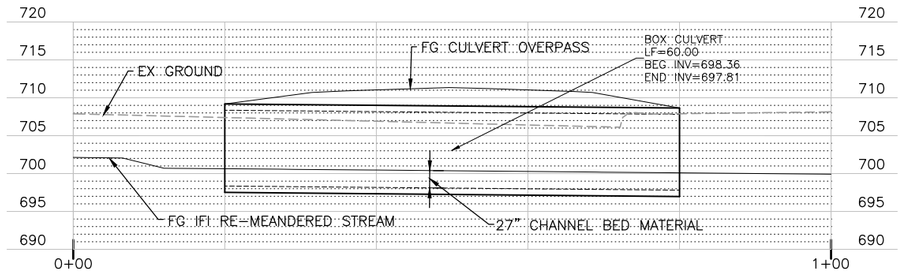
TROUT BROOK RE-MEANDER PROJECT
CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

CIVIL – CULVERT & OVERPASS

CULVERT OVERPASS PLAN & PROFILE

SHEET NO.
C1





NORTH

0 10'

VERTICAL SCALE IS 1X HORIZONTAL

NOTES:

1. CONTOURS SHOWN IN GRAY REFLECT THE EX CONTOURS MODIFIED FOR THE PLANNED CHANNEL RE-MEANDERING.

PRELIMINARY

NOT FOR CONSTRUCTION

DRAWN BY: JJC JOB DATE: 2017
APPROVED: JRH JOB NUMBER: 170327
CAD DATE: 12/5/2017 6:41:04 PM
CAD FILE: J:\2017\170327\CAD\Dwgs\C\C2.dwg

NO.	DATE	BY	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE:

DATE: 11-30-2017 JORDAN R HOREJSI REG. NO. 52241

HRGreen HRGreen.com

TROUT BROOK RE-MEANDER PROJECT
CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

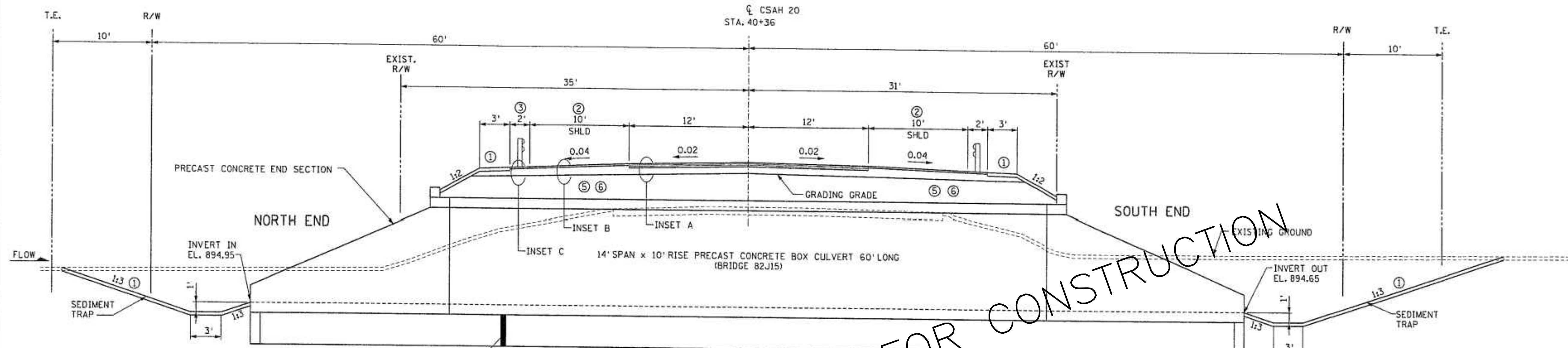
CIVIL – CULVERT & OVERPASS

CULVERT PROFILE

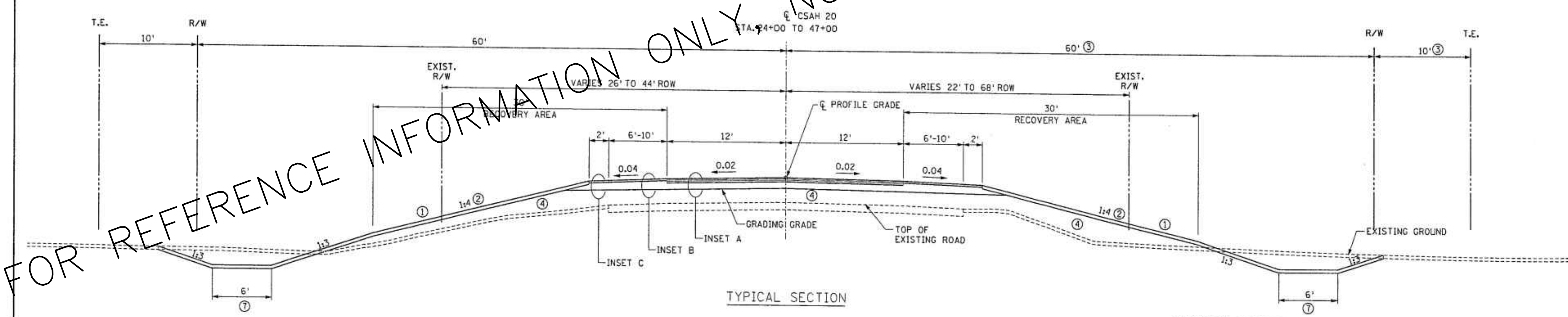
SHEET NO.
C2

NOTES:

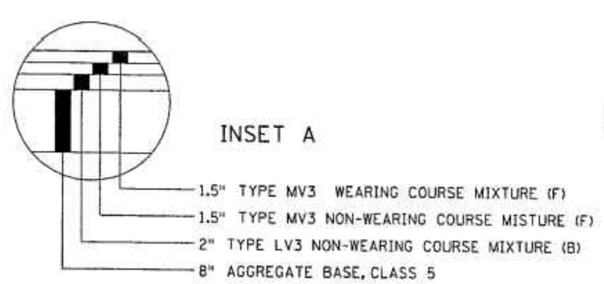
1. THIS SHEET IS ONLY FOR REFERENCE INFORMATION REGARDING A PAST PROJECT. IT IS NOT INTENDED AS A CONSTRUCTION PLAN FOR ANY PROJECT.

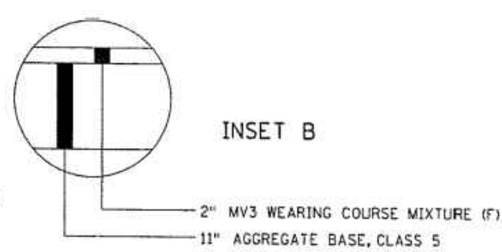


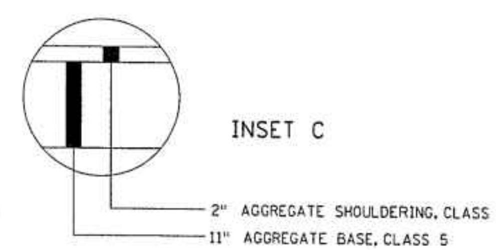
BOX CULVERT TYPICAL SECTION



TYPICAL SECTION







GENERAL NOTES:

ALL CROSS SLOPES ARE IN FOOT PER FOOT UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED THE GRADING GRADE WILL BE 13 INCHES BELOW THE FINISHED SURFACE.

NOTES:

① TURF ESTABLISHMENT: PLACE 4" MINIMUM TOPSOIL, SEED MIXTURE 50B, FERTILIZER AND MULCH.

② BETWEEN STA. 38+28 AND STA. 40+28 TRANSITION SLOPE FROM 1:4 TO 1:2. BETWEEN STA. 40+43 AND STA. 42+44 TRANSITION SLOPE FROM 1:2 TO 1:4.

③ FROM STA. 32+98 AND 47+00.

④ BACKFILL WITH SUITABLE GRADING MATERIAL.

⑤ BACKFILL WITH SELECT GRANULAR MATERIAL (MN/DOT SPEC. 3149.2B2).

⑥ REFER TO THE BOX CULVERT DETAILS (SHT. 7) FOR BACKFILL REQUIREMENTS IN THE BOX CULVERT AREA

⑦ SEE CROSS SECTIONS FOR DITCH BOTTOM ELEVATIONS.

User: STEVEN P JENSEN
Project number: 00000000000000164
Filename: \WINDM\05500I4J64\05500I4-SEC0I.DGN
Date plotted: 04/24/2003 9:27 am

HDR
HDR Engineering, Inc.

I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.
Signature: [signature] Date: 4-28-03
Printed Name: ANTHONY J. LUFT Lic. No. 40065

TYPICAL SECTIONS

C.P. 02-202004

SHEET NO 4 OF 17 SHEETS

PRELIMINARY
NOT FOR
CONSTRUCTION

DRAWN BY: JJC	JOB DATE: 2017		
APPROVED: JRH	JOB NUMBER: 170327		
CAD DATE: 11/17/2017 11:23:04 AM			
CAD FILE: J:\2017\170327\CAD\Dwgs\C\C4.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

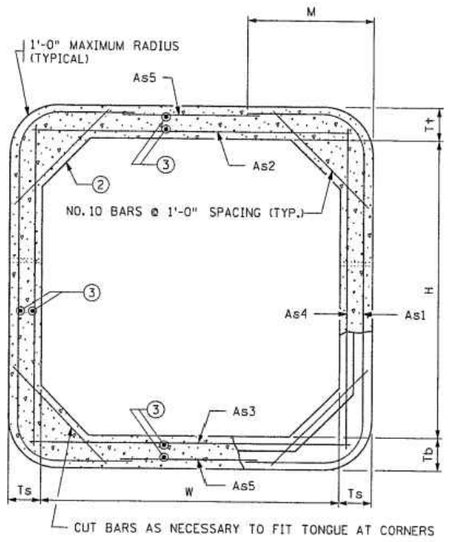
I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
SIGNATURE:
DATE: REG. NO.

HRGreen HRGreen.com

TROUT BROOK RE-MEANDER PROJECT CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

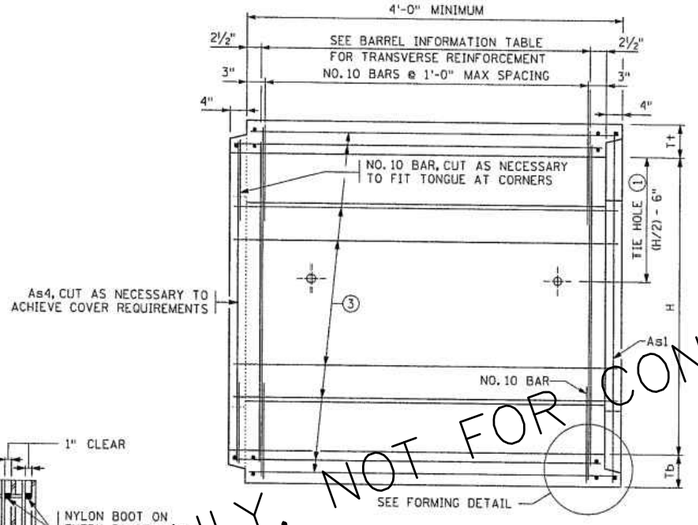
CIVIL – CULVERT & OVERPASS
REFERENCE INFORMATION

SHEET NO.
C4



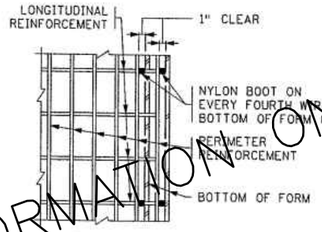
TRANSVERSE BARREL SECTION

BAR REINFORCEMENT OPTION SHOWN

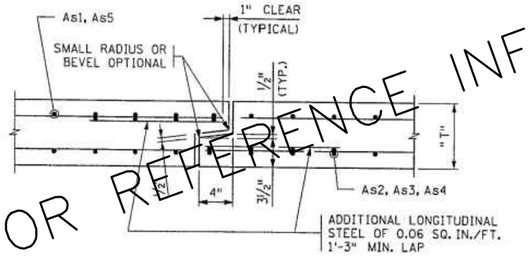


LONGITUDINAL BARREL SECTION

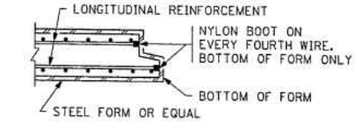
BAR REINFORCEMENT OPTION SHOWN



PLAN

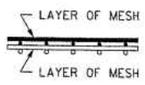


TONGUE AND GROOVE JOINT DETAIL



SECTION

FORMING DETAIL



FABRIC LAYER DETAIL

WHEN MORE THAN ONE LAYER OF STEEL FABRIC IS USED TO OBTAIN THE REQUIRED REINFORCEMENT AREAS, THE WIRES OF THE STEEL FABRIC SHALL BE PLACED AS SHOWN

CONSTRUCTION NOTES

CULVERTS TO BE CONSTRUCTED AS PER Mn/DOT SPEC. 2412 EXCEPT AS NOTED.

FILL HEIGHTS OF LESS THAN 2'-0" REQUIRE A DISTRIBUTION SLAB. SEE FIG. 5-395.100(A) AND FIG. 5-395.100(B) FOR ADDITIONAL INFORMATION.

IF THE DISTANCE BETWEEN DOUBLE BARRELS IS LESS THAN 2'-0" USE EITHER PEA ROCK OR LEAN MIX BACKFILL(Mn/DOT SPEC. 2520) BETWEEN THE CULVERTS AS APPROVED BY THE ENGINEER. (ALSO, PROVIDE APPROVED GROUT SEEPAGE CORE, MINIMUM 12" THICK, BETWEEN THE CULVERT'S TWO ENDS.) MINIMUM DISTANCE REQUIRED IS 6".

THE STEEL FABRIC, SHEAR REINFORCEMENT AND REINFORCEMENT BARS SHALL CONFORM TO APPLICABLE REQUIREMENTS OF AASHTO M259.

1½" MIN. AND 2" MAX. CONCRETE COVER ON ALL REINFORCEMENT, INCLUDING SHEAR REINFORCEMENT, EXCEPT FOR TONGUE AND GROOVE DETAIL.

ANY OF THE FOLLOWING COMBINATIONS OF STEEL REINFORCEMENT MAY BE USED:
- (a) 1 OR 2 LAYERS OF MESH OR
- (b) 1 LAYER OF MESH AND 1 LAYER OF REINFORCEMENT BARS OR
- (c) 1 LAYER OF REINFORCEMENT BARS.

THE REINFORCEMENT SHALL BE DEVELOPED IN ACCORDANCE WITH AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES". IF BAR REINFORCEMENT IS SUBSTITUTED FOR WIRE MESH, THE AREAS OF REINFORCEMENT SHALL BE INCREASED BY 8%.

THE MAXIMUM SIZE OF REINFORCEMENT BARS SHALL BE NO. 19. THE MAXIMUM MESH SIZE SHALL BE ½" DIA. PER LAYER (MAXIMUM OF 2 LAYERS).

THE SPACING CENTER TO CENTER OF THE TRANSVERSE WIRES SHALL NOT BE LESS THAN 2" NOR MORE THAN 4". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL WIRES SHALL NOT BE MORE THAN 8".

WELDING WILL NOT BE ALLOWED ON REINFORCEMENT BARS OR STEEL FABRIC, EXCEPT THAT THE ORIGINAL WELDING REQUIRED TO MANUFACTURE WIRE FABRIC IS ACCEPTABLE.

WHEN REINFORCEMENT IS CUT, ADDITIONAL REINFORCEMENT SHALL BE ADDED ON BOTH SIDES OF THE CUT MEMBER TO REPLACE OR EXCEED THE CUT STEEL.

CONCRETE SHALL BE MIX NO. 3W36 WITH NO CALCIUM CHLORIDE ALLOWED.

SHOP DRAWING APPROVAL PER Mn/DOT SPEC. 3238.2A IS NOT REQUIRED UNLESS OPENINGS OR ATTACHMENTS ARE PLACED ON A BARREL SEGMENT.

(1) CULVERT TIES ARE TO BE 1" DIAMETER RODS. SEE STANDARD PLATE NO. 3145 FOR CONNECTION DETAILS.

(2) HAUNCH SIZE AS FOLLOWS:
6'-0" AND 8'-0" WIDTHS - 6" TO 12"
10'-0" WIDTH - 10" TO 12"
12'-0" AND 14'-0" WIDTHS - 12"

(3) MINIMUM LONGITUDINAL STEEL SHALL BE 0.06 SQ. IN. /FT.

(4) TIE ROD ENDS ARE TO BE RECESSED.

(5) APPLY BITUMINOUS MASTIC JOINT SEALER TO ALL JOINTS AND APPLY RUBBERIZED ASPHALT MEMBRANE, PER Mn/DOT SPEC. 2481.3C, ON THE EXTERIOR OF ALL JOINTS

NOTES:

1. THIS SHEET IS ONLY FOR REFERENCE INFORMATION REGARDING A PAST PROJECT. IT IS NOT INTENDED AS A CONSTRUCTION PLAN FOR ANY PROJECT.

BARREL INFORMATION

LOCATION	SIZE	CLASS	f'c (P.S.I.)	FILL HEIGHT RANGE (FT.)	DIMENSIONS W (FT.)	H (FT.)	Tt (IN.)	Tb (IN.)	Ts (IN.)	WEIGHT (LBS./FT.)	STEEL FABRIC REINFORCEMENT As1 AREA (IN.I/FT.)	As1 LENGTH (FT.)	As1 M (FT.)	As2 AREA (IN.I/FT.)	As2 LENGTH (FT.)	As3 AREA (IN.I/FT.)	As3 LENGTH (FT.)	As4 AREA (IN.I/FT.)	As4 LENGTH (FT.)	As5 AREA (IN.I/FT.)	As5 LENGTH (FT.)
STA. 40+36	14x10	2	5000	2 - 8	14	10	10	10	8	6000	0.83	18'-9"	4'-2"	1.31	14'-6"	1.17	14'-6"	0.20	10'-6"	0.06	9'-0"

HDR Engineering, Inc.

I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.
Signature: Anthony J Luft Date: 4-28-03
Printed Name: ANTHONY J LUFT Lic. No. 40065

BOX CULVERT DETAILS

C.P. 02-202004 SHEET NO 5 OF 17 SHEETS

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JJC JOB DATE: 2017
APPROVED: JRH JOB NUMBER: 170327
CAD DATE: 11/17/2017 11:24:46 AM
CAD FILE: J:\2017\170327\CAD\Dwgs\C\C5.dwg

NO.	DATE	BY	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
SIGNATURE:
DATE: REG. NO.

HRGreen.com

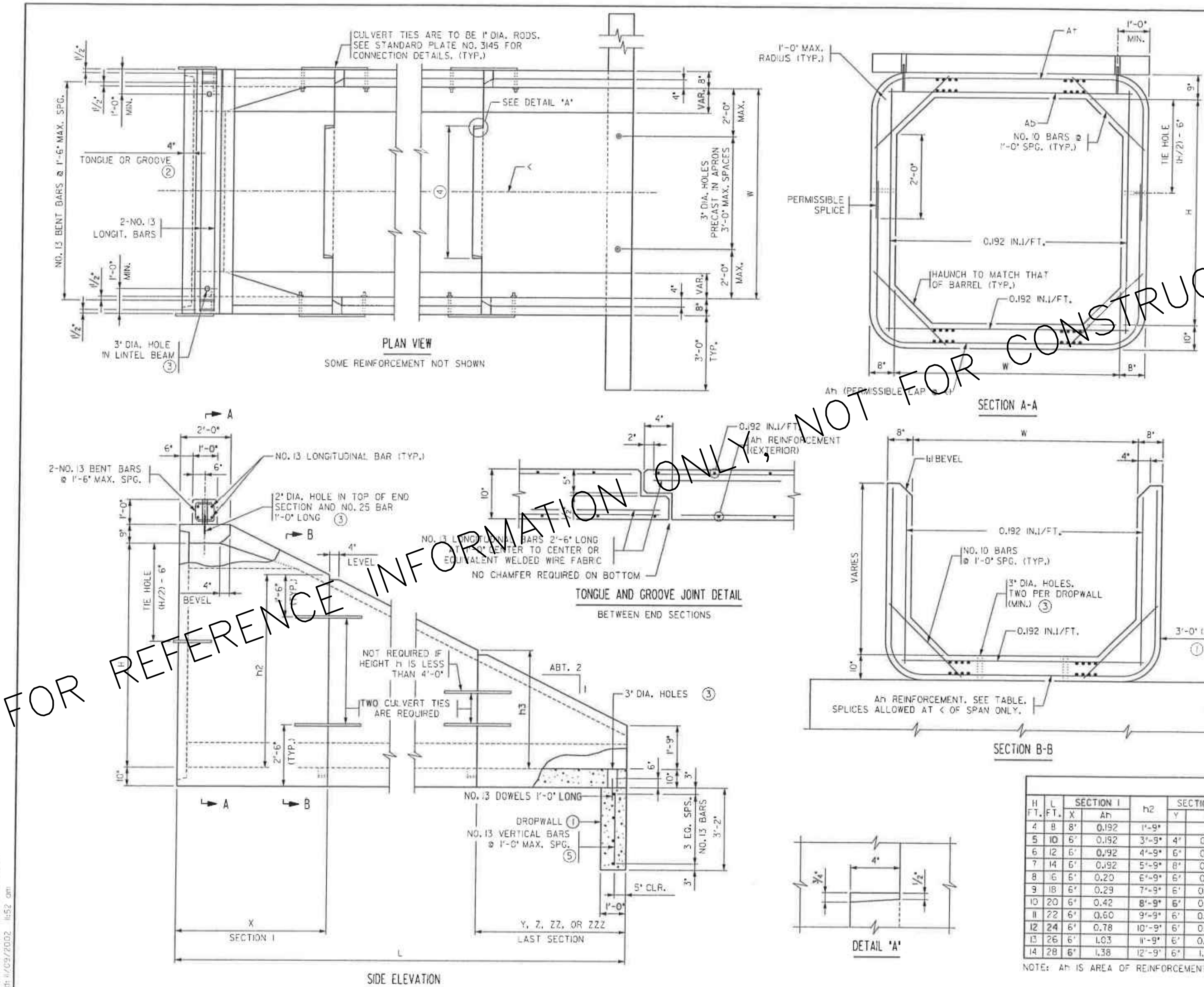
TROUT BROOK RE-MEANDER PROJECT
CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

CIVIL – CULVERT & OVERPASS
REFERENCE INFORMATION

SHEET NO.
C5

NOTES:

1. THIS SHEET IS ONLY FOR REFERENCE INFORMATION REGARDING A PAST PROJECT. IT IS NOT INTENDED AS A CONSTRUCTION PLAN FOR ANY PROJECT.



CONSTRUCTION NOTES

SEE FIG. 5-395.101(A) AND FIG. 5-395.101(B) FOR ADDITIONAL DIMENSIONS AND CONSTRUCTION NOTES.

ALL END SECTIONS REQUIRE CURB ON LINTEL BEAM.

ON ALL END SECTIONS FOR WATERWAYS, USE DROPWALLS ON INLET AND OUTLET ENDS.

LONGITUDINAL REINFORCEMENT PARALLEL TO THE AXIS OF THE CULVERT SHALL HAVE A MINIMUM OF 0.06 SQUARE INCHES PER PERIPHERAL FOOT ON ALL FACES OF THE BARREL, EXCEPT IN THE TONGUE AND GROOVE AREA.

SEE FIG. 5-395.115 FOR EMBANKMENT PROTECTION.

FINISH ALL EXPOSED EDGES OF CONCRETE WITH ½" OR ¾" CHAMFER OR RADIUS UNLESS OTHERWISE NOTED.

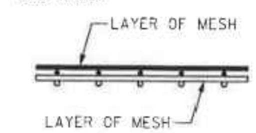
① WITH DOUBLE BOXES LOCATE DROPWALL JOINTS BETWEEN END SECTIONS. SEE FIG. 5-395.111 FOR ALTERNATE DROPWALLS. LIMITS OF EXCAVATION FOR DROPWALL TO BE APPROXIMATELY THE SAME AS DROPWALL DIMENSIONS. DROPWALL TO BE CONCRETE MIX NO. 1A43 OR MIX NO. 3Y43. FURNISHING AND INSTALLATION OF DROPWALL TO BE INCLUDED IN PRICE BID FOR END SECTIONS. DROPWALL NOT REQUIRED FOR NON-WATERWAY USE.

② CHECK LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED.

③ FILL HOLE WITH GROUT. GROUT SHALL CONSIST OF 1 PART CEMENT AND 2 PARTS SAND. USE TYPE 1A AIR ENTRAINED PORTLAND CEMENT. GROUT MIX SHALL HAVE A MAXIMUM SLUMP OF 4".

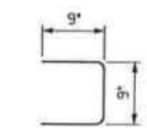
④ 3'-6" TONGUE AND 3'-7" GROOVE FOR 6'-0" WIDE CULVERTS. 5'-0" TONGUE AND 5'-1" GROOVE FOR CULVERTS OVER 6'-0" WIDE. CENTER TONGUE AND GROOVE ON ℄ OF EACH APRON JOINT.

⑤ AS AN ALTERNATE TO THE ONE LAYER MESH, PROVIDE TWO LAYERS OF REBAR OR WIRE MESH WITH THE STEEL AREA EQUAL TO HALF OF THE TEMPERATURE STEEL PER CODE REQUIREMENTS IN EACH FACE OF THE DROPWALL.



FABRIC LAYER DETAIL

WHEN MORE THAN ONE LAYER OF STEEL FABRIC IS USED TO OBTAIN THE REQUIRED REINFORCEMENT AREAS, THE WIRES OF THE STEEL FABRIC SHALL BE PLACED AS SHOWN.



NO. 13 BENT BAR

At, Ab REINFORCEMENT

WIDTH (FT.)	At (IN.1/FT.)	Ab (IN.1/FT.)
6	.27	.44
8	.47	.60
10	.62	.74
12	.88	1.06
14	1.20	1.58

APRON DIMENSIONS & Ah REINFORCEMENT

H FT.	L FT.	SECTION 1 X	SECTION 1 Ah	h2	SECTION 2 Y	SECTION 2 Ah	h3	SECTION 3 Z	SECTION 3 Ah	h4	SECTION 4 ZZ	SECTION 4 Ah	h5	SECTION 5 ZZZ	SECTION 5 Ah	h6
4	8	8'	0.192	1'-9"												
5	10	6'	0.192	3'-9"	4'	0.192	1'-9"									
6	12	6'	0.192	4'-9"	6'	0.192	1'-9"									
7	14	6'	0.192	5'-9"	8'	0.192	1'-9"									
8	16	6'	0.20	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"						
9	18	6'	0.29	7'-9"	6'	0.20	4'-9"	6'	0.192	1'-9"						
10	20	6'	0.42	8'-9"	6'	0.29	5'-9"	8'	0.192	1'-9"						
11	22	6'	0.60	9'-9"	6'	0.42	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"			
12	24	6'	0.78	10'-9"	6'	0.60	7'-9"	6'	0.20	4'-9"	6'	0.192	1'-9"			
13	26	6'	1.03	11'-9"	6'	0.78	8'-9"	6'	0.28	5'-9"	6'	0.192	1'-9"			
14	28	6'	1.38	12'-9"	6'	1.03	9'-9"	6'	0.40	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"

NOTE: Ah IS AREA OF REINFORCEMENT PER FOOT OF LENGTH (IN.1/FT.)

FOR REFERENCE INFORMATION ONLY, NOT FOR CONSTRUCTION

PRELIMINARY NOT FOR CONSTRUCTION

HDR Engineering, Inc.

I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature: [signature] Date: 4-28-03

Printed Name: ANTHONY J LUFT Lic. No. 40065

PRECAST CONCRETE END SECTION - TYPE I SINGLE OR DOUBLE BARREL

C.P. 02-202004

SHEET NO 6 OF 17 SHEETS

DRAWN BY: JJC	JOB DATE: 2017	
APPROVED: JRH	JOB NUMBER: 170327	
CAD DATE: 11/17/2017 11:26:48 AM		
CAD FILE: J:\2017\170327\CAD\Dwgs\C\C6.dwg		

NO.	DATE	BY	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE:

DATE: REG. NO.

HRGreen HRGreen.com

TROUT BROOK RE-MEANDER PROJECT
CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

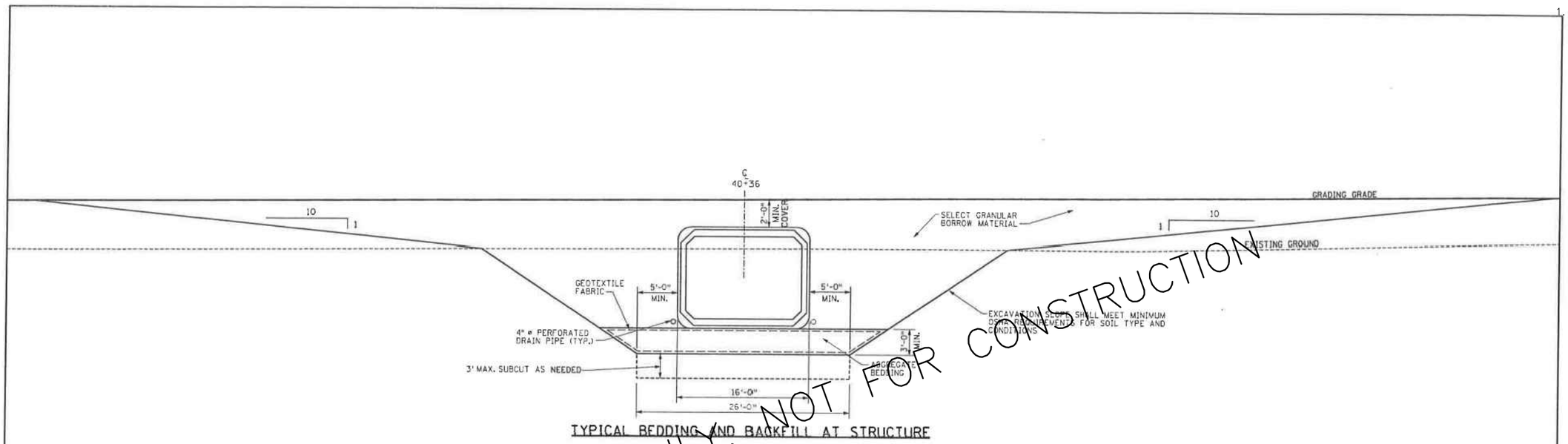
CIVIL – CULVERT & OVERPASS

REFERENCE INFORMATION

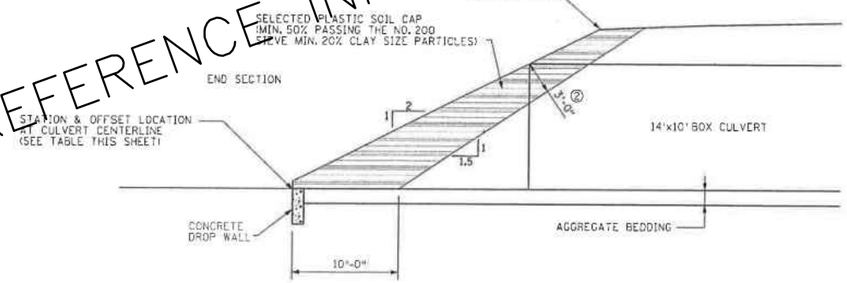
SHEET NO. C6

NOTES:

1. THIS SHEET IS ONLY FOR REFERENCE INFORMATION REGARDING A PAST PROJECT. IT IS NOT INTENDED AS A CONSTRUCTION PLAN FOR ANY PROJECT.



TYPICAL BEDDING AND BACKFILL AT STRUCTURE



TREATMENT OF BOX CULVERT - TO BE APPLIED ON BOTH ENDS

ITEM	LOCATION STA.	LOCATION OFFSET	INVERT ELEV.
END SECTION	40+36	50' RT.	894.65
END SECTION	40+36	50' LT.	894.95

END SECTION LOCATION TABLE

NOTES:

① WIDTH OF PLASTIC SOIL CAP FOR GRANULAR SOIL EMBANKMENT- A MINIMUM OF ONE WIDTH OF STRUCTURE ON EITHER SIDE OF THE STRUCTURE. TOTAL WIDTH = 48'.

② THE THICKNESS OF THE PLASTIC SOIL CAP AT CROWN IS 3' MINIMUM AND 6' MAXIMUM.

User: STEVEN.P.JENSEN
Project number: 0000000000D0164
Filename: \\WNDMN005\0164\05\0504-SEC05.DGN
Date plotted: 04/25/2003 3:04 pm

HDR Engineering, Inc.

I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.
Signature: _____ Date: 4-28-03
Printed Name: ANTHONY J. LUFT Lic. No. 40065

BOX CULVERT DETAILS

C.P. 02-202004 SHEET NO 7 OF 17 SHEETS

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JJC	JOB DATE: 2017		
APPROVED: JRH	JOB NUMBER: 170327		
CAD DATE: 11/17/2017 11:29:04 AM			
CAD FILE: J:\2017\170327\CAD\Dwgs\C\C7.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE: _____

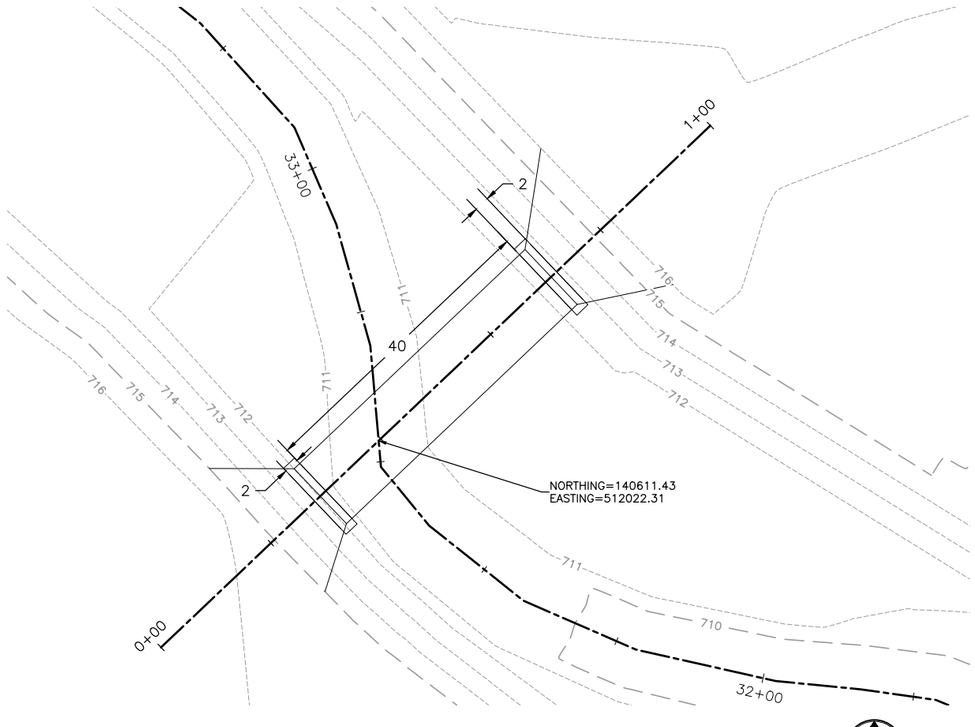
DATE: _____ REG. NO. _____

HRGreen HRGreen.com

TROUT BROOK RE-MEANDER PROJECT
CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

CIVIL – CULVERT & OVERPASS
REFERENCE INFORMATION

SHEET NO.
C7



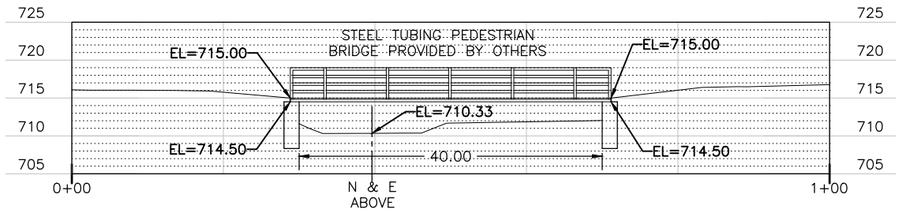
NOTES:

1. CONTOURS SHOWN IN GRAY REFLECT THE EX CONTOURS MODIFIED FOR THE PLANNED CHANNEL RE-MEANDERING.
2. SEE SHEET S2 DETAILS FOR ABUTMENT WIDTH, DEPTH & MATERIAL.

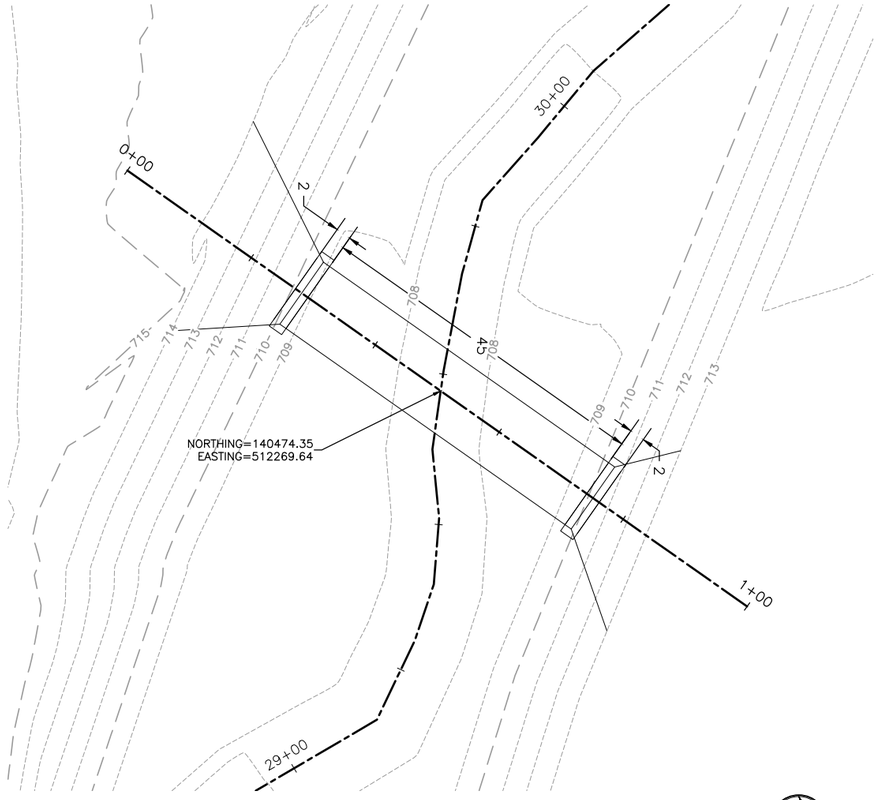
NORTH

0 10'

VERTICAL SCALE IS 1X HORIZONTAL



BRIDGE "A"



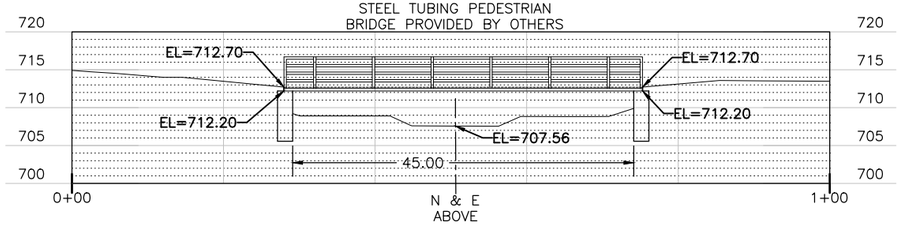
NOTES:

1. CONTOURS SHOWN IN GRAY REFLECT THE EX CONTOURS MODIFIED FOR THE PLANNED CHANNEL RE-MEANDERING.
2. SEE SHEET S2 DETAILS FOR ABUTMENT WIDTH, DEPTH & MATERIAL.

NORTH

0 10'

VERTICAL SCALE IS 1X HORIZONTAL



BRIDGE "B"

PRELIMINARY

NOT FOR CONSTRUCTION

DRAWN BY: JJC JOB DATE: 2017
APPROVED: JRH JOB NUMBER: 170327
CAD DATE: 12/5/2017 6:40:50 PM
CAD FILE: J:\2017\170327\CAD\Dwgs\S\S1.dwg

NO.	DATE	BY	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE:

DATE: 11-30-2017 DENNIS L NEUMANN REG. NO. 19807

HRGreen.com

TROUT BROOK RE-MEANDER PROJECT
CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

STRUCTURAL

PED BRIDGE PROFILES

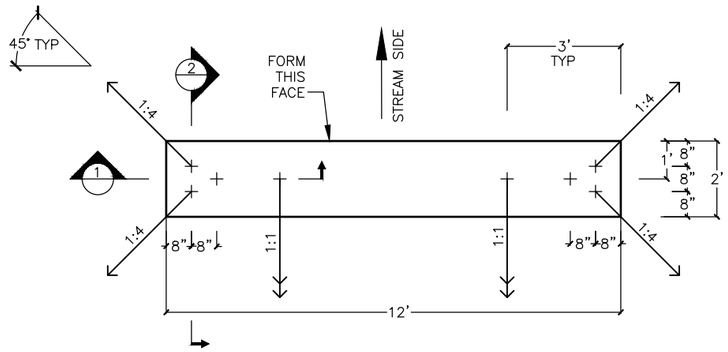
SHEET NO.

S1

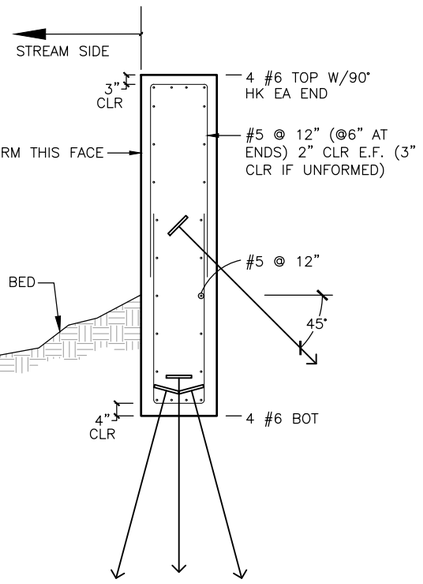
NOTES:

1. "+" 20 KIP (10 TON) ALLOWABLE AXIAL LOAD HELICAL ANCHOR.
2. "→" 1 H: 4V BATTER ON HELICAL ANCHOR.
3. "→→" 1 H: 1V BATTER ON HELICAL ANCHOR.

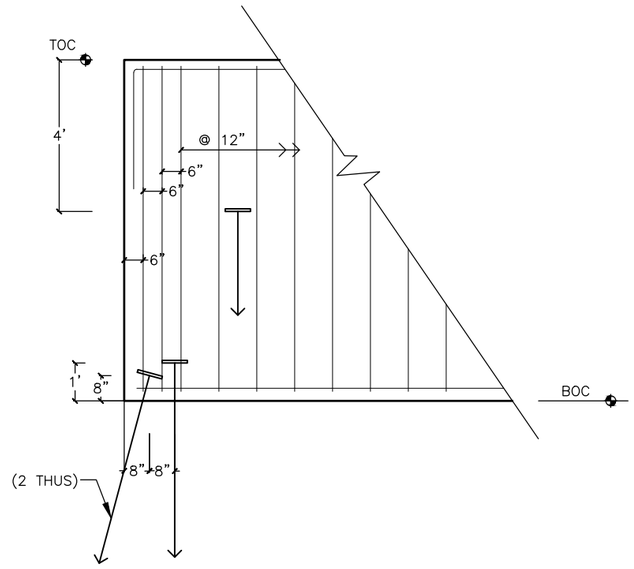
SCHEDULE		
BRIDGE	TOC	BOC
A	714.50	706.00
B	712.20	704.00



PLAN



SECTION 2



SECTION 1

1 BRDIGE ABUTMENT DETAIL

SCALE: 1/2" = 1'

PRELIMINARY

NOT FOR CONSTRUCTION

DRAWN BY: JJC JOB DATE: 2017
APPROVED: JRH JOB NUMBER: 170327
CAD DATE: 12/5/2017 5:57:38 PM
CAD FILE: J:\2017\170327\CAD\Dwgs\S\S2.dwg

NO.	DATE	BY	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE:

DATE: 11-30-2017 DENNIS L. NEUMANN REG. NO. 19807

HRGreen HRGreen.com

TROUT BROOK RE-MEANDER PROJECT
CULVERT & OVERPASS INSTALLATION
GREAT RIVER GREENING
AFTON, MINNESOTA

STRUCTURAL

PED BRIDGE ABUTMENTS

SHEET NO.

S2

APPENDIX B: USDA SOIL SURVEY

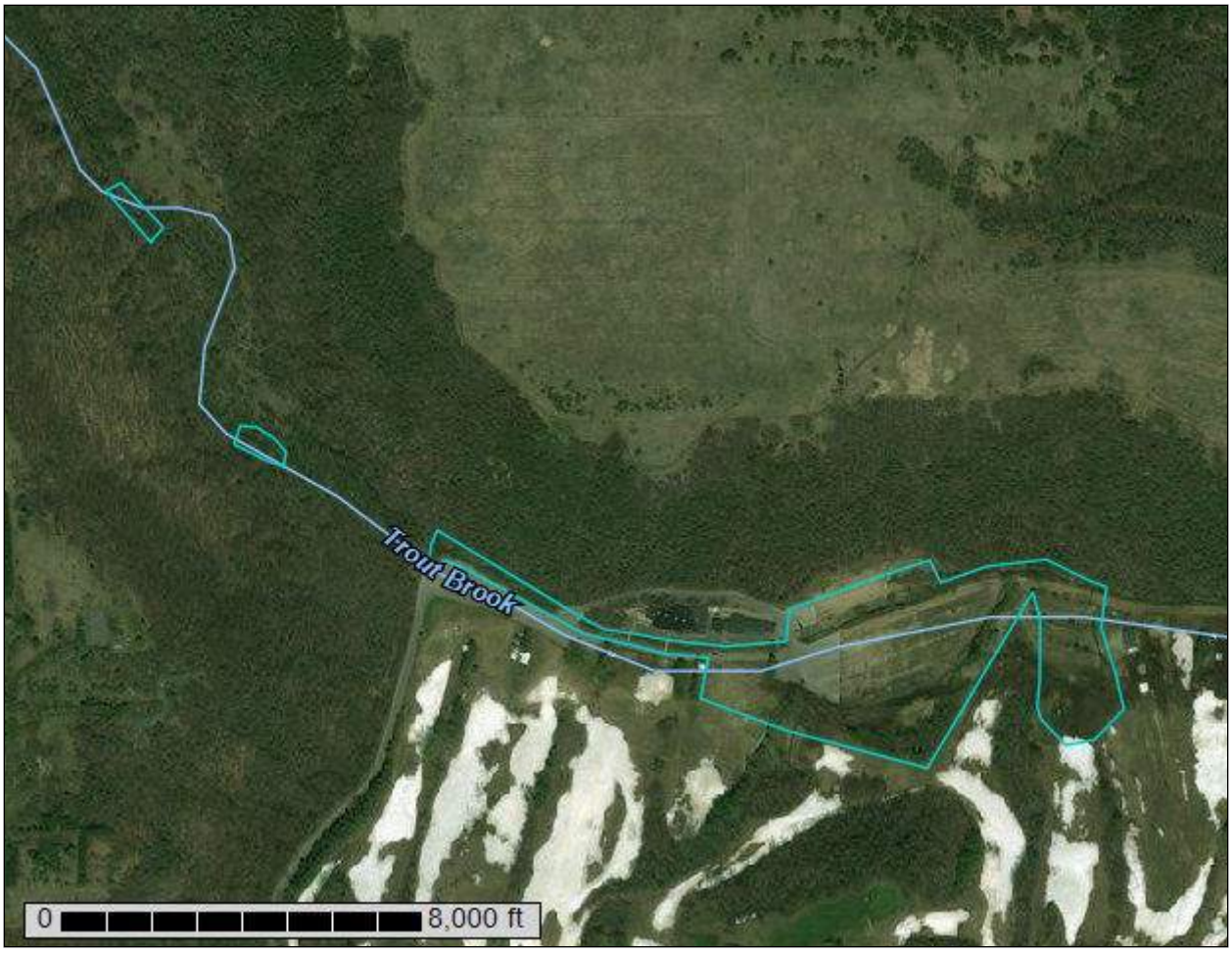
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Washington County, Minnesota



November 20, 2017

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

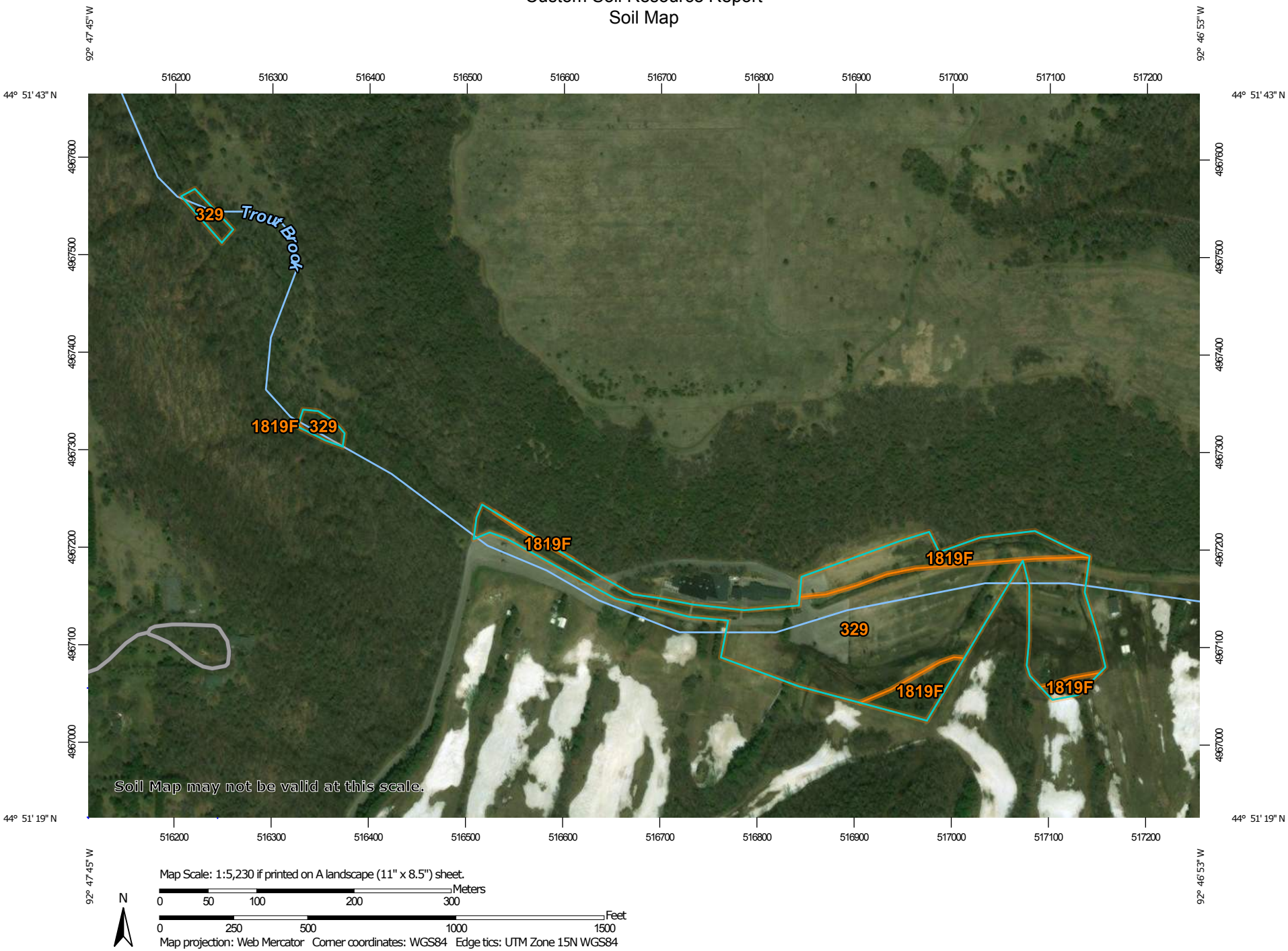
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,230 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Minnesota
Survey Area Data: Version 12, Oct 4, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 4, 2010—Jun 6, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
329	Chaska silt loam	10.1	78.7%
1819F	Dorerton-Rock outcrop complex, 25 to 65 percent slopes	2.7	21.3%
Totals for Area of Interest		**12.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Washington County, Minnesota

329—Chaska silt loam

Map Unit Setting

National map unit symbol: 1t94z
Elevation: 500 to 1,650 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Chaska and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chaska

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 6 inches: silt loam
C1 - 6 to 36 inches: stratified very fine sandy loam to silt loam
C2 - 36 to 60 inches: stratified very fine sandy loam to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Other vegetative classification: Frequently Flooded (G090XN016MN)
Hydric soil rating: Yes

Minor Components

Algansee

Percent of map unit: 10 percent
Hydric soil rating: No

1819F—Dorerton-Rock outcrop complex, 25 to 65 percent slopes

Map Unit Setting

National map unit symbol: 1t972
Elevation: 800 to 1,400 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Dorerton and similar soils: 80 percent
Rock outcrop: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dorerton

Setting

Landform: Escarpments on terraces, hills
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy sediment over limestone bedrock

Typical profile

A,E - 0 to 10 inches: sandy loam
2Bt - 10 to 30 inches: flaggy clay loam
2C - 30 to 45 inches: very flaggy loamy sand
3R - 45 to 60 inches: bedrock

Properties and qualities

Slope: 25 to 65 percent
Depth to restrictive feature: 45 to 70 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Other vegetative classification: Not Suited (G090XN024MN)
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Escarpments on terraces, hills
Landform position (two-dimensional): Shoulder
Down-slope shape: Linear
Across-slope shape: Linear

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX C: WETALND DELINEATION REPORT

Wetland Delineation Report

Afton Alps Trout Brook Restoration

Denmark Township, Washington County, Minnesota

September 1, 2017

HR Green Project No: 170327

Prepared For:

Inter-Fluve, Inc.

Prepared by:

HR Green, Inc., St. Paul, Minnesota

Table of Contents

Figures (located after text)

Appendices

1.0 Introduction

Great River Greening, in cooperation with Minnesota Department of Natural Resources, South Washington Watershed District, and Vail resorts is proposing stream restoration of approximately 1,200 linear feet of Trout Brook.

The project seeks to improve the Trout Brook corridor for both biological and resort-related functions. Trout Brook will be re-meandered at the site privately owned by Afton Alps using natural channel design principles, with construction to be completed by September 2018. This design calls for construction of a two-stage channel. The larger flood channel would be similar in dimension to the corridor of the current ditch. Within the larger channel, a smaller meandering channel will be constructed with habitat features such as riffles, pools, large wood, overhanging banks, and native riparian vegetation. Minor infrastructure improvements will also be completed nearby, including the improvement of a culvert which will allow sediment to move through the project area more effectively.

The wetland delineation study area is within the Afton Alps resort in Denmark Township, Washington County, Minnesota in Section 3, Township 27 North, Range 20 West. The study area is approximately 12.3 acres and is shown on Figures 1-7. The main study area includes all proposed work areas including minor in-stream improvements, stream re-meander areas, and stream fill areas. The east end of the study area includes an area for chair lift improvements (Chair Lift 7) unrelated to this project. An approximate central latitude/longitude of the study area is -92.786176/44.856783 Decimal Degrees.

Wetland delineation activities were conducted by HR Green wetland scientist Ted McCaslin (Minnesota Wetland Delineator Certified #1180) of HR Green, Inc. On-site wetland delineation was conducted on July 28, 2017.

The following sections describe the background data collected and reviewed, delineation methods used, and the results of the wetland delineation.

2.0 Background Data Collection and Review

Prior to the field investigation, several data sources were consulted to identify potential wetlands along the wetland investigation area. These included:

- U.S. Geologic Survey (USGS) 1:24,000 Scale Topographic Maps (See Figure 1).
- LiDAR, Minnesota DNR (See Figure 2).
- East Central National Wetlands Inventory, Minnesota DNR, 2013 (See Figure 3).
- Public Waters Inventory, Minnesota DNR, 2013.
- USDA Web Soil Survey and, USDA (See Figure 3).
- FEMA National Flood Hazard Layer (See Figure 4).
- Minnesota State Climatology Working Group (See Appendix C)

2.1 USGS Quadrangle Map and Lidar Data

The USGS Quadrangle was observed from the ArcGIS online server (See Figure 1). Elevations are shown between 710 and 750 feet. Trout Brook is located within a valley comprising most of the study area. Trout Brook runs generally west to east and outlets to Lake St. Croix approximately 3,300 feet east of the study area. The elevation of Lake St. Croix is shown as 675. Side slopes to the north and south are steep into the study area. Afton State Park is shown north of the study area with elevations up to 952 feet at an upgradient peak and the Afton Alps ski area to the south with elevations up to 978 feet at an upgradient peak.

Minnesota Department of Natural Resources two-foot generalized contours from the MnTopo data server were reviewed (See Figure 2). Elevations are shown between 702-750 feet within the study area.

2.2 East Central National Wetlands Inventory

The Minnesota DNR East Central National Wetlands Inventory (NWI) was reviewed for the presence of NWI polygons within the study area. One NWI polygon PEM1Ad (Palustrine, Emergent, Persistent, Temporary Flooded, Partially Drained/Ditched is present in the study area east of the proposed re-meander area near Chair Lift 7 (See Figure 3).

2.3 Washington County NRCS Soil Data

An NRCS web soil survey was conducted and reviewed for the project study area. There is one mapped hydric soil unit totaling 78% of the study area. The NRCS web soil survey shows the following soils present in the project study area (See Figure 3 and Appendix C).

TABLE 1: NRCS SOILS IN STUDY AREA

Map Unit Symbol	Map Unit Name	% of Study Area	Hydric?	Drainage Class
329	Chaska silt loam	78	Yes	Poorly drained
1819F	Dorenton-Rock outcrop complex, 25 to 65 percent slopes	22	No	Well drained

Source: USDA Web Soil Survey, NRCS SSURGO GIS Dataset for Washington County, Iowa

2.4 Minnesota Public Waters Inventory

The Minnesota DNR Public Waters Inventory map for Washington County was reviewed. Trout Brook is shown in the study area. No other wetlands are or watercourses are shown in the study area (See Exhibit 1).

2.5 FEMA National Flood Hazard Layer

The FEMA National Flood Hazard Layer was accessed via ArcGIS. Zone A 100-year floodplain is present through the majority of the study area generally following the course of Trout Brook (See Figure 4).

2.6 Antecedent Precipitation

Minnesota DNR's Past Climate Data Summary website[1] was used to identify precipitation totals for the three months prior to the wetland delineation field work on July 28, 2017. The precipitation total for the three months prior (including July 2017) is a combined 0.87 inches greater than the combined mean for the study area.

[1] http://www.dnr.state.mn.us/climate/historical/summary.html

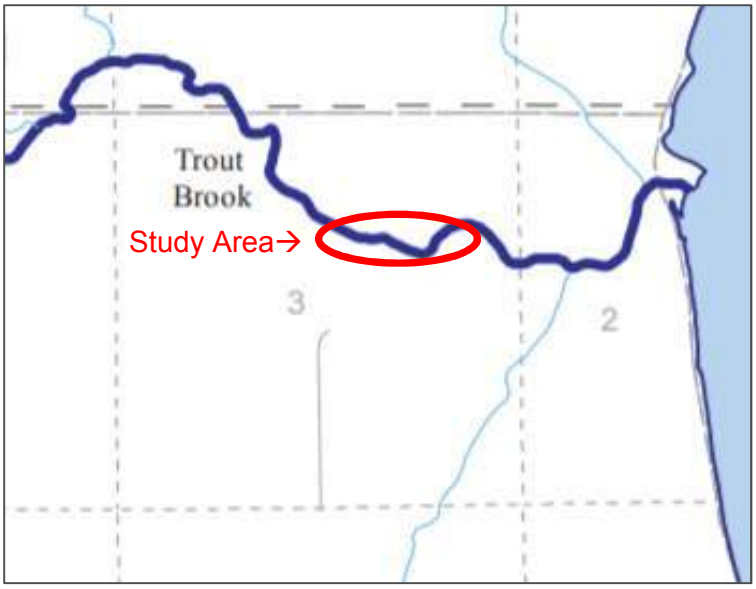


Exhibit 1 - Study Area in Washington County Public Waters Inventory Map[2]

3.0 Field Methods

Wetlands within the Project Area were identified and their boundaries delineated using the Routine On-Site Determination Method defined in the 1987 *Corps of Engineers Wetlands Delineation Manual* and 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*.

Wetland delineation was conducted on July 28, 2017. Northcentral and Northeast Region data forms were completed for wetland and non-wetland plant communities within the wetland investigation area. Data forms are in Appendix A.

Wetland boundaries were identified in the field, drawn on high resolution aerial photos and recorded with a sub-meter accuracy GPS unit, and flagged with pink pin flags marked "WETLAND DELINEATION." General landform drainage patterns and culvert locations were also noted in the field. Photographs taken during the field delineation are in Appendix B.

Wetland vegetation, soil indicators, hydrology indicators and other data were recorded on Northcentral and Northeast Supplement data forms at 9 sample points within the wetland investigation area. Additional sample points within the wetland investigation area were used to refine wetland boundaries. Sample point locations where data forms were completed are shown in Figures 5, 6, & 7.

Streams and potential waters of the United States were noted in the field. Streams were observed for stream indicators including ordinary high water marks, running water, absence of vegetation along linear wetlands, active sediment sorting, bank erosion, and bank filling.

[2] http://files.dnr.state.mn.us/waters/watermgmt_section/pwi/washingtoncountypublicwaters_2011may20.pdf

4.0 Results

The field delineation identified ten wetlands and a stream – Trout Brook – within the study area. Wetlands D1, D2, and D3 are a contiguous wetland complex. All wetlands appear to have a surface water connection to Trout Brook through culverts or overland flow. Trout Brook is a tributary of the St. Croix River.

4.1 Delineated Wetlands

Table 2 lists delineated wetlands, Circular 39 (USFWS), Observed Cowardin Classification, and Eggers & Reed Classification and Plant Community Ratings, wetland area, reference sample points, and a brief discussion of each wetland.

TABLE 2 - DELINEATED WETLAND DETAILS

WETLAND ID & LAT/LONG	WETLAND TYPE Circular 39 Observed Cowardin Class Eggers & Reed (Quality Rating	WETLAND AREA	REFERENCE SAMPLE POINTS	DISCUSSION
Wetland A 44.858030/ -92.790278	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.295 ac 12,866 sf	1-Wet 1-Up	Reed canary grass-dominated wetland located on shallow bench of Trout Brook. Wetland boundaries are distinct to steep hillslope to north and parking/road areas to the south and east. See Photos 1 & 2 in Appendix B.
Wetland B 44.857471/ -92.788203	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.200 ac 8,710 sf	2-Wet 2-Up	Mowed, maintained reed canary grass-dominated wetland along straightened channel. Bordered by rip rap covered banks. Boundary distinct at toe of slope. See Photos 3 & 4.
Wetland C 44.857578/ -92.786278	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.028ac 1,239sf	5-Wet 2-Up	Reed canary grass-dominated wetland located on bench 3 to 4 feet higher than Trout Brook. Wetland boundaries are distinct to steep hillslope to north and no wetland bench in present on south side of stream. See Photo 5.
Wetland D1 44.856667 -92785225	Type 7 PFO1B Hardwood Swamp (Medium Quality)	0.039 ac 1,685 sf	4-Wet 4-Up	Forested part of Wetland D complex. Saturated wetland at toe of steep slope. Wetland abuts Wetland D3. Wetland boundary is distinct to slope to south and gradual into Wetland D3. See Photo 6.

WETLAND ID & LAT/LONG	WETLAND TYPE Circular 39 Observed Cowardin Class Eggers & Reed (Quality Rating	WETLAND AREA	REFERENCE SAMPLE POINTS	DISCUSSION
Wetland D2 44.856795 -92.786222	Type 2 PEMB Fresh Wet Meadow (Low Quality)	0.441 ac 19,207 sf	3-Wet 3-Up	Type 2 wetland part of Wetland D complex. Mowed/maintained saturated wetland at toe of slope. Wetland appears to be part of normal ski activity and snow making may contribute saturated conditions into early growing season. Boundary is gradual into parking area, up slope, and lift facility. See Photos 7 & 8.
Wetland D3 44.856743 -92.785928	Type 3 PEMC Shallow Marsh (Medium Quality)	0.095 ac 4,121sf	4-Wet 4-Up	Type 3 wetland part of Wetland D complex. Wetland is in within historic Trout Brook channel. Diverse vegetative community observed in places within wetland. Wetland boundaries are gradual except at parking areas and fill at northeast end. See Photo 9.
Wetland E 44.857451 -92.784542	Type 2/3 PEMB Fresh Wet Meadow/Shallow Marsh (Low Quality)	0.126 ac 5,477 sf	3-Wet 3-Up 4-Wet 4-UP	Type 2/3 wetland dominated by reed canary grass and hybrid cattail. Wetland is bounded by fill and development on all sides and confined to narrow channel in places. Boundaries are distinct. See Photo 10.
Wetland F 44.857959 -92.78471	Type 3 PEMC Shallow Marsh (Low Quality)	0.028 ac 1,239 sf	5-Wet 2-Up	Small sparsely vegetated bench along Trout Brook. Wetland appears to be result of a recent cave-in of side slope. See Photo 11.
Lift South 44.856958 -92.783380	Type 2 PEMB Sedge Meadow (High Quality)	1.061 ac 46,222 sf (wetland extends to west out of study area)	Chair Lift 7-Wet Chair Lift 7-UP	Sedge meadow at toe of slope. Areas is saturated and not mowed, but appears to be part of normal ski operations. Snow making may contribute to hydrology. High quality sedge meadow observed. Wetland boundaries are gradual up slope and abuts fill to north and east. Wetland extends out of study area to the west. See Photos 12 & 14.
Lift North 44.857576 -92.783150	Type 2/3 PEMB Fresh Wet Meadow (Medium Quality)	0.126 ac 5,577	Chair Lift 7-Wet Chair Lift 7-UP	Wet drainage with moderate native species diversity. Wetland abuts fill on all sides. Culverts observed at north and south ends. Wetland ultimately outlets to Trout Brook. See Photo 13.

4.2 Stream

The Trout Brook channel was surveyed by a Minnesota DNR team. The results of the channel survey are shown in Figures 5-7. The substrate of the channel is mainly cobble and silt in the east edge of the project area. The stream substrate changes mainly to sand and silt adjacent to Wetland B and Wetland C where is has been straightened. See Photos 2, 3, 5, and 11 in Appendix B.

5.0 Summary

A wetland delineation was conducted within a study area developed for a stream restoration project and unrelated chair lift improvement at Afton Alps Ski area in Denmark Township, Minnesota. Ten wetlands and a stream – Trout Brook – were identified in the study area. All wetlands appear to have a direct or culvert-facilitated connection to Trout Brook, a tributary of the St. Croix River.

FIGURES

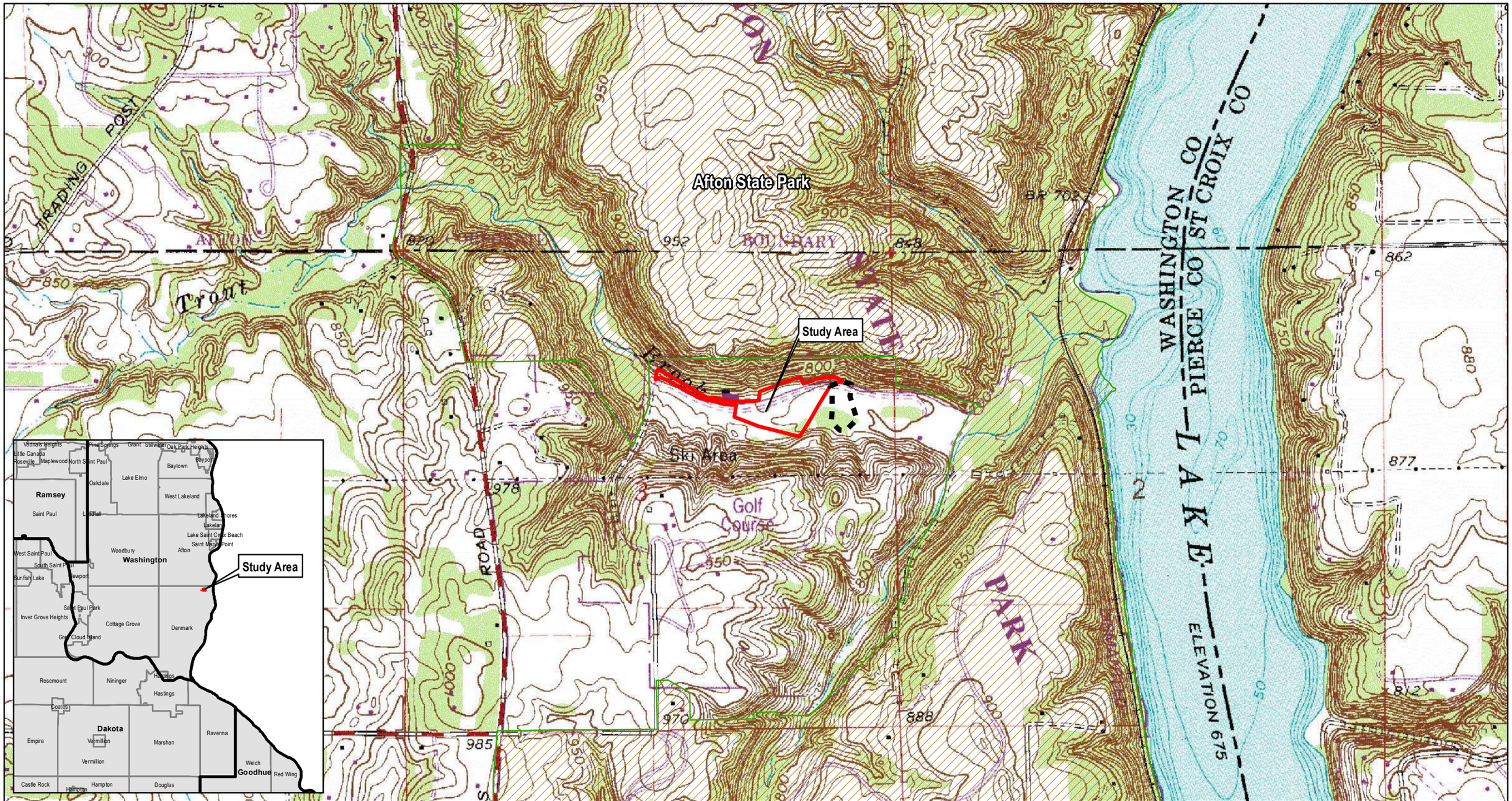


FIGURE 1

USGS QUADRANGLE/LOCATION MAP

Afton Alps Trout Brook Restoration
Denmark Township, Minnesota

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\Wetland\Report\Figure1_USGS.mxd

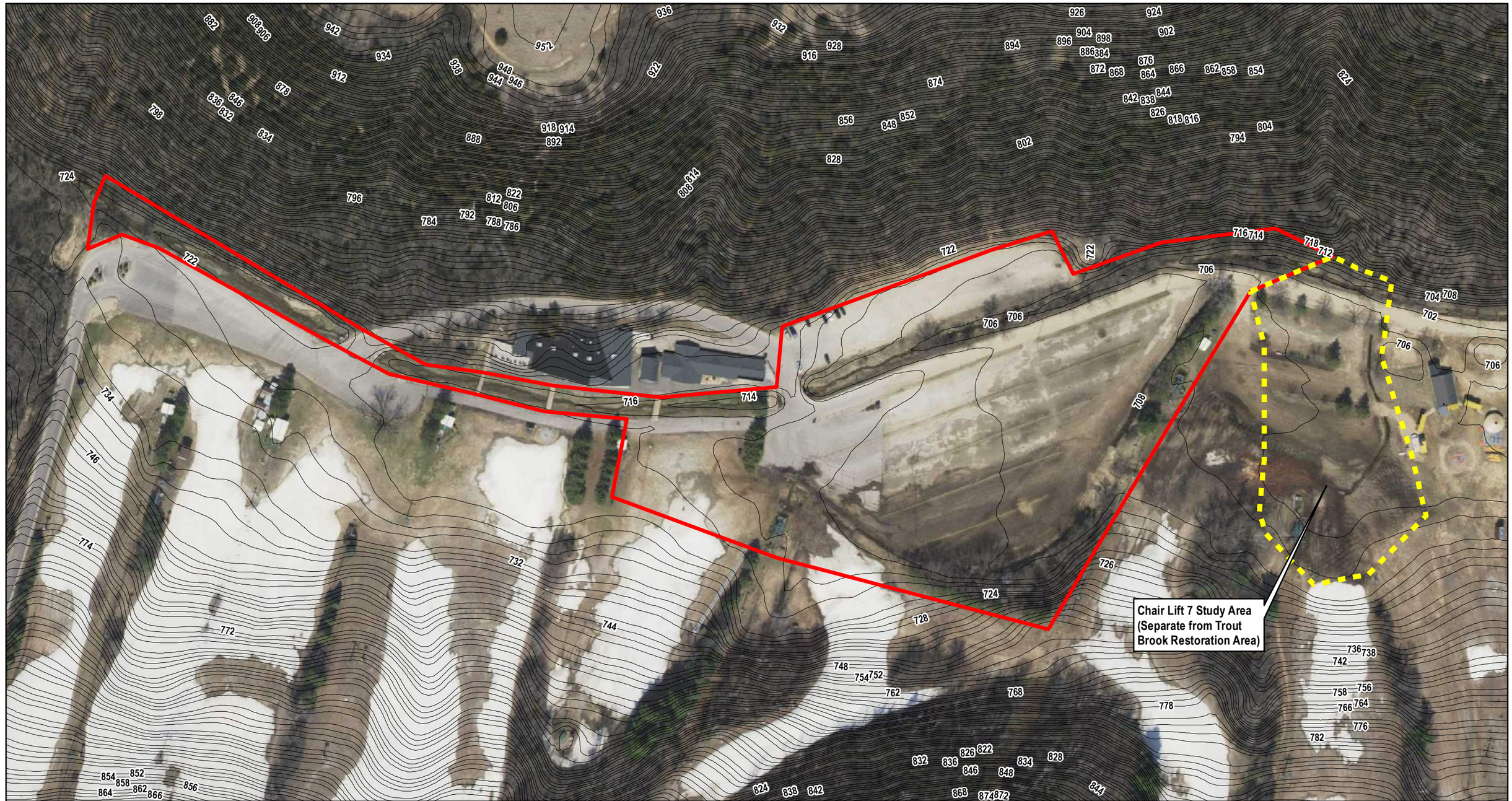


FIGURE 2

2016 AERIAL PHOTO/LIDAR

Afton Alps Trout Brook Restoration
Denmark Township, Minnesota

Re-Meander Study Area
Chair Lift 7 Study Area
contour_2f_3m

0 75 150 300
Feet

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\Wetland\Report\Figure2_Lidar.mxd

FIGURE 3

EAST CENTRAL NWI/SOILS

Afton Alps Trout Brook Restoration
Denmark Township, Minnesota

- Re-Meander Study Area
- Chair Lift 7 Study Area
- NRCS Soil Map Units
- Hydric Soils Map Units
- East Central Minnesota NWI

0 75 150 300
Feet

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\Wetland\Report\Figure3_NWISOILS.mxd

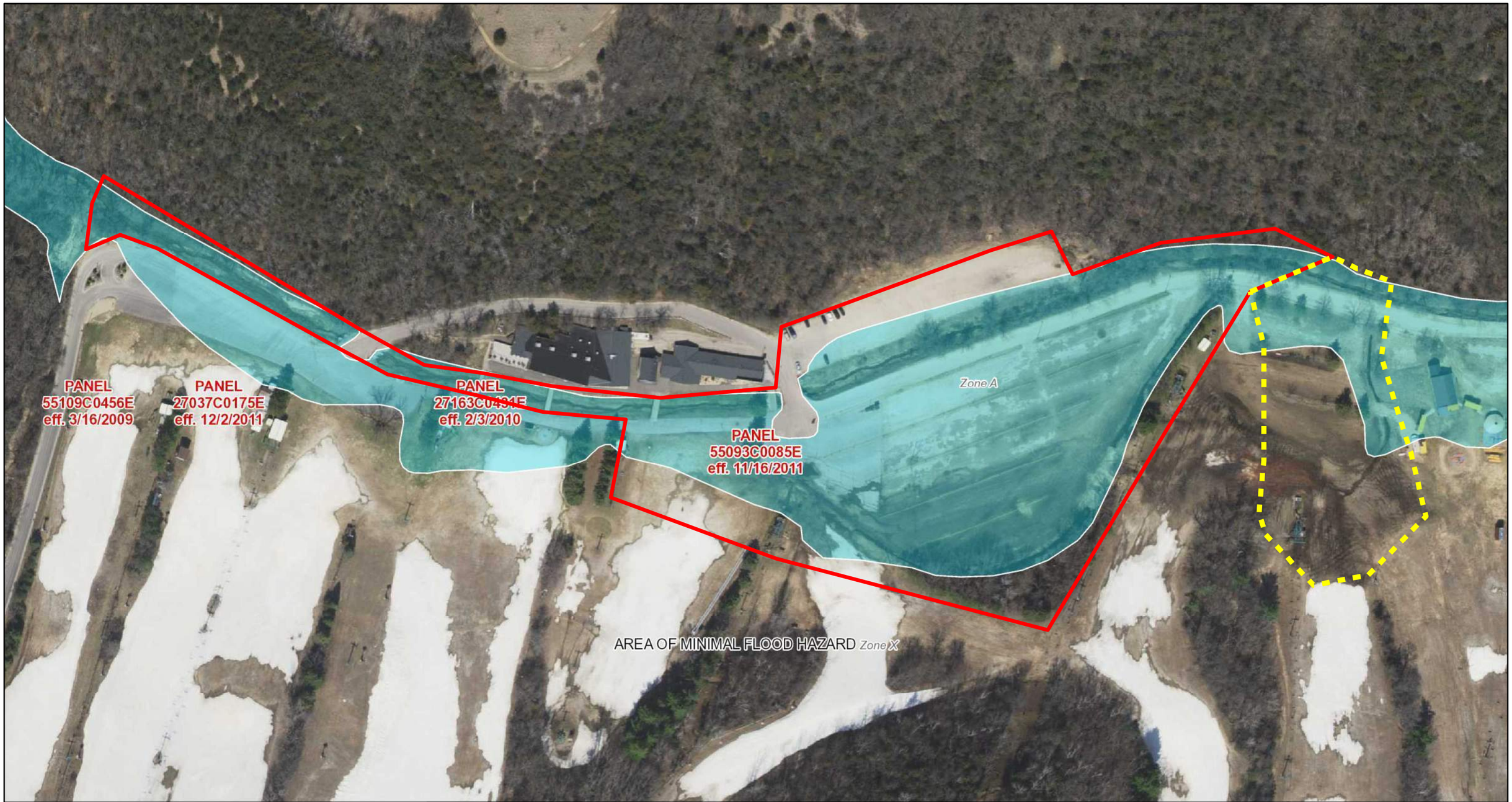


FIGURE 4

FEMA NATIONAL FLOOD HAZARD LAYER

Afton Alps Trout Brook Restoration
Denmark Township, Minnesota

Re-Meander Study Area
Chair Lift 7 Study Area

0 75 150 300
Feet

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\Wetland\Report\Figure4_FEMA.mxd

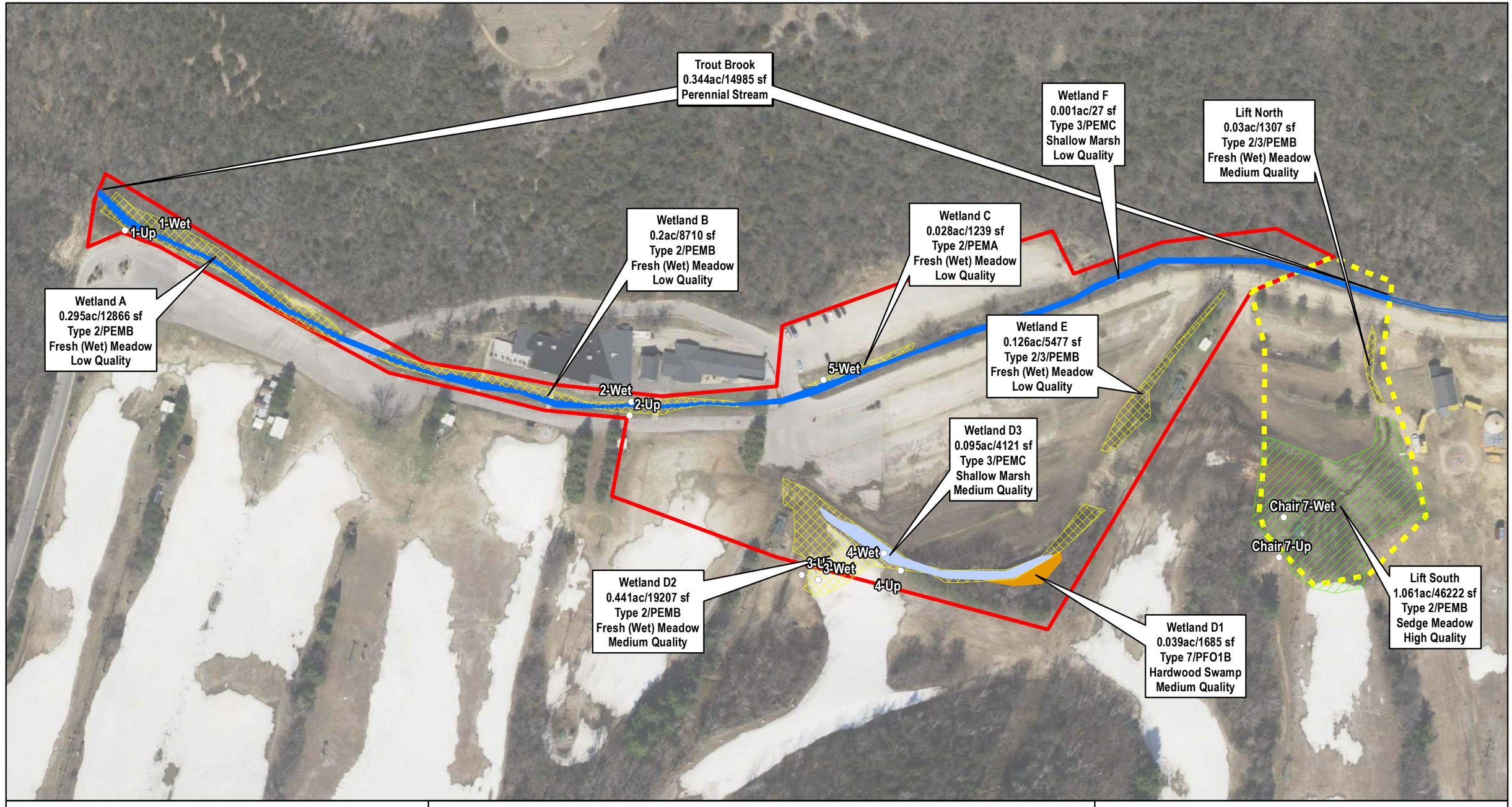


FIGURE 5

DELINEATED WETLANDS OVERVIEW

Afton Alps Trout Brook Restoration
Denmark Township, Minnesota

Sample Point Locations
Re-Meander Study Area
Chair Lift 7 Study Area

Eggers & Reed Community
Fresh (Wet) Meadow
Hardwood Swamp
Perennial Stream
Sedge Meadow
Shallow Marsh

0 75 150 300
Feet

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\Wetland\Report\Figure5_DelineatedOverview.mxd

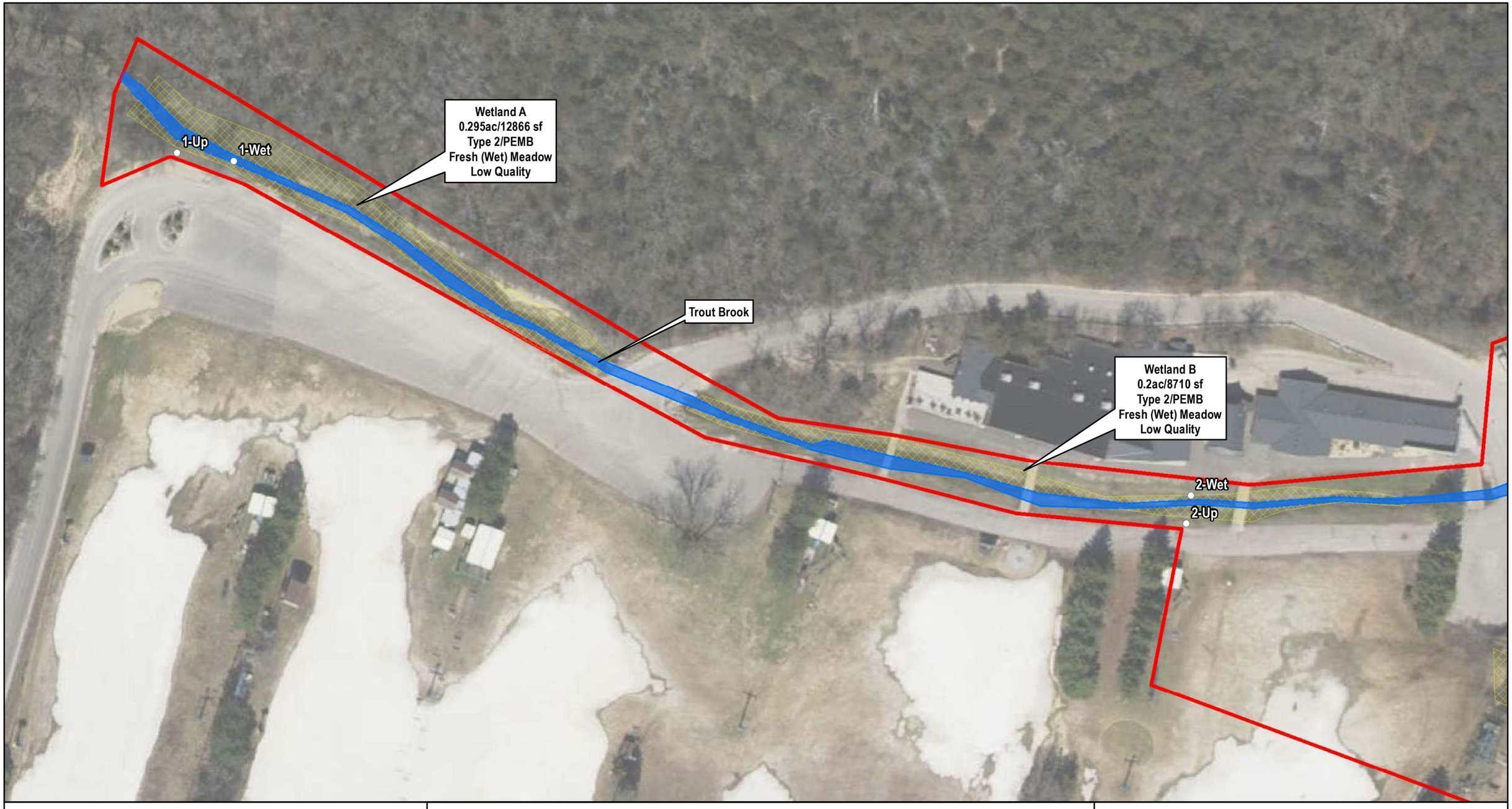


FIGURE 6

DELINEATED WETLANDS DETAIL WEST

Afton Alps Trout Brook Restoration
Denmark Township, Minnesota

Sample Point Locations
Re-Meander Study Area
Chair Lift 7 Study Area

Eggers & Reed Community
Fresh (Wet) Meadow
Hardwood Swamp
Perennial Stream
Sedge Meadow
Shallow Marsh

0 75 150
Feet

N

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\Wetland\Report\Figure6_DetailWest.mxd

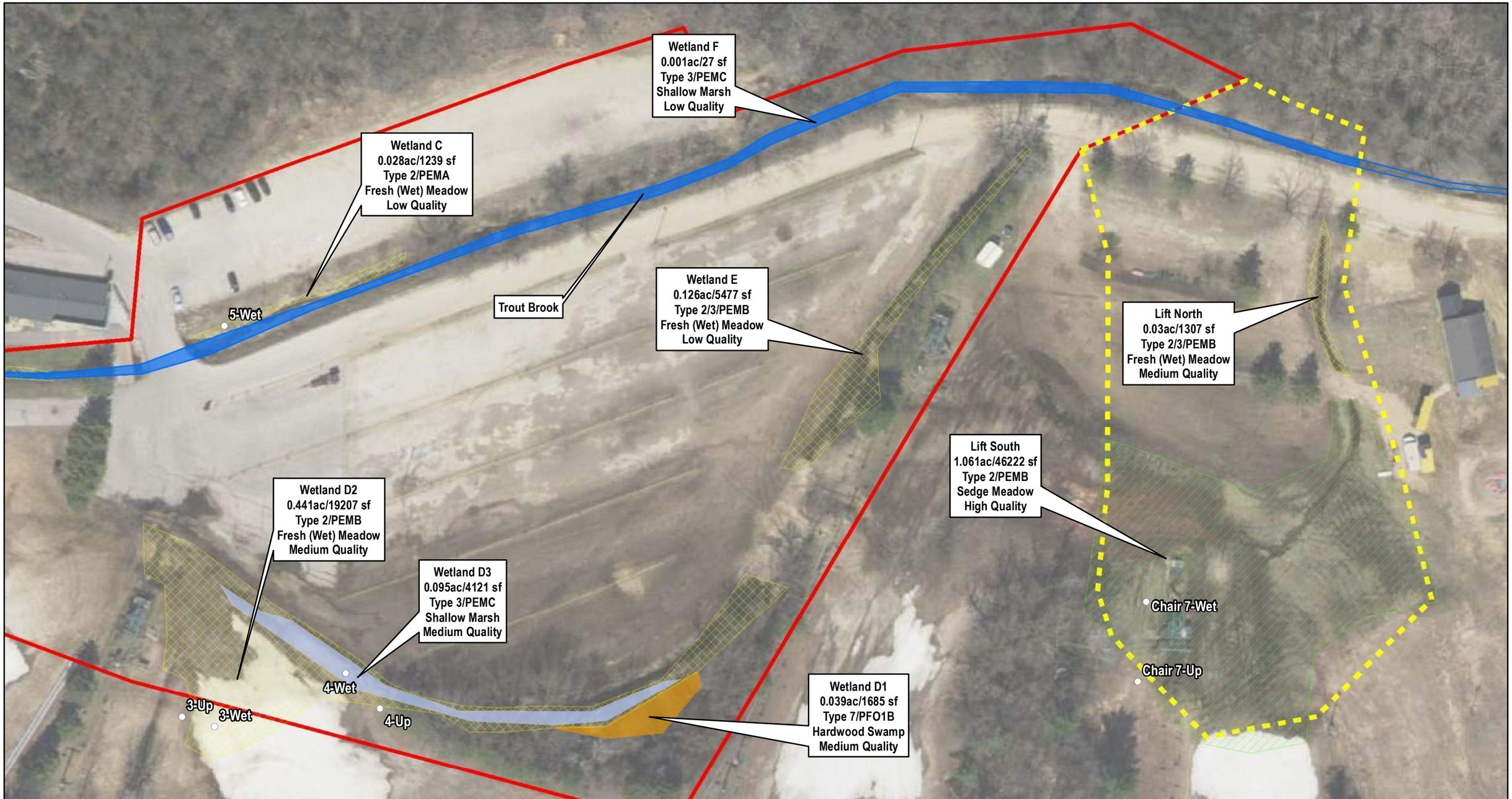


FIGURE 7

DELINEATED WETLANDS DETAIL EAST

Afton Alps Trout Brook Restoration
Denmark Township, Minnesota

Sample Point Locations
Re-Meander Study Area
Chair Lift 7 Study Area

Eggers & Reed Community
Fresh (Wet) Meadow
Hardwood Swamp
Perennial Stream
Sedge Meadow
Shallow Marsh

0 75 150
Feet

HRGreen

\\hrgreen.com\HRG\Data\2017\170327\GIS\MXD\Wetland\Report\Figure7_DetailWest.mxd

APPENDIX A: WETLAND DATA FORMS

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 1-Wet
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): stream bench Local relief (concave, convex, none): none
Slope (%): 2 Lat.: 4967219 Long.: 516534 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y		
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Sample point in shallow bench adjacent to Trout Brook

HYDROLOGY

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

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes	____	No	X	Depth (inches): ____
Water table present?	Yes	X	No	____	Depth (inches): 9
Saturation present? (includes capillary fringe)	Yes	X	No	____	Depth (inches): 5

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 1-Wet

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Salix nigra*	7	Y	OBL
2				
3				
4				
5				
6				
7				
8				
9				
10				
		7	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Phalaris arundinacea*	60	Y	FACW
2	*Poa palustris*	45	Y	FACW
3	*Impatiens capensis*	15	N	FACW
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		120	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	1	4
Sapling/Shrub Stratum	0	0
Herb Stratum	24	60
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	7	x 1 =	7
FACW species	120	x 2 =	240
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	127 (A)		247 (B)

Prevalence Index = B/A = 1.94

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetatior
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet

SOIL **Sampling Point:** 1-Wet

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-3	10YR 4/4	100					silty sand	
3-5	10YR 3/2	100					sandy loam	
5-18	10YR 4/1	95	G1 2.5/N	5	D	M	loamy sand	
18-30	10YR 3/2						loamy sand	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
_X_ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___Y___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 1-Up
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none
Slope (%): 2 Lat.: 4967215 Long.: 516528 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	N	**Is the sampled area within a wetland?**	N
Hydric soil present?	N		
Indicators of wetland hydrology present?	N	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Sample point on slight hillslope between parking area and stream. Gravel/concrete piles observed near plot.

HYDROLOGY

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes	____	No	X	Depth (inches): ____
Water table present?	Yes	____	No	X	Depth (inches): ____
Saturation present? (includes capillary fringe)	Yes	____	No	X	Depth (inches): ____

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 1-Up

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Salix nigra*	30	Y	OBL
2	*Ulmus pumila*	15	Y	FACU
3	*Acer negundo*	15	Y	FAC
4				
5				
6				
7				
8				
9				
10				
		60	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Rhamnus cathartica*	30	Y	FAC
2	*Fraxinus nigra*	7	N	FACW
3	*Lonicera tatarica*	7	N	FACU
4	*Ribes missouriense*	5	N	UPL
5				
6				
7				
8				
9				
10				
		49	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Poa pratensis*	55	Y	FACU
2	*Elymus repens*	35	Y	FACU
3	*Agrostis gigantea*	20	N	FACW
4	*Saponaria officinalis*	15	N	FACU
5	*Melilotus officinalis*	10	N	FACU
6	*Conyza canadensis*	7	N	FACU
7	*Glechoma hederacea*	5	N	FACU
8	*Trifolium repens*	5	N	FACU
9	*Ambrosia artemisiifolia*	3	N	FACU
10				
11				
12				
13				
14				
15				
		155	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	10	25
Herb Stratum	31	78
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 6 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	30	x 1 =	30	
FACW species	27	x 2 =	54	
FAC species	45	x 3 =	135	
FACU species	157	x 4 =	628	
UPL species	5	x 5 =	25	
Column totals	264	(A)	872	(B)

Prevalence Index = B/A = 3.30

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetatior

___ Dominance test is >50%

___ Prevalence index is ≤3.0*

___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet

SOIL **Sampling Point:** 1-Up

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-7	10YR 3/2	100					loamy sand	
7-20	10YR 4/2	100					sand	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: Gravel
Depth (inches): 20

Hydric soil present? N

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 2-Wet
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): shallow bench Local relief (concave, convex, none): concave
Slope (%): 2 Lat.: 4967136 Long.: 516771 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation X , soil _____ , or hydrology _____ significantly disturbed? Are "normal
Are vegetation _____ , soil _____ , or hydrology _____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y		
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Area is mowed adjacent to Trout Brook. Stream running 1 ft below top of sample point.

HYDROLOGY

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

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- X Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches):	___
Water table present?	Yes	X	No	___	Depth (inches):	8
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches):	5

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 2-Wet

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Juncus dudleyi*	70	Y	FACW
2	*Phalaris arundinacea*	20	N	FACW
3	*Trifolium repens*	5	N	FACU
4	*Taraxacum officinale*	3	N	FACU
5	*Scirpus atrovirens*	3	N	OBL
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		101	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	20	51
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	3	x 1 =	3
FACW species	90	x 2 =	180
FAC species	0	x 3 =	0
FACU species	8	x 4 =	32
UPL species	0	x 5 =	0
Column totals	101 (A)		215 (B)

Prevalence Index = B/A = 2.13

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetatior

X Dominance test is >50%

X Prevalence index is ≤3.0*

___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet

Area is mowed close to ground and inflorescence not observed in Juncus

SOIL **Sampling Point:** 2-Wet

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-4	10YR 4/2	88	10YR 3/4	12			loamy sand	
4-14	G1 2.5/N	85	10YR 3/1	15			sandy mucky loam	
14-18	10YR 2/2	90	10YR 4/3	10			sandy mucky loam	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
_X_ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
_X_ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: Gravel
Depth (inches): 18

Hydric soil present? Y

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 2-Up
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none
Slope (%): 15 Lat.: 4967127 Long.: 516772 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation X , soil X , or hydrology ____ significantly disturbed? Are "normal
Are vegetation ____ , soil ____ , or hydrology ____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? N
Hydric soil present? N
Indicators of wetland hydrology present? N

Is the sampled area within a wetland? N

If yes, optional wetland site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

Steep hillslope up from stream/wetland. Adjacent to parking/driveway to south. Maintained/mowed grass and rip rap along hillslope.

HYDROLOGY

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:
Surface water present? Yes ____ No X Depth (inches): ____
Water table present? Yes ____ No X Depth (inches): ____
Saturation present? Yes ____ No X Depth (inches): ____
(includes capillary fringe)

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 2-Up

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Poa pratensis*	70	Y	FACU
2	*Phalaris arundinacea*	25	Y	FACW
3	*Taraxacum officinale*	10	N	FACU
4	*Medicago lupulina*	5	N	FACU
5	*Trifolium repens*	3	N	FACU
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		113	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	23	57
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	25	x 2 =	50
FAC species	0	x 3 =	0
FACU species	88	x 4 =	352
UPL species	0	x 5 =	0
Column totals	113 (A)		402 (B)

Prevalence Index = B/A = 3.56

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetatior
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet

mowed

SOIL **Sampling Point:** 2-Up

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-1	10YR 2/2	100					sandy loam	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: rip rap
Depth (inches): 1

Hydric soil present? N

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 3-Wet
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): toe of slope Local relief (concave, convex, none): concave
Slope (%): 1 Lat.: 4967047 Long.: 516863 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation X , soil X , or hydrology ____ significantly disturbed? Are "normal
Are vegetation ____ , soil ____ , or hydrology ____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y		
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Toe of slope of several ski runs. Mowed occasionally. Hydrology may be increased by snow making equipment.

HYDROLOGY

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes	____	No	X	Depth (inches):	____
Water table present?	Yes	X	No	____	Depth (inches):	10
Saturation present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	14

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 3-Wet

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Poa pratensis*	55	Y	FACU
2	*Juncus canadensis*	40	Y	OBL
3	*Carex vulpinoidea*	15	N	OBL
4	*Schoenoplectus tabernaemontani*	5	N	OBL
5	*Phalaris arundinacea*	5	N	FACW
6	*Medicago lupulina*	2	N	FACU
7	*Trifolium pratense*	2	N	FACU
8				
9				
10				
11				
12				
13				
14				
15				
		124	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	25	62
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	60	x 1 =	60	
FACW species	5	x 2 =	10	
FAC species	0	x 3 =	0	
FACU species	59	x 4 =	236	
UPL species	0	x 5 =	0	
Column totals	124	(A)	306	(B)

Prevalence Index = B/A = 2.47

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetatior
- ___ Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet

mowed

SOIL **Sampling Point:** 3-Wet

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-6	10YR 3/1	95	10YR 4/6	5	C	PL	sandy loam	heavy root matter throughout
6-10	10YR 4/1	85	10YR 2/2	10	D	M	silty clay loam	
			10YR 4/4	5	C	PL		
10-34	10YR 4/2	92	10YR 4/6	5	C	PL	loamy sand	
			10YR 3/1	3	D	M		

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
_X_ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___Y___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 3-Up
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): flat past toe of slope Local relief (concave, convex, none): none
Slope (%): 0 Lat.: 4967109 Long.: 516811 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation X , soil , or hydrology X significantly disturbed? Are "normal
Are vegetation , soil , or hydrology naturally problematic? circumstances" present? No
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	N	**Is the sampled area within a wetland?**	N
Hydric soil present?	N		
Indicators of wetland hydrology present?	N	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Mowed flat past toe of slope. Hydrology possible impacted by snow making equipment.

HYDROLOGY

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):
Water table present?	Yes		No	X	Depth (inches):
Saturation present? (includes capillary fringe)	Yes		No	X	Depth (inches):

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 3-Up

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Poa pratensis*	100	Y	FACU
2	*Medicago lupulina*	5	N	FACU
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		105	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	21	53
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	105	x 4 =	420
UPL species	0	x 5 =	0
Column totals	105 (A)		420 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetatior
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet

Mowed close to ground

SOIL **Sampling Point:** 3-Up

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-4	10YR 3/3	100					loamy sand	
4-9	10YR 3/2	90	10YR 3/6	7	C	PL	sandy clay loam	
			5YR 3/3	3	C	PL		
9-12	10YR 5/3	93	10YR 5/6	7	C	PL	sandy clay loam	
			10YR 3/1	3	D	PL		
12-16	10YR 4/4	100					sandy clay loam	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___N___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 4-Wet
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): hillslop Local relief (concave, convex, none): none
Slope (%): 8 Lat.: 4967057 Long.: 516895 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology X significantly disturbed? Are "normal
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? circumstances" present? No
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y		
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Wetland between toe of slope and gravel parking lot. Hydrology possible increased by snow making equipment.

HYDROLOGY

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

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes	X	No	____	Depth (inches): 2
Water table present?	Yes	X	No	____	Depth (inches): 0
Saturation present? (includes capillary fringe)	Yes	X	No	____	Depth (inches): 0

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 4-Wet

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Scirpus atrovirens*	55	Y	OBL
2	*Carex vulpinoidea*	25	Y	OBL
3	*Carex hystericina*	20	N	OBL
4	*Phalaris arundinacea*	15	N	FACW
5	*Leersia oryzoides*	15	N	OBL
6	*Schoenoplectus tabernaemontani*	15	N	OBL
7	*Mimulus ringens*	2	N	OBL
8				
9				
10				
11				
12				
13				
14				
15				
		147	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	29	74
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	132	x 1 =	132
FACW species	15	x 2 =	30
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	147 (A)		162 (B)

Prevalence Index = B/A = 1.10

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetatior

X Dominance test is >50%

X Prevalence index is ≤3.0*

___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet

SOIL **Sampling Point:** 4-Wet

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-8	G1 2.5N	85	10YR 3/1	15	D	M	sandy mucky loam	
8-20	10YR 3/4	96	10YR 4/6	4	C	PL	loamy sand	
20-24	10YR 4/2	100					loamy sand	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
_X_ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
_X_ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___Y___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 4-Up
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): toe of slope Local relief (concave, convex, none): concave
Slope (%): 0 Lat.: 4967057 Long.: 516895 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	N	**Is the sampled area within a wetland?**	N
Hydric soil present?	N		
Indicators of wetland hydrology present?	N	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Hillslope above marked utilities.

HYDROLOGY

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes ____	No X	Depth (inches):	
Water table present?	Yes ____	No X	Depth (inches):	
Saturation present? (includes capillary fringe)	Yes ____	No X	Depth (inches):	

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 4-Up

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Pinus resinosa*	50	Y	FACU
2	*Acer saccharinum*	20	Y	FACW
3	*Acer negundo*	7	N	FAC
4				
5				
6				
7				
8				
9				
10				
		77	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Rhamnus cathartica*	40	Y	FAC
2				
3				
4				
5				
6				
7				
8				
9				
10				
		40	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Bromus inermis*	65	Y	UPL
2	*Poa pratensis*	40	Y	FACU
3	*Amphicarpaea bracteata*	10	N	FAC
4	*Equisetum arvense*	7	N	FAC
5	*Asclepias syriaca*	7	N	UPL
6	*Medicago lupulina*	3	N	FACU
7	*Ambrosia artemisiifolia*	2	N	FACU
8	*Solidago canadensis*	2	N	FACU
9	*Melilotus officinalis*	2	N	FACU
10				
11				
12				
13				
14				
15				
		138	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	15	39
Sapling/Shrub Stratum	8	20
Herb Stratum	28	69
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 5 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 40.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	64	x 3 =	192
FACU species	99	x 4 =	396
UPL species	72	x 5 =	360
Column totals	255 (A)		988 (B)

Prevalence Index = B/A = 3.87

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetatior

___ Dominance test is >50%

___ Prevalence index is ≤3.0*

___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet

SOIL **Sampling Point:** 4-Up

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-8	10YR 3/3	100					loamy sand	
8-24	10YR 4/4	100					loamy sand	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___N___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point 5-wet
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): Stream bench Local relief (concave, convex, none): none
Slope (%): 1 Lat.: 4967145 Long.: 516866 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y		
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Sample point on creek bench about 3 feet above running water. Steep side slope to north.

HYDROLOGY

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	
Water table present?	Yes	X	No		Depth (inches):	22
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	18

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: 5-wet

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Phalaris arundinacea*	97	Y	FACW
2	*Amphicarpaea bracteata*	10	N	FAC
3	*Solidago gigantea*	7	N	FACW
4	*Pastinaca sativa*	5	N	UPL
5	*Monarda fistulosa*	3	N	FACU
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		122	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	24	61
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	104	x 2 =	208
FAC species	10	x 3 =	30
FACU species	3	x 4 =	12
UPL species	5	x 5 =	25
Column totals	122 (A)		275 (B)

Prevalence Index = B/A = 2.25

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetatior
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet

SOIL **Sampling Point:** 5-wet

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-24	10YR 3/3						loamy sand	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
_X_ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___Y___

Remarks:
Loose, newly deposited alluvium

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point Chair 7-Wet
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): toe of slope Local relief (concave, convex, none): none
Slope (%): 1 Lat.: 496075 Long.: 517890 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology X significantly disturbed? Are "normal
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? circumstances" present? No
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y		
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

Sample point slightly up toe of slope. West of fence around chair lift. Hydrology possibly increased by snow making equipment.

HYDROLOGY

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

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes	____	No	X	Depth (inches):	____
Water table present?	Yes	X	No	____	Depth (inches):	3
Saturation present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	0

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: Chair 7-Wet

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Carex hystericina*	50	Y	OBL
2	*Scirpus atrovirens*	30	Y	OBL
3	*Scirpus cyperinus*	25	N	OBL
4	*Juncus dudleyi*	20	N	FACW
5	*Juncus canadensis*	10	N	OBL
6	*Prunella vulgaris*	7	N	FAC
7	*Mimulus ringens*	5	N	OBL
8	*Lycopus americanus*	2	N	OBL
9				
10				
11				
12				
13				
14				
15				
		149	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	30	75
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	122	x 1 =	122	
FACW species	20	x 2 =	40	
FAC species	7	x 3 =	21	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	149	(A)	183	(B)

Prevalence Index = B/A = 1.23

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetatior
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet

SOIL **Sampling Point:** Chair 7-Wet

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-8	10YR 3/1	85	10YR 4/4	10	C	PL	loamy sand	some muck
			G1 2.5/GY	5	D	M		
8-13	10YR 4/4	80	10YR 4/6	10	C	PL	loamy sand	
			10YR 3/1	10	D	M		
13-30	10YR 3/1	90	10YR 4/1	10	D	M	loamy sand	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
_X_ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
_X_ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___Y___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Afton Alps Remeander City/County: Dnmark Twp/Wash Sampling Date: 7/28/17
Applicant/Owner: Great River Greening State: MN Sampling Point Chair 7-Up
Investigator(s): Ted McCaslin, WDC Section, Township, Range: 3, T27N, R20W
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex
Slope (%): 5 Lat.: 4967058 Long.: 517087 Datum: UTM 15N
Soil Map Unit Nam 329-Chaska silt loam NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	N	**Is the sampled area within a wetland?**	N
Hydric soil present?	N		
Indicators of wetland hydrology present?	N	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

hillslope above lift

HYDROLOGY

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes	____	No	X	Depth (inches): ____
Water table present?	Yes	____	No	X	Depth (inches): ____
Saturation present? (includes capillary fringe)	Yes	____	No	X	Depth (inches): ____

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: Chair 7-Up

Tree Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5ft)	Absolute % Cover	Dominant Species	Indicator Status
1	*Poa pratensis*	90	Y	FACU
2	*Medicago lupulina*	15	N	FACU
3	*Equisetum arvense*	10	N	FAC
4	*Trifolium repens*	10	N	FACU
5	*Taraxacum officinale*	10	N	FACU
6	*Ambrosia artemisiifolia*	7	N	FACU
7				
8				
9				
10				
11				
12				
13				
14				
15				
		142	= Total Cover	

Woody Vine Stratum	Plot Size (30ft)	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

50/20 Thresholds

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	28	71
Woody Vine Stratum	0	0

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

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

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	132	x 4 =	528
UPL species	0	x 5 =	0
Column totals	142 (A)		558 (B)

Prevalence Index = B/A = 3.93

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetatior

___ Dominance test is >50%

___ Prevalence index is ≤3.0*

___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet

SOIL **Sampling Point:** Chair 7-Up

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-24	10YR 3/2	96	10YR 4/6	4	C	M	loamy sand	some gravel, possible fill

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains
**Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Suface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA**
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L**
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: _____
Depth (inches): _____

Hydric soil present? ___N___

Remarks:

APPENDIX B: SITE PHOTOS

Photo 1 -Looking east, sample point 1-Wet in Wetland A

Photo 2 - Cobble substrate in Trout Brook in Wetland A

Photo 3 - Looking west, Sample Point 2-Wet in Wetland B

Photo 4 - Looking north, maintained grass and rip rap on bank of Trout Brook above Wetland B

Photo 5 - Looking west, Sample Point 5-Wet in Wetland C

Photo 6 - Surface saturation in forested Wetland D1

Photo 7 - Looking northwest, Sample Point 3-Wet in Wetland D2

Photo 8 - Looking southeast at edge of parking and toe of slopes at Wetland D complex.

Photo 9 - Looking east at Wetland D3

Photo 10 - Looking north at Wetland E

Photo 11 - Trout Brook near Wetland F

Photo 12 - Sample Point Chair 7-Wet. Chair Lift 7 in background of photo.

Photo 13 - Looking north at Chair Lift 7 North wetland.

Photo 14 - Looking west at Chair Lift South wetland

APPENDIX C: ANTECEDENT PRECIPITATION

Minnesota State Climatology Office

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Data Retrieval from a Gridded Database

Obtaining a long-term precipitation data time-series can be a difficult and time-consuming process. Locating the nearest precipitation monitoring station to a site of interest often proves challenging. Once a nearby monitoring location is identified, retrieving the data, accounting for gaps in the record, and generating the summary statistics can provide further challenges.

By offering access to "synthetic" data, this application assists users in overcoming some the challenges inherent in assembling a precipitation data set. The synthetic data are made up of regularly-spaced grid nodes whose values were calculated using data interpolated from Minnesota's outstanding, but spatially and temporally irregular, precipitation data base.

Click to learn more about **Precipitation Grids**.

select a target location

Precipitation data for target location:

county: **Washington**
township name: **Denmark**
nearest community: **Basswood Grove**
township number: **27N**
range number: **20W**
section number: **3**

precipitation totals are in inches

color key:
total is in lowest 30th percentile of the period-of-record distribution
total is => 30th and <= 70th percentile
total is in highest 30th percentile of the period-of-record distribution

multi-month totals:
WARM = warm season (May thru September)
ANN = calendar year (January thru December)
WAT = water year (Oct. previous year thru Sep. present year)

A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.

Period-of-Record Summary Statistics															
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
30%	0.50	0.51	1.04	1.66	2.54	3.26	2.76	2.55	2.11	1.35	0.76	0.61	16.36	26.33	26.60
70%	1.06	1.05	2.05	2.82	4.41	5.33	4.53	4.47	4.27	2.76	1.80	1.25	21.13	32.38	32.04
mean	0.85	0.83	1.59	2.44	3.63	4.57	3.87	3.70	3.34	2.28	1.51	1.03	19.11	29.64	29.65
1981-2010 Normals															
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
normal	0.90	0.80	1.76	2.72	3.66	4.50	4.30	4.37	3.56	2.71	1.83	1.13	20.39	32.24	32.06
Year-to-Year Data															
Year	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
2017	1.21	0.73	0.70	4.89R	5.95R	3.26R	3.73R								
2016	0.38	0.82	2.02	2.74	2.83	4.90	6.52	8.29	6.02	2.73	1.55	2.21	28.56	41.01	45.36
2015	0.42	0.34	0.71	2.25	3.72	5.02	8.76	3.90	5.17	2.86	4.76	3.22	26.57	41.13	33.33
2014	1.06	1.25	0.99	5.85	5.73	12.07	3.35	3.26	2.04	1.35	0.94	0.75	26.45	38.64	40.83
2013	0.88	1.24	2.10	5.14	6.35	5.85	2.04	1.31	1.55	3.18	0.59	1.46	17.10	31.69	30.25
2012	0.66	1.56	1.98	3.54	6.84	5.19	4.01	1.53	0.45	1.17	0.70	1.92	18.02	29.55	28.25
2011	0.80	1.05	2.24	3.09	3.34	5.26	6.77	4.53	0.86	1.05	0.50	0.94	20.76	30.43	34.96
2010	0.49	0.70	0.45	2.53	3.40	6.49	6.40	6.03	6.73	1.81	2.29	2.92	29.05	40.24	41.65
2009	0.42	1.02	1.12	1.79	1.39	5.19	3.67	7.51	0.55	5.99	0.43	2.01	18.31	31.09	27.26

2008	0.23	0.62	1.55	4.00	3.47	4.32	2.53	3.86	2.18	1.93	1.31	1.36	16.36	27.36	29.50
2007	0.84	1.19	2.70	1.43	3.20	2.14	2.53	7.23	4.57	5.04	0.10	1.60	19.67	32.57	29.37
2006	1.03	0.57	1.77	3.60	2.50	1.51	2.44	6.89	3.66	0.87	1.05	1.62	17.00	27.51	30.59
2005	1.10	1.09	1.91	1.83	3.43	3.98	2.86	3.55	5.07	4.46	1.24	0.92	18.89	31.44	29.40
2004	0.43	1.36	2.08	1.94	6.27	4.44	2.97	1.96	5.38	2.74	1.40	0.44	21.02	31.41	29.62
2003	0.33	0.67	1.67	2.79	6.91	5.43	2.66	1.46	2.48	0.95	0.90	0.94	18.94	27.19	29.46
2002	0.45	0.53	2.46	3.76	2.81	8.95	5.45	7.35	5.01	4.77	0.04	0.25	29.57	41.83	41.31
2001	1.11	1.30	0.64	6.21	4.67	5.06	3.06	2.20	3.04	1.58	2.21	0.75	18.03	31.83	33.88
2000	1.28	1.32	0.97	1.35	4.48	4.76	4.96	4.41	1.32	1.64	3.65	1.30	19.93	31.44	27.85
1999	1.49	0.55	1.65	3.87	5.04	4.36	4.54	3.72	1.77	1.35	1.12	0.53	19.43	29.99	32.32
1998	1.62	1.00	4.06	2.81	5.24	7.07	2.00	4.51	1.41	3.37	1.52	0.44	20.23	35.05	33.23
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
1997	1.81	0.25	1.26	0.80	1.97	5.25	10.15	4.17	3.02	2.64	0.61	0.26	24.56	32.19	40.20
1996	2.54	0.27	1.51	1.10	2.55	3.86	3.27	2.10	1.80	4.31	5.45	1.76	13.58	30.52	26.28
1995	0.56	0.29	2.73	2.23	3.83	4.06	4.17	6.45	1.32	5.17	1.11	1.00	19.83	32.92	31.92
1994	1.06	0.60	0.45	3.78	2.35	6.33	4.84	5.34	6.98	3.96	1.65	0.67	25.84	38.01	35.38
1993	1.27	0.42	1.55	2.65	4.09	6.72	6.21	8.64	2.52	1.02	1.87	0.76	28.18	37.72	40.60
1992	0.92	0.58	1.70	2.51	0.76	4.75	6.33	3.03	6.36	2.64	2.78	1.11	21.23	33.47	34.78
1991	0.35	0.92	2.96	2.77	7.59	2.80	4.42	3.49	5.81	1.38	5.39	1.07	24.11	38.95	34.43
1990	0.26	0.79	3.60	4.11	4.78	9.82	5.64	1.37	2.20	1.50	0.59	1.23	23.81	35.89	34.93
1989	0.59	0.62	2.16	2.27	4.19	3.41	4.53	3.62	2.21	0.66	1.41	0.29	17.96	25.96	28.70
1988	1.20	0.16	1.18	1.24	2.34	0.28	1.08	4.03	6.02	0.89	3.43	0.78	13.75	22.63	22.38
1987	0.32	0.06	0.38	0.18	2.47	2.66	12.89	3.58	1.42	1.14	2.24	1.47	23.02	28.81	27.50
1986	0.74	0.91	1.69	5.89	3.22	5.24	4.84	4.60	7.84	2.25	0.86	0.43	25.74	38.51	41.66
1985	0.67	0.44	3.11	1.82	3.44	3.26	2.52	4.42	4.59	4.06	1.38	1.25	18.23	30.96	32.05
1984	0.75	1.54	1.34	4.03	2.33	4.40	2.77	3.16	2.60	4.74	0.96	2.08	15.26	30.70	30.55
1983	0.67	1.07	2.04	3.24	3.99	3.14	4.26	2.80	3.73	2.25	4.13	1.25	17.92	32.57	34.00
1982	2.21	0.38	1.53	2.05	4.20	1.52	1.51	3.07	3.48	3.76	2.71	2.59	13.78	29.01	24.34
1981	0.22	2.87	0.70	2.95	2.84	3.76	3.41	6.65	1.71	2.39	1.19	0.81	18.37	29.50	26.59
1980	1.35	0.62	1.06	1.04	2.51	6.85	2.27	6.22	5.36	0.90	0.26	0.32	23.21	28.76	31.98
1979	0.95	1.03	3.82	1.00	3.93	6.56	4.02	5.09	1.96	2.69	1.58	0.43	21.56	33.06	31.37
1978	0.41	0.16	0.39	3.79	4.77	7.44	7.23	5.59	4.29	0.31	1.89	0.81	29.32	37.08	39.62
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
1977	0.44	0.80	3.68	3.72	3.32	4.59	5.45	8.04	4.27	2.65	1.52	1.38	25.67	39.86	35.08
1976	0.68	0.69	3.15	1.49	0.53	2.69	1.71	1.25	2.36	0.36	0.07	0.34	8.54	15.32	20.07
1975	2.60	0.54	1.18	6.86	4.57	9.02	1.54	7.21	1.96	0.52	3.78	1.22	24.30	41.00	38.73
1974	0.18	0.95	0.79	2.28	2.56	3.50	1.90	3.47	0.71	1.72	1.10	0.43	12.14	19.59	20.50
1973	0.89	0.62	1.20	2.04	6.73	3.22	3.06	7.16	3.70	1.89	1.39	0.88	23.87	32.78	34.16
1972	0.85	0.30	0.94	2.01	2.06	2.73	6.59	4.62	3.13	2.72	1.54	1.28	19.13	28.77	31.39
1971	1.02	1.32	0.83	0.83	3.65	4.58	3.90	1.76	4.17	4.75	2.65	0.76	18.06	30.22	33.12
1970	0.47	0.12	2.07	2.39	4.96	3.02	3.51	2.24	4.90	6.43	4.04	0.59	18.63	34.74	29.30
1969	1.99	0.26	1.35	0.88	1.98	3.77	3.11	1.06	0.73	3.19	0.77	1.66	10.65	20.75	23.93
1968	0.75	0.12	1.60	3.34	4.45	6.75	5.16	1.43	6.81	5.25	0.72	2.83	24.60	39.21	32.89
1967	2.52	1.07	0.92	4.12	1.18	7.63	2.41	1.93	0.96	2.04	0.14	0.30	14.11	25.22	27.09
1966	0.67	1.13	2.79	1.13	1.33	3.36	2.83	3.72	2.65	2.85	0.58	0.92	13.89	23.96	24.52
1965	0.48	1.59	2.94	3.10	4.69	8.88	5.05	3.01	5.36	1.08	2.10	1.73	26.99	40.01	37.76
1964	0.51	0.02	1.50	4.05	3.93	2.27	3.68	5.29	4.89	0.89	0.81	0.96	20.06	28.80	28.47
1963	0.46	0.48	1.34	2.12	3.77	2.32	3.10	1.82	3.61	0.77	0.92	0.64	14.62	21.35	21.77
1962	0.60	1.27	1.32	1.49	6.00	2.97	5.08	4.23	3.32	1.99	0.42	0.34	21.60	29.03	31.77
1961	0.12	0.76	2.42	2.19	4.43	2.06	3.32	2.39	3.27	2.96	1.43	1.10	15.47	26.45	23.67
1960	0.38	0.23	0.53	2.61	4.83	3.85	1.63	3.29	4.20	0.81	1.16	0.74	17.80	24.26	26.63
1959	0.14	0.48	0.51	0.99	4.80	3.58	3.19	7.11	3.12	2.94	0.61	1.53	21.80	29.00	26.93
1958	0.33	0.04	0.38	2.49	1.06	2.42	5.52	2.57	1.28	1.94	0.90	0.17	12.85	19.10	19.98
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT

1957	0.32	0.57	1.22	1.56	4.16	7.18	8.45	6.31	1.81	1.52	2.00	0.37	27.91	35.47	34.93
1956	0.39	0.16	2.24	0.85	3.18	8.01	4.45	5.89	0.85	1.86	1.32	0.17	22.38	29.37	31.30
1955	0.52	1.11	0.49	1.60	1.51	4.53	5.63	3.85	0.84	3.11	1.22	0.95	16.36	25.36	23.25
1954	0.20	0.44	2.15	4.12	5.21	5.46	3.86	3.41	4.61	1.94	0.62	0.61	22.55	32.63	32.68
1953	0.55	1.27	1.66	2.22	2.77	6.82	4.94	3.65	0.71	0.05	1.73	1.44	18.89	27.81	25.94
1952	0.97	0.82	2.02	1.61	3.66	4.60	3.31	3.98	0.50	0.02	0.90	0.43	16.05	22.82	25.93
1951	0.55	1.58	2.85	2.59	3.25	7.84	4.98	3.02	6.12	1.29	1.98	1.19	25.21	37.24	37.02
1950	1.62	0.69	2.58	2.39	2.59	3.13	3.22	3.17	1.63	1.83	0.73	1.68	13.74	25.26	24.66
1949	1.55	0.22	3.79	1.84	1.53	4.40	7.14	1.71	2.42	1.84	0.52	1.28	17.20	28.24	28.66
1948	0.14	1.86	0.78	1.97	1.32	2.76	3.43	3.98	0.84	0.64	2.57	0.85	12.33	21.14	20.89
1947	0.58	0.19	0.67	3.35	2.10	4.84	1.09	2.61	4.12	0.91	2.22	0.68	14.76	23.36	25.51
1946	1.29	1.15	1.64	0.74	2.77	7.34	2.64	0.72	6.31	4.06	1.24	0.66	19.78	30.56	27.46
1945	0.54	1.66	3.06	3.77	2.97	6.00	4.75	5.83	2.32	0.45	1.24	1.17	21.87	33.76	33.46
1944	0.50	0.96	1.27	1.97	5.85	5.31	2.74	2.82	1.02	0.33	2.01	0.22	17.74	25.00	24.95
1943	1.07	0.45	1.24	1.43	4.52	4.38	4.49	2.55	2.33	1.34	1.17	0.00	18.27	24.97	25.46
1942	0.14	0.24	1.96	3.01	8.71	3.98	5.77	2.56	10.32	1.26	0.49	1.25	31.34	39.69	43.88
1941	1.06	0.85	1.23	1.33	3.92	3.15	2.92	2.64	4.14	5.17	1.07	0.95	16.77	28.43	28.67
1940	0.28	1.13	2.93	1.67	2.26	7.75	4.52	5.82	0.38	2.18	3.73	1.52	20.73	34.17	30.04
1939	1.17	1.32	0.72	2.10	2.81	5.20	2.94	5.04	3.28	2.07	0.09	1.14	19.27	27.88	28.33
1938	0.69	0.48	2.07	4.12	11.03	5.62	3.42	3.97	5.02	1.14	1.86	0.75	29.06	40.17	39.57
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
1937	0.94	0.64	0.60	2.12	4.92	2.51	1.93	3.72	2.58	1.60	0.89	0.66	15.66	23.11	22.97
1936	0.69	1.13	2.05	0.77	2.70	1.73	0.13	3.12	1.14	0.60	0.76	1.65	8.82	16.47	17.96
1935	1.39	0.15	1.09	2.40	3.60	3.62	3.42	3.12	1.55	2.48	1.32	0.70	15.31	24.84	27.38
1934	0.84	0.23	0.61	2.41	0.46	2.64	2.61	1.87	5.24	3.25	1.73	2.06	12.82	23.95	19.36
1933	1.33	0.74	1.81	1.55	5.48	1.81	2.59	1.28	5.07	1.17	0.67	0.61	16.23	24.11	26.37
1932	1.88	0.99	1.30	2.62	2.31	2.69	2.76	3.20	1.07	0.84	2.39	1.48	12.03	23.53	26.09
1931	0.12	0.74	1.45	1.75	1.58	3.24	0.61	3.44	3.41	2.92	3.64	0.71	12.28	23.61	20.33
1930	1.12	1.64	0.69	0.77	4.41	6.50	2.75	0.56	3.60	1.76	2.06	0.17	17.82	26.03	24.77
1929	1.61	0.90	0.94	2.50	2.30	3.07	3.83	2.16	3.96	1.70	0.49	0.54	15.32	24.00	25.33
1928	0.45	1.22	0.59	3.19	2.36	3.16	4.23	6.62	2.32	3.24	0.37	0.45	18.69	28.20	30.25
1927	0.58	0.26	2.28	2.12	3.81	5.58	2.36	1.91	4.57	2.23	1.74	2.14	18.23	29.58	28.94
1926	0.71	0.72	1.59	0.92	1.05	3.47	2.77	3.91	6.07	1.98	2.23	1.26	17.27	26.68	23.74
1925	0.50	0.52	0.45	1.37	1.72	6.84	3.53	0.17	3.78	0.96	0.72	0.85	16.04	21.41	22.08
1924	0.55	0.91	1.30	3.30	1.42	5.25	2.66	7.21	3.53	1.25	0.76	1.19	20.07	29.33	28.36
1923	1.10	0.43	1.04	1.53	2.49	4.85	2.34	2.48	2.74	1.06	0.38	0.79	14.90	21.23	23.64
1922	0.73	1.98	1.44	2.41	3.24	4.90	3.02	1.52	2.08	0.91	3.60	0.13	14.76	25.96	23.76
1921	0.54	0.37	1.65	2.09	3.97	3.39	4.01	1.86	4.48	0.55	1.50	0.39	17.71	24.80	26.98
1920	1.66	0.52	2.67	2.29	2.91	7.87	1.65	1.42	2.01	2.29	1.42	0.91	15.86	27.62	28.49
1919	0.44	1.78	1.03	3.51	1.71	4.22	6.08	1.87	2.41	2.47	2.47	0.55	16.29	28.54	30.28
1918	0.62	0.83	0.68	0.87	4.90	2.81	4.30	4.68	1.94	2.39	3.15	1.69	18.63	28.86	24.37
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
1917	1.55	0.63	2.20	2.16	3.86	4.01	3.68	2.33	2.14	2.20	0.06	0.48	16.02	25.30	25.90
1916	2.44	0.53	0.99	3.33	5.54	4.80	0.77	1.71	2.75	1.53	0.94	0.87	15.57	26.20	28.91
1915	0.99	2.05	0.76	1.40	3.84	5.84	4.79	3.74	2.74	2.53	3.03	0.49	20.95	32.20	28.90
1914	0.83	0.39	1.15	3.51	1.82	8.30	1.73	5.35	2.81	2.03	0.36	0.36	20.01	28.64	29.64
1913	0.38	0.71	2.09	1.99	3.50	2.81	6.44	1.42	4.54	2.98	0.75	0.02	18.71	27.63	27.44
1912	0.43	0.26	0.37	2.44	4.77	1.25	4.84	5.76	2.28	1.51	0.45	1.60	18.90	25.96	33.70
1911	0.95	0.89	1.16	2.17	3.49	5.79	4.57	3.86	5.19	7.95	1.31	2.04	22.90	39.37	30.20
1910	0.88	0.34	0.04	0.68	1.76	1.09	1.81	2.00	2.03	1.04	0.61	0.48	8.69	12.76	18.09
1909	1.17	1.58	0.65	2.32	3.44	3.91	3.49	2.24	5.43	1.95	3.90	1.61	18.51	31.69	29.02
1908	0.37	0.97	1.84	3.87	7.24	7.66	2.51	0.73	3.28	2.88	0.93	0.98	21.42	33.26	31.03
1907	1.23	0.92	0.76	1.34	1.52	3.83	3.50	6.38	5.45	0.98	0.98	0.60	20.68	27.49	30.86
1906	1.76	0.27	1.68	2.46	8.74	3.28	3.20	3.29	4.27	2.27	2.62	1.04	22.78	34.88	34.61

1905	0.71	0.74	1.21	0.52	4.80	6.84	3.49	6.36	4.11	2.78	2.63	0.25	25.60	34.44	35.41
1904	0.35	0.65	1.42	1.39	3.27	4.39	4.51	4.57	4.23	5.62	0.10	0.91	20.97	31.41	28.87
1903	0.27	0.64	1.54	2.86	6.47	0.73	5.40	4.78	9.68	3.19	0.33	0.57	27.06	36.46	39.43
1902	0.51	0.70	0.63	2.63	5.29	2.06	7.19	4.98	3.91	2.04	2.94	2.08	23.43	34.96	30.84
1901	0.62	0.41	2.11	1.23	1.32	5.79	2.08	2.86	5.20	1.68	0.73	0.53	17.25	24.56	27.64
1900	0.75	1.07	1.49	1.94	0.30	1.93	6.85	5.40	6.81	4.50	0.91	0.61	21.29	32.56	32.35
1899	1.46	2.39	2.64	1.00	3.61	5.61	1.69	4.22	1.72	3.76	0.72	1.33	16.85	30.15	31.55
1898	0.22	1.54	2.29	1.40	3.75	2.93	2.60	2.84	0.68	5.24	1.95	0.02	12.80	25.46	22.64
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
1897	1.64	1.24	2.94	1.35	1.75	6.58	4.68	2.76	3.14	2.99	1.23	0.17	18.91	30.47	33.93
1896	0.88	0.18	2.06	4.88	4.13	2.95	1.58	2.45	2.69	3.28	3.66	0.91	13.80	29.65	23.53
1895	1.26	0.65	0.43	1.83	3.69	3.61	3.95	1.74	4.43	0.13	1.18	0.42	17.42	23.32	28.04
1894	1.07	0.22	2.16	3.79	3.88	1.86	0.13	0.73	1.98	4.77	0.55	1.13	8.58	22.27	21.59
1893	0.97	2.23	2.23	4.38	2.34	1.83	2.12	3.49	2.68	1.76	0.97	3.04	12.46	28.04	24.30
1892	0.13	1.84	0.99	1.17	6.06	7.21	9.31	3.23	2.40	0.76	0.56	0.71	28.21	34.37	38.88
1891	1.40	1.72	2.05	2.25	1.43	4.68	2.77	3.00	1.52	1.59	0.88	4.07	13.40	27.36	

APPENDIX D: WETLAND CONSERVATION ACT NOTICE OF DECISION

Minnesota Wetland Conservation Act
Notice of Decision

Local Government Unit (LGU)	Address
South Washington Watershed District	**2302 Tower Drive** **Woodbury, MN 55125**

1. PROJECT INFORMATION

Applicant Name	Project Name	Date of Application	Application Number
Great River Greening - Wiley Buck	**Afton Alps Trout Brook Restoration**	**09/05/2017**	**201701001**

☒ Attach site locator map.

Type of Decision:

☒ Wetland Boundary or Type Sequencing ☐ No-Loss ☐ Exemption ☐

☐ Replacement Plan ☐ Banking Plan

Technical Evaluation Panel Findings and Recommendation (if any):

☒ Approve ☐ Approve with conditions ☐ Deny

Summary (or attach): A TEP review of the submitted information and performed a site visit September 20, 2017. The TEP concurred with the delineation report and conclusions.

2. LOCAL GOVERNMENT UNIT DECISION

Date of Decision: **11/07/2017**

☒ Approved ☐ Approved with conditions (include below) ☐ Denied

LGU Findings and Conclusions (attach additional sheets as necessary):

The South Washington Watershed District (SWWD) acting as the WCA LGU, approves the above referenced wetland delineation report dated September 1, 2017, prepared by HR Green for Great River Greening, Denmark Township, MN. Approval of the delineation report includes boundary and type for Wetland A, B, C, D1, D2, D3, E and F identified on the site.

A complete delineation report dated September 1, 2017 was received by the SWWD September 5, 2017. The report included a review of the site, soils, public waters and national wetland inventory. Field delineation was completed according to 1987 Manual and Regional Supplement, US Army Corps of Engineers.

The TEP reviewed the delineation report and agreed with the conclusions of the report.

For Replacement Plans using credits from the State Wetland Bank:

Bank Account #	Bank Service Area	County	Credits Approved for Withdrawal (sq. ft. or nearest .01 acre)

Replacement Plan Approval Conditions. In addition to any conditions specified by the LGU, the approval of a Wetland Replacement Plan is conditional upon the following:

☐ **Financial Assurance:** For project-specific replacement that is not in-advance, a financial assurance specified by the LGU must be submitted to the LGU in accordance with MN Rule 8420.0522, Subp. 9 (List amount and type in LGU Findings).

☐ **Deed Recording:** For project-specific replacement, evidence must be provided to the LGU that the BWSR "Declaration of Restrictions and Covenants" and "Consent to Replacement Wetland" forms have been filed with the county recorder's office in which the replacement wetland is located.

☐ **Credit Withdrawal:** For replacement consisting of wetland bank credits, confirmation that BWSR has withdrawn the credits from the state wetland bank as specified in the approved replacement plan.

Wetlands may not be impacted until all applicable conditions have been met!

LGU Authorized Signature:

Signing and mailing of this completed form to the appropriate recipients in accordance with 8420.0255, Subp. 5 provides notice that a decision was made by the LGU under the Wetland Conservation Act as specified above. If additional details on the decision exist, they have been provided to the landowner and are available from the LGU upon request.		
Name **Matt Moore**	Title **SWWD Administrator**	
Signature 	Date **11/07/2017**	Phone Number and E-mail **651-714-3729** **mmoore@ci.woodbury.mn.us**

THIS DECISION ONLY APPLIES TO THE MINNESOTA WETLAND CONSERVATION ACT. Additional approvals or permits from local, state, and federal agencies may be required. Check with all appropriate authorities before commencing work in or near wetlands.

Applicants proceed at their own risk if work authorized by this decision is started before the time period for appeal (30 days) has expired. If this decision is reversed or revised under appeal, the applicant may be responsible for restoring or replacing all wetland impacts.

This decision is valid for three years from the date of decision unless a longer period is advised by the TEP and specified in this notice of decision.

3. APPEAL OF THIS DECISION

Pursuant to MN Rule 8420.0905, any appeal of this decision can only be commenced by mailing a petition for appeal, including applicable fee, within thirty (30) calendar days of the date of the mailing of this Notice to the following as indicated:

Check one:

☒ Appeal of an LGU staff decision. Send petition and $**0.00** fee (if applicable) to: **SWWD Board President** **WCA Decision Appeal** **2302 Tower Drive** **Woodbury, MN 55125**	☐ Appeal of LGU governing body decision. Send petition and $500 filing fee to: Executive Director Minnesota Board of Water and Soil Resources 520 Lafayette Road North St. Paul, MN 55155

4. LIST OF ADDRESSEES

- ☒ SWCD TEP member: **Mr. Jay Riggs, WCD**
- ☒ BWSR TEP member: **Mr. Ben Meyer, BWSR**
- ☒ LGU TEP member (if different than LGU Contact): **Ms. Kathy Higgins, Denmark Township**
- ☒ DNR TEP member: **Ms. Rebecca Horton, DNR**
- ☐ DNR Regional Office (if different than DNR TEP member)
- ☐ WD or WMO (if applicable):
- ☒ Applicant and Landowner (if different)
- ☐ Members of the public who requested notice:

- ☒ Corps of Engineers Project Manager
- ☐ BWSR Wetland Bank Coordinator (wetland bank plan decisions only)

5. MAILING INFORMATION

➢ For a list of BWSR TEP representatives: www.bwsr.state.mn.us/aboutbwsr/workareas/WCA_areas.pdf

➢ For a list of DNR TEP representatives: www.bwsr.state.mn.us/wetlands/wca/DNR_TEP_contacts.pdf

➢ Department of Natural Resources Regional Offices:

NW Region:	NE Region:	Central Region:	Southern Region:
Reg. Env. Assess. Ecol. Div. Ecol. Resources 2115 Birchmont Beach Rd. NE Bemidji, MN 56601	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1201 E. Hwy. 2 Grand Rapids, MN 55744	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1200 Warner Road St. Paul, MN 55106	Reg. Env. Assess. Ecol. Div. Ecol. Resources 261 Hwy. 15 South New Ulm, MN 56073

For a map of DNR Administrative Regions, see: http://files.dnr.state.mn.us/aboutdnr/dnr_regions.pdf

➢ For a list of Corps of Project Managers: www.mvp.usace.army.mil/regulatory/default.asp?pageid=687 or send to:

US Army Corps of Engineers
St. Paul District, ATTN: OP-R
180 Fifth St. East, Suite 700
St. Paul, MN 55101-1678

➢ For Wetland Bank Plan applications, also send a copy of the application to:

Minnesota Board of Water and Soil Resources
Wetland Bank Coordinator
520 Lafayette Road North
St. Paul, MN 55155

6. ATTACHMENTS

In addition to the site locator map, list any other attachments:

- ☐
- ☐
- ☐
- ☐
- ☐

APPENDIX E: DNR NHIS REVIEW

Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

December 15, 2017
Correspondence # ERDB 20180223

Mr. Ted McCaslin
HR Green, Inc.
2550 University Avenue West, Suite 400N
St. Paul, MN 55114

RE: Natural Heritage Review of the proposed Afton Alps Trout Brook Restoration,
T27N R20W Section 3; Washington County

Dear Mr. McCaslin,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area (for details, please visit the Rare Species Guide for more information on the biology, habitat use, and conservation measures of these rare species). Please note that the following rare features may be adversely affected by the proposed project:

Ecologically Significant Areas

- Portions of the project boundary are within areas the Minnesota Biological Survey (MBS) has identified as Sites of *Moderate* Biodiversity Significance. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *Moderate* contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.

  The project boundary is also within the following DNR Native Plant Communities: White Pine – Sugar Maple – Basswood Forest (Cold Slope), which is considered critically imperiled in Minnesota, and Oak – (Red Maple) Woodland, which is considered uncommon but not rare. (Please see attached the map; GIS shapefiles of MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be downloaded from the MN Geospatial Commons)

  Given the ecological significance, we recommend minimizing disturbance in these areas as much as possible, especially within the rare White Pine – Sugar Maple – Basswood Forest (Cold Slope) community. Actions to minimize disturbance may include, but are not limited to, the following recommendations:

- As much as possible, operate within already-disturbed areas;
- Minimize vehicular disturbance in the areas (allow only vehicles/equipment necessary for construction activities);
- Do not park equipment or stockpile supplies in the areas;
- Do not place spoil within MBS Sites or other sensitive areas;
- Disturbed soil areas should be reseeded immediately upon project completion, with native plant species;
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species;
- Use effective erosion prevention and sediment control measures.

State-listed Species

Plants:

- Kitten-tails (*Besseya bullii*), a state-listed threatened plant, has been documented in the vicinity of the proposed project. This species is found in savannas, prairies, and oak woodlands. Minnesota's endangered species law (Minnesota Statutes, section 84.0895) and associated rules (Minnesota Rules, part 6212.1800 to 6212.2300 and 6134) prohibit the taking of threatened or endangered species without a permit. **Given the protected status of this species and the presence of suitable habitat, we recommend a qualified surveyor (please see enclosed list) conduct a habitat assessment and, if needed, a botanical survey within the project footprint and access routes.** Please contact Lisa Joyal at 651-259-5109 or lisa.joyal@state.mn.us before any survey work is initiated, as you will need to discuss potential surveyors, survey protocol, and other requirements.

- Bloody beard lichen (*Usnea mutabilis*), a state-listed threatened species, and red beard lichen (*Usnea rubicunda*), a state-listed species of special concern, have been documented growing near the top of a large north-facing sandstone outcrop adjacent to Trout Brook. These species are typically found together on north-facing outcrop of Jordan Sandstone in close proximity to cool rivers within this area of Minnesota. Given the protected status and habitat specificity of the bloody beard lichen, impacts to any north-facing sandstone outcrops must be avoided. **Please contact Lisa Joyal if avoidance is not feasible**, as a survey may be needed.

Birds:

- The Henslow's Sparrow (*Ammodramus henslowii*), a state-listed endangered bird species, has been documented in the vicinity of the project area. This species nests on the ground in uncultivated grasslands and old fields with standing, dead vegetation and a substantial litter layer. Given the project boundary does not include the appropriate habitat, impacts are not anticipated.

- The Bell's Vireo, (*Vireo bellii*), a state listed bird species of special concern, has been documented in the vicinity of the project. In Minnesota, Bell's Vireo prefers shrub thickets within or bordering open habitats such as grasslands or wetlands. This bird suspends its nests from forks of low branches of small trees or

shrubs. If feasible, avoid tree & shrub removal from May 15th through August 15th to avoid disturbance of nesting birds.

- Red-shouldered Hawks (*Buteo lineatus*), a state-listed species of special concern, have been documented during the breeding season in the vicinity of the project. This species requires large, contiguous forest tracts interspersed with wetlands and prefers lowland woods and river bottoms. We recommend, to the extent possible, the retention of forest cover on the project site to help maintain habitat connectivity to other forest tracts in the area. Check any trees scheduled to be removed from April through July for active nests. If feasible, disturbance near active nests should be avoided during the critical nesting time, April and May. See the attached fact sheet regarding large bird nest identification. Please contact me if any nests are discovered.

Reptiles:

- The gopher snake (*Pituophis catenifer*), a state-listed species of special concern, and eastern hognose snake (*Heterodon platirhinos*), a Species in Greatest Conservation Need as identified in Minnesota's State Wildlife Action Plan, have been documented in the vicinity of the proposed project and may be encountered on site. Given the presence of these rare snakes, the DNR recommends that the use of erosion control mesh, be limited to wildlife-friendly materials (see enclosed fact sheet).

Federally Protected Species

- Several federally and state-listed mussels, as well as state-listed fish and amphibians, have been documented in the St. Croix River in the vicinity of the proposed project. These species are particularly vulnerable to deterioration in water quality, especially increased siltation. As Trout Brook flows into the St. Croix, is important stringent erosion prevention and sediment control practices be implemented and maintained throughout the duration of the project.

- The northern long-eared bat (*Myotis septentrionalis*), federally listed as threatened and state-listed as special concern, can be found throughout Minnesota. During the winter this species hibernates in caves and mines, and during the active season (approximately April-October) it roosts underneath bark, in cavities, or in crevices of both live and dead trees. Pup rearing is during June and July. Activities that may impact this species include, but are not limited to, wind farm operation, any disturbance to hibernacula, and destruction/degradation of habitat (including tree removal).

- The rusty patched bumble bee (*Bombus affinis*), a federally-listed endangered species, was documented in the vicinity of the proposed project. The rusty patched bumble bee typically occurs in grasslands and urban gardens with flowering plants from April through October. This species nests underground in abandoned rodent cavities or in clumps of grasses. Please reference the USFWS rusty patched bumble bee website for guidance to determine if the project has the potential to impact this protected species.

Environmental Review and Permitting

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance. Sufficient information should be provided so the DNR can determine whether a takings permit will be needed for any of the above protected species.

- Please include a copy of this letter in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. If you have not done so already, please contact your DNR Regional Environmental Assessment Ecologist to determine whether there are other natural resource concerns associated with the proposed project (contact information available at http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html). Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,

Samantha Bump
Natural Heritage Review Specialist
Samantha.Bump@state.mn.us

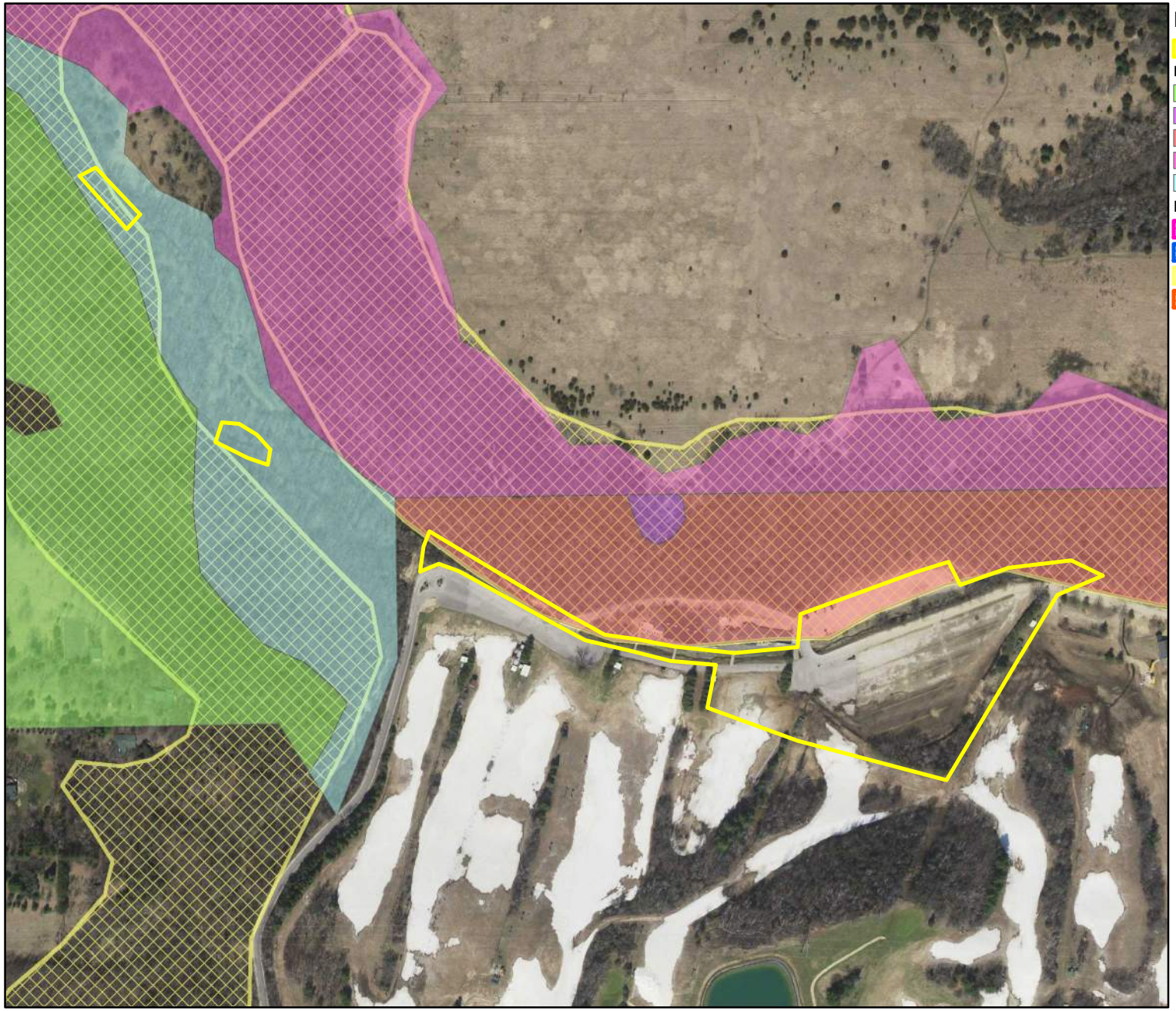
Enc. Map
Large Bird Nest Identification
Wildlife Friendly Erosion Control
Rusty Patched Bumble Bee Fact Sheet
Rare Species Survey Process

Links: Rare Species Guide
http://www.dnr.state.mn.us/rsg/index.html
MBS Sites of Biodiversity Significance
http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html
DNR Native Plant Communities
http://www.dnr.state.mn.us/npc/index.html
MN Geospatial Commons
https://gisdata.mn.gov/
Rusty-patched Bumble Bee Guidance
https://www.fws.gov/midwest/endangered/insects/rpbb/guidance.html
MN State Wildlife Action Plan
http://www.dnr.state.mn.us/cwcs/index.html
USFWS Key to the Northern Long-Eared Bat 4(d) Rule for Non-Federal Activities
http://www.fws.gov/midwest/endangered/mammals/nleb/KeyFinal4dNLEB.html
USFWS Key to the Northern Long-Eared Bat 4(d) Rule for Federal Actions
http://www.fws.gov/midwest/endangered/mammals/nleb/KeyFinal4dNLEBFedProjects.html
USFWS Northern Long-eared Bat Website
http://www.fws.gov/midwest/endangered/mammals/nleb/index.html
USFWS Northern Long-eared Bat Fact Sheet
http://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html

Cc: Becky Horton
Leslie Parris

ERDB# 20180223 - Afton Alps Trout Brook Restoration
T27N R20W Section 3
Washington County

GIS shapefiles of MBS Sites of Biodiversity Significance & DNR Native Plant Communities can be downloaded from the MN Geospatial Commons at https://gisdata.mn.gov/



Legend

- AftonAlpsStudyArea

DNR Native Plant Communities

- Basswood - Bur Oak - (Green Ash) Forest
- Dry Bedrock Bluff Prairie (Southern)
- Oak - (Red Maple) Woodland
- Southern Dry Prairie
- WhitePine-Sugar Maple-BasswoodForest(ColdSlope)

MBS Sites of Biodiversity Significance

- Outstanding
- High
- Moderate
- Below

Miles
0 0.2 0.4

N

DEPARTMENT OF NATURAL RESOURCES

NATURAL HERITAGE REVIEW: A RARE SPECIES SURVEY IS REQUESTED. NOW WHAT?

Questions? Contact Lisa Joyal, Endangered Species Review Coordinator
Lisa.Joyal@state.mn.us or 651-259-5109

Minnesota's endangered species law (*Minnesota Statutes*, section 84.0895) and associated rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134) prohibit the taking of threatened or endangered species without a permit. Given the potential for the proposed project to negatively impact a state-listed threatened or endangered species, a rare species survey has been requested. The Minnesota Department of Natural Resources' Division of Ecological and Water Resources (DNR) relies upon the results of endangered and threatened species surveys to conserve these species through its conservation, management, environmental review, and permitting responsibilities. When surveys for rare species are requested as part of the environmental review process, the DNR makes every effort to coordinate closely with surveyors to ensure high quality survey results and to avoid any potential project delays due to miscommunication, inappropriate survey protocol, or misidentified threatened or endangered species.

WHAT NEEDS TO BE DONE PRIOR TO THE SURVEY?

CHOOSE A SURVEYOR

The DNR maintains a List of Surveyors (attached) that are considered qualified to conduct rare species surveys in Minnesota. Using a surveyor from this list minimizes the time needed to obtain a collection permit and the time needed to review survey proposals.

➤ *Documents to send to the Endangered Species Review Coordinator* ➤ If you would like to choose an individual that is not on the attached list, the DNR would like to review his/her qualifications prior to any survey work. Please see the attached Surveyor Criteria document for details.

DETERMINE IF A PERMIT IS REQUIRED TO CONDUCT THE SURVEY

A permit is required to collect specimen vouchers of state-listed threatened or endangered species. All plant surveyors should have a collection permit prior to conducting any survey work. A permit is also required to survey for bats, turtles, mussels, or butterflies. Please contact Richard Baker, Endangered Species Coordinator, at Richard.Baker@state.mn.us to request a permit.

PREPARE A SURVEY PROPOSAL

- Refer to the attached Rare Species Survey Proposals and Reports for information to include in the survey proposal.
- Refer to the DNR Rare Species Guide for suitable habitat and appropriate survey periods for the target species.
- Review the rare species data spreadsheet templates for Submitting Data to the NHIS.
- For plant surveys, follow the procedures in the attached Rare Plant Guidance.
- For mussel surveys, follow the procedures in the attached Mussel Survey and Relocation Protocol.

➤ *Documents to send to the Endangered Species Review Coordinator* ➤ Please submit the survey proposal for DNR review. Please anticipate an approximate two week turnaround for DNR comments.

WHAT NEEDS TO BE DONE DURING THE SURVEY?

- For plant surveys, follow the procedures in the attached Rare Plant Guidance.
- For mussel surveys, follow the procedures in the attached Mussel Survey and Relocation Protocol.
- Identify any suitable habitat for target species within the potential project footprint.
- Survey for target species within any suitable habitat that may be impacted by the project.
- If any threatened or endangered species are found, delineate extent of population or at least extent of population within the potential project footprint. Consider flagging the population for avoidance purposes. If you are considering applying for a takings permit, conduct a count of individual plants that you are proposing to take.

WHAT NEEDS TO BE DONE AFTER THE SURVEY IS COMPLETED?

COMPLETE A REPORT ON THE RESULTS OF THE SURVEY

Refer to the attached Rare Species Survey Proposals and Reports for information to include in the survey report. The survey report should include detailed information for any state-listed species that are found during the survey.

➤ *Documents to send to the Endangered Species Review Coordinator* ➤ Please submit survey report, specimens, GIS shapefile, and spreadsheet (see templates for Submitting Data to the NHIS) for DNR review.

WHAT IF A THREATENED OR ENDANGERED SPECIES IS FOUND?

The project proposer should consider project alternatives that would avoid impacting these species. If there are any questions as to what constitutes avoidance, please contact the Endangered Species Review Coordinator.

➤ *Documents to send to the Endangered Species Review Coordinator* ➤ Please submit an avoidance plan for DNR review. The plan should identify measures that will be taken to avoid and minimize disturbance.

WHAT IF A THREATENED OR ENDANGERED SPECIES CANNOT BE AVOIDED?

The project proposer will need to apply for a takings permit. For more information on the endangered species permitting process, please visit the DNR Endangered Species Permits website or contact Rich Baker, Endangered Species Coordinator, at Richard.Baker@state.mn.us or 651-259-5073.

Preventing Entanglement by Erosion Control Blanket

Plastic mesh netting is a common component in erosion control blanket. It is utilized to hold loose fibrous materials in place (EG straw) until vegetation is established. Erosion control blanket is being utilized extensively and is effective for reducing soil erosion, benefitting both soil health and water quality. Unfortunately there is a negative aspect of the plastic mesh component: It is increasingly being documented that its interaction with reptiles and amphibians can be fatal (Barton and Kinkead, 2005; Kapfer and Paloski, 2011). Mowing machinery is also susceptible to damage due to the long lasting plastic mesh.

Potential Problems:

- Plastic netting remains a hazard long after other components have decomposed.
- Plastic mesh netting can result in entanglement and death of a variety of small animals. The most vulnerable group of animals are the reptiles and amphibians (snakes, frogs, toads, salamanders, turtles). Ducklings, small mammals, and fish have also been observed entangled in the netting.
- Road maintenance machinery can snag the plastic mesh and pull up long lengths into machinery, thus binding up machinery and causing damage and/or loss of time cleaning it out.

Suggested Alternatives:

- Do not use in known locations of reptiles or amphibians that are listed as Threatened or Endangered species.
- Limit use of blanket containing welded plastic mesh to areas away from where reptiles or amphibians are likely (near wetlands, lakes, watercourses, or rock outcrops) or habitat transition zones (prairie – woodland edges, rocky outcrop – woodland edges, steep rocky slopes, etc.)
- Select products with biodegradable netting (preferably made from natural fibers, though varieties of biodegradable polyesters also exist on the market). Biodegradable products will degrade under a variety of moisture and light conditions.
- DO NOT use products that require UV-light to degrade (also called “photodegradable”) as they do not degrade properly when shaded by vegetation.

Solution: Most categories of erosion control blanket and sediment control logs are available in natural net options.

- Specify ‘Natural Netting’ for rolled erosion control products, per MnDOT Spec 3885. See Table 3885-1.
- Specify ‘Natural Netting’ for sediment control logs, per MnDOT Spec 3897

The plastic mesh component of erosion control blanket becomes a net for entrapment.

Literature Referenced

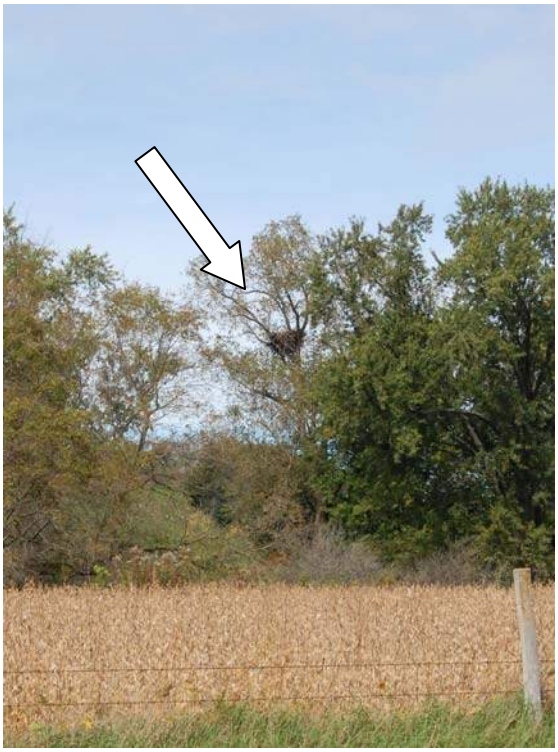
Barton, C. and K. Kinkead. 2005. Do erosion control and snakes mesh? Soil and Water Conservation Society 60:33A-35A.
Kapfer, J.M., and R.A. Paloski. 2011. On the threat to snakes of mesh deployed for erosion control and wildlife exclusion. Herpetological Conservation and Biology 6:1-9.

US Fish and Wildlife Service

IDENTIFICATION GUIDE TO LARGE NESTS

Eagle Nests

Eagle nests in Minnesota and Wisconsin are usually built in white pine or cottonwood trees, but can be built in other trees, such as aspen. The nests are usually built in a supportive crotch of the tree, typically below the highest point of the canopy. Generally more bowl shaped than osprey nests. The typical eagle nest can vary in size greatly. They are usually about 5-9 feet in diameter, 3-5 feet deep, and composed of large sticks. (Note: Nests can be up to 8 feet deep). The nests are used year after year, and can reach 1,000-2,000 pounds. The nest tree of an active nest will frequently have whitewash on the tree trunk and under the nest, although this is not always obvious. Nests may also have feathers, bones, and small animal carcasses under them. Eagles will build multiple nests within their territory; some nests will never be completed and will be small. These **unfinished alternate nests are still protected**. Eagles, osprey, and owls commonly take over each others nests. Once an eagle uses a nest, even if they don't build it, or if they don't use it on a subsequent year, **it is still an eagle nest**, and all Eagle Act laws still apply.



Large eagle nest in cottonwood tree in agricultural area. West central Wisconsin

Moderate-sized eagle nest in cottonwood tree, with person climbing up for size comparison. East central MN.

Moderate eagle nest in cottonwood tree, in residential area, Minneapolis, MN (photo credit: www.birdchick.com)

Large eagle nest in white pine tree, Mississippi River, MN. Adult eagle is above and left of the nest.

Large eagle nest in aspen tree. Hwy 11, MN Photo credit: MN-DOT

Unfinished eagle nest in white pine. This nest is smaller than the previously pictured nests. Camp Ripley, MN

Osprey Nests

Osprey nests typically resemble a flat (not bowl-shaped) disorganized pile of large sticks. These nests can be as large as eagle nests, but are flatter. Unlike eagle nests, osprey will sometimes use man-made materials, such as bailing twine or plastic bags. If the nest has been active, the nesting material may be covered in whitewash. Osprey are relatively tolerant of human development and will readily nest on top of platforms, light posts, transmission towers, or the tops of broken trees. Osprey usually nest above the crown of the tree and at the highest point of a tree or other structure. However, both eagles and osprey have been known to use each other's nests.

Osprey nesting on a platform.
Photo: Ramsey Parks and Recreation

Osprey nesting on the top of a broken tree.
Photo credit: Crane Lake Nature Blog

Red-tailed Hawk Nests

Red-tailed hawk nests are smaller than eagle or osprey nests, and can be as deep as or deeper than they are wide. They have a fairly tight construction, and the sticks that compose the nest tend to be smaller than those used for eagle or osprey nests (sticks generally 1-2 cm in diameter).

Adult red-tailed hawk in nest, close-up
Photo credit: www.sages-place.com

View of red-tailed hawk nest from the ground. Photo credit: HDR consulting

Crow/Raven Nests

Crows can be found breeding throughout the state of Minnesota. Ravens, although rare, can be found in the northeast portion of the state. Crow/raven nests are typically built out of sticks, although they can consist of some grass material. They are fairly large (although not as large as eagle nests). They usually measure about 2 feet in diameter, and can be up to a foot deep. They tend to have a fairly tight construction.

Crow nest from the side
Photo credit: www.flickr.com/photos/rbs10025/

Crow nest from above, with chicks.
Photo credit: Kevin J. McGowan

Heron Nests

Heron nests are almost always near water. Herons nest in a "Rookery" where many nests are present, individual nests are rare. Heron nests are composed of sticks, flat and broad, and resembling a thin platform. Nest will usually appear "messy" and "flimsy".

Typical heron rookery. Photo credit: HDR consulting

Squirrel Nests

Squirrel nests can reach basketball size or larger. They are distinguished from bird nests by being made mostly of leaf and other "softer" vegetation matter (grasses, etc), and very few sticks. They are usually round shaped, and often look "messy".

Typical squirrel nest, close-up

Squirrel nest, from ground

*Unless indicated, all photos were taken by Margaret Rheude, US Fish and Wildlife Service

U.S. Fish & Wildlife Service

Rusty Patched Bumble Bee
Bombus affinis

The U.S. Fish and Wildlife Service listed the rusty patched bumble bee as endangered under the Endangered Species Act. Endangered species are animals and plants that are in danger of becoming extinct. Identifying, protecting and recovering endangered species is a primary objective of the U.S. Fish and Wildlife Service's endangered species program.

What is a rusty patched bumble bee?

Appearance: Rusty patched bumble bees live in colonies that include a single queen and female workers. The colony produces males and new queens in late summer. Queens are the largest bees in the colony, and workers are the smallest. All rusty patched bumble bees have entirely black heads, but only workers and males have a rusty reddish patch centrally located on the back.

Habitat: Rusty patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil).

Illustrations of a rusty patched bumble bee queen (left), worker (center), and male (right) by Elaine Evans, The Xerces Society.

Photo courtesy of Christy Stewart

Reproduction: Rusty patched bumble bee colonies have an annual cycle. In spring, solitary queens emerge and find nest sites, collect nectar and pollen from flowers and begin laying eggs, which are fertilized by sperm stored since mating the previous fall. Workers hatch from these first eggs and colonies grow as workers collect food, defend the colony, and care for young. Queens remain within the nests and continue laying eggs. In late summer, new queens and males also hatch from eggs. Males disperse to mate with new queens from other colonies. In fall, founding queens, workers and males die. Only new queens go into diapause (a form of hibernation) over winter - and the cycle begins again in spring.

Feeding Habits: Bumble bees gather pollen and nectar from a variety of flowering plants. The rusty patched emerges early in spring and is one of the last species to go into hibernation.

Why conserve rusty patched bumble bees?

As pollinators, rusty patched bumble bees contribute to our food security and the healthy functioning of our ecosystems. Bumble bees are keystone species in most ecosystems, necessary not only for native wildflower reproduction, but also for creating seeds and fruits that feed wildlife as diverse as songbirds and grizzly bears.

Bumble bees are among the most important pollinators of crops such as blueberries, cranberries, and clover and almost the only insect pollinators of tomatoes. Bumble bees are more effective pollinators than honey bees for some crops because of their ability to "buzz pollinate." The economic value of pollination services provided by native insects (mostly bees) is estimated at $3 billion per year in the United States.

It needs a constant supply and diversity of flowers blooming throughout the colony's long life, April through September.

Range: Historically, the rusty patched bumble bee was broadly distributed across the eastern United States and Upper Midwest, from Maine in the U.S. and southern Quebec and Ontario in Canada, south to the northeast corner of Georgia, reaching west to the eastern edges of North and South Dakota. Its range included 28 states, the District of Columbia and 2 provinces in Canada. Since 2000, this bumble bee has been reported from only 13 states and 1 province: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin – and Ontario, Canada.

Why is the rusty patched bumble bee declining?

Habitat loss and degradation: Most prairies and grasslands of the Upper Midwest and Northeast have been converted to monoculture farms or developed areas, such as cities and roads. Grasslands that remain tend to be small and isolated.

Intensive farming: Increases in farm size and technology advances improved the operating efficiency of farms but have led to practices that harm bumble bees: increased use of pesticides, loss of crop diversity resulting in flowering crops being available for only a short time, loss of hedgerows with flowering plants, and loss of legume pastures.

Disease: Pathogens and parasites may pose a threat, although their prevalence and effects in North American bumble bees are not well understood.

Pesticides: The rusty patched bumble bee may be vulnerable to pesticides. Pesticides are used widely on farms and in cities and have both lethal and sublethal toxic effects. Bumble bees can absorb toxins directly through their exoskeleton and through contaminated nectar and pollen. Rusty patched bumble bees nest in the ground and may be susceptible to pesticides that persist in agricultural soils, lawns and turf.

Global climate change: Climate changes that may harm bumble bees include increased temperature and precipitation extremes, increased drought, early snow melt and late frost events. These changes may lead to more exposure to or susceptibility to disease, fewer flowering plants, fewer places for queens to hibernate and nest, less time for foraging due to high temperatures, and asynchronous flowering plant and bumble bee spring emergence.

What is being done to conserve rusty patched bumble bees?

U.S. Fish and Wildlife Service: Several Service programs work to assess, protect, and restore pollinators and their habitats. Also, the Service works with partners to recover endangered and threatened pollinators and pollinator-dependent plants. Concern about pollinator declines prompted formation of the North American Pollinator Protection Campaign, a collaboration of people dedicated to pollinator conservation and education. The Service has a Memorandum of Understanding with the Pollinator Partnership to work together on those goals. The Service is a natural collaborator because our mission is to work with others to conserve, fish, wildlife, and plants and their habitats.

Other Efforts: Trusts, conservancies, restoration groups and partnerships are supporting pollinator initiatives and incorporating native plants that support bees and other pollinators into their current activities. For example, the USDA Natural Resource Conservation Service is working with landowners in Michigan, Minnesota, Montana, North Dakota, South Dakota, and Wisconsin to make bee-friendly conservation improvements to their land. Improvements include the practices of planting cover crops, wildflowers, or native grasses and improved management on grazing lands.

Research: Researchers are studying and monitoring the impacts of GMO crops and certain pesticides on pollinators. Efforts by citizen scientists and researchers to determine the status of declining bee species are underway throughout the United States.

What can I do to help conserve the rusty patched bumble bee?

Garden: Grow a garden or add a flowering tree or shrub to your yard. Even small areas or containers on patios can provide nectar and pollen for native bees.

Native plants: Use native plants in your yard such as lupines, asters, bee balm, native prairie plants and spring ephemerals. Don't forget spring blooming shrubs like ninebark and pussy willow! Avoid invasive non-native plants and remove them if they invade your yard. For more information on attracting native pollinators, visit www.fws.gov/pollinators/pdfs/PollinatorBookletFinalrevWeb.pdf.

Natural landscapes: Provide natural areas - many bumble bees build nests in undisturbed soil, abandoned rodent burrows or grasss clumps. Keep some unmowed, brushy areas and tolerate bumble bee nests if you find them. Reduce tilling soil and mowing where bumble bees might nest. Support natural areas in your community, county and state.

Minimize: Limit the use of pesticides and chemical fertilizer whenever possible or avoid them entirely. Pesticides cause lethal and sublethal effects to bees and other pollinators.

APPENDIX F: SHPO CORRESPONDENCE

MINNESOTA HISTORICAL SOCIETY

Using the Power of History to Transform Lives
PRESERVING › SHARING › CONNECTING

STATE HISTORIC PRESERVATION OFFICE

September 8, 2017

Mr. Ted McCaslin
HR Green Inc.
2550 University Ave W, Suite 400 N
St. Paul, MN 55114

RE: Re-meander Trout Brook within Afton Alps Ski Area
T27 R20 S3 NE
Denmark Twp., Washington County
SHPO Number: 2017-2816

Dear Mr. McCaslin:

Thank you for the opportunity to review and comment on the above project. It has been reviewed pursuant to the responsibilities given the Minnesota Historical Society by the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act.

Based on our review of the project information, we conclude that there are **no properties** listed in the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this project.

Please note that this comment letter does not address the requirements of Section 106 of the National Historic Preservation Act of 1966 and 36 CFR § 800. If this project is considered for federal financial assistance, or requires a federal permit or license, then review and consultation with our office will need to be initiated by the lead federal agency. Be advised that comments and recommendations provided by our office for this state-level review may differ from findings and determinations made by the federal agency as part of review and consultation under Section 106.

Please contact our Compliance Section at (651) 259-3455 if you have any questions regarding our review of this project.

Sincerely,

Sarah J. Beimers

Sarah J. Beimers, Manager
Government Programs and Compliance