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: EAW Form and Guidelines.

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 for.

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:** Roseau Lake Rehabilitation & Sprague Creek Wetland Restoration

2. **Proposer:** MN Department of Natural Resources

   Contact person: MN DNR, FAW (Randy Prachar)
   Title: Wildlife Area Supervisor
   Address: DNR-Roseau River WMA, 27952 400th St.
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   Phone: 218-463-1130
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3. **RGU:** MN Department of Natural Resources

   Contact person: MN DNR, EWR (Gina Quiram)
   Title: EAW Project Manager
   Address: 500 Lafayette Road
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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):

M.R. 4410.4300, Subp. 24.B, Water appropriation and impoundments.
M.R. 4410.4300, Subp. 27.B, Public waters, public waters wetlands, and wetlands.

5. Project Location:

County: Roseau, Minnesota
City/Township: Dieter Township and Unorganized Township T163N R40W
PLS Location (¼, ¼, Section, Township, Range): Sec 2,3,4,7, 8,9,10,11,14,15,16, 17, 18, 19, 20, 21, 26, 27, 28, 29, 30, 31, 32 & 33 T163N R40W; Sec 12, 13, 23, 24, 25, 26, 35 & 36 T163N R41W; Sec 26,27,28,33,34,35 T164N R40W
Watershed (81 major watershed scale): Roseau River
GPS Coordinates: N5423264.8 E290779.7
Tax Parcel Number:

70023501	70053500	73004700	140159500	440003400
70024100	70053600	140148700	140160400	440004000
70025600	70053700	140149000	140160700	440005500
70027100	70054500	140149300	140162200	440010000
70027700	70073900	140150800	140162800	440012200
70045100	70075100	140153800	140162900	440015100
70045400	70075700	140154100	140163100	443002500
70046000	70077800	140154400	140164000	443002600
70046600	73001001	140155100	143005000	443003100
70049000	73001100	140155600	143005002	443003200
70049300	73001200	140156500	143005100	443003300
70051100	73001300	140157100	440000100	490005500
70051500	73001400	140157700	440000700	493002800
70052600	73004600	140158000	440001300	493002900

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

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

Attached figures:

- Figure 1. General project location
- Figure 2. USGS 1:24,000 topographic project location
- Figure 3. Project watershed
- Figure 4. Roseau Lake Rehabilitation Project components
- Figure 5. State-owned lands by interest type in project area
- Figure 6. NLCD land use in project area
- Figure 7. Sprague Creek Area Restoration Project components
- Figure 8. Roads, public waters, and ditches in the project area
- Figure 9. Watershed downstream from the project area
- Figure 10. Ground and proposed pool elevations for the project area
- Figure 11. Minnesota Biological Survey rankings for the project area
- Figure 12. Long-term precipitation and runoff trends for the project area

6. Project Description:

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

The Roseau Lake Rehabilitation project would install water control structures, embankments, and a drainage way to allow for water level management in the historic Roseau lakebed. Improved water level management capability would reduce peak flows and adjust timing of outflows of existing storage, which would reduce flooding damage and improve wildlife habitat. Restoration of hydrology at Sprague Creek would provide wetland mitigation for the Roseau Lake Rehabilitation Project.

Table 1: Work Sites in the Roseau Lake WMA/Sprague Creek Peatland SNA Wetland Area Restoration.

Location Description	Work to be Done	Benefits	Impacts	Comments
Drained Lake Roseau	Install active and passive flood control structures throughout the nearby area to restore the lake to a shallow lake during most of the year. The lake would be drained for the winter.	This will improve wildlife habitat and plant communities and would mitigate severity and flashiness of small to midsized flooding events.	Embankments necessary to contain flood waters will destroy some wetlands. Downstream flooding is expected to be reduced.	Lake will be dewatered every winter to set back plant succession and manage invasive plants and unwanted fish.
Sprague Creek Peatland SNA	Work will be constrained within the ditches bisecting the SNA. Cedar dams will be added to the ditches running perpendicular to JD 61 Lat 7 Br 1. Cedar dams are expected to fill with sediment over time, eliminating flow through the ditches and restoring groundwater flow.	Groundwater flow mimicking historic patterns should be restored.	Temporary construction should result in little disturbance to the SNA. This work could impact a calcareous fen. Existing paths of disturbance will be used along with low-impact equipment, and hand tools where possible. Disturbance to rare plants is possible.	Vegetation survey was begun in Summer 2020. Additional rare plant surveys will be required in early summer, 2021.
JD 61 and associated branch ditches	Abandon and fill in ditches with brush clippings and spoil adjacent to and surrounding Sprague Creek Peatland SNA.	Reconnect surface and subsurface water flow severed by the ditches to restore the pre-drainage hydrology.	Restore native vegetation in a large brushland/wetland complex. Might impact a calcareous fen. This will replace all of the wetlands lost by the lake rehabilitation.	Restoration area will be monitored pre- and post-project to determine efficacy of restoration efforts.
Pine Creek (aka SD 87)	Historic channel within the drained Roseau Lake basin will be restored and the channelized portion of Pine Creek will be filled with spoil.	Improved fish habitat and water quality within the lowest reach of Pine Creek.	Will affect some wetlands within the drained Roseau Lake basin	Pine Creek is impaired for fisheries bioassessments.

Location Description	Work to be Done	Benefits	Impacts	Comments
Roseau River	Install a rock weir to divert normal flows of the Roseau River back into its historic channel where it had been channelized a century ago. The bend in the river channel will be altered to reduce erosion from the additional flows, further reducing the chance that project embankments would become unstable.	Will provide better fish habitat and reduce downstream channel velocities while also allowing for natural stream behavior.	Temporary impacts from construction, including possible sedimentation and reduced fish passage.	The Roseau River will remain navigable.
360th Ave. (Township Road)	Raise road from 340th St., just south of the Roseau River, to UT-55/390th St. Road will be raised to an elevation of 1036' to act as a portion of the easternmost impoundment embankment, but to avoid abandoning the road in more northerly stretches.	The road raise will allow 360th' Ave. to remain open to local traffic post-project.	Road raise will require widening as well as displacement and reconstruction of existing road ditches, which will result in destruction of some wetlands.	360th Ave. will remain usable post-project in flood events where peak water level is < 1036.0'.
Other Roadways: 330th Ave. 350th Ave. 370th Ave. 380th Ave.	Where these roads intersect project embankments, roadways will need to be raised to an elevation of 1036'.	Road raises will allow roads to remain open post-project.	Road raises will require widening of roads and possible displacement of associated road ditches.	Roads will remain usable post-project in flood events where peak water level is < 1036.0'.

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.

The Roseau Lake Rehabilitation Project is a cooperative effort between the Minnesota Department of Natural Resources (MN DNR) and the Roseau River Watershed District (RRWD). The project will restore shallow lake functionality to a significant portion of Roseau Lake north of the Roseau River, providing habitat for waterfowl and wetland-associated wildlife. It will also reduce flood damages both downstream and on adjacent properties. Rehabilitation of Roseau Lake will require:

- embankments along the northwest side of the historic Roseau Lake basin, and also to the north and south of the Roseau River
- a gated inlet structure and inlet channel to route flood waters from the Roseau River
- an outlet structure to allow water from the lake to be released back into the Roseau River
- several drainage structures to allow water from current drainage ditches and Pine Creek to enter the historic Roseau Lake basin
- restoration of flows to channelized portions of Pine Creek
- a rock weir structure to divert flows from the channelized portion of the Roseau River back into the historic channel (Figure 4; HDR 2019).

Roseau Lake is located in Roseau County, approximately 6 miles northwest of Roseau, MN (Figures 1, 2 and 3). The lake was drained in 1914 when the Roseau River was channelized and a legal ditch system was created through the lake basin. It now functions as a lake only during flood conditions and is dry most of the year. Most of the lake basin and surrounding upland areas are part of a MN DNR Wildlife Management Area (WMA), but most areas outside of these lands are currently in agricultural production (Figures 5 and 6). The WMA provides shallow water, wetland, and associated upland habitats that are substantially degraded compared to historic conditions. The temporary and inconsistent presence of a pool combined with frequent water level fluctuations (bounce) has led to generally undesirable plant communities dominated by invasive plants with relatively low wildlife habitat value. There is no current capacity to manage for shallow lake functions, improve plant communities, or manage water levels to reduce bounce.

The Sprague Creek Restoration Area is upstream and northeast of Roseau Lake is dissected by three laterals of Judicial Ditch 61 (JD 61; Figure7; RRWD 2020).The ditches act as a conduit for groundwater and surface water from the large expanse of peat lands located in the Sprague Creek Peatland Scientific and Natural Area (SNA) and Lost River State Forest north of the Roseau Lake basin, cutting off groundwater flow from the north to the south at JD 61 Lat 7 Br1, and from the east to west at JD 61 Lat 5B and Lat 6. Thus, the fens south of JD61 Lat 7 Br 1 and west of JD 61 Lat 5B and Lat 6 are severed from their groundwater sources (Figure 7).

Hydrologic restoration of the Sprague Creek Restoration Area will serve as wetland mitigation for the Roseau Lake Rehabilitation project. The goal is to restore the hydrology of the area by reconnecting severed surface and subsurface flows to mirror a pre-drainage hydrological regime. Restoration of hydrology will require multiple strategies for restoring and maintaining water tables throughout the site. These hydrologic improvements will result in restoration of native vegetation in a large complex of brush land and wetlands.

Existing Conditions at Roseau Lake and Sprague Creek Restoration Area

In 1914, Roseau Lake was drained by constructing drainage ditches throughout the watershed for agricultural purposes. Due to this ditching effort, the time it takes for water to reach the historic lake basin has been decreased, causing inflows to the basin to have higher peaks of shorter duration.

Water reaches the lake basin via overland flow from the north, as well as from the Roseau River, Pine Creek, and Lateral 7 of Judicial Ditch 61 (JD 61 Lat 7; Figure 8). In the southern portion of the lake basin, the Roseau River has been channelized, removing historic flows from the river and away from the lake basin. Water leaving the lake basin flows downstream via the Roseau River and occasionally contributes to downstream flooding in the Roseau River watershed, flowing into an area known as the Big Swamp (Figure 9), which is a large wetland complex that attenuates flood peaks for the entire Roseau River watershed (1,399 sq. mi.). In large runoff events, the Big Swamp fills and some of the water flows overland from the Roseau River Watershed into the Two Rivers Watershed. The capacity of the Big Swamp to attenuate high flows and reduce transfer water to the Two Rivers Watershed has been demonstrated on numerous occasions during the past 20 years (i.e., when lower flow rates have been observed at the USGS gage at Caribou, MN, which is downstream of the Big Swamp, compared to the upstream gage at Ross, MN).

Existing water levels vary considerably from spring through fall. A typical scenario, though, would be: (1) Early spring prior to runoff—very little water is in the basin except for certain potholes, which would have frozen to the bottom. Water elevation is at or below 1026.0’ (North American Vertical Datum (NAVD) of 1988; Figure 10), which occurs primarily within interior ditches and not across most of the lake basin. (2) Spring—Runoff will fill the basin. The typical level during spring is approximately 1030.0-1034.0’. (3) Summer—by late May to early June, water levels typically fall to a range of <1028’ to about 1031’. (4) Late summer to early fall—there is less variability at this time with the basin usually going dry (<1026.0 feet). (5) Fall to early winter—the basin typically remains dry, though September rains can temporarily raise water levels to $\geq$1028.0’. By late fall, the basin is usually dry.

The existing project location is a drained lake basin, and the proposed project therefore is not creating new or additional flood storage, but rather modifying how the existing flood storage volume is utilized during a flood event to reduce flood damage. This will be achieved by creating the ability to manage when water is stored instead of allowing passive flow-through via the existing ditches and channel. This project will, in general, send early flow downstream of the project to reserve the main pool capacity for later storage to reduce the Roseau River peak.

The Sprague Creek Restoration Area was also ditched in the early 20th century, which has altered the natural flow of surface water and ground water in this area. For example, Lateral 7 Branch 1, runs east-to-west with the natural grade running north to south. Lateral 6 runs north-to-south with the natural grade draining northeast to southwest. Lateral 5B is aligned north-to-south with the surrounding land draining to the ditch corridor. This area also has several spring-fed fens, including Northern Rich Fens (i.e. calcareous fens), maintained by groundwater flow. While the fens are identified north of JD 61 Lat 7 Br 1, the groundwater flows to the south of the SNA have been intercepted by the ditch, reducing the amount of groundwater that reaches south of the ditch.

Sprague Creek Peatland SNA is listed by Minnesota Biological Survey (MBS) as a site of outstanding biodiversity significance and the area immediately west of the SNA is listed as having high biodiversity significance (Figure 11). The area south of Lateral 7 Branch 1 of JD 61 is listed as moderate biodiversity significance, though, likely due to altered hydrology. By restoring the original hydrology, the biodiversity significance in this area is expected to more closely match that of the adjacent areas.

Water level management regime

The water level management regime was designed to meet both flood damage reduction and wildlife management goals (Table 2). It will allow timely drawdown of the lake basin prior to spring runoff events and temporarily increase water storage capacity. Following spring run-off, water levels will be managed for minimal water level fluctuations within the lake basin during the open water nesting period. The ability to conduct periodic complete or nearly complete drawdowns is also important for long-term invasive vegetation management and embankment repairs. Beginning in late fall, water levels in the lake basin will be at $\leq$1026.0' (NAVD of 1988) to allow for storage of spring runoff events. At this elevation, the bulk of the basin is dry and water is confined to existing ditches. During spring runoff, the lake will be managed up to a level of 1034.0' to impound water for downstream flood reduction. The lake basin will later be lowered to an elevation of $\leq$1028.0' to maximize habitat potential for nesting waterfowl and other water birds; water will be released in a manner not to exacerbate potential downstream flood conditions. During the nesting period, water levels will be actively managed to reduce bounce, except in runoff events where water elevations exceed 1032' (> 1700 cfs, approximately a 5-year 24-hour event), where levels would be allowed to rise to reduce downstream flood damages (Table 3). In the fall, the lake will be allowed to fill up to an elevation of up to 1030.0' to provide migratory waterfowl habitat and to allow for recreational use of the lake basin (approximate lake elevations shown in Figure 10).

The ability to dewater the lake completely or nearly completely is important to the project. Dewatering will be used each winter to set back plant succession and manage invasive or undesirable plant species, such as narrow-leaved cattails, which thrive in permanent shallow water conditions. Dewatering will also favor the native sedge meadow communities and bulrushes already found at Roseau Lake over invasive reed canary grass in addition to maximizing the storage potential for spring runoff events. Additionally, dewatering overwinter will allow for control of undesirable fish, like common carp (*Cyprinus carpio*) and fathead minnows (*Pimephales promelas*), which compete with waterbirds for aquatic invertebrates and

through feeding activities, can lead to excess suspended nutrients within the water column (Bouffard and Hanson 1997).

The operation of the project will be governed by both upstream and downstream triggers. United States Geological Survey (USGS) gauges at Ross and Caribou, MN and the gauge in the City of Roseau will be monitored to determine when to store water in the impoundment and release water from the impoundment. Triggers will be based on flow data corresponding to runoff events. Early flood waters will be allowed to pass through the project area ahead of the flood peak, while later flood waters that correspond with the flood peak will be stored in the lake basin. Precise trigger data has not been developed at this time, but will be established prior to completion of the project after goals are agreed upon by project partners.

Table 2: Water level management regime, Roseau Lake Rehabilitation project. [1]Early Spring is defined as ice-out through the flood peak when flood conditions subside. Spring-Summer is that time period after spring flooding conditions through August 31. Fall is defined as September 1 through fall freeze-up. Winter is defined as any time between fall freeze-up and ice-out. [2]Current conditions are widely variable

Time Period[1]	Current Conditions[2]	Water Level Target	Primary Management Objective
Early Spring	Up to 1034.0	$\leq$ 1034.0	Provide flood storage during spring runoff events
Spring-Summer	Up to 1031.0	$\leq$ 1028.0	Maintain stable water levels for overwater nesting birds
Fall	As low as 1026.0	1030.0 – 1031.0	Provide fall migratory habitat and hunting opportunities
Winter	As high as 1028.0 or higher	< 1026.0	Complete drawdown; Maximize flood storage potential

The Sprague Creek component of the project will need no active operation. Groundwater flows from the reconnected spring fens are expected to follow historical pathways through the wetland soils and remaining ditch system; eventually draining into the northeast portion of the Roseau Lake basin.

Upstream Watershed Conditions

While land use within the Roseau River Watershed has remained relatively unchanged in recent years at about 46% cropland; 7% roads, ditches and towns; and 47% woodlands, wetlands, and grasslands, the amount of runoff per year has increased at a faster rate than precipitation (Figure 12). This trend is likely due to overall increases in the size and number of surface drains (i.e. ditches, field ditches, and scrapes) and subsurface tile drains in the watershed, changes in cropping patterns from small grains to corn and soybeans, and an increase in the number and magnitude of single-storm events.

The Sprague Creek Restoration Area is upstream of Roseau Lake and has been altered in the past by ditching. Ditching has bypassed historical groundwater flow paths increasing the drainage of the area. By reconnecting the spring fens in the northern parts to the southern part

of the restoration area through filling/plugging ditches, hydrology will be restored to this area and also partially to Roseau Lake.

Roseau Lake Project Components

Components of the Roseau Lake Rehabilitation Project are displayed in Figure 4 and include the following:

1. Principal Inlet channel and inlet structure
2. Drainage structures
3. Main outlet structure
4. Embankments
5. Exterior ditches (parallel to embankments)
6. Pine Creek restoration and inlet structure
7. Weirs
8. Roseau River diversion channel structure and Cutoff Channel
9. Township road raise

Inlet Channel and Inlet Structures

The principal inlet for the project is proposed to be a 1.1-mile long principal inlet channel that passes under 370th Ave. and connects the Roseau River directly to the main pool storage area. The proposed channel is 100 feet wide, has a bottom elevation of 1026.0', and has a minimal grade. It is designed to convey large volumes of water over a range of river stages and operational parameters to maximize flood reduction benefits. The inlet channel is larger than the Roseau River because its function is to convey large floodplain flows at higher stages, which exceed the river channel capacity at lower stages. The inlet weirs are sized so Roseau Lake will fill within three to four days if the weirs are overtopped when water elevations exceed 1034'. The inlet channel will pass under 370th Ave, a township road (i.e., between Section 20 and 21 of T163N R40W), in order to pass water into the lake basin. The main inlet structure will consist of eight 8' x 6' RCB box culverts under the township road, with each culvert regulated by a sluice gate accessible from an access road (HDR 2016). Location of the inlet structure along the inlet channel will be defined during final designs and approvals.

One additional inlet structure will be located where Pine Creek enters the project area (Figure 4). The purpose of this structure is to regulate water flow into the project area or divert some water from the project area once the lake is filled. This structure will be similar to the main inlet structure, but scaled smaller due to lower required flow rates. Since Pine Creek is a perennial stream, some flow must be maintained at all times. Excess flows will be shunted southward along an exterior ditch parallel to the northwest embankment. No weirs are proposed with these ancillary inlet structures.

Table 3: Gate operation for the main inlet structure on Roseau Lake for river stages observed at the USGS gauge at Ross, MN, during spring runoff.

River Stage	Flow (cfs)	Elevation (feet)	Recurrence Interval (years)	Gate Operation
< 11.9 feet	1700	1031.9	> 2	All gates closed
12 - 13 feet	1700 – 1800	1032.0-1033.0	> 2	Gates half open
13 – 14 feet	1800 – 2150	1033.0-1034.0	2	All gates open
> 14 feet	2150	> 1034.0	2.5	All gates closed
> 16 feet	3490	> 1036	5	All gates closed

Drainage Structures

Drainage structures include locations where a culvert will need to be added or extended in order to maintain existing drainage patterns. Depending on where the culvert is located within the embankment, flap or screw gates will be used to prevent backwater from passing through the embankment. In total, eight drainage structures will be needed along the south and north river embankments. Exterior ditches will parallel embankments and carry drainage water downstream of the project when the project area is inundated to prevent water from backing onto agricultural land from the basin (Figure 4).

Main Outlet Structure

The Main Pool Storage Area will have one main outlet structure located where the proposed North River embankment intersects the existing drainage ditch between the Roseau River and JD61 Lat7 Br3 at the center of Roseau Lake (Figure 4). This outlet structure would consist of one 8'x4' sluice gate and a second bay with stop logs. Water leaves the project area at the westernmost edge of the project through the natural channel of the Roseau River. This unstructured outlet occurs where the river passes through the Northwest and Southern embankments.

Embankments and Ditches

Three embankments are proposed for this project: the northwest embankment, north river embankment, and south embankment (Figure 4). The Northwest and South embankments will have variable sideslopes of either 5:1 or 4:1 (Figures 13 and 14). In total, 22.4 miles of embankments are necessary for the project, with a total embankment footprint of 248.9 acres (Table 4) requiring 930,000 cubic yards of embankment fill. Embankments along the Roseau River will be constructed with 5:1 side slopes and set away from the existing Roseau River banks so they do not put excessive pressure on the riverbank, and thus contribute to potential riverbank instability. Exact distances are to be determined in the next phase of design. All embankments will be built to an elevation of 1036.0', average 1.39 feet above ground, and average 25.1 feet in width. Two weirs, one south and the other northeast of the inlet ditch will be built into the North River embankment (Figure 4) to allow inflow for the project during events where the river stage rises above the elevation of the weirs. The proposed weir will be

constructed to an elevation two feet lower (i.e. 1034.0') than the elevation of the top of the main embankments (1036.0'), thus creating two feet of freeboard.

Both the Northwest and South embankments will require exterior drainage ditches along their entirety to provide drainage for the areas where existing drainage patterns are impacted, and to provide the ability to route early flood water from the north, south, and west around the project site (Figure 4). The ability to route early flood water around the project site before Roseau Lake fills will help prevent water from backing up outside the project area during the more frequent events. Bottom elevations and widths will be unique to each ditch, although all exterior ditches will have either 5:1 or 4:1 side slopes (Table 4).

Table 4: Proposed Embankment and Ditch Impacts

Embankment and Ditch Alignment	Embankment and Ditch Length (miles)	Embankment and Ditch Footprint (acres)	Side Slope
North River Embankment	8.2	33.1	5:1 or 4:1 (variable)
South Embankment and Exterior Drainage Ditch	9.3	108.3	5:1
Northwest Embankment and Exterior Drainage Ditch	4.9	65.6	5:1 or 4:1 (variable)
Inlet Channel	1.1	23.3	5:1
Total Embankment and Ditch/Channel	25.6	248.9	N/A

Exact location of new embankments and exterior ditches rely on several factors, including:

- Topography
- Land ownership
- Land use
- Wetlands
- Cultural resources

Roseau River Diversion Channel Structure and Pine Creek Restoration

Part of this project involves restoring flow through the historic oxbow of the Roseau River north of the Roseau River diversion channel (hereafter, cutoff channel; Figure 4). A riprap or boulder spillway will be constructed to restrict low and normal flows from the cutoff channel until an increased river stage is reached (Figure 13).

Currently, most flow is diverted through the cutoff channel and water only flows in the historic channel during high flows. This project will reverse this situation, thus restoring all flow below 500 cfs through the historic channel. At discharges above 500 cfs, the water flow will be split between the cutoff channel and the historic channel. For example, at 1,400 cfs, 75% of the flow would be diverted through the historic channel. In large events, the entire area would be inundated as it is currently. Restoration of the historic channel will provide additional fish habitat, reduce channel velocities downstream, and allow for more natural stream behavior.

In addition to restoration of the river reach described above, the primary flow of Pine Creek south of the Pine Creek inlet structure (Figure 4) will be restored to its natural channel; the channelized ditch will be abandoned and plugged. This restoration will improve fish habitat and maintain connectivity of the stream.

Roadways

The roadways affected by the proposed embankments include 370th St., 330th Ave., 360th St., 350th Ave., 360th Ave., and 370th Ave. (Figure 8). Where the specified roadways and embankments intersect, the roadways will need to be raised to the elevation of the top of the embankment (1036.0'). In addition, 360th Ave. will be improved such that the road is flooded less frequently than when compared to existing conditions. The road raise of 360th Ave. will be to an elevation of 1036.0' with equalizer box culverts installed to the north of the inlet ditch to convey flow through the raised road, which will have 4:1 side slopes. At this slope, the east side of the road raise will carry construction into the adjacent (existing) road ditch. The road ditch will need to move over and be reconstructed. The project will match the existing ditch invert elevation and have a western side slope of 3:1. The ditch bottom will be approximately 12'-14' wide and will neither improve nor impede current drainage. The inlet channel will pass under 370th Ave., so culverts will be placed under this roadway.

Project Storage Volume and Operation

Water will flow into the impoundment through the inlet channel and inlet weirs as well as Pine Creek, JD 61, Lat. 7, and overland and subsurface from the Sprague Creek restoration area. During low to moderate flows, Pine Creek flows will enter into the Roseau Lake basin as they do under existing conditions. During moderate to high flood flows (comparable to when Roseau Lake would back up to inundate Pine Creek under existing conditions), Pine Creek flows may be diverted around the main pool via the Northwest Embankment/exterior ditch to provide increased storage during Roseau River peak flows. Since additional water will be entering Pine Creek from the northeast along the project embankment via an exterior ditch, some water may need to be diverted further to the west/south in the Northwest embankment exterior ditch (Figure 4). Base flows will be allowed into Pine Creek to maintain this perennial stream. The South embankment will keep the Roseau River from flooding land to the south of the project. An exterior ditch adjacent to the South embankment is included to convey surface runoff so local flood damages are reduced south of the embankment while allowing for unimpeded flow of the West Interceptor ditch (an unrelated flood damage reduction project that intersects the river ½ mile southwest of where 360th Ave. crosses the Roseau River—see Figure 4). The Northwest embankment and South embankment are intended to reduce flooding adjacent to the main pool and manage flood storage volumes in the basin.

There will be two types of storage for this project: gated and ungated storage. Gated storage refers to the volume of water that can be held within the project, the release of which is completely controlled by the structures. Ungated storage refers to the volume of water that can be retained within the embankments of the project but is at an elevation greater than that of the weirs (1034.0'). Ungated storage is available storage but is not able to be controlled by operation of the structures. Embankments will be built to an elevation of 1036.0' while two

weirs within the north river embankment will be two feet lower at 1034.0'to provide an emergency spillway (Figure 4). Therefore, the storage volume within the embankments below 1034.0' will be considered gated storage and the storage volume between 1034.0' and 1036.0' will be considered ungated storage. When the project is filled to an elevation of 1036', it would provide approximately 47,480 ac-feet of total storage, with approximately 30,890 ac-feet of that gated.

Operation of the Roseau Lake Project will vary depending on the estimated size of the upcoming storm event and also upon wildlife habitat needs. For smaller events (e.g. 2-10 year floods; Tables 5 &6) where the stage of the river does not reach the elevation of the spillways, the operation of the project will be subject to wildlife habitat needs and based on local triggers upstream and downstream of the project. The purpose of operation during smaller events is intended to keep local agriculture drainage functioning. During larger events (i.e. greater than a 10-year flood), floodwaters may overtop the weirs.

Table 5: Existing condition vs. modeled condition post-project at Ross, MN gage (HDR 2019). * Inlet gate operation to reduce downstream flow

Event	Existing Peak Flow Rate (cfs)	Existing Peak Water Surface Elevation (feet)	Modeled Peak Flow Rate (cfs)	Modeled Peak Water Surface Elevation (feet)	Flow Change from Existing (cfs)
100-Year 10-Day	9,509	1038.75	9,509*	1038.77	0*
100-Year 24-Hour	4,599	1037.36	4,581	1037.35	-18
50-Year 24-Hour	4,391	1037.36	3,451	1036.36	-940
25-Year 24-Hour	2,771	1035.28	2,665	1035.05	-106
10-Year 10-Day	3,816	1036.74	3,779	1036.70	-37
10-Year 24-Hour	2,163	1033.70	2,069	1033.39	-94
5-Year 10-Day	3,077	1035.84	3,040	1035.78	-37
5-Year 24-Hour	1,718	1032.36	1,718*	1032.36	0*
2-Year 10-Day	2,474	1034.56	2,275	1034.03	-199
2-Year 24-Hour	1,204	1030.60	1,204*	1030.60	0*

Table 6: Existing condition vs. modeled condition post-project at the Roseau Lake Project Inlet (HDR 2019).

Event	Existing Peak Flow Rate (cfs)	Existing Peak Water Surface Elevation (feet)	Modeled Peak Flow Rate (cfs)	Modeled Peak Water Surface Elevation (feet)	Flow Change from Existing (cfs)
100-Year 10-Day	3,610	1039.46	3,505	1039.45	-105
100-Year 24-Hour	4,937	1037.72	3,504	1037.69	-1433
50-Year 24-Hour	4,390	1036.74	3,432	1036.7	-958
25-Year 24-Hour	3,889	1035.79	3,269	1035.85	-620
10-Year 10-Day	4,311	1037.09	3,237	1037.04	-1074
10-Year 24-Hour	3,378	1034.66	3,058	1034.66	-320
5-Year 10-Day	3,951	1036.25	3,147	1036.19	-804
5-Year 24-Hour	2,980	1033.77	2,846	1034.39	-134
2-Year 10-Day	3,439	1035.25	3,004	1035.25	-435
2-Year 24-Hour	2,222	1032.79	2,211	1033.75	-11

During the rising limb of the hydrograph, the inlet gates will be closed to route flow around the main pool. The gates will be half-open as the river exceeds 1700 cfs, and will be fully opened once the river exceeds 1800 cfs. At river flows beyond 2150 cfs, all gates will be closed, at which point water will overtop the weirs (elevation 1034.0'; Table 3; Figure 4). If the Roseau River rises faster than flow through the gated inlet can fill the main pool, a 1,000 foot long weir (elevation 1034.0') along the east side of the project will allow flood flows to enter the main pool.

Water management through the existing Roseau River channel and the cutoff channel will be modified by construction of a fixed rock weir (Figure 4, Figure 13). Currently, most flow is diverted through the cutoff channel and water only flows in the historic channel during high flows. Operation of this project will reverse this condition. All flow below 500 cfs will be diverted into the historic channel. At discharges above 500 cfs, the water flow will be split between the cutoff channel (25%) and the historic channel (75%). During large runoff events, the entire area would be inundated as it currently is.

Sprague Creek Restoration Area Components

Due to the varying wetland communities within the restoration site and the different ways each ditch affects its associated wetlands, there is no overarching single strategy to be employed across the entire restoration site (Figure 7). The strategy for hydrological restoration of each segment is outlined below.

Components of the Sprague Creek Restoration Project are displayed in Figure 7 and include the following:

1. Lateral 5B
2. Lateral 6
3. Lateral 7 Branch 1

Lateral 5B

Lateral 5B of Judicial Ditch 61 extends (north to south) from Sprague Creek Peatland SNA to the Roseau River. This ditch drains a longitudinal path through the area within its alignment, requiring surface and groundwater flows to run within, or parallel to, the ditch corridor rather than following the historical groundwater flow that ran in a roughly NE to SW direction. Hydrology restoration in the ditch will target maintaining the water table near the elevation of the top of bank to reduce ditch drainage of water, essentially wetting the peat while not promoting separation from mineral soil or the ditch bank. The proposed strategy would enlist shearing of the brushland on the west side of the ditch and placing the brush within the ditch corridor since there is no available spoil along the ditch corridor (Figure 7). The brush will be placed in the ditch and compressed with the assistance of amphibious equipment. The brush will provide a medium for accumulation of organic material within the open channel. Additionally, the tops of beaver dams would be pressed to match grade with the top of bank. The larger dams that extend 20+ feet beyond the ditch will be removed by placing spoil from the dam into the ditch. The northern half mile of Lateral 5B is located within Sprague Creek Peatland SNA and presents unique challenges to establish target water levels. There are limited spoil reserves located along the narrow ditch corridor. The preferred strategy for restoring hydrology to the adjacent ground surface is to install cedar dams in series at each one foot drop in elevation (Figure 7). Cedar dams provide the least impact to the site, can be installed either by hand or with the assistance of light equipment, and can be set to a specific elevation that will persist for decades, thus allowing the channel to fill in with organic material. Amphibious equipment will access the site through existing corridors of disturbance.

Lateral 6

Lateral 6 of JD 61 (Figure 8) extends from the Roseau River northward to approximately one half mile from the Canadian border. The landscape within the Lateral 6 corridor slopes from northeast to southwest with the ditch and road acting as a dam and diversion, forcing flows southward to the river rather than following the historical pathways of northeast to southwest. Lateral 6 has on-site plug material to provide a suitable medium to re-establish, in part or wholly, hydraulic connectivity to wetlands on either side of the ditch. The ditch spoil material is sourced from the original ditch construction. On-site organic material is preferred to hauling in clay or other off-site fill. There are areas where peat has subsided or eroded from the spoil bank, therefore it is unlikely the spoil would completely fill the ditch cut in all locations. Where suitable material is available, spoil will be placed in-channel up to the level of the east top of bank in order to establish a stable grade transition. In the former road bed along the ditch, the top layer of peat will likely require agitation to encourage flows in the upper 10 cm. There will be areas where insufficient spoil is available or the degree of subsidence makes transitioning hydrology from east to west across the corridor of disturbance difficult. To address this, log diverters will be installed in the former corridor of disturbance to aid reestablishment of flow direction (Figure 7). Logs will be sourced from within the property, likely with the aid of DNR Forestry, to identify suitable stands. Tamarack (*Larix laricina*) and black spruce (*Picea mariana*) are the preferred species due to their abundance and slow rate of decay. The log diverter structures will be installed at each one foot drop in elevation, and will align with the surface grade of wetlands on either side of the ditch (Figure 7). Each diverter will consist of several logs

and will be approximately 390 feet long to ensure ground elevations from the east wetlands are tied to west wetlands and restrict potential southward flow in the former channel corridor. Ponding of water should not occur at diverter locations as the logs will provide a permeable dam.

Lateral 7 Branch 1, JD 61

Lateral 7 Branch 1 extends from east-to-west on the northern portion of the site bisecting normal groundwater flowpaths and the spring channels and conifer islands (Figure 7). Restoration of this area aims to connect they hydrology from wetlands north of the ditch to wetlands south of the ditch. Ditch plugs will be placed along the ditch to stop east-to-west flows and reconnect north-to-south flows to restore hydrologic connections. Plugs in the lateral will be placed at locations where the Black Spruce/Tamarack islands intersect the ditch or in areas where no current or former spring channels have been identified. In areas where spring channels have been identified, the ditch will be left open (unplugged) to promote southerly flows. Ditch spoil and trees growing along the top of spoil banks will provide material for ditch plugs. Removing the spoil will accomplish the secondary goal of restoring the grade of filled wetlands within the corridor of disturbance. Peat underneath the spoil is likely compacted and may require agitation of the top 10 cm to mimic the top layer of peat where the bulk of groundwater flow occurs. In areas where available spoil is insufficient, or where native vegetation is present (other than spring fen runs), cedar dams will be installed to encourage north-to-south flows.

Restoration of the fen at Sprague Creek Peatland SNA will only go forward if DNR staff agree that the purpose of the restoration (e.g. to provide wetland mitigation for other project components) is compatible with the funding mechanisms used to purchase the land initially, and is in compliance with rules associated with State Scientific and Natural Areas. The Wetland Conservation Act (WCA) Technical Evaluation Panel (TEP) has met with regards to the restoration efforts at Sprague Creek and have agreed that the project will not permanently adversely affect the natural community, and thus, is in compliance with M.R. 8420.0515 Sub. 3.

Since there are also designated calcareous fens located within Sprague Creek, restoration efforts must also comply with M.R. 8420.0935, Subp. 5. Water chemistry analysis is necessary to confirm the presence of calcareous fens on the SNA. It is the project design team's goal to seek full avoidance of any impacts to any possible fen on the SNA or elsewhere within the project area.

Construction at Roseau Lake and Sprague Creek

Construction will occur at various times throughout the year depending on local conditions. Late summer and into the fall months is likely for construction of embankments and water control structures so that fill and concrete have time to settle before freezing temperatures. Impacts from heavy equipment (e.g. excavator, bulldozer, front-end loader, skid steer, road grader, agricultural tractor, cement trucks, semi-tractor/trailer, dump trucks and fueling trucks) on soft wetland soils will be apparent, but will later be mitigated through revegetation efforts. Embankments built for the project will also be used as travel routes for construction equipment.

Exterior drainage ditches may be dug during winter months when impacts to wetland soils will be minimal. The project managers will apply for a National Pollutant Discharge Elimination System (NPDES) permit that will regulate how construction occurs within the construction areas.

c. Project magnitude:

Parameter	Size
Total Project Acreage	248.83
Linear project length	22.4 miles
Number and type of residential units	N/A
Commercial building area (in square feet)	N/A
Industrial building area (in square feet)	N/A
Institutional building area (in square feet)	N/A
Other uses – specify (in square feet)	N/A
Structure height(s)	N/A

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.

Roseau Lake was historically an important lake basin which provided a diversity of habitats for many aquatic mammals, birds, fish, amphibians, and reptiles. The lake was drained in 1914 when the Roseau River was channelized and a legal ditch system was created through the lake basin. The lake basin area now functions as a lake only during flood conditions and is dry during most months of each year.

Most of the lake basin and surrounding upland areas are part of a MN DNR Wildlife Management Area (Roseau Lake WMA). The area provides shallow water, wetland, and associated upland habitats that are substantially degraded compared to historic conditions. The temporary and inconsistent presence of a pool combined with frequent “bounce” (Apfelbaum and Lewis, 1998) has led to generally undesirable plant communities dominated by invasive plants (e.g. reed canary grass) with relatively low wildlife habitat value. There is currently no capacity to maintain a permanent pool or to manage water levels to reduce bounce, improve plant communities, and restore shallow lake functions.

Channelization of streams also resulted in lost stream habitats near the lake. Specifically, a 3.2-mile-long segment of the Roseau River channel that previously flowed through the lake basin was diverted through a cutoff channel and the historic channel has now been abandoned except during higher flows. The historic channel represents degraded fish habitat in the river. Pine Creek was also channelized within the historic Roseau Lake basin, further resulting in degraded habitat.

The areas near and downstream of Roseau Lake are subject to relatively frequent and severe inundation of floodwaters. Damages from these floods occur during a wide range of flood events and result in crop losses and damages to roads.

Roseau Lake currently provides about 60,000 acre-feet of floodwater storage during a 100 year flood event and about 30,000 acre-feet of storage during a 50 year event; however, since the lake fills early in a flood event, much of this storage capacity is unavailable during the peak of a flood. In its present configuration, the lake basin begins to fill when flows in the Roseau River reach a 1.5 year event level, approximately 800 cubic feet per second (cfs) at the Ross gage (USGS Gage 05107500). Since the lake fills prior to the peak, the storage capacity available during the flood peak is reduced substantially which results in higher peak flows downstream. To utilize this vast wetland complex for reduction of downstream flooding, the lake basin levels needs to pass more water downstream prior to peak flow periods so that a larger volume of the existing storage capacity is available for peak floods that occur later in the event. During a larger event (> 10-year interval) where floodwaters reach an elevation greater than 1036.0', the project will have no effect on flooding in the immediate area and reduced effect on flooding downstream (Tables 5 & 6).

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

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

Parties involved with the project have discussed additional embankments around "the island," a piece of agricultural land between the historical channel of the Roseau River to be restored and the cutoff channel ditched in the early 1900's (Figure 4). At this time, these embankments are not proposed, however future negotiations associated with this project may result in their construction. These embankments would not contribute to wildlife habitat improvements and would only provide flood damage reduction benefits for the area within the embankments. Embankments would be similar to those found in Figures 13 and 14, listed as "Embankment B".

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:

Table 7: Estimated cover type acreage before and after the Roseau Lake Rehabilitation.

Cover Type	Before	After
Wetlands	4739.1	4637.1
Deep water/streams	91.6	91.6
Wooded/forest	55.1	52.2
Brush/Grassland	0.5	0.5
Cropland	7190.2	7066.0
Lawn/landscaping	0.0	0.0
Impervious surface	265.5	265.5
Stormwater Pond	0.0	0.0
Other (Embankment)	0.0	206.2

Cover Type	Before	After
Other (Ditch)	35.0	57.9
TOTAL	12,377.0	12,377.0

Table 8: Estimated cover type acreage before and after the Sprague Creek Restoration. *All ditches within the restoration area will be abandoned and revert to functioning wetlands.

Cover Type	Before	After
Wetlands	3835.3	3854.6
Deep water/streams	0	0
Wooded/forest	83.2	83.2
Brush/Grassland	55.2	55.2
Cropland	82.7	82.7
Lawn/landscaping	0.0	0.0
Impervious surface	0.0	0.0
Stormwater Pond	0.0	0.0
Other (Embankment)	0.0	0.0
Other (Ditch)	19.3	0*
TOTAL	4075.7	4075.7

For this analysis, the 2011 Cropland Data Cover data layer (United States Department of Agriculture National Agricultural Statistics Service, 2017) was used (Figure 6). This layer was likely developed during a time of flooding in the area, and thus likely overestimates the amount of "open water" within the project area, while underestimating the amount of cropland and wetland (among others) in the area. Therefore, all coverages in the table above are estimated based upon the 2011 NLCD layer along with aerial imagery and the wetland delineation completed for this project.

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
BWSR	Wetland Conservation Act	To be submitted
MN DNR	Public Waters Work Permits	To be submitted
MN DNR	Water Appropriation	To be submitted
MN DNR	Dam Safety	To be submitted
MN DNR	SNA Permit	To be submitted
MN DNR	Permit for Take of Endangered Species	To be submitted
MN DNR	Calcareous Fen Management Plan	To be determined
MPCA	401 Certification	To be submitted

Unit of Government	Type of Application	Status
MPCA	NPDES Stormwater Construction	To be submitted
SHPO	Section 106 Review	Request submitted
Roseau County	Floodplain Permit	Not yet requested
Roseau County	Work within ROW of legal ditch system and ditch abandonment	Not yet requested
US Army Corps of Engineers	Section 404	To be submitted
USFWS	ESA Rule 4(d) review	Completed

Easements or fee title purchases are necessary on parcels of private land to complete the project. A 160-acre parcel on the western side of the Sprague Creek restoration area will have drainage impacts associated with the restoration efforts. The landowner in question has been consulted and is in favor of the project, though no agreement on land use has been decided at this point.

Minnesota Statute 103G.223 states that a Calcareous Fen Management Plan (CFMP) is necessary if the fen in question is to be filled, drained, or otherwise degraded, wholly or partially. Project partners have agreed that the conditions of the calcareous fens in the Sprague Creek Restoration Area will either be unchanged or improved upon. Although no impacts to the fens are anticipated, the plan is, in essence, a CFMP for the project. A pre-construction monitoring project completed in August 2020 provides baseline data for the water chemistry and plant species associated with the calcareous fens (RRWD 2020). Subsequent water chemistry monitoring and plant surveys conducted after construction is completed will identify changes in the fens. If this subsequent monitoring reveals degradation or reduction in size, a CMFP would be devised. The restoration plan, including pre and post construction monitoring, will be part of and incorporated into any developed fen management plan.

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.

      The bulk of the project will occur on Roseau Lake Wildlife Management Area (WMA), which is currently managed for wetland wildlife habitat. Idled lands owned by the Roseau River Watershed District will also be included in the project, along with adjacent privately owned agricultural lands which are primarily planted in row crops (Figures 5 and 6). Additionally, the restoration for mitigation portion of the project will occur in part on the Sprague Creek Peatland SNA and Lost River State Forest (Figure 5 and 6). Pine Creek Peatland SNA is also nearby the project area

(north and west of the project area, Figure 9), but not contained within it and will not be affected by the project.

A number of soil types within the project footprint are listed as Prime Farmlands or Farmlands of Statewide Importance (Table 9). Of these, only two soil types are listed as Farmlands of Statewide Importance: Percy loam and Foxhome fine sandy-loam (Hydric Soils are shown in Figure 15 and Organic Soils are shown in Figure 16).

Active forest management occurs in the Lost River State Forest (Figure 9) including planned timber harvests. Timber harvesting is limited, however, due to the wet nature of the area. There is no active peat mining within the project area.

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 planned land use for this project area will remain largely unchanged. The wildlife management area use for hunting and recreation will be enhanced, and surrounding agricultural fields should have minimal impacts. The project is compatible with Minnesota Statute 86A.05, Subdivision 8 regarding the purpose for State Wildlife Management Areas. The Roseau County Local Water Management Plan (RCLWMP, 2010) and the Roseau River Watershed District Overall Plan (2004) identify land use within this area as largely for conservation, but also for agricultural production. Flood damage reduction is a Priority Concern listed in the Roseau County RCLWMP (2010). Additionally, Minnesota's Wildlife Action Plan (2016) will be used to guide management decisions on the Wildlife Management Area. The proposed project is consistent with the goals of these plans.

Lands in the project area located north of the Roseau River will continue to be managed for both natural resource enhancements (i.e. wildlife habitat), recreation, agricultural production, and flood damage reduction, to be decided jointly by the project partners as part of an operational plan. Lands in the project area located south of the Roseau River will continue to be used for agricultural production. Land use will remain unchanged except for those lands where embankments and exterior drainage ditches are constructed. On embankments, permanent vegetation will be established to provide erosion control. Agricultural lands within the embankments will not see decreased flooded acres in the future, but rather changes in the timing and duration of flood events as described above under Question 6.c., Project Purpose.

During most of the year, the project will optimize wetland habitat for resident and migratory wildlife in the existing Roseau Lake WMA. During runoff events, the project area will be managed to reduce the downstream impacts of flooding, which is prevalent in the area. The Roseau River Watershed District recommends rehabilitation of Roseau Lake in their Overall Plan (2004).

Management of Sprague Creek Peatland SNA will not change because of this project. Future forestry activities within the Lost River State Forest portion of the project may be restricted as a result of the wetland mitigation, but poor quality timber reserves and the wet soils already restrict timber harvest operations.

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

Roseau County does not have land use zoning within the project limits. Shoreland Rules (M.R. 6120), the Roseau County shoreland ordinance, the Roseau County floodplain ordinance, and floodway setbacks associated with the Roseau River apply.

The construction of the rock weir restoring flows to the historic oxbow channel of the Roseau River and the restoration of flow to Pine Creek will occur within these respective streams, which are public waters, but no other construction is planned within 300' of any public waters. A public waters work permit is required for construction of the rock weir to restore flows to the historic channel.

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

There are no zoning issues related to land use with the project limits. This project will enhance opportunities to achieve wildlife habitat management and flood damage reduction objectives in the project area and is compatible with nearby uses of the land, which are dominated by annual cropping, haying and grazing, conservation, and outdoor-based recreation. The project will minimally change land use within the area and is consistent with the Roseau River Watershed District Overall Plan (2004) and the Roseau County Local Water Management Plan (2010). Land use may change where embankments and associated ditches are placed, but generally, lands within the footprint of the project will remain unchanged. Flooding of private and agricultural lands will not be more frequent within the project footprint, though flooding of lands immediately surrounding the project area should be reduced. When flooding of private and agricultural lands does occur, flood waters should recede more quickly than under current conditions.

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

This project should not interfere with current land use. The majority of the land affected by the project is within the Roseau Lake Wildlife Management Area and habitat management will be enhanced by the project. The private agricultural lands that fall within the project footprint are already subjected to periodic flooding, which will not change with the project. Timing and duration of future flooding are likely to change; that is, flood waters within the project footprint flood durations should be shorter than current conditions. Current land use will change only where embankments and ditches are located on private lands, and will not change due to flooding. Property rights to those lands where embankments and ditches are planned will be purchased either through fee-title acquisition or flowage easement.

Land use will not change in the area of the Sprague Creek fen restoration. Nearly all the land in this area is state-owned, and the majority of that is in State Forest. Since the area will be used as wetland mitigation, timber harvest activities may be restricted, but poor quality timber reserves and the wet soils already restrict timber harvest operations. One parcel of private land (160 ac) could be affected by the project, that is, drainage capacity from this property could be decreased as a result of the restoration. For this property, the land will need to be either purchased or easement rights acquired before the project can be completed.

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.

The topography of the Red River Basin was shaped by the Laurentide Ice Sheet, a continental glacier, during the last two stages of the Wisconsin glacial age. This topography was subsequently modified by glacial Lake Agassiz. The geomorphic associations in this project were formed by the Red River Lobe. The Red River Lobe was part of the most recent glacial advance, which receded about 9,000 years ago. The glacial setting is mirrored in the present topography; the glacial lake bottom is now represented by the relatively level valley bottom near the Red River, the rolling to undulating area reflects the glacial lake near-shore area, and the hummocky area reflects where stagnant ice of the end moraine wasted away.

This area is characterized by 100-200 feet of glacial till, generally peat underlain by clay, before reaching bedrock, consisting of Paleozoic limestone, dolomite and sandstone (USGS Hydrologic Investigations Atlas HA-241; Winter et al. 1967).

The area within the Roseau Lake project area is mostly flat, with only gentle elevation change (Figure 10). The elevation of the bottom of the drained lake basin is roughly 1026’ and ranges up to 1036’ near the Roseau River (NAD 88 Datum). There is more topographical change within the Sprague Creek Restoration area, however. Here, elevations at the southern part of the restoration area (butting up to the Roseau Lake Restoration area) are at about 1036’, whereas elevations at the north end of the restoration area (along the Canadian border) reach 1074’. Still, the slope is mostly a gentle grade from north to south. Outside of the lake basin the terrain is still generally flat, with more relief north and west of the lake basin near the Canadian border.

There are no known karst conditions in the project area according to the MN DNR Karst Feature Inventory GIS layer (referenced June 2019).

The project is not expected to have any effect on the geology of the area. A geotechnical analysis conducted as part of final engineering will be used to guide project construction (HDR 2019).

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.

The Roseau River Watershed is comprised of a large range of soil types, including the land near Roseau Lake. Table 9 lists soil types within and surrounding the project area. The majority of the area within the proposed Roseau Lake Rehabilitation embankments consists of Lallie mucky silt loam. This soil type is primarily found where depressions on lake plains occur, and typically have very poor drainage. The soils mainly found under or near the potential embankment areas are Colvin silty clay loam, Borup silt loam, and Cathro muck (Figures 15 and 16; Natural Resources Conservation Service 2002).

Given the wet nature of the area, hydric soils are common within the project footprint, and only a small portion of the Sprague Creek Restoration area is classified as “non hydric” (Figure 15). Much of the soils within historic lake basin are dominated by mineral soils, less than 50% organic material, though soils within the Sprague Creek Restoration area are typically greater than 50% organic materials (Figure 16). Indeed, Sprague Creek Peatland SNA is designated as such because of the amount of peat in the area.

In order to make the project as economical as possible, borrow materials are planned to come from within or in close proximity to the project location wherever possible (Figure 17). Initially, the NRCS Soil Survey Maps were used to determine a specific location’s likelihood of containing a suitable borrow source (i.e. clay). The first criteria used in selecting potential borrow locations was whether the site is located within the project footprint. This ensures that the site will be relatively close to the project. The second criteria used was to limit hauling distance along any portion of the embankment to one (1) mile. The final criteria used was to ensure any potential borrow sources would be located completely on one landowner’s property. Borrow sources will be chosen by the contractor, willing landowners, and ultimately according to the Geotechnical Exploration Report completed in 2017 (Terracon Consultants, Inc. 2017; HDR 2019). Saturated borrow materials will be stockpiled for a period of time in order for them to decant to the point that they can be used in constructing the embankments. Borrow pits and stockpile locations will be located in accordance with WCA and Section 404 permitting to avoid and minimize impacts to delineated wetlands.

Poor foundation materials (e.g. topsoil consisting of organic clay and fill) were present in all boreholes examined during the geotechnical analysis. Where embankments follow existing contours (e.g. along the beach ridge on the NW side of the project; Figure 10), then embankments will be of smaller scale and likely will not require a clay core, allowing for use of materials other than clay. Where embankments are expected to be larger (e.g. the North River Embankment), then clay cores must be utilized (Figures 13 and 14). Clay cores are necessary

on larger embankments to withstand external pressure from larger flood events. Excavation of existing topsoil, organics, peat, and non-native fill within the embankment footprint cannot be placed in wetlands. It is anticipated that any non-usable material can be used to flatten the embankment slope or as fill in the borrow sites. Further analysis from the geotechnical report can be found in the Final Engineer's Report (HDR 2019).

Table 9: Soils found in project area.

Map Unit Number	Map Unit Name/Description	Area in Project (ac)	Area in Project (%)	Prime Farmland?
77	Garnes fine sandy loam, 0-3% slopes	2.2	< 0.1%	Yes
117	Cormant loamy fine sand, 0-2% slopes	17.4	< 0.1%	No
158B	Zimmerman fine sand, 1-6% slopes	3.5	< 0.1%	No
187	Haug muck, 0-1% slopes	22.9	0.12%	No
191	Epoufette sandy loam, 0-2% slopes	17.3	< 0.1%	No
482	Grygla loamy fine sand, 0-2% slopes	29.6	0.16%	No
532	Sago muck, 0-1% slopes	205.5	1.12%	No
534	Mooselake mucky peat, 0-1% slopes	1683.5	9.16%	No
540	Seelyville-Seeleyville ponded, complex, 0-1 % slopes	2107.7	11.47%	No
541	Rifle-Rifle, ponded, complex 0-1% slopes	552.1	3.01%	No
544	Cathro muck, occasionally ponded, 0-1% slopes	2248.9	12.24%	No
546	Lupton-Lupton ponded, complex, 0-1% slopes	966.3	5.26%	No
561	Bullwinkle muck, 0-1% slopes	232.6	1.27%	No
563	Northwood muck, 0-1% slopes	79.0	0.43%	No
568	Zippel very fine sandy loam, 0-2% slopes	298.9	1.63%	If Drained
569	Wabanica silt loam, 0-2% slopes	201.2	1.10%	If Drained
627	Tawas muck, map 22-30, 0-1% slopes	7.4	< 0.1%	No
1154	Sax muck, 0-1% slopes	752.4	4.10%	No
1182	Warroad find sandy loam, 0-2% slopes	102.9	0.56%	If Drained
1314	Tacoosh mucky peat, map 22-30, 0-1% slopes	19.1	< 0.1%	No
1328	Northwood muck, wooded, 0-1% slopes	8.1	< 0.1%	No
1399B	Two Inlets loamy sand, noncalcareous substratum, 0-6% slopes	5.5	< 0.1%	No
1401	Grygla mucky loamy fine sand, depressional, 0-1% slopes	19.1	< 0.1%	No
1402	Leafriver muck, wooded, 0-1% slopes	7.0	< 0.1%	No
1405	Lallie mucky silt loam, map 18-22, 0-1% slopes	6091.6	33.16%	No
1807	Cathro muck, ponded, map 22-30, 0-1% slopes	23.1	0.13%	No

Map Unit Number	Map Unit Name/Description	Area in Project (ac)	Area in Project (%)	Prime Farmland?
I16F	Fluvaquents, frequently flooded-Hapludolls complex, 0-30% slopes	286.1	1.56%	No
I55A	Rosewood fine sandy loam, Aspen Parkland, 0-1% slopes	16.3	< 0.1%	No
I79A	Berner, Cathro, and Haug soils, ponded, 0-1% slopes	111.9	0.61%	No
I82A	Cathro muck, dense till, 0-1% slopes	137.9	0.75%	No
I84A	Percy loam, 0-1% slopes, very cobbly	0.6	< 0.1%	Statewide Importance
I86A	Percy mucky loam, 0-1% slopes	9.8	< 0.1%	No
I95A	Kratka and Strathcona soils, dense till, 0-1% slopes	3.5	< 0.1%	No
I101A	Foxhome sandy loam, dense till, 0-2% slopes	5.6	< 0.1%	Statewide Importance
I103A	Kratka fine sandy loam, dense till, 0-1% slopes	31.2	0.17%	If Drained
I106A	Enstrom loamy fine sand, dense till, 0-2% slopes	2.5	< 0.1%	No
I109A	Fluvaquents, 0-2% slopes, frequently flooded	80.9	0.44%	No
I110A	Augsburg, Borup, and Colvin Soils, very poorly drained, 0-1% slopes	126.3	0.69%	No
I114A	Foldahl fine sandy loam, dense till, 0-2% slopes	74.2	0.40%	If Drained
I125A	Skagen loam, dense till, 0-2% slopes	11.9	< 0.1%	Yes
I127A	Percy loam, 0-1% slopes	153.4	0.84%	If Drained
I467A	Bearden silt loam, 0-2% slopes	110.2	0.60%	Yes
I629A	Colvin silty clay loam, Aspen Parkland, 0-1% slopes	499.6	2.72%	Yes
I682A	Borup-Glyndon complex, 0-2% slopes	39.1	0.21%	No
I704A	Glyndon very fine sandy loam, Aspen Parkland, 0-2% slopes	202.4	1.10%	Yes
I741A	Boash clay loam, dense till, 0-1% slopes	53.2	0.29%	If Drained
I846A	Borup silt loam, Aspen Parkland, 0-1% slope	708.3	3.86%	No

In total, approximately 740,124 cubic yards (CY) of fill will be necessary to construct the embankments and 38,842 CY of fill is necessary for the road raise. A portion of this borrow material may come from the channel/ditch cut areas, which total 1,998,844 CY. Excess spoil materials will be spread in upland sites and will be reseeded with an appropriate upland seed mix.

Rutting may occur as a result of ingress/egress from the construction areas during wet periods. Impacts from rutting will be addressed as necessary by grading and revegetating with an appropriate seed mix and biodegradable mulch.

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.

Numerous perennial streams and legal ditches are found within the footprint of the project (Table 10; Figure 8). The Roseau River, also known as State Ditch (SD) 51, enters the project area from the southeast. Sprague Creek enters the project area from the northeast and enters the Roseau River just west of State Highway 310. Laterals 5, 5B, and 6 of JD 61 enter the Roseau River (SD 51) within the footprint of the project. Lateral 7 of JD 61 enters the historic lake basin and empties into JD 61 Lateral 7, Branch 3 inside the historic lake basin, which then empties into the Roseau River (SD 51). Pine Creek enters the project area from the northwest. The Roseau River (PWI 04001a), Sprague Creek (PWI 68040a), and Pine Creek (PWI 68041a) are all designated public waters (Figure 8).

The 2018 federal 303(d) list of impaired waters in the Roseau River Watershed identifies the Roseau River (AUIDs 0902314-501, 0902314-502, and 0902314-504) as being impaired for Aquatic Consumption due to elevated levels of mercury in fish tissue. The 2018 303(d) list also identifies Sprague Creek (AUID 0902314-508) as being impaired for Aquatic Life due to high turbidity; however, the MPCA has approved the delisting of the Sprague Creek impairment. The Sprague Creek delisting action is expected to be finalized during the 2020 cycle. Pine Creek was listed as impaired for aquatic life due to fish bioassessments during a 2017 assessment (AUIDs 09020314-501, 08020314-527, and 09020314-528).

Table 10: Perennial streams and legal ditches and current impairments found within the footprint of the project area.

Water Body	Public Water? Y/N	Impairment	Reason for Listing
Roseau River (SD 51)	Y	Aquatic consumption	Elevated mercury
Sprague Creek	Y	Aquatic life	High turbidity
Pine Creek	Y	Aquatic Life	Fish bioassessments
JD 61 Lat 5	N	N/A	N/A
JD 61 Lat 5B	N	N/A	N/A
JD 61 Lat 6	N	N/A	N/A

Water Body	Public Water? Y/N	Impairment	Reason for Listing
JD 61 Lat 7	N	N/A	N/A
JD 61 Lat 7 Br 1	N	N/A	N/A
JD 61 Lat 7 Br 3	N	N/A	N/A

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.

The shallow water table and varying depths of private wells indicate the potential for unconfined aquifers within or adjacent to the project site. Depth to groundwater in the project area ranges from 0-20 feet beneath the surface (Winter et al. 1967). A geotechnical analysis of the area failed to find groundwater in 13 of 16 bore holes. When found, ground water ranged from 7.5 to 31 feet below the soil surface (Figure 17; Terracon Geotech report which is an appendix to the Final Engineer's report, HDR 2019). The project is not within a Minnesota Department of Health (MDH) wellhead protection area. Spring fen and northern rich fens are identified within the Sprague Creek restoration area, north of JD 61 Lat 7 Br 1 within the Sprague Creek Peatland SNA (Figure 7). In this area, wetlands are fed by groundwater upwelling from deep, confined aquifers (artesian conditions). Construction will occur at the land surface. In the event that a surficial aquifer is encountered, standard construction practices will be followed observing a protocol of avoid, minimize, and remediate.

There are several wells within the project area, including some within the proposed impoundment area (Table 11 and Figure 18). No wells are found within the footprints of the proposed embankments. Identified wells within the project area will be officially abandoned per MDH rules.

Table 11: Wells within the Roseau Lake Rehabilitation project footprint. Well use and status taken from Minnesota Dept. of Health Minnesota Well Index.

Well No. on Map	Unique Well No.	Use	Well Depth (ft)	Static Water Level (ft)	Inside Impoundment	Status
1	131452	Domestic	115	2	N	Active
2	131489	Domestic	59	-1	Y	Active
3	141953	Domestic	81	1	N	Active
4	173265	Domestic	90	11	Y	Active
5	173269	Domestic	55	17	Y	Active
6	181826	Domestic	90	42	Y	Active
7	220334	Domestic	70	-1	Y	Active
8	220335	Domestic	68	3	Y	Active
9	220336	Domestic	58	20	N	Active
10	220337	Domestic	108	20	Y	Active

Well No. on Map	Unique Well No.	Use	Well Depth (ft)	Static Water Level (ft)	Inside Impoundment	Status
11	220338	Domestic	33	5	N	Active
12	220339	Domestic	104	8	N	Active
13	220345	Public	134	-2	N	Active
14	247533	Unknown	90	N/A	N	Unknown
15	276972	Unknown	40	N/A	N	Active
16	455385	Domestic	153	21	Y	Active
17	467936	Domestic	177	0	N	Active
18	508508	Domestic	115	10	N	Active
19	548833	Domestic	158	2	N	Active
20	572496	Domestic	175	4	Y	Active
21	630534	Domestic	50	4	N	Active
22	712688	Domestic	75	43	N	Active
23	766991	Domestic	142	-5	N	Active
24	808458	Domestic	160	5	N	Unknown
25	812689	Domestic	100	5	N	Active
26	455393	Domestic	190	10	N	Active
27	591589	Domestic	53	3	N	Active
28	766991	Domestic	142	-5	N	Active
29	812689	Domestic	163	5	N	Active

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.

Not applicable, The Project's operations will not generate wastewater.

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.

The biggest stormwater impacts associated with this project are from construction. Construction stormwater discharges could result in temporary increased siltation and turbidity in the Roseau River and Pine Creek (an impaired water), which would negatively affect stream biota, decrease oxygen levels, and perhaps even affect river flows at the confluence of the river with the project outlet. Any effects are anticipated to be temporary in nature and will be minimized by following construction best management practices.

The following measures will be included in pollution prevention planning for this project:

1) Install coffer dams at the sites of the new water control structures sufficient in strength and elevation to steer water discharges away from construction to alternative discharge sites during construction.
2) Use silt fences to contain erosion at vulnerable sites (e.g. new water control structures) during construction.
3) Use silt curtains on all waterbodies during construction to prevent sediment suspension into the downstream waterway.
4) Use wildlife-friendly erosion control blankets to cover vulnerable slopes after construction and before vegetative cover becomes established.
5) Seed ditch slopes and other embankments, etc. that were exposed during construction to BWSR 32-241 native construction mix (including winter wheat) to establish, at a minimum, an 80% aerial coverage of vegetation to anchor topsoil.
6) Construct side slopes on the outlet channel that are gradual enough (e.g., 4:1 or 5:1) to ensure adequate slope stabilization for the water velocities that the site will be subjected to.

Post-construction runoff may temporarily increase in quantity and decrease water quality near construction sites (structures, embankments, etc.). In particular, slopes on embankments and structures locations where soil has been exposed may produce more runoff, sediment, and nutrients than current conditions. Implementing standard erosion control measures will minimize changes to stormwater runoff near construction sites. Long-term water quality post-construction should improve since the lake should act as a settling basin, with high flows routed down the cutoff channel and normal flows going through the historic oxbow channel.

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.

De-watering will be necessary for water control structure construction as well as construction of the rock weir diverting flow from the cutoff channel into the historic channel of the Roseau River (Figure 13). While this will be temporary in nature, a construction de-watering appropriation permit from MN DNR will be obtained. De-watering associated with construction will be accomplished with minimal pumping, but primarily through temporary site-surface ditches with gravity drainage. No de-watering within borrow pits is anticipated. No direct or indirect impacts to the Sprague Creek spring fens are anticipated.

No municipal water supply is involved with this project.

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.

The Roseau River Watershed District completed a preliminary wetland determination in order to complete this document. Wetland boundaries were identified using the Guidance for Offsite Hydrology/Wetland Determinations document, endorsed by the Army Corps of Engineers (St. Paul District) and Minnesota Board of Water and Soil Resources (BWSR 2016). The field wetland delineation has been completed. To complete this project, 102.0 acres of wetlands regulated under the Minnesota Wetlands Conservation Act (WCA) will be filled or otherwise disturbed (i.e., type change; Figure 19). Embankment scenarios with lesser wetland impacts were considered but rejected due to greatly reduced flood damage reduction benefits or greater physical alteration to the Roseau River (i.e. on-channel structure). Furthermore, embankment scenarios that provided more in terms of flood damage reduction were ultimately removed from consideration due to excessive wetland impacts.

There are also some expected changes to existing wetlands. The new inlet channel to the project will have minimal grade and thus will be filled with at least some water during most of the year. Wetland type may change in other areas, especially in areas where ditches are excavated. The wetland type within the main basin is expected to remain unchanged.

To enhance wetlands within the lake basin and to provide habitat for migratory waterfowl, project managers intend to remove an area of sediments that have accumulated over time within the basin, near the outlet of the historic channel of Pine Creek (Figure 4). Though the entire basin has silted in to some degree over time, this area has deeper sediment because of the proximity of the river, the waters of which slow in velocity as they spill out of the banks. Sediment excavation may be between 6" and 12" in depth. Sediments removed would then be placed in nearby upland areas or used as fill to flatten slopes on embankments.

The Sprague Creek restoration area should contribute the bulk, if not all, of the wetland mitigation acres. A review by the local Technical Evaluation Panel (TEP) will be conducted prior to final engineering to avoid, minimize, and mitigate wetland impacts. Furthermore, pre-project coordination with the U.S. Army Corps of Engineers has been on going to address wetland impacts with regards to Section 404 of the Clean Water Act.

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. 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.

Ditches/Drainage:

No drainage improvements are expected, rather, only an improved capacity for managing flood waters should result from the project. The inlet channel to the project will be designed to avoid altering flows in the Roseau River or convey additional water from the landscape. Exterior ditches designed to route water around the project area will not increase flow to the Roseau River.

Drainage ditches within the Sprague Creek area will be formally and officially abandoned under 103E by Roseau County to allow for the restoration and plugging of ditches. Areas upstream from the restoration site will likely see resulting decreased drainage. Areas downstream will likely see less incoming run-off from the plugged ditches.

Roseau River and Historic channel restoration

The project proposes to restore the historic channel on the Roseau River through the lakebed (Figure 4). Current conditions route the majority of flows in normal flow conditions through the manmade cutoff channel. The cutoff channel contains limited and degraded fish habitat and the banks of the cutoff channel are

experiencing severe sloughing. To restore the historic channel, a riprap boulder spillway will be constructed to restrict low flows down the current cutoff channel until the river exceeds approximately 500 cfs. Afterward, approximately 75% of the flow would be routed through the restored historic channel. The historic channel will need some restoration or re-contouring at the point where the flow turns from northwesterly to southwesterly (Figure 4) to avoid erosion caused by additional flows. This work will be completed in a MN DNR public watercourse, and thus, a Public Waters Work Permit will be required. This part of the project should have minimal impacts on watercraft usage of the Roseau River, however, during low flows, watercraft will need to avoid the cutoff channel and instead use the historic channel.

Pine Creek

Construction of the Roseau Lake Rehabilitation Project will require modification of Pine Creek (SD 87) as it outlets into the Roseau River (SD 51) in the drained lake basin. The channelized portion of Pine Creek, SD 87, is both a public waters (defined as an altered watercourse) and a legal drainage system administered under M.S. 103E. The dual designation results in added complexity to permitting any modification to the channel as a result of the Roseau Lake Rehabilitation Project.

Here, we propose to restore flow to the historic channel within the lake basin. Restoration of Pine Creek would include filling the open ditch (SD 87; no longer utilized) with spoil to prevent fish entrapment following inundation and enhance communities within the former corridor of disturbance. The Restoration of Pine Creek to its former channel would entail the following:

- Reconnect approximately 7,650 ft of stream corridor
- Plug approximately 8,200 ft of former open ditch (i.e. State Ditch 87)
- Relocate terminus of SD 87 approximately 3,880 ft north of current location (Figure 4).

Re-meandering of the Pine Creek channel throughout its channelized portion (i.e. within the Main Pool Storage Basin) should improve fish and wildlife habitat during times when the creek is itself not inundated. Pine Creek is generally too narrow for watercraft, so this project should not have any impact on navigation. When the Main Pool Storage Basin is operating at elevations above 1028.0, Pine Creek is likely to be inundated, but that is not different from current conditions. In conjunction with the restoration of Pine Creek, an area of 100-150 acres of sediments deposited in the lake basin since the channelization of Pine Creek will be scraped out to improve wetland wildlife habitat conditions (Figure 4). This additional area of wetland restoration within the Roseau Lake basin, potentially up to 12” deep, is near the historic outlet of Pine Creek within the lake basin. Since this portion of the project will occur within areas of identified wetlands, it will be subject to wetland regulations through both the Wetlands Conservation Act (WCA) and Section 404 of the Clean Water Act. This portion of the project will be included in those permit

applications. And, since Pine Creek is listed as an impaired water, special regulations apply. A separate Storm Water Pollution Prevention Plan (SWPPP) is required since the area of disturbance is greater than 50 acres and has a discharge point within one mile of the impaired water. This plan will need to ensure that the restoration activities will not further harm the impaired water.

Erosion Control

A properly executed SWPPP is important to prevent soil from eroding during construction. All work directly adjacent to or within the Roseau River will require the use of floating silt curtains coupled with sheet piling or cofferdams to minimize sedimentation in the river. Newly constructed channels and embankments will be vegetated with appropriate seed mixes in accordance with Board of Soil and Water Resources (BWSR) seeding guidelines (Native Vegetation Establishment Enhancement Guidelines; BWSR 2019) and use biodegradable, plastic-free mulch. Upland areas of disturbance will be seeded with native construction mix (32-241), while channel bottom, wetland and transitional areas will be seeded with emergent wetland mix (34-181). The spillways along embankments will be lined with Armorflex and Class II Riprap. This will prevent scour from occurring along the top edge of the embankment where the spillway is located. Riprap will also be placed at all inlet and outlet locations along the embankments. The SWPPP will be subject to review and approval by the Minnesota Pollution Control Agency.

An additional area of wetland restoration within the Roseau Lake basin is proposed (Figure 4). This area may total 100-150 acres of sediment removal, potentially up to 12" deep, and is near the historic outlet of Pine Creek within the lake basin. Since Pine Creek is listed as an impaired water, special regulations apply. A separate SWPPP may be required since the area of disturbance is greater than 50 acres and has a discharge point within 1 mile of the impaired water. Any plan would need to ensure that the restoration activities would not further harm the impaired water. This SWPPP would also be subject to review and approval by the Minnesota Pollution Control Agency.

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.

There are no known contamination sources within the project area according to the MPCA's website, "What's in My Neighborhood?" Four feedlots are within five miles of

the project area. There are no anticipated impacts from contaminations within the project area or downstream from the project.

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 solid wastes are expected to be generated or stored during construction or operation of this project.

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.

The only toxic or hazardous materials to be used or present at the project site are fuel, oil, and hydraulic fluid associated with construction equipment and machinery. Refueling will be done away from the project site in upland areas and equipment will be inspected and maintained to prevent accidental loss of hazardous fluids. We will specify that no fuel be stored on site, therefore, no storage tanks will be held on site.

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.

No hazardous wastes will be generated or stored. The project as proposed will not generate any hazardous wastes. Any accidental leaks or spills on site will be immediately mitigated and contaminated materials will be removed from site in accordance with the SWPPP (to be developed). Any leaks or spills of petroleum products that total five or more gallons will be reported to the State Duty Officer at (651)-649-5451 or (800)-422-0798.

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.

Habitat conditions within the drained lake basin are variable depending upon the season. The lake only fills during flood conditions, and as a result, wildlife habitat in Roseau Lake has been degraded for the past century. While the interior of the project area consists of native shallow marsh vegetation, including various sedges (*Carex* spp.) and bulrushes (*Schoenoplectus* spp.), much of the lake basin is dominated by invasive reed canary grass (*Phalaris arundinacea*) with patches of hybrid or narrow-leaved cattails (*Typha* spp.)

interspersed. Still other areas within the project footprint are in agricultural production and provide little wildlife habitat. While waterfowl are abundant in the area when shallow water is available, production at Roseau Lake WMA is hampered by unpredictable water levels within the lake basin that flood or strand nests. Nesting efforts can be undone by rapidly rising water levels caused by local flooding. Operation of the project aims to improve habitat conditions for waterfowl and associated wetland wildlife by stabilizing water levels during the spring nesting season (i.e., reducing "bounce"; Apfelbaum and Lewis 1998). The project will also allow for complete drawdown of the lake each winter; that is, no permanent pool is proposed with this project. Complete drawdown should help manage for beneficial wetland plants found within the project area by eliminating the potential for wintering fish, which typically increase water turbidity and negatively impact wetland plant communities (Bouffard and Hanson 1997). Complete freezing of the basin (i.e. to the bottom) is anticipated to occur every year after completion of the project, which currently occurs in most years.

Roseau River aquatic habitats contain a variety of warm water fish species in a relatively wide stable channel of the Roseau River downstream of the project area. Thirty-eight fish species have been reported within the Roseau River (Nelson 2017, Van Offelen et al. 2008). The Index of Biotic Integrity (IBI) scores for nearby sampling stations were rated as "very poor" to "poor", whereas the sampling site farther downstream was rated as "fair" (MPCA 2018). The cutoff channel south of the historic channel was channelized as part of a U.S. Army Corps of Engineers Project in the 1910s. This has resulted in the loss and degradation of stream habitat. The altered hydrology of the watershed has also contributed to degraded habitat conditions in the Roseau River. Increases in the frequency and duration of peak runoff and increases in annual water yield tend to increase erosion in stream channels, increasing turbidity and decreasing habitat quality.

Pine Creek was also channelized within the historic Roseau Lake basin. Pine Creek is listed by the Minnesota Pollution Control Agency (MPCA) as impaired for aquatic life, specifically for low fish IBI scores (MPCA 2018). Possible causes for the low IBI score include loss of longitudinal connectivity, flow regime instability, insufficient physical habitat, high suspended sediment, and low dissolved oxygen (Anderson and Sharp, 2018). This project may address the problem of insufficient physical habitat by re-meandering the historic channel. Fish and other aquatic wildlife should benefit from refugia created by current breaks within a more natural, meandered channel.

Vegetation within the Sprague Creek Restoration Area is dominated by hydrophitic communities with diverse species composition. The northern extent of the site's wetlands are dominated by tamarack (*Larix laricina*), black spruce (*Picea mariana*), sphagnum moss (*Sphagnum* spp.), small cranberry (*Vaccinium oxycoccos*), and pitcher plant (*Sarracenia purpurea*). In the southern extent, Canada bluejoint (*Calamagrostis canadensis*) and meadow willow (*Salix petiolaris*) are dominant in undrained wetlands while reed canary grass and hybrid cattail are dominant in corridors of disturbance. Between the north and south extents exists a mosaic of emergent and shrub dominated wetland communities

exhibiting varying degrees of alteration because of drainage and previous attempts at agricultural production, most likely haying and grazing.

As a result of the Roseau Lake Rehabilitation project, overwater nesting waterfowl and grassland ground nesting birds are expected to benefit from reduced bounce and more stable water regimes. Migrating waterfowl and other water birds should also benefit from water retained within the Main Pool Storage area during fall months. Wildlife species dependent upon spring fen and boreal woodland habitats should benefit from the Sprague Creek Restoration portion of the project.

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 #20200021-0002) 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.

Minnesota Biological Survey (MBS) has identified much of the project area surrounding the historic lake basin as "Below" biodiversity (Figure 11). This ranking is likely influenced by widespread ditching across the landscape and channelization of Pine Creek and the Roseau River, leading to altered hydrology of the lake basin, and favoring establishment and dominance of invasive reed canary grass and narrow-leaved cattail around the fringes of the lake. Areas to the north of the Roseau Lake rehabilitation area, including the Sprague Creek restoration area, have been identified as having "Moderate" to "Outstanding" biodiversity. Roseau Lake is listed by DNR as a lake of "Moderate" biological significance because of existing bird diversity, mostly during times when the lake is flooded (Figure 11).

No rare native plant communities have been documented within the Roseau Lake project area. However, within the Sprague Creek restoration area, several rare occurrences have been documented, including Spring Fens (Table 12; Attachment B). Additional occurrences are located within the Lost River State Forest and Pine Creek Peatland SNA. Hydrology is proposed to be restored to portions of Sprague Creek Peatland SNA and the Lost River State Forest as a result of this project, thereby resulting in improved habitats. No habitats found within the Pine Creek Peatland SNA are expected to be affected by construction or operation of this project.

Initial vegetation surveys were completed in late summer, 2020. Additional vegetation and rare species surveys will be completed in early summer, 2021 in an effort to capture earlier flowering rare species (Attachment C). Minnesota DNR plant ecologists and SNA managers have been involved with the plant survey development and intend to use this data for future monitoring to determine the efficacy of the restoration efforts.

Table 12: NHIS occurrences within two miles of Roseau Lake WMA and the Sprague Creek Restoration Area (All elements accessed through NHIS data, 2/10/20). [1] Categories are: THR = threatened; SPC = special concern. [2] Species of Greatest Conservation Need (SGCN) are animals identified in Minnesota's Wildlife Action Plan 2015-2025. [3] S-ranks reflect the statewide degree of endangerment for high quality

examples of native plant communities in Minnesota as described in Minnesota's Native Plant Community Classification. S1 = critically imperiled; S2 = Imperiled; S3 = Rare or uncommon; S4 = apparently secure; uncommon but not rare; SNR = not ranked. [4] G-rank is a global conservation designation. G2 = imperiled – at high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; G3 = vulnerable – at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors; G4 = apparently secure; G5 = demonstrably widespread, abundant and secure; GNR = globally not ranked. [5] Purple lesser fritillary (Boloria charilclea grandis) is not mentioned in Minnesota's Wildlife Action Plan 2015-2025, but is a subspecies of Arctic fritillary (Boloria chariclea) which replaced Bog copper (Lycaena epixanthe) as a representative dependent upon a habitat of concern (open peatland).

Rare Element	Scientific Name/Class	State Listing[1]	SGCN[2]	S Rank[3]	G Rank[4]	Within Project Footprint?
Eastern spotted skunk	Spilogale putorius	THR	Yes	S2	G4	No
Nelson's sparrow	Ammodramus nelsoni	SPC	Yes	S3B	G4	Yes
American bittern	Botaurus lentiginosus	Watchlist	Yes	S4B	G4	Yes
Yellow rail	Coturnicops noveboracensis	SPC	Yes	S3B	G4	No
Marbled godwit	Limosa fedoa	SPC	Yes	S3B	G5	Yes
Zigzag darner	Aeshna sitchensis	SPC	Yes	S3	G5	Yes
Subarctic darner	Aeshna subarcitica	SPC	Yes	S3	G5	Yes
Purple lesser fritillary[5]	Boloria chariclea grandis	Watchlist	No	SNR	G5	Yes
Black sandshell	Ligumia recta	SPC	Yes	S3	G4	No
Northern androsace	Androsace septentrionalis	SPC		S3	G5	No
Twig rush	Cladium mariscoides	SPC		S3	G5	Yes
Ram's head orchid	Cypripedium arietinum	THR		S2	G3	Yes
English sundew	Drosera anglica	SPC		S3	G5	Yes
Northern oak fern	Gymnocarpium robertianum	SPC		S3	G5	No
White adder's mouth	Malaxis monopyllos var brachypoda	SPC		S3	G5	No
Rock sandwort	Minuartia dawsonensis	THR		S2	G5	No
Lapland buttercup	Ranunculus lapponicus	SPC		S3	G5	No

Rare Element	Scientific Name/Class	State Listing[1]	SGCN[2]	S Rank[3]	G Rank[4]	Within Project Footprint?
Hair-like beak rush	Rhynchospora capillacea	THR		S2	G4	Yes
Alder – (Red Currant - Meadow-Rue) Swamp	WFn74a	N/A	N/A	S3S4	G5	No
Graminioid Rich Fen (Water Track), Featureless Water Track Subtype	OPn91b1	N/A	N/A	S3	GNR	Yes
Graminoid Rich Fen (Water Track), Flark Subtype	OPn91b2	N/A	N/A	S2	GNR	No
Lowland White Cedar Forest (Northern)	WFn53b	N/A	N/A	S3	GNR	Yes
Northern Rich Fen (Water Track)	OPn91	N/A	N/A	(S2)	(G3)	Yes
Northern Rich Spruce Swamp (Water Track)	FPn71	N/A	N/A	(S3)	(GNR)	Yes
Northern Wet Cedar Forest	WFn53b	N/A	N/A	S3	GNR	No
Northern Wet - Mesic Boreal – Hardwood Conifer Forest	MHn44	N/A	N/A	(S2)	(G5)	Yes
Northwestern Rich Conifer Swamp	FPw63	N/A	N/A	(S3)	(G4)	No
Rich Black Spruce Swamp (Water Track)	FPn71a	N/A	N/A	S3	GNR	Yes
Spring Fen – Northern Extremely Rich Fen (Calcareous Fen)	OPn93a	N/A	N/A	S2	G2	Yes
Tamarack – Black Spruce Swamp (Aspen Parkland)	FPw63a	N/A	N/A	S3	G4	No
White Cedar Swamp (Northwestern)	FPn63c	N/A	N/A	S3	G4	Yes

Special considerations are to be taken by the WCA TEP when the application involves areas of Outstanding or High Biodiversity, or native plant communities with a conservation rank S1, S2 or S3; state-listed endangered or threatened species. According to M.R. 8420.0515 Subp. 3, the TEP shall not approve a wetland replacement plan if the proposed activities will permanently adversely affect a rare natural community. In this case, the TEP has agreed that the areas of Outstanding and High Biodiversity within the Sprague Creek Mitigation Area will not be permanently adversely affected by the restoration efforts. Furthermore, M.R.

8420.0515 Subp. 2 covers state-listed endangered or threatened species and requires that replacement plans receive a permit issued by the MN DNR for the take of those species.

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.

Roseau Lake only fills during flood conditions, and as a result, wildlife habitat in Roseau Lake has been degraded for the past century. While waterfowl are abundant in the area when shallow water is available, waterbird production at Roseau Lake WMA is hampered by changing water levels within the lake basin. Nesting efforts can be undone by rapidly rising water levels caused by local flooding. Operation of the project aims to improve habitat conditions for waterfowl and associated wetland wildlife by stabilizing water levels (i.e., reducing bounce) during the spring nesting season.

The operation will also allow for complete drawdown of the lake each winter; that is, no permanent pool is proposed with this project. Complete drawdown is intended to help manage for more beneficial wetland plants than are currently found within the project area. Permanent bodies of water, particularly those that are not isolated, often harbor fish populations, which can degrade available habitat for migratory birds, especially waterfowl, by re-suspending sediments and nutrients that diminish aquatic vegetation and encourage growth of phytoplankton and by competing for invertebrates (Bouffard and Hanson 1997).

Minnesota's Wildlife Action Plan (2016) defines species in greatest conservation need (SGCN) as animals whose populations are rare, declining, or vulnerable to decline and below levels desirable to ensure their long-term health and stability. This area has a low-medium to medium-high quality habitats and species presence in the Wildlife Action Network, which indicates that this area provides some important habitats for SGCN, but that restoration efforts could improve the quality of habitats for these species.

Some of the rare features identified in the Natural Heritage Information System (NHIS) are expected to experience some degree of disruption caused by the construction of the project, but none are expected to be harmed from long-term operation. Ground nesting birds, including Nelson's sparrow and Upland sandpiper, should benefit from the project through reduced flooding in adjacent lands during the nesting season. Over water nesters, including many waterfowl, American bitterns, marbled godwits, and yellow rails should benefit from reduced frequency, duration, and depth of inundations during the nesting season and from a more diverse vegetative community that results from the post-project water regime. No

species are expected to be harmed by normal operation of the project.

Bald eagles are protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The NHIS shows one bald eagle nest located near the project site, and construction of the project could be disruptive to nesting eagles. The United States Fish and Wildlife Service (USFWS) provides a step-by-step guidance document that was used to determine that the project is unlikely to result in a non-purposeful take since the construction will take place more than 660 feet from the nest location. Conversely, bald eagles are likely to benefit from the management of a wildlife pool during fall and spring migration periods as this should attract many different prey species.

Eastern spotted skunks were last identified in the project area in 1933. Recent statewide surveys have revealed a greatly diminished population in Minnesota. Since eastern spotted skunks have typically been found around small farms in Minnesota, and have not been identified in this area for more than 80 years, the construction and operation of this project is not expected to have any adverse effects on eastern spotted skunks.

Northern long-eared bats (*Myotis septentrionalis*) should not be affected by the project. Any impacts to woodlands (i.e. potential habitat for northern long-eared bats) adjacent to the project components will occur during winter. Furthermore, there are no known hibernacula or maternal roost trees in the area of the project and this project will not result in either “incidental” or “purposeful take” as per USFWS rule (ESA Section 4(d)).

Black sandshells (*Ligumia recta*) (mussels) have been documented downstream of the project in the Roseau River. This species is usually found in the riffle and run areas of medium to large rivers in areas dominated by sand or gravel. Degradation of mussel habitat in streams throughout the black sandshell's known range is a continuing threat to this species. Dams, channelization, and dredging increase siltation, physically alter habitat conditions, and block the movement of fish hosts. Project operation should not directly impact black sandshells. There is potential for siltation to occur during project construction; however, measures will be taken to minimize erosion and siltation during construction. Wildlife friendly erosion and sediment control practices will be implemented and maintained throughout the duration of this project in order to minimize impacts.

A subspecies of a butterfly, purple lesser fritillary (*Boloria chariclea*), on the state watch list has been identified in the Sprague Creek Peatland SNA restoration area. The purple lesser fritillary inhabits solely bogs (Butterflies and Moths of North America 2019). These types of habitats are more common upstream from and north of the project area, respectively, and should not be affected by either construction or

operation of the project. Two listed dragonflies, zigzag darner (*Aeshna sitchensis*) and subarctic darner (*A. subarctica*) are listed within Sprague Creek Peatland SNA within the restoration project area. Each of these species occurs in northern poor fens, northern open bogs and acidic peatland systems (Minnesota's Wildlife Action Plan 2016). Since the hydrology is expected to be improved south of Lateral 7, Branch 1 of Judicial Ditch 61, we expect habitat conditions to be improved, or at least not harmed, for these species.

The Roseau River is home to a diverse population of game and non-game fish species. Lake Sturgeon (*Acipenser fulvescens*), a state listed species of special concern, is currently being restored throughout the Red River watershed, including in the Roseau River. Lake Sturgeon likely reproduce at a few locations throughout the Roseau River where good spawning habitat exists. One of these locations is upstream of the project area near the City of Roseau. Exceptional populations of Channel Catfish (*Ictalurus punctatus*), Walleye (*Sander vitreus*), and Northern Pike (*Esox lucious*) reside within the Roseau River. Seasonal movement and habitat availability are imperative to successful management of these populations. Because river connectivity will be maintained, fish passage will continue post-project and restoration of the oxbow channel should result in improved in-stream habitat. Current conditions make it possible for fish to become stranded within the project basin, and that will likely continue, but managers expect that the project will not increase the likelihood of fish stranding. Since the goal is to drain the lake basin prior to freeze-up, any fish remaining in the lake basin during winter months will likely experience winter mortality.

Many amphibians and reptiles use permanent water during late fall and winter months for hibernation. Late fall or winter drawdowns have the potential to expose overwintering amphibians and reptiles to freezing temperatures and make them susceptible to desiccation and freezing during a time when they are unable to escape. Since the project will be managed for waterfowl and other water birds, which typically do not migrate through the area until late fall just before freeze-up, and since complete drawdown is sought prior to winter, operation of the project has the potential to harm amphibians and reptiles found in the area. Operation of the project may not lead to more mortality of amphibians and reptiles than they are experiencing now, however. Since the water entering and drying from the lake basin is now uncontrolled, it is common for the basin to dry out completely late in the fall, after amphibians and reptiles have already chosen their overwintering sites. Further, reduced bounce within the basin during summer months should benefit reptiles nesting in nearby uplands.

Several listed plant species have been identified within the restoration project area. English sundew (*Drosera anglica*) is found in Minnesota exclusively within open rich

peatland fens and is sensitive to disruptions in ground water flow (MN DNR English sundew web page). Similarly, hair-like beak rush (*Rhynchospora capillacea*), found primarily in calcareous fens but also in spring fens (found at Sprague Creek Peatland SNA), is also highly dependent upon groundwater flow (MN DNR hair-like beak rush web page). Twig rush (*Cladium mariscoides*) is also found within ground water fed fen ecosystems in Minnesota (MN DNR twig rush web page). Since ground water flow at the site has been altered by historic ditching in the area, this project would likely not harm these species any further, and may re-create groundwater flow that would, in time, benefit these species south of Lateral 7, Branch 1 of Judicial Ditch 61. Proposed construction activities (e.g. construction with hand tools, transportation of construction materials during months when the ground is frozen) are aimed at limiting the impact to these species. However, potential exists for these species to be harmed during restoration and construction efforts. To determine whether any individual plants are subject to harm by construction activities, a rare plant survey will be conducted prior to construction. If it is determined that harm to these rare plants cannot be avoided, the project proposer will need to apply for a permit for take of an endangered or threatened species incidental to a development project before proceeding with the project.

Ram's head orchid (*Cypripedium arietinum*) is also found within Sprague Creek Peatland SNA. Water level manipulations are listed as potentially affecting populations of this rare plant (MN DNR ram's head orchid web page), and as such, the activities of this project in the area around Sprague Creek Peatland SNA could be harmful to ram's head orchid in the end. With construction of this project, taking of this protected species is a possibility. Future surveys will be completed to determine whether individual plants will be harmed by construction practices, and if so, an application for a permit for take of an endangered or threatened species incidental to a development project will be submitted. Water level manipulation in the area may also affect ram's head orchid, and thus this issue will need to be discussed with the permitting authority.

Other listed plants in the area of the restoration work, including Northern androsace (*Androsace septentrionalis)*, Northern oak fern (*Gymnocarpium dryopteris)*, white adder's mouth (*Malaxis monophyllos*), Lapland buttercup (*Ranunculus lapponicus*), and rock sandwort (*Minuarita dawsonensis*) should not be affected by the restoration work since they are either outside the scope of the work or are found only in habitats that will not be affected by the project.

Several native plant communities with conservation status ranks of S1, S2, or S3 have been identified within the project footprint. The restoration project at Sprague Creek Peatland SNA and within the Lost River State Forest aims to reconnect ground water flow cut off by historic ditching efforts, which presumably have had a great effect on

spring fens, in some cases leading to a replacement of original sedge-dominated wetlands with more acidic shrubs and trees. Ground water flow will be restored in the spring fens, and in time, functions of spring fens could return. Expected consequences of restoring historic groundwater flow are some replacement of the shrubs and trees with sedge meadows; an increase the residence time of groundwater in the area; and some restoration of alkalinity. As a potential rare natural community determined by the MN DNR, according to M.R. 8420.0515 Subp. 3, the local government unit must meet to determine that the replacement plan will not permanently adversely affect the natural community. A preliminary meeting of the local TEP has determined that the restoration plan will not cause permanent damage to any of the rare native plant communities found on or around Sprague Creek Peatland SNA.

Other rare terrestrial communities are within two miles of the project, including a black spruce swamp, tamarack swamp, and white cedar swamp. Each of these communities is located within the Lost River State Forest, north of the Roseau Lake basin and to the west of Sprague Creek Peatland SNA. Hydrology should not be affected by operation of the Roseau Lake portion of the project, since the area of inundation is not expected to change and this area is outside of the proposed rehabilitated lake basin. This area is also downstream/west of the Sprague Creek Restoration area, where Judicial Ditch 61 Lateral 7 Branch 1 is proposed to be abandoned, but since this ditch ultimately flows south of the identified terrestrial communities, abandonment should not affect hydrology of this area and thus, not affect the identified terrestrial communities.

MN DNR Operational Order 113 aims to "prevent or limit the introduction, establishment, and spread of invasive species" and to "implement site-level management to limit the spread and impact of invasive species." Private contractors working on state lands are subject to this policy and shall be required to both arrive and leave with equipment cleaned of visible plant parts, seeds, mud, dirt clods, and animals. Equipment used in aquatic habitats shall be dried for a minimum of two weeks or be allowed to freeze for at least 48 hours prior to work at the project site. In the event that a new invasive plant community becomes established during construction, it will be physically removed or chemically treated to prevent expansion into adjacent native habitats.

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

The footprint of the project will be as small as possible while still accomplishing the stated goals of improved wildlife habitat and flood damage reduction. Embankments must also be constructed during times when water levels are low. Any concrete around water control structures must be allowed to set and embankments, too, must be allowed to settle before

freezing conditions. Therefore, embankment construction during winter months, when there would be the fewest impacts to plants and wildlife, is not possible.

Water control structures will be constructed during times when water levels in the lake basin are low, likely late in the growing season. Water control structures must be constructed during the growing season in order to allow concrete to set; exact timing will depend on local conditions (i.e. flooding) and the progress of other project features. Construction late in the growing season would pose the least effect to local wildlife, but it may not be feasible to ensure completion of the project in reasonable time. Thus, local wildlife may be disturbed in the area of new water control structures, but those impacts would be limited to a single season.

Construction in wetland areas would preferably take place in fall or winter to ensure minimal effects to adjacent communities, from either compaction or rutting from heavy equipment. Construction during winter months would also pose little impact to migratory birds that otherwise use the project area. New ditches may be constructed during winter months to avoid impacts to plant communities and nesting birds as well as to avoid compaction or rutting from heavy equipment. Erosion control measures will remain in place until vegetation has been established. However, like with water control structures, ambient conditions will dictate when construction ultimately occurs. Even during winter months, some amphibians and reptiles may be affected by construction activities, but those effects should be temporary and only affect individuals, not local populations.

Temporary effects on wildlife and wildlife habitat, including nesting birds, will occur within the project footprint during times of construction. The majority of the disturbance will be associated with the embankments and associated drainage ditches, but also in borrow areas and transport routes between borrow areas and the project components. Heavy equipment impacts will be contained within existing ingress/egress routes and the project footprint, with project embankments used as ingress/egress routes as they are completed. Erosion control measures will control sediment transfer from construction sites, limiting potential sedimentation to adjacent terrestrial and aquatic communities. MPCA stormwater permit documents (to be developed) will include guidance that requires sediment removal and stabilization of the area to occur within seven days of discovery or obtaining access. Disturbed upland areas will be reseeded with native plant mixes upon project completion and monitored for complete re-establishment as per Board of Water and Soil Resources (BWSR) recommendations, but may also receive temporary annual seed mixes for more immediate cover (BWSR 2019). Seed mixes will be certified free of invasive species and will be appropriate to the seeded habitats.

The historic channel restoration will be constructed outside of the fish-spawning season; no work will be done between March 15 and June 15.

This project was designed to minimize wetland impacts while still meeting the project objectives (i.e. improved wildlife habitat, reduced downstream flood damages). To complete this project, 102 acres of wetlands will be filled or otherwise disturbed (i.e. type change). Rejected alternatives incorporated more and larger embankments and ditches that would

have impacted more acres of wetlands, requiring more wetland mitigation. Partial mitigation of the proposed impacts may be achieved through improved wetland function in the basin during the growing season. The remainder of the necessary mitigated wetland acres will occur within Roseau County at a 2:1 ratio through a plan approved by the local TEP. All or most of the wetland mitigation for this project will be within the Sprague Creek restoration area. Additional areas may be necessary if the wetland impacts cannot be mitigated within the Sprague Creek restoration area.

Construction of project components within the Sprague Creek restoration area will be conducted mostly during winter months to avoid significant rutting associated with equipment necessary for completing the work. All work completed within Sprague Creek SNA (i.e. placement of cedar dams) will be done by use of hand tools to minimize physical impacts to the SNA outside of the corridor of disturbance, in compliance with the Minnesota Peatland Protection Act (M.S. 84.035 and M.S. 84.036). Plant surveys are scheduled in the Sprague Creek area to document locations of state-listed plants. All efforts will be taken to avoid or minimize effects on state-listed plants. The project proposers will apply for a Permit for the Take of Endangered or Threatened Species Incidental to a Development Project for those plants that cannot be avoided during construction or through operation of the project.

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 State Archaeological Site Database maintained by the Office of the State Archaeologist (OSA), as many as ten pre-contact and contact-era cultural heritage sites are located within or near the footprint of the project, including a known American Indian burial ground (Attachment A). In consultation with the OSA and the State Historic Preservation Office (SHPO), a research design for Phase I Cultural Resource Reconnaissance Survey was prepared, and archaeologists from HDR, Inc. were contracted to complete the investigations. The Red Lake Band of Chippewa Tribal Historic Preservation Office (THPO) provided in-field consultation. HDR has completed the field investigations and submitted a report to SHPO for review.

Inasmuch as the project will affect WMA parcels acquired through federal programs administered by the U.S. Fish and Wildlife Service (USFWS), it is subject to the requirements of Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR 800). The USFWS, under 36 CFR 800.2(c)(4), has authorized the Minnesota DNR to act as its agent in meeting the requirements of Section 106 and its implementing regulations on state-administered lands. Upon the receipt of the final cultural resource report from HDR, the Minnesota DNR will complete Section 106 consultation with the SHPO and the Red Lake THPO.

The Project Area of Potential Effects (APE) entails a 1-mile buffer around all proposed embankments and ditches (Figure 20). The Project APE does not, however, encompass indirect effects, and as such, potential properties were not evaluated. HDR conducted a Phase I archaeological investigation to identify historic properties within the proposed Project APE in August, 2017; May and June, 2018; and September, 2019. Over the course of those investigations, six sites archaeological sites were identified by HDR, and another two were included for consideration by the SHPO (Table 13). In addition, a literature review conducted by HDR, Inc. revealed eight previously identified archaeological sites and two previously inventoried architectural surveys within the study area, but only one of which intersected the APE. Only site number 21RO0004 is included in Table 13.

Table 13: Results of the cultural resources study conducted by HDR, Inc.

Site Number	Site Type	Within Project APE? (Y/N)	Eligible for Listing in Register of National Historic Places?
21RO0004	Precontact Artifact Scatter and Cemetary	Y	Unevaluated
21RO0045	Historic Foundation and Artifact Scatter	Y	No
21RO0046	Historic Foundation and Artifact Scatter	Y	No
21RO0047	Precontact Isolated Find	Y	No
21RO0047	Precontact Isolated Find	Y	No
21RO0048	Precontact Isolated Find	Y	No
21RO0049	Precontact Isolated Find	Y	No
21RO0050	Precontact Lithic Scatter	Y	Yes
Bridge L9507 (RO-JAD-002)	N/A	N	N/A
Town Hall (RO-DET-002)	N/A	N	N/A

In a letter from SHPO (Attachment A), the Environmental Review Unit contact noted that because the APE did not consider indirect effects, additional surveys were needed. Additionally, project reviewers noted numerous farmsteads/historic structures/diversion ditches are apparent in the aerial imagery of the project area. If any history/architecture properties are over 50 years old and lie within the final Project APE, they will need further surveys and evaluation.

Project managers are in close contact with state archaeological experts and are committed to following the process laid out in Section 106 of the National Historic Preservation Act. A MN DNR archaeologist has additional field studies scheduled for fall of 2020. Additional research is needed to determine whether there will be any indirect impacts to cultural resources. Known historic properties and resources will be avoided during construction and will be flagged to exclude construction personnel. Flooding historic features is not a concern since the footprint of flooding will not be changed in the area. Also, an additional 30-day comment period on findings in the archaeological report is necessary before a permit will be issued.

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 area is generally rural and flat with no scenic vistas. Construction will produce exhaust and dust plumes from equipment, but these are not expected to persist. Most construction will be completed during daylight hours, so lighting will be minimal. Most visual impacts will occur during construction, and only the proposed embankments, which were minimized to the extent possible, will alter the landscape in a significant way. There will be no permanent lighting or tall structures associated with the project. Water control structures will be located out of sight from major roads.

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.

   There are no proposed stationary sources of emissions with this project. The only emissions generated will be those by construction equipment (outlined below).

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.

   Diesel emissions will be the primary source of air emissions created by the project. The project construction duration is expected to last approximately two seasons. Some of the construction duration may include winter months as well as summer construction. All of this equipment is diesel-powered. Heavy equipment (excavator, bulldozer, front-end loader, skid steer, road grader, agricultural tractor, cement trucks, semitractor/trailers, dump trucks, and fueling trucks) will be employed by contractors to install the embankments, excavate the new exterior ditches, install and subsequently remove coffer dams, install water control structures, excavate the inlet from the Roseau River, and install the rock riffle/weir at the confluence of the historic channelized portion of the Roseau River.

   The heavy equipment listed above will emit diesel exhaust on days when project work is occurring. No emissions are anticipated to linger beyond workdays; all emissions will cease upon project completion. Depending on season of work, additional emissions may occur when warming equipment during cold weather. No significant vehicle emissions will occur after construction and during the operation of the project.

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.

Odors from diesel-powered equipment emissions will occur during construction. These emissions will be temporary and short in duration. Heavy equipment will create dust during extremely dry periods of construction. Borrow material areas and stockpiling areas may also generate dust. Dust control measures may be used in areas where the project footprint is affecting residences nearby. Given that the area is in a rural landscape, few residences will be affected by emissions or dust generated by construction.

No additional dust or odors are expected after construction is completed or during the operation of the project.

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 area where the project is proposed is generally rural in nature, and little to no man-made noise is currently produced. Noise generated from the project will occur during construction. The MPCA recommends that the equipment used for construction, during each phase of the project build-out, be appropriately muffled, and that construction activities take place during daytime hours, which are defined as 7:00 a.m. to 10:00 p.m., in the state noise rules (M.R. 7030.0020). For construction near (i.e. within 1-mile of a residential receptor), which will include areas of the south embankment and the Pine Creek control structure, construction will be limited to 8:00 a.m. to 8:00 p.m. to further protect those areas. Operation of the project will not involve electric or diesel motors, and thus will not contribute to local noise pollution.

Noise generated by construction has the potential to disturb local and migratory wildlife. Since much of the construction must occur during the growing season, little can be done to avoid these impacts. However, noise impacts will be temporary and will not last beyond construction.

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 project area is in a rural agricultural area and traffic is likely to be restricted to local residents, agricultural producers, and Wildlife Management Area users during the hunting seasons. During construction, parking will exist at various points around the project area and will be temporary in nature. Erosion and/or runoff associated with parking areas will be addressed through standard practices and through the NPDES permit. All efforts will be taken to minimize impacts of parking on wildlife habitat and no parking will occur in areas sensitive to high traffic or compaction (e.g. wetlands). Daily traffic will consist of contractors accessing work sites for their daily work and transportation of equipment and materials to the work sites. Fewer than 50 total daily trips generated by construction efforts are expected, and will occur in large part within the footprint of the project, generally occurring between the hours of 7 a.m. and 6 p.m. Traffic will be minimal when no materials or equipment are transported. Borrow sites are proposed to be within or near the project footprint (Figure 17) so traffic generated by moving fill will be minimal and restricted to the immediate project area. An unorganized township road, 360th Ave., will be raised to act as an embankment on the eastern side of the impoundment. Additionally, 340th St., 350th Ave. and 330th Ave. will have to be raised to 1036' in areas where the embankments intersect the roadways, and traffic may be affected in these areas as well, but likely for less time than 360th Ave. The inlet channel necessary for the project will pass under 370th Ave, so culverts will be placed through this roadway. During this phase of the construction, traffic will need to be re-routed around those stretches of roads, causing temporary impacts. No transit system exists in the area.

Local traffic may be improved after completion of the project. The easternmost boundary of the impoundment is located along 360th Avenue, and since this road will need to be raised to act as an embankment, it will no longer be subject to moderate flooding. Only during the most extreme flood events is this road expected to be flooded. Other roads within the project footprint will be unaffected long-term as they already experience uncontrolled flooding and can be overtopped.

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,

The project area is rural and traffic is expected to be minimal. 360th Avenue on the east side of the project will need to be raised to 1036.0' causing local traffic disruption. Some local traffic congestion may occur with increased traffic by construction vehicles which may temporarily delay access to the project area and surrounding areas. Traffic generated by construction of this project is expected to be far below 250 vehicles per hour and 2,500 daily trips. Additionally, 340th St., 350th Ave., 330th Ave., and 370th Ave. will have to be raised to 1036' in areas where the embankments intersect the roadways, and traffic may be affected in these areas as well, but likely for less time than 360th Ave.

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

Traffic control personnel (i.e. flagman, etc.) will be used as needed to minimize conflicts for use of the road. The road raise of 360th Avenue and other affected roads will likely require a detour around the area during construction. No additional traffic mitigation will be necessary post-construction.

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.

Cumulative impacts may occur when there is a relationship between the proposed Project and other actions expected to occur in a similar location or during a similar time period. The Roseau Lake Rehabilitation & Sprague Creek Wetland Restoration area is located within the Roseau River Watershed in Roseau County on the Minnesota – Canada border. Construction would occur during the fall and winter seasons of 2021 and 2022.

The potential environmental effects related to this project could combine with environmental effects from other past, present, or reasonably foreseeable future projects for which a basis of expectation has been laid. In order to provide a meaningful assessment of a project's contribution to cumulative potential effects, the geographic and temporal scope of the assessment needs to be within the environmentally relevant area where the project related impacts would occur. The environmentally relevant area for the Roseau Lake Rehabilitation and Sprague Creek Restoration are different and variable depending on the specific environmental effect. The environmental effects of actions occurring at Roseau Lake WMA and Sprague Creek SNA are considered with other actions identified below.

This cumulative impact analysis considers activities occurring within the Project area as well as a broader geographic scope where potential plan may be sited or projects undertaken that would have impacts considered aggregately with Project impacts. The spatial boundaries were determined based upon the likely scope of impacts to specific resources. The geographic scale and timeframe of environmental effects are in Tables 14 and 15.

Table 14: Extent of Potential Impact of the Roseau Lake Rehabilitation Project.

Environmental Effect	**Geographic Scale**	**Timeframe**
Surface water impacts	Project Area of Potential Effect (Figure 20) and 2-4 miles downstream of project boundary before unimpacted County Ditches enter the Roseau River	Project implementation (up to 40 weeks)

Environmental Effect	Geographic Scale	Timeframe
Fisheries	Roseau Lake Rehabilitation Project Area (Figure 5)	Project implementation (up to 40 weeks)
Terrestrial and avian wildlife	Roseau Lake Rehabilitation Project Area (Figure 5)	Project implementation (up to 40 weeks)
Soils and sediments	Roseau Lake Rehabilitation Project Area (Figure 5)	Project implementation (up to 40 weeks)
Vegetation Cover	Roseau Lake Rehabilitation Project Area (Figure 5)	Project implementation (up to 40 weeks)
Cultural resources	Project Area of Potential Effect (Figure 20)	Permanent
Aesthetics/visual resources	Roseau Lake Rehabilitation Project Area (Figure 5)	Project implementation (up to 40 weeks)
Land use	Roseau Lake Rehabilitation Project Area (Figure 5)	Permanent
Air quality and noise	Roseau Lake Rehabilitation Project Area (Figure 5)	Project implementation (up to 40 weeks)

Table 15: Extent of Potential Impact of the Sprague Creek Wetland Restoration Project.

Environmental Effect	Geographic Scale	Timeframe
Surface water impacts	Sprague Creek Restoration Area (Figure 5)	Project implementation (up to 20 weeks)
Terrestrial wildlife	Sprague Creek Restoration Area (Figure 5)	Project implementation (up to 20 weeks)
Soils and sediments	Sprague Creek Restoration Area (Figure 5) Roseau Lake WMA downstream (Figure 9)	Project implementation (up to 20 weeks)
Vegetation Cover	Sprague Creek Restoration Area (Figure 5)	Project implementation (up to 20 weeks)
Aesthetics/visual resources	Sprague Creek Restoration Area (Figure 5)	Project implementation (up to 20 weeks)

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

Whitney Lake

A future stage of achieving the Roseau River Watershed Districts' goals of reducing local flood damages as well as reducing their contribution to the main-stem Red River by 20% includes the Whitney Lake flood damage reduction project including water retention areas and drainage components. This project would be located downstream from the proposed project in the Roseau River Watershed, Whitney Lake subwatershed.

Anticipated Environmental Effects of the Whitney Lake Flood Damage Reduction project include increased turbidity during construction, vegetation disturbance and displacement of fish and wildlife. Implementation of a drainage component of the project along 7 miles County Ditch 16 is anticipated to occur in the 2021 construction season. County Ditch 16 drains into the Roseau River less than 2 miles downstream of the western edge of the Roseau Lake Rehabilitation project area. Additional drainage components and retention areas are still under consideration.

Lost River State Forest Timber Harvest

Between fiscal years 2021 and 2030 the forest resource management plan specifies which stands the DNR will visit and assess for potential harvest of the next 10 year. Within the immediate vicinity (~1 mile) of Roseau Lake WMA and Sprague Creek SNA there is the potential to harvest up to 40 acres of Black Spruce lowland and 271 acres of Tamarack from Lost River State Forest (Figure 9). Recent devastation of Tamarac by the eastern larch beetle has reduced the quality of the timber for harvest. As a result, harvest is unlikely but remains

authorized. However if harvest does occur, impacts to Roseau Lake and the Roseau River are anticipated to be minimal.

No other reasonable foreseeable projects were identified that would take place within the same geographic scales and timelines.

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.

Project actions along with the Whitney Lake Flood Damage reduction project could be cumulative in nature. The specific outcomes identified above might result in some temporary negative environmental effects and in some instances may require special consideration in the permitting phase of the project. Over the long term, the Project's improvements to vegetation and wildlife habitat, along with reduction of flood damage and increased water quality should result in positive outcomes and beneficial effects to the Roseau River Watershed.

Project actions when combined with reasonably foreseeable projects are likely to result in limited and temporary water quality effects and limited and temporary effects on localized impacts to wildlife and vegetation. Local impacts to fisheries and wildlife habitat, as well as native vegetation, are expected to be minor and limited to the immediate project area, and therefore impacts are not expected to accumulate. The cumulative potential effects on water quality are expected to be confined to approximately 4 miles of the Roseau River between the western edge of the Roseau Lake Rehabilitation project area, the following 2 miles before County Ditch 16 enters the river, and an additional 2 miles before County Ditch 17 (an unimpacted tributary) enters the Roseau River. The cumulative potential effects on water quality in the water resources of the Roseau River Watershed due to construction activities are generally minor and have a minor contribution to cumulative potential effects. Negative cumulative potential effects on water quality due to erosion, as well as cumulative potential effects on native plant and animal communities due to construction activities, will be controlled by permits and approvals required before commencing construction and effective monitoring during construction. The conditions for these permits require the use of BMP's to achieve a reduced environmental effect.

The Whitney Lake and Roseau Lake Rehabilitation projects may also interact for a cumulative benefit to the Roseau Rivers hydrology. Both the Whitney Lake project and Roseau Lake restoration are designed to reduce the overall peak of the Roseau River by conveying early spring run-off to the river prior to the main flood event (which occurs later in the spring). These projects would only have noticeable effects in smaller more frequent floods, up to a 10 year flood event. Together these projects would reduce stream flashiness and restore river hydrology towards a natural flow regime which is consistent with the Roseau River Watershed District goals.

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 that the DNR is aware of 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 Gina Quiram Digitally signed by Gina Quiram Date: 2020.11.30 07:11:44 -06'00' Date November 30, 2020

Title EAW Project Manager/Environmental Review Unit

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