Fall Vegetation Survey Report
in 08/09/10/11-29-20 W4M and 20/29-28-19 W4M
Resiliency and Flood Mitigation Program

Submitted to:

Drumheller Resiliency and Flood Mitigation Office
Drumheller, Alberta

SweetTech Engineering Consultants
Calgary, Alberta

Submitted by:

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FINAL
January 2021
AAR Project: 20-105

Table of Contents

Tables

Appendices

Figures

1 INTRODUCTION

1.1 Project Overview

AAR Environmental Services* (AARES – a Division of Applied Aquatic Research Ltd.) was retained by SweetTech Engineering Consultants (SweetTech) to complete a vegetation survey and habitat assessment of five locations (Nacmine, North Drumheller, Rosedale, Hoodoo Trail, and Wayne Valley) along the Red Deer River Valley near the Town of Drumheller, Alberta (Figures 1-4). This survey is part of pre-construction planning for upcoming structural flood mitigation works proposed at each location. The proposed works include: new dike construction, upgrades to existing dikes, new pedestrian bridge construction, and river bank erosion protection. To complete the Project a desktop assessment was done using available databases, and a field assessment consisting of a vegetation survey and habitat assessment at each of the five locations.

2 APPROACH

2.1 Desktop Assessment

Available literature and databases were reviewed to develop a desktop review understanding of vegetation, native habitat, and sensitive areas relevant to the proposed project areas. Current regulations and guidelines pertaining to vegetation management in Alberta were also reviewed in detail. Key information sources included the following:

- Satellite and aerial imagery (Google 2020);
- The Natural Regions and Sub-regions of Alberta report (NRC 2006);
- Grassland Vegetation inventory (GOA 2019)
- Alberta provincial Sensitive Species Inventory Guidelines (GOA 2013);
- Alberta Conservation Information Management System (ACIMS, [AEP 2020a]);
- Landscape Analysis Tool (LAT) [AEP 2020b]);
- Provincial and federal species conservation rankings (Species at Risk Act [GOC 2019]); and
- Weed Control Act and Weed Control Regulations (GOA 2017b; GOA 2013).

2.2 Supplemental Vegetation Survey Field Work

A field crew comprised of an ecologist and field assistant completed a qualitative vegetation survey at each area from October 20th to 21st, 2020. Wayne Valley was not directly accessed due to landowner approval constraints at the time of on-site investigation. The purpose of the field work was to identify presence of vegetation and habitat types within, and adjacent to, the proposed construction areas including species with special conservation status. The crew recorded environmental conditions, presence, and distribution of native and invasive species (weeds), visible soil erosion, and bare soil exposure. Based on the inventory of vegetation and stability of the riparian area present at each site, feasible, site-specific mitigative measures to avoid or reduce potential adverse effects of bank stabilization works on species of concern are included.

The vegetation survey was conducted on foot and included visual scans and ground inspections at all locations to observe native and noxious species, and classify habitats immediately next to the proposed construction sites. The field work was limited to the proposed construction route footprint in compliance with landowner and municipality requests. All observed native and noxious species and habitat types observed were recorded during the field work (i.e., field notes, GPS data, and field photos).

3 RESULTS

3.1 Desktop Assessment

All sites are located within Native prairie – specifically the Northern Fescue Natural sub-region of the Grassland Region, within a large river system riparian zone landscape type (GOA 2019; NRC 2006). However, Hoodoo Trail is near the mixedgrass subregion (about 1km to the border). Occurrence of species typical for mixedgrass subregion can be expected on this site. Native Prairies in the Northern Fescue Natural Subregion (NFNS) are characterized by dominant fescue species which differentiates this area from other grasslands natural subregions (NRC 2006). Other native species of the NFNS are: western porcupine grass, Hooker's oatgrass, and slender wheat grass. Wetlands and riparian habitats are rare and account for 3 percent of total area in this subregion (AEP 2019). Several endangered and threatened species, or species of concern, are contained mostly within the boundaries of the Grassland Natural Region. Examples include a provincially sensitive species, smooth goosefoot (*Chenopodium subglabrum*) and three provincially endangered species: soapweed (*Yucca glauca*), tiny cryptantha (*Cryptantha minima*) and Western spiderwort (*Tradescantia occidentalis*) (GOA 2016).

Agriculture is the primary land use. Approximately 50% of the area is cultivated annually, with wheat being the main crop, although barley and canola are also important. Domestic grazing occurs across the remainder of the area. Oil and gas activity are important, and surface coal mining occurs as well. The relatively long summer season provides recreational opportunities such as camping and nature appreciation (NRC 2006).

3.1.1 Vascular Plant and Lichen Species and Industry Guidelines

A summary of species detected historically in the areas visited (T29, R20, R4W for Nacmine and North Drumheller and T28, R19, R4W for Rosedale, Hoodoo Trail and Wayne Valley) was compiled based on desktop analysis (ACIMS 2020a), and is presented in Table 1. The Landscape Analysis Tool (AEP 2020b) was used to search environmental constraints specific to vegetation within each location. The LAT report results show that all areas have the same regulatory requirements based on sensitive layers they intersect. Under the Alberta *Weed Control Act*, plant species designated as noxious weeds must be controlled, and those designated as Prohibited Noxious weeds must be destroyed by the owner or occupant of those lands on which the species are present. Chemicals must be applied for the purpose of vegetation control in accordance with Pesticide Regulation and Environmental Code of Practice for Pesticides.

Table 1: Historical observations of listed vascular plants and lichens in each area visited (ACIMS 2020a).

Location	Species		Species Conservation Ranks*		
	Scientific name	**Common Name**	**Subnational**	**National**	**Global**
T28, R19, R4W	*Atriplex powellii*	Powell's saltbush	S2	N1N2	G4
	Crataegus chrysocarpa	Round-leaved hawthorn	S3	N5	G5
T029, R20, R4W	*Cetraria arenaria*	Sand-loving Iceland lichen	S1S2	N4N5	G5
	Lecidella carpathica	Disk lichen	S1S2	NNR	G5
	Rhizoplaca subdiscrepans	Rock-posy lichen	SU	N4N5	G4G5
	Mannia fragrans	Liverwort	SU	NNR	GNR

*Definitions (AEP 2018, NatureServe):
S1: Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s).
S2: Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors.
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S#S#: Indicates a range of uncertainty about the status of the taxon
SU: Taxon is currently unrankable due to lack of information or substantially conflicting information. Example - native versus non-native status not resolved.
NR – not ranked. Conservation status not yet assessed.

N1/G1: Critically Imperilled
N2/G2: Imperiled
N3/G3: Vulnerable
N4/G4: Apparently Secure
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3.2 Supplemental Vegetation Survey Results

At the time of the survey, no issues related to erosion, subsidence or significant surface unevenness were observed within the footprint of the proposed construction sites. No sensitive species were observed during the survey. However, cold weather at the time given the late season likely compromised vegetation survey results. The likelihood of species detection was decreased at site given the presence of snow (GOA 2013). Completing an additional vegetation survey during summer is recommended to detect rare plants that may have not been flowering or present at the time of this field survey. Late fall is less than ideal for this type of survey.

Several patches of the noxious weeds Canada thistle (*Cirsium arvense*) and common mullein (*Verbascum Thapsus*) as well as two ruderal species (foxtail barley (*Hordeum jubatum*) and common tansy (*Tanacetum vulgare*) were observed during the survey within close proximity of proposed construction areas. Black knot disease was observed on bark of young and mature trees along the north-west section of the Rosedale site (Plate 5).

Regarding the vegetation and habitat types found at surveyed sites, riparian habitat with shoreline vegetation was situated along river banks (Nacmine, North Drumheller and Rosedale sites). Sagebrush bushland and grasslands that are considered to be typical habitats of the Grassland Region were found at the Hoodoo Trail and the south-east portion of Rosedale sites.

The following is a description of the terrain and vegetation observed at each of the sites. Environmental conditions consisted of: temperature -4 - 5 °C, mix of sun/cloud, wind light, no precipitation, 1-2 cm of snow (October 20-21, 2020). Vegetation crew completed a ground-based walk along the potential construction footprint (Figure 1 - 4).

3.2.1 Nacmine

The Nacmine location (Figure 1) had approximately 50% forest canopy cover; shrubs covered 30% and the remaining 20% represented ground floor and vegetation (Plate 1-3). Species largely consisted of mature deciduous trees (poplar and aspen species) with a shrub understory dominated by willows and wild and prickly rose. The western portion of the route followed the bank of the Red Deer River (Plate 3) with vegetation typical of prairie region riparian habitat (willows, sages, rushes, horsetail, and cattail) although unsurprisingly, considering the proximity to houses and disturbance, ruderal vegetation and weed species were also observed, notably Canada thistle, foxtail barley, and common tansy. The eastern and south-eastern portions of the route follow the south bank of the Red Deer River; a mix of shrubs and mature trees are found along the route. Seasonal wetlands (Plate 2) and river bank shoreline consisted of wetland vegetation: horsetail, sedges, rushes and common cattail.

Table 2: Summary of Vegetation observed at Nacmine

	Common name	Scientific name	Species Conservation Rank			Origin
			Subnational	National	Global	
Trees:	Quaking aspen	*Populus tremuloides*	S5	N5	G5	Native
	Eastern cottonwood	*P. deltoides*	S5	N5	G5	Native
	Balsam poplar	*P. balsamifera*	S5	N5	G5	Native
	White Spruce	*Picea glauca*	S5	N5	G5	Native
Shrubs:	Basket willow	*Salix petiolaris*	S5	N5	G5	Native
	Wild and prickly rose	*Rosa* spp.	S5	N5	G5	Native
	Silver sagebrush	*Artemisia cana*	S5	N5	G5	Native
Herbs:	Canada goldenrod	*Solidago canadensis*	-	-	-	Native
Ruderal and Noxious species:	Canada thistle	*Cirsium arvense*	S5	N5	G5	Non-native
	Foxtail barley	*Hordeum jubatum*	S5	N5	G5	Native
	Common tansy	*Tanacetum vulgare*	SNA	NNA	GNR	Non-native
Shoreline Vegetation:	Horsetails	*Equisetum* spp.	S5	N5	G5	Native
	Sedges	*Carex* spp.	S5	N5	G5	Native
	Rushes	*Juncus* spp.	S5	N5	G5	Native
	Common cattail	*Typha latifolia*	S5	N5	G5	Native

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3.2.2 Northern Drumheller

The Northern Drumheller site had approximately 30% forest canopy cover; shrubs covered 40% and the remaining 30% represented ground floor and vegetation (Figure 2). North Drumheller routes follow the north bank of the Red Deer River through a residential area of the Town of Drumheller (Plate 4). The west bank has been stabilized previously with concrete pieces and boulders. Vegetation is similar to Nacmine, consisting of riparian species with large mature deciduous trees (aspen and poplar) and shoreline vegetation. Proximity with residential areas and recent construction activity have undermined integrity of native vegetation since soils have been disturbed. As the result low-quality habitat with ruderal and noxious species such as Canada thistle were observed.

Table 3: Summary of Vegetation observed at North Drumheller.

	Common name	Scientific name	Species Conservation Rank			Origin
			Subnational	National	Global	
Trees:	Quaking aspen	*Populus tremuloides*	S5	N5	G5	Native
	Eastern cottonwood	*P. deltoides*	S5	N5	G5	Native
	Balsam poplar	*P. balsamifera*	S5	N5	G5	Native
Shrubs:	Basket willow	*Salix petiolaris*	S5	N5	G5	Native
	Wild and prickly rose	*Rosa* spp.	S5	N5	G5	Native
Herbs:	Canada goldenrod	*Solidago canadensis*	-	-	-	Native
Ruderal and Noxious species:	Canada thistle	*Cirsium arvense*	S5	N5	G5	Non-native
	Foxtail barley	*Hordeum jubatum*	S5	N5	G5	Native
	Common tansy	*Tanacetum vulgare*	SNA	NNA	GNR	Non-native
Shoreline Vegetation:	Horsetails	*Equisetum* spp.	S5	N5	G5	Native
	Sedges	*Carex* spp.	S5	N5	G5	Native
	Rushes	*Juncus* spp.	S5	N5	G5	Native
	Common cattail	*Typha latifolia*	S5	N5	G5	Native

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3.2.3 Rosedale

The Rosedale site (Figure 3) had approximately 35% forest canopy cover; shrubs covered 35% and the remaining 30% represented ground floor and vegetation. The Rosedale location has an abundance of mature and young deciduous trees and tall shrubs (aspen, poplar, and choke cherry) with riparian vegetation along the riverbank. Trees in the north-west portion are affected by black knot disease (Plate 5). The south-east portion of the route includes open grass habitat, and transitions into badlands with vegetation more typical to prairie grasslands (Plate 6).

Table 4: Summary of Vegetation observed at Rosedale.

	Common name	Scientific name	Species Conservation Rank			Origin
			Subnational	National	Global	
Trees:	Quaking aspen	*Populus tremuloides*	S5	N5	G5	Native
	Eastern cottonwood	*P. deltoides*	S5	N5	G5	Native
	Balsam poplar	*P. balsamifera*	S5	N5	G5	Native
	Choke cherry	*Prunus virginiana*	S5	N5	G5	Native
Shrubs:	Basket willow	*Salix petiolaris*	S5	N5	G5	Native
	Wild and prickly rose	*Rosa* spp.	S5	N5	G5	Native
Herbs:	Canada goldenrod	*Solidago canadensis*	-	-	-	Native
Grasses:	Fescue grasses spp.	*Festuca spp.*	-	-	-	Native
Ruderal and Noxious species:	Canada thistle	*Cirsium arvense*	S5	N5	G5	Non-native
	Common mullein	*Verbascum thapsus*	S5	N5	G5	Non-native
	Common tansy	*Tanacetum vulgare*	SNA	NNA	GNR	Non-native

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3.2.4 Hoodoo Trail

The Hoodoo Trail site (Figure 4) consisted of shrubs that covered about 35% and the remaining 65% represented ground floor and vegetation. The hoodoo trail is surrounded by a silver sagebrush shrubland and native and introduced grasses that are typical for Grassland Region (Plate 7). The site is within close proximity to Mixedgrass Natural Subregion and therefore can also have species representative to Mixedgrass habitat. At the time of survey, cleared vegetation areas, stripped topsoil and recent culvert installation were recorded along the route (Plate 8).

Table 5: Summary of Vegetation observed at Hoodoo Trail

	Common name	Scientific name	Species Conservation Rank			Origin
			Subnational	National	Global	
Shrubs:	Silver sagebrush	*Artemisia cana*	S5	N5	G5	Native
	Wild and prickly rose	*Rosa* spp.	S5	N5	G5	Native
	Creeping juniperus	*Juniperus horizontalis*	S5	N5	G5	Native
Herbs:	Canada goldenrod	*Solidago canadensis*	-	-	-	Native
Grasses:	Native and agronomic grass spp.	*Poaceae*	-	-	-	Native
Ruderal and Noxious species:	Canada thistle	*Cirsium arvense*	S5	N5	G5	Non-native
	Foxtail barley	*Hordeum jubatum*	S5	N5	G5	Native
	Common tansy	*Tanacetum vulgare*	SNA	NNA	GNR	Non-native

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3.2.5 Wayne Valley

Based on the desktop assessment and visual assessment from the road, composition of vegetation and habitat types are expected to be similar to those found along the Rosedale footprint (Plates 9 and 10). Wayne Valley was not directly accessed due to landowner approval constraints at the time of on-site investigation.

4 DISCUSSION

4.1 Conclusion and Recommendations

As a result of existing anthropogenic activities, ruderal plant communities were present within the surrounding areas of the proposed construction projects. Much of the riparian corridor at each location has been disturbed. Consequently, negative effects of proposed works on vegetation and habitat are not anticipated. Mitigation measures listed below are recommended to be implemented before and during constructions activities.

4.1.1 Noxious and Invasive Species Management

During the survey two noxious weed species were observed including Canada thistle (*Cirsium arvense*) and common mullein (*Verbascum Thapsus*). Under the Alberta *Weed Control Act*, plant species designated as noxious weeds must be controlled, and plant species designated as Prohibited Noxious weeds must be destroyed by the owner or occupant of those lands on which the species are present. No Prohibited Noxious weeds were observed during the field portion of this assessment. However, care should be taken to control the spread of the noxious weeds identified. Chemicals must be applied for the purpose of vegetation control in accordance with Pesticide Regulation and Environmental Code of Practice for Pesticides. Under the Alberta *Environmental Protection and Enhancement Act* (EPEA), the disposition holder has the duty to reduce land disturbance, clean up contamination, salvage, store, and replace soil, and revegetate disturbed areas. All construction activities must be conducted with proper erosion prevention and control measures.

4.1.2 Surveys

The foot-based vegetation survey conducted between October 20 and 21, 2020 provided an opportunity to review vegetation and classify native habitat along the proposed construction areas (Nacmine, North Drumheller, Rosedale, and Hoodoo Trail). Based on the vegetation survey conducted in the field, no vegetation observed would affect the construction scheduled. However, the late season timing of the survey limited plant species identification.

To maintain best practice management standards, pre-construction rare plant surveys (GOA 2013; GOA 2016) should be conducted at each location: Nacmine, North Drumheller, Rosedale, Hoodoo Trail, and Wayne Valley from June to August. However, no rare vascular plants are anticipated as the relatively disturbed plant communities

encountered in the field was not composed of high-quality habitat for the one rare vascular plant identified historically in the area. All related surveys (pre-and post-construction) and analysis of data are required to be conducted by an experienced botanist. Survey results are to be submitted to the AEP Alberta Conservation Information Management System (ACIMS). If sensitive species are detected at a construction site area, implementation of mitigation measures may be required.

Based on regulatory requirement above, AAR recommends following mitigation measures:

- Develop a weed management plan as per Alberta *Weed Control Act;*
- Management of noxious species (Canada thistle and common mullein) should follow provincial weed control regulation;
- Where appropriate, develop a soil handling and erosion control protocol to minimize sedimentation, loss of soil and optimize salvage and use of topsoil;
- Prevent spread of non-native plants on site;
- Conduct pre-disturbance rare plant survey;
- Disturbed areas should be revegetated using native seed and plants;
- All plant material used for construction should be sourced from native species;
- Soil and plant material used in construction that does not originate from site should be sampled for weed analysis as per Alberta *Weed Control Act*; and
- Conduct site specific pre and post construction assessment and mitigation recommendations.

All the incidental records, occurrences of sensitive species will be submitted to the AEP Alberta Conservation Information Management System (ACIMS).

5 CLOSURE

Please do not hesitate to contact us if you have any questions. We can be reached at (403) 294-0488, or by email at jhromadkova@appliedaquatic.com.

Sincerely,

Applied Aquatic Research Ltd.

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Environmental Specialist

Reviewed by:

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Senior Wetland Ecologist

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Appendix A Photo Plates

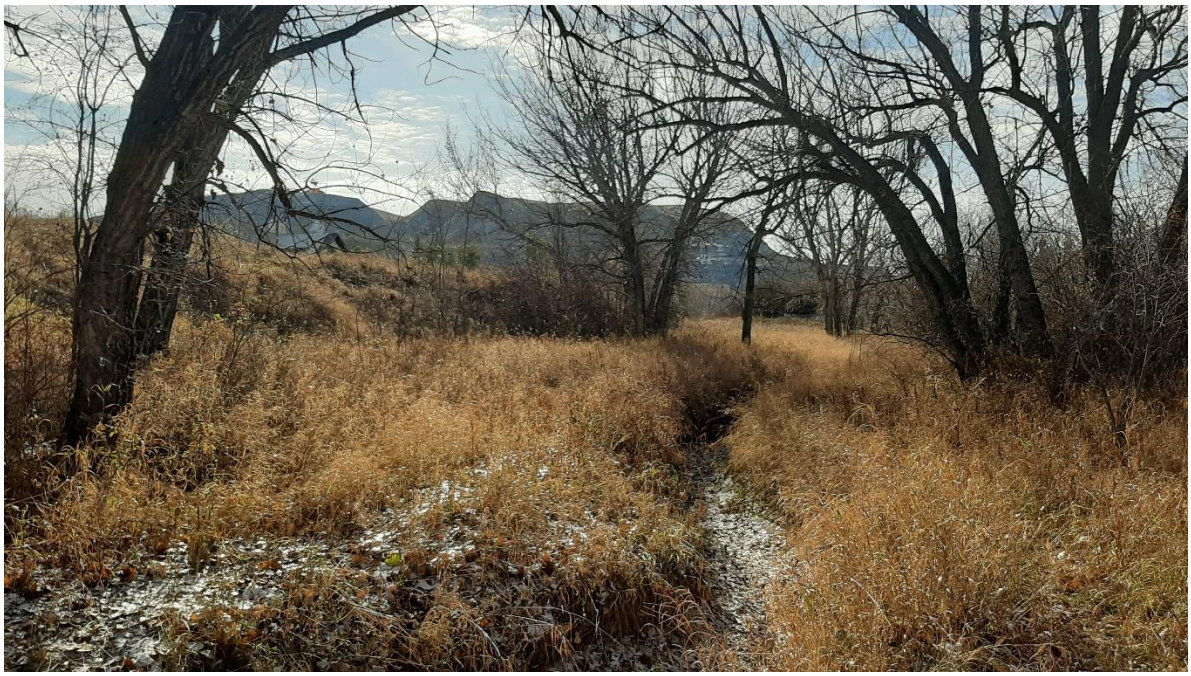

Plate 1. Nacmine. West bank of the proposed construction footprint (October 20, 2020).

Plate 2. Nacmine. Seasonal wetland. (October 20, 2020).

Plate 3. Nacmine. Shoreline vegetation along river bank (October 20, 2020).

Plate 4. North Drumheller. The river bank of the Red Deer River (October 20, 2020).

Plate 5. Rosedale. Black knot disease (October 21, 2020).

Plate 6. Rosedale. Badlands with native grasslands (October 21, 2020).

Plate 7. Hoodoo Trail. Sagebrush shrubland and fescue grasses spp. characterizing a typical habitat of Northern Fescue Natural Subregion (October 21, 2020).

Plate 8. Hoodoos Trail. Recent vegetation clearing, stripping topsoil and culvert installation were recorded along the route (October 21, 2020).

Plate 9. Wayne Valley. West view of the Wayne Valley proposed construction area (October 21, 2020).

Plate 10. Wayne Valley. East view of the Wayne Valley proposed construction area (October 21, 2020).

SWEETTECH ENGINEERING CONSULTANTS

AAR Environmental Services®

DRUMHELLER
RESILIENCY AND FLOOD MITIGATION OFFICE

FALL VEGETATION SURVEY

North

1:3000
20.2311.009
JAN. 8, 2021

REFERENCE:
1. AERIAL IMAGE FROM 2019 (PROVIDED BY DRUMHELLER RESILIENCY AND FLOOD MITIGATION OFFICE)

LEGEND:

GPS TRACKS OF FIELD TEAM (OCT. 20, 2020) –
EXISTING DIKES –

50 0 50
SCALE:1:3,000 METRES

SCALE NOTATIONS INDICATED ARE BASED ON AN ISO A1 DRAWING FORMAT

FIG.1 VEGETATION SURVEY ROUTE - NACMINE

SWEETTECH ENGINEERING CONSULTANTS

AAR Environmental Services®

DRUMHELLER
RESILIENCY AND FLOOD MITIGATION OFFICE

FALL VEGETATION SURVEY

North

1:2000
20.2311.009
JAN. 8, 2021

REFERENCE:
1. AERIAL IMAGE FROM 2019 (PROVIDED BY DRUMHELLER RESILIENCY AND FLOOD MITIGATION OFFICE)

LEGEND:

GPS TRACKS OF FIELD TEAM (OCT. 20, 2020) –
EXISTING DIKES –

NORTH DINOSAUR TRAIL
HILLSIDE AVE
POPLAR CRESCENT
VILLA STREET
POPLAR STREET
MICHICHI DRIVE
MICHICHI CREEK FLOW
MCDOUGALL LANE
GROVE AVENUE
BEACH STREET
BRIDGE STREET
LARCH AVENUE
HIGHWAY 56
40+500
RED DEER RIVER FLOW
CENTENNIAL DRIVE
1 STREET W
1 AVENUE W
CENTRE STREET
RIVERSIDE DRIVE E
VETERANS WAY
1 STREET E
2 STREET E
3 STREET E
41+000
41+500

50 0 50
SCALE:1:2,000 METRES

SCALE NOTATIONS INDICATED ARE BASED ON AN ISO A1 DRAWING FORMAT

FIG.2 VEG. SURVEY ROUTE - NORTH DRUMHELLER

SWEETTECH ENGINEERING CONSULTANTS

AAR Environmental Services®

DRUMHELLER
RESILIENCY AND FLOOD MITIGATION OFFICE
Dinosaur Capital of the World

FALL VEGETATION SURVEY

North

1:3000
20.2311.009
JAN. 8, 2021

REFERENCE:
1. AERIAL IMAGE FROM 2019 (PROVIDED BY DRUMHELLER RESILIENCY AND FLOOD MITIGATION OFFICE)

LEGEND:

GPS TRACKS OF FIELD TEAM (OCT. 20, 2020) –
EXISTING DIKES –

HIGHWAY 56
ROPER ROAD
RED DEER RIVER FLOW
324+500
0+000
31+500
1 AVE N
2 AVE N
3 AVE N
CENTRE STREET
1 AVE S
2 AVE S
1 ST S
2 ST S
3 AVE S
4 AVE S
5 AVE S
RAILWAY AVE
1 AVE E
3 ST E
2 ST E
1 ST E
0+500
31+000
1+500
ROSEBUD RIVER FLOW
ROSEDALE COMMUNITY CAMPGROUND
HIGHWAY 10X
1+000
ALBERTA POOL ROAD
3 ST S
1 AVE S
30+500
30+000

50 0 50
SCALE:1:3,000 METRES

SCALE NOTATIONS INDICATED ARE BASED ON AN ISO A1 DRAWING FORMAT

FIG.3 VEGETATION SURVEY ROUTE - ROSEDALE

SWEETTECH ENGINEERING CONSULTANTS

AAR Environmental Services®

DRUMHELLER
RESILIENCY AND FLOOD MITIGATION OFFICE

FALL VEGETATION SURVEY

North

1:5000
20.2311.009
JAN. 8, 2021

REFERENCE:
1. AERIAL IMAGE FROM 2019 (PROVIDED BY DRUMHELLER RESILIENCY AND FLOOD MITIGATION OFFICE)

LEGEND:

GPS TRACKS OF FIELD TEAM (OCT. 20, 2020) –
EXISTING DIKES –

HIGHWAY 849
27+500
RED DEER RIVER FLOW
27+000
HOODOO CAMPGROUND
HIGHWAY 10
26+500
26+000
25+500
25+000
24+500
RED DEER RIVER FLOW
24+000
HIGHWAY 10
HIGHWAY 10

100 0 100
SCALE:1:5,000 METRES

SCALE NOTATIONS INDICATED ARE BASED ON AN ISO A1 DRAWING FORMAT

FIG.4 VEGETATION SURVEY ROUTE - HOODOO TRAIL