TECHNICAL MEMORANDUM

DATE July 19, 2024 **Project No.** CA-EI-CW238404

TO Deighen Blakely
Drumheller Resiliency and Flood Mitigation Office

CC Josh Strukoff

FROM Julie Benedik **EMAIL julie.benedik@wsp.com**

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROGRAM – TERRESTRIAL ASSESSMENT OF NACMINE: WETLAND AND WILDLIFE TECHNICAL MEMORANDUM

1.0 INTRODUCTION

The Town of Drumheller (Drumheller) is located within the Red Deer River valley in southeastern Alberta. Historically, Drumheller has experienced numerous floods, resulting in significant damage to properties and infrastructure. Over the last 30 years, flooding occurred in 1991, 2005, 2013, and 2018. The Drumheller Resiliency and Flood Mitigation Program (DRFM Program) aims to complete a flood mitigation system that provides flood protection while meeting the following conditions:

- easily maintainable
- erosion resistant
- accommodates deterioration over time
- minimizes encroachments on the river and associated afflux
- minimizes impacts on private land
- considers the existing structural measures such as berms along riverbanks as well as construct new structures

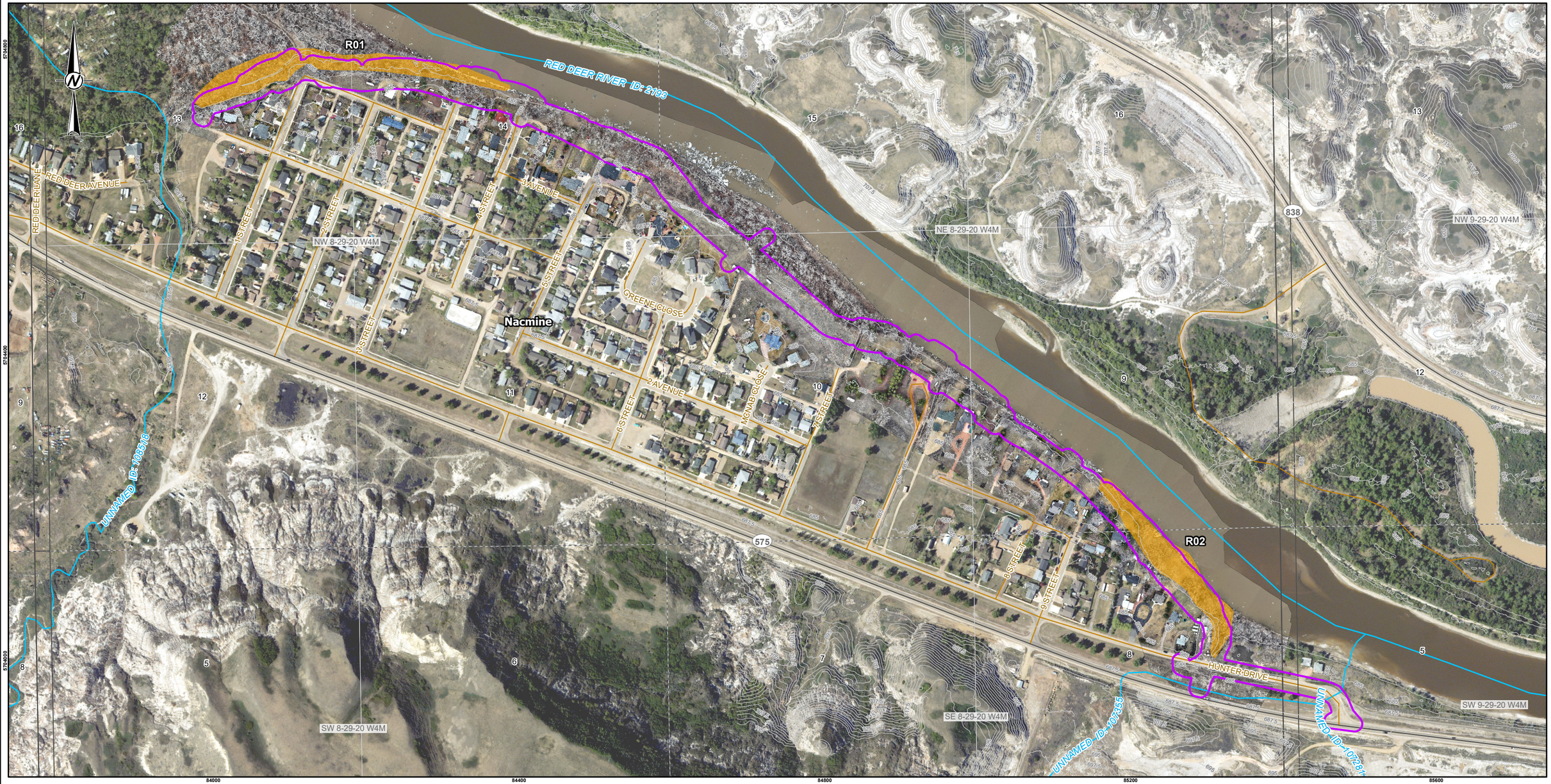
Drumheller has retained WSP Canada Inc. (previously Wood E&I) to complete a terrestrial assessment (i.e., vegetation and wildlife) related to the Nacmine Berm, as part of the larger DRFM Program.

In 2023, WSP completed a tree health assessment for the Nacmine Project Footprint plus a 5-m buffer. A terrestrial assessment was completed in May 2024 for the Project Study Area (PSA) proposed for flood mitigation along the Red Deer River by the DRFM Program within the Nacmine subdivision. The PSA includes the Project footprint plus a 10-m buffer as shown in Figure 1. This memorandum is intended to report data collected from the 2024 terrestrial assessment by identifying wet areas (i.e., riparian and wetland areas), and notable wildlife features within the Nacmine PSA.

2.0 STUDY AREA

The PSA extends for approximately 1.7 km and is located in the NW Subsection of Section 08 of Township 29, Range 20, West of the Fourth Meridian (W4M) (NW-08-029-20 W4M) within the Northern Fescue Natural Subregion of the Grassland Natural region. This subregion is dominated by plains rough fescue (*Festuca hallii*) and forms dense stands on undisturbed sites, on lightly grazed sites it commonly occurs with western porcupine grass (*Hesperostipa curtiseta)*, slender wheat grass (*Elymus trachycaulus* ssp*. trachycaulus),* Hooker's oatgrass (*Helictochloa hookeri),* and a variety of perennial herbs (e.g., prairie crocus [*Pulsatilla nuttalliana*], prairie sagewort [*Artemisia ludoviciana*], wild blue flax [*Linum lewisii*], northern bedstraw [*Galium boreale*], and three-flowered avens [*Geum triflorum*]). Sparsely vegetated grasslands include blue grama grass (*Bouteloua gracilis*), northern wheat grass (*Elymus lanceolatus*), prairie sandreed (*Sporobolus rigidus*), and June grass (*Koeleria macrantha*) occurring on the driest sites with coarse textured, rapidly drained Regosol and Rego Chernozem soils (NRC 2006). Tall shrub and tree communities are limited to river valleys and moist lowland sites where groundwater is adequate throughout the growing season, and are dominated by balsam poplar (*Populus balsamifera*), aspen (*Populus tremuloides*), and plains cottonwood (*Populus deltoides)* with willows (*Salix* spp.), sedge (*Carex* spp.) common cattail (*Typha latifolia),* and bulrush (*Typha* spp.) communities occurring in poorly drained depressions and along rivers on Gleysolic soils (NRC 2006).

The Nacmine PSA is located along the south (or right) bank of the Red Deer River with the upstream extent located north of 1st Street in the Village of Nacmine (NW-08-029-20 W4M). Construction is scheduled to begin in spring or summer 2025, with tree clearing proposed prior to he bird window, possible over the winter.

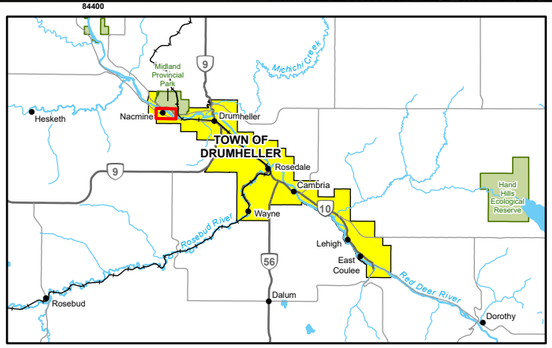


LEGEND

- PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)
- SECONDARY HIGHWAY
- LOCAL ROAD
- MAJOR CONTOUR (2.5M)
- WATERCOURSE (FWMIS ID)

CURRENT RIPARIAN BOUNDARY

- RIPARIAN - SHRUBBY



0 100 200

1:5,000 METRES

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. DRONE IMAGERY CAPTURED BY KEITH POOLE, 5 CM RESOLUTION, © 2024.
3. HIGH RESOLUTION AERIAL PHOTO FROM 2019 AND PROVIDED BY DRFMO.
4. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

CLIENT: DRUMHELLER VALLEY

CONSULTANT: wsp

PROJECT: DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT TERRESTRIAL ASSESSMENT OF NACMINE

TITLE: **WETLAND AND RIPARIAN ASSESSMENT FOR THE NACMINE PROJECT STUDY AREA**

YYYY-MM-DD	2024-07-19
DESIGNED	MP
PREPARED	HB
REVIEWED	JB
APPROVED	JB

PROJECT NO.	CONTROL	REV.	FIGURE
CA0011571.8462		0	1

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3.0 ASSESSMENT METHODS

3.1 Vegetation Mapping

A desktop assessment was completed for the PSA in 2024 to distinguish wetlands from riparian areas, this included a review of current aerial imagery, historical aerial photographs, Alberta Merged Wetland Inventory (AEP 2018), LiDAR contour data (DRFMO 2018), and watercourse mapping (Government of Canada 2016).

A review of historical aerial photographs of the PSA was completed by obtaining historical aerial photographs for selected years from Government of Alberta's (GOA) Aerial Photographic Record System (GOA 2016). Aerial photographs from 1950, 1963, 1976, 1986, 1990 2005, and 2019 were reviewed to support the current delineations of wetland and riparian boundaries. Ortho imagery from 2019 was also reviewed to support the delineations of wetland and riparian boundaries. Dates of historical aerial photographs were selected primarily based on availability but also with reference to imagery scales, season of imagery capture, and climate data for 029-20 W4M.

A desktop interpretation of historical and recent aerial imagery was completed in conjunction with a review of topographic maps to delineate current wetland and riparian boundaries. Current wet areas were delineated through the interpretation of aerial imagery by a WSP vegetation ecologist at a scale of 1:1,500. Individual polygons were delineated based on the presence of hydrological influences, including areas of standing water, bare ground, patchy vegetation, and topography. Wetlands were classified as defined in the Alberta Wetland Classification System (AWCS) (GOA 2015) and riparian areas as defined by vegetation form (i.e., treed, shrubby, or graminoid).

All current desktop-mapped wetland and riparian boundaries were drawn, and a vegetation association was assigned based on evidence of water permanence and changes to the observed vegetation (e.g., changes in image texture and colour). Vegetation associations differ for riparian areas (i.e., areas that have overland water flow and connect streams or upland areas to wetlands [Government of British Columbia 1998; Miller 2023]) and wetlands (i.e., areas that are adapted to soil water storage [Miller 2023]). Once mapped, a vegetation association was assigned a classification as per AWCS for wetlands (GOA 2015) or by assessing the vegetation form for riparian areas. All wet areas were assessed as individual, discrete polygons.

Desktop mapping was confirmed through a field survey in May 2024 by two vegetation and wetland ecologists. The entirety of the PSA was assessed, and five vegetation plots were surveyed to characterize the wet areas.

3.2 Terrestrial Survey

3.2.1 Wetland and Riparian Area Assessment

A terrestrial survey assessment was completed in May 2024, with the objective of assessing potential wet areas within the Nacmine PSA to determine whether they were wetlands or riparian areas. Vegetation plots were completed to characterize and document wet areas. However, no wetlands were identified, thus, no wetland assessments were completed. Incidental observations of noxious/prohibited weed occurrences were documented; UTM coordinates and photographs were taken when these were observed.

3.2.2 Wildlife

The Alberta *Wildlife Act* (the Act) protects nests, dens and hibernacula of wildlife within the province. Under the Act, it is prohibited to destroy, disturb or harass wildlife and/or their dens, nests or burrows. To comply with the Act, a terrestrial wildlife sweep was performed to assess the PSA and 100 m buffer for the presence of wildlife features. A qualified wildlife biologist conducted a meandering search of this survey area on May 10, 2024 to identify any important wildlife features such as raptor nests, active dens or burrows and other wildlife features that may be impacted during construction (GOA 2021a). Wildlife features and incidental wildlife observations were documented; UTM coordinates and photographs were taken for any wildlife features observed.

4.0 ASSESSMENT RESULTS

4.1 Vegetation Mapping

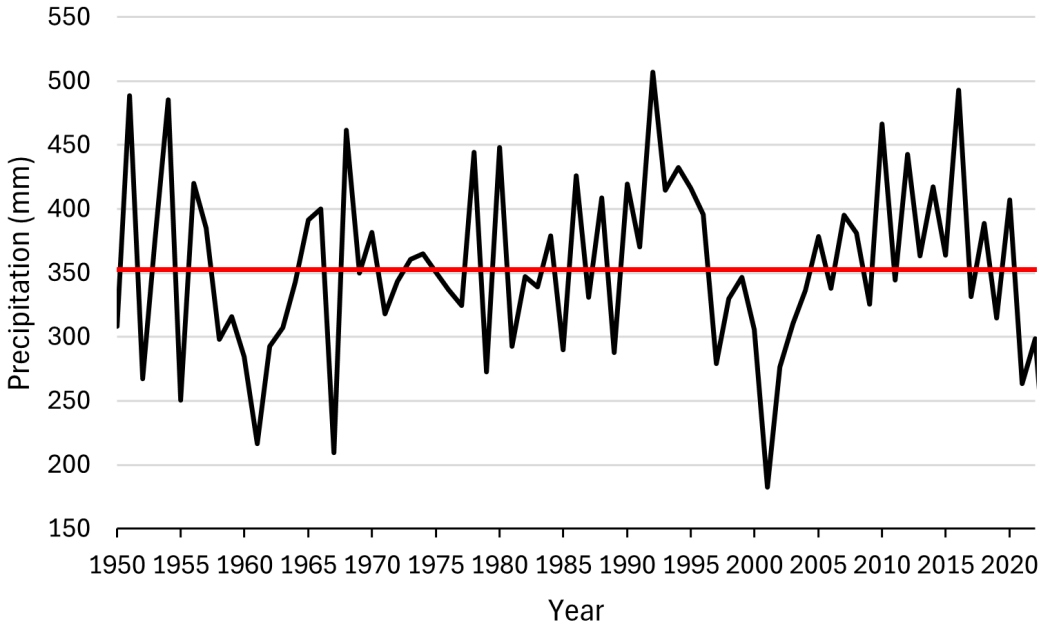
Seven historical aerial photographs from 1950, 1963, 1976, 1986, 1990, 2005 and 2019 were reviewed to delineate current boundaries of wetlands and riparian areas in the PSA. The following summarizes the results of the desktop wetland and riparian area mapping exercise and field survey.

The historical aerial photographs show that the wet areas along the Project are primarily shrubby riparian areas (Table 1). In the 1950 photograph the wet area along the entirety of the PSA is classified as shrubby riparian area; the non-riparian area along the West portion is part of a cutoff channel or natural levee, and the non-riparian area along the East portion forms part of a gully (Appendix A – Figure A-1). In the 1963 photograph, the West portion of the PSA is primarily classified as shrubby riparian area and the previously existing channel has changed to a small tributary (FWMIS nnnamed ID: 108518) flowing in from the south and emptying towards the north-east surrounded by drier ground and emerging vegetation; the East portion is classified as shrubby riparian area (Appendix A – Figure A-2). In the 1976, 1986 and 1990 photographs, the majority of wet area along the entirety of the PSA is classified as shrubby riparian area (Appendix A – Figures A-3 to A-5). In the 2005 photograph, the wet area along the entirety of the PSA is classified as shrubby riparian area; the photograph depicts high water levels of the Red Deer River and portions of the identified riparian areas are partially submerged (Appendix A – Figure A-6). In the 2019 photograph, the majority of the wet area is classified as shrubby riparian area; the water level of the Red Deer River is low in 2019 and sandy shores and a sand bank are exposed along a portion of the PSA (Appendix A – Figure A-7).

Cleared areas, disturbances, an undeveloped greenspace, and residences are visible in the earliest imagery available (1950) (Appendix A – Figure A-1). In this year, a trail is visible along the river, in the west portion of the PSA. Further development is visible in the 1986 imagery along the periphery of the previously disturbed but undeveloped area in the central portion of the PSA, which is further developed in the 2005 imagery, and even further developed in the 2019 imagery (Appendix A). Development of the residential area of Nacmine is visible in all years.

Climate analysis of local precipitation data for years corresponding with historical aerial photographs shows that above-average precipitation occurred in 1986 (425.74 mm), 1990 (419.48 mm), and 2005 (378.51 mm) compared with long-term average precipitation of 352.74 mm (Figure 2; GOA 2022; Table 1). Below-average precipitation occurred in 1950 (308.22 mm), 1963 (306.96 mm), and 2019 (314.79 mm) (Figure 2; GOA 2022; Table 1). Normal precipitation occurred in 1976 (337.03 mm) (Figure 2; GOA 2022; Table 1).

Figure 2: Annual and Average Precipitation from 1950 to 2023 for 29-20 W4M



Source: Government of Alberta (2022)

Table 1: Documentation of Historical Aerial Photographs used to Classify Wet Areas within the Nacmine PSA

Photo Date (MM-DD-YYYY)	Photo ID (Roll AS# - Photo #)[a]	Resolution	Season[b]	Precipitation (mm)			Wetland ID	AWCS Wetland Classification	Open Water Visible or Consistent Wetland Vegetation Signature[e]	Assessment of Permanence[f]	Photo Notes
				Year[c]	Preceding Month Analysis[c]	Preceding Day Analysis[d]					
06-11-1950	AS 0164-235	1:40,000	S	308.22 (D)	12.4 (D)	0.00 (0.00)	n/a	n/a	n/a	n/a	Vegetation along the PSA is dominated by shrubby riparian areas, dispersed with disturbed graminoid dominated sections of the PSA. The PSA is adjacent to a residential area and the Red Deer River. Boundary of shrubby riparian areas are easily distinguishable from surrounding vegetation and open water. Riparian area is partially submerged in the western portion of the PSA and almost fully submerged in the eastern portion of the PSA. Portions of the PSA are cleared and developed.
05-19-1963	AS 0873-059	1:31,680	S	306.96 (D)	10.02 (D)	0.00 (10.31)	n/a	n/a	n/a	n/a	Shrubby riparian areas are located throughout the PSA at edge of Red Deer River and are adjacent to a residential area. Boundary of shrubby riparian areas are easily distinguishable from surrounding vegetation and open water. Portions of the PSA are cleared and developed.
06-20-1976	AS 1479-146	1:31,680	S	337.03 (N)	24.14 (N)	0.00 (39.07)	n/a	n/a	n/a	n/a	Shrubby riparian areas are located at edge of Red Deer River and are adjacent to a residential area. Boundary of shrubby riparian areas are easily distinguishable from surrounding vegetation and open water. Additional portions of the PSA are now disturbed.
06-10-1986	AS 3290-189	1:25,000	Sum	425.74 (W)	55.04 (N)	0.00 (20.38)	n/a	n/a	n/a	n/a	Shrubby riparian areas are located at edge of Red Deer River and are adjacent to a residential area. Boundary of shrubby riparian areas are easily distinguishable from surrounding vegetation and open water. Portions of the PSA are cleared and developed.
07-11-1990	AS 4057-35	1:30,000	Sum	419.48 (W)	88.47 (W)	0.00 (42.42)	n/a	n/a	n/a	n/a	Shrubby riparian areas are located at edge of Red Deer River throughout the PSA and are adjacent to a residential area. Boundaries of shrubby riparian areas are easily distinguishable from surrounding vegetation and open water. Portions of the PSA are cleared and developed.
06-21-2005	AS 5335 217	1:10,000	Sum	378.51 (W)	9.92 (D)	0.00 (102.41)	n/a	n/a	n/a	n/a	Shrubby riparian areas are located at edge of Red Deer River. Boundaries of shrubby riparian areas are easily distinguishable from surrounding vegetation. Riparian areas and developed areas are partially submerged throughout the entire PSA due to high water levels in the Red Deer River.
2019	Orthophoto	30 cm	S/Sum	314.79 (D)	n/a	n/a	n/a	n/a	n/a	n/a	Shrubby riparian areas are located at edge of Red Deer River. Boundaries of shrubby riparian areas are easily distinguishable from surrounding vegetation and open water. Large portions of the PSA are cleared and developed. Water levels are low and very little open water is present within the PSA.

Notes: ha = hectare; mm = millimetres; n/a = not applicable.

a) Photo source from GOA (2016) unless otherwise stated.

b) S=Spring (April to June); Sum = Mid-Late Summer (June to September);; Seasonality based on aerial photo and historical imagery capture date.

c) D=Dryer; N=Normal; W=Wetter. Long-term average annual precipitation: 352.74 mm (GOA 2022).

d) Total precipitation from previous day (precipitation from previous two weeks).

e) W=Water present/inundated; D=Dry; DV=Dry, vegetated (consistent with wetland class); DVI=Dry, vegetated indistinguishable from surrounding uplands.

f) Y=Yes (Reasonably Permanent, a Sec. 3 *Public Lands Act* body of water); N=No (Not Permanent, but wetland regulated under *Water Act*).

4.2 Terrestrial Survey

4.2.1 Wetland and Riparian Area Assessment

A field survey was completed on May 10, 2024 to survey potential wet areas and to confirm desktop mapping. Five vegetation plots along the PSA were surveyed in areas where wet features were present. Vegetation and topography indicated that the wet areas in the PSA were shrubby riparian areas. No vegetation indicators were observed in the PSA to support wetland classification. Identification of some vegetation within the survey plots were classified to species level, because surveys were completed before flowers and other structures required for identification had developed.

4.2.2 Wildlife

A wildlife sweep was conducted on May 10, 2024 by a qualified WSP biologist working in conjunction with the wetland and riparian assessment. The site was populated with poplar trees Manitoba maple (*Acer negundo*), trembling aspen, white spruce (*Picea glauca*), red-osier dogwood (*Cornus sericea*),and willow species. There were numerous mature poplar trees that had potential for summer bat roosting, mammal dens, and roosting, nesting, and foraging for pileated woodpeckers. A pileated woodpecker (*Dryocopus pileatus*) was observed at the east end of the PSA during the wildlife sweep; however, no nesting cavities were observed during the survey. The pileated woodpecker is provincially listed as Sensitive and listed under Schedule 1 of the Migratory Bird Regulation (MBR) (GofC 2022; AEP 2024). Bank swallows (*Riparia riparia*) and their nesting burrows were observed across the river where the banks were steep and tall as opposed to banks within the PSA which do not support bank swallow nests. Bank swallows are federally listed as Threatened under Schedule 1 of the *Species at Risk Act* (SARA) and provincially listed as Sensitive (GoC 2023; AEP 2024). A small stream exists along the west border of the site, the stream was slow moving and turbid. No amphibian activity including egg masses or tadpoles were observed during the wildlife sweep.

5.0 SUMMARY

Surveys were conducted to identify wetlands and riparian areas within the PSA. Based on the field verification of the aerial photograph and satellite imagery review, the wet areas along the Project are shrubby riparian areas (Figure 1). Riparian areas generally function as upland areas; moisture levels can vary between years due to events such as drought or flooding, but the ground does not stay saturated with water long enough to promote water altered soils or the growth of water tolerant vegetation.

A terrestrial wildlife sweep was performed to assess the PSA and 100 m buffer for the presence of important wildlife features, including occupied nests or dens and mineral licks. Habitat noted during the wildlife sweep conducted on May 10, 2024, indicated that habitat within the PSA is consistent with suitable nesting habitat for migratory birds, woodpeckers, bats, and raptors. However, during the wildlife sweep no protected wildlife features were observed within the PSA.

6.0 RECOMMENDATIONS

Disturbance to riparian areas do not require a Wetland Assessment and Impact Report, and therefore, one will not be required under the *Water Act* for the proposed Nacmine Berm. To comply with the Alberta *Wildlife Act* and *Migratory Birds Convention Act* (MBCA) prior to any Project activities, including the clearing of vegetation, if activities occur between March 15 and August 25 the contractor must be aware of other potential wildlife issues or conflicts within the PSA. The contractor is responsible for following all federal and provincial policies and Acts in dealing with encounters and/or impacts to wildlife that may occur during Project activities including:

- A pre-disturbance wildlife sweep must be completed prior to any Project activities, including the clearing of any vegetation on non-public lands, during the sensitive nesting and breeding period from March 15 to August 15 or on public lands at any time during the year (GOA 2021a). If construction does not proceed within the same growing season as the completed wildlife sweep (i.e., construction occurs in spring 2025 or later), the current wildlife sweep will expire and a new wildlife sweep will be required to ensure identification of any new wildlife features within the PSA and 100 m buffer.
- Construction activities should occur outside the nesting season for the B4 Nesting Zone which has a nesting period of April 20 to August 25 (GOC 2024). If any Project activities, including vegetation removal are required during this period, a qualified wildlife biologist must conduct a nest sweep of the disturbance area. If active nests are found, the qualified biologist will provide written mitigation and protection measures (e.g., setbacks and/or timing restrictions) to minimize effects to migratory birds.

Additional wildlife and wildlife feature mitigations may be required if wildlife or wildlife features are observed during construction. All wildlife observations made during construction should be reported to a qualified biologist. The biologist will recommend mitigations depending on the species, as needed.

7.0 CLOSURE

This report was prepared by WSP for Drumheller. The material in this report reflects WSP's best judgment considering information available to it at the time of preparation. If Drumheller edits, revises, alters, or adds to the material in this report in any way, all reference to WSP and WSP's employees must be removed unless Drumheller's changes are agreed to by WSP. Any use which a third party makes of this report or any reliance on or decisions to be made based on it, are the responsibility of such third party. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or action based on this report.

We trust the information contained in this report is sufficient for your present needs. Should you have any questions regarding the project, please do not hesitate to contact the signatories below.

WSP Canada Inc.

Julie Benedik, M.Sc., P.Biol
Experienced, Vegetation Ecologist

Marcie Plishka, M.Sc.
Lead, Vegetation Ecologist

JB/MP/rd

https://wsponlinecan.sharepoint.com/sites/ca-ca00115718462/shared documents/05. technical/rosedale trees & rosedale_nacmine wetlands & michichi veg_wetlands/reporting/nacmine wetland & wildlife memo/nacmine_flood mitigation_wetland wildlife_memo_2024.docx

8.0 REFERENCES

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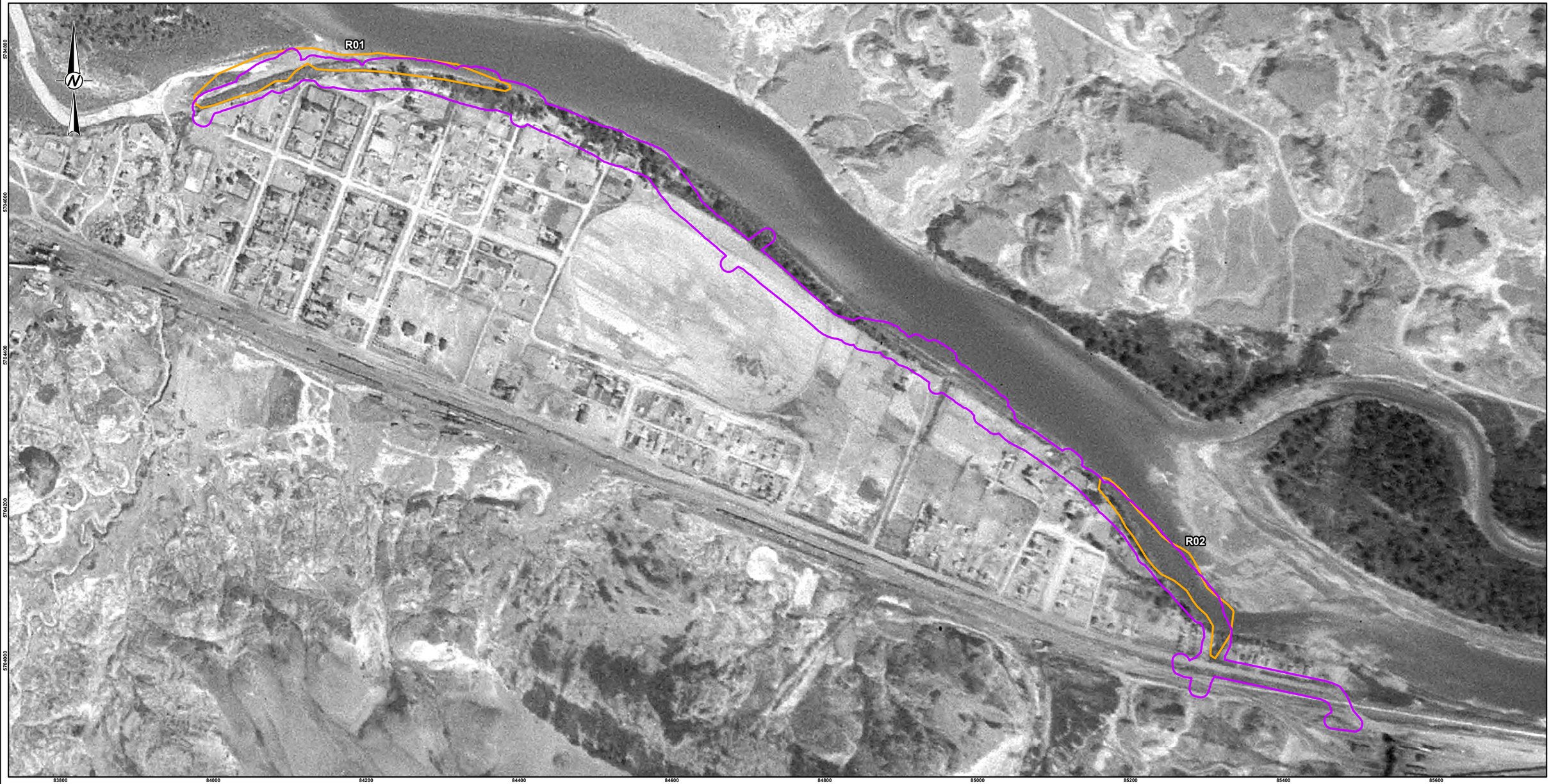
APPENDIX A

Historical Aerial Photographs



LEGEND

PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)

CURRENT RIPARIAN BOUNDARY

RIPARIAN - SHRUBBY

0 100 200

1:5,000 METRES

CLIENT

DRUMHELLER VALLEY

CONSULTANT

wsp

YYYY-MM-DD	2024-07-19
DESIGNED	MP
PREPARED	HB
REVIEWED	JB
APPROVED	JB

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. HISTORIC IMAGERY PROVIDED BY THE AIR PHOTO LIBRARY, GOVERNMENT OF ALBERTA, PHOTO CAPTURED JUNE 11, 1950.
3. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

PROJECT

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT
TERRESTRIAL ASSESSMENT OF NACMINE

TITLE

HISTORIC AIR PHOTO - 1950

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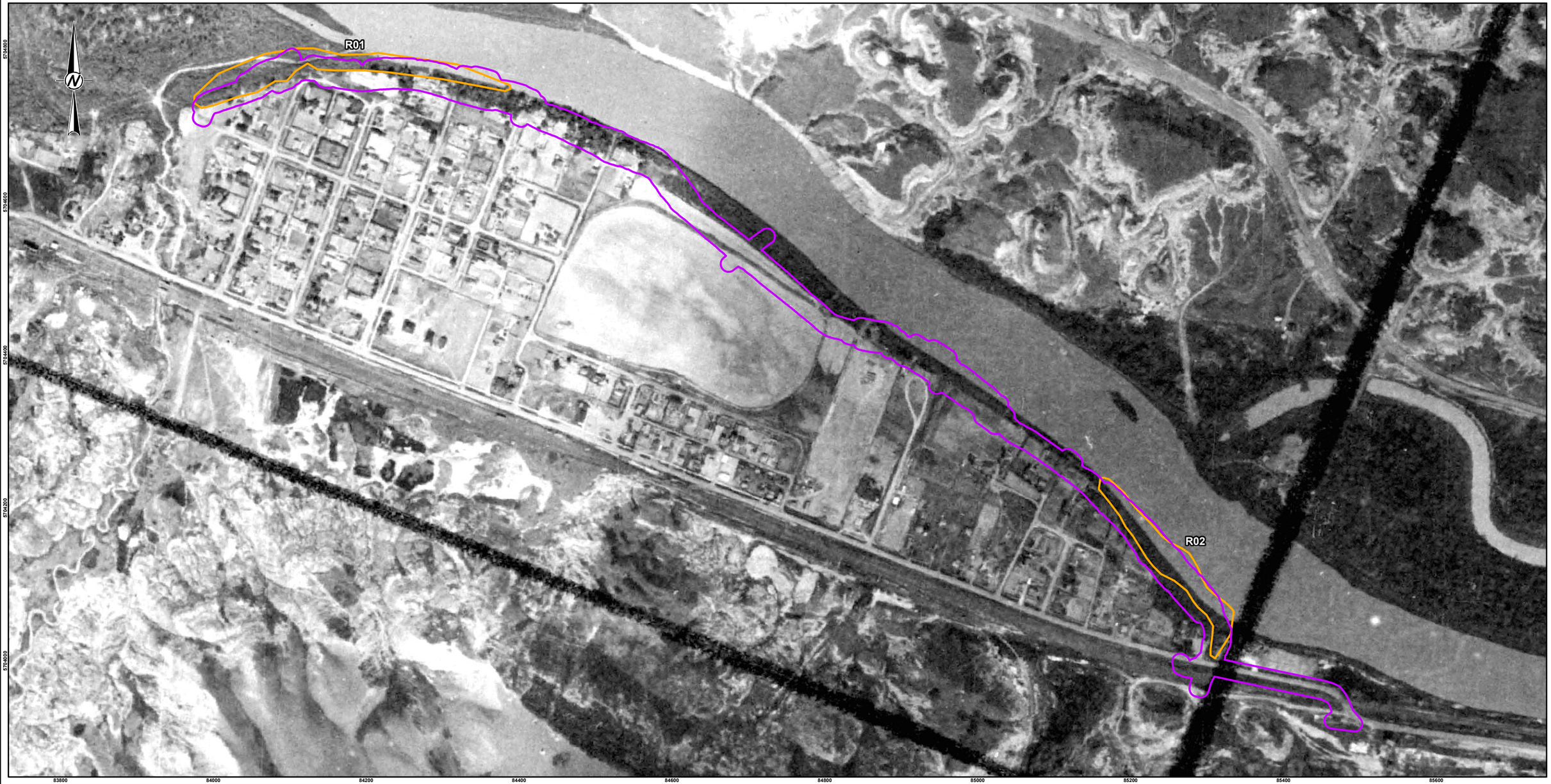


LEGEND

PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)

CURRENT RIPARIAN BOUNDARY

RIPARIAN - SHRUBBY

0 100 200

1:5,000 METRES

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. HISTORIC IMAGERY PROVIDED BY THE AIR PHOTO LIBRARY, GOVERNMENT OF ALBERTA, PHOTO CAPTURED MAY 19, 1963.
3. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

CLIENT

DRUMHELLER VALLEY

CONSULTANT

wsp

YYYY-MM-DD	2024-07-19
DESIGNED	MP
PREPARED	HB
REVIEWED	JB
APPROVED	JB

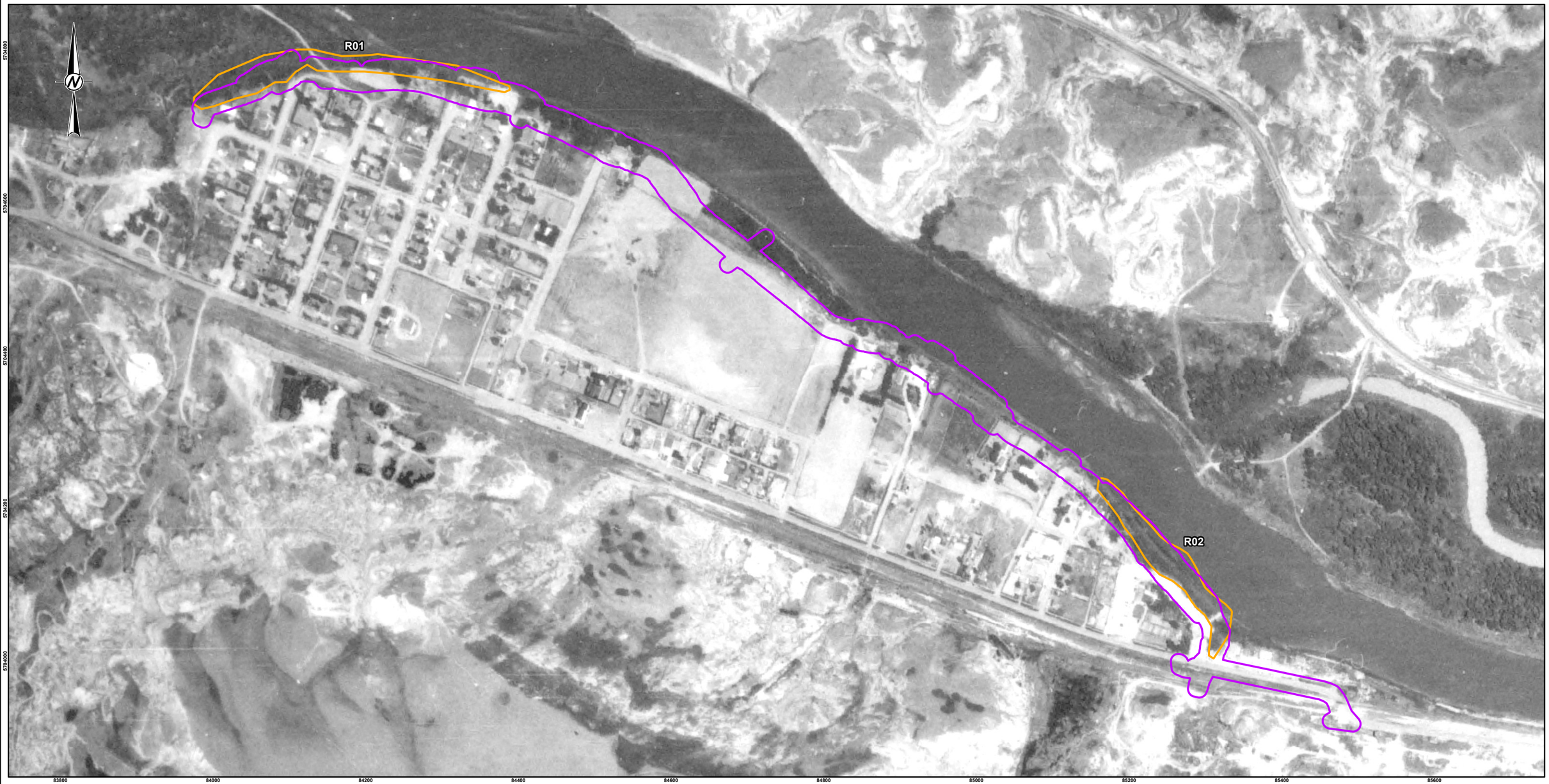
PROJECT

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT
TERRESTRIAL ASSESSMENT OF NACMINE

TITLE

HISTORIC AIR PHOTO - 1963

PROJECT NO.	CONTROL	REV.	FIGURE
CA0011571.8462		0	A-2



LEGEND

PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)

CURRENT RIPARIAN BOUNDARY

RIPARIAN - SHRUBBY

0 100 200

1:5,000 METRES

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. HISTORIC IMAGERY PROVIDED BY THE AIR PHOTO LIBRARY, GOVERNMENT OF ALBERTA, PHOTO CAPTURED JUNE 20, 1976.
3. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

CLIENT

DRUMHELLER VALLEY

CONSULTANT

wsp

YYYY-MM-DD	2024-07-19
DESIGNED	MP
PREPARED	HB
REVIEWED	JB
APPROVED	JB

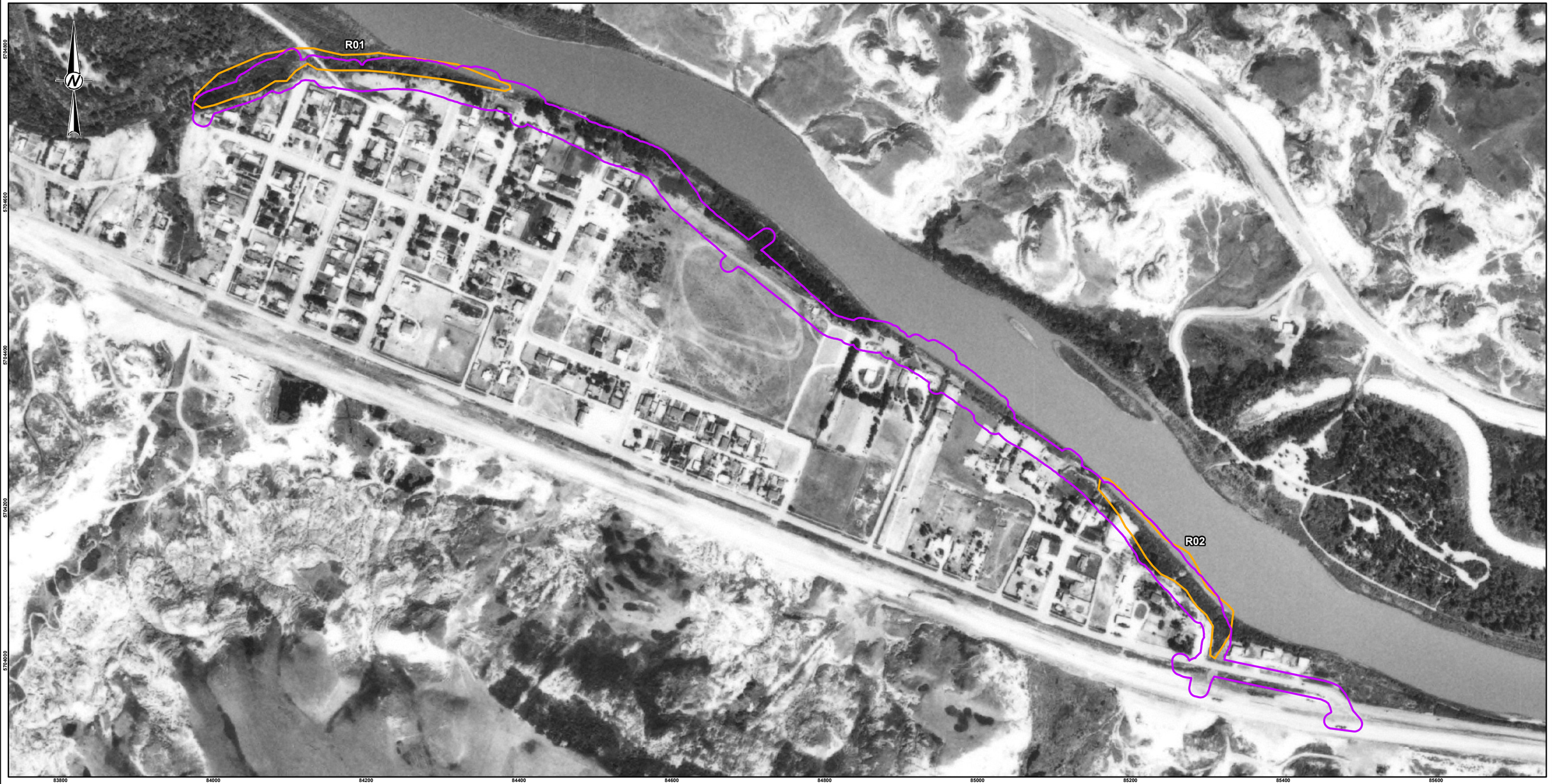
PROJECT

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT
TERRESTRIAL ASSESSMENT OF NACMINE

TITLE

HISTORIC AIR PHOTO - 1976

PROJECT NO.	CONTROL	REV.	FIGURE
CA0011571.8462		0	A-3



LEGEND

PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)

CURRENT RIPARIAN BOUNDARY

RIPARIAN - SHRUBBY

0 100 200

1:5,000 METRES

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. HISTORIC IMAGERY PROVIDED BY THE AIR PHOTO LIBRARY, GOVERNMENT OF ALBERTA, PHOTO CAPTURED JUNE 10, 1986.
3. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

CLIENT

DRUMHELLER VALLEY

CONSULTANT

wsp

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APPROVED	JB

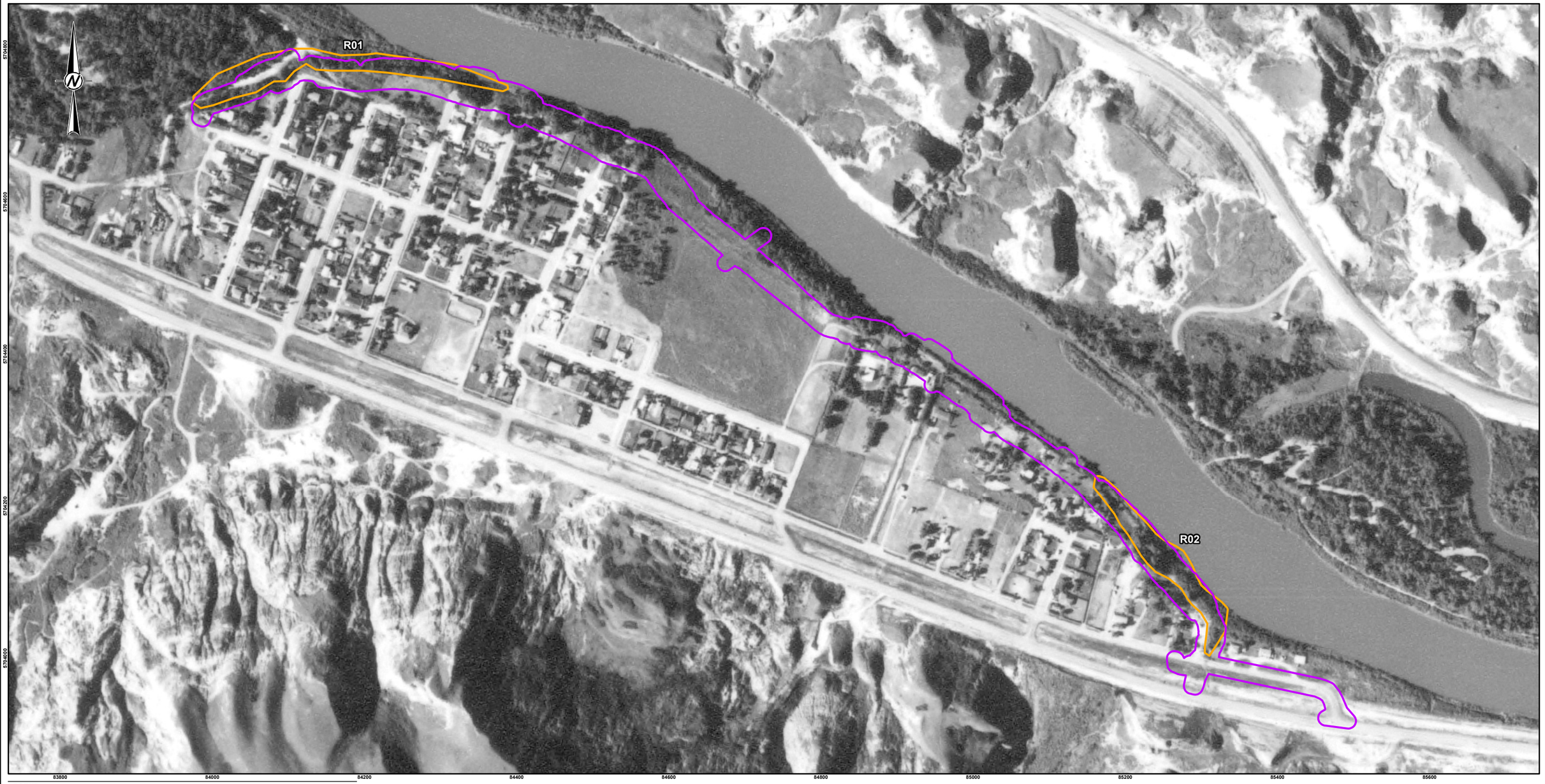
PROJECT

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT
TERRESTRIAL ASSESSMENT OF NACMINE

TITLE

HISTORIC AIR PHOTO - 1986

PROJECT NO.	CONTROL	REV.	FIGURE
CA0011571.8462		0	A-4



LEGEND

PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)

CURRENT RIPARIAN BOUNDARY

RIPARIAN - SHRUBBY

0 100 200

1:5,000 METRES

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. HISTORIC IMAGERY PROVIDED BY THE AIR PHOTO LIBRARY, GOVERNMENT OF ALBERTA, PHOTO CAPTURED JULY 11, 1990.
3. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

CLIENT

DRUMHELLER VALLEY

CONSULTANT

wsp

YYYY-MM-DD	2024-07-19
DESIGNED	MP
PREPARED	HB
REVIEWED	JB
APPROVED	JB

PROJECT

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT TERRESTRIAL ASSESSMENT OF NACMINE

TITLE

HISTORIC AIR PHOTO - 1990

PROJECT NO.	CONTROL	REV.	FIGURE
CA0011571.8462		0	A-5

LEGEND

PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)

CURRENT RIPARIAN BOUNDARY

RIPARIAN - SHRUBBY

0 100 200

1:5,000 METRES

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. HISTORIC IMAGERY PROVIDED BY THE AIR PHOTO LIBRARY, GOVERNMENT OF ALBERTA, PHOTO CAPTURED JUNE 21, 2005.
3. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

CLIENT

DRUMHELLER VALLEY

CONSULTANT

wsp

PROJECT

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT
TERRESTRIAL ASSESSMENT OF NACMINE

TITLE

HISTORIC AIR PHOTO - 2005

YYYY-MM-DD	2024-07-19
DESIGNED	MP
PREPARED	HB
REVIEWED	JB
APPROVED	JB

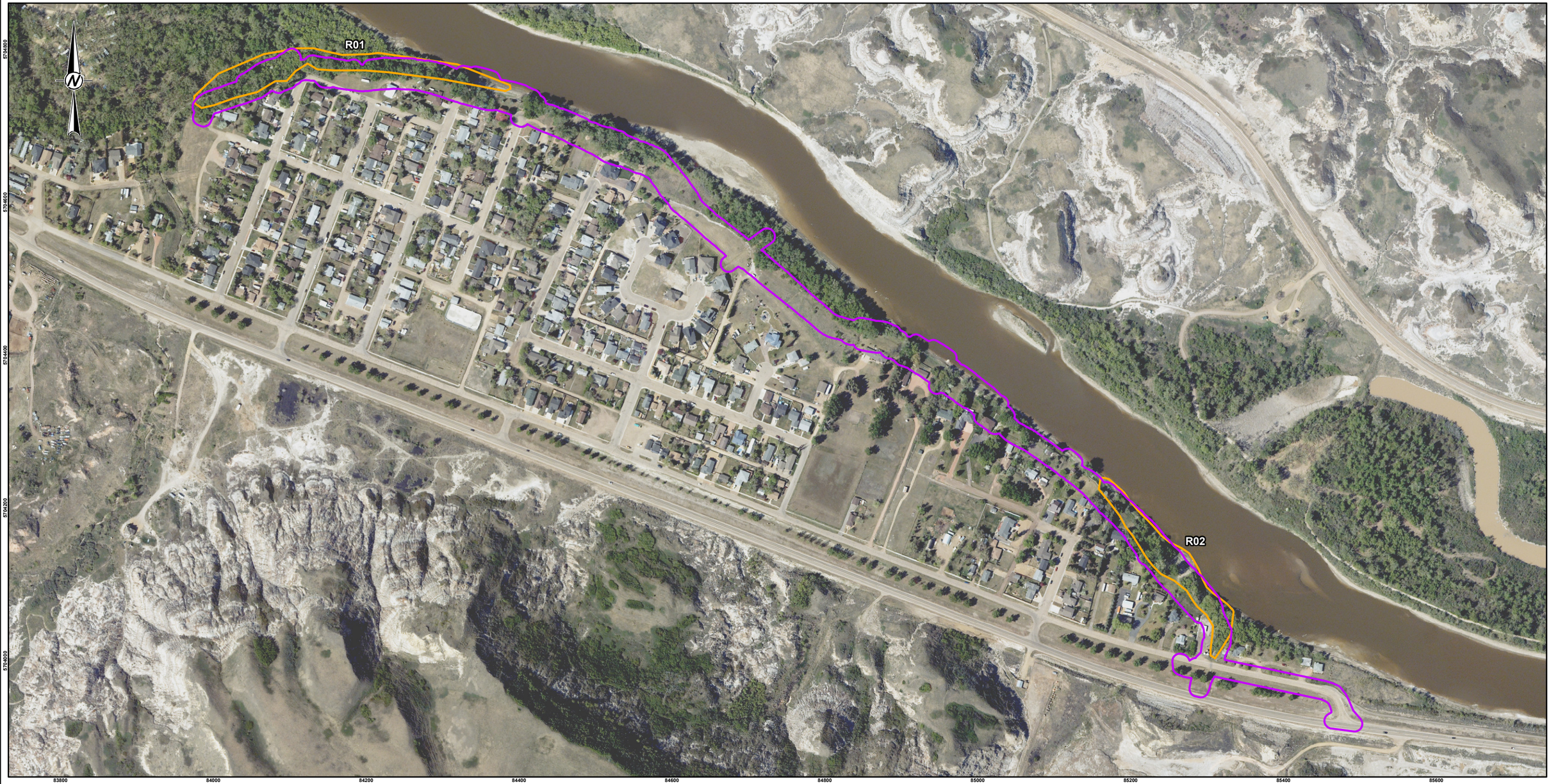
PROJECT NO.	CONTROL	REV.	FIGURE
CA0011571.8462		0	A-6

PATH: I:\CLIENTS\TOWN_OF_DRUMHELLER\CA0011571_8462\Mapping\02_VEGETATION\CA0011571_8462_NACMINE_FIG_A0_HISTORIC5.aprx, PRINTED ON: AT 2:12:07 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

0



LEGEND

PROJECT STUDY AREA (10 M OF BERM FOOTPRINT)

CURRENT RIPARIAN BOUNDARY

RIPARIAN - SHRUBBY

0 100 200

1:5,000 METRES

REFERENCE(S)

1. FIELD WORK DATE: MAY 10, 2024.
2. HIGH RESOLUTION AERIAL PHOTO FROM 2019 AND PROVIDED BY DRFMO.
3. BASEDATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ALBERTA.

SPATIAL REFERENCE: CANA83-3TM114

CLIENT

DRUMHELLER VALLEY

CONSULTANT

wsp

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DESIGNED	MP
PREPARED	HB
REVIEWED	JB
APPROVED	JB

PROJECT

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROJECT
TERRESTRIAL ASSESSMENT OF NACMINE

TITLE

HISTORIC AIR PHOTO - 2019

PROJECT NO.	CONTROL	REV.	FIGURE
CA0011571.8462		0	A-7