PARAGON
soil & environmental consulting

Biophysical and Wetland Assessment for the Town of Bentley Southeast Area Structure Plan

Prepared for:

Town of Bentley
Alberta

Prepared by:

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November 2021

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ABBREVIATIONS

%	Percent
°C	Degrees Celsius
ABMI	Alberta Biodiversity Monitoring Institute
ABWRET	Alberta Wetland Rapid Evaluation Tool
ACIMS	Alberta Conservation Information Management System
AEP	Alberta Environment and Parks
AER	Alberta Energy Regulator
AMWI	Alberta Merged Wetland Inventory
FWMIS	Fisheries and Wildlife Management Information System
GOA	Government of Alberta
ha	Hectare
km	Kilometre
LAT	Landscape Analysis Tool
m	Metre
mm	Millimetre
NRC	Natural Regions Committee
Paragon	Paragon Soil and Environmental Consulting Inc.
Town	Town of Bentley
PCPS	Parkland Community Planning Services
Plan	Area Structure Plan
WAIR	Wetland Assessment and Impact Report

1 INTRODUCTION

1.1 Purpose and Scope

Paragon Soil and Environmental Consulting Inc. (Paragon) was retained by the Town of Bentley (the Town) working with Parkland Community Planning Services (PCPS) to prepare a biophysical and wetland assessment to support an Area Structure Plan (the Plan) along the south and southeast boundaries of Bentley, Alberta (the Plan Area).

The biophysical and wetland assessment was prepared using publicly available information and aerial photography to identify and assess the environmental significance and sensitivity of existing vegetation, wetlands and other water features, wildlife habitat, and other unique physical features of the Plan Area. This assessment generally follows *Lacombe County's Guide to the Approval Process for Multi-lot Development Proposals* (Lacombe County 2020); however, onsite (field) investigations were not conducted in preparation of the biophysical and wetland assessment as contact with landowners had not yet been made and timing for some required elements was out of season (e.g., species lists, plant and wetland community mapping verification, and some landscape characteristics). As such, a desktop-based approach at various scales was used to identify and evaluate natural features within the Plan Area that should be considered during future development planning.

Recommendations, including best management practices, on mitigating impacts to and monitoring of key environmental features are provided along with additional studies (if applicable).

1.2 Plan Area Location and Current Land Use

The Plan Area is located on private land in the NE/SE/SW and portions of NW 23-040-01-W5M located southeast of Bentley, Alberta, in the County of Lacombe (Lacombe County 2021a) (Appendix A, Figure A1). The Plan Area is predominantly agricultural (cultivated) lands with farms/residences located in SE 23-040-01-W5M.

The second most prevalent land use within the Plan Area is industrial lands. The Plan Area is intersected by Provincial Highway 12 and bounded by Range Roads 11 and 12 to the east and west, respectively, along with portions of the Town's 48th and 50th avenues and 44th Street along the northern boundary (Figure A1). A rail line also splits the southwest portion of the Plan Area in SW 23-040-01-W5M. Other notable industrial features incudes a stormwater management system (reservoir and associated landscape) in NW 23-040-01-W5M, a communications tower and well site in SW 23-040-01-W5M, and the Bentley Fire Hall situated in the northwest corner of NE 23-040-01-W5M (Figure A1).

Natural features are limited to upland woodlands/windrows and occasional temporary wetlands and woodland swamps within agricultural lands. These features account for a very small proportion of the Plan Area and are described in more detail below.

The Plan Area does not intersect any higher-level plans, such as local or subregional integrated resource plans, access management plans, or landscape management plans (GOA 2021a).

2 METHODS

Because of the integrated nature of biophysical and wetlands elements, they have been reported together in these methods and following results sections.

2.1 Historical Aerial Photographs

Historical aerial photographs were used to track land changes as well as to help determine historical boundaries and permanence of wetlands within the Plan Area. Historical aerial imagery was sourced from the *Aerial Photographic Record System* (GOA 2021b). Historical aerial photographs from 1949, 1962, 1974, 1982, 1998 and 2009 were selected for the Plan Area. Historical imagery is presented in Appendix B (Figures B1 to B7).

To select relevant photos, a cumulative historical precipitation departure graph was developed using annual total precipitation values (rain and snow) for the nearest weather stations(s) over the time period available (Alberta Agriculture and Forestry 2020). The deviation from average total precipitation for each year was calculated by subtracting the historical precipitation average from the yearly precipitation value. The cumulative deviation from historical precipitation average was calculated by adding the deviation from the current year to the previous year's cumulative value(s). The resulting cumulative precipitation departure graph is presented in Appendix B, Figure B8.

Photographs were selected to target years with within all phases of wetting and drying periods and to favour adequate aerial coverage and quality.

Table 1 Historical Aerial Photographs and Climate Data

Aerial Photo Date	Photo ID (Roll AS, Line and Photo)	Scale	Season	Precipitation		
				Year Type[1]	Annual Total (mm)[2]	Cumulative Deviation from Average (mm)
1949	AS-0151 5208 222	1:40,000	Not available	Not available	Not available	Not available
1962	AS-0823 5210 47	1:31,680	Spring	End of drying period	425	-519
14 Jun 1974	AS-1452 2 301	1:24,000	Spring	In a wetting period	537	-152
Jul 1982	AS-2584 12 119	1:30,000	Fall	In a wetting period	590	200
1998	AS-4970 24 127	1:30,000	Summer	End of a wetting period	526	837
3 Jun 2009	AS-5469 17E 174	1:20,000	Spring	In a drying period	351	446
2019	N/A	N/A	N/A	End of most recent drying period	400	14

Notes:
[1] Drying or wetting period interpreted from the cumulative precipitation departure graph (Figure B8)
[2] Alberta Agriculture and Forestry (2020)

2.2 Biophysical and Wetland Assessment Elements

To identify and evaluate natural features within the Plan Area that should be considered during future development planning, a desktop review of the biophysical environment was conducted at various scales. Biophysical elements within the Plan Area that were specifically reviewed included:

- Climate
- Bedrock and Surficial Geology
- Topography and Drainage
- Landform and Soils
- Vegetation
- Hydrology and Wetlands
- Fish and Wildlife

Initially, the digital boundary of the proposed Plan Area was overlain in ArcGIS onto recent (2019) aerial imagery and historical aerial photographs and a classification system was adapted and applied to create a comprehensive land unit map. Vegetation and land units within the Plan Area were derived and described from the following sources:

- Wheatly and Bentz (2002) for uplands
- Government of Alberta (2015) for wetlands
- Alberta Environmental Protection (2005) for agricultural, industrial and settled lands

Additional information on vegetation structure, wetland boundaries and general land use observations were made while mapping using 0.3 m resolution colour orthophoto imagery (2019) and historic aerial photographs (see Section 2.1).

Secondly, several publicly available digital data sets and databases that overlapped the Plan Area were searched and a review was conducted on all existing biophysical information. The following sources were used in the review:

- *Aerial Photographic Record System* (GOA 2021b)
- *Natural Regions and Subregions of Alberta* (Natural Regions Committee [NRC] 2006)
- *Physiographic Subdivisions of Alberta* (Agriculture Canada 1986)
- *Surficial Geology of The Rocky Mountain House Map Area and Associated Map Sheet 83B* (Alberta Energy Regulator [AER] 2020)
- *Agricultural Regions of Alberta Soil Inventory Database (AGRASID)* (GOA 2021c)
- *Alberta Conservation and Information Management System* (ACIMS) database (Alberta Environment and Parks [AEP] 2021a)
- *Alberta Wetland Rapid Evaluation Tool (ABWRET) - Estimate of Relative Wetland Value by Section* (GOA 2021d)
- *Alberta Merged Wetland Inventory* (GOA 2021e)
- Lacombe County Website – clubroot occurrences and weeds of concern in the county (Lacombe County 2021b, c)

- *Hydrologic Unit Code Watersheds of Alberta* (AEP 2019)
- *Red Deer Regional Plan - Groundwater Vulnerability* (AEP 2011)
- *Fisheries and Wildlife Management Information System* (FWMIS) (AEP 2021b)

Additionally, the *Landscape Analysis Tool* (LAT) *Viewer* was reviewed to identify landscape features and sensitivities (GOA 2021a). General slope classes were extrapolated from 5 metre (m) interval contours across the Plan Area.

3 RESULTS

3.1 Historical Aerial Photographs

Historical imagery and the cumulative precipitation departure graph are presented in Appendix B. A summary of the Plan Area as identified in the historical photograph review is presented in Table 2 below.

Overall, cultivated land uses have remained dominant within the Plan Area since 1949. Wetlands within the Plan Area have remained proportionally consistent, between 0.3 and 1.5 percent (%) of total extent since 1949, with minor changes reflective of variations in climatic conditions. Industrial land uses were introduced within the last 10 to 15 years (since 2009).

Table 2 Summary of Historical Aerial Photograph Review

Year of Aerial Photograph	Comments
1949	The Town of Bentley and rail line are present. Land use is predominantly cultivated, with small proportion of wetland (approximately 1.3% of total Plan Area). Residence(s) established in SE 23-040-01-W5M.
1962	At end of a drying period, a marginal decrease in proportion of wetland (approximately 0.3% of total Plan Area) is observed.
1974	During wetting period, a marginal increase in proportion of wetland (approximately 0.7% of total Plan Area) is observed.
1982	During wetting period, very minor increase in proportion of wetland relative to 1974 (approximately 0.8% of total Plan Area) is observed.
1998	At end of a wetting period, very minor increase in proportion of wetland relative to 1974 and 1984 (approximately 0.9% of total Plan Area). Land is still primarily agriculture (cultivated lands) based.
2009	During drying period, very minor increase in proportion of wetland relative to 1974, 1984 and 1998 (approximately 1.0% of total Plan Area). Additional farm residence(s) established in SE 23-040-01-W5M.
2019	Additional industrial land uses within the Plan Area now include: Highway 12, fire hall, communications infrastructure, reservoir/storm ponds and a well site (approximately 9.3% of total Plan Area). Relative decrease in proportion of cultivated lands observed, with similar proportions of wetland relative to 1974, 1984, 1998 and 2009 (approximately 1.5% of total Plan Area).

3.2 Biophysical and Wetland Assessment Elements

3.2.1 Climate

The Plan Area is situated within the Central Parkland Natural Subregion of the Parkland Natural Region of Alberta (NRC 2006). The climate of this subregion is characterized by a mean annual temperature of 2.3 degrees Celsius (^{o}C), with an average summer temperature of 16.5 ^{o}C, and an average winter temperature of -14.7 ^{o}C (NRC 2006). The mean annual precipitation is 441 millimetres (mm), with approximately two-thirds falling as rain during the growing season.

3.2.2 Bedrock and Surficial Geology

The Plan Area falls within the Interior Plains Physiographic Division of Canada dominated by sandstone, shale and coal Tertiary bedrock geology (Agriculture Canada 1986). The physiography of the Plan Area is further subdivided into the Western Alberta Plains (G) Region, Olds Plain (G2) Section, and Medicine River Plain (G2.2) District (Agriculture Canada 1986). The surficial geology within this district is composed mainly of undulating morainal (till) material, with substantial inclusions of glaciolacustrine veneers and blankets

overlying undulating till or, in some areas, glaciofluvial materials (Agriculture Canada 1986). This ground moraine of the Paskapoo Formation is typically clayey to sandy and generally thin (AER 2020).

3.2.3 Topography and Drainage

Slopes are level to gentle (0 to 9%) within the Plan Area (Figure A2) with level to undulating surface expression. The Plan Area ranges in elevation from 897 m in the southwest corner to 944 m in the northeast corner, with surface drainage along this general gradient (Figure A3). As such, the general aspect of the entire Plan Area is southwest with minor variability expected in Slope Class 4 (6 to 9%).

The only notable culverts observed on aerial photography occur in NW 23-040-01-W5M crossing under Highway 12 to the southwest as part of the Town's stormwater management system.

3.2.4 Landform and Soils

The central and eastern portions of the Plan Area is primarily situated on an undulating, high relief landform with moderately fine textured (sandy clay loam, clay loam and silty clay) till. Soils are predominantly well drained Orthic Dark Gray Chernozems of the Markerville soil series found in mid-slope positions (GOA 2021c). Secondary soils in this area are also well drained, but classified as Dark Gray Luvisols of the Benalto soil series found in upper slope positions (MKV1/U1h; Figure A4).

An inclined and undulating, low relief landform is described within the southwest corner of the Plan Area with moderately fine textured to medium (loam, silt loam and very fine sandy loam) textured till (GOA 2021c). Soils are predominantly well drained Eluviated Black Chernozems belonging to the Cygnet soil series in mid slope positions with secondary soils classified as Orthic Black Chernozems belonging to the Lonepine and Penhold soil series on mid to lower slopes, respectively (CYG1/IUI; Figure A4).

Landform and soils within the Town of Bentley are disturbed (ZDL1/DL; Figure A4).

3.2.5 Vegetation

The Central Parkland Natural Subregion is a transition area between the northern boreal and southern grasslands in Alberta. It is one of the most diverse subregions within the province, created from a landscape consisting of different vegetation communities from a mixture of grassland, mixed deciduous and mature aspen forests, wetlands, shrublands, and pioneer communities (GOA 2013). Much of the subregion is under cultivation (NRC 2006) and very few remnants of native vegetation remain (GOA 2013).

As noted, the Plan Area is dominated by disturbance (agricultural, industrial and settled lands), which accounts for roughly 96% of the area (Appendix C). Natural vegetation is limited to upland woodlands and windrows that are tied to the Aspen Woodland Alliance of Wheatly and Bentz (2002), composed primarily of aspen, but can contain balsam poplar and/or spruce. These upland wooded units account for roughly 3% of the Plan Area (Appendix C). Occasionally, temporary (Class II) Graminoid Marsh wetlands dominated by wet meadow vegetation occur within agricultural lands of the Plan Area, as evidenced in historic aerial photographs (Appendix B). These wetlands take on the form of semi-circular potholes and a linear drainage path in the central and southeastern portion of the Plan Area (Appendix C). Where these temporary wetlands meet the woodland windrow between the southern two quarters of the Plan Area, Deciduous Woodland Swamps are noted (Appendix C). Collectively, all wetland land units account for just over 1% of the Plan Area. Proportions and descriptions of all land units mapped within the Plan Area are found in Appendix C.

A search of Alberta Conservation Information Management System (ACIMS) records did not identify any known occurrences of rare or sensitive species or communities within the Plan Area (AEP 2021a) (Figure A5). Protected areas or crown reservations/notations were also not found (Figure A5).

A search of the Lacombe County website showed no evidence of clubroot within the Project Area between 2008 and 2016; however, there are confirmed cases to the north and east (Figure A6) (Lacombe County 2021b). Prohibited Noxious weed species in Lacombe County include spotted knapweed (*Centaurea stoebe* ssp. *micranthos*) and Himalayan balsam (*Impatiens glandulifera*) (Lacombe County 2021c). Noxious weed species of concern in Lacombe County include creeping [Canada] thistle (*Cirsium arvense*), common tansy (*Tanacetum vulgare*), field scabious (*Knautia arvensis*), leafy spurge (*Euphorbia esula*), perennial sow thistle (*Sonchus arvensis*), tall buttercup (*Ranunculus acris*), white cockle (*Silene latifolia*), and common [yellow] toadflax (*Linaria vulgaris*). In September 2019, Lacombe County Council passed Bylaw 1299/19 that elevated sea buckthorn (*Hippophae rhamnoides*) to a local Noxious weed within the county (Lacombe County 2021c).

3.2.6 Hydrology and Wetlands

The Plan Area is located within the South Saskatchewan River Basin and the Red Deer River Watershed (AEP 2019). Other than the Town's stormwater management system / reservoir located in NW 23-040-01-W5M, no open waterbodies or channels have been identified within the Plan Area from historical aerial photographs or provincial hydrology layers (Altalis 2021). The nearest major drainage system is the Blindman River situated west of the Plan Area (Figure A1).

A review of groundwater vulnerability (AEP 2011) indicates the potential of Medium risk to shallow groundwater quality by the potential impacts of land-based activities across the Plan Area. This ranking is an approximate, relative risk of contamination to shallow groundwater on a regional scale based on the concept of potential time of travel as a contaminant moves from the ground surface into an underlying, relatively shallow water bearing formation. Rankings are higher (greater sensitivity) for faster travel times in coarser materials (AEP 2011).

Review of the Alberta Merged Wetland Inventory (AMWI) revealed several potential marsh wetlands around the outside perimeter of the Plan Area along with a single potential marsh wetland in the northeast corner of SW 23-040-01-W5M (Figure A7) (GOA 2021e). This single wetland was later mapped as one of several potential temporary marsh (Class II) wetlands in the central and southeastern portions of the Plan Area after review of historic aerial photographs (Appendices B and C). Because these marsh wetlands are temporary in nature, they are typically flooded every year for a short period of time after snowmelt or heavy rainfall, but otherwise lack surface water, and are affected long enough by the water table to promote the formation of water-altered soils and a dominance of water tolerant vegetation during parts of the growing season (GOA 2015). In drier years these temporary wetlands may be cultivated, making them difficult to see in aerial photography.

Results of the ABWRET-E estimate of relative wetland value for Section 23-040-01-W5M (GOA 2021a) suggests there is approximately 1 hectare (ha) of wetland within this section with the lowest relative wetland value of "D" (Figure A8).

The Crown's ownership claim to a wetland is limited to wetlands which are permanent, naturally occurring bodies of water (AEP 2014). Due to the lack of permanent open water wetland types within the Plan Area, the likelihood of the Crown claiming ownership of these wetlands is low.

3.2.7 Fish and Wildlife

Overall, the Plan Area presents a relatively low proportion of potential wildlife habitat, such as wetlands (approximately 1% of current Plan Area) and upland woodlands (approximately 3% of current Plan Area).

A review of the *Fisheries and Wildlife Management Information System* (FWMIS) for the plan area and 1 kilometre (km) buffer was conducted and identified no known fish or wildlife inventory (Alberta Environment and Parks 2021a) (Figure A9). The nearest inventories available are over 2 km away, in or near the Blindman River (Figure A9). However, based on results of the LAT Report, the Plan Area intersects a sensitive raptor range as well as a sharp-tailed grouse survey area (GOA 2021a).

4 RECOMMENDATIONS

The following outlines recommended mitigation, monitoring and additional studies (if applicable) within the Plan Area for key environmental features evaluated for the biophysical and wetland assessment.

4.1 Soils, Hydrology and Vegetation

Most of the proposed Plan Area occurs on well drained, moderately fine to medium textured till in level to undulating landforms. Construction and operation activities should minimize soil erosion potential and sediment runoff, soil compaction, disruption to drainage patterns, and the spread of undesirable species. Specific mitigations include:

- Establish and maintain erosion and sediment control measures around the construction area to prevent excess sediment runoff from entering wetland communities on or off site.
- Vegetation cover should be maintained where possible to avoid potential soil erosion.
- Strip topsoil (to the depth of colour change) and make sure topsoil and subsoil stockpiles are separated (at least 1 m between topsoil and subsoil piles).
- Avoid working in wet conditions or implement appropriate matting to minimize rutting or compaction to soils.
- Properly install and maintain culverts during construction and operation activities to preserve existing drainage patterns.
- Monitor any potential surface water discharge regularly to prevent an excess of sediment loading and soil erosion to any sensitive or low-lying areas (i.e., wetlands) on and off site.
- Groundwater vulnerability maps cannot be used as the sole source of information related to the location of new activities that may impact shallow groundwater quality (AEP 2011). Site-specific groundwater knowledge should be collected to confirm geological and groundwater conditions to help with specific mitigation measures during construction and operations activities.
- Make sure all equipment is cleaned prior to arriving on site to mitigate the spread of undesirable species along with any potential clubroot spores from adjacent lands.
- Use an approved and certified seed mix to re-seed any disturbed areas during construction. The seed mix certificate should be reviewed for any noxious weeds prior to purchase.
- Monitor and control Prohibited Noxious and Noxious weeds as per the *Alberta Weed Control Act* (Government of Alberta 2008) to prevent spread into adjacent croplands or wetlands.
- Where practical, reclaimed areas should be planted with native vegetation appropriate for the site and subregion.

4.2 Sensitive Bird Species and Habitat

Tree clearing in select areas that will alter the remaining native habitat within the Plan Area may be required. Specific mitigations include:

- Clearing should be done outside of the migratory bird breeding season (April to September) and, where feasible, wildlife trees suitable for habitat in woody areas of the Plan Area should be retained.

- If any vegetation clearing activities are planned within the breeding bird season, a nest search is recommended to reduce the potential of disturbance to protected species; however, a stick or platform nest survey for raptors should be conducted regardless of tree clearing schedule.
- For the sharp-tailed grouse, it is recommended that a lek survey be completed during the breeding season (April to September). Consultation with AEP is recommended prior to any development of mitigation activities to develop a specific plan around these sensitive species and their habitat requirements as guidelines and requirements may differ between private and public lands.

4.3 Wetlands

Although wetlands account for a very small proportion of the Plan Area, limited to occasional temporary wetlands and woodland swamps within agricultural lands, they are affected by the Alberta Wetland Policy. Specific recommendations include:

- The applicable regulatory authorities for the identified wetlands should be contacted and the appropriate documentation submitted for approval prior to any disturbance or removal of these features (e.g., *Water Act*) prior to development within the Plan Area.
- As part of the *Water Act* approval application, a Wetland Assessment and Impact Report (WAIR) will need to be completed by a qualified authenticating professional that has signing authority as outlined in the Alberta Wetland Policy directives and guidelines.
    - The WAIR includes a desktop summary of information surrounding the subject wetlands (completed as part of this assessment) as well as a field component to assess wetland function that must be completed during the growing season (May to September).
- The deciduous woodland swamp wetlands identified within the southern windrow should be field verified, along with the other temporary (Class II) graminoid marsh wetlands noted in the Plan Area. Other marsh wetlands observed from aerial photography are adjacent to/outside of the Plan Area and should remain unaffected by any development activities within the Plan Area given mitigation measures described above.

Only after field verification and boundary delineation of these wetlands have been confirmed within the Plan Area can a decision be made on whether to avoid wetlands entirely, minimize negative impacts to these wetlands, or replace lost wetland area and value through compensation following the *Alberta Wetland Mitigation Directive* (GOA 2018). A wetland mitigation and replacement plan is included as part of the WAIR and compensation may be required for wetlands that cannot be avoided.

5 CLOSING

We trust the contents of this report meet your requirements. Please do not hesitate to contact the undersigned at vfutoransky@paragonsoil.com or (780) 434-0400 should you have any questions or require further assistance.

Report prepared by:

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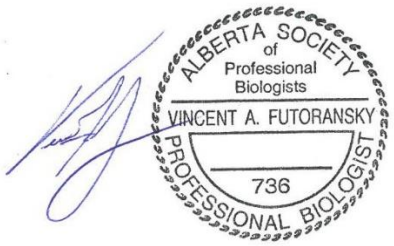

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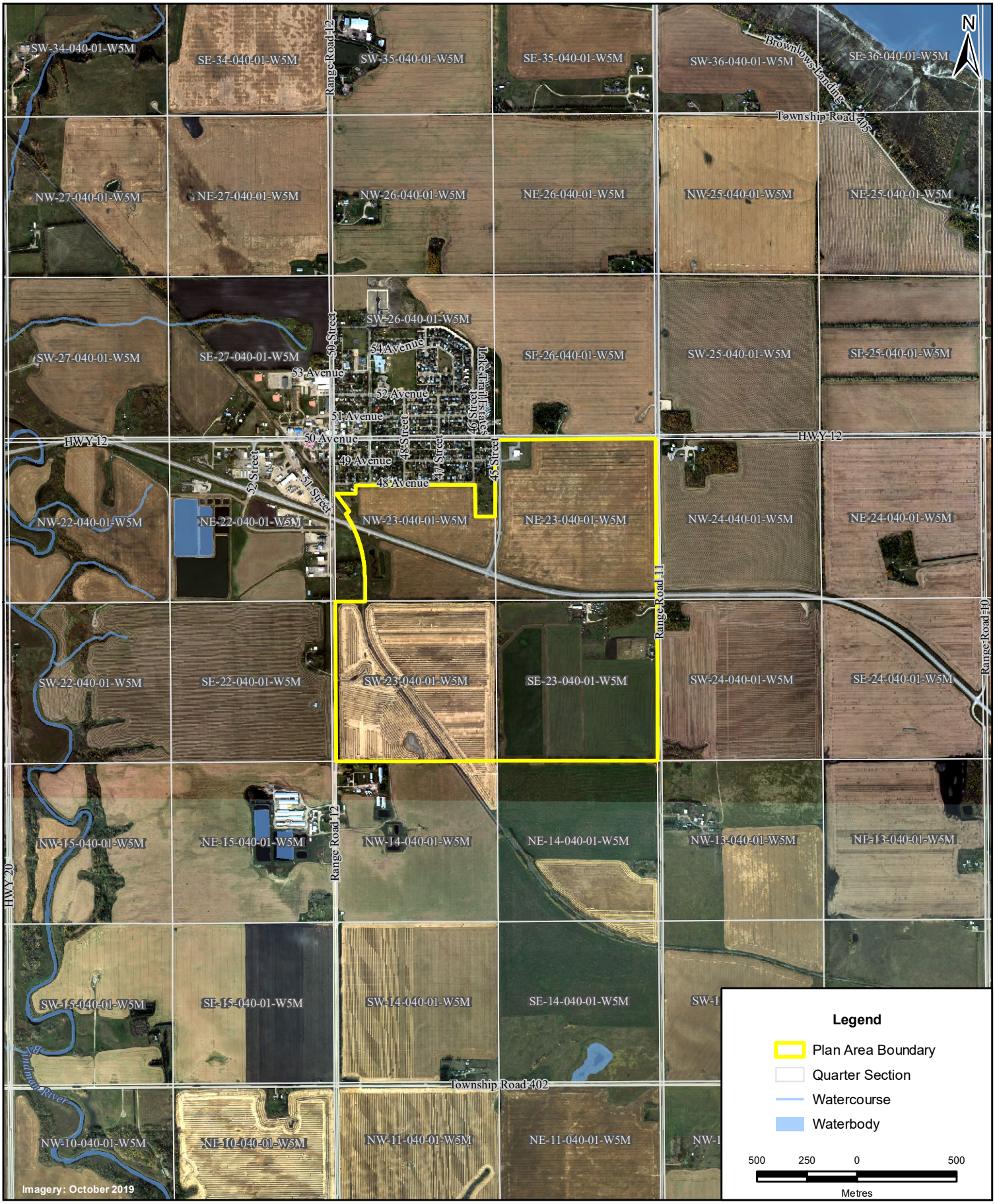
Appendix A Figures



PARAGON
soil and environmental consulting inc.

Paragon Map No. 21098-211020-01

Projection:	Scale:	
UTM 11N NAD83	1:25,000	
	Drawn: SD	Approved: VF

Figure A1
Plan Area Location

Town Of Bentley

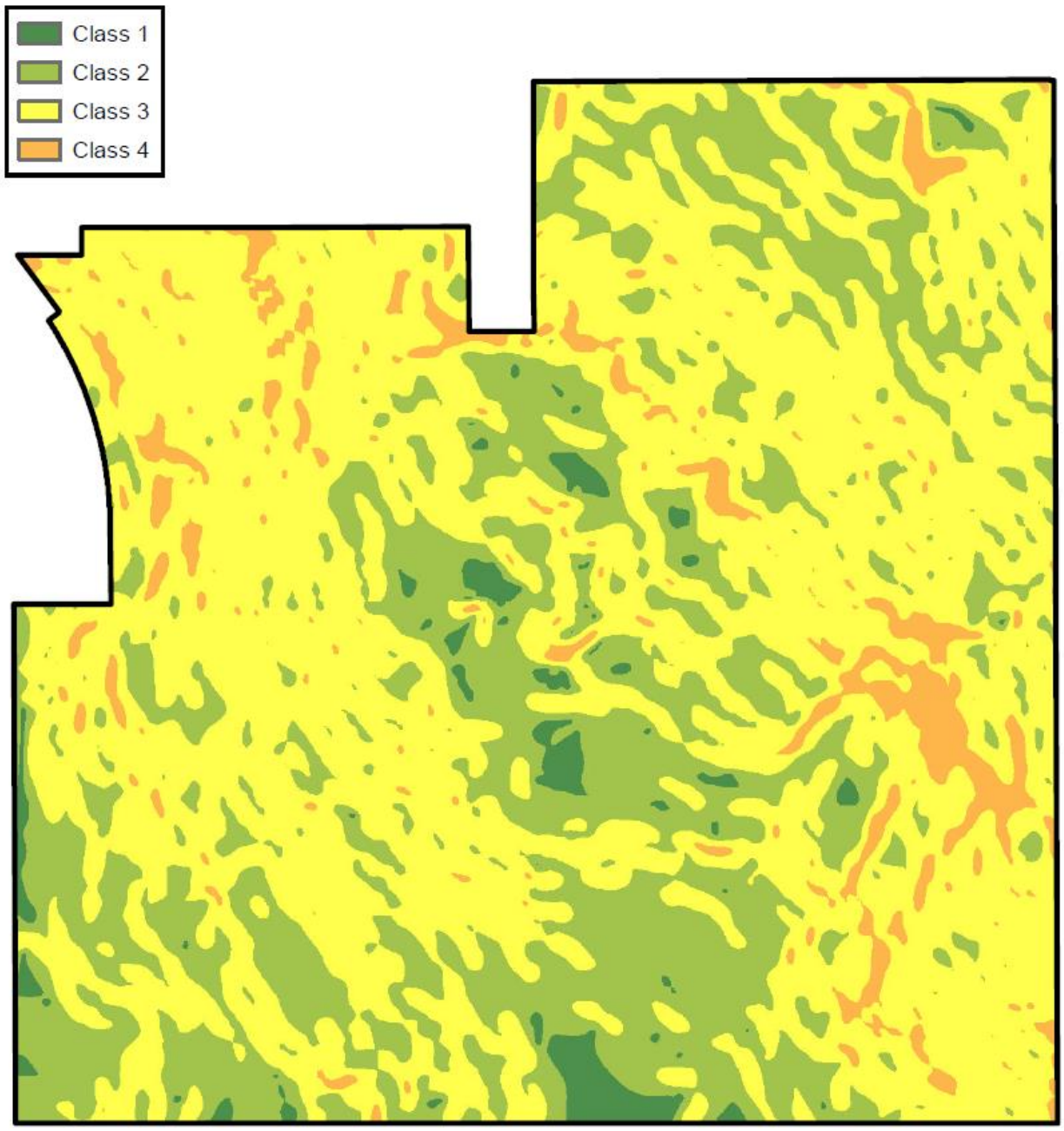


Figure A2 Slope Gradient Classes within the Plan Area

Class 1 = level (0 to 0.5%) slope; Class 2 = nearly level (0.5 to <2%) slope; Class 3 = very gentle (2 to 5%) slope; Class 4 = gentle (6 to 9%) slope.

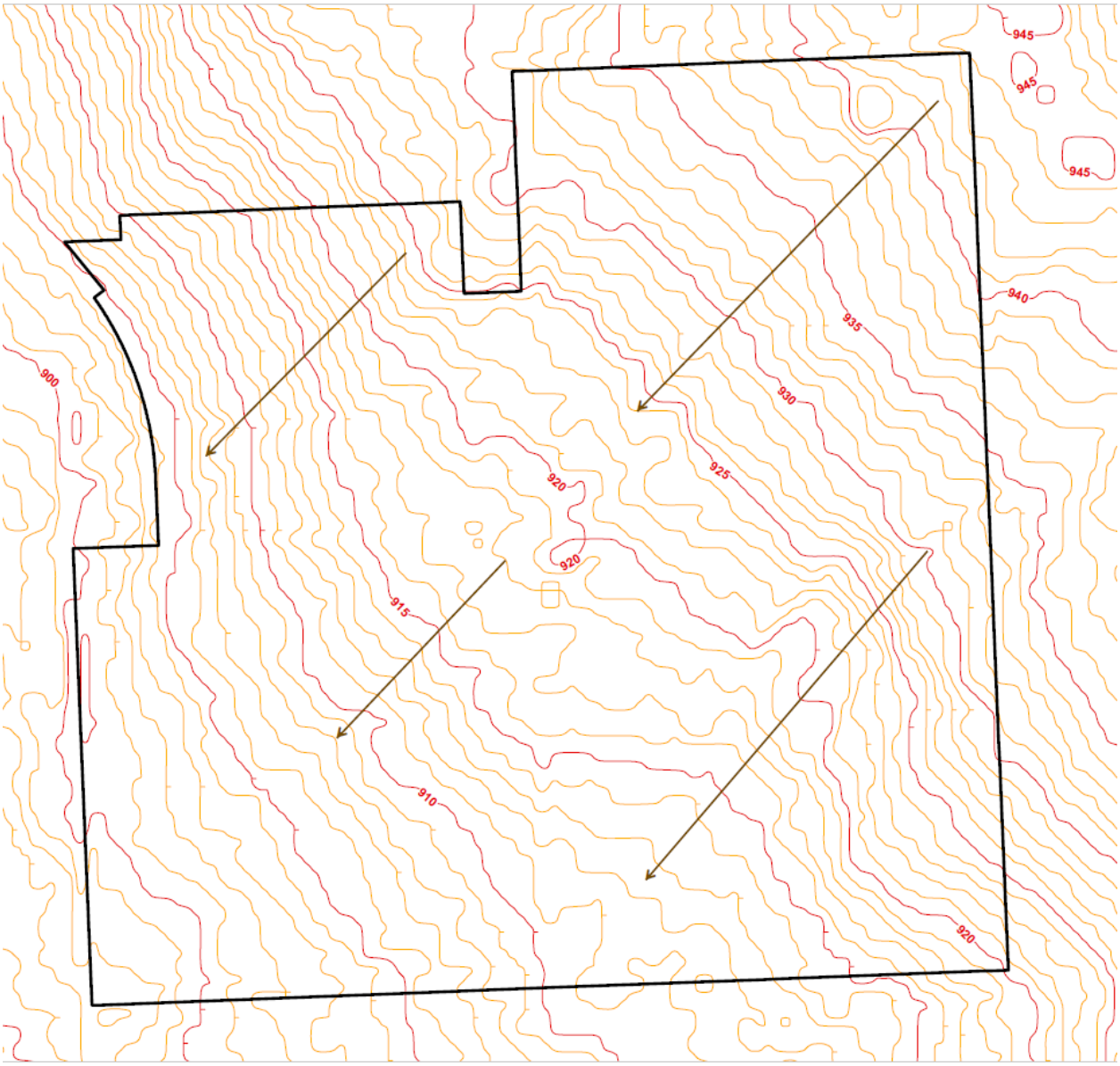


Figure A3 Contours and General Site Drainage within the Plan Area

Black line = Plan Area; red lines = 5 m contour intervals; orange lines 1 m contour intervals; brown arrows = general site drainage direction.

Figure A4 Agricultural Regions of Alberta Soil Inventory Database (AGRASID) within the Plan Area

Source: GOA 2021c.

Date: 14/10/2021
Requestor: Consultant
Reason for Request: Element Occurrence Search
SEC: 23 **TWP:** 040 **RGE:** 01 **MER:** 5

Alberta Parks

Non-sensitive EOs (updated: October 2017)

M_RR_TTT_SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Non-sensitive EOs Found: Next Steps - See FAQ (https://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/faqs.aspx#2 - Process)

Sensitive EOs (updated: October 2017)

M-RR-TTT	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Sensitive EOs Found: Next Steps - See FAQ (https://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/faqs.aspx#2 - Process)

Protected Areas (updated: October 2017)

M-RR-TTT-SS	PROTECTED_AREA_NAME	TYPE	IUCN

No Protected Areas Found

Crown Reservations/Notations (updated: October 2017)

M-RR-TTT-SS	NAME	TYPE

No Crown Reservations/Notations Found

Updated: Dec 11, 2019

Figure A5 Alberta Conservation Information Management System (ACIMS) Results

Source: AEP 2021a.

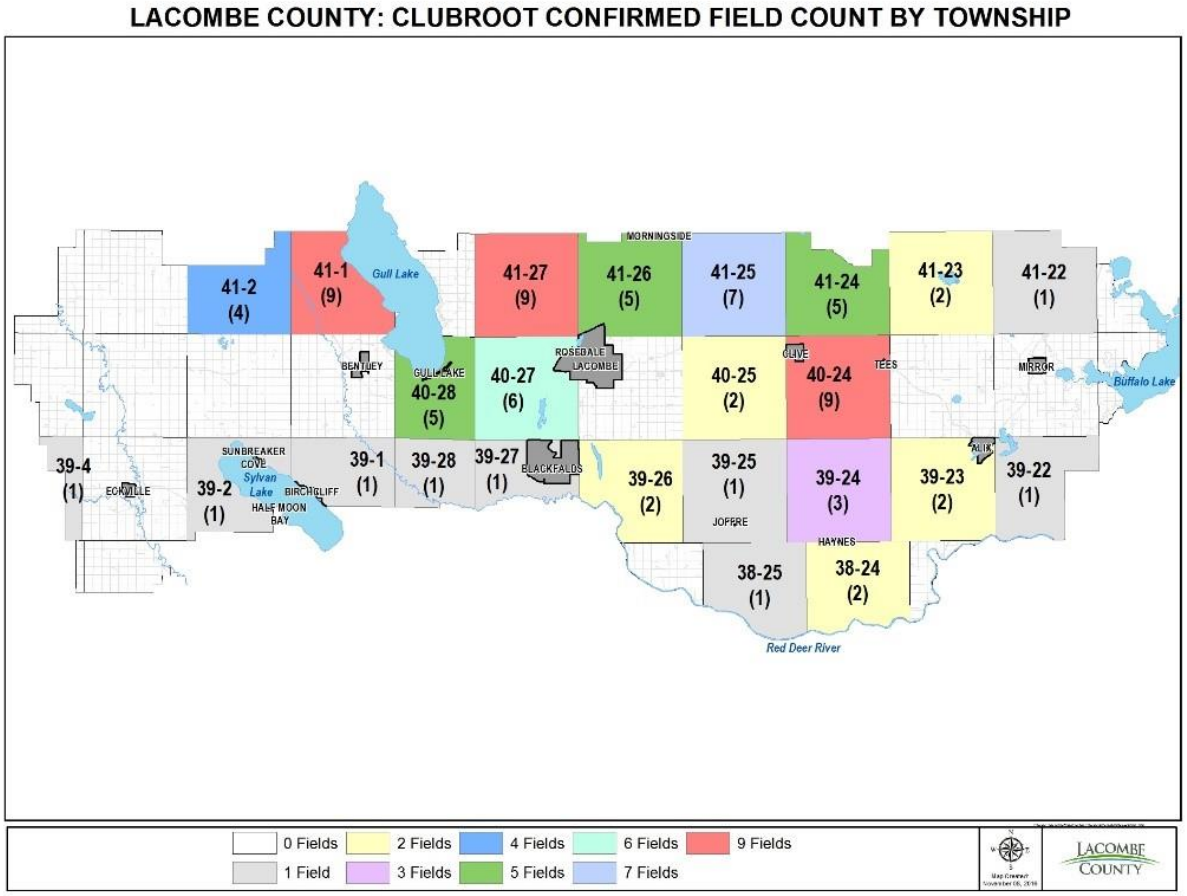


Figure A6 Confirmed Clubroot Cases in Lacombe County (2008-2016)

Source: Lacombe County 2021b.

Figure A7 Alberta Merged Wetland Inventory (AMWI) within and surrounding the Plan Area

Source: Government of Alberta 2021e.

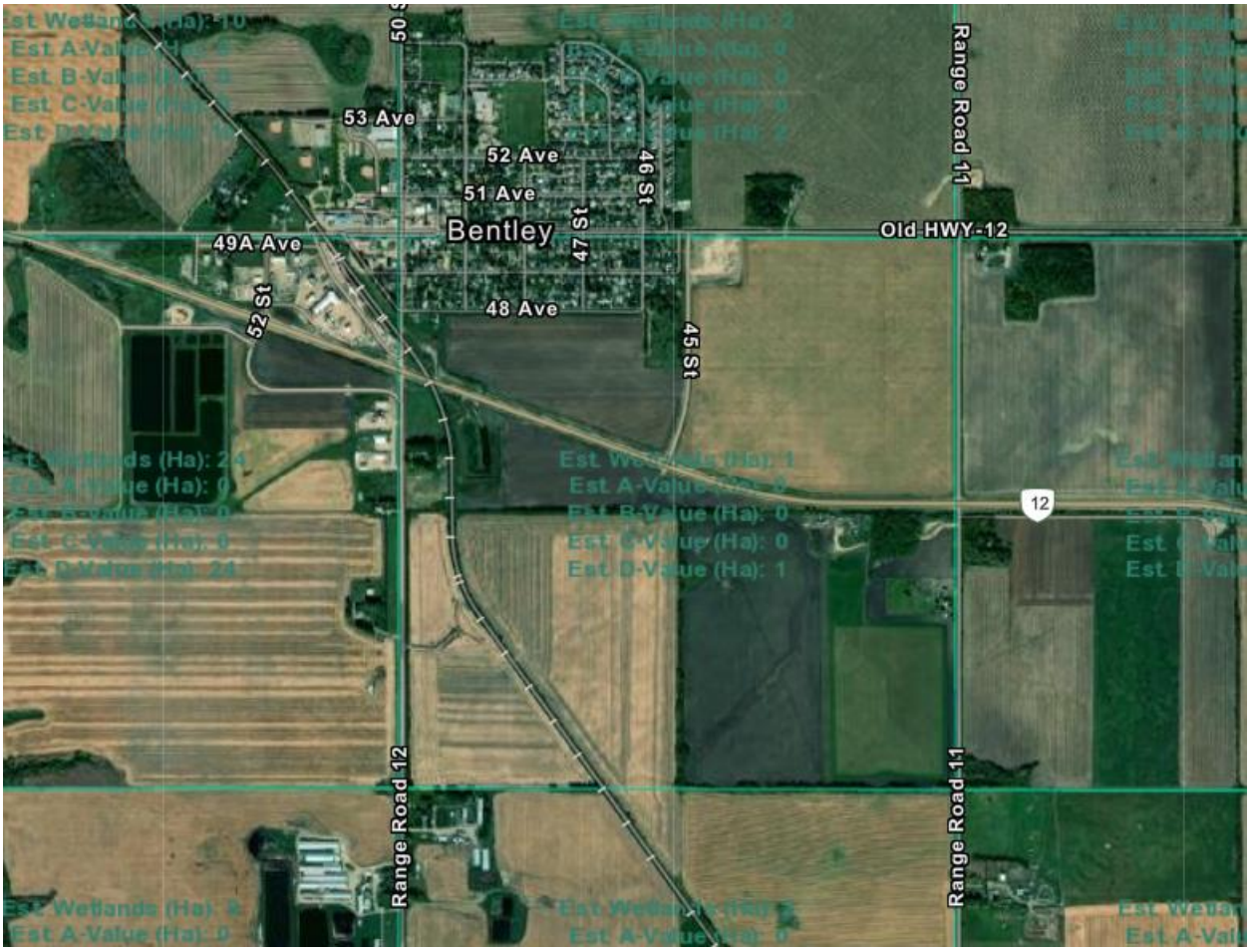


Figure A8 Estimated Relative Wetland Value Map (ABWRET-E)

Source: Government of Alberta 2021d.

Alberta Environment and Parks

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Date: 13-Oct-2021 16:58

Species present within the current extent

Fish Inventory	Wildlife Inventory	Stocked Inventory
No Species Found in Search Extent	No Species Found in Search Extent	No Species Found in Search Extent

Buffer Extent

Centroid (X,Y)	Projection	Centroid (Qtr Sec Twp Rng Mer)	Radius or Dimensions
565338, 5810065	10-TM AEP Forest	NW 23 40 1 5	1682, 1629 meters

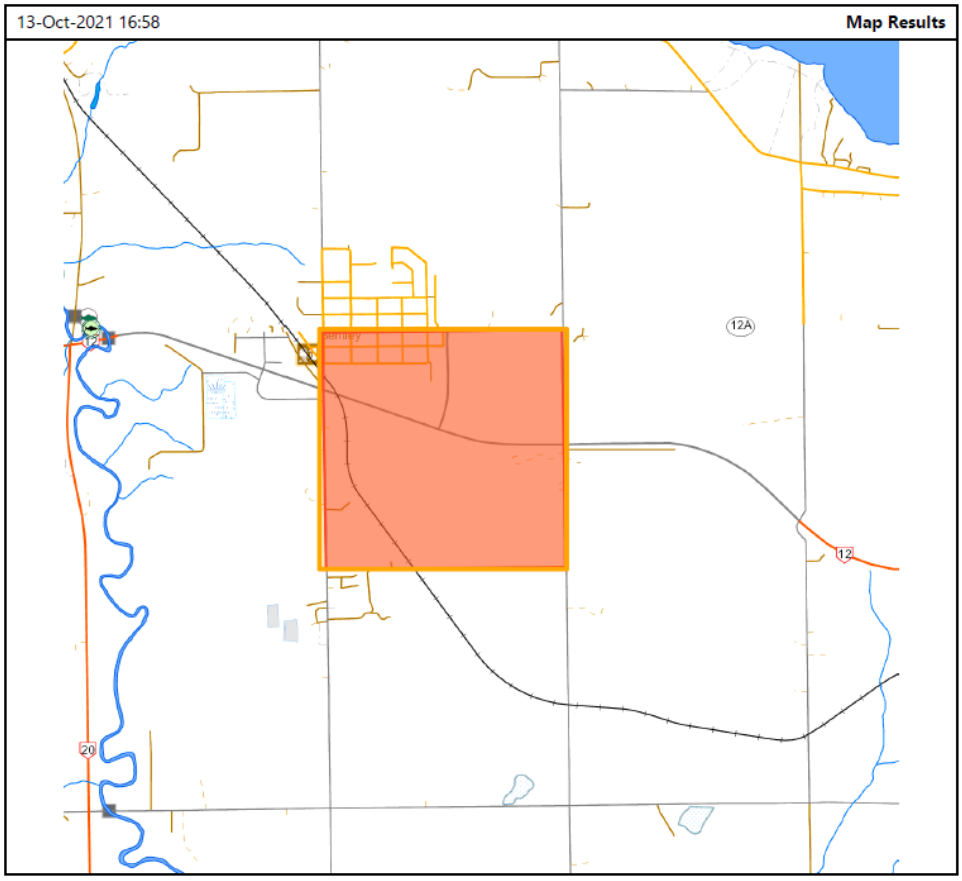


Figure A9 Fish and Wildlife Information Management System (FWIMS) Results

Source: AEP 2021b.

Appendix B Historic Aerial Photographs

Figure B1 Plan Area with 1949 Imagery

Source: GOA 2021b.

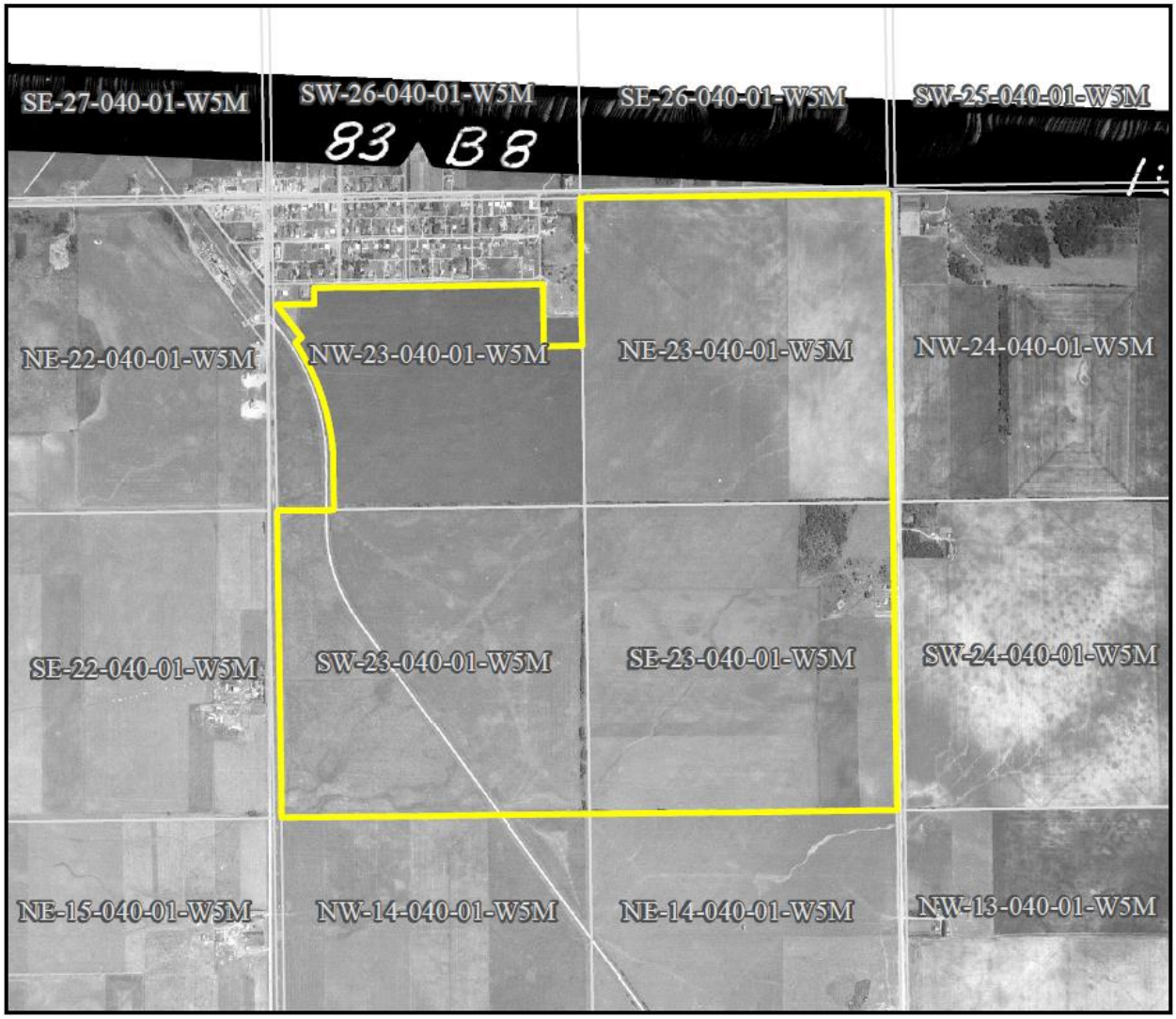


Figure B2 Plan Area with 1962 Imagery

Source: GOA 2021b.

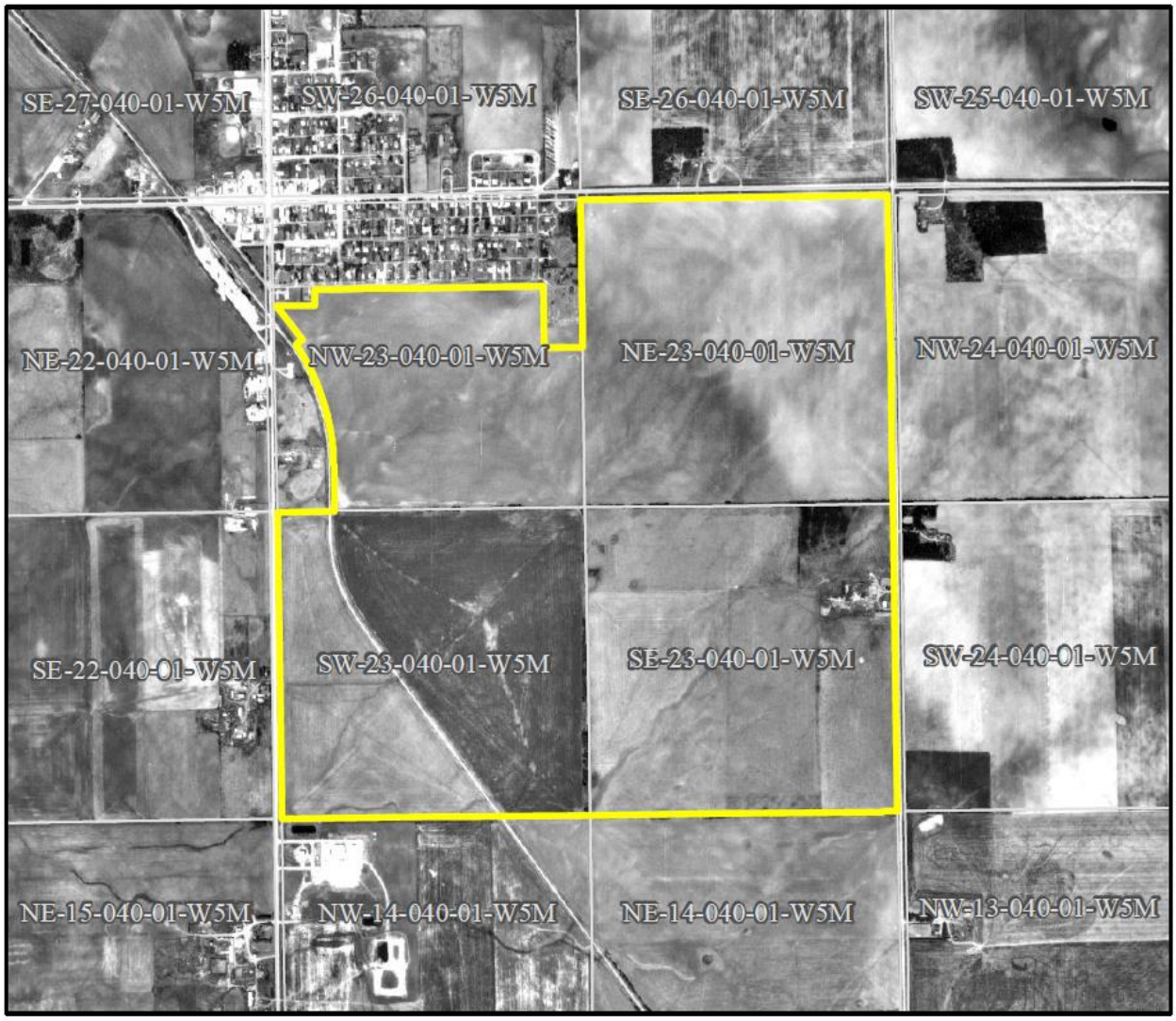


Figure B3 Plan Area with 1974 Imagery

Source: GOA 2021b.

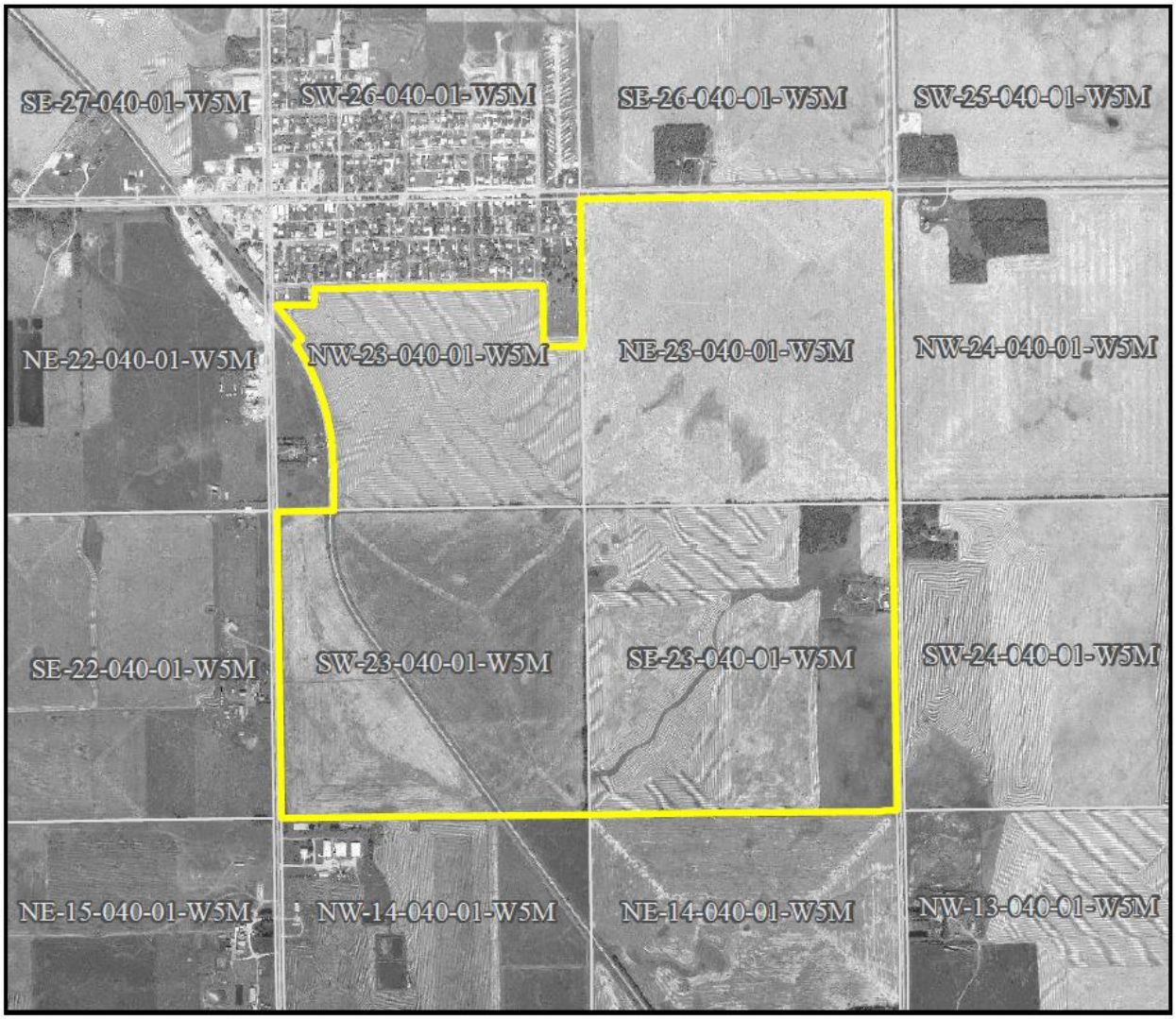


Figure B4 Plan Area with 1982 Imagery

Source: GOA 2021b.

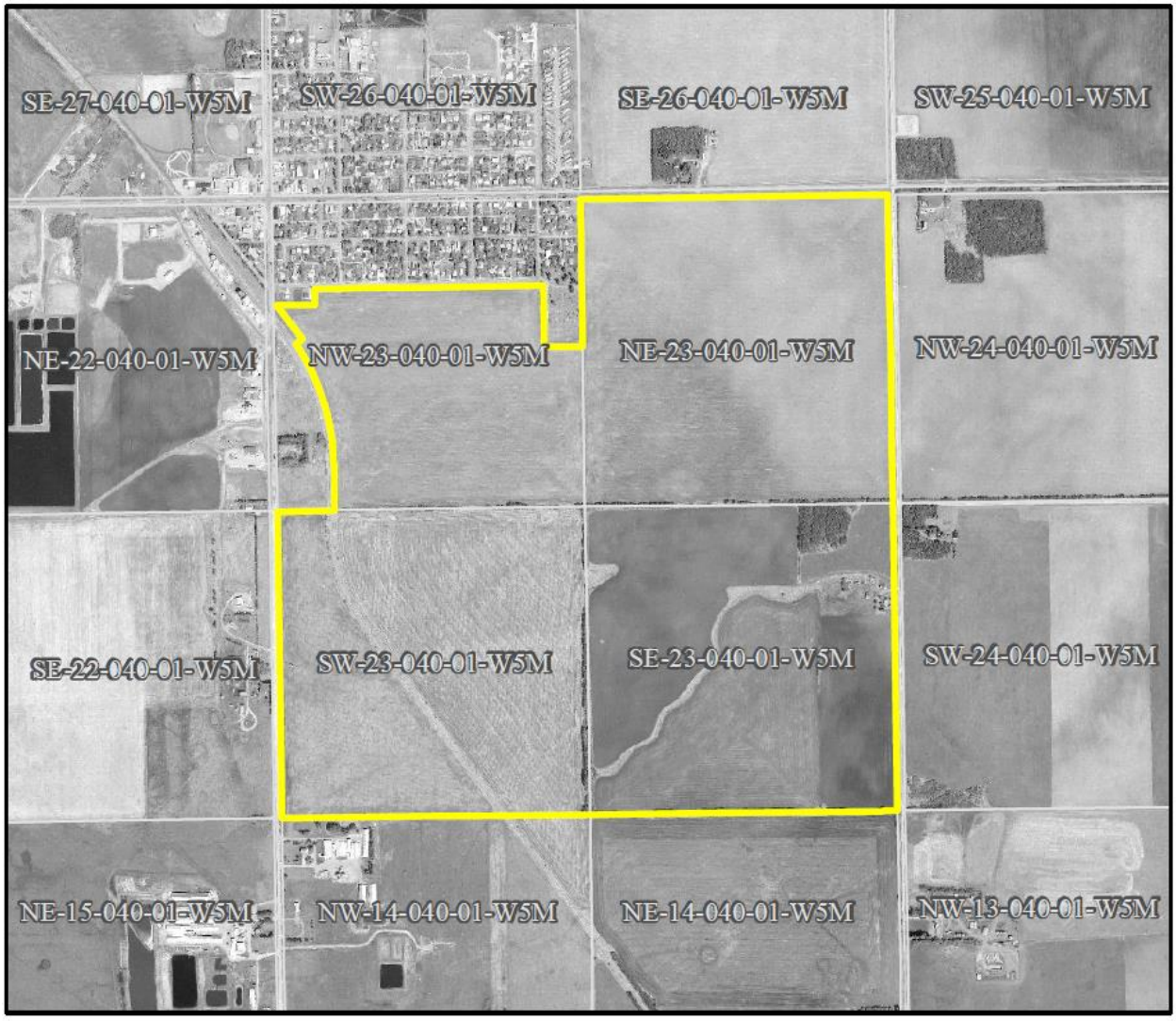


Figure B5 Plan Area with 1998 Imagery

Source: GOA 2021b.

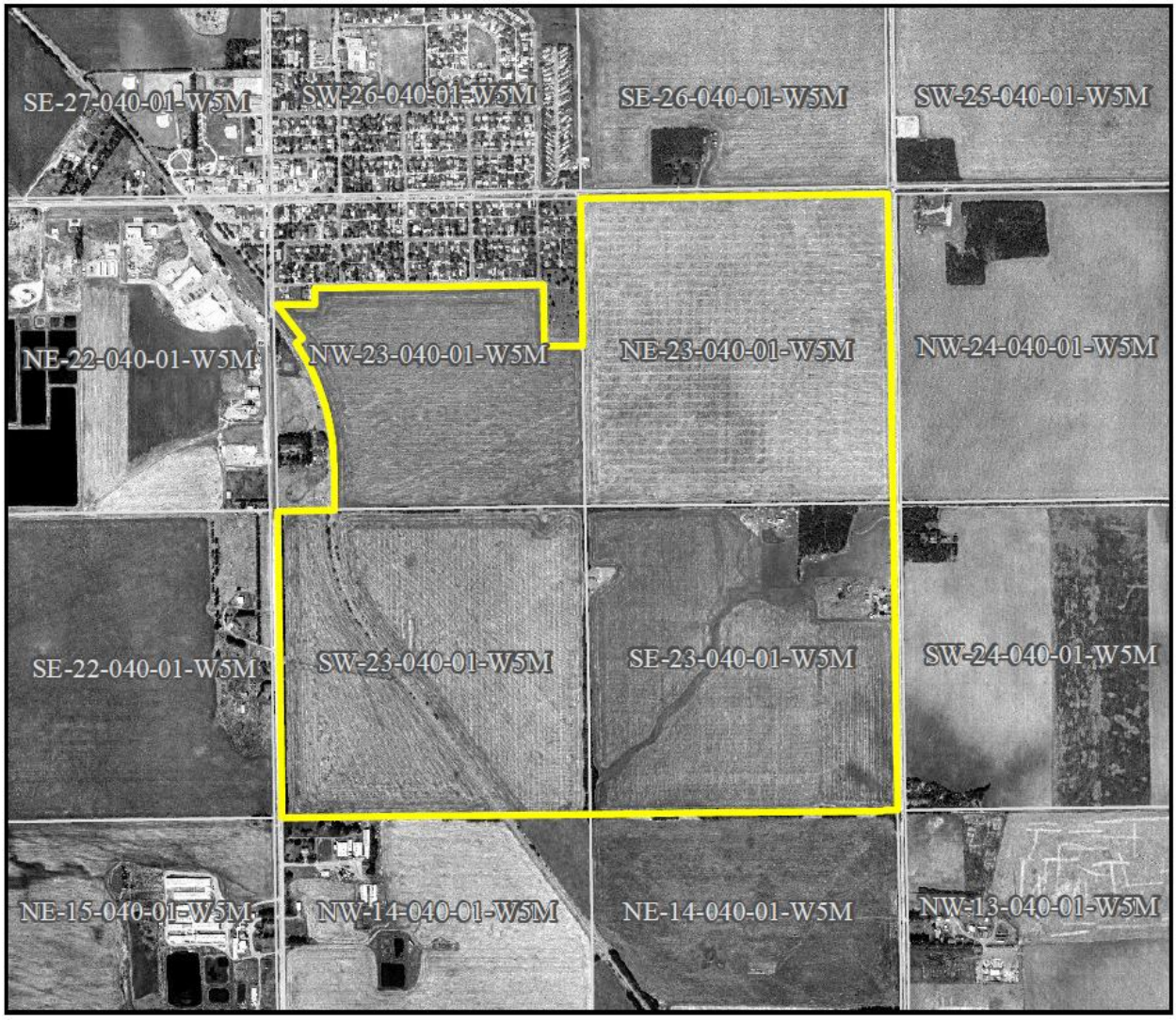


Figure B6 Plan Area with 2009 Imagery

Source: GOA 2021b.

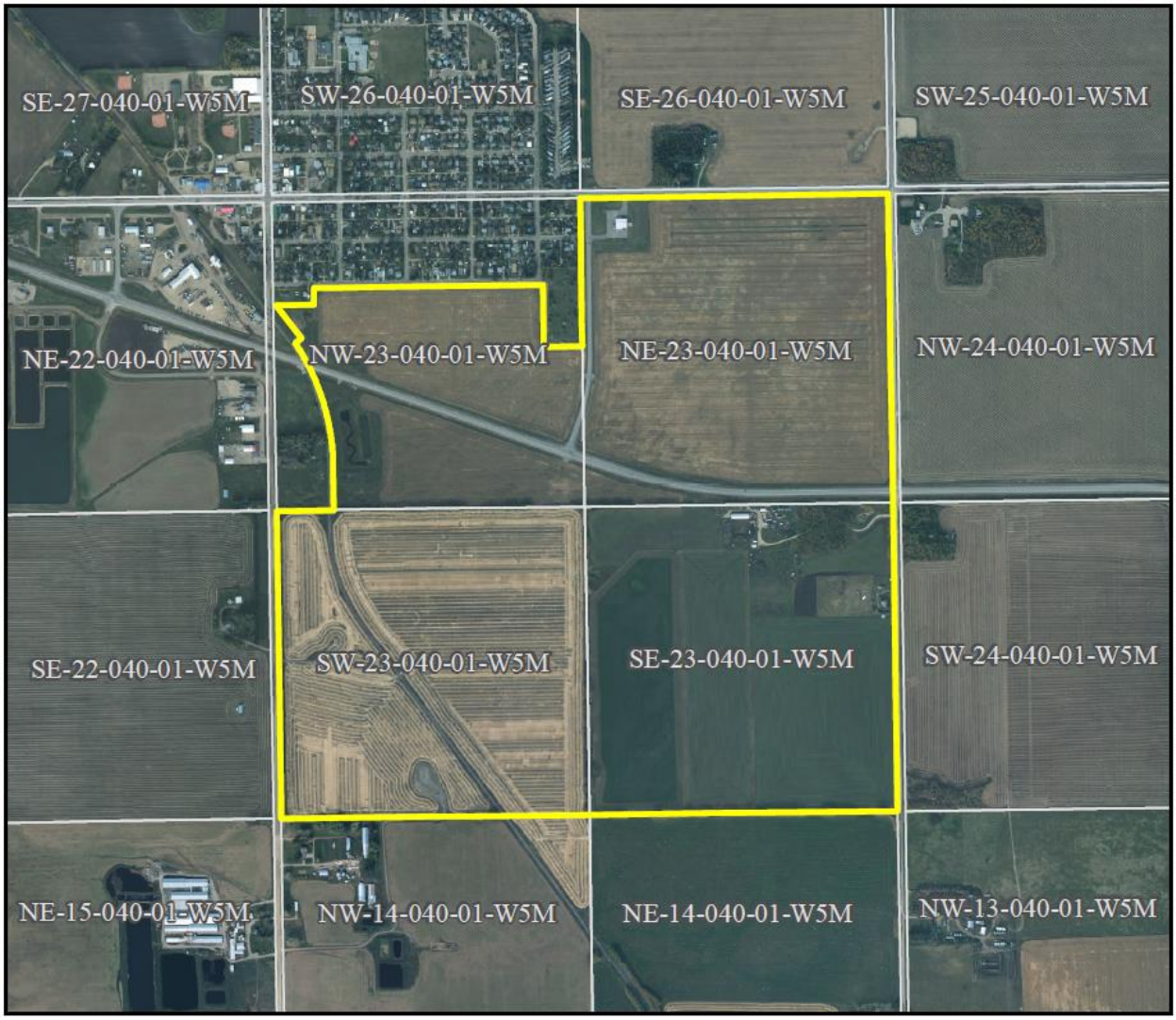


Figure B7 Plan Area with 2019 Imagery

Source: Orthophoto imagery (2019) provided by Lacombe County, source unknown.

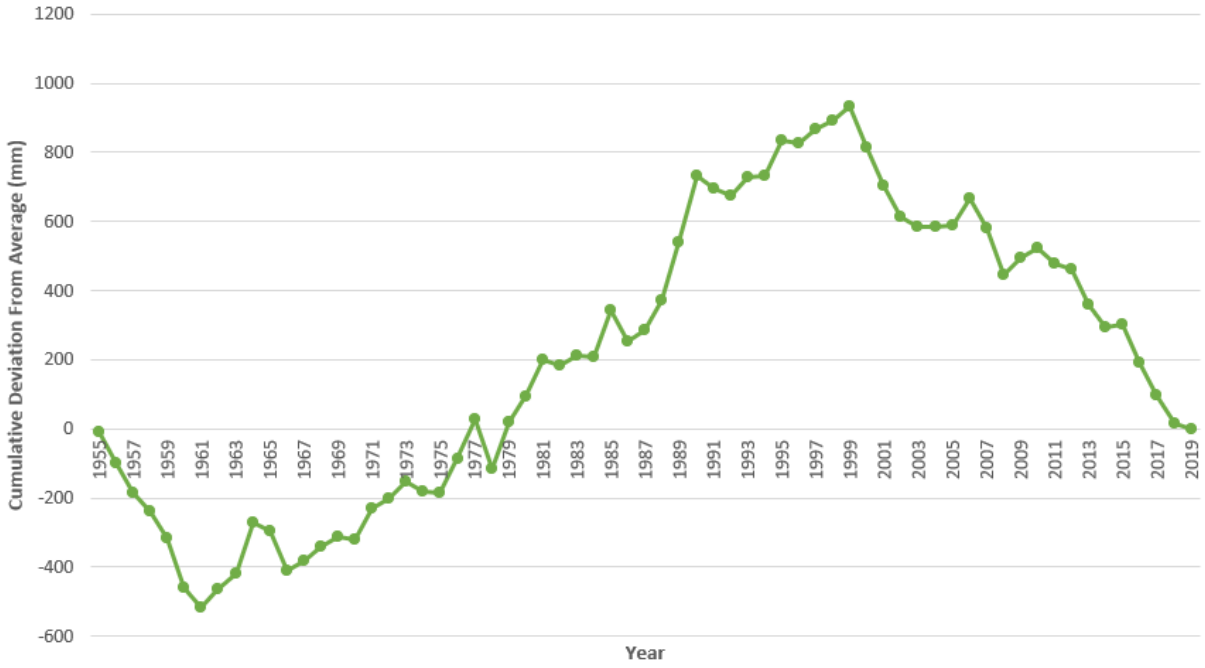


Figure B8 Cumulative Precipitation Departure Graph for T040 R01 W5M (1955-2019)

Source: Alberta Agriculture and Forestry 2020

Appendix C Land Units within the Plan Area

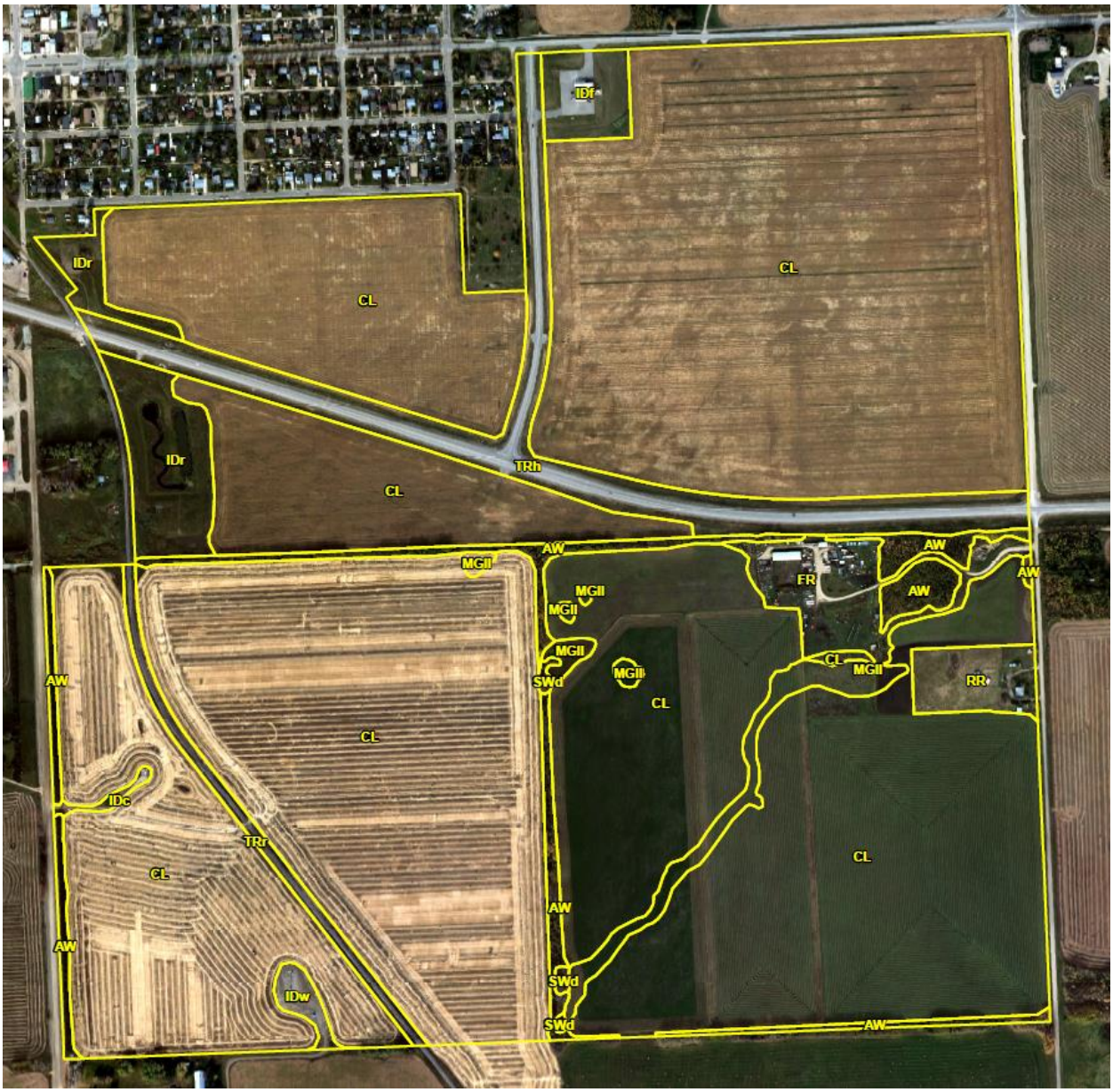


Figure C1 Land Units Mapped within the Plan Area

See Table C1 below for mapping legend.

Table C1 Land Units Mapped within the Plan Area

Land Unit	Map Code	Proportion (%) of Plan Area	Description
Uplands			
Aspen Woodland Alliance	AW	3	This woodland unit is composed primarily of aspen, but may have minor components of balsam poplar and/or spruce trees. It is found on sites that are not typically wet (ranging from submesic to subhygric in moisture regime) on well to moderately well drained soils. Narrow features, such as windrows, are included within this woodland unit.
Wetlands			
Graminoid Marsh (Class II)	MGII	1	This is a mineral wetland defined by water permanence. It includes temporary (Class II) wetlands dominated by wet meadow vegetation (grasses, sedges, and/or herbs) in the deepest part of the wetland basin. Invasive species may be present, as well as other species that prefer moist conditions.
Deciduous Woodland Swamp	SWd	<1	This wetland woodland unit has a deciduous-dominated canopy that is typically mixed with balsam poplar and aspen. Occasionally paper birch and/or spruce can be present in the canopy with open patches dominated by willow or dogwood. It is often found in lower slope positions, along wet margins of other wetlands, or in depressional areas where soil moisture is typically hygric in moisture regime on imperfectly to poorly drained soils.
Agricultural Lands			
Cultivated Land	CL	84	This land unit includes all cultivated areas used for agronomic, annual crops (such as barley, wheat or oats) and hayfields used for bailing or silage.
Farmsteads	FR	2	This land unit includes mid- to large-scale farms and general areas devoted to agricultural use, like granaries, barns and livestock pens. These areas may or may not be used as residences.
Industrial Lands			
Highways and Roads	TRh	5	These land units include all transportation corridors, including highways and roads (TRh) and rail lines (TRr) that may or may not be vegetated. Areas cleared and/or maintained in association with these rights-of-way are included.
Rail Lines	TRr	1	
Reservoir/Storm Pond	IDr	2	These land units include all general industrial and/or anthropogenic development areas, including well sites (IDw), communication towers (IDc), reservoir/storm drainage ponds (IDr), and the Town Fire Hall (IDf). These areas are typically include road access and may or may not be vegetated.
Fire Hall	IDf	1	
Well Sites	IDw	<1	
Communications	IDc	<1	
Settled Lands			
Rural Residential	RR	1	This land unit includes all settled areas outside of the Town site, such as acreages and/or small farms. These lands typically include mowed areas, planted trees, gardens and small pasture areas for animals.
Note: Proportions may not add up to 100% due to rounding.			