



Bremner Agricultural Impact Assessment

April 2019

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1.0 Executive Summary

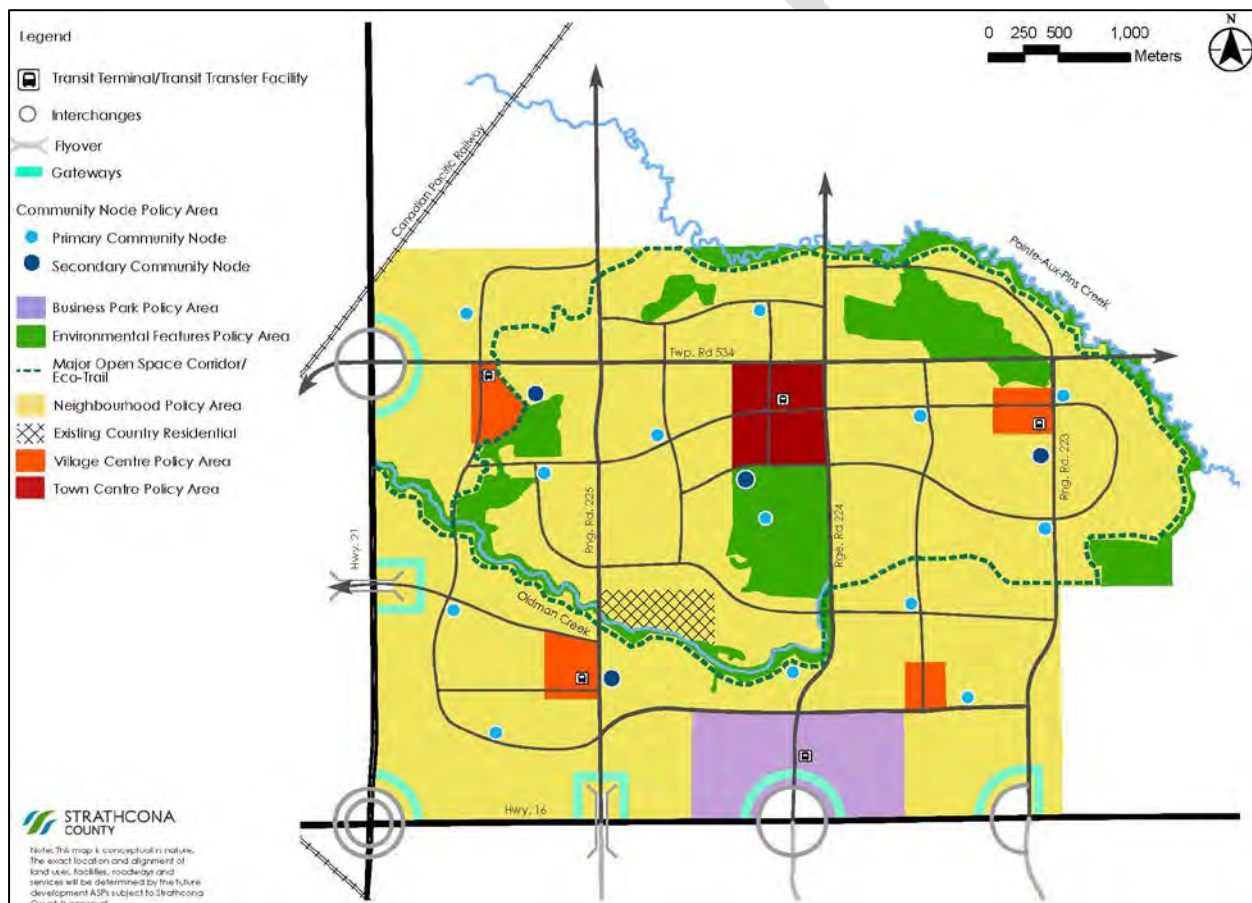
The Bremner Urban Reserve, herein referred to as Bremner, is expected to accommodate a complete community. The area is being planned with the following principles in mind.

- Protect and Enhance the Natural Environment
- Maintain and Support Agriculture
- Reinforce and Diversify the Economy
- Accommodate a Diversity of Housing
- Provide Transportation Options for Everyday Travel
- Create Strong, Distinctive and Safe Neighbourhoods
- Establish a Hierarchy of Mixed-use Places
- Provide a Full Range of Recreational and Cultural Amenities

It is expected that Bremner will take about 40 years to develop. A Bremner Development Phase Plan is provided in Appendix A along with a Land Development Forecast in Appendix B.

Figure 1, from the Bremner Area Concept Plan, illustrates the Bremner Development Concept.

Figure 1: Bremner Development Concept



Source: Bremner and LEA Area Concept Plan, Final Draft, Bylaw 3-2019, April 2019.

Bremner is expected to accommodate around 80,000 people. Activities such as building transportation networks, installing services like gas, electricity, storm, water and

wastewater and stripping and grading land for urban development will result in the loss of agricultural land in the Bremner Area Concept Plan Boundary observed in Figure 2 below.

Figure 2: Bremner Area Concept Plan Boundary



2.0 Planning and Context

Bremner was first identified as a potential location for urban development within the 1998 MDP. The 1998 MDP directed that a study be undertaken to evaluate the feasibility of four future urban study areas for long-term urban growth. The Future Urban Areas Feasibility Study was completed in 2001. The study evaluated the four potential areas located in the west half of the County, between Leduc County and Fort Saskatchewan and recommended future Urban Area 2 and a 3-4 hybrid for further study.

The 2001 study was followed by an Evaluation of Urban Growth Options Report (2003) that evaluated three areas identified as Options A, B, and C. The report recommended Option A due, in part, to its lower class of agricultural land and access to infrastructure.

With some boundary revisions, the hybrid option from The Future Urban Areas Feasibility Study (2001), also known as Option B from the Urban Growth Options Report (2003),

became the Urban Reserve in the 2007 MDP. In addition, the 2007 MDP identified a Rural/Urban Transition Policy Area, previously identified as Urban Area 2 from The Future Urban Areas Feasibility Study (2001) and Option A from the Urban Growth Options Report (2003). By this time, the Urban Reserve was commonly referred to as Bremner and the Rural/Urban Transition Policy Area was commonly referred to as Colchester. The 2007 MDP required both areas to conduct growth management strategies prior to more detailed planning being completed.

In 2009, the Capital Region Growth Plan was created, which identified both Bremner and Colchester as Priority Growth Areas for future urban development. Amendments were made to the County's MDP to reflect the Capital Region Growth Plan and identify both areas for future urban growth. In 2012, Council initiated the Bremner Growth Management Strategy which was completed in 2014. A growth management strategy for Colchester was subsequently completed in 2016. Following the completion of the two growth management strategies, in 2016 a Comparison Matrix was generated which compared and evaluated the results of both strategies. Upon reviewing the Comparison Matrix, Strathcona County Council endorsed the Growth Management Strategy for Bremner and amendments were approved to the MDP confirming the Bremner area lands south of Pointe-Aux-Pins Creek for urban development.

In 2017, Strathcona County adopted a new MDP which continued to identify the 2,679 hectare (6,620 acres) Bremner Urban Reserve Policy Area for future urban growth, whereas Colchester was re-designated as a rural policy area. The boundaries of Bremner being south of Pointe-Aux-Pins Creek reflect the results from the Bremner Growth Management Strategy (2014) and the Metropolitan Area of the Edmonton Metropolitan Region Growth Plan, which replaced the Capital Region Growth Plan in 2017. During development of the Bremner Area Concept Plan, Bremner was further reduced to 2,118 ha (5,234 acres) as shown in Figure 2 above.

2.1 Applicable Planning Policies and Regulations

2.1.1 Modernized Municipal Government Act

The Modernized Municipal Government Act (MMGA) is responsible for providing the operational framework and governance model for all forms of local government in Alberta, including specialized municipalities. It also lays the basis for how municipalities operate, how their councils function and how residents work with their municipality. The MMGA has three main areas of focus:

1. Governance and Administration;
2. Planning and Development; and
3. Assessment and Taxation.

The MMGA enables municipalities to govern the development of lands within their boundaries in a manner that is logical, timely, economical and environmentally responsible. The MMGA requires that municipalities with a population more than 3,500 adopt a Municipal Development Plan. Strathcona County's MDP provides a comprehensive long term land use policy framework that guides present and projected growth and development over the next 20 years and beyond.

2.1.2 Edmonton Metropolitan Region Growth Plan (2017)

The Edmonton Metropolitan Region (EMR) Growth Plan approved in 2017 provides a thirty year plan and a fifty year vision for the region's growth and development. The population of

the Edmonton Metropolitan Region is expected to double to 2.2 million by 2044; the growth plan addresses this population increase using the following guiding principles:

1. *Collaborate and coordinate as a Region to manage growth responsibly;*
2. *Promote global economic competitiveness and regional prosperity;*
3. *Recognize and celebrate the diversity of communities and promote an excellent quality of life across the Region;*
4. *Achieve compact growth that optimizes infrastructure investment;*
5. *Ensure effective regional mobility;*
6. *Ensure the wise management of prime agricultural resources; and*
7. *Protect natural living systems and environmental assets.*

In 2017, a new policy area addressing agriculture was added to the EMR growth plan. The plan recognizes future food security issues and the economic value of agriculture in the region while laying out three agricultural objectives:

1. Identify and conserve an adequate supply of prime agricultural lands to provide a secure local food source for future generations;
2. Minimize the fragmentation and conversion of prime agricultural lands for non-agricultural uses; and
3. Promote diversification and value-added agriculture production and plan infrastructure to support the agricultural sector and regional food system.

The Edmonton Metropolitan Region Growth Plan was adopted with the following density targets.

Table 1: Plan Greenfield Density, Centres and Intensification Targets

Communities by Tier	Minimum Greenfield Residential Density* (du/nrha)	Aspirational Intensification Target***(% Dwellings to Built-Up Urban Areas)	Aspirational TOD Centres Density Target** (people+jobs/gha)	Aspirational Urban and Sub-regional Centres Density Target** (du/nrha)
Metropolitan Core	n/a	Varies	140-160	n/a
Metropolitan Area	Varies	Varies	Varies	Varies
Edmonton***	45	25%	140-160	n/a
Leduc County (West of QE2 to Whitemud Creek)		n/a		
St. Albert	40	17.5%	n/a	100
Strathcona County (Urban)				
Fort Saskatchewan	35	15%		
Leduc				
Stony Plain		10%		
Beaumont				
Spruce Grove				
Leduc County (balance)		n/a		

Source: Edmonton Metropolitan Region Growth Plan – Re-imagine. Plan. Build (2017).

The plan acknowledged a need for a Regional Agriculture Master Plan that would study and identify specific conservation measures in relation to agricultural lands and industry, this study is currently underway and expected to be complete in the second quarter of 2020.

2.1.3 Strathcona County Municipal Development Plan (2017)

The MDP recognizes the past and future significance of agriculture from cultural and heritage perspectives, as well as its economic importance. Specific goals and policies within the MDP aim to diversify and support agri-business and promote public agriculture in both urban and rural areas.

Section 4.4 of the new MDP is specific to the Bremner Urban Reserve Policy Area and sets the long term development goal:

Bremner will be a complete community that is green, connected and diverse. It will incorporate green infrastructure, open space and urban agriculture into each community and neighbourhood. Communities and neighbourhoods within Bremner will be designed for compact, mixed-use and transit oriented development. The design of communities and neighbourhoods will encourage all residents to utilize active transportation for their daily living by creating a distinct town centre and smaller village centres that will provide residents with a variety of services, amenities, education and employment opportunities in close proximity to where they live.

This section also promotes continuing agricultural operations to continue as long as possible until such time that urban development occurs. Public agriculture, rooftop gardens and urban farms are to be promoted during urban development.

Other policies contained in the Agriculture Large and Small Holdings Policy Areas include ensuring road networks that allows for the safe and timely movement of agricultural equipment and goods in addition to requiring soil conservation and reclamation plans for aggregate extraction operations. Diversifying and supporting small and large agribusiness is also recognized as goals throughout the MDP.

2.1.4 Strathcona County Land Use Bylaw (2015)

The Land Use Bylaw has not yet been updated to reflect Bremner as part of the Urban Service Area. Most of the land in Bremner is currently zoned as Agriculture: General with some smaller areas zoned Recreation, Low Density Country Residential, Rural Residential/Agriculture and Direct Control. Updates to the Land Use Bylaw are expected following the completion of the Bremner Area Concept Plan.

2.1.5 Strathcona County Strategic Plan (2018 Update)

Strathcona County's Strategic Plan outlines how the County's activities align to achieve its vision which includes advancing diverse agricultural business and preserving the County's agricultural heritage. This plan directs long term planning and provides the foundations for Strathcona County's corporate and department business plans, sustainability plans and guides annual budget development.

With respect to agriculture, Strathcona County's goal is to provide critical physical and technology infrastructure to enable and stimulate growth and diversify agricultural business.

The Strategic Plan also recognizes that appropriate and effective use of agricultural land ensures effective stewardship of water, land, air and energy resources.

2.1.6 Strathcona County Agriculture Master Plan (2015)

Strathcona County's Agriculture Master Plan was approved in June 2015. The main goals of the plan were to assess the future of agriculture in the County and to identify strategies and policies that would support this desired future.

Included in the Agriculture Master Plan is a requirement for Agricultural Impact Assessments that inform decision making at all levels of the planning process. The Agricultural Impact Assessment addresses a proposed development's effects on existing and future agricultural activities as well as recommends mitigation measures.

The Agricultural Master Plan recognizes that while there are challenges facing agriculture, there are also numerous opportunities for the industry and that without a strong commitment from all stakeholders these opportunities might not be realized. Four planning principals were developed to guide the Master Plan, they are:

- *Supporting Policies – The long term success of agriculture in a metropolitan context can only be assured with strong supporting and integrated land use, food and agriculture sector development and infrastructure policies;*
- *Agriculture Land Conservation – The conversion or fragmentation of large tracks [of agricultural land] primary or unique agriculture lands to non-agricultural uses to accommodate growth (residential, commercial, industrial) will only be done as a last resort;*
- *Shared Leadership – The advancement of agriculture requires shared leadership including the municipality, residents and stakeholders within Strathcona County, and the Capital Region; and*
- *Proactive Agriculture – Changes in agriculture are both continuous and considerable, requiring dynamic and proactive approach in response to emerging trends and opportunities both urban and rural.*

2.1.7 Strathcona County Urban Agriculture Strategy (2016)

Strathcona County adopted an Urban Agriculture Strategy in 2016. The County's vision for urban agricultural is:

Urban agriculture is easily accessed and seen in Strathcona County; it contributes to creating a healthy, livable community by helping to grow food, relationships, and economy in our community.

The strategy identified several goals to achieve its vision of urban agriculture:

- *Build a sense of community, identity, and place;*
- *Bring people together;*
- *Connect urban and rural communities;*
- *Build food literacy and awareness;*
- *Support local economic development and entrepreneurship;*
- *Expand food production;*
- *Build shared leadership; and*
- *Reflect Strathcona County's natural history.*

To meet these goals, the strategy focuses on building opportunities for community gardens, urban farms, home gardens, urban livestock, school agriculture programs and public agriculture and edible landscapes while providing education and coordination services to the community.

2.2. Biophysical Inventory

2.2.1 Soil Classification

Bremner is located in the Thick Black Soil Zone of Alberta and the dominant soils are Eluviated Black Chernozems and Orthic Dark Gray Chernozems developed on moderately fine till or glaciolacustrine parent materials. Wetland areas are predominantly Gleysols with

the possibility of some Organics; areas adjacent to the creeks contain Gleyed Black Chernozems and miscellaneous Gleysols.

2.2.2 Soil Capability and Land Suitability

The Canadian Land Inventory (CLI) Soil Capability for Agriculture and Canadian Land Suitability Rating System (LSRS) are the two most commonly used systems of agricultural land classification in Alberta. The primary difference between the two systems is that LSRS is crop specific and includes factors like climate and landforms that were not included during the development of the CLI system. Bremner contains primarily Class 1, 2 and 3 soils under the CLI classification system which was developed in 1967. Under the LSRS, created in 1995, the land is classified as mostly as Class 2 and 3. The following is a breakdown of the differences between the CLI Soil Capability for Agriculture and LSRS. The 1995 LSRS includes the soil capability from the 1967 CLI but it is crop specific and takes into account factors like climate and landforms which were not included in the older CLI mapping.

Table 2: CLI and LSRS Comparison

Component	CLI [1969]	LSRS [1995]
general	-capability -11 factors -factors not indexed -7 classes -limitation (specified)	-suitability -17 factors -factors indexed -7 classes -limitation (specified)
climate	-frost-free period -annual precipitation	-growing season -moisture index (P-PE) -energy index (EGDD) -modifiers
soils	-structure -salinity -texture -drainage -depth -erosion -fertility -no organic rating -subjective	-structure -salinity, sodicity -texture -drainage -depth -organic matter -soil reaction -organic rating -specific
landscape	-topography -stoniness -inundation	-slope steepness (gradient) -slope length -stoniness -inundation -pattern
scale	1:250K	1:100K in White Area of AB 1:1M in Green Area of AB

Source: Table provided by Candace Vanin with Agriculture and Agri-food Canada.

2.2.2.1 Canadian Land Inventory Soil Capability for Agriculture (1967)

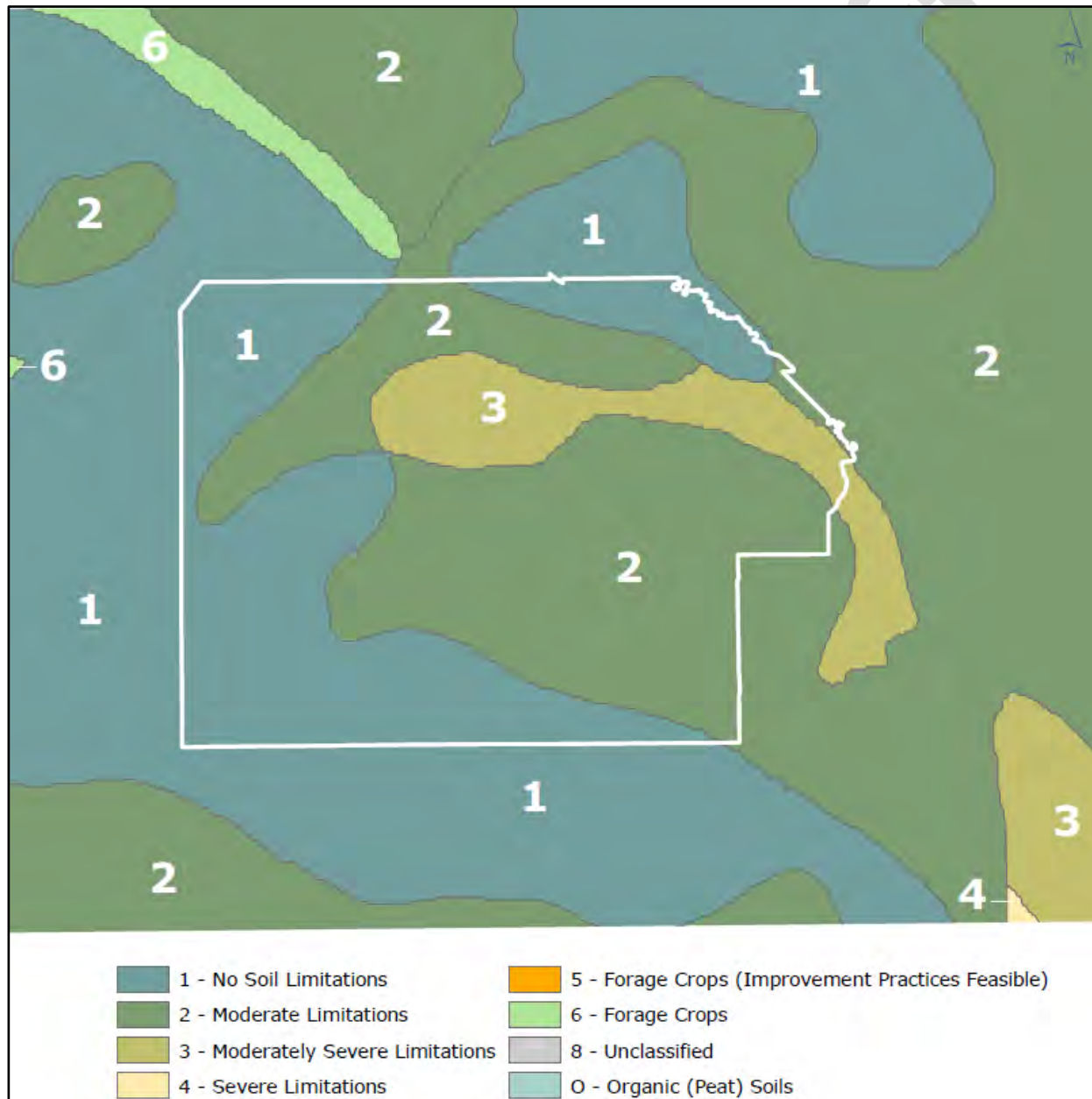
Bremner contains four classes of soils as per the Canada Land Inventory's Soil Capability for Agriculture maps.

- Class 1 - Soils in this class have no significant limitations in use for crops.

- Class 2 - Soils in this class have moderate limitations that reduce the choice of crops, or require moderate conservation practices.
- Class 3 - Soils in this class have moderately severe limitations that reduce the choice of crops or require special conservation practices.
- Class 6 - Soils in this class are unsuited for cultivation, but are capable of use for unimproved permanent pasture.

There is approximately 820 hectares (2,026 acres) of Class 1 soil, 245 hectares (605 acres) of Class 2 soil and 1,050 hectares (2,595 acres) of Class 3 soil within Bremner.

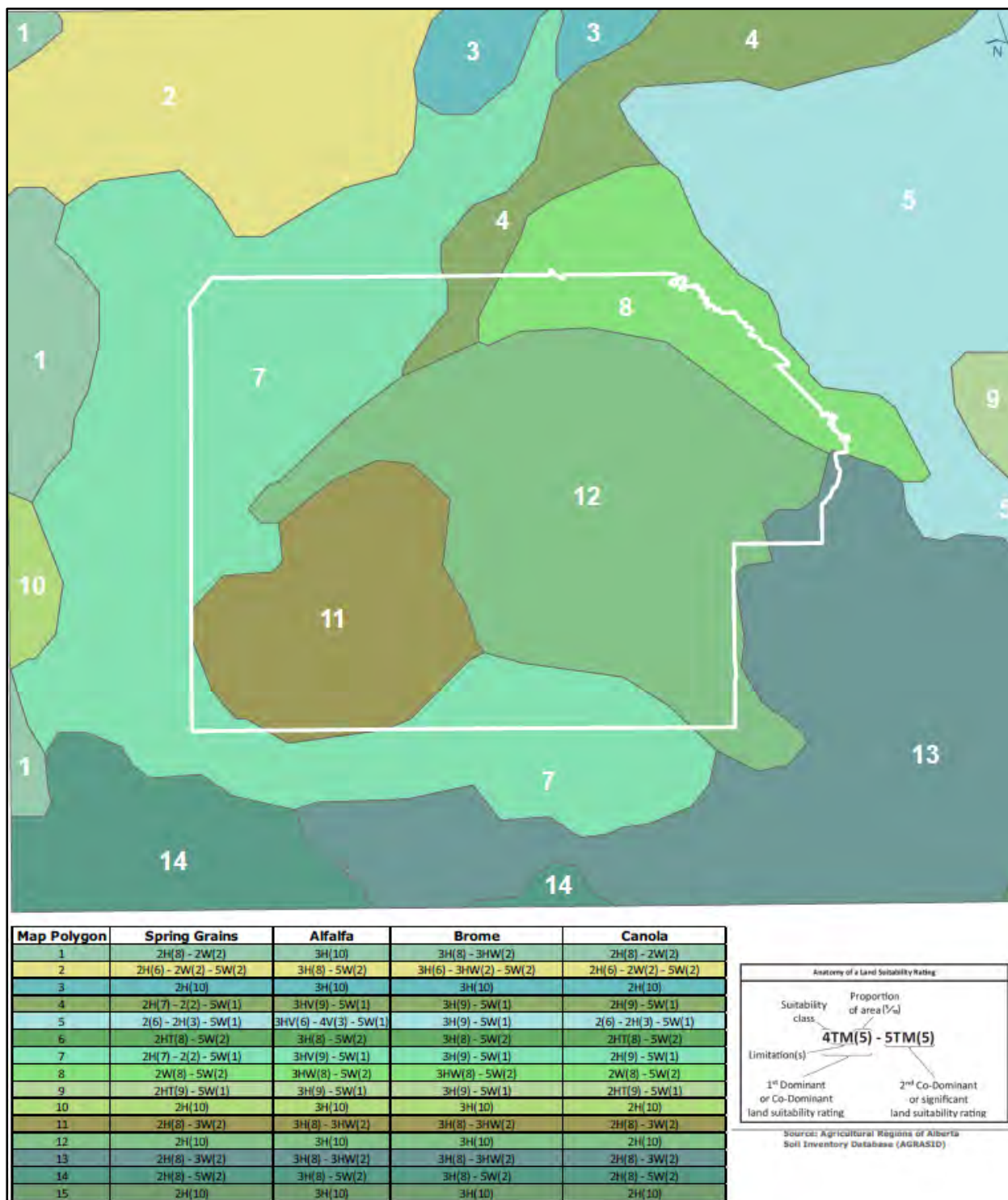
Figure 3: CLI Soil Capability for Agriculture



2.2.2.2 Agriculture and Agri-Food Canada Land Suitability Rating System (1995)

For the Bremner there are four LSRS maps available for spring-seeded small grains, canola, brome-timothy grasses and alfalfa. These maps have been combined and area presented in Figure 4 below.

Figure 4: LSRS for Spring-Seeded Small Grains, Canola, Brome-Timothy Grasses and Alfalfa



The LSRS ratings are interpreted as follows.

Table 3: LSRS Suitability Class

LSRS Manual Table 2.1 -- Relationship of suitability class to index points.		
Suitability Class	Index Points	Limitations for specified crop*
1	80 -100	none to slight
2	60 – 79	slight
3	45 – 59	moderate
4	30 – 44	severe
5	20 – 29	very severe
6	10 – 19	extremely severe
7	0 – 9	unsuitable
*Limitations are for production of the specified crops. This does not imply that the land could not be developed for other crops or for other uses.		

Table 4: LSRS Limitations

Temperature (H)	This subclass indicates inadequate heat units for the optimal growth of the specified crops.
Drainage (W)	This subclass indicates soils in which excess water (not due to inundation) limits the production of specified crops. Excess water may result from a high water table or inadequate soil drainage.
Slope (T)	This subclass indicates landscapes with slopes steep enough to incur a risk of water erosion or to limit cultivation.

Table 5: LSRS Degrees of Limitation

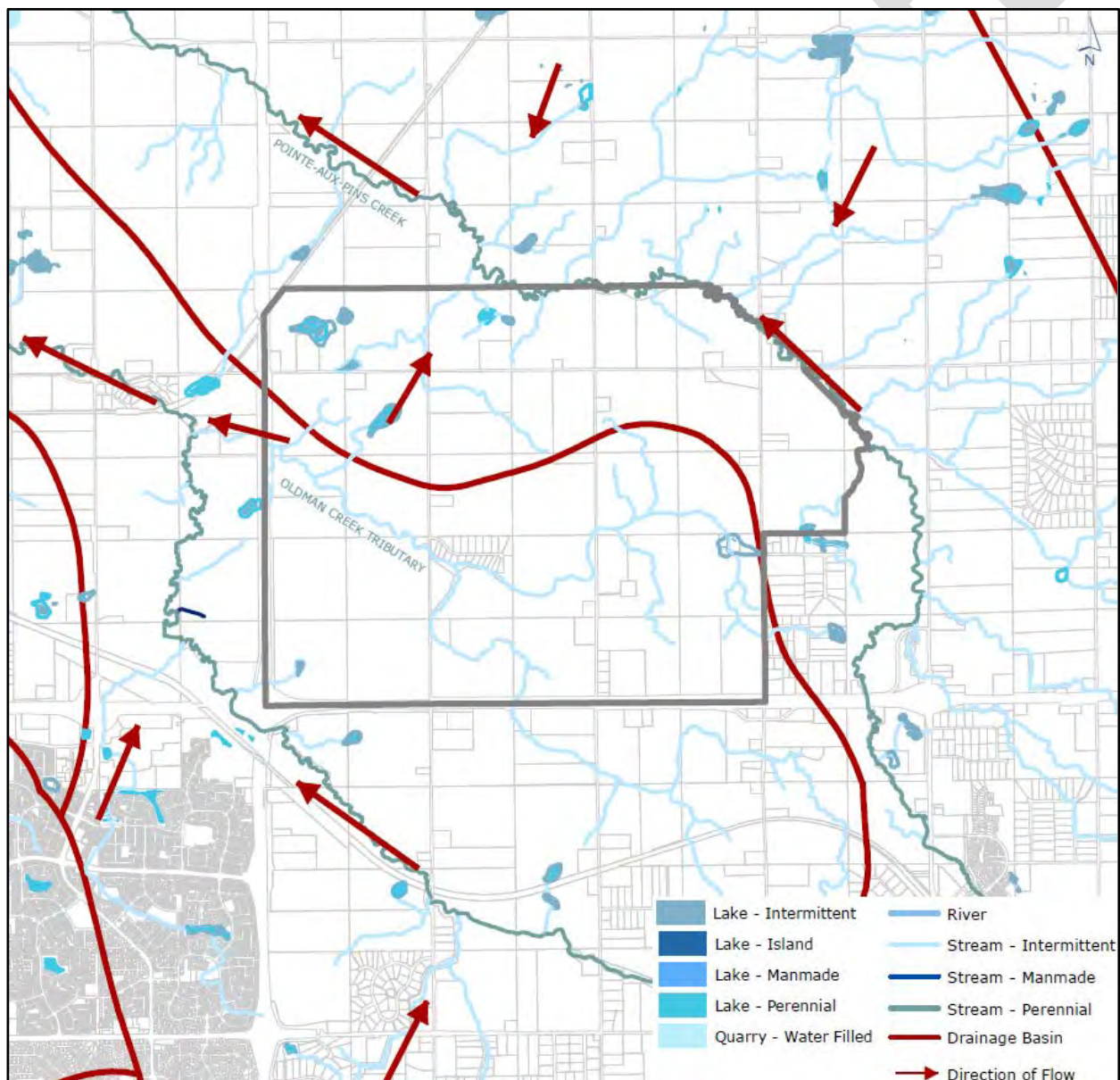
Class 1	Land in this class has no significant limitations for production of the specified crops (80 - 100 index points).
Class 2	Land in this class has slight limitations that may restrict the growth of the specified crops or require modified management practices (60 - 79 index points).
Class 3	Land in this class has moderate limitations that restrict the growth of the specified crops or require special management practices (45 - 59 index points).
Class 4	Land in this class has severe limitations that restrict the growth of the specified crops or require special management practices or both. This class is marginal for sustained production of the specified crops (30 - 44 index points).
Class 5	Land in this class has very severe limitations for sustained production of the specified crops. Annual cultivation using common cropping practices is not recommended (20 - 29 index points).
Class 6	Land in this class has extremely severe limitations for sustained production of the specified crops. Annual cultivation is not recommended even on an occasional basis (10 - 19 index points).
Class 7	Land in this class is not suitable for the production of the specified crops (0 - 9 index points).

2.2.3 Surface Drainage

The surface water drainage in Bremner is generally directed towards Pointe-Aux-Pins Creek and its tributaries or the Oldman Creek tributary. Approximately 60% of the area exists inside the Oldman Creek drainage basin and 40% of the area is in the Pointe-Aux-Pins drainage basin. Both creeks flow northwesterly into the North Saskatchewan River which is approximately three and a half kilometers downstream of the east boundary of Bremner.

A Drainage Master Plan will be completed for Bremner that will address appropriate discharge rates into the creeks which should prevent negative effects to agriculture, aggregate extraction and other development downstream of the proposed urban development in Bremner.

Figure 5: Surface Drainage



2.2.3.1 Drainage Improvements

Strathcona County staff from the Transportation and Agricultural Services department, interviewed in June of 2017, indicated that wide ephemeral drainage swales in Bremner were channelized in the 1960's to increase agricultural production. Some of these channels can be identified on aerial photographs and during a review of historical aerial photos ten quarter sections showed signs of improvements which are highlighted in Figure 6 with the specific type of improvement listed in Table 6.

An online search of Alberta Environment and Parks Authorization Viewer on February 21, 2017 found one approval for drainage improvements and flood control on wetlands and an intermittent stream bed on SW 22-53-22 W4. A physical search of Alberta Environment and Parks approval documents was not conducted for the purposes of this report; other authorizations may exist that are not available online.

There may be opportunities to restore the altered wetlands and ephemeral drainage corridors so they may be incorporated into open space areas or stormwater management facilities.

Figure 6: Surface Water Drainage Improvements

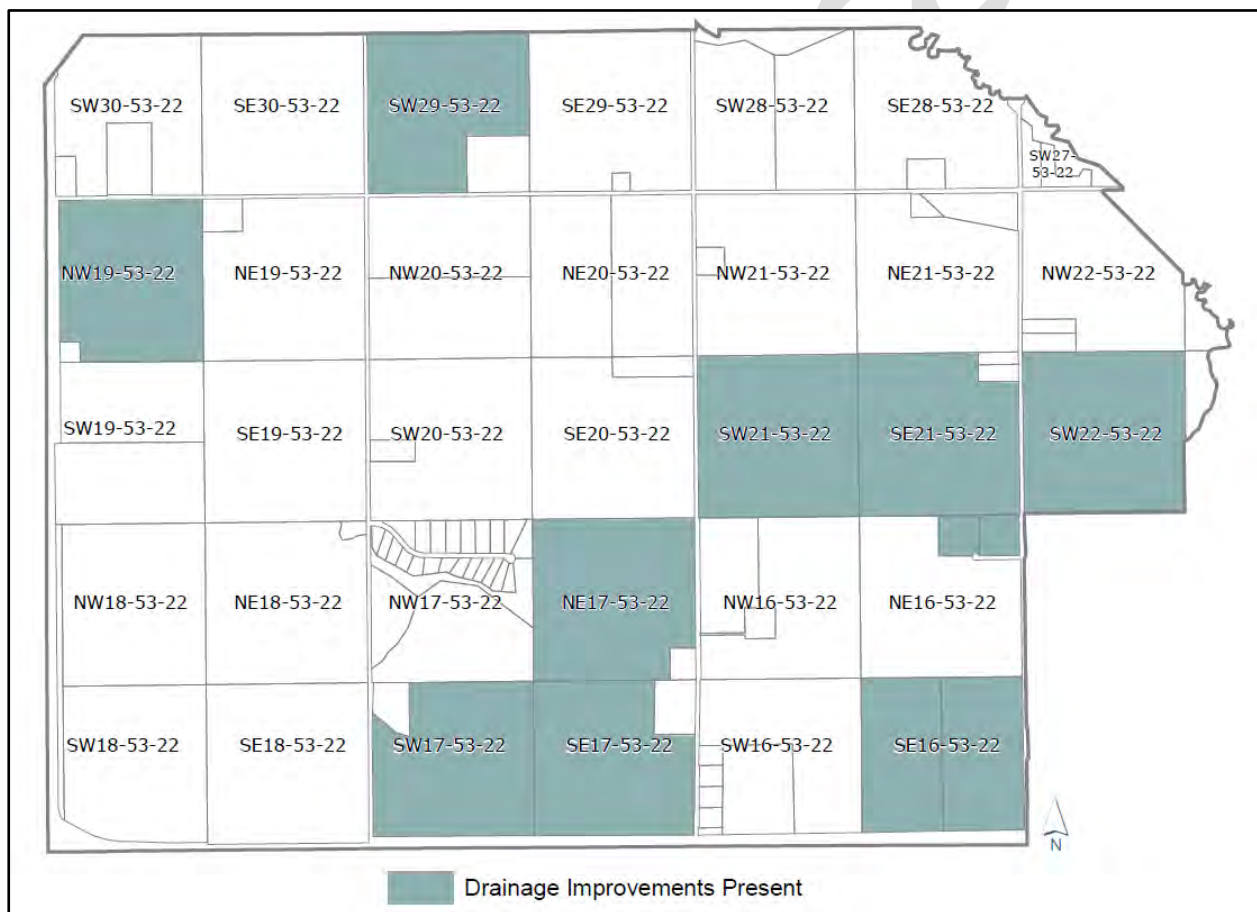


Table 6: Type of Surface Water Drainage Improvement

Location	Type of Surface Water Drainage Improvement (based on historical aerial photo review)
SE 16-53-22 W4	- channelized natural drainage
SE 17-53-22 W4	- channelized natural drainage
SW 17-53-22 W4	- channelized natural drainage
NE 17-53-22 W4	- channelized natural drainage
NE 17-53-22 W4	- channelized natural drainage
NW 19-53-22 W4	- channelized natural drainage
SE 21-53-22 W4	- channelized natural drainage
SW 21-53-22 W4	- channelized natural drainage
SW 22-53-22 W4	- channelized natural drainage in watercourse and in wetlands, watercourse crossing installed
SW 29-53-22 W4	- channelized natural drainage

2.2.4 Groundwater and Irrigation:

As per the Regional Ground Water Assessment (2001), groundwater in the study area comes mainly from the Bearpaw aquifer which is generally 80 to 100 meters thick and less than 100 meters below the surface. There is an estimated 10 to 50 cubic meters of water, per section, being pumped from this aquifer daily for a variety of uses including household and agricultural use. Groundwater in Bremner's surficial deposits is generally high in total dissolved solids and sodium concentrations. The average total dissolved solids is 1,164 mg/L and the average sodium concentration is 219 mg/L, both are above the Government of Canada's Guidelines for Canadian Drinking Water Quality (2017) of ≤ 500 mg/L total dissolved solids and ≤ 200 mg/L for sodium.

A search of Alberta Environment and Parks' Authorization Viewer on February 23 and 27, 2017 found thirteen Traditional Agricultural Registrations under the *Water Act* for the purposes of raising animals and applying pesticides to crops. Table 7 shows the total of all registrations is 9,978 cubic meters of water annually, a copy of each registration is available in Appendix C.

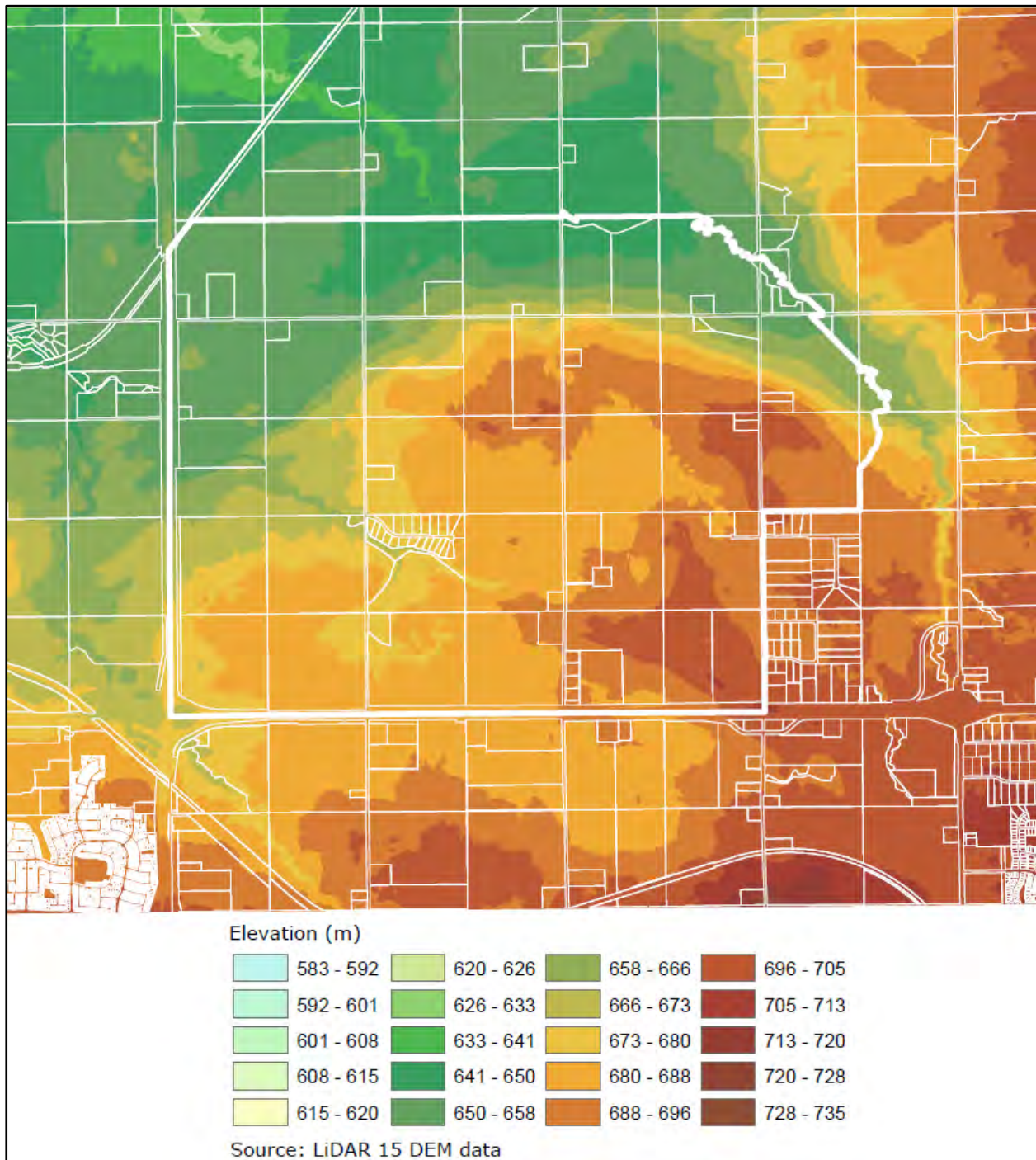
Table 7: Water Licences

Land Location	Water Source	Amount of Water (m3/year)	Priority No.
SW 17-53-22 W4	Unnamed Aquifer – Unclassified	935	1903-12-31-035
SW 17-53-22 W4	Unnamed Aquifer – Unclassified	940	1903-12-31-034
SE 18-53-22 W4	Unnamed Aquifer – Unclassified	329	1953-04-01-001
SW 18-53-22 W4	Surface Runoff	111	1920-07-01-005
SW 18-53-22 W4	Unnamed Aquifer – Unclassified	2930	1966-08-15-002
SW 18-53-22 W4	Unnamed Aquifer – Unclassified	55	1916-08-01-003
SW 20-53-22 W4	Surface Runoff	334	1985-06-01-016
SW 20-53-22 W4	Unnamed Aquifer – Unclassified	896	1985-03-01-008
SE 22-53-22 W4	Pointe-Aux-Pins Creek	152	1913-04-29-004
SW 22-53-22 W4	Surface Runoff	2933	1913-04-29-002
SW 22-53-22 W4	Unnamed Aquifer – Unclassified	108	1913-04-29-001
SE 29-53-22 W4	Pointe-Aux-Pins Creek	126	1989-12-31-281
SE 29-53-22 W4	Unnamed Aquifer – Unclassified	129	1989-12-31-280
Total Amount of Water (m3/year)		9,978	

2.2.5 Slope/Topography

The undulating and hummocky landscape of Bremner creates a diverse landscape with low to high relief land forms of varying elevations. Elevations range from 706 m near the southeast corner, to 642 m in Pointe-Aux-Pins Creek near the middle of the north boundary of Bremner. The landscape generally slopes northwestward as illustrated in Figure 7.

Figure 7: Topography

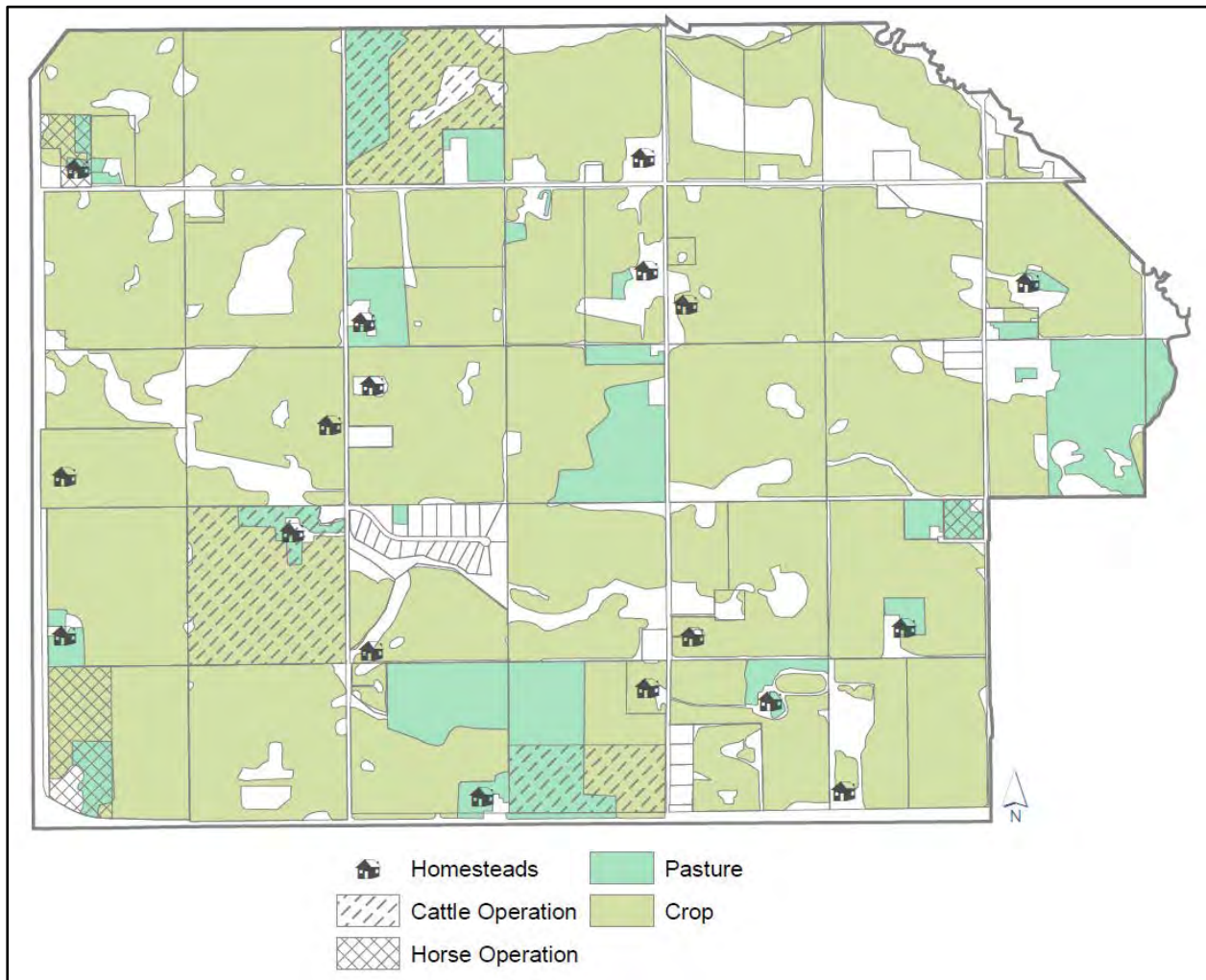


2.3 Agricultural Inventory

2.3.1 Existing Agricultural Production

The majority of agricultural land in Bremner is dedicated to cropping but there is also a significant amount of lands used for pasture. In addition to crop and pasture land, there are eighteen homesteads, three cattle, and three horse operations.

Figure 8: Existing Agricultural Production



Interviews with farmers over the summer of 2016, indicated that they had historically rotated cereal-canola on a two year rotation but due to the changing climate and an increase in returns, a higher percentage of farmers are planting pulses and have begun a cereal-pulse-canola three year rotation. Average yields from 2016 are presented in the table below.

Table 7: Average Yield

Crop Type	Average Yield For 2016 (Bushels/Acre)
Wheat (Hard Red)	75
Barley	115
Field Peas	55
Faba Beans	62.5
Canola	56.5
Soybeans	40

Source: Agricultural Services, Strathcona County.

2.3.2 Non-Agricultural Land Use

Non-agricultural land use within Bremner is limited but some potential conflicts that could affect farming operation do exist. Potential conflicts include several oil and gas pipelines that run along the west and south boundaries of Bremner. These pipelines are reclaimed and the surface above them continues to be used for agricultural purposes but there is potential for pipeline maintenance that could disrupt farming operations.

There is one Low Density Country Residential Subdivision that may cause increased local traffic which has the potential to affect farmers moving equipment or farm animals from time to time or seasonally.

Strathcona County's Agricultural Services branch operates out of an historic homestead site just north of Bremner which produces additional vehicle traffic that may impede farming operations. This site is used for community events which have the potential to cause traffic conflicts.

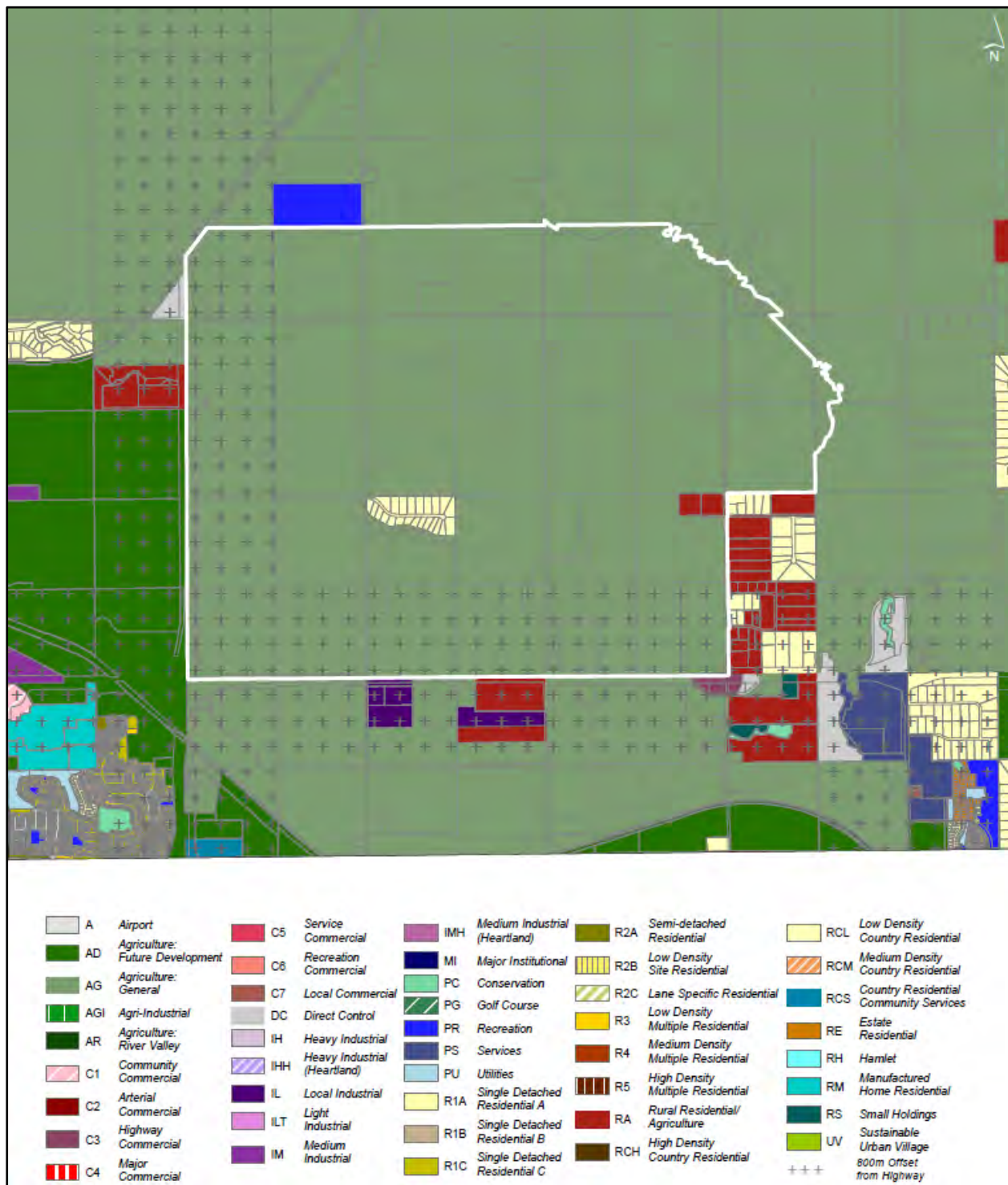
2.3.3 Parcel Size, Configuration, and Agricultural Accessibility

Currently there are few limitations to agricultural accessibility in Bremner and it can be accessed from the north, east, south and west from major highways and a series of Strathcona County owned township and range roads. A review of recent air photos (2017) showed that all parcels had at least one access and many of the larger parcels (larger than 16 ha) had multiple accesses. Parcels with drainage corridors that split the parcel often had visible culvert style crossings installed.

Access for agricultural operations will need to be maintained during the development of Bremner.

A table of parcel size and zoning of each Bremner parcel are provided in Appendix D. Figure 9 shows the current zoning districts for Bremner and the surrounding areas.

Figure 9: Zoning Districts



2.3.4 Agricultural Economic Impact

The agricultural economic impact assessment prepared by Serecon Inc. found an annual impact between \$6,938,887 and \$15,964,881 to the provincial GDP. Serecon Inc.

recommends using the higher estimated loss prediction of \$15,964,881 as it is a better representation of the economic impacts on the province as a whole.

Serecon's report includes lands that are now excluded from the Bremner Area Concept Plan, including approximately 182 hectares (450 acres) of crop land and 61 hectares (150 acres) of perennial crops, pastures and grasslands. Consideration should be given to the economic impacts accordingly.

It should be noted that an area of approximately 82 hectares (200 acres) that was removed from the Bremner ACP boundary but was included in Serecon's report is slated to become Strathcona County's Multipurpose Agricultural Facility and that land will be removed from traditional agricultural production.

A detailed analysis of the economic impacts of developing Bremner is provided under a separate cover in Appendix E.

2.4 Surrounding Lands

2.4.1 Surrounding Land Use Types

Immediately west of Bremner is Cambrian Crossing which is included in the North of Yellowhead Area Concept Plan (ACP). The approved Cambrian Crossing Area Structure Plan (2013) has areas for industrial, residential and commercial development. Cambrian Crossing is expected to be constructed prior to Bremner with an interchange at Highway 21 and Township Road 534, as well as a flyover south of the interchange to connect Cambrian Crossing to Bremner. The remainder of Bremner's western boundary abuts the West of 21 Area Concept Plan that includes light and medium industrial and commercial uses.

Directly south of Bremner, the Local Employment Area (LEA) that extends to the CN railway line is currently being studied as a potential area for light industrial and public service uses. The lands north and east of Bremner are intended to remain agricultural under the current MDP.

The map illustrates the Bremner Area Project Boundary, which is outlined in a dashed line. The area is divided into several distinct zones and land use designations:

- City of Edmonton:** The northern and western portions of the map are labeled as part of the City of Edmonton.
- West of 21st ACP:** A blue hatched area in the northwest.
- North of Yellowhead ACP:** A pink hatched area in the north-central region.
- North of Lakeland Dr ACP:** An orange hatched area in the central-eastern region.
- Bremner Urban Reserve Policy Area:** A large green area in the east-central region.
- Local Employment Policy Area:** A grey area in the south-central region.
- Country Residential Policy Area:** A light green area in the south-eastern region.
- Agriculture Large Holdings Policy Area:** A brown area in the north-eastern corner.
- Agriculture Small Holdings Policy Area:** A purple area in the south-eastern corner.

Key roads and landmarks include:

- Roads:** HWY 16, HWY 21, TWP RD 534, Baseline Rd, Petroleum Wy, Sherwood Park Pkwy, Broadmoor Blvd, Wye Rd (HWY 430), and Lakeland Dr.
- Waterways:** North Saskatchewan River and Pointe-aux-Pes Creek.
- Neighboring Areas:** City of Edmonton to the west and south, and Ardrossan to the east.

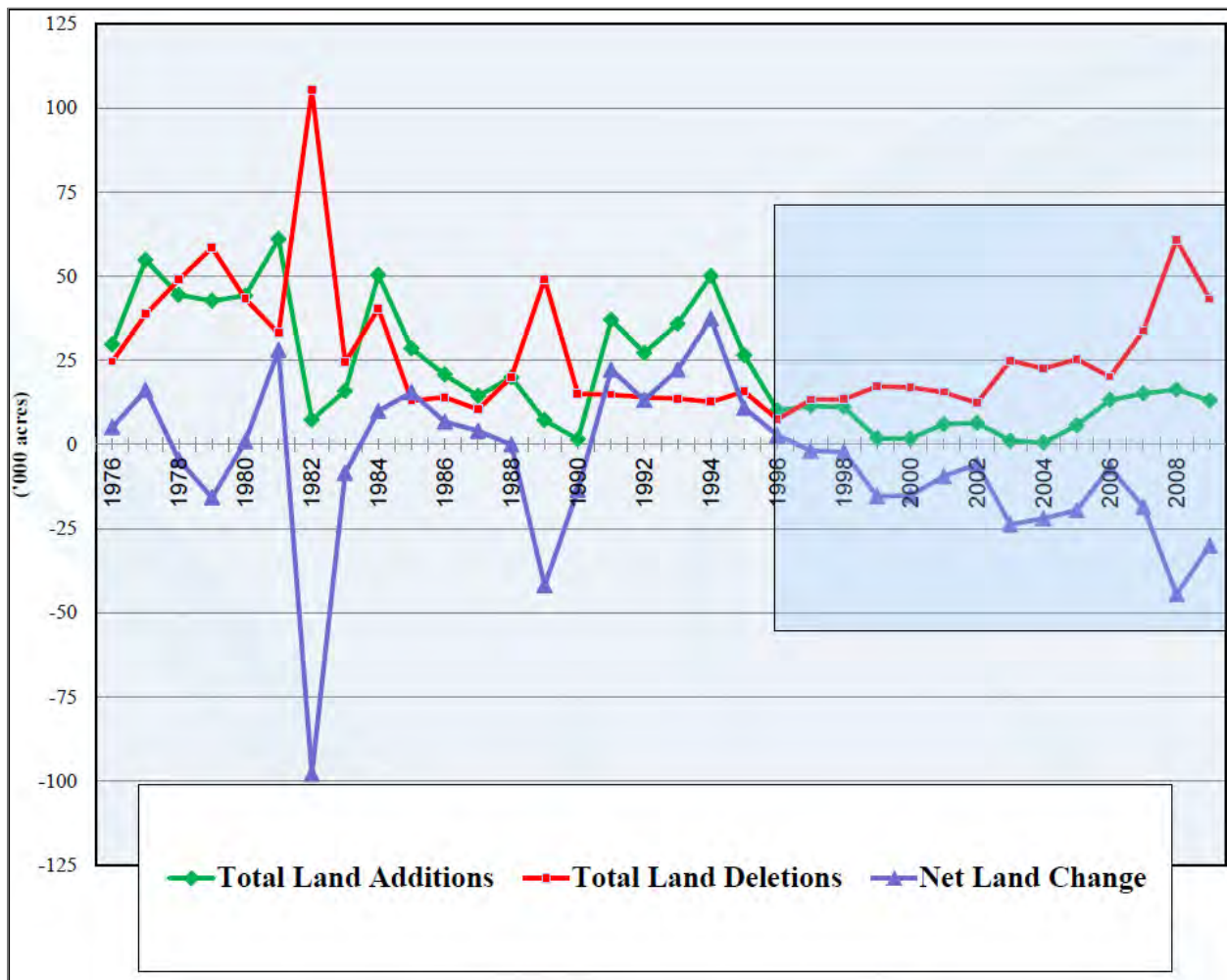
The map also includes a north arrow in the top right corner.

2.4.2 Regional Land Use, Land Fragmentation and Conversion

From 1976 to 1996 the province regularly monitored and reported changes to agricultural land within Alberta. During that period, there was a net loss of less than 0.5 % of Alberta's agricultural land. However, monitoring did not include losses due to fragmentation.

22

Figure 11: Agricultural Land Base Changes in Alberta from 1976 to 2009



Source: Jason Cathcart, Manager of Land-use Policy, Alberta Agriculture and Rural Development.

The "Economic Evaluation of Farmland Conversion and Fragmentation in Alberta, Summary of Findings" produced by the Alberta Land Institute in 2017 identified that farmland and natural areas in the Edmonton Calgary Corridor became more fragmented between 1984 and 2013 and that most of the land converted to developed uses between 2000 and 2012 was of high suitability for agricultural uses.

A survey of urban and rural residents, conducted in the Alberta Capital Region for the report, found that both were concerned about urban expansion and the loss of natural and agricultural land. The residents surveyed indicated that conserving farmland was most important to produce *food for the local market, followed by air quality, water purification, scenic beauty, and production of food for the global market*. Respondents also indicated that they were more interested in the scenic value of farmland as viewed from highways than conserving the highest value farmland.

2.4.3 Availability of Agricultural Services

Agriculture support services are spread throughout the Edmonton Metropolitan Region and likely serve not just the region but also farming operations in northern and central Alberta. The closest grain elevator is about 30 kilometres northwest and the nearest canola crusher is about 20 kilometres north of Bremner. Other services within a 10 kilometre radius include

a seed supplier, fertilizer distributor, fuel delivery service, veterinary services and farm equipment sales and repair. Bremner is well serviced with most farming necessities located less than an hour away by vehicle.

3.0 Agricultural Viability

Very little data exists on the minimum size of farm needed to be viable in Alberta and sustainable in the long term. According to the most recent Alberta Agriculture Statistics Yearbook (2015), the average farm size in Alberta is 740 hectares however; there is no information available about farm configurations and whether the average farm consists of parcels that are adjacent, spread apart in fragmented parcels. The current area being farmed in Bremner is approximately 2,000 hectares and there are over 100 landowners.

Due to its close proximity to the Edmonton Metropolitan Region, Bremner could also potentially support other types of farms such as market gardens, u-picks, tree nurseries, cannabis production facilities, greenhouses and floriculture operations which tend to be smaller in size.

4.0 Potential Impacts on Agriculture

Current land use conflicts include slow moving farm traffic, noise, dust and drainage issues. These issues are generally minor but since complaints have been tracked within the last three years, traffic speed on Hwy 824 on the east edge of Bremner has been predominant.

The most significant expected impacts to neighbouring farming operations are transportation issues, especially during planting, spraying and harvesting. Traffic volumes will increase as Bremner develops. Urban roads are not generally suited to transporting farm equipment such as combines, sprayers and tractors, which require large turning radiuses and wide accesses (at least 6 metres) into farmland.

It is currently unknown if there will be significant impacts to agri-business such as seed and equipment suppliers. Development of Bremner will proceed over approximately 40 years which may give supporting agri-businesses time to adjust to any loss of business created by the development of Bremner.

5.0 Mitigation Measures

Table 8: Mitigation Measures

Agri-tourism and Agri-business	Continue to provide opportunities for small scale agri-tourism and agri-businesses such as agricultural product processing, agricultural support services, agriculturally related home based businesses and associated sales within undeveloped areas of Bremner as transitional uses.
	Encourage the provision of active transportation connections between Bremner and surrounding agricultural areas to encourage agri-tourism and agri-businesses within the rural area.
	Encourage the provision of active transportation connections to public agriculture opportunities and transitional agri-tourism and agri-business within Bremner.
	Provide way finding signs to agri-tourism and agri-businesses along active transportation, local roadways and major roadways.

Bremner Heritage Site	Explore opportunities to create an agriculture related public use and programming at the existing Bremner Heritage site.
	Maintain the current Bremner house as a heritage site and implement its associated master plan which includes education on the historical and cultural importance of agriculture in Strathcona County.
	Consider additional community amenities and services as indicated by the Bremner Heritage Site Master Plan.
Urban Agriculture	Integrate public agriculture into the Bremner design and construction standards.
	Encourage public agriculture within open space planning.
	Designate priority locations for urban agriculture such as community gardens based on topographical features, soil quality, ease of access and proximity to user base.
	Update Strathcona County's Urban Agriculture Strategy to meet the needs of the new Bremner community.
Education	Provide educational opportunities in open spaces that explain the importance of natural areas with respect to adjacent agricultural uses (example could be pollinator importance).
	Provide educational opportunities in open spaces about the history of Bremner and the importance of continued conservation and urban agriculture within the area.
	Create a farmer education program for rural areas surrounding Bremner regarding the potential agricultural economic development opportunities that may arise with the new proximity to an urban market base such as greenhouses, agri-tourism and market gardens.
	Incorporate the agricultural history of Bremner when naming streets and open spaces.
Transition	Ensure that rural roads and accesses within the undeveloped Bremner area continue to accommodate farm machinery (large, wide, slow-moving) and provide access to farmland.
	Consider the effects on current and future agriculture within the Bremner when establishing development phasing. Phasing should attempt to allow agricultural operations to continue as long as possible prior to development.
	Create a "Welcome to Bremner, what to expect" package for new residents with information about living next to agricultural and conservation lands. Include right-to-farm legislation and development timing expectations. Other items in the package should include warnings about slow moving agricultural equipment, wide load agricultural equipment and when people are most likely to be impacted by agricultural operations including dust and noise. This package should be reviewed annually and adjusted to answer new concerns or questions that arise. This package should be created by a group of representatives from Transportation and Agriculture Services, Planning and Development Services, Bylaw Services and Transportation Planning and Engineering with input from the Agricultural Services Board.
Other	Encourage visual features in Bremner's Design and Construction Standards, like tree plantings that act can as a buffer between the Bremner and adjacent agricultural areas.
	Ensure Bremner's Design and Construction Standards require that plant species are not invasive.

Where introduced plant species (from landscaping) are prone to disease or pests, ensure that appropriate measures are taken through County Design and Construction Standards and programming and operations to prevent disease spread into agricultural lands.
Ensure the Bremner design and construction standards requires the reuse of topsoil within Bremner and create a topsoil management plan (Proposed Topsoil Conservation and Management Plan available in Appendix F) to support the design and construction standards.
Ensure that developers are aware of clubroot management requirements to ensure that clubroot is not spread to other agricultural areas.

6.0 Discussion

While there are methods available to measure the economic loss of converting agricultural land to developed uses, there is currently no way for a single municipality to economically form a complete measure of the potential effects of land conversion on issues such as local and global food security, loss of ecosystem services provided by agricultural lands or social and cultural consequences of losing agricultural lands.

A broader regional discussion may be needed to address the long term costs of lost ecosystem services provided by agricultural land such as flood and drought mitigation, water and air quality regulation, wildlife habitat services and pollination. In cases where agricultural lands are converted due to low servicing costs for urban development, a cost analysis that looks at ecosystem services losses may change the overall cost of development in the long term. What seems like a smart economic decision might not be.

Ideally, the Edmonton Metropolitan Region Growth Plan would identify natural and agricultural lands for conservation, taking all factors into consideration so that firm direction on where growth should or should not occur, based on long term environmental, economic and social sustainability is provided. Further work should also be completed to determine the critical mass of agricultural land needed to sustain the agricultural industry in the region.

7.0 Limitations and Qualifications

In conducting this assessment and rendering our recommendations, Strathcona County gives the benefit of its best judgment based on its experience and in accordance with generally accepted professional standards for this type of assessment. This report was submitted with the best available information to date and on the information provided. The recommendations made within this report are a professional opinion, no other warranty, expressed or implied is made. This report has been prepared for the exclusive use of Strathcona County for the purposes of assessing the agricultural impacts of the proposed development of Bremner. Any use which any third party makes of this report, or any reliance on or decisions to be made on it, are the responsibility of such third parties. Strathcona County accepts no responsibility for damages, if any, suffered by any other third party as a result of decisions made or actions based on this report.

8.0 References

Strathcona County (2017). Strathcona County Municipal Development Plan Bylaw 20-2017: Forwarding Our Future Together.

Strathcona County (2018), 2013-2030 Strategic Plan: Becoming Canada's Most Livable Community.

Alberta Environment and Parks (February 23 and 27, 2017). Traditional Agriculture Registration Viewer. Retrieved from <https://avw.alberta.ca/TraditionalAgricultureRegistrations.aspx>

Kathol, C.P. and McPherson, R.A. 1975. Urban Geology of Edmonton, Bulletin 32.

Bayrock, L.A. and Hughes, G.M. 1962. Surficial Geology of the Edmonton District, Alberta. Research Council of Alberta.

Stein, R. 1976. Hydrogeology of the Edmonton Area, (northeast segment), Earth Sciences Report 76-1, Alberta Research Council.

Policy Secretariat, 2002. Loss and Fragmentation of Farmland, Resource Planning Group, Alberta Agriculture, Food and Rural Development.

Alberta Soil Information Centre. 2001. AGRASID 3.0: Agricultural Region of Alberta Soil Inventory Database. Edited by J.A. Brierley, T.C. Martin, and D.J. Spiess.

Government of Alberta. 2008. Land Use Framework. Available Online: https://www.landuse.alberta.ca/Documents/LUF_Land-use_Framework_Report-2008-12.pdf.

Rashford, B.S., C.T. Bastian, & J.G. Cole. 2011. Agricultural Land-Use Change in Prairie Canada: Implications for Wetland and Waterfowl Habitat Conservation. Canadian Journal of Agricultural Economics.

Qiu, F, L. Laliberte, B. Swallow, and S. Jeffrey. 2015. Impacts of fragmentation and neighbor influence on farmland conversion: A case study of the Edmonton-Calgary Corridor, Canada.

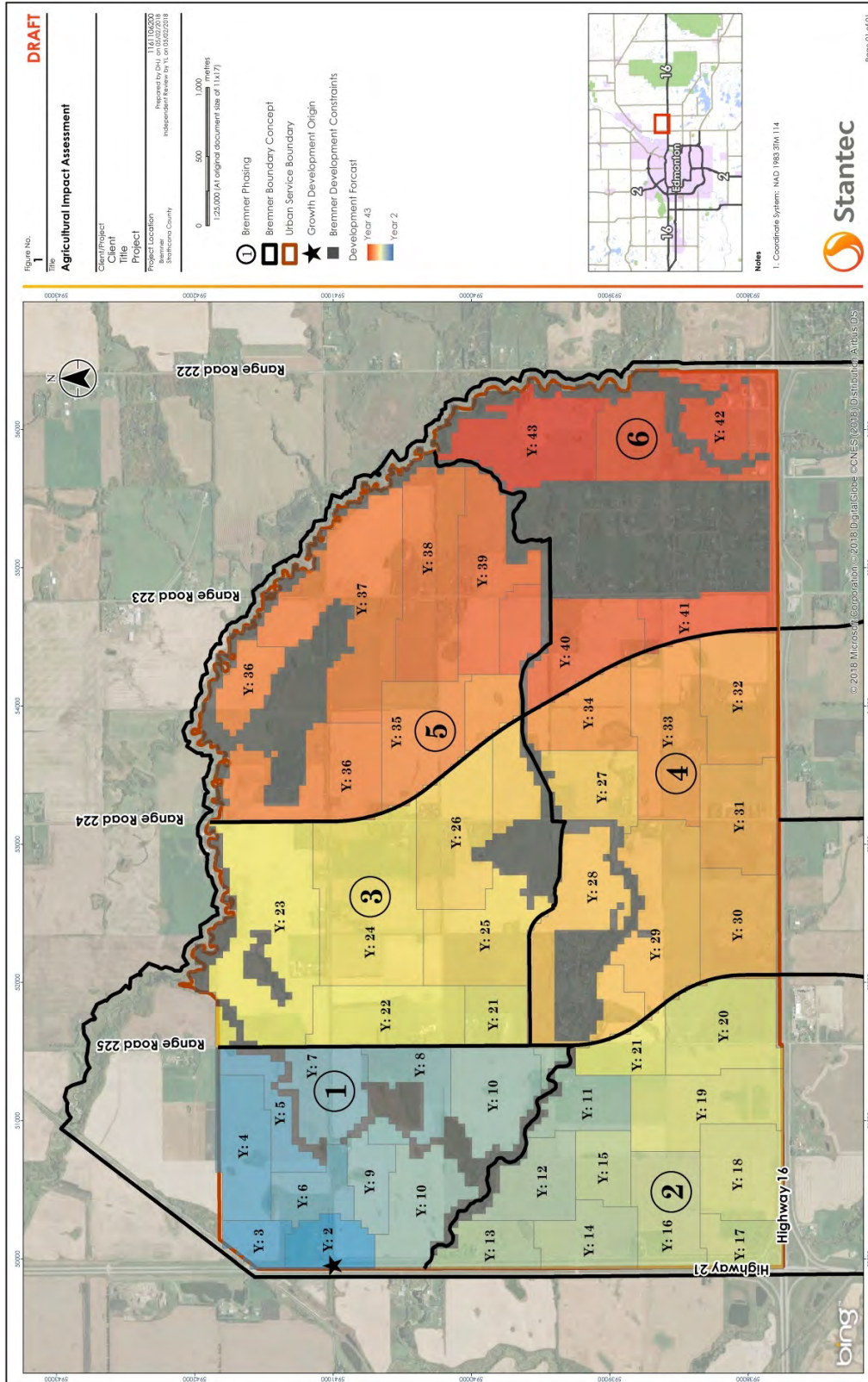
Hydrogeological Consultants Ltd. Agriculture and Agri-Food Canada. Prairie Farm Rehabilitation Administration. Strathcona County, Part of the North Saskatchewan River Basin Regional Groundwater Assessment, Parts of Tp 050 to 057, R 20 to 24, W4M.

Toma & Bouma Management Consultants. Stantec. 2015. Strathcona County | Agriculture Master Plan: A Time to Choose.

Intelligent Futures. Community Food Lab. 2015. Strathcona County Urban Agriculture Strategy.

Strathcona County. 2015. Land Use Bylaw 6-2015.

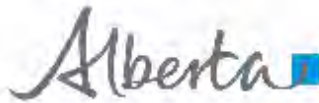
Appendix A Bremner Development Forecast Phases



Appendix B Land Development Forecast

Year	Units Developed	Residential	Commercial	SWMF	Road	MR/ER CS	Total	
1		0						
2	156	6.24			6.1	6.77	3	22.11
3	159	6.36				5.61	2	13.97
4	162	6.48		3	6.1	9.42	14	39.00
5	165	6.60		5		6.33	3	20.93
6	168	6.72		3	6.1	7.07		22.89
7	171	6.84		3		14.15	10	33.99
8	348	11.45			6.1	7.52	3	28.07
9	354	11.64				7.32		18.96
10	361	11.87		3	6.1	48.1	12	81.07
11	367	12.07		5		6.93	5	29.00
12	374	12.30		3	6.1	8.59	2	31.99
13	380	12.16		3		7.84		23.00
14	387	12.38			6.1	9.52	3	31.00
15	394	12.17				8.94		21.11
16	401	11.09			6.1	11.74	12	40.93
17	408	9.34				9.78	2	21.12
18	416	10.68		10	6.1	10.12	3	39.90
19	846	17.05		10		11.52	12.5	51.07
20	861	17.35		10	6.1	16.64	2	52.09
21	877	17.68		10		11.32	2	41.00
22	892	17.98		10	6.1	12.82	3	49.90
23	908	18.30		17.5		51.21	12	99.01
24	925	18.64		17.5	6.1	17.82	32	92.06
25	941	18.97		17.5		11.56	3	51.03
26	958	19.31		17.5	6.1	12.12		55.03
27	1139	21.77		17.5		11.76	2	53.03
28	1159	22.15		17.5	6.1	13.21	5	63.96
29	1180	22.55		17.5		13.47	12.5	66.02
30	1201	22.95		3	6.1	10.88		42.93
31	1222	22.86		5		10.21	5	43.07
32	1244	24.76		3	6.1	11.12	5	49.98
33	1266	32.04		3		12.95	14	61.99
34	1289	31.94			6.1	11.91	3	52.95
35	1312	32.51		3		11.51		47.02
36	1335	33.08		5	6.1	15.74	17	76.92
37	1359	34.43		3		51.14	3.5	92.07
38	1384	39.06		3	6.1	11.84	5	65.00
39	1409	38.98				10.22	2	51.20
40	1434	39.67			6.1	11.32	3	60.09
41	1459	39.07				9.89	2	50.96
42	1485	42.74			6.1	12.16	4	65.00
43	1513	43.20				10.98	2	56.18
	34769	855.44	538	228.5	128.1	571.07	225.5	2008.62

Appendix C Water Act Registrations



Registration for Traditional Agriculture User Under The Water Act

Land Location NE 15-053-22-W4

File No. 00082633

Registration No. 00082633-00-00

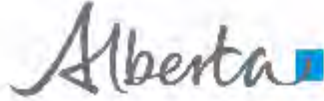
Water Source	Amount Of Water (m ³ /year)	Priority No.
Pointe-Aux-Pins Creek	152	1913-04-29-003

The information in this printout is derived from the Environment and Sustainable Resource Development's official database.

The original paper copy resides in the offices of Environment and Sustainable Resource Development. In the event of a discrepancy between this printout and the original paper registration, the original paper registration shall take precedence.

If the legal land location has been subdivided, please contact the closest regional office of Environment and Sustainable Resource Development for confirmation of the registration.

To contact a regional office of Environment and Sustainable Resource Development, please see the Viewer Help tab.



Registration for Traditional Agriculture User Under The *Water Act*

Land Location **SE 18-053-22-W4**

File No. **00162964**

Registration No. **00162964-00-00**

Water Source	Amount Of Water (m ³ /year)	Priority No.
Unnamed Aquifer - Unclassified	328	1853-04-01-001

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Registration for Traditional Agriculture User Under The *Water Act*

Land Location **SE 22-053-22-W4**

File No. **00082633**

Registration No. **00082633-00-00**

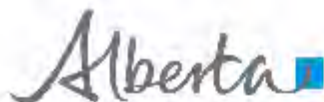
Water Source	Amount Of Water (m ³ /year)	Priority No.
Pointe-Aux-Pins Creek	152	1813-04-29-004

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**Registration for Traditional Agriculture User
Under The *Water Act***

Land Location **SE 29-053-22-W4**

File No. **00176590**

Registration No. **00176590-00-00**

Water Source	Amount Of Water (m ³ /year)	Priority No.
Pointe-Aux-Pins Creek	126	1989-12-31-281
Unnamed Aquifer - Unclassified	129	1989-12-31-280

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**Registration for Traditional Agriculture User
Under The *Water Act***

Land Location **SW 17-053-22-W4**

File No. **00160419**

Registration No. **00160419-00-00**

Water Source	Amount Of Water (m ³ /year)	Priority No.
Unnamed Aquifer - Unclassified	935	1903-12-31-035
Unnamed Aquifer - Unclassified	940	1903-12-31-034

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**Registration for Traditional Agriculture User
Under The *Water Act***

Land Location **SW 18-053-22-W4**

File No. **00162964**

Registration No. **00162964-00-00**

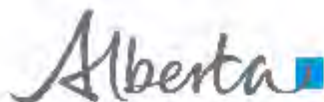
Water Source	Amount Of Water (m ³ /year)	Priority No.
Surface Runoff	111	1920-07-01-005
Unnamed Aquifer - Unclassified	2930	1988-08-15-002
Unnamed Aquifer - Unclassified	55	1916-08-01-003

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Registration for Traditional Agriculture User Under The *Water Act*

Land Location **SW 20-053-22-W4**

File No. **00167193**

Registration No. **00167193-00-00**

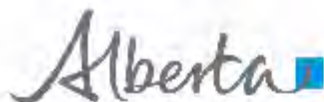
Water Source	Amount Of Water (m ³ /year)	Priority No.
Surface Runoff	334	1985-06-01-016
Unnamed Aquifer - Unclassified	898	1985-03-01-008

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**Registration for Traditional Agriculture User
Under The *Water Act***

Land Location **SW 22-053-22-W4**

File No. **00082633**

Registration No. **00082633-00-00**

Water Source	Amount Of Water (m ³ /year)	Priority No.
Surface Runoff	2933	1913-04-29-002
Unnamed Aquifer - Unclassified	108	1913-04-29-001

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Appendix D Parcel Size and Zoning

ATS	LUB DESCRIPTION	LOT SIZE (sq m)	LOT SIZE (ha)
SW21-53-22	AG - Agriculture: General	642636.76	64.26
SW28-53-22	AG - Agriculture: General	287925.40	28.79
SE21-53-22	AG - Agriculture: General	618210.93	61.82
NE17-53-22	AG - Agriculture: General	629089.73	62.91
NW19-53-22	AG - Agriculture: General	564699.83	56.47
NW20-53-22	AG - Agriculture: General	323790.32	32.38
NE19-53-22	AG - Agriculture: General	614807.45	61.48
NE28-53-22	AG - Agriculture: General	642589.10	64.26
SW19-53-22	AG - Agriculture: General	287018.32	28.70
SW30-53-22	AG - Agriculture: General	8521.23	0.85
SW30-53-22	AG - Agriculture: General	470291.44	47.03
SW30-53-22	AG - Agriculture: General	20223.65	2.02
NW17-53-22	RCL - Low Density Country Residential	6116.61	0.61
SE19-53-22	AG - Agriculture: General	646333.45	64.63
NE16-53-22	RA - Rural Residential/Agriculture	40139.29	4.01
NW16-53-22	AG - Agriculture: General	25471.62	2.55
NW16-53-22	AG - Agriculture: General	455958.85	45.60
NE16-53-22	AG - Agriculture: General	557522.77	55.75
SE28-53-22	AG - Agriculture: General	526087.47	52.61
NE29-53-22	AG - Agriculture: General	323523.60	32.35
SW20-53-22	AG - Agriculture: General	623474.92	62.35
SE21-53-22	AG - Agriculture: General	16709.75	1.67
SW17-53-22	AG - Agriculture: General	40632.29	4.06
NW17-53-22	RCL - Low Density Country Residential	12071.18	1.21
NW17-53-22	RCL - Low Density Country Residential	13868.37	1.39
SE20-53-22	AG - Agriculture: General	607343.15	60.73
NW17-53-22	RCL - Low Density Country Residential	12062.24	1.21
NW17-53-22	RCL - Low Density Country Residential	6609.72	0.66
NW17-53-22	RCL - Low Density Country Residential	12066.17	1.21
SW27-53-22	AG - Agriculture: General	40476.55	4.05
NW17-53-22	RCL - Low Density Country Residential	6418.01	0.64
NE20-53-22	AG - Agriculture: General	323905.37	32.39
NW17-53-22	RCL - Low Density Country Residential	5786.23	0.58
NW17-53-22	RCL - Low Density Country Residential	7192.62	0.72
SE22-53-22	AG - Agriculture: General	648569.33	64.86
SW22-53-22	AG - Agriculture: General	652932.95	65.29
SW29-53-22	AG - Agriculture: General	87671.63	8.77
NE21-53-22	AG - Agriculture: General	565075.35	56.51
NE18-53-22	AG - Agriculture: General	10383.81	1.04

NE18-53-22	AG - Agriculture: General	635768.28	63.58
NW17-53-22	RCL - Low Density Country Residential	12062.59	1.21
NW17-53-22	RCL - Low Density Country Residential	12066.74	1.21
SE20-53-22	AG - Agriculture: General	40462.60	4.05
NW22-53-22	AG - Agriculture: General	16360.84	1.64
NW17-53-22	RCL - Low Density Country Residential	5349.62	0.53
SE29-53-22	AG - Agriculture: General	8090.74	0.81
NW29-53-22	AG - Agriculture: General	632592.79	63.26
SW28-53-22	AG - Agriculture: General	287960.54	28.80
NW17-53-22	RCL - Low Density Country Residential	12070.51	1.21
SW16-53-22	AG - Agriculture: General	4317.26	0.43
NE20-53-22	AG - Agriculture: General	323895.53	32.39
SW27-53-22	AG - Agriculture: General	394414.21	39.44
SW27-53-22	AG - Agriculture: General	26183.98	2.62
NW22-53-22	AG - Agriculture: General	18580.93	1.86
SE16-53-22	AG - Agriculture: General	308675.14	30.87
SE16-53-22	AG - Agriculture: General	307589.84	30.76
SE30-53-22	AG - Agriculture: General	646840.51	64.68
SE28-53-22	AG - Agriculture: General	28314.52	2.83
NE19-53-22	AG - Agriculture: General	32540.07	3.25
SW16-53-22	AG - Agriculture: General	12094.38	1.21
NW22-53-22	AG - Agriculture: General	24241.75	2.42
SE21-53-22	AG - Agriculture: General	12147.13	1.21
NE22-53-22	AG - Agriculture: General	645970.63	64.60
NE21-53-22	AG - Agriculture: General	12108.68	1.21
SE17-53-22	AG - Agriculture: General	561524.08	56.15
NW17-53-22	RCL - Low Density Country Residential	6061.72	0.61
NW21-53-22	AG - Agriculture: General	19535.41	1.95
NW21-53-22	AG - Agriculture: General	616457.87	61.65
SE28-53-22	AG - Agriculture: General	97792.46	9.78
NW17-53-22	AG - Agriculture: General	72459.25	7.25
NW17-53-22	AG - Agriculture: General	291615.44	29.16
SW15-53-22	RA - Rural Residential/Agriculture	40377.95	4.04
NW29-53-22	AG - Agriculture: General	13666.43	1.37
SW29-53-22	AG - Agriculture: General	558088.78	55.81
NE16-53-22	RA - Rural Residential/Agriculture	40455.16	4.05
NW28-53-22	AG - Agriculture: General	623510.60	62.35
SW30-53-22	AG - Agriculture: General	79803.37	7.98
SE17-53-22	AG - Agriculture: General	55304.86	5.53
SW17-53-22	AG - Agriculture: General	574969.82	57.50
NW17-53-22	RCL - Low Density Country Residential	6470.14	0.65

SW16-53-22	AG - Agriculture: General	11748.32	1.17
SW16-53-22	AG - Agriculture: General	156456.91	15.65
NW17-53-22	RCL - Low Density Country Residential	12079.63	1.21
NW19-53-22	AG - Agriculture: General	9995.59	1.00
SW27-53-22	AG - Agriculture: General	26498.85	2.65
NW17-53-22	RCL - Low Density Country Residential	6330.52	0.63
SW16-53-22	AG - Agriculture: General	412452.19	41.25
NW17-53-22	RCL - Low Density Country Residential	6844.11	0.68
NW16-53-22	AG - Agriculture: General	157856.17	15.79
NW22-53-22	AG - Agriculture: General	519555.54	51.96
NW20-53-22	AG - Agriculture: General	323925.54	32.39
NW17-53-22	RCL - Low Density Country Residential	6500.14	0.65
SW27-53-22	AG - Agriculture: General	26545.21	2.65
NW17-53-22	RCL - Low Density Country Residential	6400.53	0.64
NE17-53-22	AG - Agriculture: General	20214.40	2.02
SW28-53-22	AG - Agriculture: General	63936.43	6.39
SW27-53-22	AG - Agriculture: General	58459.49	5.85
NW17-53-22	<Null>	70000.95	7.00
SW18-53-22	AG - Agriculture: General	542489.78	54.25
SE18-53-22	AG - Agriculture: General	638436.09	63.84
SW16-53-22	AG - Agriculture: General	12094.44	1.21
NW17-53-22	RCL - Low Density Country Residential	12097.37	1.21
SW20-53-22	AG - Agriculture: General	24257.87	2.43
SW16-53-22	AG - Agriculture: General	11625.86	1.16
NW22-53-22	AG - Agriculture: General	64601.59	6.46
SE29-53-22	AG - Agriculture: General	638694.25	63.87
NE21-53-22	AG - Agriculture: General	62960.85	6.30
NW17-53-22	RCL - Low Density Country Residential	6934.73	0.69
SW19-53-22	AG - Agriculture: General	298949.73	29.89
NW18-53-22	AG - Agriculture: General	574203.52	57.42

Bremner Area Agricultural Economic Impact Assessment

Prepared For

STANTEC

Prepared By

Serecon Inc.

Edmonton, Alberta

May 29, 2018



May 29, 2018

Scott Cole
Planning Discipline Leader - Community Development
Stantec
10160 112 Street
Edmonton AB T5K 2L6

Dear Mr. Cole,

RE: Bremner Area Agricultural Economic Impact Assessment

We are pleased to provide the following report outlining our assessment of the economic impacts associated with the development on Agricultural lands in the Bremner area. This assessment has been conducted using the most relevant data available for the area and multipliers provided by Alberta Treasury.

We have also looked at a secondary approach to the question using the contribution margin generated by a typical farm in the specific region. Results from these two approaches vary significantly but do provide the upper and lower boundaries of impacts.

We trust that this information will be of use to you and your client, Strathcona County. Please do not hesitate to contact me directly with any questions that you might have.

Yours truly,

Serecon Inc.



Bob Burden MBA, P.Ag.

Enclosure

Executive Summary

Agricultural Economic Impact

Our analysis suggests that the total Agricultural Economic Impact for the Bremner area falls within the **range of \$6,938,887 to \$15,964,881**. The low end of this range is based on the approximate net cash proceeds farmers earn following the Contribution Margin approach while the high end is based on using Gross Domestic Product (GDP) estimation with an Input/Output (I/O) model using provincial-level multipliers.

It is important to note that the Contribution Margin approach accounts only for the part of upstream and supporting industry effects of agricultural operations in the Bremner area. Given that there are obvious additional economic impacts, **we recommend using the \$15,964,881 estimate** we obtained from the I/O model as an assessment of the overall agricultural impact that removing agriculture from the Bremner area would have on Alberta's economy.

The recommended estimate may be felt to be somewhat overstated when compared with the net cash proceeds farmers earn. However, it gives a better idea of the total GDP these proceeds generate when farmers spend this money in the local economy.

Limitations of Scope and Information that affect the Recommended Estimate

The Alberta Treasury and Finance calculates multipliers for the whole province and some upstream businesses located elsewhere in Alberta are not present in Strathcona County. Thus, farmers do not spend all the money earned in Strathcona County and therefore \$15,964,881 GDP estimation is their impact on the province as a whole, not just the County. Nevertheless, most of their spending does occur within municipal borders. Two more factors suggest that the GDP generation is even higher:

1. The I/O model does not account for the induced impact of business profits that farmers may re-invest into farming operations or other business expansions in the county over time. The GDP multipliers account for their regular business and household expenditures but omit savings, which they may direct in expanding their business. Our profitability analysis indicates that the farmers would have this opportunity. Although there is not enough information to quantify such effect, there is little doubt that it exists and is likely material.
2. We could not allocate equine and other livestock sectors appropriately to the Bremner area due to insufficient information. We do not think it would have material impact on our assessment given that the beef cattle sub-sector accounts for approximately one third of the total livestock herd in Strathcona County and has less than 4.5% of the overall primary agricultural GDP. On the other hand, the equine and other livestock sectors are non-zero and if included would increase the total GDP above our estimate.

Key Considerations

We have considered all economic factors and contributions of crop and beef cattle operations located in the Bremner area. In the case of crop production, we have used typical rotations and land use allocations derived from 2014-2016 remote sensing data.



This data is the most recent and consistent dataset available. In calculating the financial flows and risk factors (the discount rate) we tried to maintain consistency and use the information from the same or similar period. For revenues and costs, we used the years 2012-2016 and we calculated the discount rate based on 2009-2016 data.

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Introduction

This report provides an objective assessment of the economic impact that farming operations in the Bremner area generate – and more precisely the impact that removal of those operations will have given a permanent change in land use from agriculture to the planned urban development. These impacts need to be assessed under perpetual change conditions since the allocation of land for development usually means a rapid change, which is long-term enough to be considered indefinite for the economic analysis. Our understanding is that this assessment may be included as one of the inputs into Strathcona County's overall Agricultural Impact Assessment from the development of the area.

We begin by setting a broader context and analyzing agricultural activity at the county level. We then narrow the focus and present the information that is available and calculated specifically for the Bremner area.

Our analysis involves two approaches:

- **I/O Model:** The first approach utilizes an economic impact calculator and quantifies the financial value the agriculture industry contributes to the local, regional and provincial GDP. It includes consideration for direct spending from the employers in the area, as well as those whose employment income originates from the industry. This is calculated using an Input/Output (I/O) model approach. The I/O model was designed to measure such impacts for “shock” type changes when the use of economic resources changes once for indefinite or very long period and as such fits this purpose well.
- **Contribution Margin Model:** A second approach involves calculating a contribution margin for the agricultural producer to reflect the amount of income available for re-investment. This information is used to help validate the amounts directly available to Strathcona County since the I/O model is only applicable in full at the provincial level. On the other hand, this approach does not consider multiplier effects.

As a result, the ultimate economic impact of primary Agriculture on Strathcona County will be somewhere between these two figures, and likely closer to the I/O result. We have provided both to provide a more robust assessment.

Economic Multipliers

Economic multipliers are used to measure the economic activity that is generated when purchases and investments are made by a business or a sector, including the resulting spin-off activities. The multipliers are used to estimate the total impact on economic activity rather than just the first-order impact. These models are designed to be used for estimates that a change in economic activity will have on the overall economy. In this case, the change in use from agriculture to other urban uses will result in less farm revenue, but also in farm-related expenditures. The goal of the economic impact estimates is to model this overall impact, which includes three types of impact as outlined in Figure 1. below.

Figure 1: Types of Economic Impact



- **Direct Impacts**
the effects occurring to spending of the sector where the change in economic activity takes place (e.g. the removal of agriculture results in less spending on farm-related business inputs)
- **Indirect Impacts**
the effects occurring to the backward-linked industries that supply the sector experiencing a change in economic activity (e.g. feed mills or crop input suppliers receive less business and in turn decrease their purchases)
- **Induced Impacts**
the effect that a change in income of employees will have on their personal expenditures on goods and services (e.g. both the employees of farms and their upstream suppliers will have less income to spend)

Our analysis accounts for and models the direct, indirect and induced impacts on the Alberta economy of removing agricultural production from the Bremner area.

Purpose and Function

The economic impact is a measure of value that activity creates for society. It is used to assess alternatives for resource allocation, such as land. We have used a specifically designed I/O model and respective multipliers for this purpose. These multipliers have been updated and released by Alberta Treasury Board and Finance in 2017 for the base year 2013.

The economic impact types outlined above would specifically include the following potential outcome areas in the specific case of Bremner agriculture:

- **Direct consequences of the change** – the effects of changes to spending activities that would occur. These are most likely directly related to changes in the purchases of inputs like farm supplies (seed, fertilizer, fuel), veterinary services, equipment, other;
- **Indirect impacts** – the effects occurring in the backward-linked industries that currently supply the primary agriculture sector in Bremner. These include the multiplier effects of the loss of direct expenditures as well as employment and other economic activities that are indirectly tied to agricultural production. We also consider the impacts on adjacent lands and how this might

affect decisions made on the investment in agriculture. An example of indirect expenses would include employment in the farm supply chain: fertilizer and seed distribution, agronomy services as well as employment in the industries including gas stations and office supply stores.

- **Induced impacts** – typically associated with the income earned by employees from the ag and upstream sectors who spend it on goods and services in the area that would no longer be available. This type of impact concerns businesses directly serving the general community regardless of the industry sector. The examples may include grocery and corner stores, entertainment industry, education and other. These businesses generate the revenue from spending that employees in primary agriculture and farm input supply industries earn.

The total of these elements represents the full economic impact of the changes that are likely to occur because of the forecast urban development. For every dollar of initial expenditures by agricultural producers, total spending throughout the local economy would have historically increased by a more substantial amount^a. As the land use changes over time, these farming expenditures would be lost and diverted.

The report considers area land uses, livestock operation profiles, soil capability ratings, productivity information, and crop rotations.

Information Sources

A variety of sources were used in researching the subject property and surrounding areas. Data used included remote sensing data, land use documents, various area maps, and agricultural statistics from the following sources:

- Agriculture and Agri-Food Canada
- Strathcona County
- Canada Land Inventory (Soil Capability for Agriculture)
- Statistics Canada (Census of Agriculture)
- Alberta Agriculture and Forestry
- Alberta Treasury Board and Finance

Agriculture in Strathcona County 2016 Statistics

An overview of agriculture at the County level determines the context for this engagement. A complete summary of this analysis includes statistical information on the agricultural industry, as well as technical aspects of agricultural suitability and soil capability within the County.

Strathcona County had 164,078 acres in annual crop production according to the 2016 Census of Agriculture. There is significant diversity in output due to its geographic positioning, and proximity to a large metropolitan area.

The following table contains the data reported in Strathcona County from Statistics Canada^b.

^a - While we used a different set of multipliers based on the basic agricultural commodity prices it approximately corresponds to 2.124 in a farmer's expenditure to illustrate this explanation. That is, for each dollar a farmer spends in producing agricultural commodity, the total economy increases for additional \$1.124 and thus creates accumulated effect of \$2.124 on GDP.

^b - Statistics Canada, Table 004-0203 – Census of Agriculture, land use, every 5 years, CANSIM (database). (accessed: 12/19/17)

Table 1: Agricultural Land Use in Strathcona County

Land use	Unit of measure	2011	2016	Change
Land in crops (excluding Christmas tree area) ^c	Number of farms reporting	478	407	-15%
	Acres	150,138	164,078	9%
Summerfallow land ^b	Number of farms reporting	37	35	-5%
	Acres	2,958	1,217	-59%
Tame or seeded pasture	Number of farms reporting	226	175	-23%
	Acres	19,555	18,418	-6%
Natural land for pasture	Number of farms reporting	344	301	-13%
	Acres	33,002	24,816	-25%
Woodlands and wetlands	Number of farms reporting	273	234	-14%
	Acres	x ^d	11,022	n/a
Christmas trees, woodlands, wetlands	Number of farms reporting	274	235	-14%
	Acres	8,439	11,036	31%
All other land ^a	Number of farms reporting	494	387	-22%
	Acres	6,092	4,910	-19%
Total Area of Farms (Acres)		220,184	224,475	2%
Total Number of Farms		658	579	-12%
Average Farm Size (Acres)		335	388	16%

The data indicates that approximately 56% of Strathcona County's land base was being used as crop or pasture land in 2016.

While remaining an important economic contributor, agriculture in the County is characterized as having several interesting and important trends. These include:

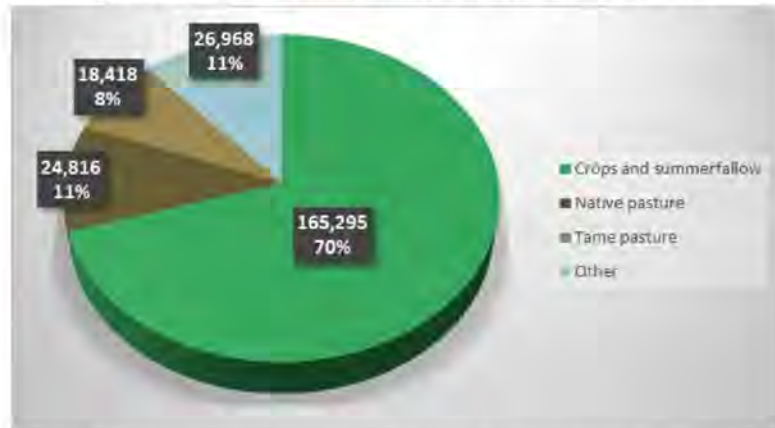
- A trend to fewer farms within the county;
- A reduction in native and tame pastureland;
- An increase in the average farm size between 2011 and 2016; and
- An increase in total cultivated acres^e.

^c – In 2011, in Alberta, Saskatchewan, and Manitoba, land that was reported as "too wet to seed" has been classified as "other land" instead of cropland or summerfallow.

^d – Suppressed to meet the confidentiality requirements of the Statistics Act.

^e It is important to note that this may well be a result of the way Census reporting works where acres are linked to the postal code of the owner and not necessarily where the acres are.

Figure 2: Farming in Strathcona County as per 2016 Agricultural Census



As of 2016, the Census of Agriculture reported 579 farms in Strathcona County. While the crop farms occupied most of the land, they represented less than a half of all farms, with only 118 operations declaring specialization in traditional annual crops production. In comparison, 119 operations specialized in forage production for the livestock sector and 281 operations claimed specialization in the livestock industry itself. The actual distribution is presented in Table 2.

Table 2: Farm Specialization in Strathcona County

Farming Activity by Farm Specialization	Farms	%
Crop (wheat, canola, other grain)	118	20.38%
Forage and other	119	31.09%
Livestock	281	48.53%
Total	579	100%

Table 3: Livestock-Related Farm Specialization in Strathcona County

Livestock-related Farming Activity	Farms	%
Beef cattle ranching and farming, including feedlots	115	40.9%
Horse and other equine production	107	38.1%
Other livestock farming	59	21.0%
Total	281	100%

The cow herd in Strathcona County comprised up to 5,916 head, with horses accounting for 2,139 animals in 2016. The rest of the livestock operations represented less than 25% of the total sector based on the reported farm specialization.

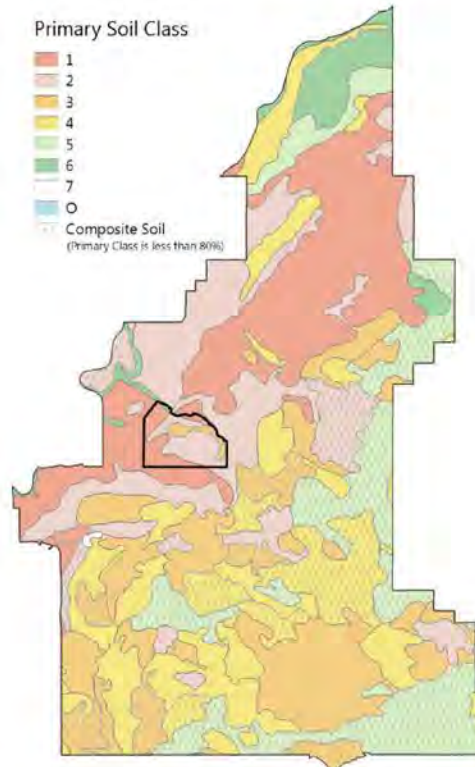
Table 4: Main Livestock Herds in Strathcona County

Animal Profile	Head
Total cows	5,916
Horses and ponies	2,139
Total	8,055

Canada Land Inventory

The Canada Land Inventory Soil Capability for Agriculture (CLI) ratings provide an indication of soil productivity capacity concerning agriculture. These ratings are analyzed at the County level below, with the subject area outlined in black.

Figure 3: Strathcona County CLI Map



Bremner is in the area characterized with more productive agriculture lands that run Southwest to Northeast of the county.

The following table summarizes Strathcona County's land base by primary soil class, with Class 1 being the most productive and Class 7 being least productive regarding land use and productivity for agricultural production.

Table 5: Soil Classes in Strathcona County

Primary CLI Soil Class Component	Area in Strathcona County (acres)	Percent of Total County Land Base
1	57,454	19.7%
2	51,570	17.6%
3	60,572	20.7%
4	64,479	22.1%
5	46,705	16.0%
6	11,259	3.8%
7	234	0.1%
Total	292,271	100%

The majority of the Bremner area's soils fall into Class 1 and 2 and this is further outlined in Table 6 below.

Subject Area

The area is in Strathcona County: North of the Trans Canada Highway 16 (Yellowhead Highway), between Range Road 222 (secondary Highway 824) and Range Road 230 (Highway 21), and south of Pointe-aux-Pins Creek. The area includes portions of 47 quarter sections. Aerial imagery of Bremner is provided in Figure 4 below.

Figure 4: Aerial Map



The Bremner area has approximately 6,348 acres of land, which can be accurately distributed among usage patterns based on remote sensing technology. This land base equates to 2.0% of the area in the County. Cropland within the subject comprises 2.7% of farmland within the county.

Soil classes in Bremner include Class 1, Class 2S, Class 2T, Class 3T (70%)/6T (30%), and Class 6T.

We present subject soil classes as a percentage of the total in the County. These percentages are based on primary soil class of Bremner as a percentage of the soil in the County of the same primary class whose secondary soil class is equal or superior to the subject.

Table 6: Soil Classes in Bremner Area

Primary Soil Class	Acres in Bremner Area	Acres in Bremner Area, %	Bremner Acres as % of County
1	2,346s	37.0%	3.9%
2	3,141	49.5%	7.5%
3	799	12.5%	1.6%
6	62	1.0%	1.4%
Total	6,348	100.0%	2.0%

The data indicates that Bremner contains a higher proportion of quality agricultural soils in Class 1 and 2 than the County as a whole. In other words, the subject soil is more agriculturally productive than land commonly found in Strathcona County.

Land Use

As of 2016, existing land use in Bremner is primarily agricultural (70%) with country residential making up most of the remaining land.

The following chart shows the land use trend within the subject area, with some increase to developed acres already.

Figure 5: Land Use Trends in Bremner Area

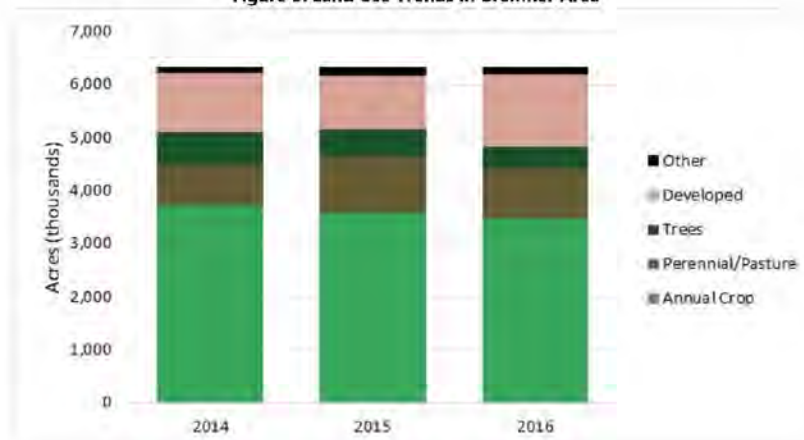


Table 7: Land Use in Bremner Area

Year	Annual Crop		Perennial Crop, Pastures and Grassland		Tree Cover		Developed Land		Other		Total
	Acres	% chg.	Acres	% chg.	Acres	% chg.	Acres	% chg.	Acres	% chg.	
2014	3,722.10	-14%	752.2	-10%	632.8	5%	1,110.80	163%	130.1	-18%	6,348
2015	3,589.70	-4%	1,055.00	40%	509.7	-19%	1,026.00	-8%	167.6	36%	6,348
2016	3,464.50	-3%	941	-11%	426.7	-16%	1,354.40	32%	161.4	-4%	6,348

Remote Sensing

The following maps show the Bremner area land use data in the years between 2014 and 2016. The legend displayed applies to all the charts within the series. Some growth in the pink (Urban/Developed) areas is visible between Figure 5 and Figure 7. This may be due in changes in the methodology used for creation of this dataset, which is prepared annually by Agriculture and Agri-Food Canada (AAFC)^f. The estimates of land use are prepared using a decision-tree based methodology using a combination of optical and radar satellite imagery and ground-truthing efforts.

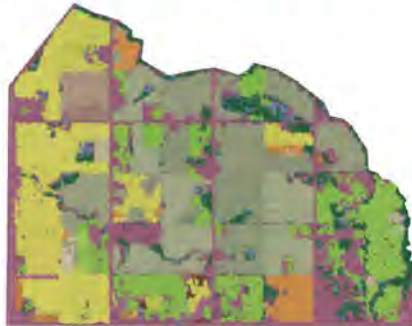
Figure 6: 2014 Remote Sensing Land Use Data


^f Available from the Government of Canada's Open Government portal at:
<https://open.canada.ca/data/en/dataset/ba2645d5-4458-414d-b196-6303ac06c1c9>

Figure 7: 2015 Remote Sensing Land Use Data



Figure 8: 2016 Remote Sensing Land Use Data



The focus in this AAFC dataset has been on getting an accurate annual inventory of crop maps and accuracy of the dataset in Alberta in 2017 was 94.15% on crop classes. While the accuracy has improved on crop class every year for the last three years, the data is less accurate for classification of non-agriculture land cover, being only 68.46% accurate on average for the province in 2017, for example. The maps are included here for a general overview of regions with development within Bremner, being mainly along roadways and in several areas with subdivisions. They also show the type of crops being grown and the crop rotations, as discussed in the section below.

Crop Rotation

Crop rotations are an important consideration when assessing economic impacts of agriculture. Soils, proximity to livestock-intensive areas and other conditions such as forecast prices for particular commodities affect farming practices. Each crop in established rotations have both diverse basic expected crop output value and contribution margin – thus, the direct economic effect on a region. These rotations for Bremner area can be observed in Figures 5-7 but are grouped into the main categories in Table 8.

Table 8: Crop Rotation in Bremner Area
(Share of Annual Crop Acreage as Detected by Remote Sensing Analysis)

	Canola	Wheat	Other
2016	33.8%	53.6%	12.6%
2015	57.7%	32.6%	9.7%
2014	29.9%	68.3%	1.8%
2013	64.4%	32.8%	2.8%
2012	22.5%	59.8%	17.7%
2011	53.6%	33.0%	13.4%
Total	44%	46%	10%

This chart clearly indicates that farmers were using a Canola/Wheat rotation over the period analyzed, since other crop types are grown just 10% of the time.

Expected Livestock Profile

In addition to the fieldcrops, there are a total of 926 acres designated as pasture based on GIS data for 2016 in the Bremner area. This constitutes 2.14% of all pastures reported for Strathcona County and is in line with the similar representation of crop production.

The livestock industry is often highly connected with local feed production. We think that the relative resource allocation between the cattle and equine operations observed at the county level holds true for the Bremner area to a large extent. Therefore, we may expect the Bremner area to accommodate or affect directly up to 127 cows and 46 horses in its vicinity. We tried to find accurate and reliable information to incorporate into the economic impact assessment for both value chains but could estimated reliably only the beef cattle.

Economic Analysis

As previously discussed, there are two distinct approaches to this analysis. The first involves using provincial level I/O models to calculate the:

- Gross output (of agriculture commodities);
- GDP;
- Labour Income & Employment

The second approach uses a contribution margin calculation to address the fact the I/O model is at the provincial level of aggregation and does not account for re-investment of producers' profits.

I/O Impact Analysis

Economic impact calculations analyze the annual crop/commodity loss that would be otherwise be realized by maintaining the current land use of the subject property and continuing to farm it. We assume that historical farming practices and traditional rotations would continue.

We have provided quantification of the estimated economic impact associated with this change. We calculate it using the I/O model with respective multipliers updated and released by Alberta Treasury Board and Finance (ATBF) in 2017 for the base year 2013 – the most recent update provided by (ATBF).

The multipliers are applied to the total primary commodity production to provide an estimate on the extent that this output creates gross domestic product (GDP) that resides in the province. GDP represents the net flow of commodities at market prices along with the economic value added by labour.

We use Alberta Total Multipliers for basic commodity prices, which account for total economic impact, including the induced effect of additional household spending. Although the multipliers represent economic linkages at the provincial jurisdiction level, it is the most granular level for which they are available, and thus the result should be interpreted as the economic impact the primary agriculture in Bremner area has on the province overall. We think that the upstream and supporting sectors are represented enough at the county level, so the application of the multipliers may be considered in the decision-making process. A decision maker should be aware that such evaluation provides the upper limit to the actual economic impact given that operators farming in Bremner likely spend a portion of their money outside Strathcona County.

A review of historical cropping production we presented in Table 8 for this area suggests that a traditional rotation would involve spring wheat followed by canola. Average yields in the area for stubble seeded crops in black soils range between 60-65 bu/acre for wheat and 45-50 bu/acre for canola.

It is critical that we use the multipliers for the base year prices since the linkages between interconnected sectors represent that year only. Therefore, we use 2013 pricing for wheat (\$459.99), canola (\$540.94) and cow/calf "Value of Production" (\$820.29 by wintered cow) as reported by Alberta Agriculture and Forestry in Agri-Profit\$ tables for 2013.

Given that there are approximately 3,465 cultivated acres in Bremner area as presented in Table 6, this would mean that the annual drop in production would be in the range of 207,900 bu of wheat and 159,400 bu of canola.

In 2013 prices it translates into the total sales of \$1,876,498 consisting of wheat (\$814,642), canola (\$958,005) and beef cattle (\$103,851) produced in the Bremner area, which was approx. \$542 per cultivated acre in 2013.

It is important to notice that the difference between crop prices in the year 2013 and any other year does not have substantial effect on overall economic impact assessment because the Alberta Treasury and Finance would compute a different multiplier in line with commodity price levels and it does not account for re-investment money. In simple words, say the 2013 average crop price is \$500 per acre. A farmer needs \$300 to cover direct costs and \$150 in machinery, thus it leaves him



with \$50 in profit. The 2013 multiplier would take into account \$450 of economic impact. Next year the price drops to \$350 an acre. The farmer covers \$300 in direct costs and decides to apply for a loan for machinery for \$100 and leave \$50 for himself. In 2014 the multiplier would take into account \$400 of economic impact. So even though the crop price changed for \$150, the economic impact would change only for \$50. Thus, the commodity price changes do influence the economic impact but to very limited extent in the short-run.

The analysis is initiated by quantifying Direct and Indirect industry impact first and then proceed with adding household income increase effect (induced) to produce the total economic impact estimation using the I/O closed model.

The economic impact under this model is measured by GDP change if the activity is discontinued indefinitely.

Table 9: Direct and Indirect Industry Annual Economic Impact in Base 2013 Prices

Commodity	Produced Ag Commodities at Base Prices \$	Annual GDP, \$	Annual Labour Income, \$	Employment, FTE	Total Gross Output, \$
Wheat	\$ 814,642	\$562,918	\$103,460	2.5	\$1,198,339
Canola	\$ 958,005	\$661,981	\$121,667	3.0	\$1,409,225
Beef Cattle	\$ 103,851	\$42,786	\$25,236	1.2	\$276,554
	\$ 1,876,498	\$1,267,686	\$250,362	6.7	\$2,884,118

Table 10: Total Annual Economic Impact Including Induced Impacts in Base 2013 Prices

Commodity	Produced Ag Commodities at Base Prices \$	Annual GDP, \$	Annual Labour Income, \$	Employment, FTE	Total Gross Output, \$
Wheat	\$ 814,642	\$ 615,055	\$ 124,640	3.0	\$1,285,506
Canola	\$ 958,005	\$ 723,294	\$ 146,575	3.5	\$1,511,731
Beef Cattle	\$ 103,851	\$ 61,064	\$ 32,505	1.3	\$307,086
	\$ 1,876,498	\$ 1,399,413	\$ 303,720	7.9	\$3,104,323

It is evident that all performance indicators, including the total economic impact represented by annual GDP, increase between Tables 9 & 10. The total gross output appreciates by approximate \$220,000 and the GDP by \$130,000 (\$1,399,413 – \$1,267,686), which is the induced I/O model effect reflecting the new spending by households in line with \$250,362 labour income reported without it. The amounts also consider and account for the spending that occurs outside the county.

Labour income increases as well since it brings additional business to the county. Results suggest that there would be almost 8 full time equivalent positions lost if the primary agriculture in the area is discontinued.

Employment in this context represents the estimated number of full-time employees serving the industry. The difference of 1.2 employees - between 7.9 and 6.7 - suggests that the additional

spending would create slightly more than one full-time job, probably spreading across commercial retail, including grocery stores, and agri-retail.

Total gross output describes the accumulated flow of goods and services within the primary agricultural production and its serving industries such as fuel and seeds. We do not use it to estimate the economic impact since it double counts the input expenditure both in the serving industries and farms.

After the initial application of the multipliers, the results need to be indexed forward to the valuation date of February 2018. This is accomplished using the Consumer Price Index for Alberta from the average of 2013 to February 2018.

We use Consumer Price Index (General Items variety) to adjust the level of price changes. In February 2018 prices, which were 8.4% higher than 2013 average, the annual GDP impact increases to \$1,516,664.

If the agricultural land use were discontinued indefinitely, the annual GDP stream would be reduced by \$15,964,881 overall economic impact under the 9.5% discount rate, which is a recent historical risk-rate for small-size agricultural operations.

Equine operations are very diverse, and therefore we avoided including them into the final calculation without detailed information. We do not expect them to provide any substantial change to our assessment because the estimated horse herd is less than that of the beef cattle, which in turn has less than 4.5% share in the total economic impact.

Discount Rate

We calculate 9.5% discount rate using weighted average cost of capital (WACC) because both equity and debt components generate the crop and beef cattle revenue streams in our analysis

$$WACC = R^e * E + R^d * D * (1 - ETR)$$

Where:

- D is portion of debt in the average AB farm operation;
- E is portion of equity in the average AB farm operation;
- ETR is the expected effective tax rate;
- R^d is cost (rate) of debt;
- R^e is cost (rate) of equity.

We used Debt to Equity (D/E) ratio of 15/85 as reported by Statistics Canada in the most recent AB farm financial survey for 2015. We assumed ETR at 40% level.

As per our methodology, average R^d approaches 4.8% over 2009-2016 period calculated using PRIME+2% base.

R^e reaches 12.04% over the same period using Capital Asset Pricing Model (CAPM) which we compute using Bank of Canada marketable bonds with over 10 years to maturity for the risk-free rate and implied equity premium published for S&P 500 by New York University. We use farming/agriculture ungeared betas published by the same source and historical small-size premium published by Dartmouth College, Tuck School of Business.

Income Analysis

Average Rotational Contribution Margin

The Contribution Margin has been used in the net present value calculations to calculate the loss of agriculture value to the county as a whole. We assume that due to the small land base of the subject compared to the entire agricultural land base of Strathcona County, the overall capital costs involved in agricultural enterprise would not change significantly if the subject properties' agricultural use was discontinued.

Based on the crop inventory data, we have used a typical rotation of Wheat/Canola for income analysis purposes. Selected data on these crops from Alberta Agriculture and Forestry AgriProfit\$ program tables is below. This excerpt is from the 2013 dataset for black soils, for which Strathcona County and the Bremner area, in particular, belong as per the Alberta Agriculture and Forestry classification.

Table 11: AgriProfit\$ (2013 – Exhibit)

2013 Production Costs and Returns (\$/acre)

Stubble Seeded Crops							
<i>AgriProfit\$</i>	Spring Wheat 2 CWRS 11.5%	CPS Wheat 1 CPSR	Feed Barley 1 CW	Malt Barley Select CW 2R	Milling Oats 3 CW	Argentine HT Canola 1 CAN	Field Peas 2 CAN
Expected Yield per Acre	65.00 bu	75.00 bu	90.00 bu	75.00 bu	115.00 bu	45.00 bu	50.00 bu
Expected Market Price	7.08 /bu	6.94 /bu	4.57 /bu	5.23 /bu	3.16 /bu	12.02 /bu	7.89 /bu
Crop Sales (\$/acre)	459.99	520.55	411.50	391.90	363.59	540.94	394.67
Direct Expenses:							
Seed, Cleaning & Treatment	28.31	27.76	18.29	20.90	15.81	39.66	47.36
Fertilizer (NPKS blend)	75.50 80-30-10-0	75.50 80-30-10-0	75.50 80-30-10-0	77.00 70-30-20-10	64.00 70-30-0-0	104.50 100-40-15-20	26.50 5-30-15-0
Chemical	32.00 *	27.00	16.00	50.42 *	11.50	24.00	35.80 *
Hail/Crop Insurance	18.30	23.67	16.02	16.02	15.70	24.37	21.05
Trucking & Marketing	13.27	15.31	14.69	12.24	13.30	7.65	10.20
Fuel, Oil & Lube	18.50	16.75	17.50	19.25	12.25	19.00	24.00
Machinery Repairs	17.25	17.00	11.50	16.75	11.50	15.25	17.75
Building Repairs	2.00	5.00	2.00	5.50	2.75	2.25	4.50
Custom Work	2.00	2.00	2.25	3.00	14.50	2.50	8.25
Labour (Paid and Unpaid)	18.00	22.00	14.50	23.50	19.50	18.50	22.00
Utilities & Miscellaneous	11.50	13.50	8.50	17.75	12.00	10.50	15.25
Operating Interest	6.79	6.51	5.49	7.42	4.57	8.41	5.48
Total Direct Expense	243.41	252.00	202.24	269.76	197.37	276.59	238.15
Contribution Margin	216.58	268.55	209.25	122.14	166.21	264.35	156.52

Historical costs and crop pricing from 2012 through 2016 were used to estimate the average Contribution Margin for the Bremner area and this can be observed in Table 12. The suggested crop rotation would result in \$184 and net profits at \$66 per acre under the 44%/46% rotation

calculated in Table 8. Please note that Table 11 only provides a one-year example of the information available from Agri Profits, that we used for I/O model and it is the average for the period that was used for contribution margin analysis as previously stated. We used the information up till 2016 since it was the last most recent year for which we had all the information on crop rotations, yields and beef cattle estimations available.

Given that there are approximately 3,465 cultivated acres in the subject lands, the aggregate annual Contribution Margin accumulates at \$637,909 and Net Profit at \$229,454. These yearly benefits translate to \$6,714,828 and \$2,415,310 respectively under the 9.5% discount rate if these crop operations are discontinued indefinitely.

Table 12: Excerpts from AgriProfit\$ for Wheat and Canola per Acre

	2012	2013	2014	2015	2016	Average
Wheat	\$ 247.42	\$ 216.58	\$ 74.89	\$ 124.50	\$ 123.71	\$ 157.42
Canola	\$ 308.65	\$ 264.35	\$ 148.38	\$ 163.69	\$ 174.90	\$ 211.99
Contribution Margin	\$ 277.35	\$ 239.93	\$ 110.82	\$ 143.66	\$ 148.74	\$ 184.10
CAPEX	\$ 117.25	\$ 109.75	\$ 116.72	\$ 122.84	\$ 122.84	\$ 117.88
Net Profit	\$ 160.10	\$ 130.18	\$ (5.90)	\$ 20.82	\$ 25.90	\$ 66.22

Livestock Operations

Similar calculations performed for the beef cattle sector indicate that the annual contribution margins in the Bremner area approximately aggregate to \$21,286 for approximately 127 cows this area has effect on, while the net profits reach \$13,174, which translates to \$224,059 and \$138,676 respectively under the 9.5% discount rate if these beef cattle operations are discontinued indefinitely.

Together with crop farming, the total value of contribution margins attributable to agriculture is \$5,992,675 and the total net profits in the area are \$2,553,986.

Table 13: Excerpts from AgriProfit\$ for Beef Cattle per Farm

	2012	2013	2014	2015	2016	Average of Years
Average Farm Size (wintered cows)	198	205	217	190	167	192
\$/Cow Wintered						
(A)						
1. Weaned Calves	715.59	843.54	1,465.08	1,350.33	977.86	1,027.53
6. Cull Cows/Open Heifers	158.91	147.13	296.40	272.13	204.95	208.34
7. Bulls	25.87	20.33	42.32	32.47	29.12	29.03
8. Bred Cows/Bred Heifers	16.14	20.56	9.88	19.34	57.93	26.30
9. Miscellaneous Receipts	0.12	0.59	0.00	1.21	24.63	5.96
10. Government Programs	0.00	0.12	0.29	6.02	11.23	3.87
11. Inventory Adjustment	87.01	94.14	93.07	18.04	-83.55	35.99
12. Less: Cattle Purchases	274.66	306.12	475.53	791.90	420.09	448.12
Value of Production	728.99	820.29	1,431.51	907.63	802.08	888.90
(B)						
1. Winter Feed	265.77	274.04	330.47	307.40	390.01	312.35
2. Bedding	11.67	19.25	10.26	16.48	19.00	15.59
3. Pasture	218.16	194.82	273.70	232.04	240.99	228.85
4. Veterinary & Medicine	18.49	20.66	22.93	26.55	30.55	23.89
5. Breeding Fees/Bull Rental	0.73	0.45	0.00	3.41	0.10	1.01
6. Trucking & Marketing Charges	12.15	15.31	16.67	21.03	17.04	16.30
7. Fuel	13.95	16.08	19.62	14.08	20.34	16.53
8. Repairs - Machine	11.47	12.26	15.04	11.90	23.07	14.78
9. Repairs - Corrals & Buildings	4.41	8.97	6.45	10.54	10.74	8.25
10. Utilities & Miscellaneous Expenses	15.33	18.47	18.44	26.41	38.52	23.90
11. Custom Work & Specialized Labour	5.75	3.28	6.20	7.86	2.62	5.08
12. Operating Interest Paid	1.01	0.63	1.28	2.78	3.10	1.82
13. Paid Labour & Benefits	13.26	7.90	10.85	14.38	22.20	14.20
14. Unpaid Labour	31.47	35.16	38.14	34.95	51.31	38.22
Variable Costs	623.61	627.29	770.04	729.79	869.58	720.77
(C)						
1. Share/Lease Cattle Payments	1.99	11.59	0.00	3.19	0.04	3.36
2. Taxes, Water Rates, Lic. & Insurance	7.95	9.57	8.63	10.16	12.42	9.82
3. a) Equipment & Building Depreciation	34.94	33.47	34.11	46.52	67.23	44.30
b) Lease Payments	1.00	3.01	2.66	0.31	6.90	2.77
4. Paid Capital Interest	3.70	3.47	2.23	3.51	5.43	3.82
Total Capital Costs	50	61	48	64	92	64
(D) Cash Costs (B+C-B14-C3a)	606.78	619.77	745.42	712.01	843.05	702.32
(E) Total Production Costs (B+C)	673.18	688.40	817.67	793.48	961.58	784.84
(F)						
Gross Margin (A-D)	122.21	200.52	686.08	195.62	-40.96	186.58
Return to Unpaid Labour (A-E+B14)	87.27	167.05	651.98	149.09	-108.19	142.28
Return to Investment (A-E+C4)	59.50	135.36	616.06	117.65	-154.08	107.88
Net Return (A-E)	55.80	131.89	613.83	114.15	-159.50	104.06

Conclusion

Our analysis suggests that the total Agricultural Economic Impact for the Bremner area falls within the **range of \$6,938,887 (Contribution Margin approach) to \$15,964,881 (I/O Model approach)** with provincial level multipliers.

It is important to note that the Contribution Margin approach accounts only for the part of upstream and supporting industry effects the agricultural operations in the Bremner area have. Given that there are obviously additional economic impacts, **we recommend using the \$15,964,881 as the estimate of the overall agricultural impact** that the Bremner area has on the county level. This represents approximately 0.0052% of Alberta's Gross Domestic Product of \$304.7 billion^g.

This may appear optimistic given the fact that the Alberta Treasury and Finance calculated multipliers for the whole province and some upstream businesses located elsewhere in the Alberta are not present in Strathcona County. At the same time, the I/O model does not account for the induced impact of business profits that farmers may re-invest into farming operations or other business expansions in the county over time. Our profitability analysis indicates that the farmers have this opportunity but there is not enough information to quantify such effect and we leave it outside the scope of this report. These two limitations of the I/O model mitigate each other while the model provides the most comprehensive conclusion with information available.

^g Statistics Canada, Table: 36-10-0402-01 (formerly CANSIM 379-0030). With the valuation year 2018 not being complete, the GDP at basic prices at the end of 2017 is deemed to be the best comparator at \$304.7 billion. The five-year trend would lead to a very similar result at \$299.4 billion (0.0053%).

Appendix F Proposed Topsoil Conservation and Management Plan

Introduction

This plan is intended to provide guidance on topsoil conservation and management when developing in Bremner.

Context

As identified in the Bremner Agricultural Impact Assessment, all topsoil removed during the conversion of land from agricultural to residential/commercial/light industrial must be managed. Topsoil disposal in areas adjacent to Bremner has been identified as a primary negative impact of the land conversion and development. Additional negative impacts of excess topsoil disposal include, but are not limited to:

- unpermitted site grading
- drainage alterations
- wetland infilling
- agricultural soil degradation
- crop/soil disease transmission
- road damage from unpermitted hauling
- noise, dust and vibration disturbances to adjacent residents and farming operations

Strathcona County is developing strong urban agriculture programs to increase the footprint of edible plant and food cultivation in urban spaces. These plants require healthy, productive soil.

Urban soils tend to be poor quality, consisting of compacted subsoils covered with a thin layer of introduced topsoil. These soils are nutrient deficient, have poor structure and limited microbial activity. To create effective urban agriculture programs, proper soil must be available. Creating requirements at the planning and development stage to conserve topsoil will enable residents and municipal staff to immediately begin their urban agriculture projects.

Topsoil is essential for plant success, the deeper the topsoil, the easier it is for plants to grow deep, healthy roots which improves soil composition and structure and results in plants that are more resilient to disease and pest pressures. In turn, this results in decreased time and energy required by staff/residents to manage urban agriculture projects.

The ability of topsoil to absorb and retain water reduces the need for irrigation, which is especially important during the summer months when demand is high and water availability is low.

Topsoil Conservation Guidelines

Where possible, topsoil should be left undisturbed. Areas that are to be conserved such as Environmental and Municipal Reserve Lands are ideal places to limit stripping and grading activities that would disturb soils.

Topsoil Management Guidelines

Low Impact Development practices include increasing topsoil depths throughout the entire development with the intention to improve surface water quality, reduce water consumption and improve stormwater systems but those same practices also work to conserve and manage topsoil removed during development. The following topsoil conservation techniques (or BMPs) have been applied in other jurisdictions with success:

- Minimum of 300 millimetres of topsoil to be placed on expected turf or urban agriculture areas which includes but is not limited, to front and rear yards, open spaces, boulevards and stormwater management facilities.
- Minimum of 600 millimetre of topsoil to be placed in tree and shrub planting beds.

Current vs. Proposed Standards

Category	Current Strathcona County Design and Construction Standards (2011)	Proposed Bremner Design and Construction Standards
Definition	- Topsoil to be fertile agricultural soil, capable of sustaining vigorous Plant growth, free of subsoil, clay, stone, lumps, noxious odor, roots, other foreign matter except for native soils where seed base or roots may be used for re-establishment of natural vegetation cover and approved by Contract Manager/Developer Representative	As identified by the Canadian System of Soil Classification, topsoil, identified as the A, L, F, H and O layers, is the uppermost horizon of soil that is capable of growing and supporting vegetation. Topsoil contains the essential nutrients, microorganisms, organic matter and other physical characteristics needed grow and sustain permanent vegetation.
Stripping	- The Contractor shall remove the topsoil and stockpile it separately in accordance with the following: The Contractor shall salvage the topsoil, subsoil and overburden in a manner, which prevents contamination of one material with another. A minimum distance of 1m is required between stockpiles of different materials. The materials shall be stockpiled separately in a safe and accessible location as approved by the Contract Manager/Developer Representative. - Topsoil may consist of two distinct layers. The blacker layer shall be stockpiled separately from the lower brownish layer. The Contractor shall consult with the Contract Manager/Developer Representative who will determine if separate salvage and stockpiling is required. The Contractor shall suspend the salvage and stockpiling of topsoil and subsoil materials when excessively wet, frozen or other adverse conditions are encountered. These operations shall remain suspended until field conditions improve or the Contract Manager/Developer Representative approves alternate procedures.	Same or similar to current.
Depth	150 mm for seeded areas; 100 mm for sodded areas; 450 mm for flower beds;	300 mm for seeded areas; 300 mm for sodded areas; 450 mm for flower beds;

	450 mm for shrub beds; and 200 mm for sport fields.	600 mm for shrub beds; and 300 mm for sport fields.
Compaction	No current standard	<ul style="list-style-type: none"> - Do not place topsoil when frozen, excessively wet, extremely dry, or in a condition inhibiting proper grading, cultivation, or compaction or otherwise in a condition detrimental to the work or topsoil integrity - For topsoil depths greater than 300 mm, place topsoil in maximum 150 mm lifts and compact with appropriate weighted landscape roller where applicable. Landscape rollers are not recommended for naturalization areas as micro-topography is recommended. - Placed topsoil shall be allowed to settle or shall be lightly compacted such that it is firm against deep footprints prior to planting, seeding or sodding. Compaction shall not be more than necessary to meet this requirement. - Topsoil shall be placed and spread with appropriate low impact equipment and in a manner that does not adversely affect its structure. - Remove roots, weeds, rocks, and foreign material greater than 50mm in diameter while spreading. <p>*adapted from City of Edmonton's Design and Constructions Standards (Volume 5 Landscaping)</p>
Soil Property Testing	Sand - 40% +/- 3% by dry mass Clay - 30% +/- 3% by dry mass Silt - 30% +/- 3% by dry mass Organic Matter 6-10% by dry mass Toxic Chemicals None pH Value 6.0 – 7.5 EC - Max 1.5 mhos/cm ² Nitrate Nitrogen 10-20 ppm Phosphorus 10-60 ppm Potassium 80-250 ppm	Same or similar to current. Variances should be granted to accommodate soil properties in Bremner without having to add amendments under most circumstances.

Clubroot

Clubroot management plans must be taken into consideration when doing topsoil management planning. Please note that clubroot contaminated soil must be managed onsite or landfilled. It is appropriate to use clubroot contaminated soils for uses such as turf fields and boulevards.

Other Considerations

If there is insufficient topsoil, variances may be granted to the developer and home builders so that topsoil does not have to be imported.

If excessive topsoil exists that cannot be used during development alternatives may be considered on a case by case basis.

References

Alberta Low Impact Development Partnership. 2016. Alberta Clean Runoff Action Guide (preliminary draft July 2016)

Okanagan Basin Water Board. The Partnership for Water Sustainability in BC. 2012. Topsoil Bylaws Tool Kit: An Appendix to the Green Bylaws Toolkit

Young, D. Morrison, C. (2012) Soil Management Best Practices Guide for Urban Construction [PowerPoint slides]. Retrieved from <https://trieca.com/app/uploads/2016/07/Soil-Mgmt-Guideline-Mar-28-2012.pdf>

City of Edmonton. (2014). Low Impact Development Practices Best Management Practices Design Guide Edition 1.1.

Cook, J. City of Vancouver. 2016. Top Soil Requirements In Vancouver: The Need, The Benefits, And The Next Steps.

City of Edmonton. (2017). Design and Construction Standards Volume 5: Landscaping.

Ritter, J. Ontario Ministry of Agriculture, Food and Rural Affairs. 2016. Factsheet: Importation of Soil onto Agricultural Land.

Case Studies and Examples

Currie Barracks Calgary <http://albertawater.com/alberta-water-blog/2581-low-impact-development-and-flooding-a-drop-in-the-bucket-by-leta-van-duin>

Village of Alix <http://lombardnorth.ca/project/sustainable/>

Box Grove, Ontario http://www.latornell.ca/wp-content/uploads/files/presentations/2016/Latornell_2016_T3F_Dean_Young.pdf