

Sask FNs Water Assoc.

➤ PRESENTATION: November 1, 2019

❖ WATER
&
❖ INDUSTRY



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➤ WATER

- ❖ Contrary to the position of the Provincial and Federal Governments that the water flow thru the Qu' Appelle Valley is NATURAL.
- ❖ This position is untrue as Governments have constructed water control structures throughout the Qu' Appelle Valley since 1897.
- ❖ These water control structures store and release waters throughout the Qu' Appelle Valley

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➤ WATER

- ❖ Before we understand the dynamics on how the Qu' Appelle Valley Water Way is managed, we must first look at all the man-made water control structures.

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➤ WATER

❖ Diefenbaker Lake



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➤ WATER

❖ Diefenbaker Lake

- Lake Diefenbaker is the largest body of water in southern Saskatchewan.
- It was formed by two dams, the Qu' Appelle River Dam and Gardiner Dam.
- 9,400,000 cubic dam Full Supply Level (FSL) or 7.6 million acre ft. storage.
- The Qu' Appelle Dam controls flows in the Qu' Appelle River and the Gardiner Dam controls flows in the South Saskatchewan River.

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➤ WATER

❖ Diefenbaker Lake

- The dams were officially opened June 21, 1967.
- Lake Diefenbaker provides domestic water for approximately 45 percent of Saskatchewan people.
- Water is also stored for use by 10 potash mines, 4 major irrigation projects, various industries and wildlife interests. The lake also plays an important role in power generation and flood control.

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➤ WATER

❖ Qu' Appelle Dam Outlet to Buffalo Pound

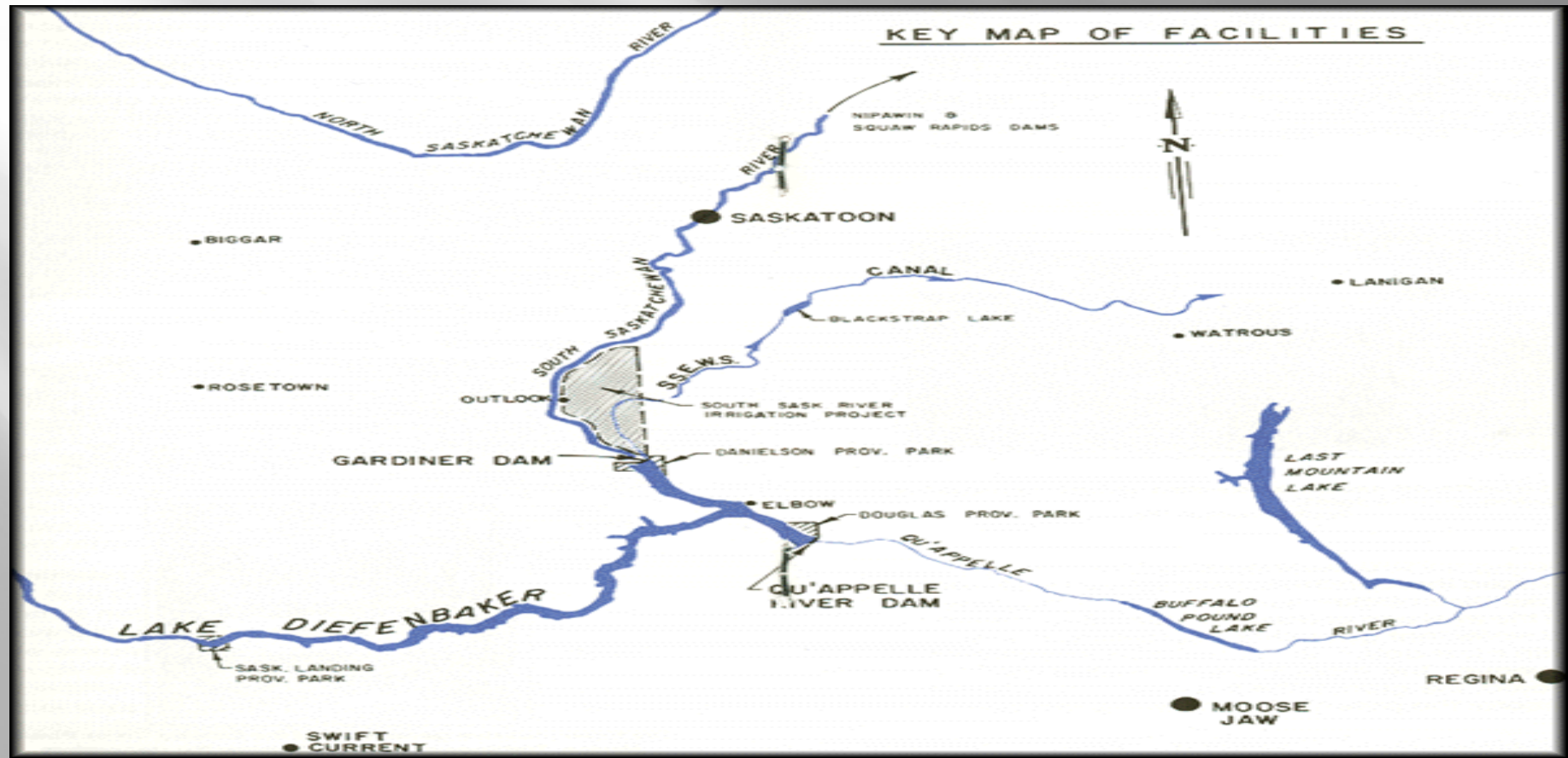


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➤ WATER

❖ Buffalo Pound Lake Map



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➤ WATER

❖ Buffalo Pound Lake and Spill-way

- Buffalo Pound Dam is located 100 km southeast of Lake Diefenbaker, and approximately 30 km northeast of Moose Jaw.
- 91,279 cubic dam FSL
- This reservoir is the first major lake on the Qu'Appelle River below the Qu'Appelle River Dam.
- The dam and control structure provide a stable source of water for direct withdraws from the lake as well as for downstream use.

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➤ WATER

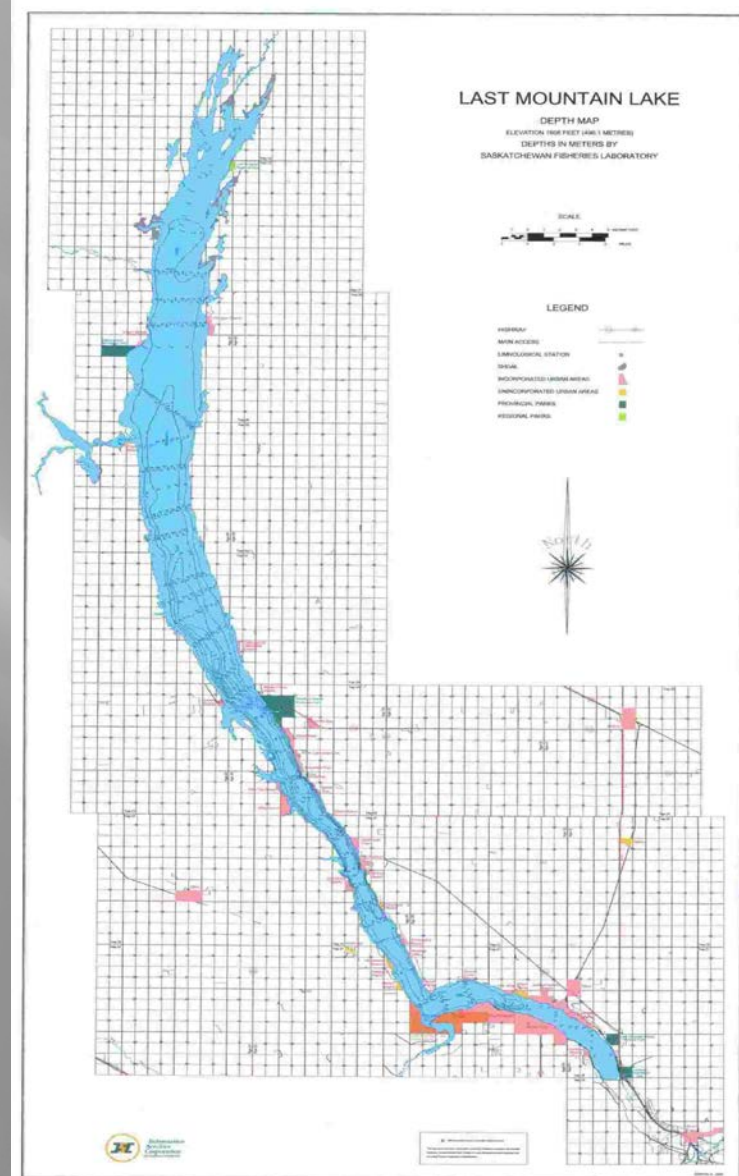
❖ Buffalo Pound Lake and Spill-way

- The works form an important component to manage water along the Qu' Appelle River system.
- The Saskatchewan Watershed Authority owns and operates the control structure.
- The Buffalo Pound Lake control structure and dam were constructed by the Prairie Farm Rehabilitation Administration in 1939. In 2000, a new control structure and improvements to the dam were completed and placed into operation

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- ❖ Last Mountain Lake or Kinookimaw Lake



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➤ WATER

❖ Last Mountain Lake or Kinookimaw Lake

- Approximately 81 km long, and only 3 km wide at its widest point. It is the largest natural body of water in southern Saskatchewan.
- 1,840,000 cubic dam FSL
- Lake level is controlled by the VALEPORT DAM.

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➤ WATER

❖ Valeport Dam

- Valeport Dam was approved for construction by Order-In-Council PC 1601 on June 9, 1939.
- 1947 Valeport Dam was removed.
- 1958 Valeport Dam was rebuilt due to floods of 1955 and 1956.
- Valeport maintains lake level from a low of 1604 Feet Above Sea Level (ASL) to 1609.5 Feet ASL.

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➤ WATER

❖ Craven Dam



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➤ WATER

❖ Craven Dam

- First constructed in 1903
- Re-built in 1942-43
- Replaced in 2003.
- Regulates water flows downstream to the Qu' Appelle River and Qu' Appelle Chain of Lakes.
 - Pasqua Lake
 - Echo Lake
 - Mission Lake
 - Katepwa Lake
 - Crooked Lake
 - Round Lake

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➤ WATER

❖ Echo Lake Dam



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➤ WATER

❖ Pasqua Lake and Echo Lake



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➤ WATER

❖ Echo Lake Dam

- Constructed in 1941–42
- Maintains lake levels on
 - Pasqua Lake: 119,000 cubic dam FSL
 - Echo Lake: 122,000 cubic dam FSL
- Both Lake Levels
 - Low: 1564 ASL
 - High: 1572 ASL

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➤ WATER

❖ Mission Lake



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➤ WATER

❖ Katepwa Lake



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➤ WATER

❖ Katepwa Weir

- First constructed in 1888
- Regulates water on all four lakes of the Upper Qu' Appelle
 - Pasqua Lake: 119,000 cubic dam FSL
 - Echo Lake: 122,000 cubic dam FSL
 - Mission Lake: 63,500 cubic dam FSL
 - Katepwa Lake: 231,000 cubic dam FSL
- Reconstructed in 1957
- Major renovations in 2005

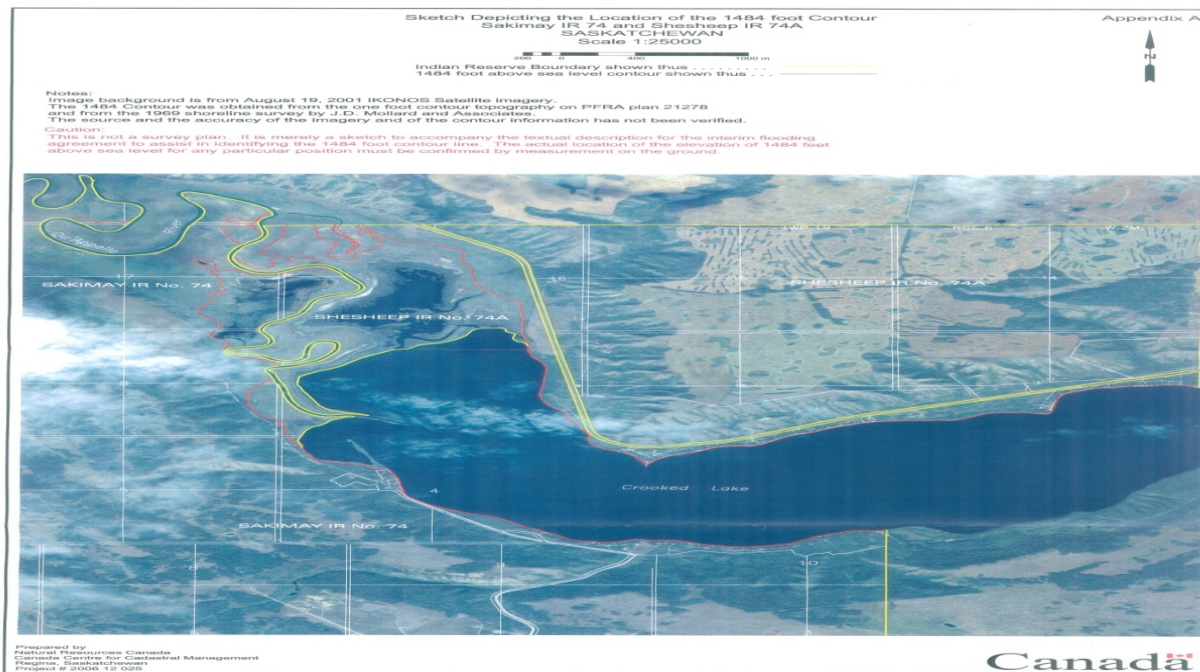
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➤ WATER

❖ Crooked Lake Dam

- Constructed in 1942
- 121,000 cubic dam FSL



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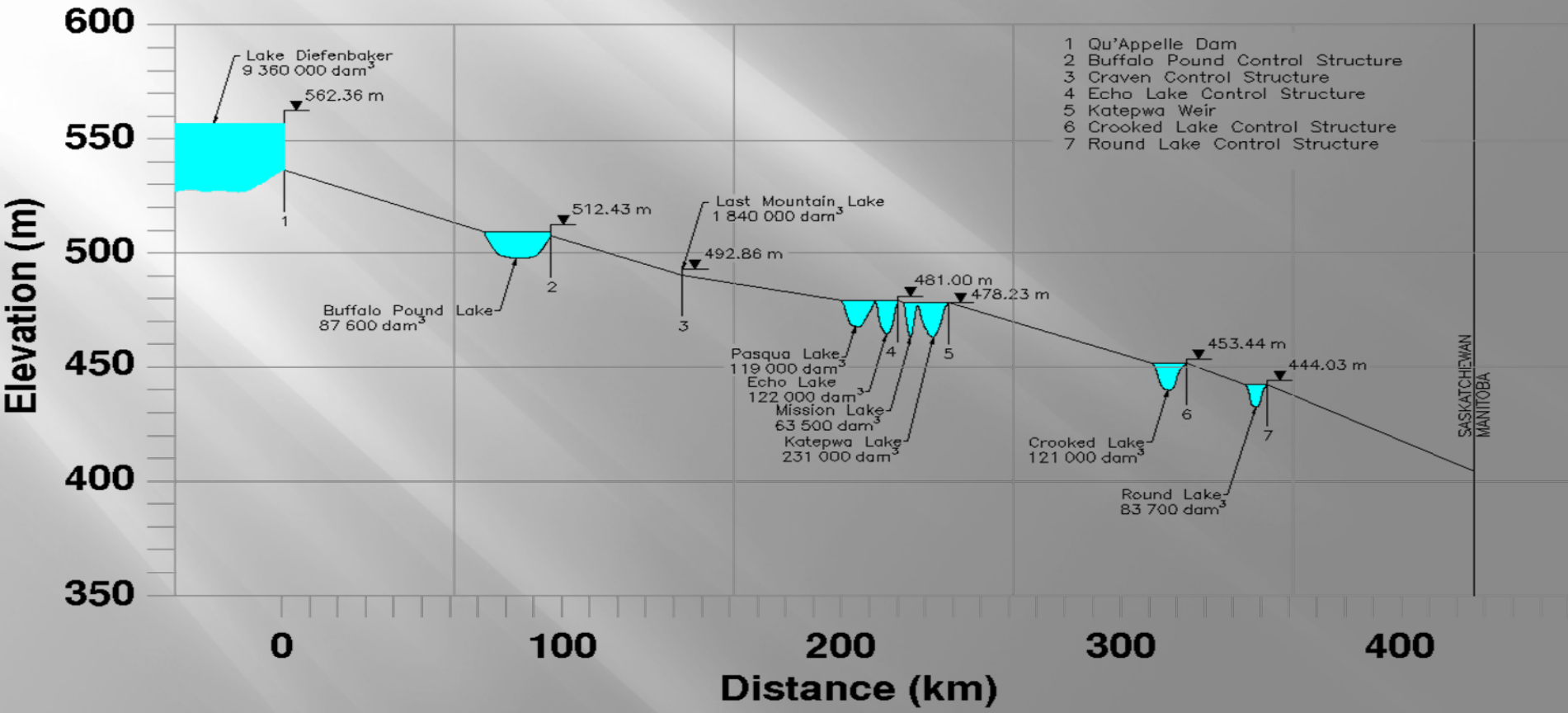


➤ WATER

❖ Round Lake Dam

- Constructed in 1942
 - 83,700 cubic dam FSL
 - Renovations: 1971 & 2000

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➤ Potash Industry

- ❖ There are currently 10 potash mines operating in Saskatchewan.
 - 8 conventional underground mines: Started 1962
 - Ownership:
 - Potash Corporation of Saskatchewan
 - Cory
 - Conventional
 - 2010 Production: 800,000 tonnes
 - Water Consumption:
 - Withdrawn: 1,372,000 m³
 - Recycled: 11,860,000 m³
 - Depth: 1,027 meters

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➤ Potash Industry

❖ Ownership

▪ Potash Corporation of Saskatchewan

• Allan

- Conventional
- 2010 Production: 1.1 million tonnes
- Water consumption:
 - Withdrawn: 1,839,000 m³
 - Recycled: 4,832,000 m³
- Depth: 1,040 meters

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➤ Potash Industry

❖ Ownership

▪ Potash Corporation of Saskatchewan

• Lanigan

- Conventional
- 2010 Production: 2.3 million tonnes
- Water Consumption:
 - Withdrawn: 2,507,000 m³
 - Recycled: 2,458,000 m³
- Depth: 1,000 meters

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➤ Potash Industry

❖ Ownership

▪ Potash Corporation of Saskatchewan

• Rocanville

- Conventional
- 2010 Production: 2.18 million tonnes
- Water consumption:
 - Withdrawn: 994,000 m³
 - Recycled: 11,000,000 m³
- Depth: 960 meters

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➤ Potash Industry

❖ Ownership

▪ Mosiac Potash

- Colonsay
 - Conventional
 - 2010 Production: 1.8 million tonnes
 - Expansion by 2012: 2.27 million tonnes
 - Water Consumption: Unknown

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➤ Potash Industry

❖ Ownership

▪ Mosiac Potash

- Esterhazy K1 & K2
 - Conventional
 - 2010 Production: 5.3 million tonnes
 - Water Consumption: Unknown

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➤ Potash Industry

❖ Ownership

- Agrium
 - Vanscoy
 - Conventional
 - 2011 Production: 1.7 million tonnes
 - Water Consumption: Unknown

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➤ Potash Industry

❖ 2 solution mines: Started 1964

Ownership:

- Potash Corporation of Saskatchewan
 - Patience Lake
 - Solution
 - 2010 Production: 372,000 tonnes
 - Water Consumption:
 - Withdrawn: 399,000 m³
 - Recycled: 14,773,000 m³
 - Depth: 1,000 meters

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➤ Potash Industry

❖ Ownership

▪ Mosaic

• Belle Plaine

▪ Solution

▪ 2010 Production: 2.8 million tonnes

▪ Water Consumption

- Current – 12 million m³

- 2020 Completion – 26 million m³ – producing 5.3 million tonnes

- Mosaic consumes 282,416,000 m³ of water world wide

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➤ Potash Industry

❖ Solution Mining

▪ Other Industry

- K+S Potash Inc. – Legacy Project
 - Request approved: 17 Mm³ = 3.7 billion Imperial gallons
 - Producing 2 million tonnes annually
- Vale Potash – Kronau Project
 - Requested: 21 Mm³ = 4.6 billion Imperial gallons
 - Producing 2.5 million tonnes annually

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➤ Potash Industry

❖ Solution Mining

▪ Other Industry

- BHP Billiton – Melville Project – Unknown water source
- Muskowekwan/Encanto Project – Unknown water source
- Agrium Inc. – Triton Project – Unknown water source
- Western Potash – Milestone Project
 - Water source
 - City of Regina sewage effluent

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➤ Potash Industry

❖ Summary

- 8 Conventional Mines
 - 2 solution Mines
 - 3 solution Mines in Development Stage
 - 2 potential Mines in Melville Area
 - 1 potential Mine on Muskowekwan First Nation
-
- 62,111,000 m³ or 13,662,509,981 gal annually
 - Does not include all of Mosaic's requirements

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➤ Potash Industry

❖ Summary

- Potash Production
 - Current: 17,552,000
 - 2020 Projection: 24,552,000
 - Does not include 4 mines
- Water Consumption
 - 62,111,000 m³ or 13,662,509,981 gal annually
 - Does not include all of Mosaic's requirements

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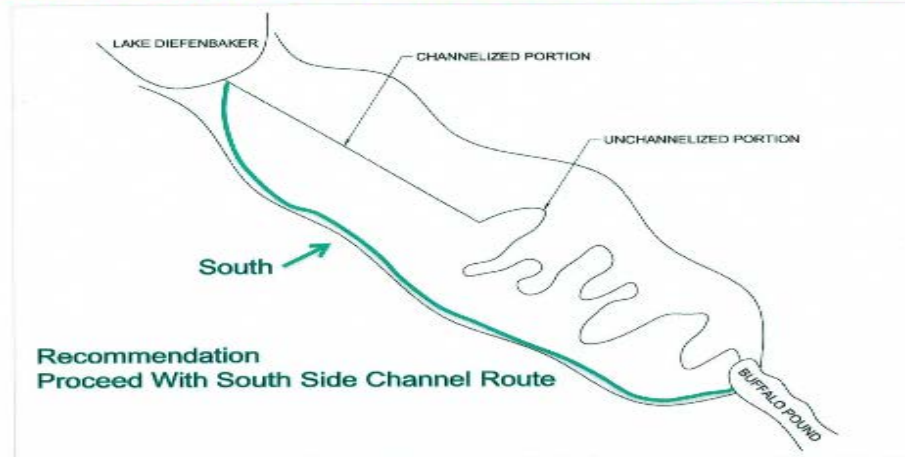


- Potash Industry
 - ❖ Future Water Demands

Study Components

AECOM

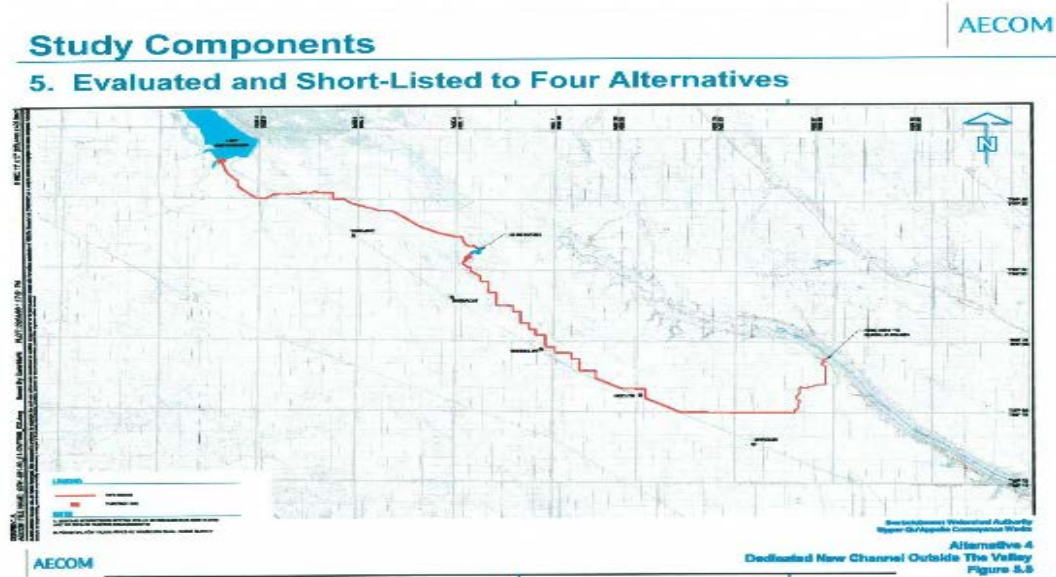
Alternative Group 3 – Dedicated Channel Within Valley



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- Potash Industry
 - ❖ Future Water Demands



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- Potash Industry
 - ❖ Future Water Demands

Study Components

AECOM

Comparison of Cost for Conveyance Alternatives

	11 m³/s			21 m³/s			26 m³/s		
	Alternative	Cost (\$000,000)	% Difference from Lowest	Alternative	Cost (\$500,000)	% Difference from Lowest	Alternative	Cost (\$600,000)	% Difference from Lowest
Pipeline (In Valley)	1A	\$802	140%	1A	\$754	180%	1A	\$850	201%
Pipeline (Out side Valley)	1B	\$537	115%	1B	\$673	160%	1B	\$758	121%
Existing Conveyance	2	\$284	-	2	\$269	-	2	\$258	-
Dedicated Channel Within Valley	3	\$295	10%	3	\$308	17%	3	\$320	0%
Dedicated Channel Outside Valley	4	\$250	-	4	\$273	-	4	\$295	-

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➤ Potash Industry

❖ Future Water Demands

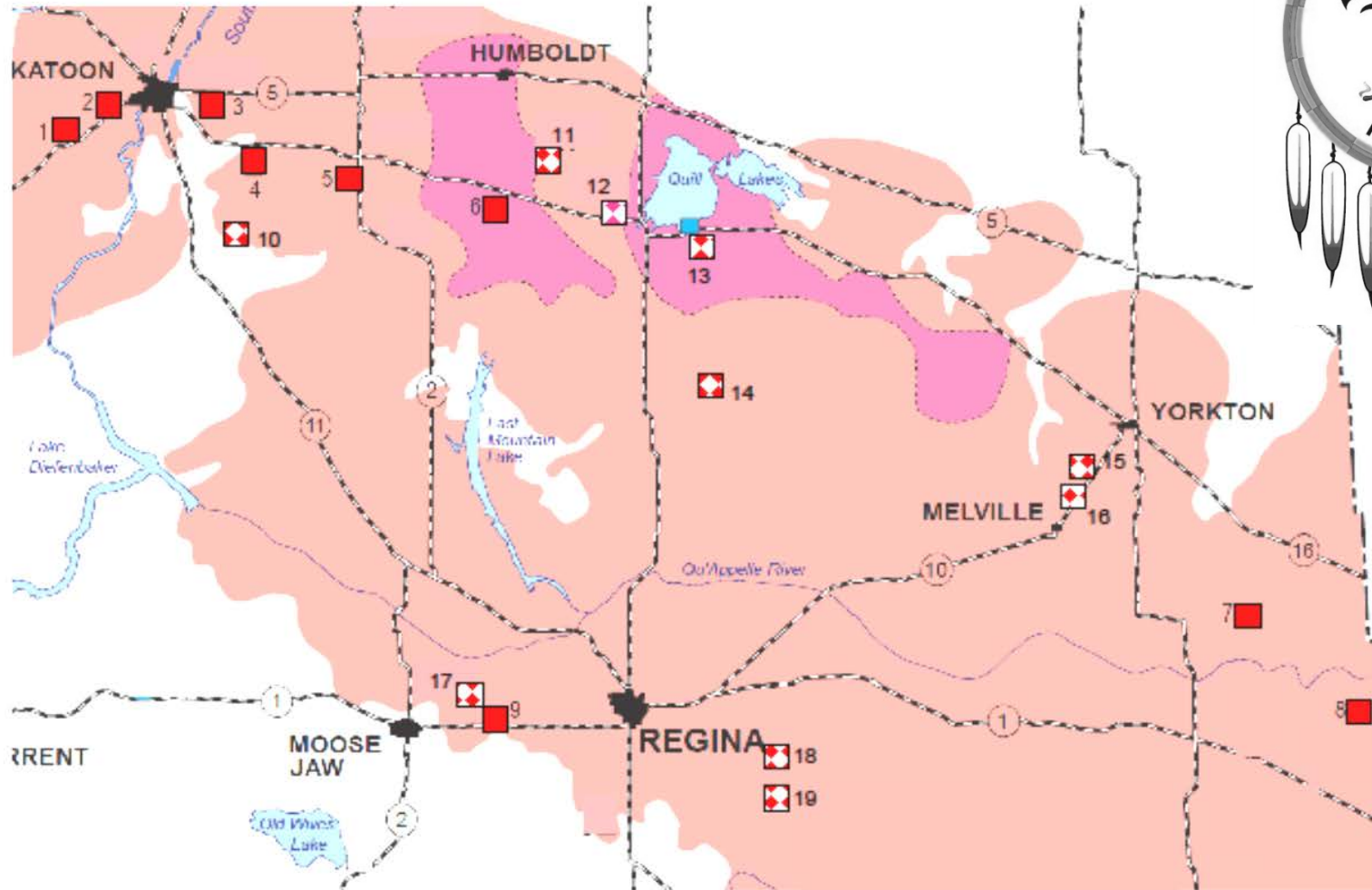
▪ SWA

- Proposing the construction of a canal on top of south side of Qu' Appelle Valley from Diefenbaker Lake to Buffalo Pound.
- Water flow may be increased by either
 - 17 m³/s, 21 m³/s or 25 m³/s
 - 3740 gal/s, 4619 gal/s or 5499 gal/s respectfully.

Potash/Salt Deposits



Carnallite Deposits



Operating Mines

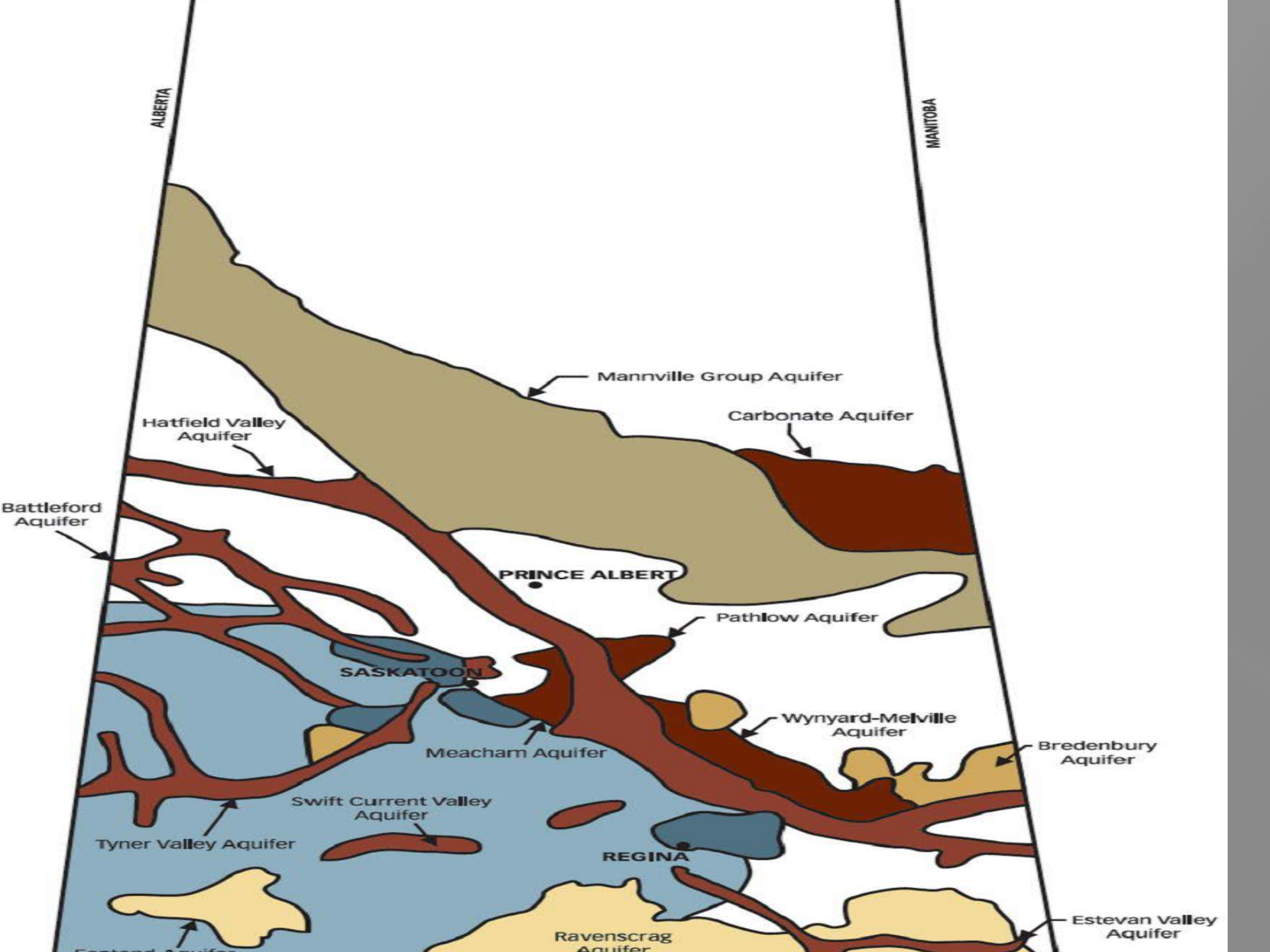
Mines under development or potash project locations

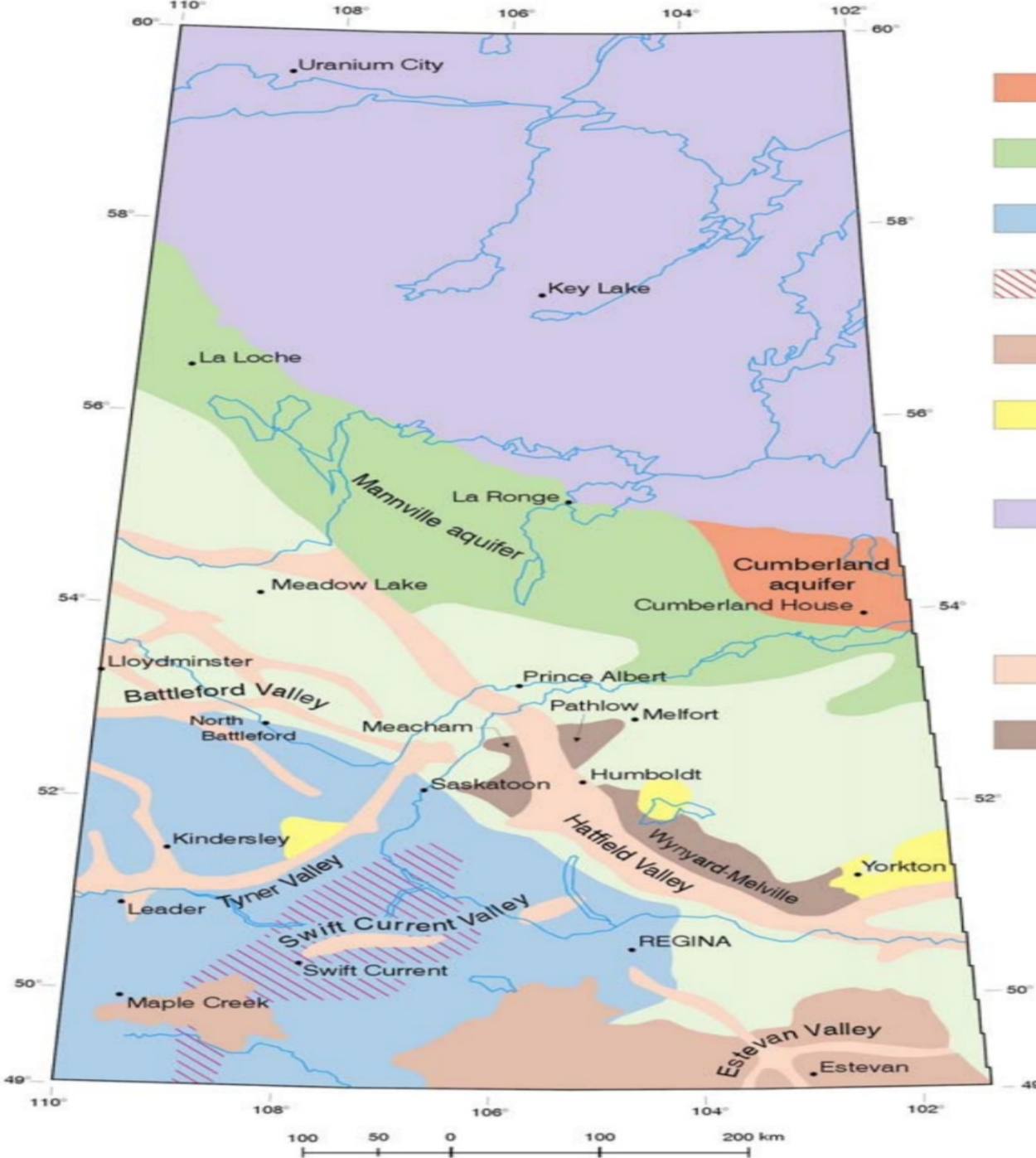
1 – Vanscoy; 2 – Cory; 3 – Patience Lake; 4 – Allan; 5 – Colonsay; 6 – Lanigan; 7 – Esterhazy (K1 & K2); 8 – Rocanville; 9 – Belle Plaine; 10 – M & J potash project; 11 – Burr potash project; 12 – Jansen potash project; 13 – Wynyard potash project; 14 – Muskowekwan potash project; 15 – Melville potash project; 16 – Triton potash project; 17 – Legacy potash project; 18 – Regina potash project; 19 – Milestone potash project.

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Canada Golden Fortune Potash Company

- ▣ The Broadview Project is a proposed solution potash mine in southeast Saskatchewan. It is situated on KL280, which is 281 square kilometres in size and located approximately 12 kilometres south of the Town of Grenfell and 120 kilometres east of Regina.
- ▣ CGFPC water license is to withdraw from the Hatfield Valley Aquifer.





Bedrock Aquifers

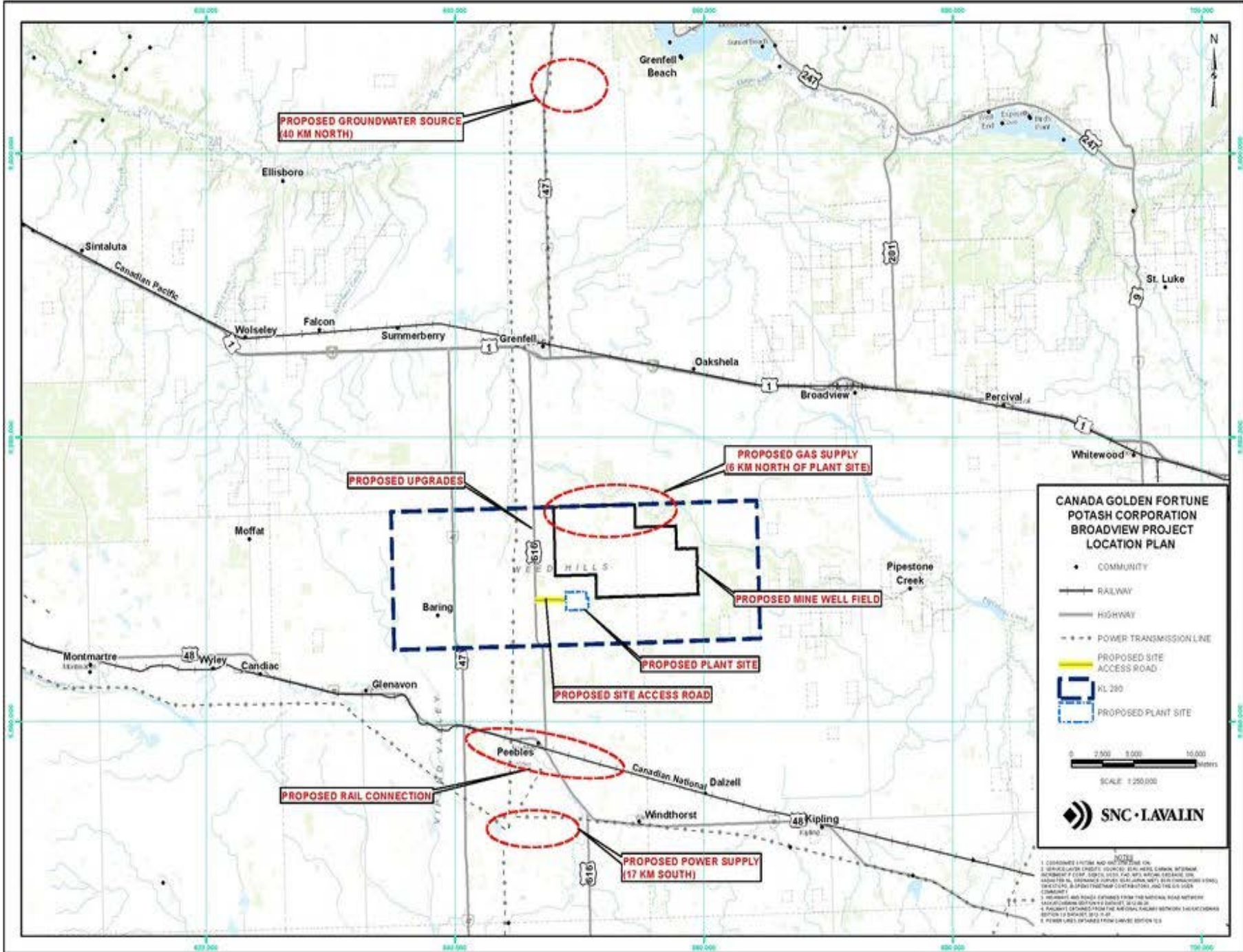
- Cumberland aquifer:**
Ordovician and Silurian limestone and dolomites
- Mannville aquifer:**
Sands and gravels of the Mannville Group
- Judith River aquifer:**
Sands of the Judith River Formation
- Aquifers formed by sand members of the Bearpaw Formation**
- Eastend-Ravenscrag aquifer:**
Sands of the Eastend-Ravenscrag Formation (Late Cretaceous-Tertiary)
- Tertiary aquifers:**
Sands of undifferentiated Tertiary deposits
- Precambrian Shield**

Major Drift Aquifers

- Tertiary aquifers:**
Sands of undifferentiated Tertiary deposits
- Blanket aquifers:**
Sands and gravels of the Empress Group



Latitudes north of Equator
Longitudes west of Greenwich



**PROPOSED GROUNDWATER SOURCE
(40 KM NORTH)**

**PROPOSED GAS SUPPLY
(6 KM NORTH OF PLANT SITE)**

PROPOSED UPGRADES

PROPOSED MINE WELL FIELD

PROPOSED PLANT SITE

PROPOSED SITE ACCESS ROAD

PROPOSED RAIL CONNECTION

**PROPOSED POWER SUPPLY
(17 KM SOUTH)**

**CANADA GOLDEN FORTUNE
POTASH CORPORATION
BROADVIEW PROJECT
LOCATION PLAN**

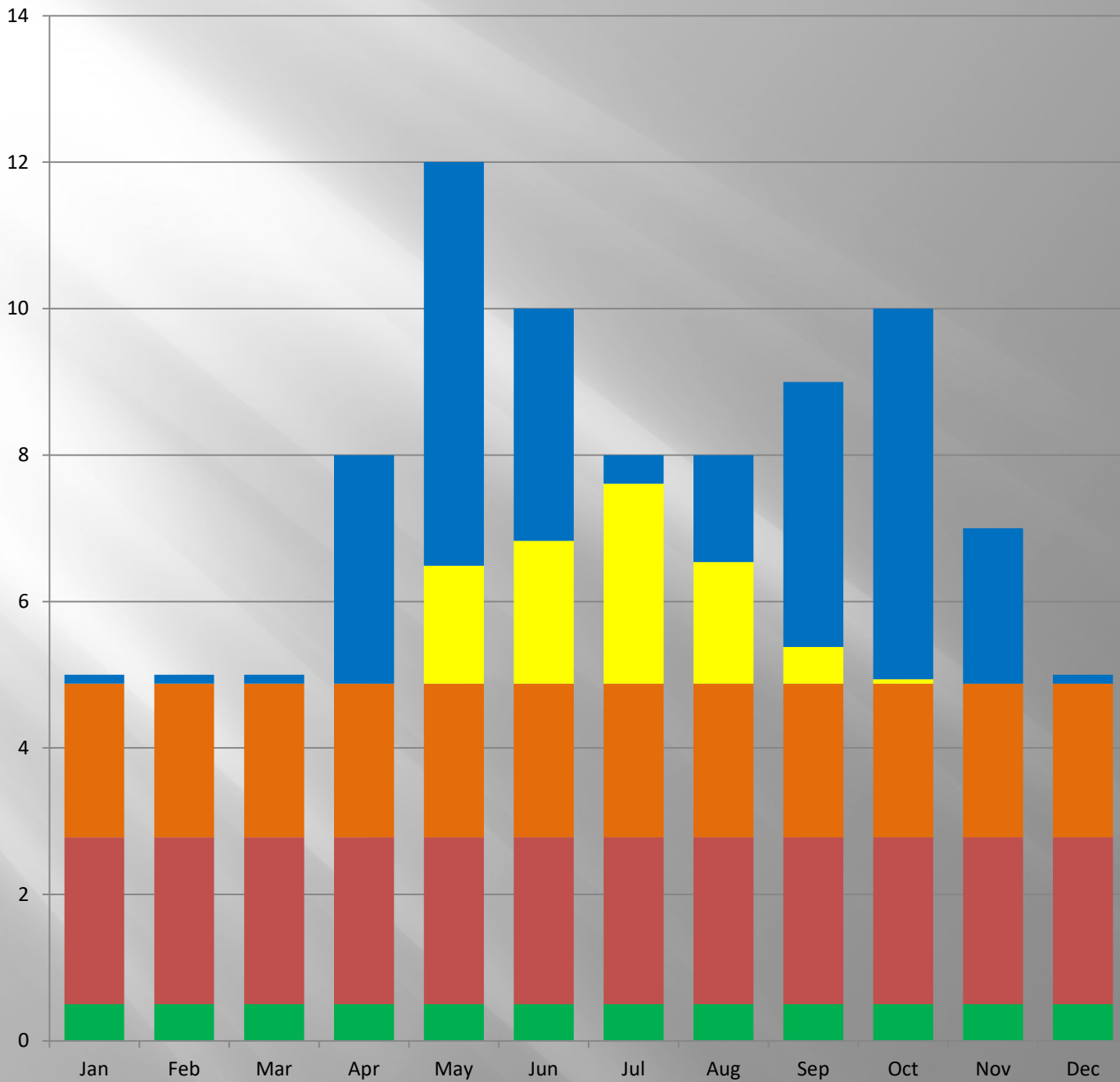
- COMMUNITY
- RAILWAY
- HIGHWAY
- - - POWER TRANSMISSION LINE
- PROPOSED SITE ACCESS ROAD
- KL 280
- PROPOSED PLANT SITE

0 2,500 5,000 10,000 METERS
SCALE: 1:250,000

SNC · LAVALIN

NOTES

1. COMMUNITY NAMES AND LOCATIONS ON THIS MAP ARE BASED ON THE 2011 CANADIAN CENSUS. SOURCE: STATISTICS CANADA, 2011.
2. PROPERTY LINES SHOWN ON THIS MAP ARE BASED ON THE 2011 CANADIAN CENSUS. SOURCE: STATISTICS CANADA, 2011.
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- Capacity
- Summer Use
- New Use
- Cont. Use
- Env Flow

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- THANK YOU
- QUESTIONS

