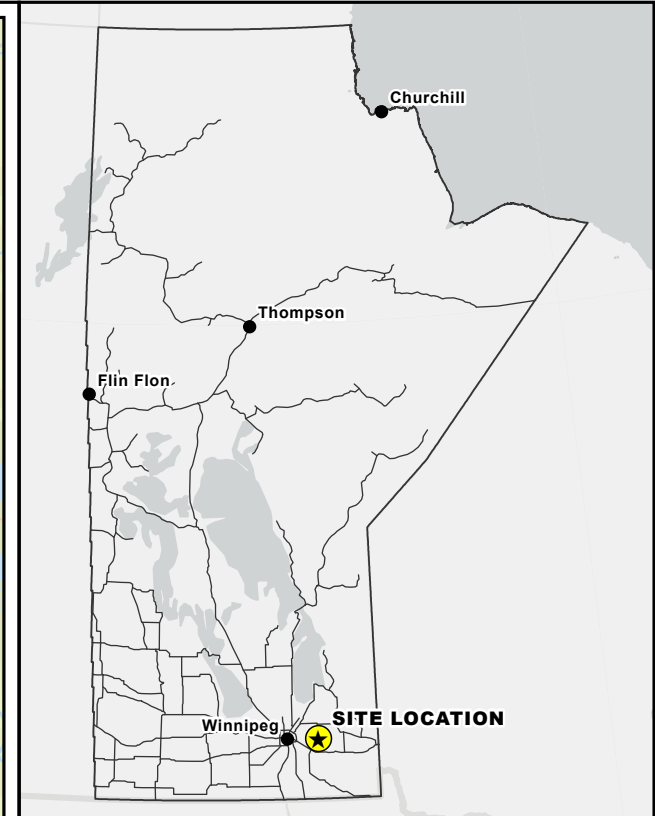
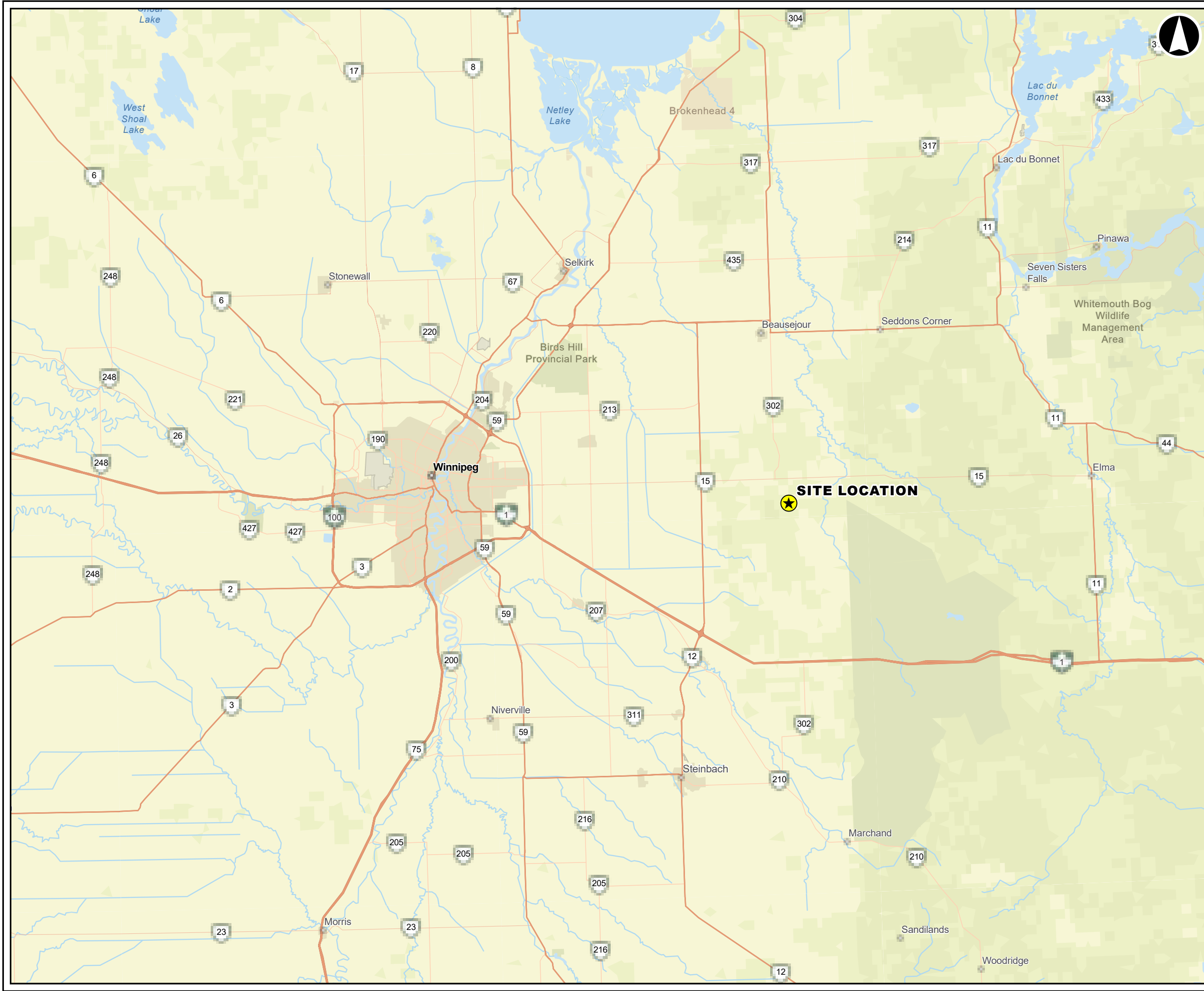


## **FIGURES**





**Legend**

- Site Location

**SIMBA PROJECT**  
**SIO SILICA CORPORATION**  
**HYDROGEOLOGY AND GEOCHEMISTRY ASSESSMENT**

**PROJECT LOCATION**

0510152025

Kilometres

Datum: NAD 1983 UTM Zone 14N

Nov, 2024

PN#: 60730241

1:500,000  
\* when printed 11"x17"

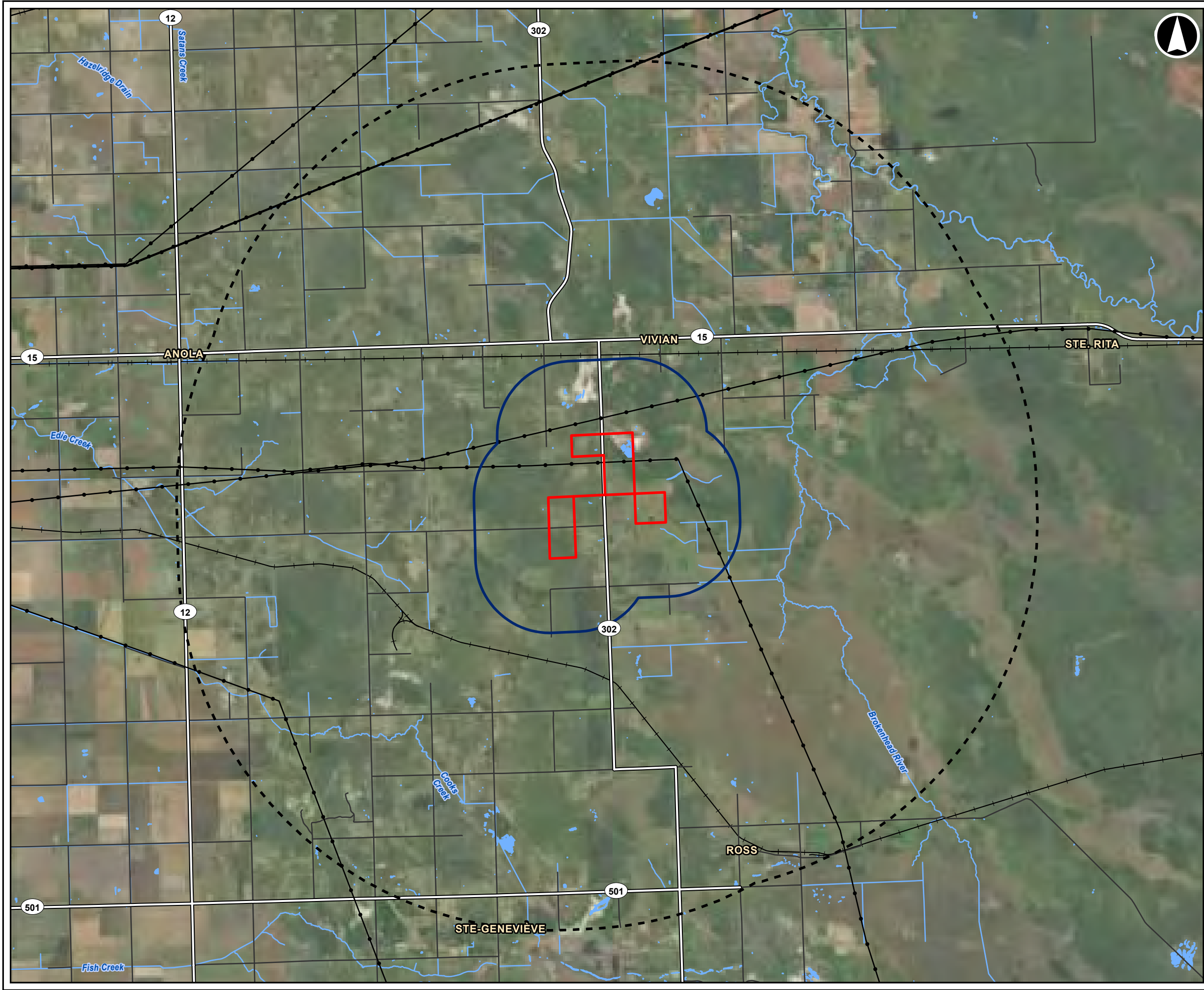
**Figure 1-1**

**AECOM**

Data Sources: ML, NRCAN - Canvec  
Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada, Esri Canada, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NRCAN, Parks Canada

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MAP LOCATION: L:\GIS\GIS\PROJECTS\2024\07\30241\_SIO\_SILICA\_EXTRACT\REPORTS\HYDROGEOLOGY\B0730241\_SIO\_SILICA\_EXTRACT\_HYDROGEOLOGY\APRX\_FIGURE\_1-1-1\_HYDROGEOLOGY\PROJECT LOCATION  
DATE SAVED: 2024-11-21 USER NAME: PAGE CROSSMAN



**Legend**

- Project Site Boundary
- Local Project Area
- Regional Project Area

**General Features**

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody

**SIMBA PROJECT**  
**SIO SILICA CORPORATION**  
**HYDROGEOLOGY AND GEOCHEMISTRY ASSESSMENT**

**SPATIAL BOUNDARIES**

0 1 2 3 4  
Kilometres

Datum: NAD 1983 UTM Zone 14N

|           |               |                                     |
|-----------|---------------|-------------------------------------|
| Nov, 2024 | PN#: 60730241 | 1:100,000<br>* when printed 11"x17" |
|-----------|---------------|-------------------------------------|

**Figure 1-2**

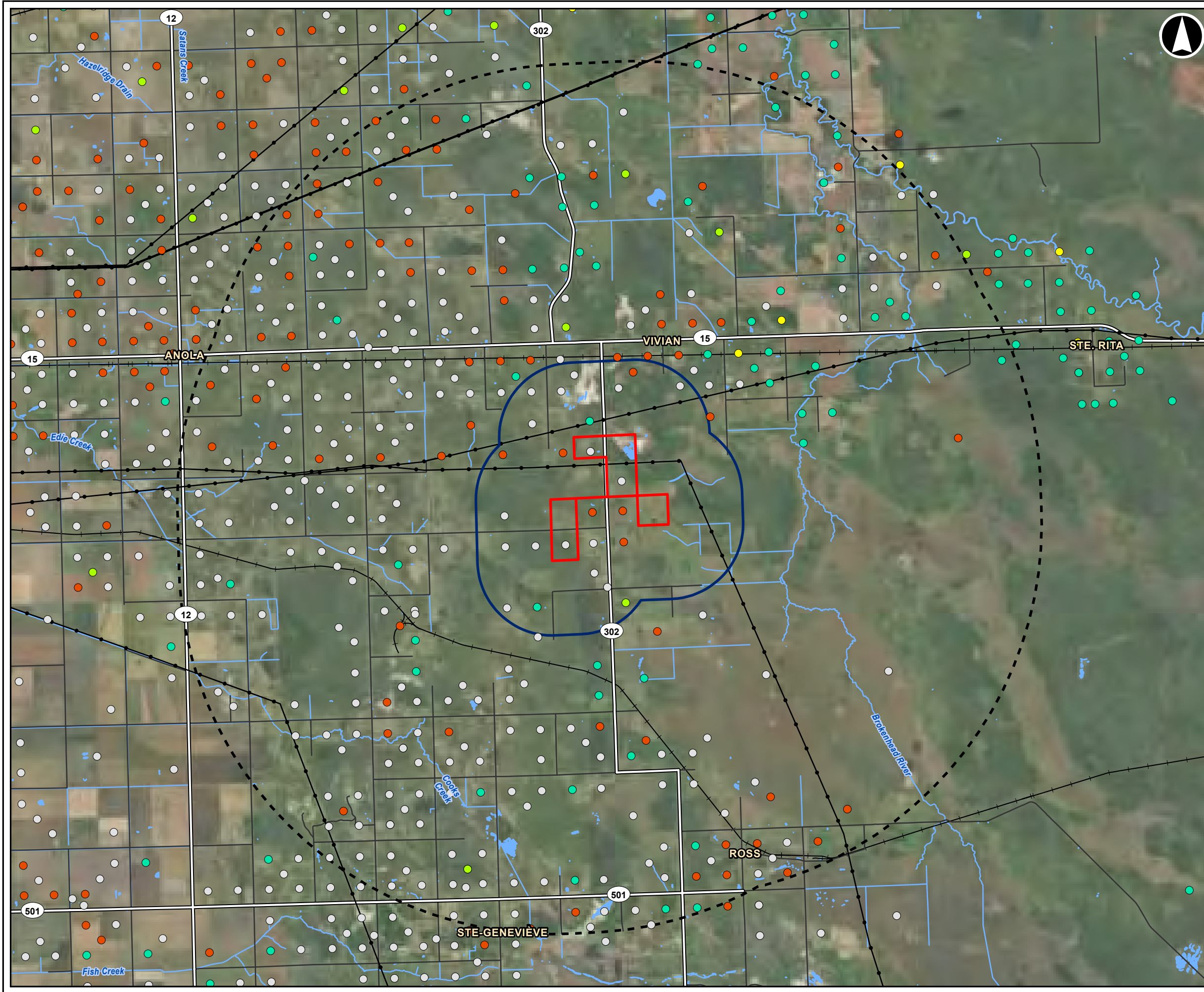
Data Sources: MLI, NRCan - Canvec  
Earthstar Geographics

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\\01\location\GIS\GIS\WANT\03\60730241\SIO\_SILICA\EXTRACT\REPORTS\HYDROGEOLOGY\B0730241\_SIO\_SILICA\EXTRACT\_HYDROGEOLOGY\APRX\_FIGURE\MAP\_FIG\_1-2\_HYDROGEOG\_SPATIALBOUNDARIES

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**Legend**

- Project Site Boundary
- Local Project Area
- Regional Project Area

**Existing Goundwater Users by Aquifer**

- Quaternary Sediments
- Red River Carbonate
- Winnipeg Shale
- Winnipeg Sandstone
- Lower Shale/Precambrian

**General Features**

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody

**SIMBA PROJECT**  
**SIO SILICA CORPORATION**  
**HYDROGEOLOGY AND GEOCHEMISTRY ASSESSMENT**

**EXISTING GROUNDWATER USERS BY AQUIFER**

01234

Kilometres

Datum: NAD 1983 UTM Zone 14N

Nov, 2024

PN#: 60730241

1:100,000  
\* when printed 11"x17"

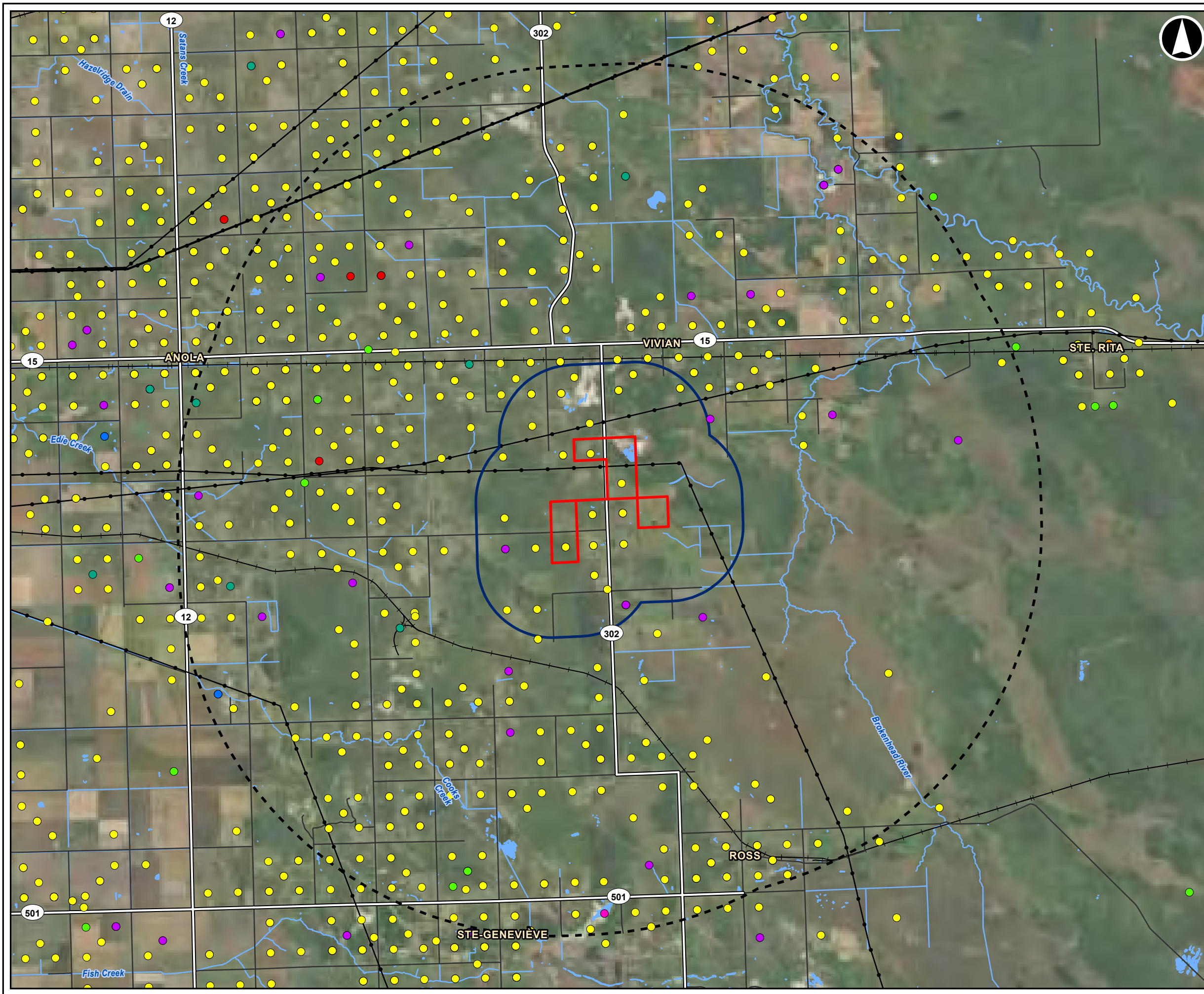
**Figure 1-3**

**AECOM**

Data Sources: MLI, GIN, NRCan - Canvec  
Earthstar Geographics

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MAP LOCATION: L:\GIS\GIS\WANT\03\07\30241\_SIO\_SILICA\EXTRACT\REFLECTED\REPORT\HYDROGEOLOGY\B0730241\_SIO\_SILICA\EXTRACT\_HYDROGEOLOGY\APRX\_FIGURE\_MAP\_FIG-1-3\_HYDROGEOLOGY\GROUNDWATER\WELLS\USER DATE SAVED: 2024-11-21 USER NAME: PAGE CROSSMAN



**Legend**

- Project Site Boundary
- Local Project Area
- Regional Project Area

**Existing Goundwater Users by Type**

- Air Conditioning
- Domestic
- Industrial
- Irrigation
- Livestock
- Missing
- Municipal
- Other

**General Features**

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody

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**EXISTING GROUNDWATER USERS BY TYPE**

01234

Kilometres

Datum: NAD 1983 UTM Zone 14N

Nov, 2024

PN#: 60730241

1:100,000  
\* when printed 11"x17"

**Figure 1-4**

Data Sources: MLI, GIN, NRCan - Canvec  
Earthstar Geographics

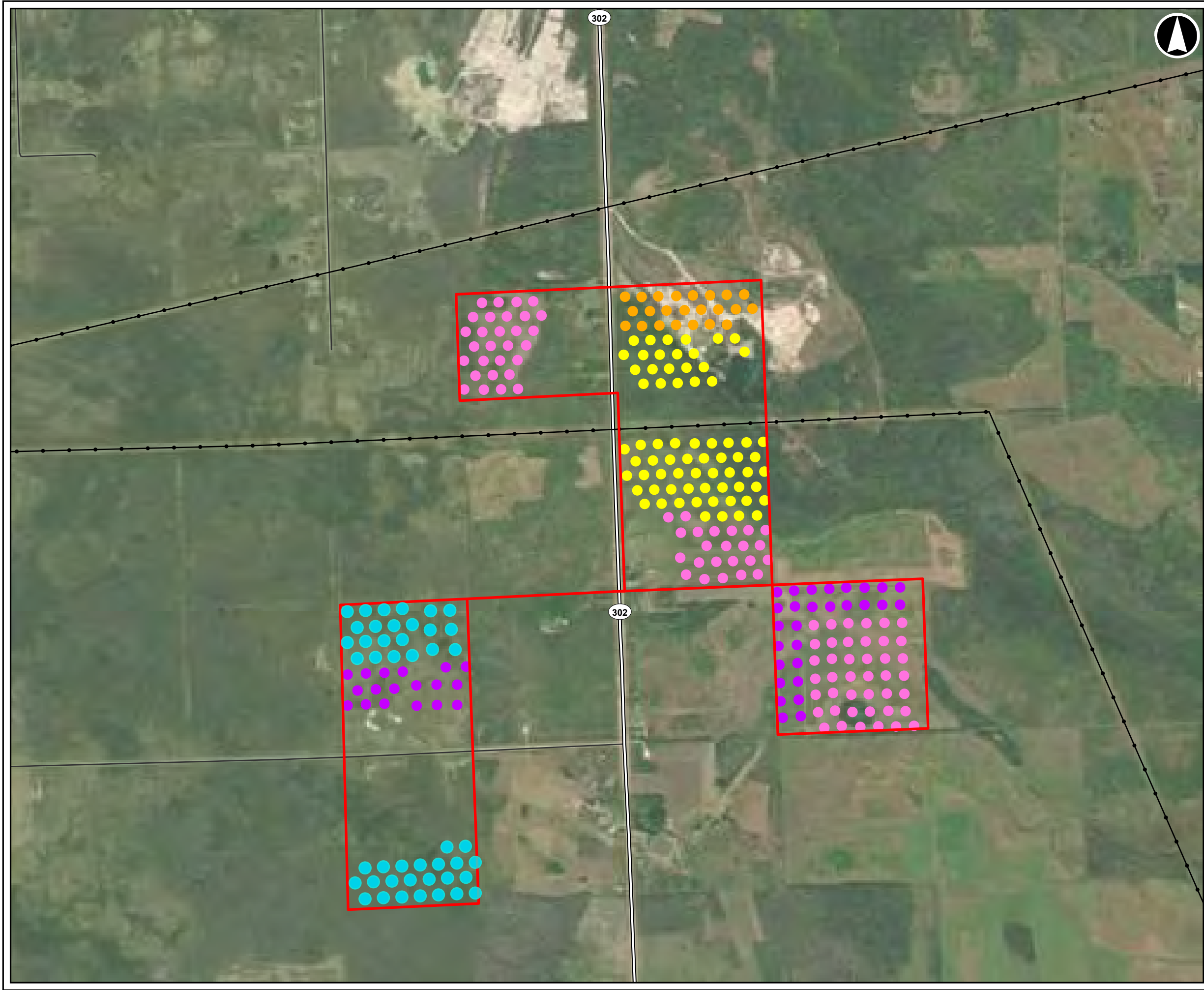
**AECOM**

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MAP LOCATION: L:\GIS\GIS\WANT\03\07\30241\_SIO\_SILICA\EXTRACT\REPORTS\HYDROGEOLOGY\B0730241\_SIO\_SILICA\_EXTRACT\_HYDROGEOLOGY\APRX\_FIGURE\_1-4\_HYDROGEOG\_GROUNDWATERWELLS.TIF

DATE SAVED: 2024-11-21

USER NAME: PAGE CROSSMAN



**Legend**

 Project Site Boundary

**Proposed Silica Sand Extraction Years**

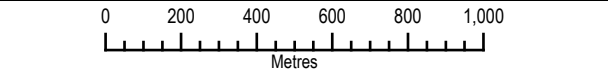
-  Year 0
-  Year 1
-  Year 2
-  Year 3
-  Year 4

**General Features**

-  Highway
-  Road
-  Railway
-  Transmission Line

**SIMBA PROJECT  
SIO SILICA CORPORATION  
HYDROGEOLOGY AND GEOCHEMISTRY ASSESSMENT**

**PROPOSED SILICA SAND EXTRACTION  
(YEARS 0 TO 4)**



Datum: NAD 1983 UTM Zone 14N

Nov, 2024    PN#: 60730241    1:20,000  
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**Figure 2-1**

Data Sources: ML, NRCan - Canvec  
Maxar

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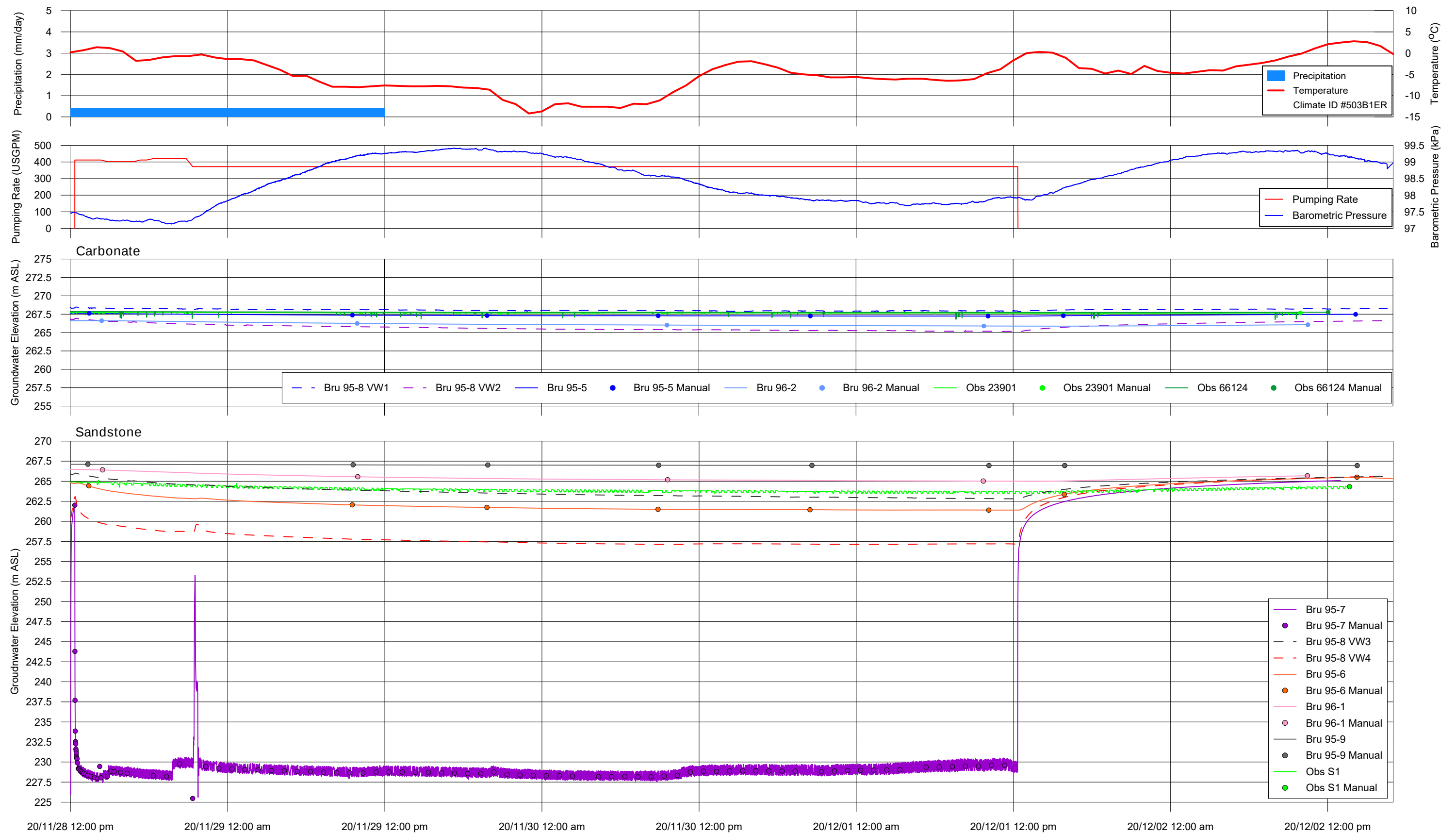


Figure 3-2. Groundwater Levels During Pumping Test – Red River Carbonate and Winnipeg Sandstone

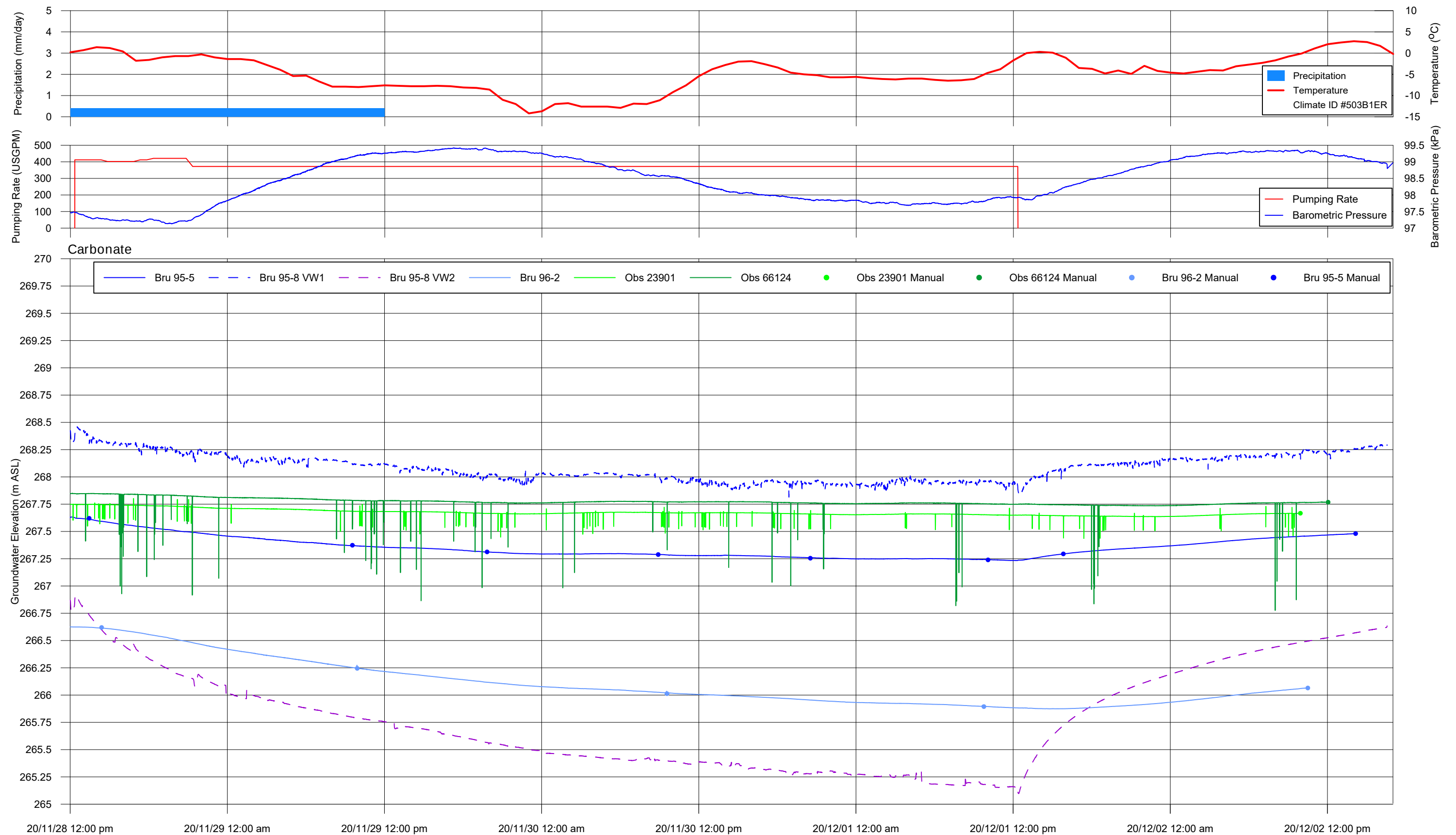


Figure 3-3. Groundwater Levels During Pumping Test – Red River Carbonate



**Legend**

- Groundwater Monitoring Well (Sio)
- Vibrating Wire Piezometers (Sio)
- Water Supply Wells (Sio)
- Surveyed Domestic Well
- Extent of 1 m Drawdown Cone (Carbonate)
- Extent of 1 m Drawdown Cone (Sandstone)
- (1.5 m) Measured Drawdown (Carbonate)
- (2.8 m) Measured Drawdown (Sandstone)

**General Features**

- Highway
- Road
- Railway
- Transmission Line

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**MAXIMUM EXTENT OF DRAWDOWN DURING 72-HOUR PUMPING TEST**

0 100 200 300 400  
Metres

Datum: NAD 1983 UTM Zone 14N

|                   |               |                                    |              |
|-------------------|---------------|------------------------------------|--------------|
| Nov, 2024         | PN#: 60730241 | 1:10,000<br>* when printed 11"x17" | <b>AECOM</b> |
| <b>Figure 3-4</b> |               |                                    |              |

Data Sources: ML, NRCan - Canvec  
Maxar

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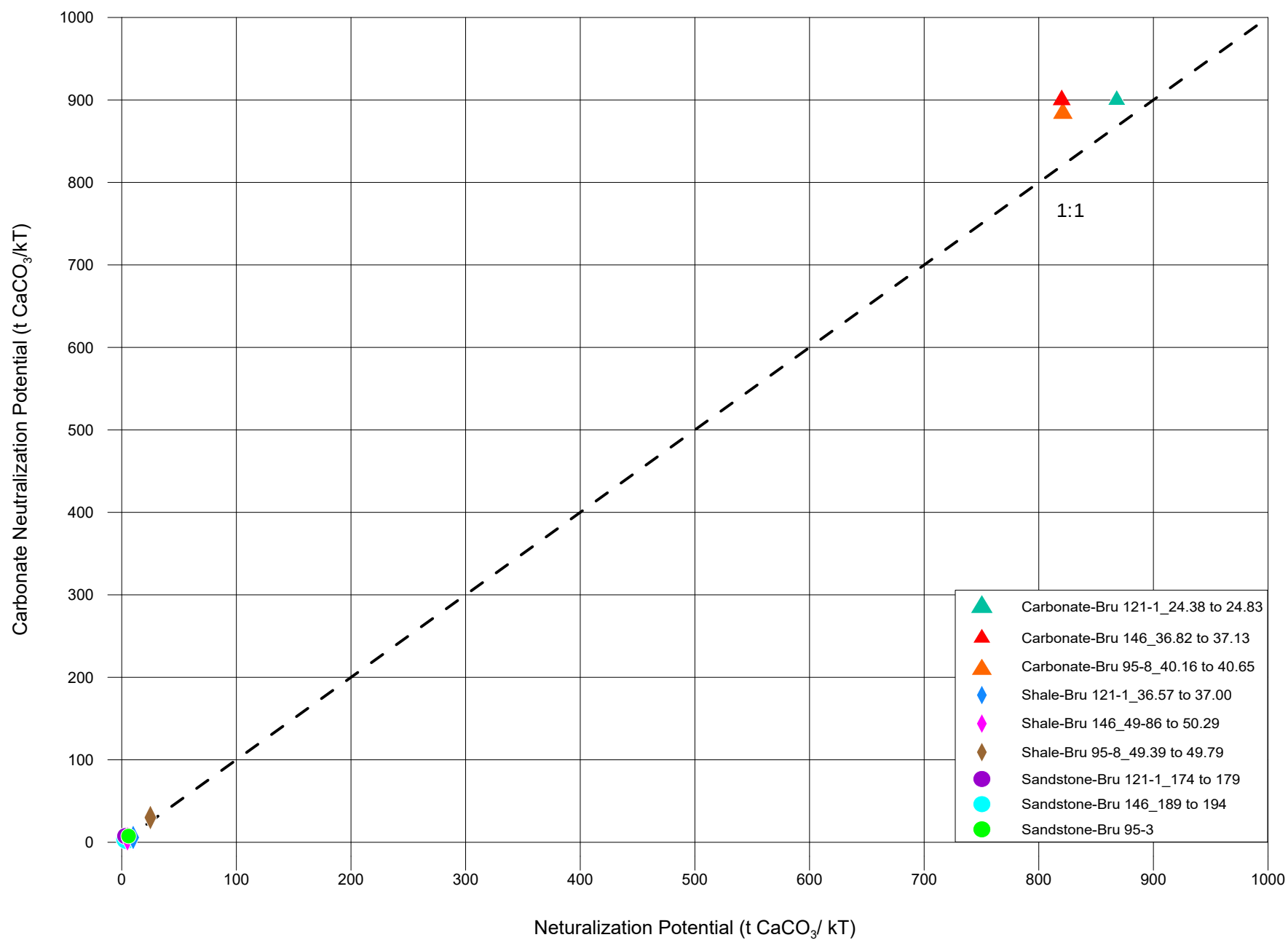


Figure 4-1. Neutralization Potential (NP) vs. Carbonate Neutralization Potential (CaNP)

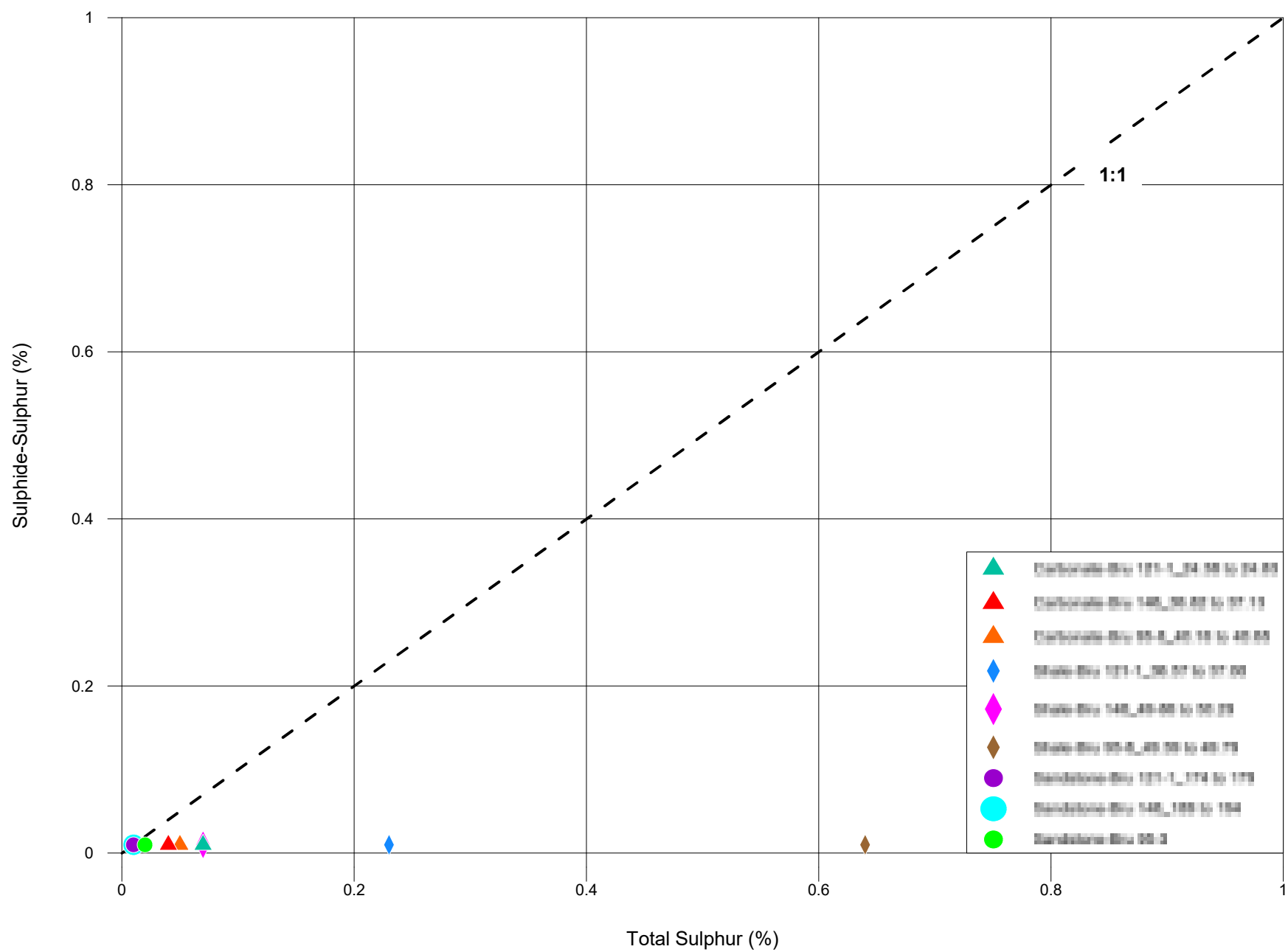


Figure 4-2. Sulphide Sulphur (%) vs. Total Sulphur (%)

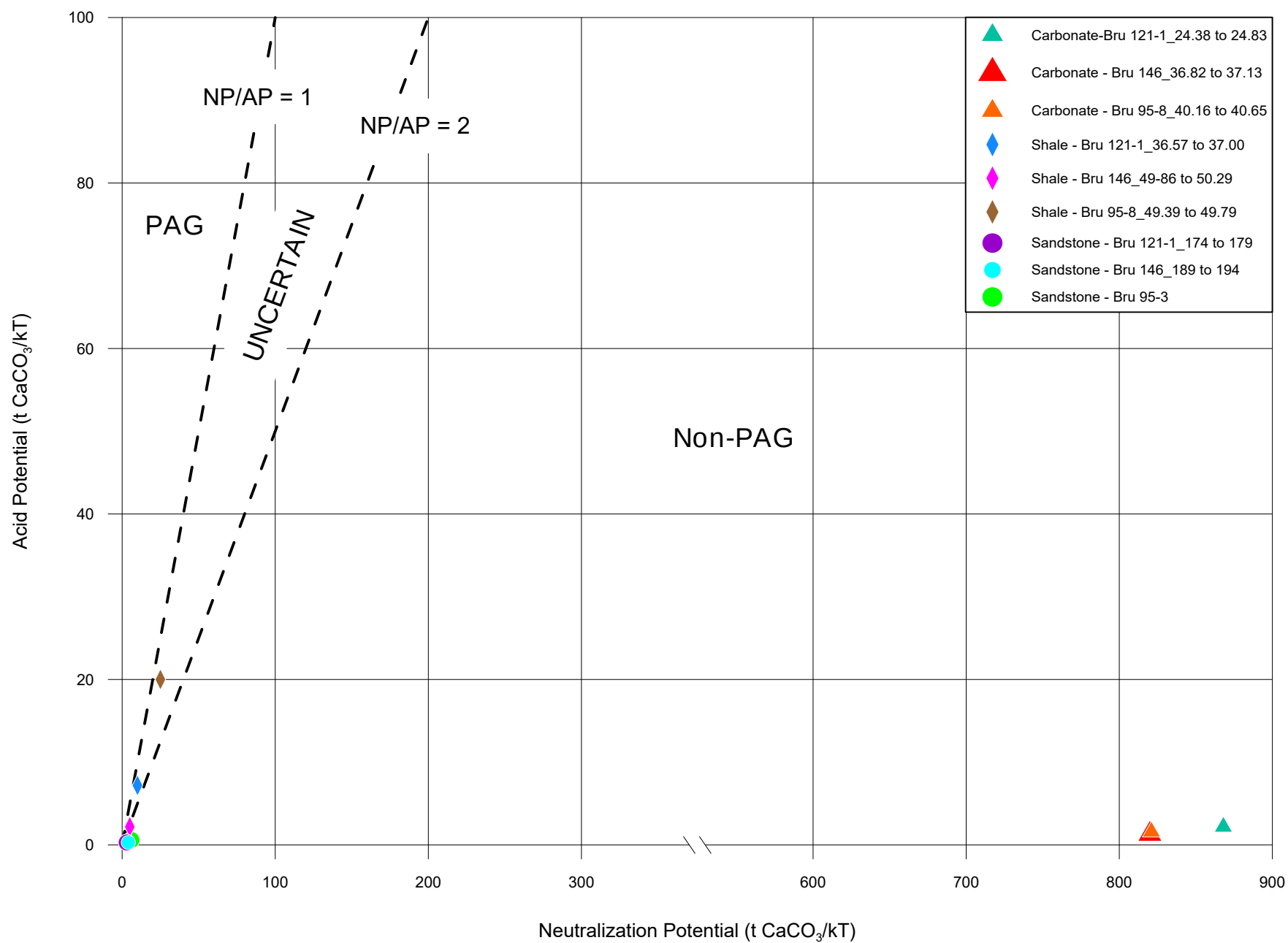


Figure 4-3. Acid Generation Potential (AP) vs. Neutralization Potential (NP)

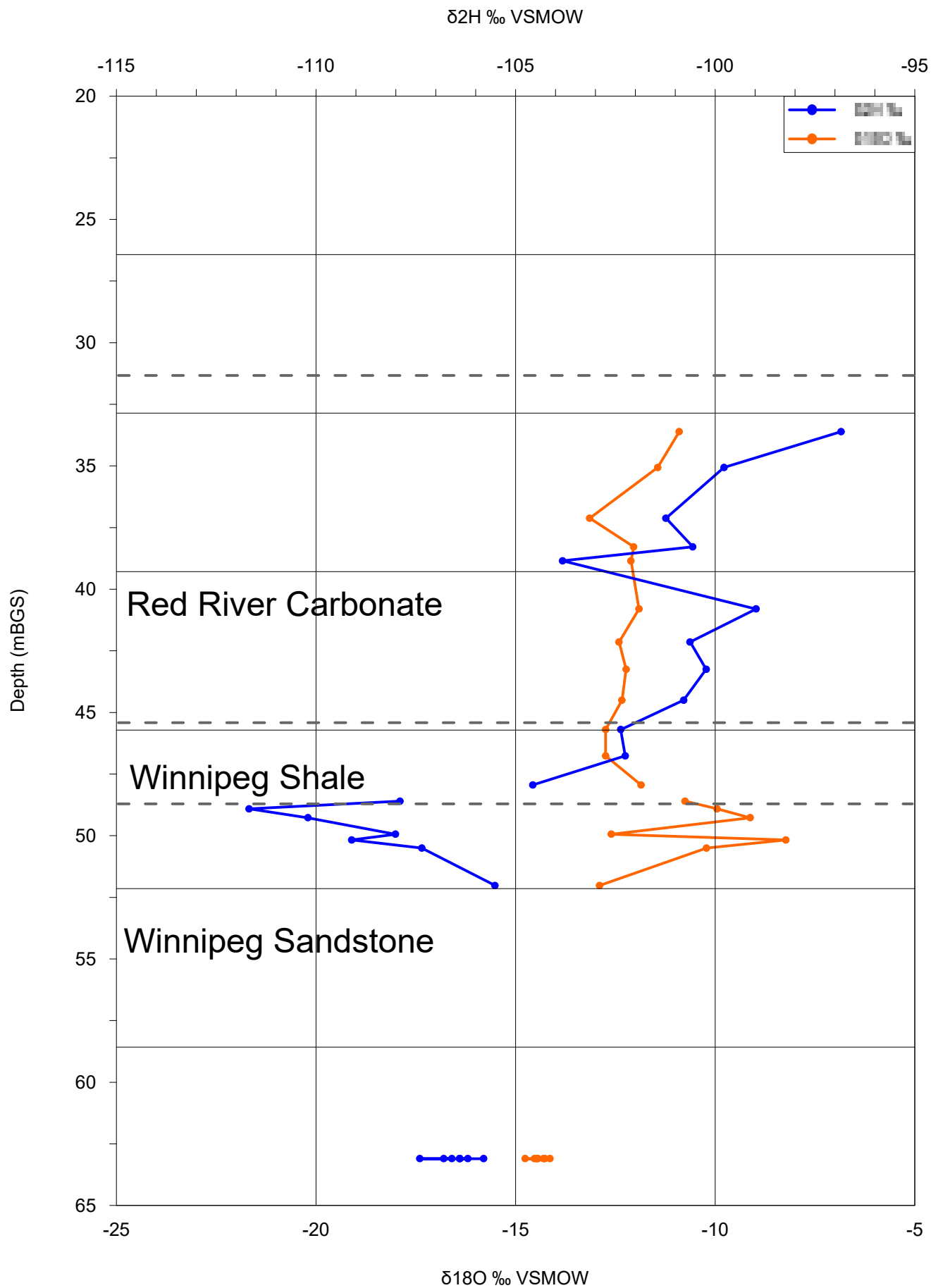
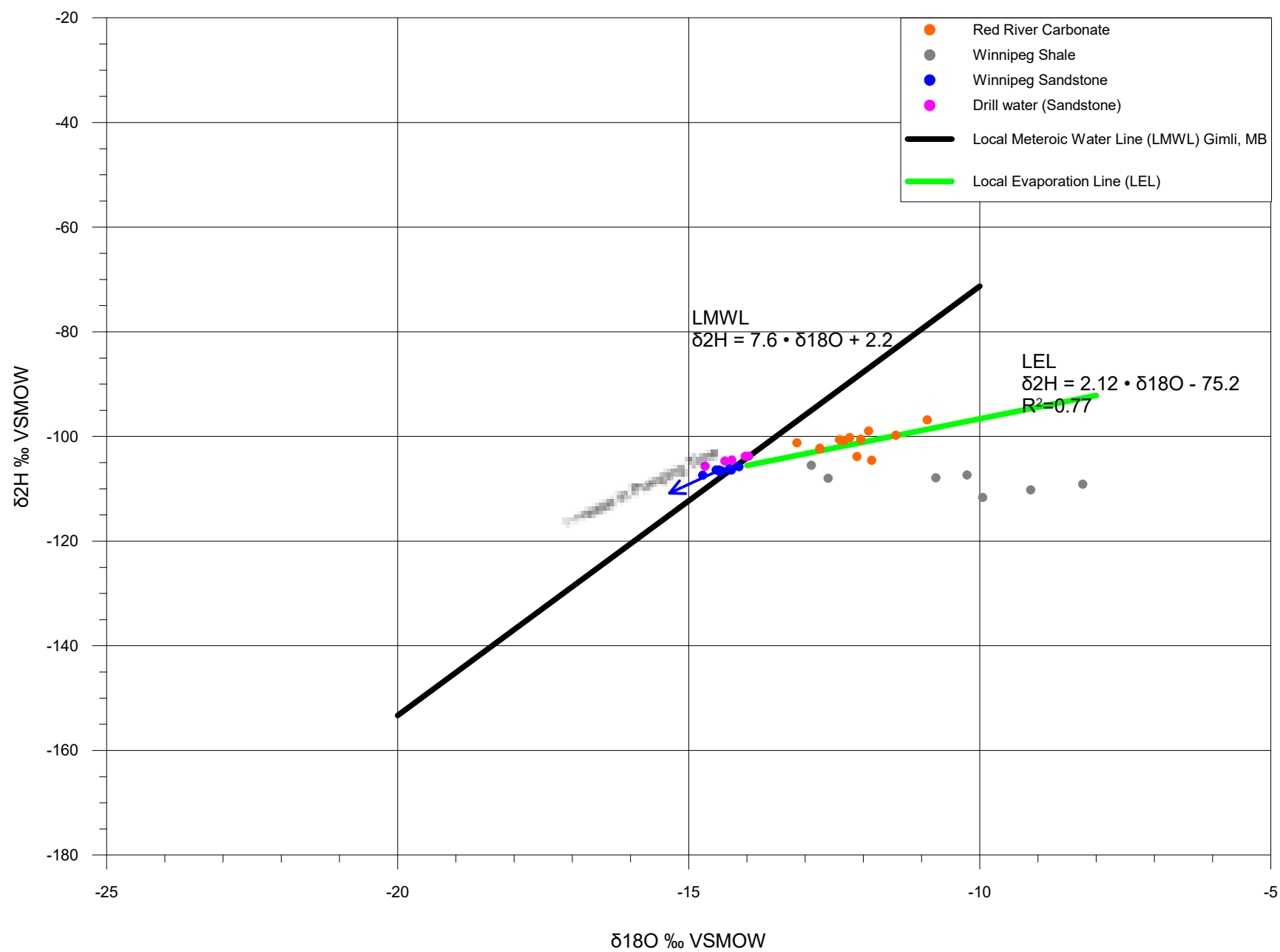


Figure 4-4. Depth Profile of Stable Isotopes - Oxygen-18 and Deuterium



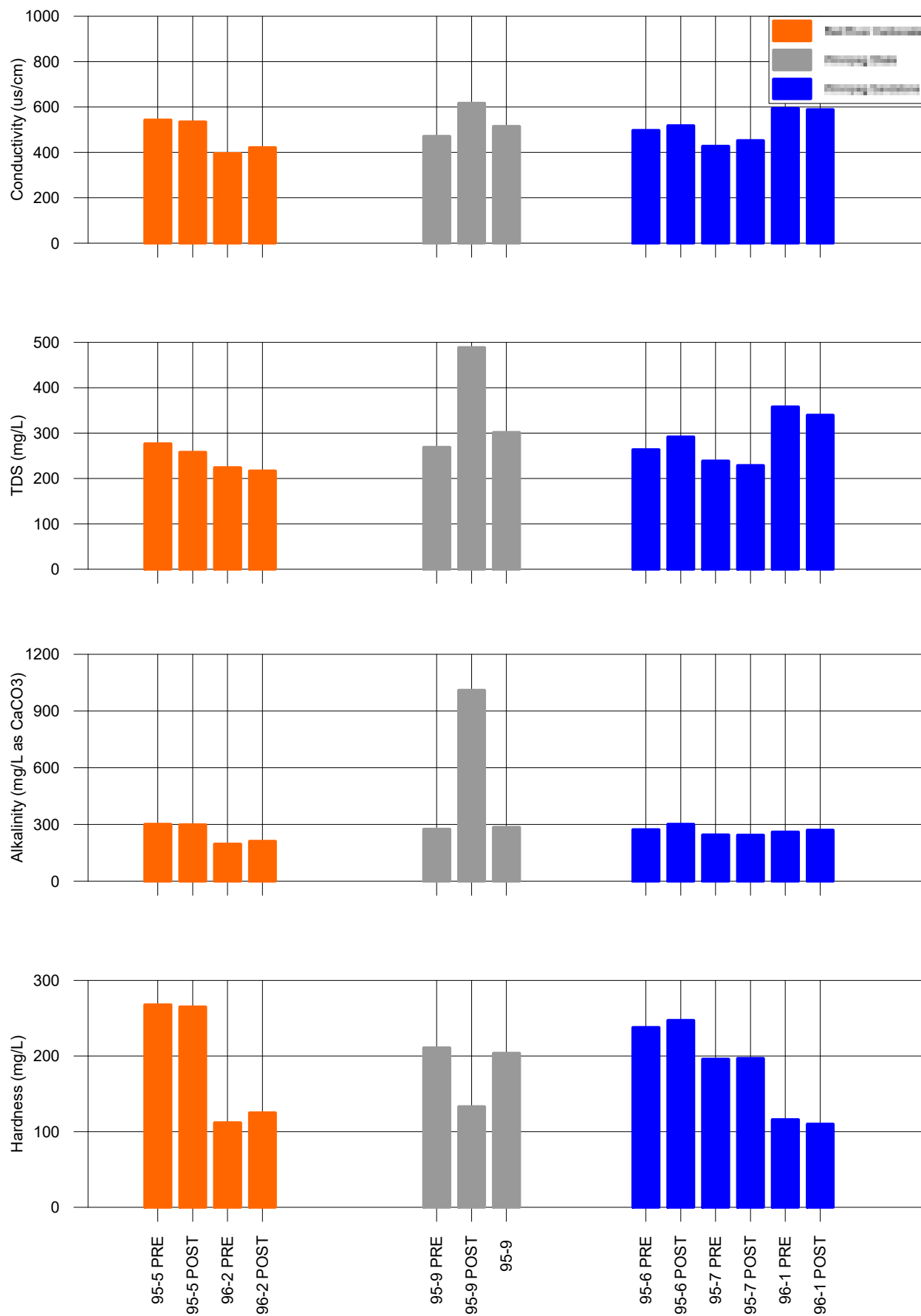


Figure 4-6. Groundwater Chemistry - Conductivity, Total Dissolved Solids, Alkalinity and Hardness

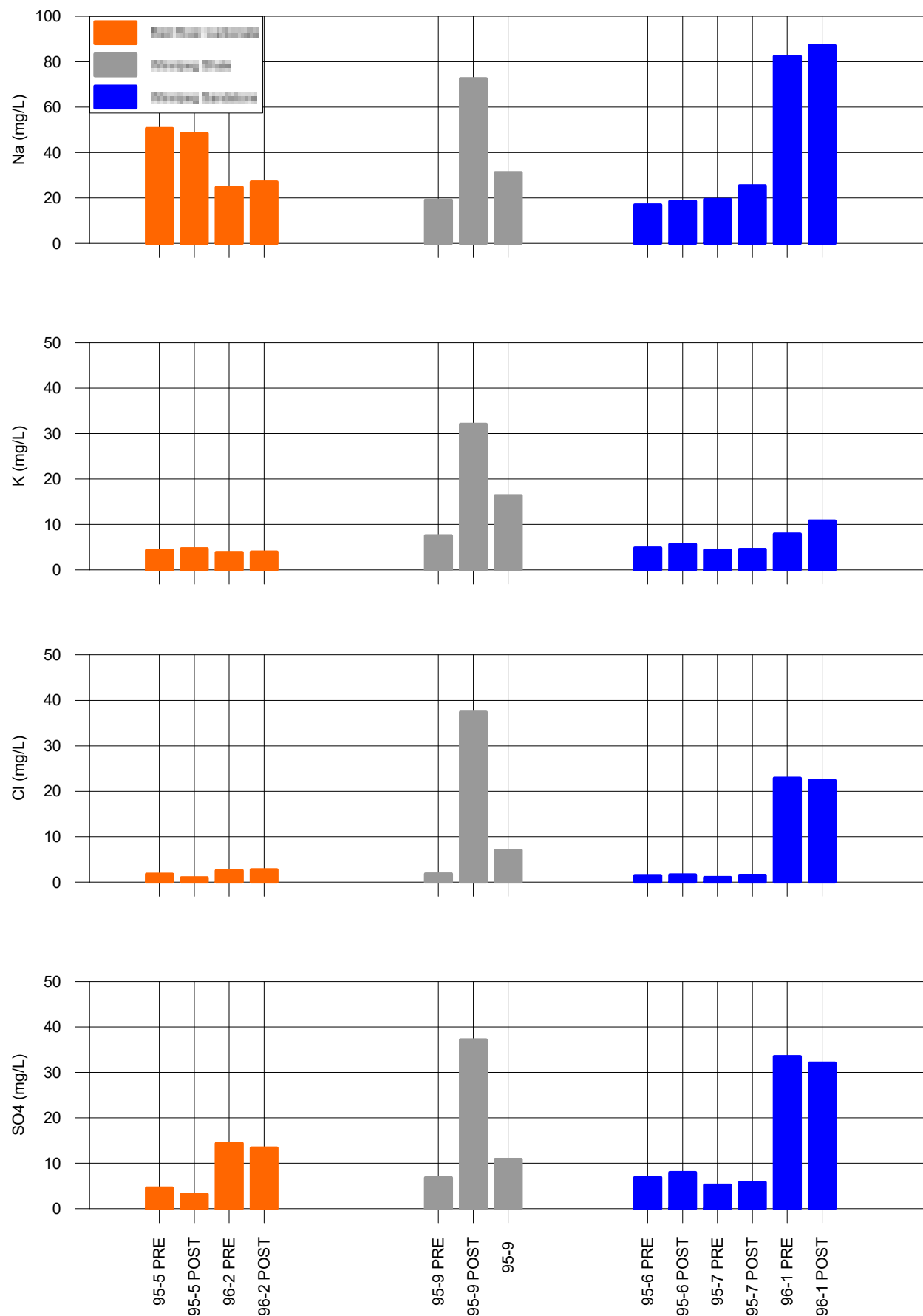
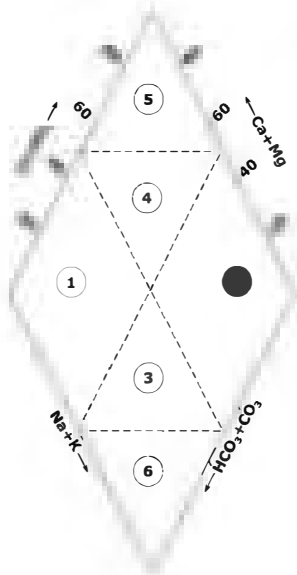


Figure 4-7. Groundwater Chemistry – Sodium, Potassium, Chloride and Sulphate



#### Dominant Water Composition

- ① Ca-HCO<sub>3</sub> type
- Na-Cl-SO<sub>4</sub>
- ③ Mixed Ca-Na-HCO<sub>3</sub>
- ④ Mixed Ca-Mg-Cl
- ⑤ Ca-Cl
- ⑥ Na-HCO<sub>3</sub>

#### Red River Carbonate

▲ Bru 95-5

▲ Bru 96-2

#### Winnipeg Shale

◆ Bru 95-9

#### Winnipeg Sandstone

● Bru 95-6

● Bru 95-7

● Bru 96-1

#### Private Wells

⊕ 66124

⊕ 23901

⊕ unknown

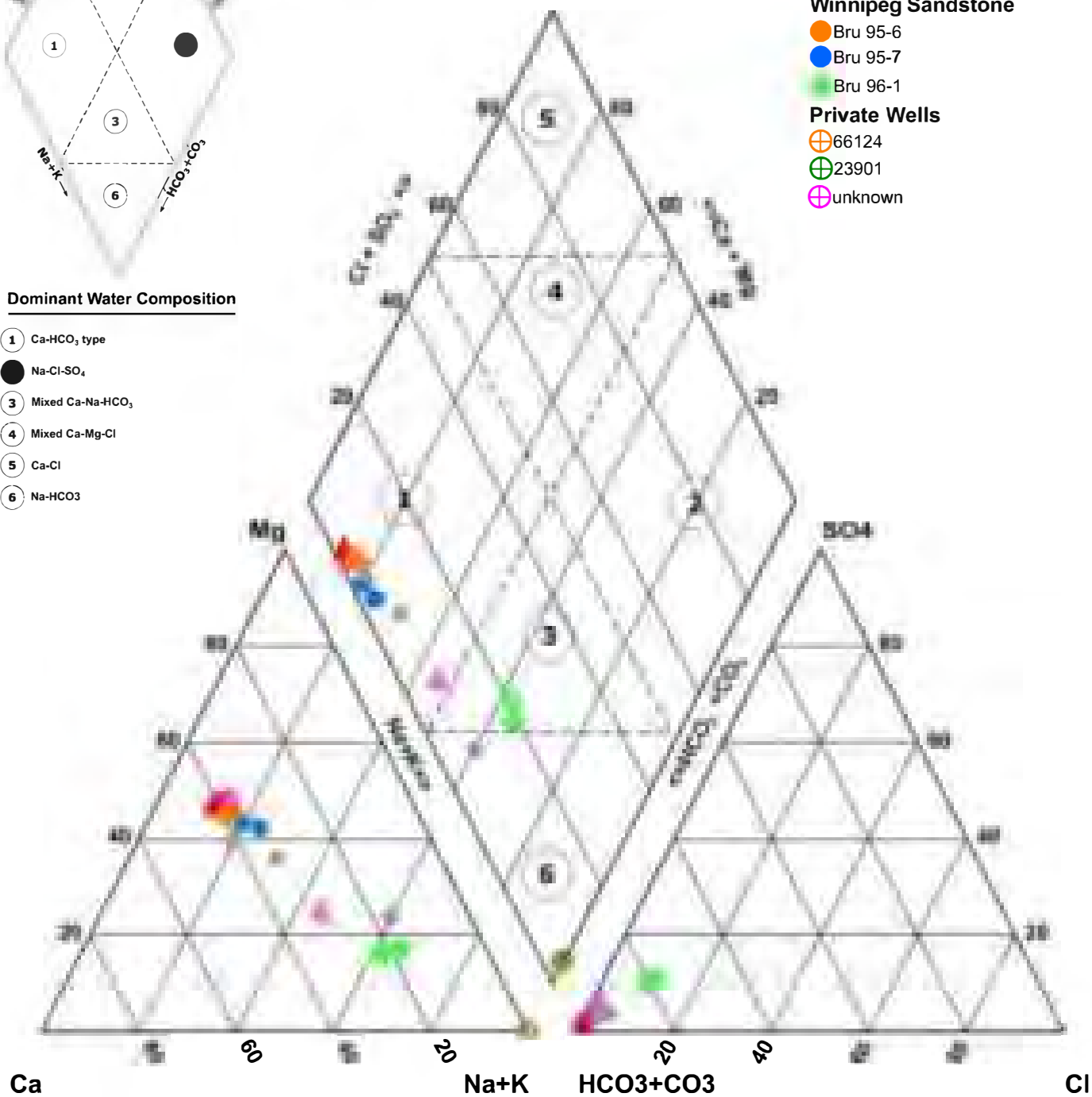


Figure 4-8 Groundwater Piper Plot of Major Ions

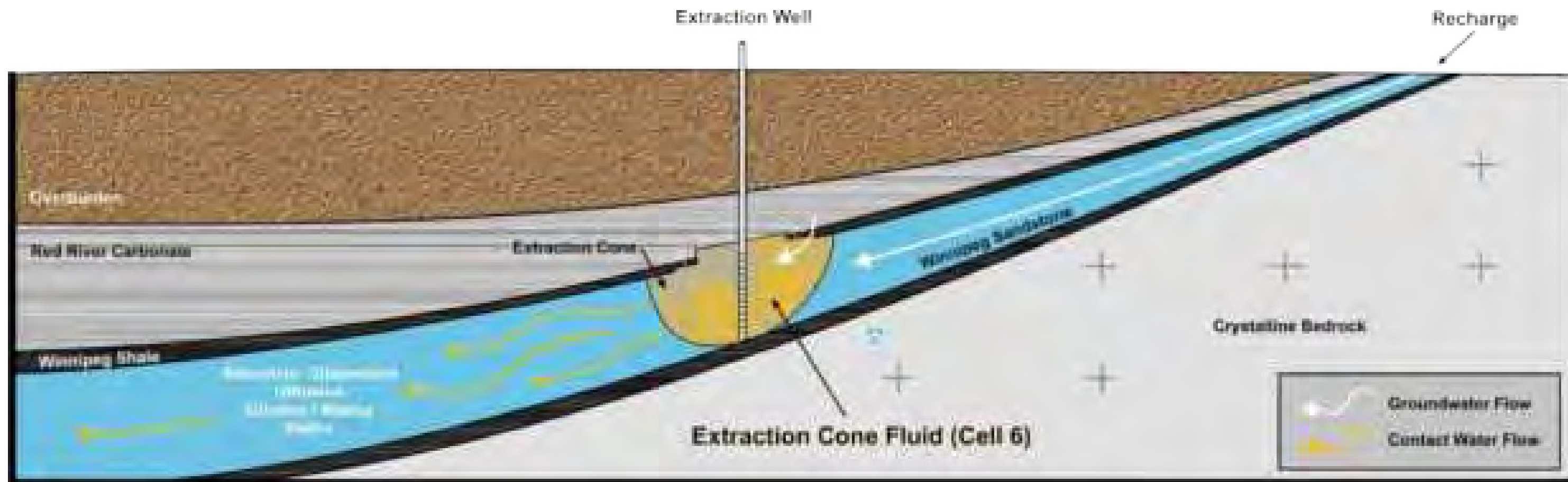


Figure 4-9. Conceptual Hydrogeochemical Model

Note That the Y-Axes In these Plots are Not at Equal Scales

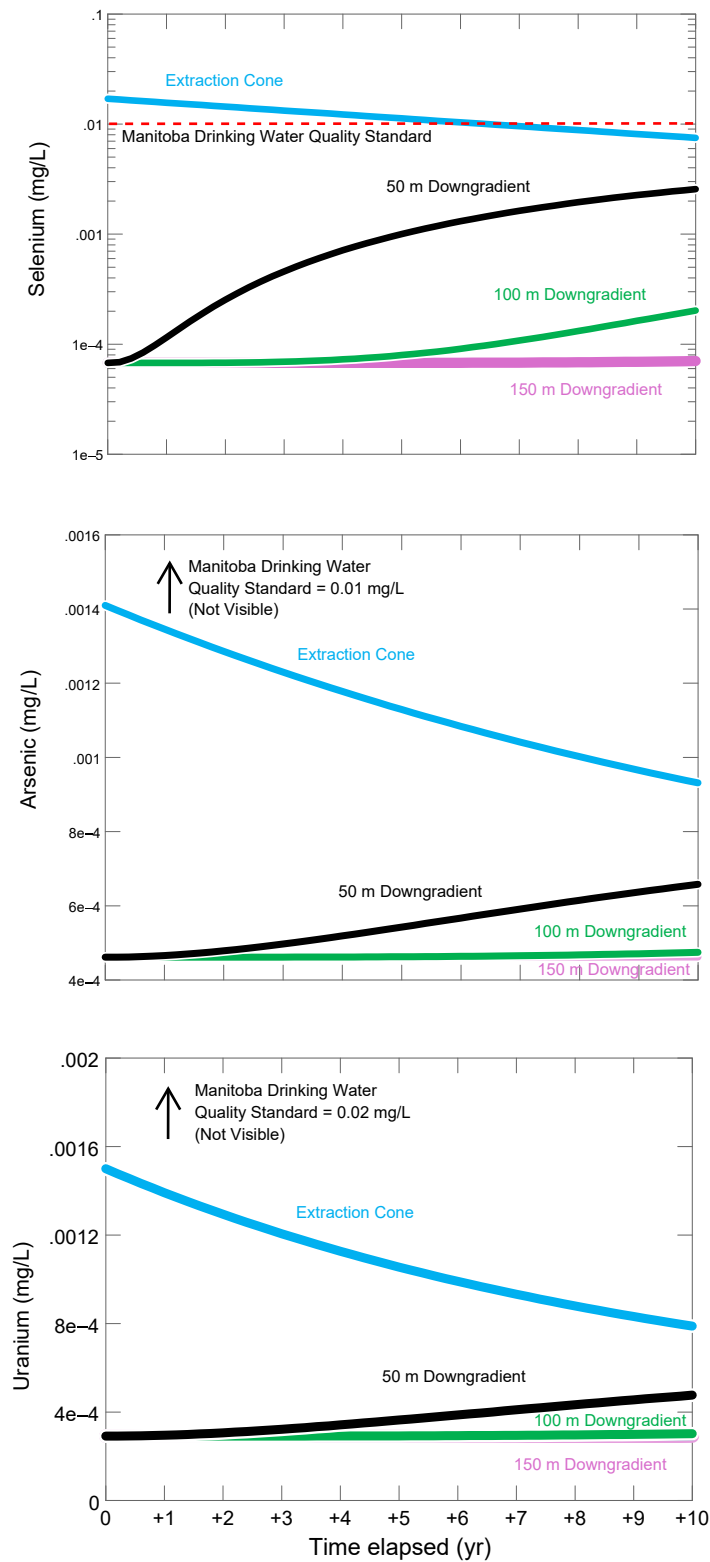


Figure 4-10. Selenium, Arsenic, and Uranium Concentrations as a Function of Time.

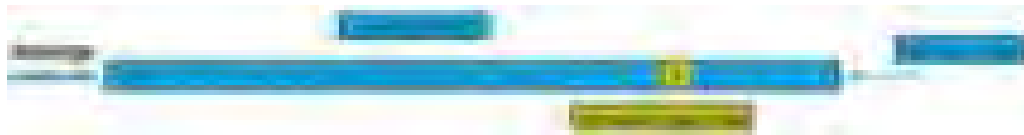
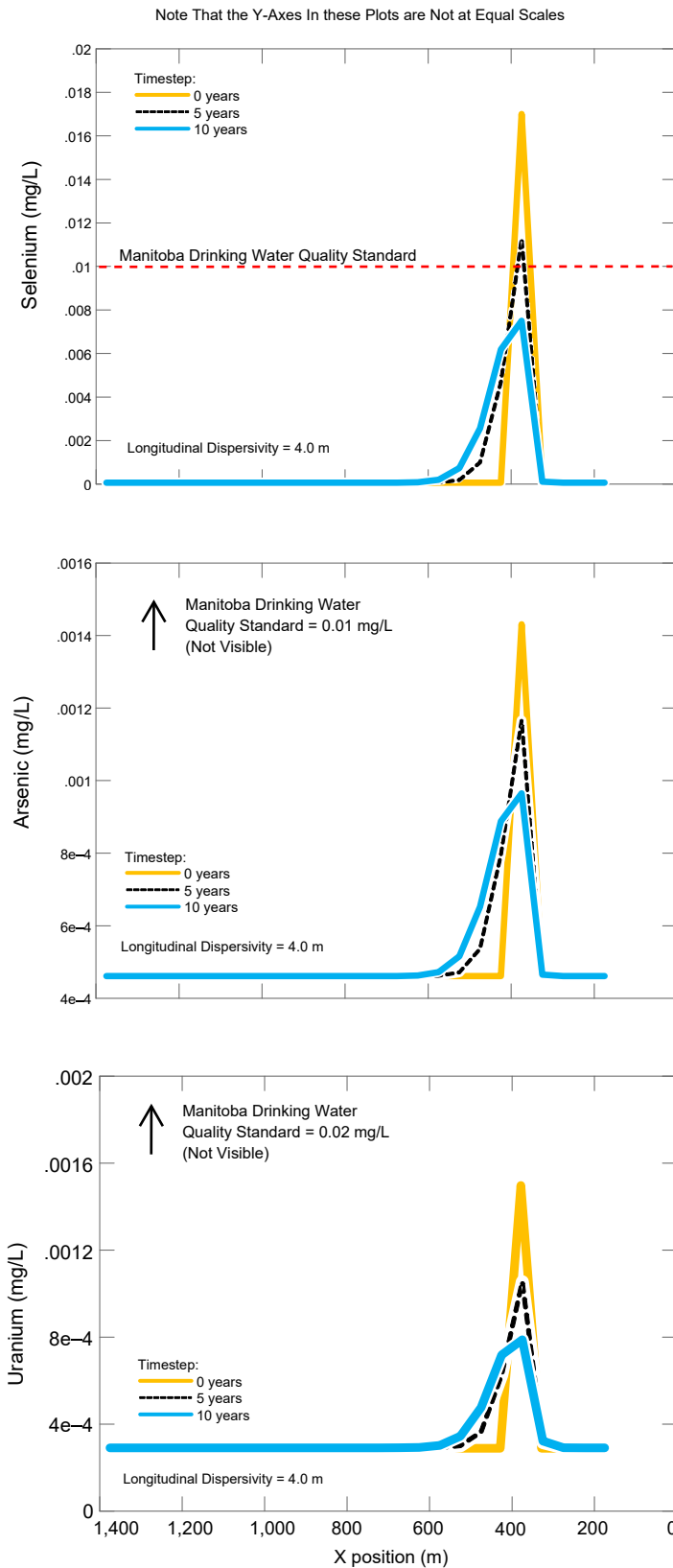


Figure 4-11. Selenium, Arsenic, and Uranium Concentrations as a Function of Distance

Note That the Y-Axes in these Plots are Not at Equal Scales

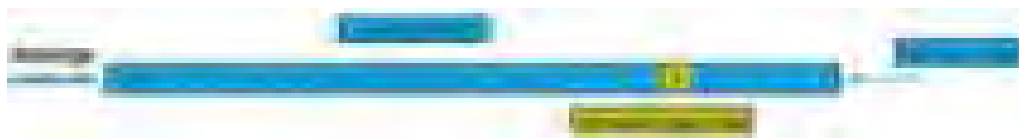
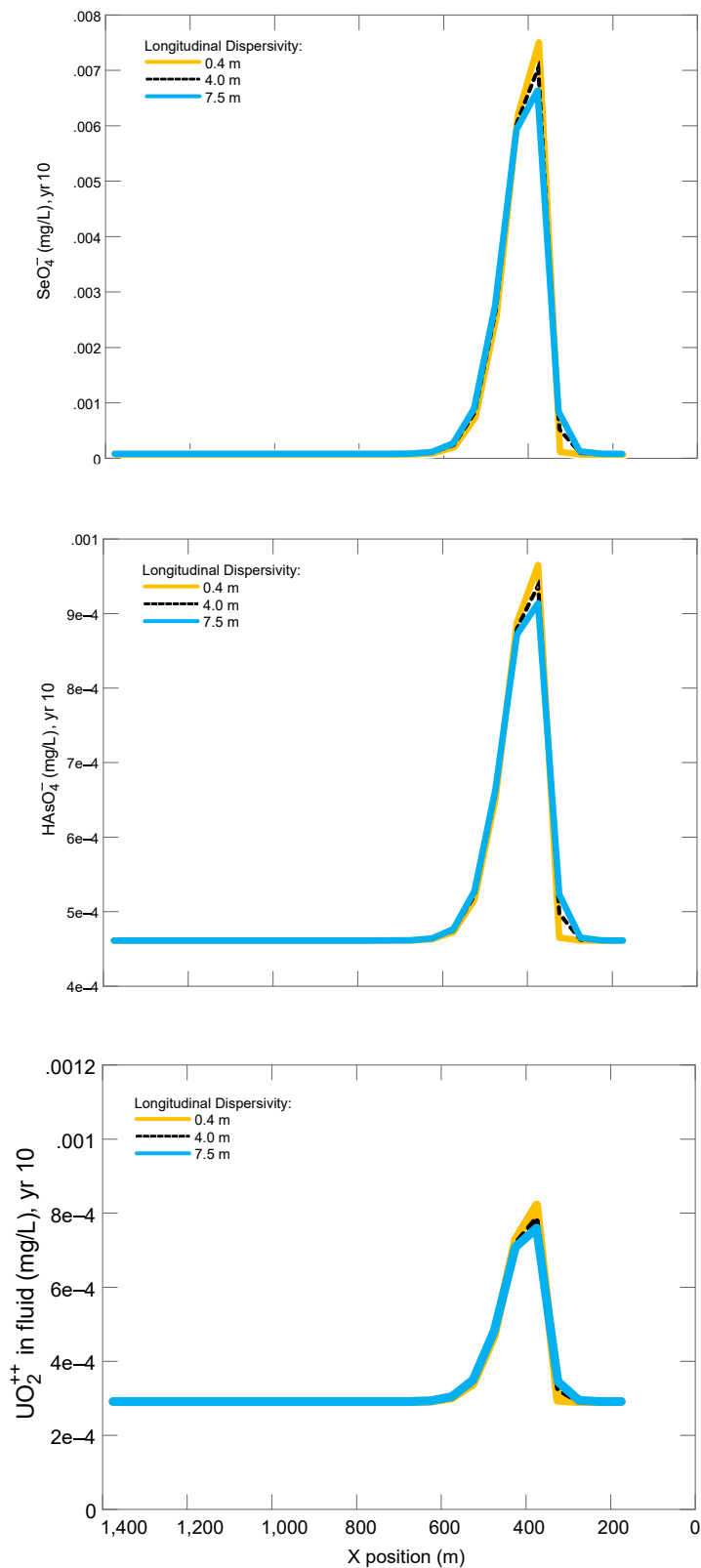
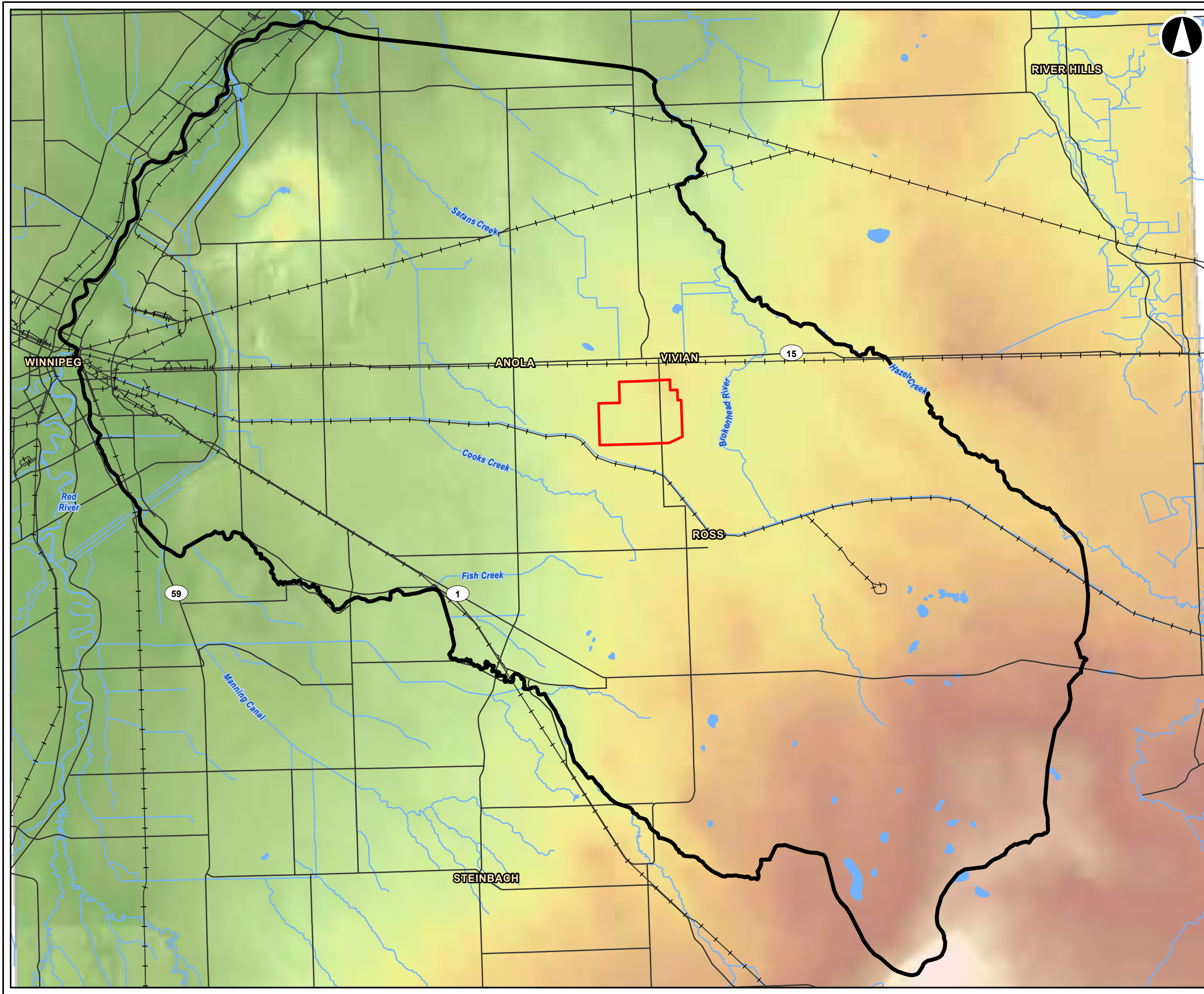


Figure 4-12. Selenium, Arsenic, and Uranium Concentrations as a Function of Distance and Varied Longitudinal Dispersivity



**Legend**

25 Year Mine Area

Model Domain

**General Features**

Highway

Railway

Watercourse

Waterbody

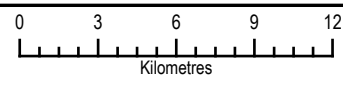
**Elevations (m)**

397

217

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**SIO SILICA CORPORATION**  
**HYDROGEOLOGY AND GEOCHEMISTRY ASSESSMENT**

**TOPOGRAPHY AND DRAINAGE**



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|                   |               |                                     |
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| <b>Figure 5-1</b> |               |                                     |



Data Sources: MLI, NRCan - Canvec

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