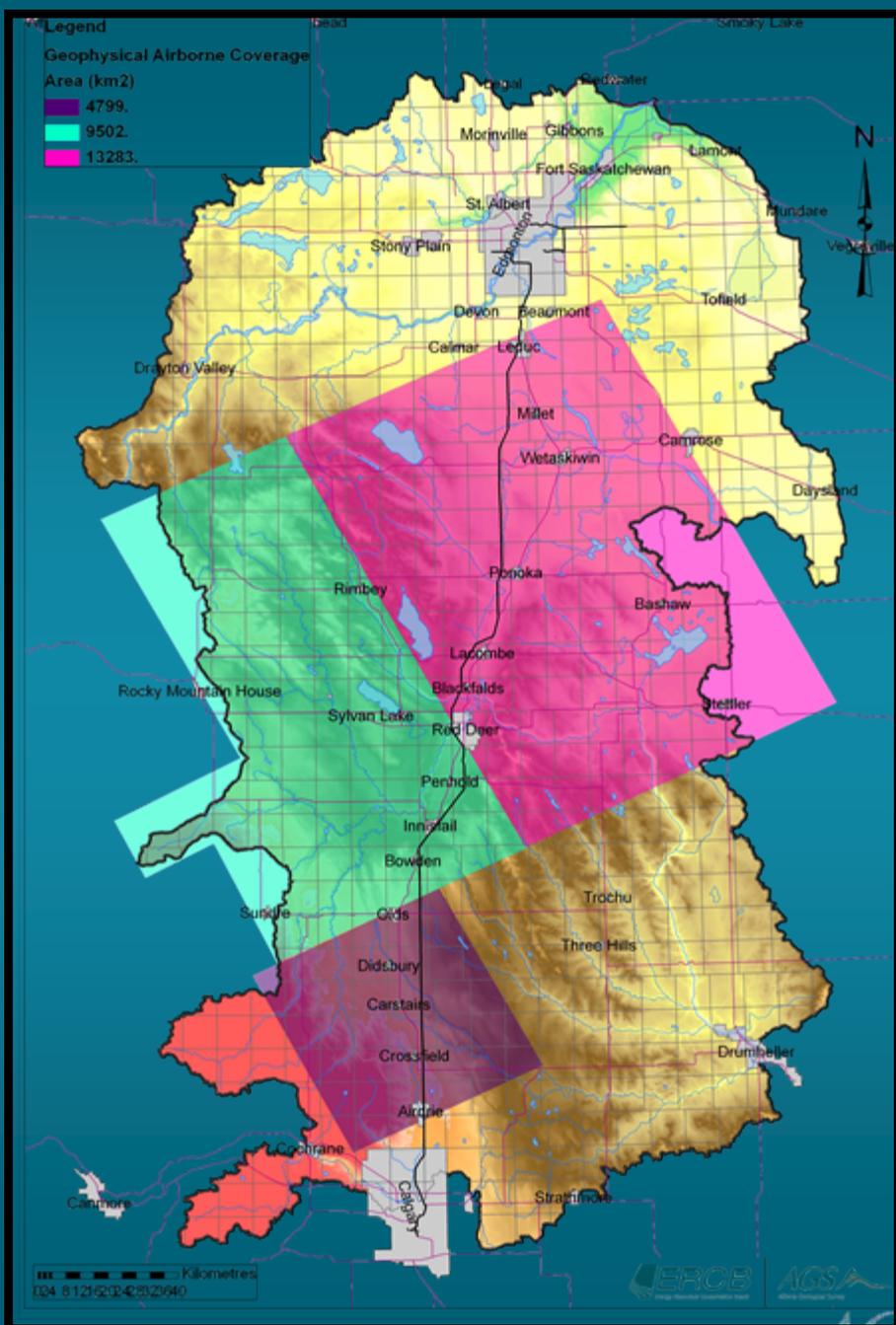


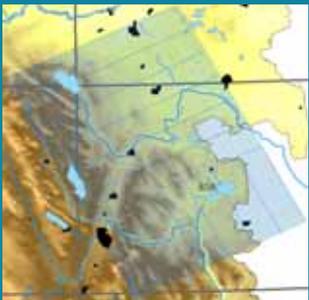
Airborne Electromagnetic Surveys – ECC Project

**Total to date
~ 27,500 km²**



Airborne EM Surveys (2007)

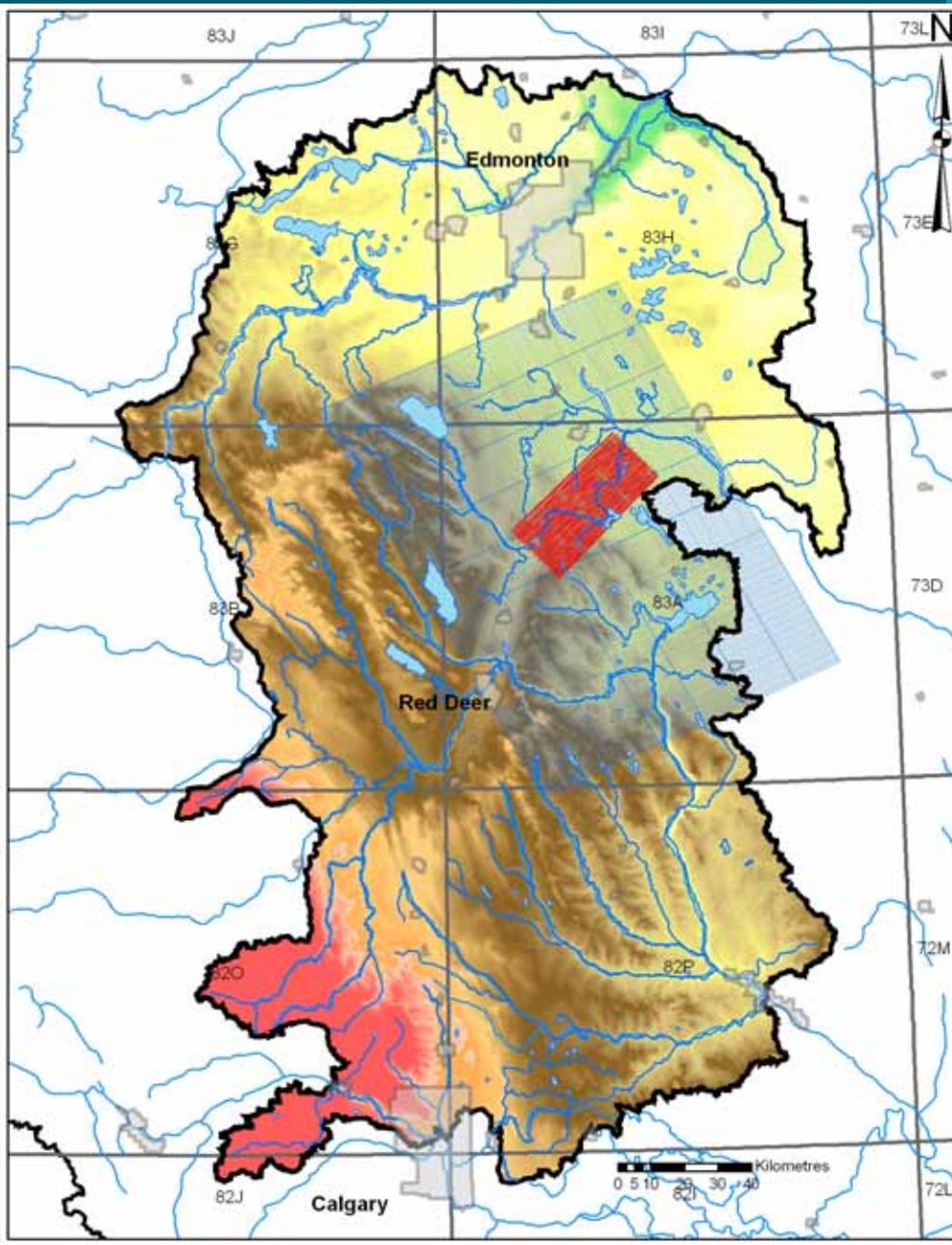
~13,000 km² coverage



**Geotem fixed wing
800m line spacing**



**RESOLVE helicopter
200m line spacing**

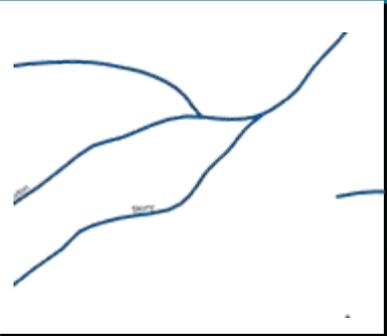


Results of fixed-wing survey - 30m depth slice

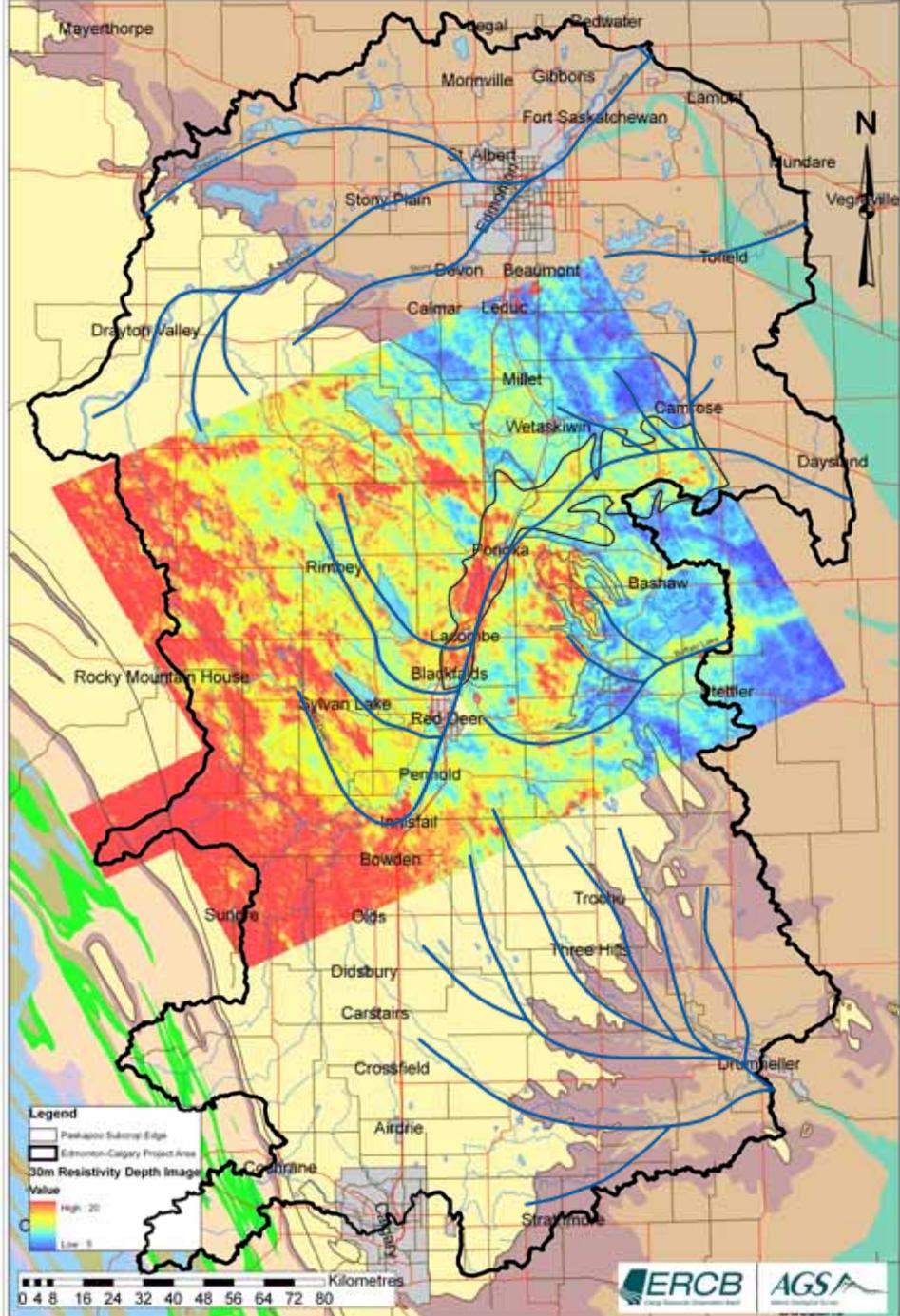
resistive elements of the landscape correspond to sand-rich geological units

 High resistivity - sandy

 Low resistivity - clayey



Buried valley thalweg

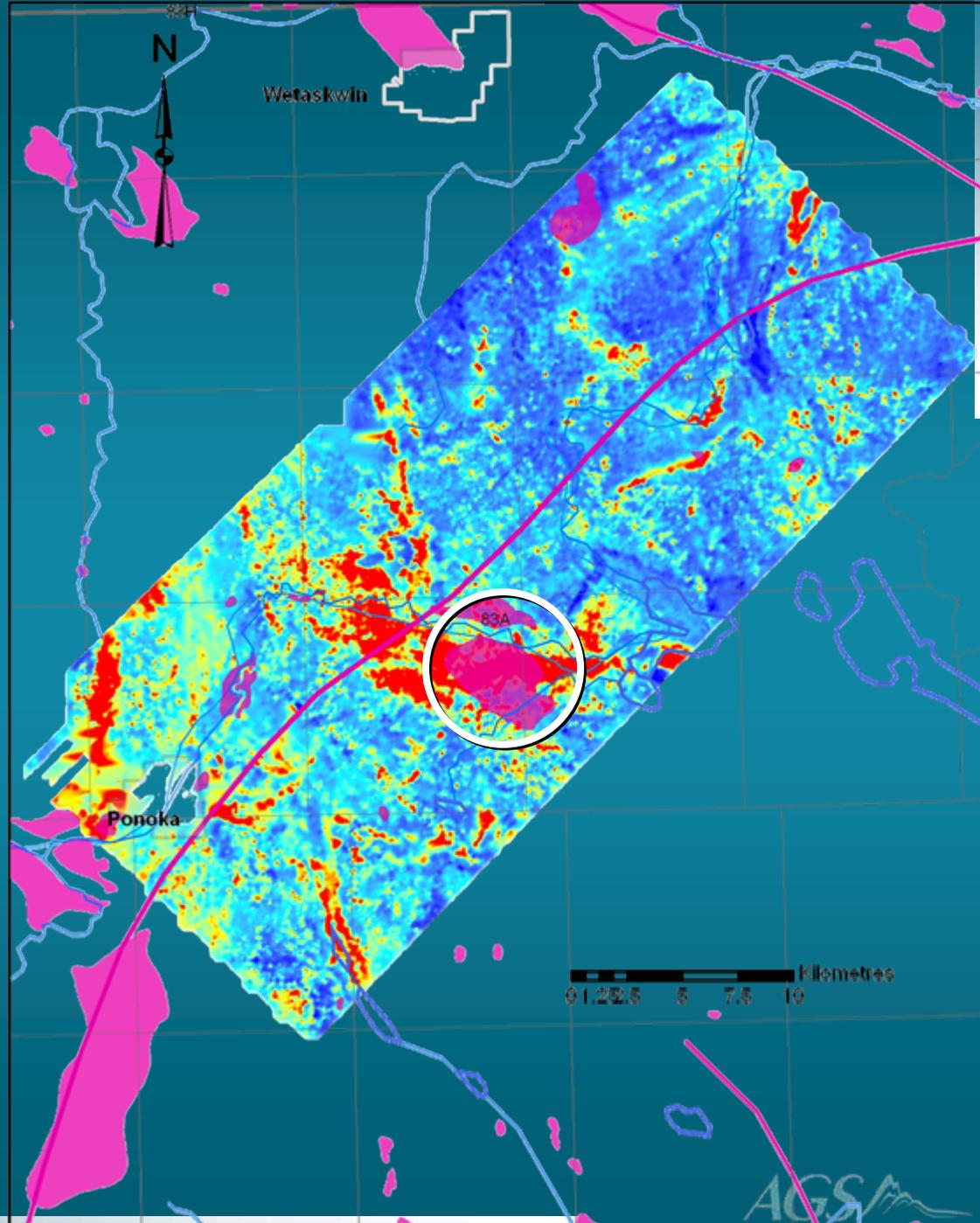


Results of helicopter survey (200m spacing)

 High resistivity – sand-rich

 Low resistivity – clay-rich

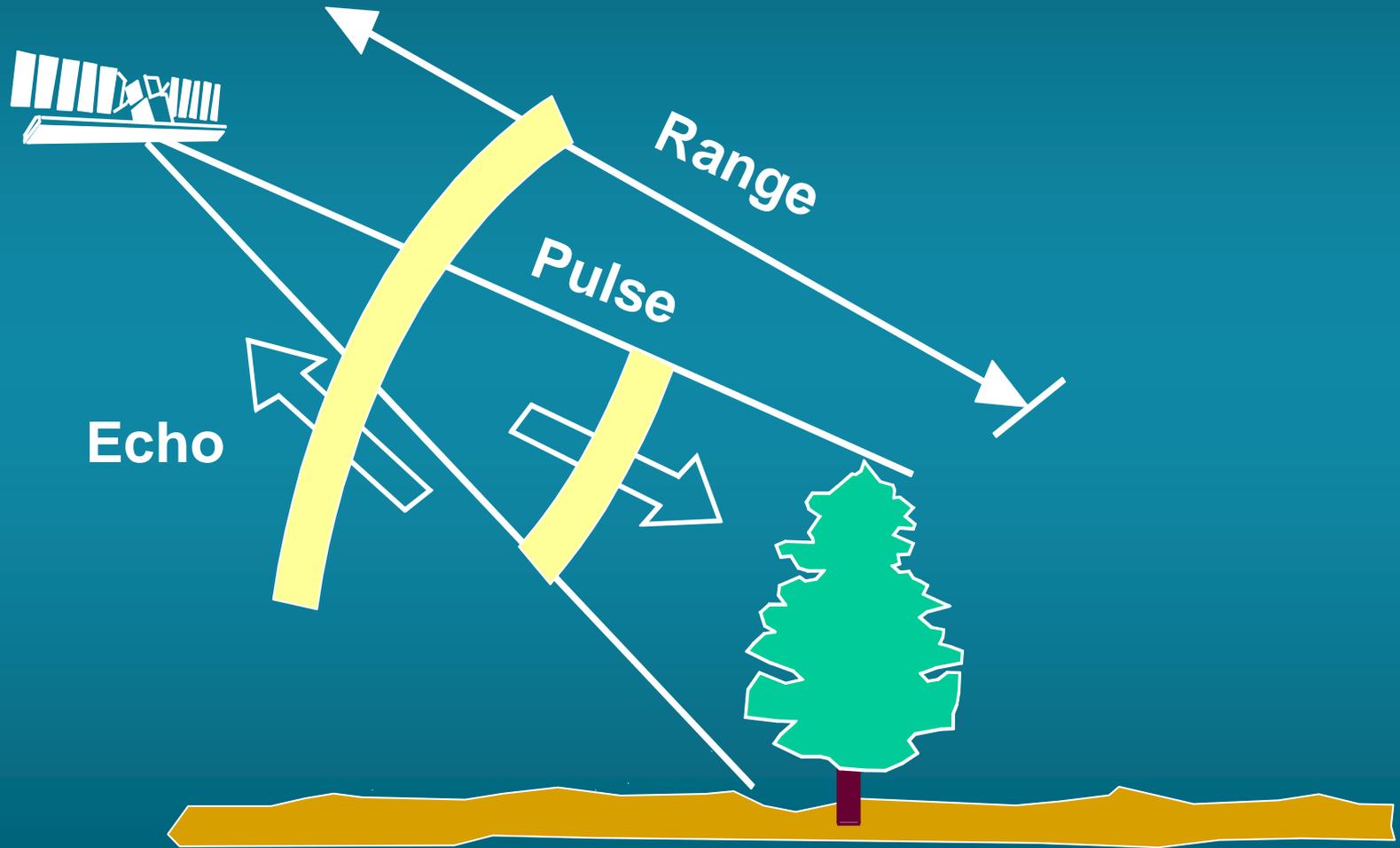
 near-surface sand and gravel as indicated from AGS aggregate maps



Spaceborne

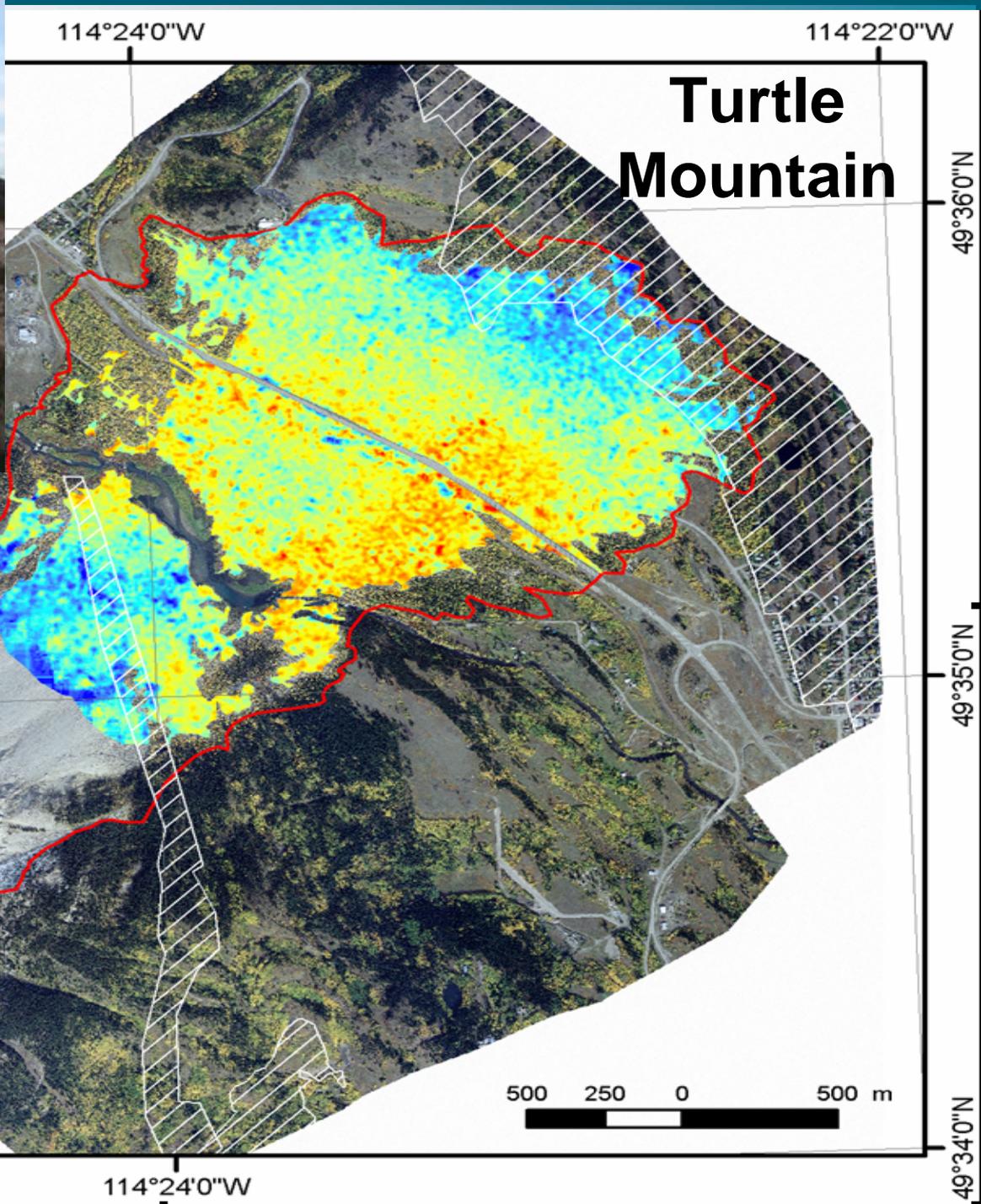
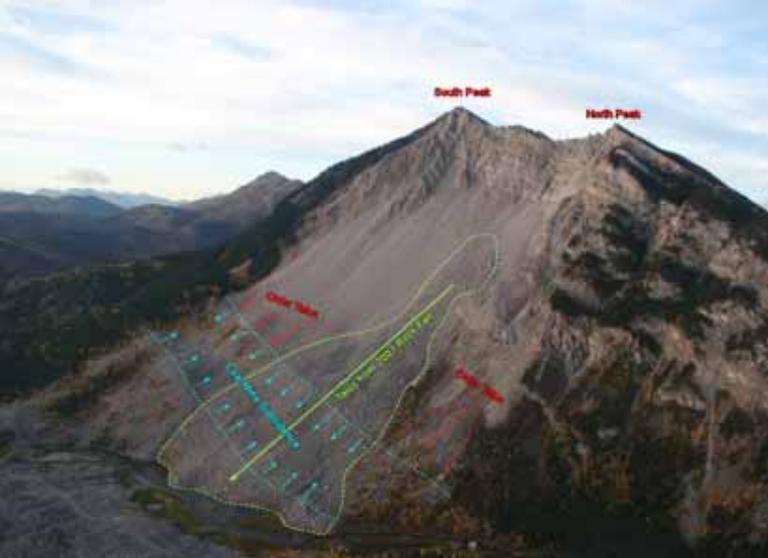
- **Radar satellites**
- **Optical satellites**

Spaceborne InSAR

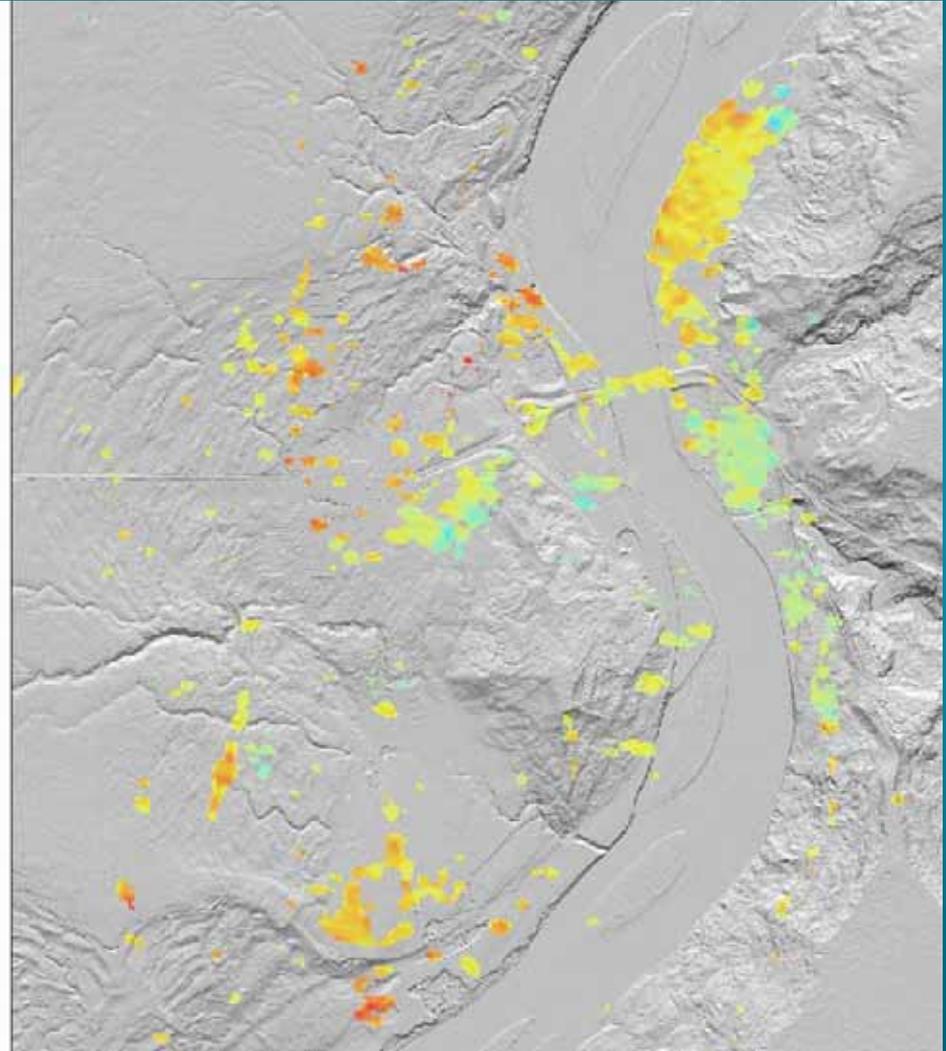
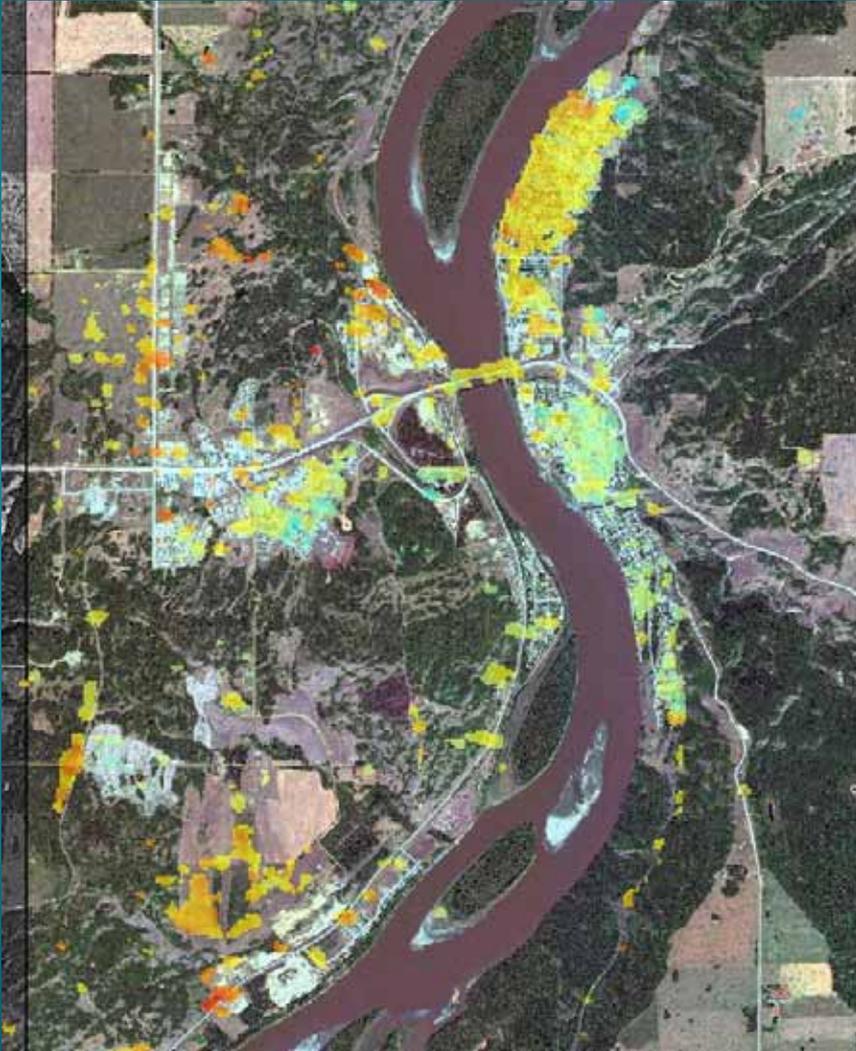


Urban InSAR Project Sites

- Municipality of Crowsnest Pass
- Town of Peace River
- City of Edmonton
- Lethbridge
- Drumheller
- Canmore



InSAR: Peace River



InSAR: Edmonton

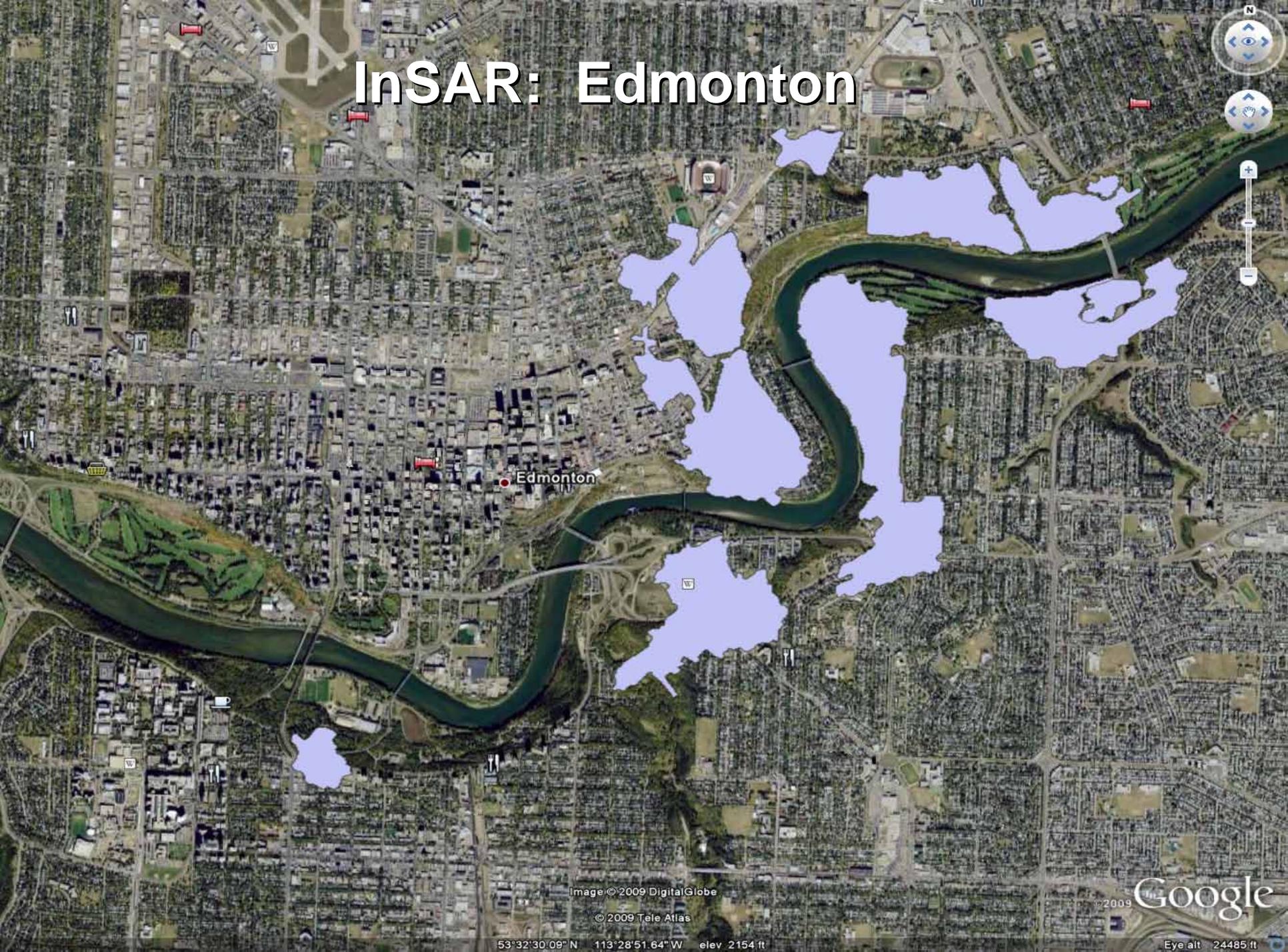


Image © 2009 DigitalGlobe

© 2009 Tele Atlas

53°32'30.09" N 113°28'51.64" W elev 2154 ft

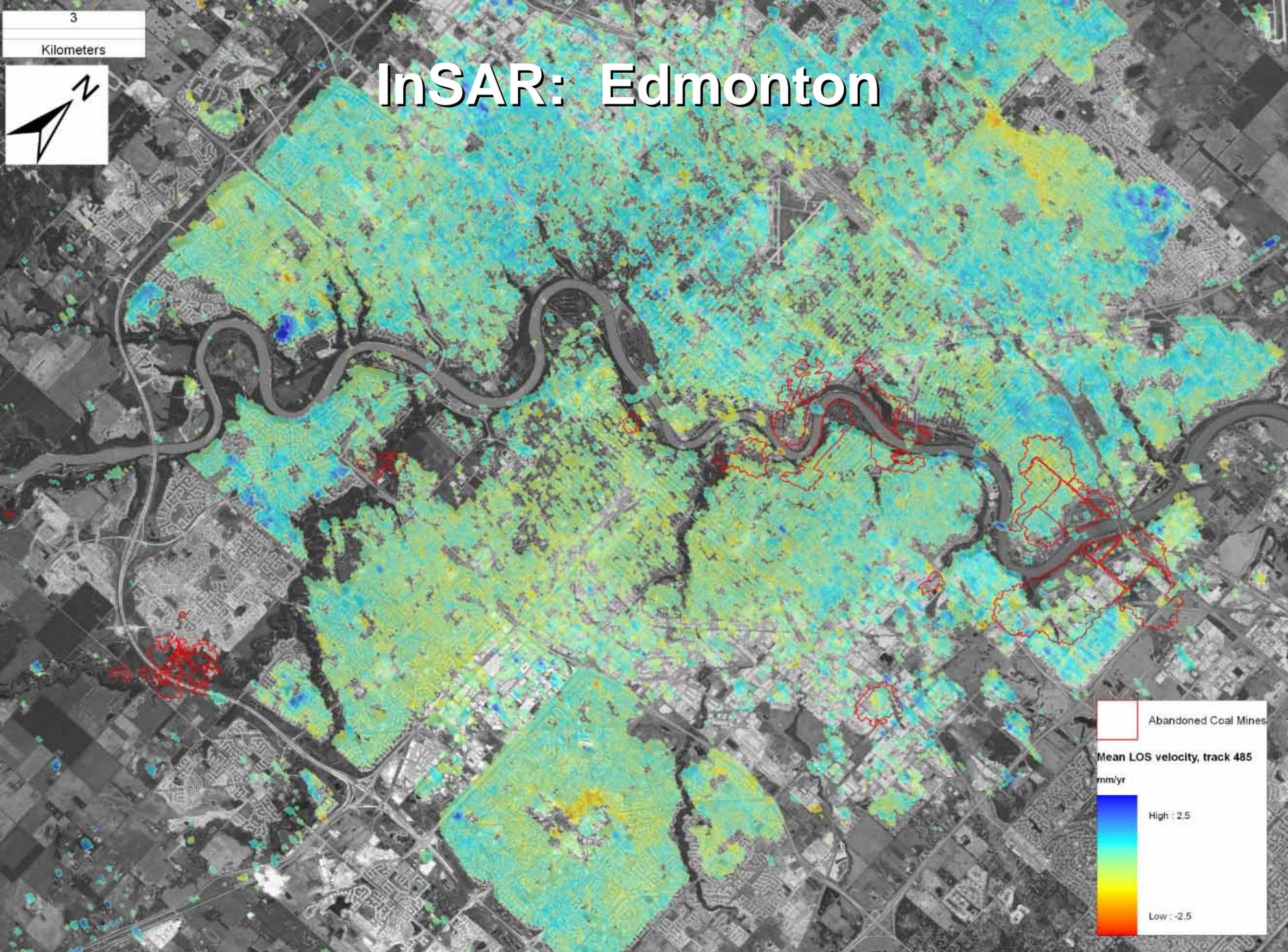
2009

Google

Eye alt 24485 ft



InSAR: Edmonton



Abandoned Coal Mines

Mean LOS velocity, track 485
mm/yr

High : 2.5

Low : -2.5

Web Applications

- **Web-GIS**
- **Geo-spatial Browsers**
 - **Google Earth**
 - **MS Virtual Earth**

Map Navigation



(Scroll the mouse wheel forward/ backward to zoom in/zoom out)

[Help](#) [Refresh](#)

Information/ Measure

Tasks

Borehole Log Viewer



Select by Rectangle

(Select boreholes that contain geology data to view the borehole log)

[View Borehole Log](#)

Relevant links:
[Peace River 3D Models](#)
[Alberta Environment Water Well](#)
[Alberta Geological Survey Publications](#)

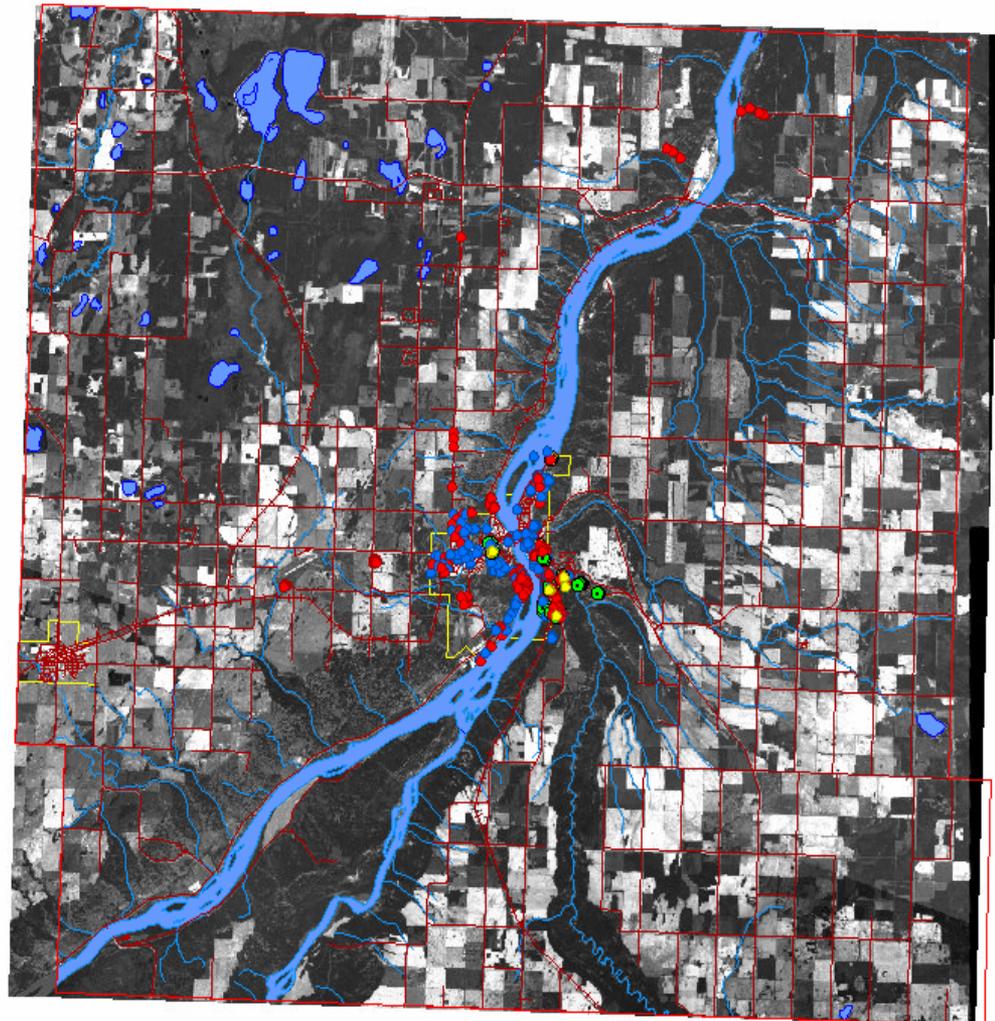
SI Displacement Tool



SI Displacement

Use this tool for Slope Inclinometer (SI) Data -

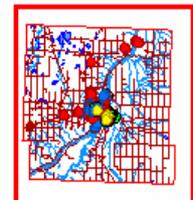
- Displacement/ Geology
- Displacement/ Geotechnical Test



Map Contents

- Peace River Layers
 - Geotechnical Boreholes
 - Displacement/ Geology
 - Displacement/ Geotechnical
 - Geotechnical Test/ Geology
 - Geology Only
 - Pore Pressure/ Geology
 - Water Well Boreholes
 - ▲ Has Geology
 - ▲ No Geology
 - Township
 - LSD
 - Study Area
 - Rail
 - Road
 - 50m Contours
 - Streams and River Channels
 - Rivers and Lakes
 - Urban Area
 - Park
 - Bedrock Geology
 - Dunvegan Formation
 - Kaskapau Formation
 - Peace River Formation
 - Shaftesbury Formation

Overview





Tasks

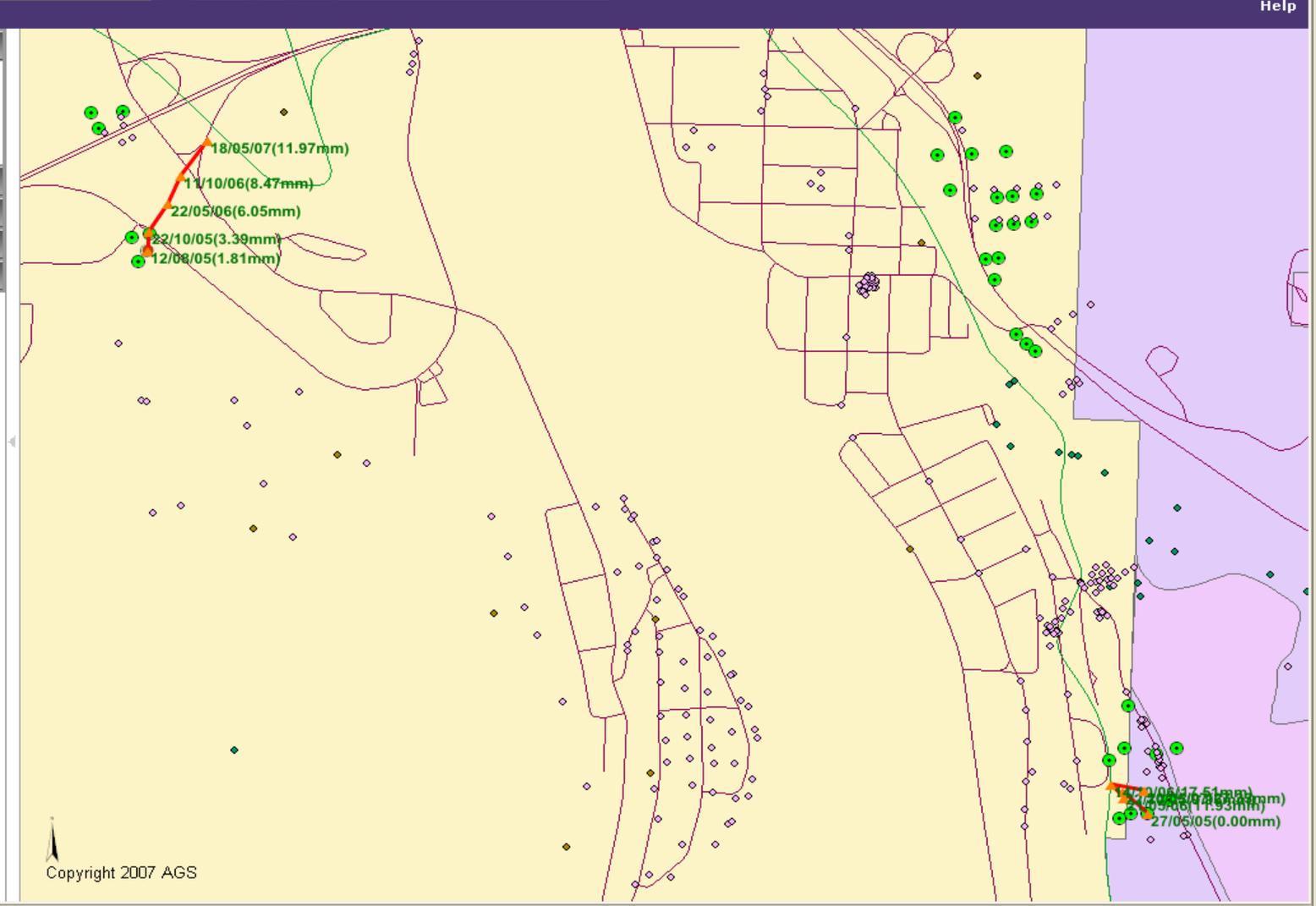
- Search borhole
- Query Borehole by Name
- Query Borehole by Inclinator

Results

Map Contents

Navigation

Overview



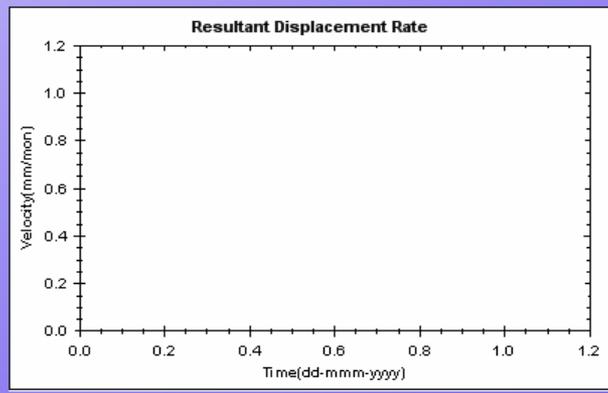
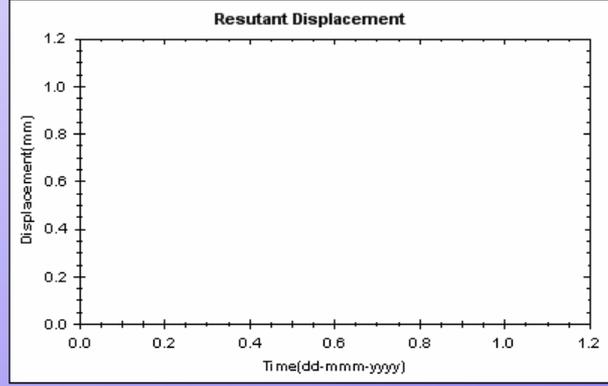
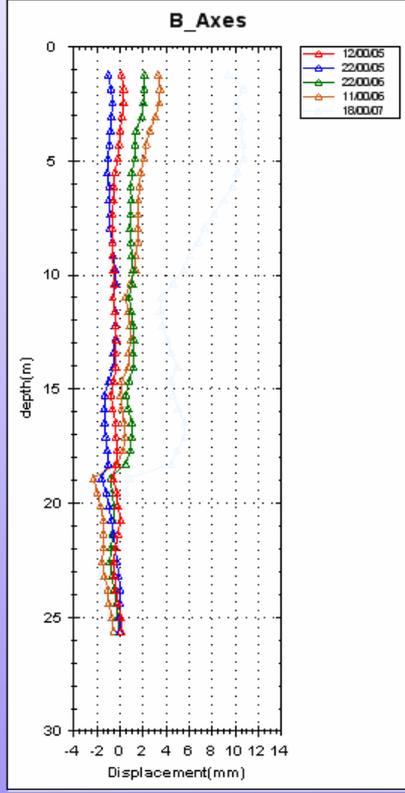
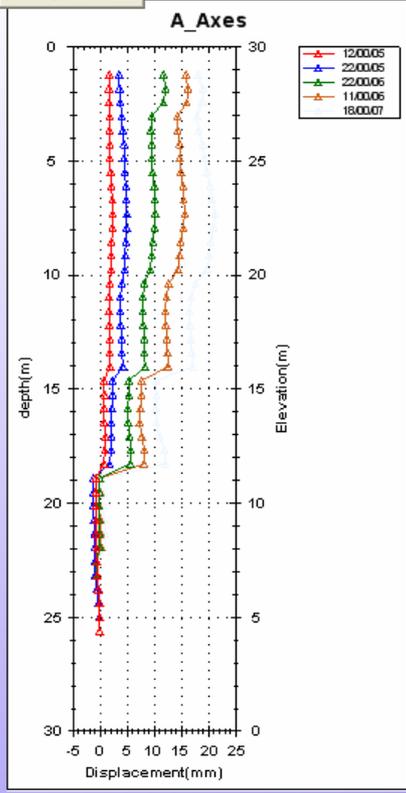
Copyright 2007 AGS



Select Borehole: 15-85-13_S105-3 From: 8/12/2005 6:21:00 AM FromDepth: 1.22
Cumulative Displacement To: 5/18/2007 1:13:00 PM ToDepth: 25.60

Initial Survey: 6/6/2005 1:45:00 PM

Table A_Axis Time B_Axis Time Resultant Time

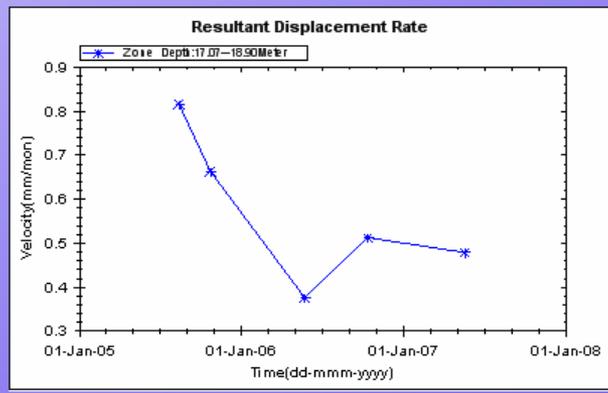
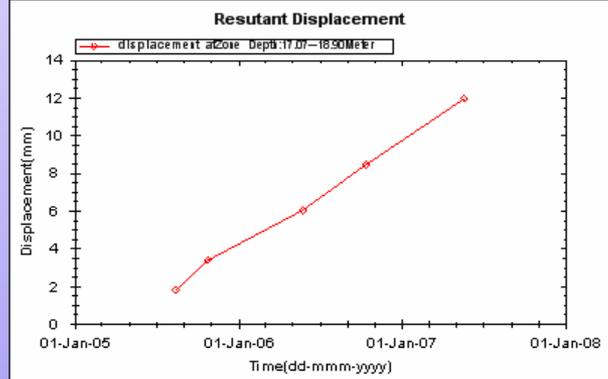
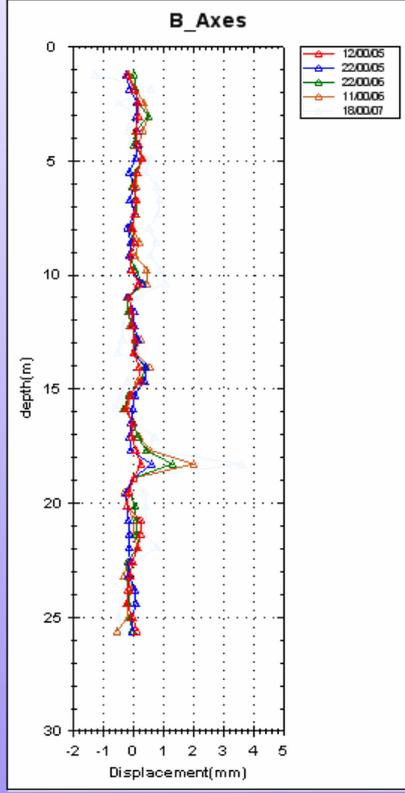
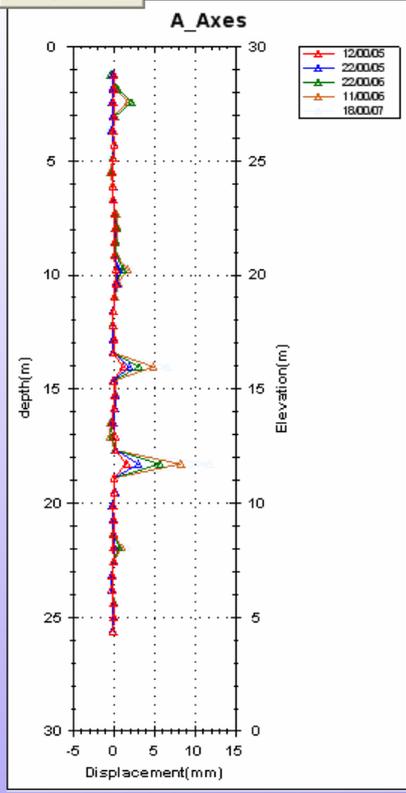




Select Borehole: 15-85-13_S105-3 From: 8/12/2005 6:21:00 AM FromDepth: 17.07
 Time Displacement To: 5/18/2007 1:13:00 PM ToDepth: 18.90

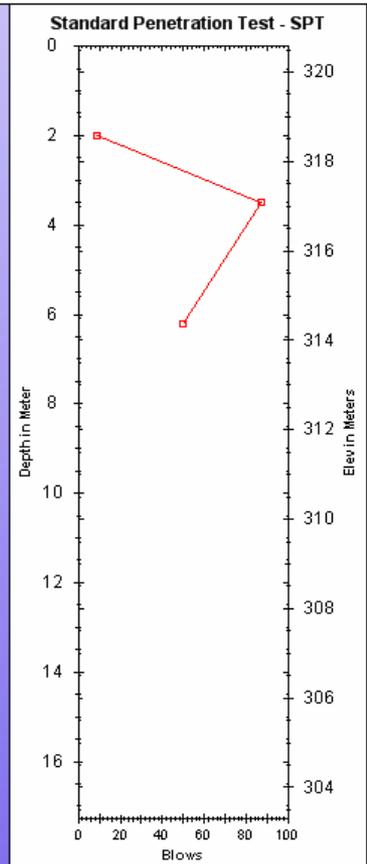
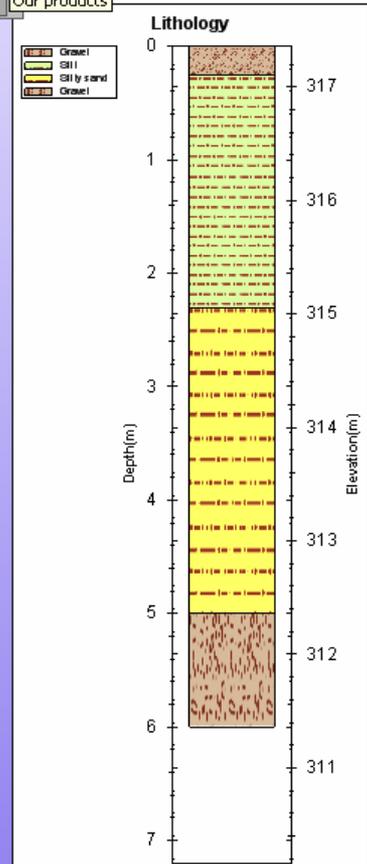
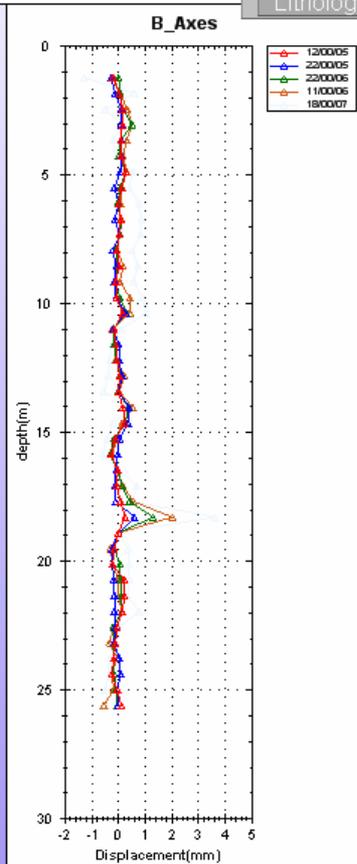
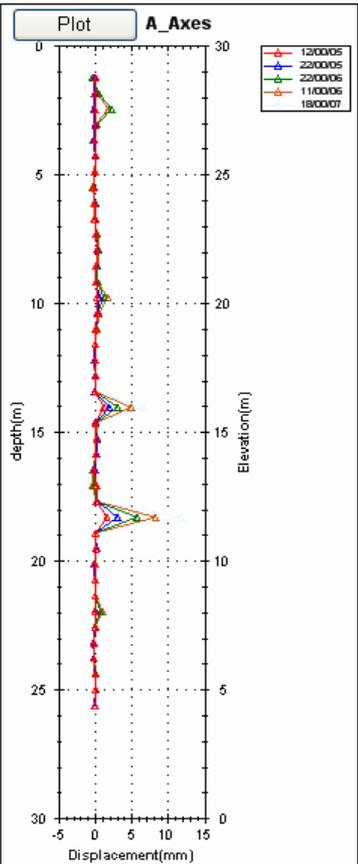
Initial Survey: 6/6/2005 1:45:00 PM

Table A_Axis Time B_Axis Time Resultant Time





- Displacement_A
- Displacement_B
- Lithology
- Lithology_Label
- SPT
- Pocket Penetrometer
- Plastic Limit
- Liquid Limit

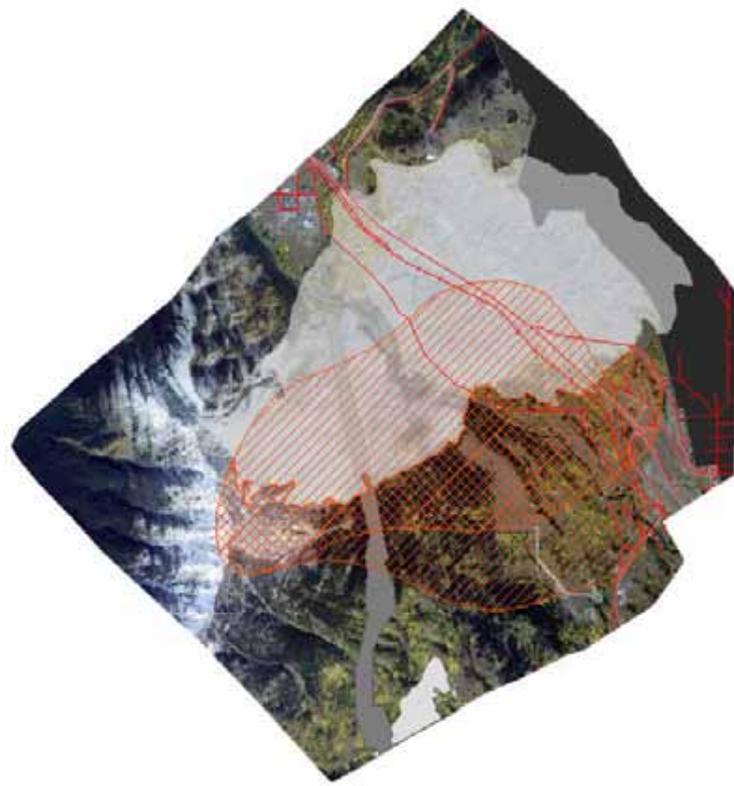




Turtle Mountain Monitoring Project

- General
- Zoom In
- Zoom Out
- Pan
- Full Extent
- Help | Refresh

- Advanced
- Identify
- Measure
- Description
- Query
- Select Feature(s)
- Charting
- 3D LIDAR



- ### Map Contents
- Layers
 - Historical Monitoring Points
 - Tri-Lateral Point
 - Photogrammetry Plat
 - Moiré Crack Gauge
 - John Allen Station
 - Sensor Networks
 - Weather Station

Overview Map

1:29053

Navigation

0.5 0.25 0 0.5 Kilometers



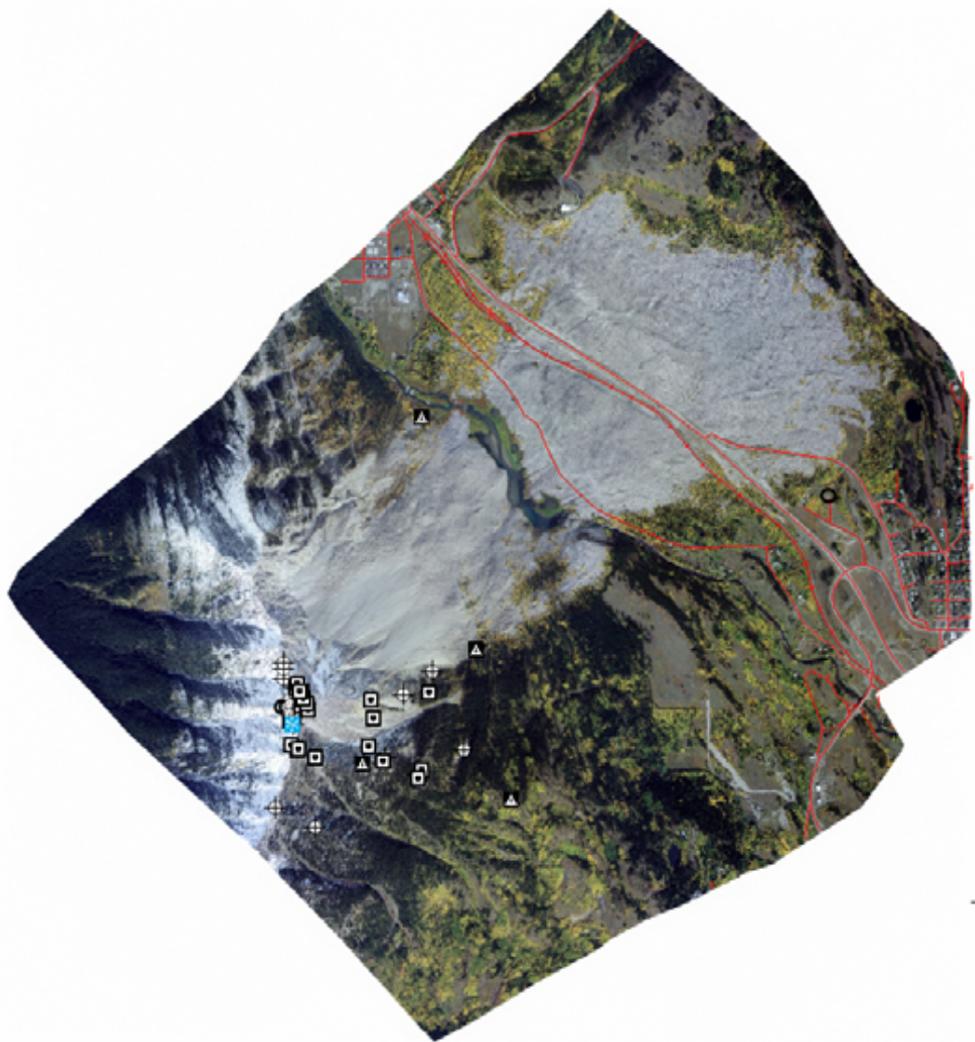
Turtle Mountain Monitoring Project

General

- Zoom In
- Zoom Out
- Pan
- Full Extent
- Help | Refresh

Advanced

- Identify
- Measure
- Description
- Query
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- Charting
- 3D LIDAR



Map Contents

- Differential GPS Moni
- Periodic GPS Points
- Crackmeters
- Borehole
- Infrastructure and urban de
- Roads
- Railway

Overview Map

1:21810

Navigation

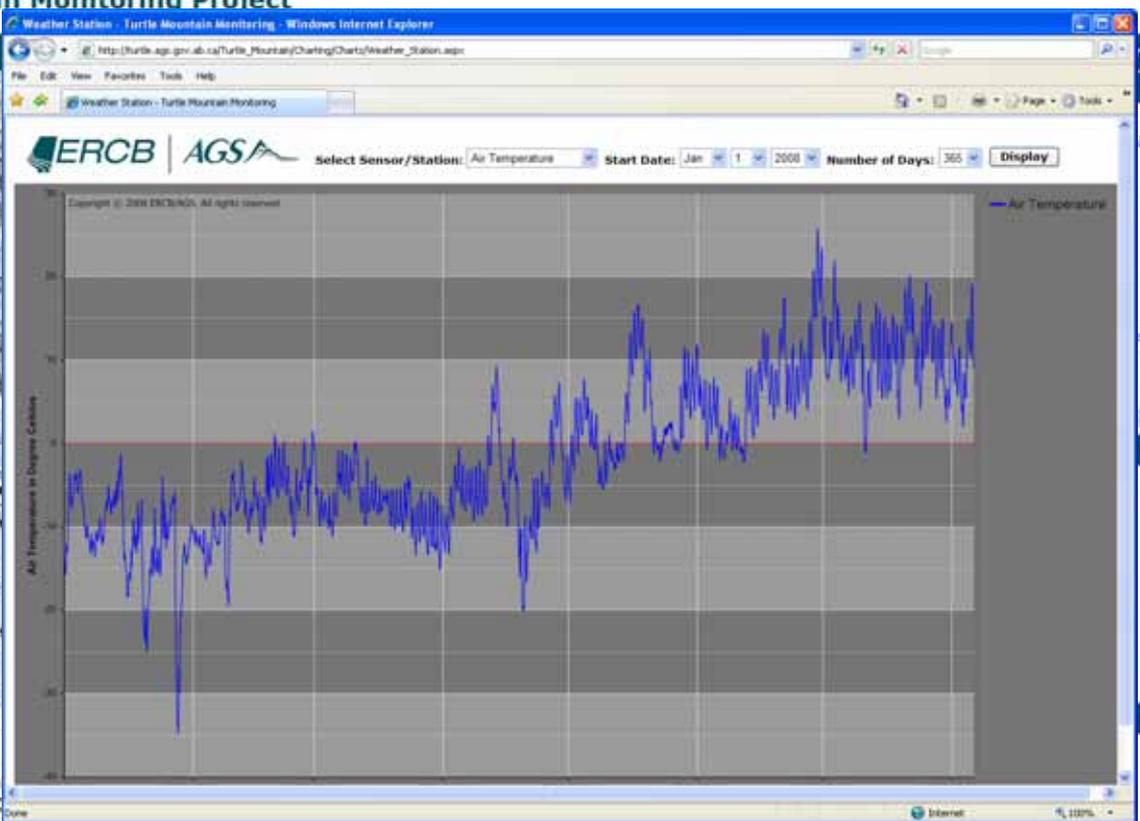
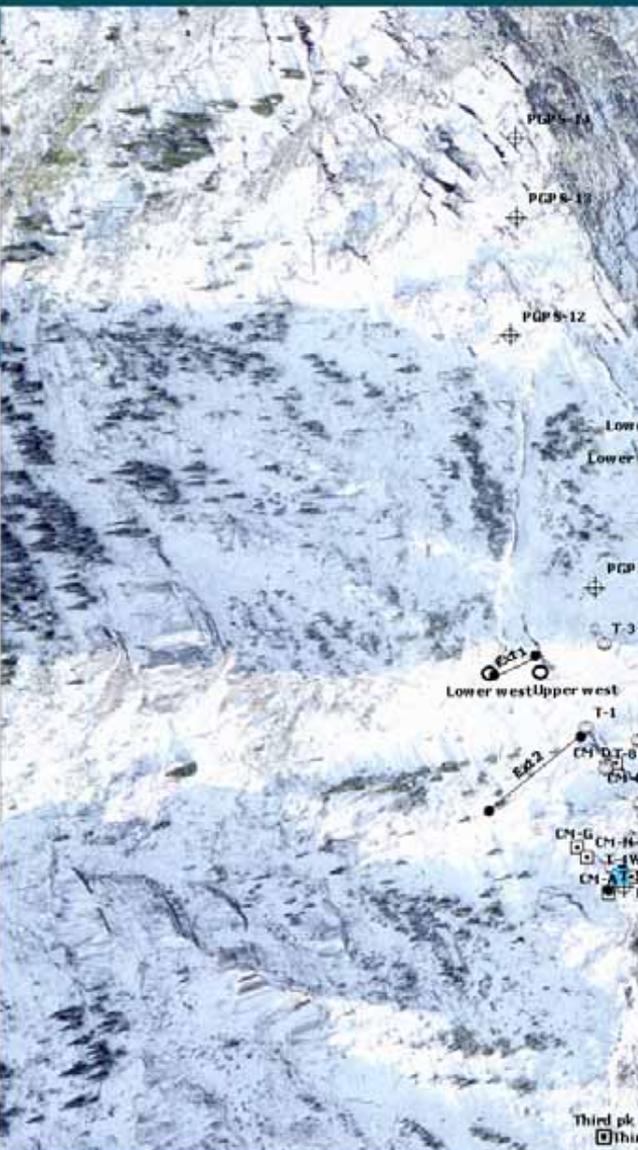




Turtle Mountain Monitoring Project

- General
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- Help | Refresh
- Advanced

- Identify
- Measure
- Description
- Query
- Select Feature(s)
- Charting
- 3D LIDAR



Search

Fly To Find Businesses Directions

Fly to e.g., 37.25.81° N, 122.05.26° W

Search

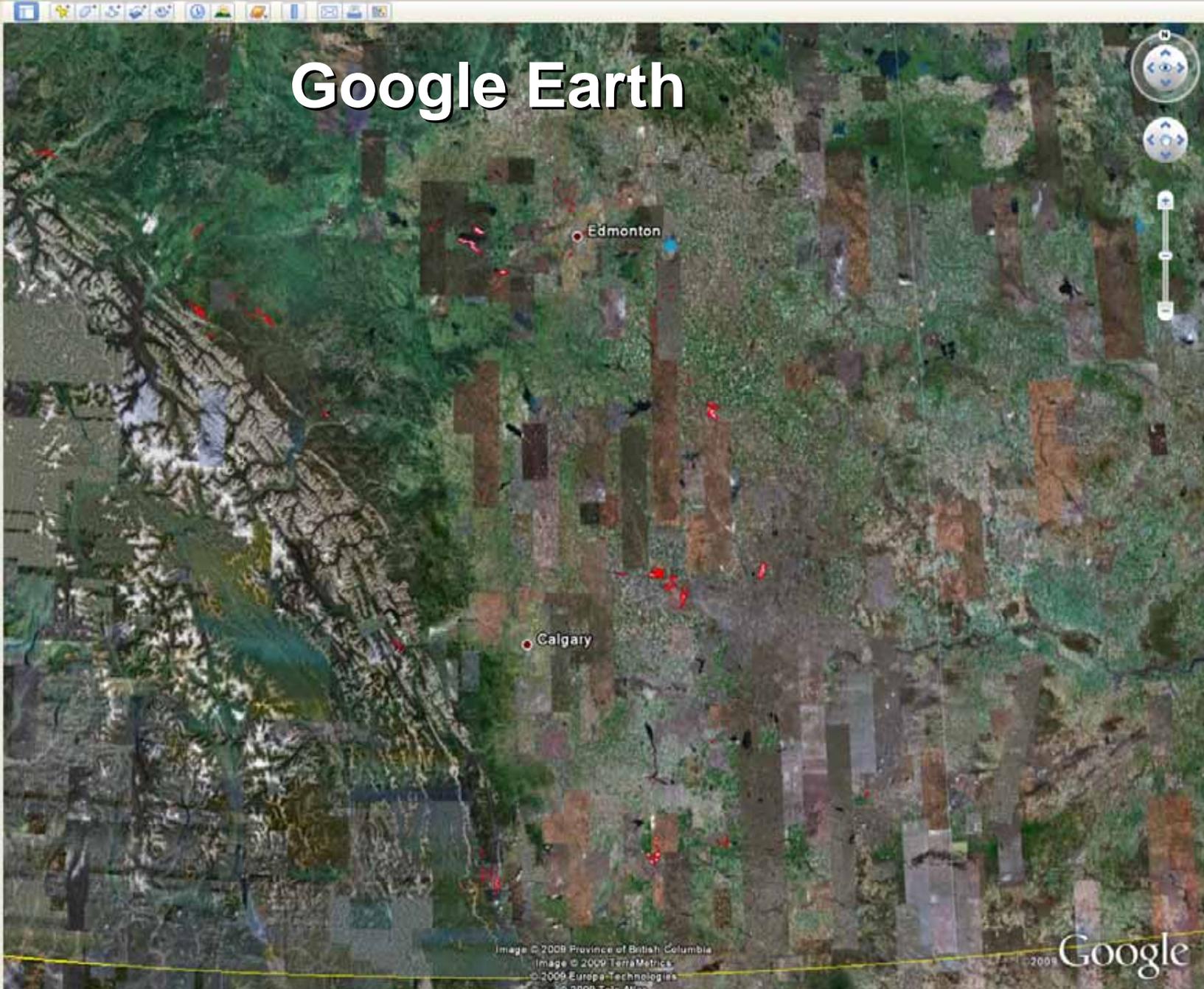
Places Add Content

My Places

- Sichtseeing
- Temporary Places
- coal_mines_py_fm
- Features

Layers

- Primary Database
- Geographic Web
- Panoramic
- Wikipedia
- Places
- Preview
- National Geographic Ma...
- Discovery Networks
- Earthquakes
- Everytrail
- European Space Agency
- NASA
- 100% Pure New Zealand
- Japan Tourism
- Kyoto Tourism
- Walt Disney World® R...
- Disneyland® Resort Paris
- Wikiloc
- Tremble Outdoors Trips
- Ocean Observations
- Volcanoes
- Webcams.travel
- Climate Data



Google Earth

Edmonton

Calgary

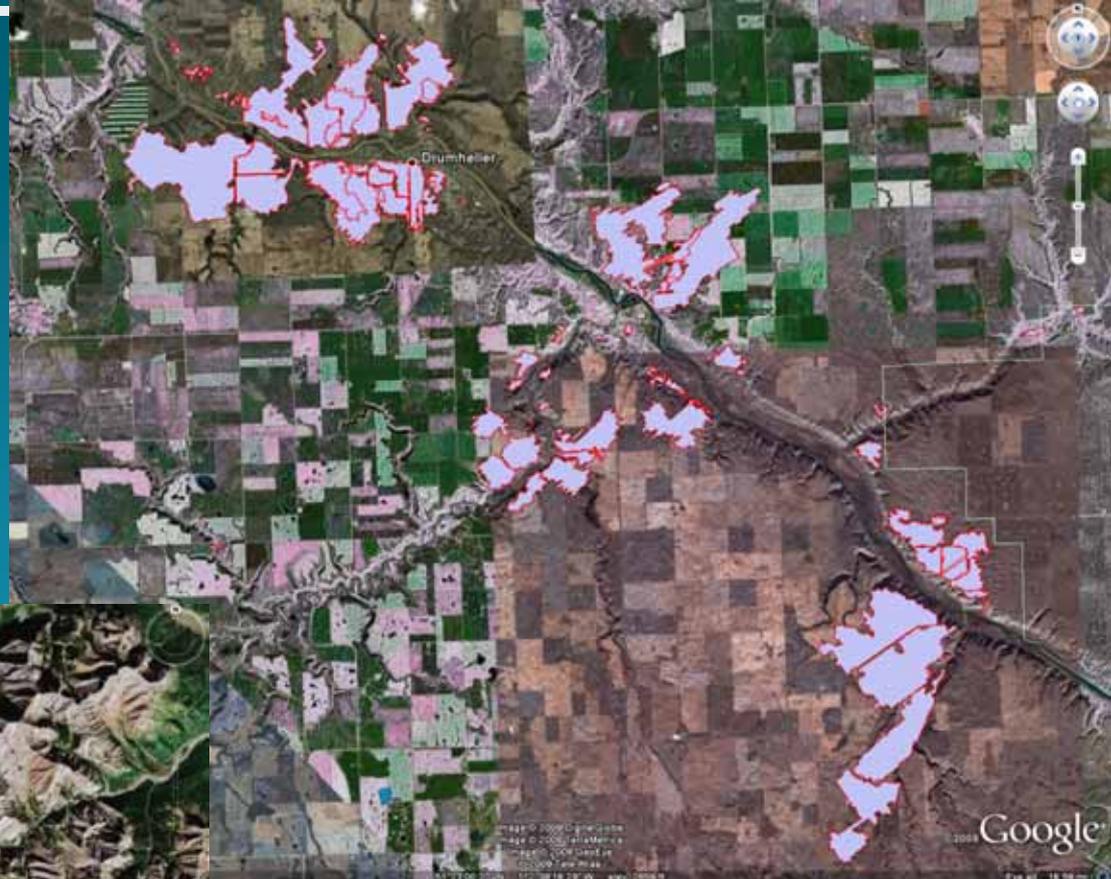
Image © 2008 Province of British Columbia
 Image © 2009 TerraMetrics
 © 2009 Europa Technologies
 © 2009 Tele Atlas

Google

51°49'24.69" N 113°16'48.88" W elev: 3026 ft

Eye alt: 443.71 mi

Abandoned Coal Mine Workings



Drumheller



Canmore

Summary

- **Rapid development and resource usage necessitate better geological information for planning and mitigation**
- **Higher data density and more powerful modeling tools aid in development of 3D models**

Summary

- **Remote sensing data allows for faster, more accurate regional mapping**
- **Web applications allow easier dissemination of data to stakeholders (public)**

11th International Symposium on Landslides/2nd North American Symposium on Landslides

Banff Springs Hotel, June 3-8, 2012



***Hosted by the Canadian Geotechnical Society
Standing Committee on Landslides***

Thank You

corey.froese@ercb.ca