

Field Drainage Technology LiDAR

NDSU NORTH DAKOTA
STATE UNIVERSITY

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STUDENT FOCUSED • LAND GRANT • RESEARCH UNIVERSITY

LiDAR Applications to Drainage

LiDAR Technology and Applications

What is Needed to use LiDAR?

Online Viewing Tool

Downloading LiDAR Data

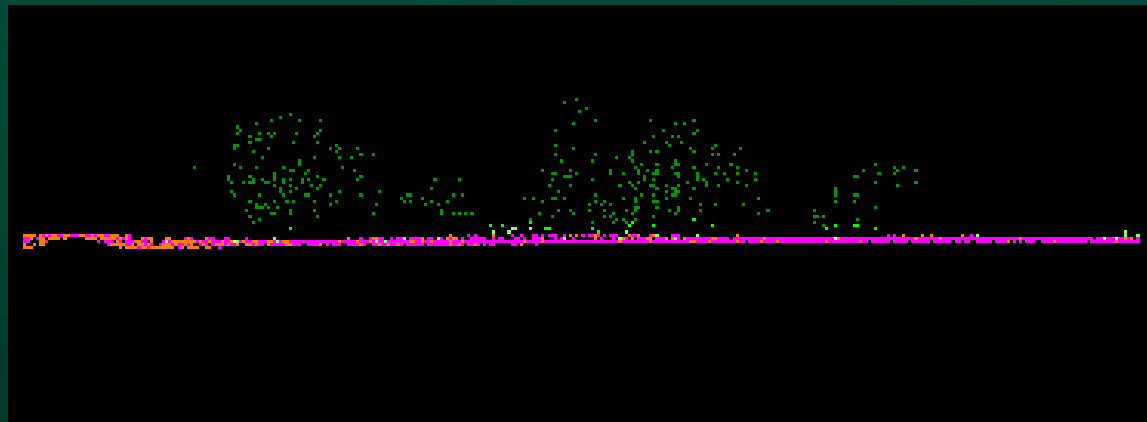
Viewing in Free Fugro Viewer

GIS Software to Make Drainage Plan

measures the time delay between transmission of a pulse and detection of the reflected signal

LiDAR Technology

- Light Detection And Ranging
 - Optical Remote Sensing using Lasers
 - Measuring Distance to Ground from Airplane



Agriculture Applications

- Flood Maps
- Tile and Surface Drainage
- Topographic Layer for Precision Agriculture
- Road Construction
- Community Development

What is Needed to use LiDAR?

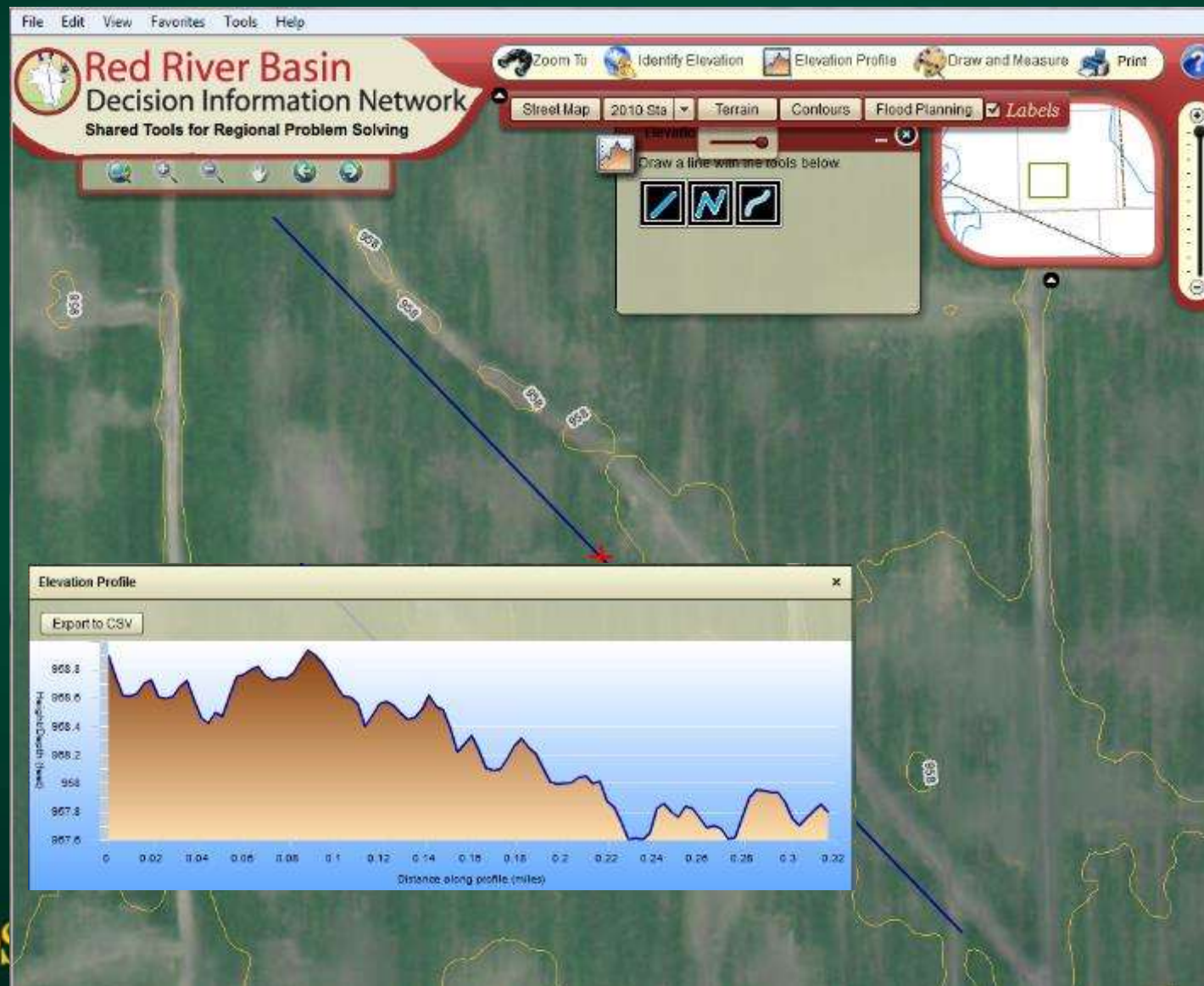
- Computer
 - Storage Space – 100 Megabytes per Square Mile
 - Bare Earth Data – LAS File Format - LASer
- GIS Program
 - Fugro Viewer – Free – Quick Elevation Model
 - Commercial GIS Software Programs – Usable for Drainage
- Online Viewer -
<http://gis.rrbdin.org/lidarviewer/index.html>

Downloading LiDAR Data

- USGS (US Geologic Survey – South Dakota
 - <http://earthexplorer.usgs.gov/>
- ND Water Commission – James River
 - <http://lidar.swc.nd.gov/>
- International Water Institute – Red River
 - <http://gis.rrbdin.org/lidardownload/index.html>

International Water Institute LiDAR Viewer

<http://gis.rrbdin.org/lidarviewer/>



International Water Institute Viewer



Downloading LiDAR Data

The screenshot displays a web browser window with the URL <http://gis.rmbdin.org/lidar/download/index.html>. The page title is "IWI - Lidar Download Portal". The main content area features a map of the Red River Basin, outlined in blue, with various counties labeled. Two panels are overlaid on the right side of the map:

- Zoom to Location:** A panel with a text input field labeled "Address or Place" and a "Locate" button.
- Data Download:** A panel with a yellow folder icon and text that reads: "Click the select by rectangle icon to activate download selection tool. Draw a box on the map to select the Lidar data for download. The tiles will highlight in red after a selection is made on the map. The data download is limited to 50 tiles." Below the text is a square icon with a diagonal line.

At the bottom of the map, there is a "Layers" panel. The footer of the page includes the NDSU Extension Service logo and the International Water Institute logo, with the text "NDSU NORTH DAKOTA STATE UNIVERSITY".

www.internationalwaterinstitute.org/lidar.htm

Downloading LiDAR Data

RED RIVER BASIN
DECISION INFORMATION NETWORK *Lidar Viewer*
"Shared Tools For Regional Problem Solving"

Street Map Aerials Terrain

Zoom to Location
Red River Basin Township and Range
Select Township Select Range

Data Download
Click the select by rectangle icon to activate download selection tool. Draw a box on the map to select the Lidar data for download. The tiles will highlight in red after a selection is made on the map. The data download is limited to 50 tiles.

NDSU Extension Service
North Dakota State University

International Water Institute
Downloaded and supported in collaboration by the International Water Institute

200 km
100 mi

NDSU NORTH DAKOTA STATE UNIVERSITY

Downloading LiDAR Data

The screenshot displays the 'RED RIVER BASIN DECISION INFORMATION NETWORK Lidar Download Portal'. The main map shows a grid of townships and ranges in North Dakota, with a red rectangular selection box covering a portion of the area. A 'Data Download' dialog box is open on the right, showing a list of data types with checkboxes:

- Raw LAS Files
- Bare Earth LAS Files
- Hybrid Intensity Images
- 2ft Contours
- 1m DEM
- 3m DEM

Below the list is an 'Enter Email' field and two buttons: 'Download Data' and 'Clear Search'. The map includes a 'Zoom to Location' button and a 'Layers' button. Logos for 'NDSU Extension Service' and 'International Water Institute' are visible in the bottom left corner.

www.internationalwaterinstitute.org/lidar.htm

Downloading LiDAR Data

The screenshot displays the 'RED RIVER BASIN DECISION INFORMATION NETWORK Lidar Download Portal'. The main map area shows a grid of red rectangular tiles selected for download. A 'Process Successful' dialog box is centered on the screen, stating: 'Your message has been sent. You should receive an email in approximately 10 minutes containing information about downloading selected data.' Below this message is an 'OK' button. To the right, a 'Data Download' panel is open, showing 'Tiles Selected: 6'. The panel includes a list of data types with checkboxes: 'Raw LAS Files' (unchecked), 'Bare Earth LAS Files' (checked), 'Hybrid Intensity Images' (unchecked), '2ft Contours' (unchecked), '1m DEM' (unchecked), and '3m DEM' (unchecked). Below the list is an 'Enter Email' input field, a 'Download Data' button, and a 'Clear Search' button. The map background shows a street grid in North Dakota with labels like 'T 152NR 51W', 'T 152NR 50W', and 'T 151NR 50W'. The bottom left corner features logos for 'NDSU Extension Service' and 'InternationalWaterInstitute'.

www.internationalwaterinstitute.org/lidar.htm

Downloading LiDAR Data

grit@iwinst.org

Request from: John.Nowatzki@ndsu.edu

LiDAR Data Request Download Links


For more information about the LiDAR data, please visit <http://www.internationalwaterinstitute.org/lidar.htm>.

Contour Shapefiles (11.8 MB): - http://gis.rrbdin.org/LiDAR_data/contours/requestzips/20120221202804_contours.zip

Your data request will be available for download for 5 days.

1 Email Message

Downloaded Files

 20120221160048_belas.zip **2**







 20120221160048_contours.zip

Extracted Contours

LASer (LAS) File Format

3 Extracted LiDAR

 b06785124.las

 c4809719_ne_contour	DBF File
 c4809719_ne_contour.prj	PRJ File
 c4809719_ne_contour.sbn	SBN File
 c4809719_ne_contour.sbx	SBX File
 c4809719_ne_contour.shp	SHP File
 c4809719_ne_contour.shx	SHX File

Downloading LiDAR Data

- USGS - US Geologic Survey

The screenshot shows the USGS EarthExplorer web interface. The browser address bar displays 'http://earthexplorer.usgs.gov'. The page header includes the USGS logo and navigation links like 'USGS Home', 'Contact USGS', and 'Search USGS'. Below the header, there are tabs for 'Search Criteria', 'Data Sets', 'Additional Criteria', and 'Results'. The 'Search Criteria' section is active and contains the following elements:

- 1. Enter Search Criteria**: A heading followed by instructions: 'To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the help documentation), and/or choose a date range.'
- Address/Place**: A text input field with 'Show' and 'Clear' buttons.
- Coordinates**: A section with 'Predefined Area', 'Shapefile', and 'KML' options. It includes a 'Degree/Minute/Second' input field with a 'Decimal' button. Below this, it says 'No coordinates selected' and has three buttons: 'Use Map' (circled in yellow), 'Add Coordinates' (circled in yellow), and 'Clear Coordinates'.
- Date Range**: A section with 'Recent Options' and a date range from '01/01/1920' to '02/09/2014'. A 'Search months' dropdown is set to '(all)'.
- Navigation buttons: 'Data Sets >', 'Additional Criteria <', and 'Results >'.

On the right side of the page, there is a map of North America. A yellow arrow points to a small white square on the map, which is a search area selection tool. The map also shows a search criteria summary and a 'Clear Criteria' button.

http://earthexplorer.usgs.gov/

EarthExplorer

Home Profile Save Criteria Load Favorite Manage Criteria

Search Criteria Data Sets Additional Criteria Results

1. Enter Search Criteria

To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range.

Address/Place Path/Row Feature Circle

Show Clear

Coordinates Predefined Area Shapefile KML

Degree/Minute/Second Decimal

1. Lat: 46.3913, Lon: -96.7885	🗑️ ❌
2. Lat: 46.3913, Lon: -96.7779	🗑️ ❌
3. Lat: 46.3842, Lon: -96.7779	🗑️ ❌
4. Lat: 46.3844, Lon: -96.7883	🗑️ ❌

Use Map Add Coordinate Clear Coordinates

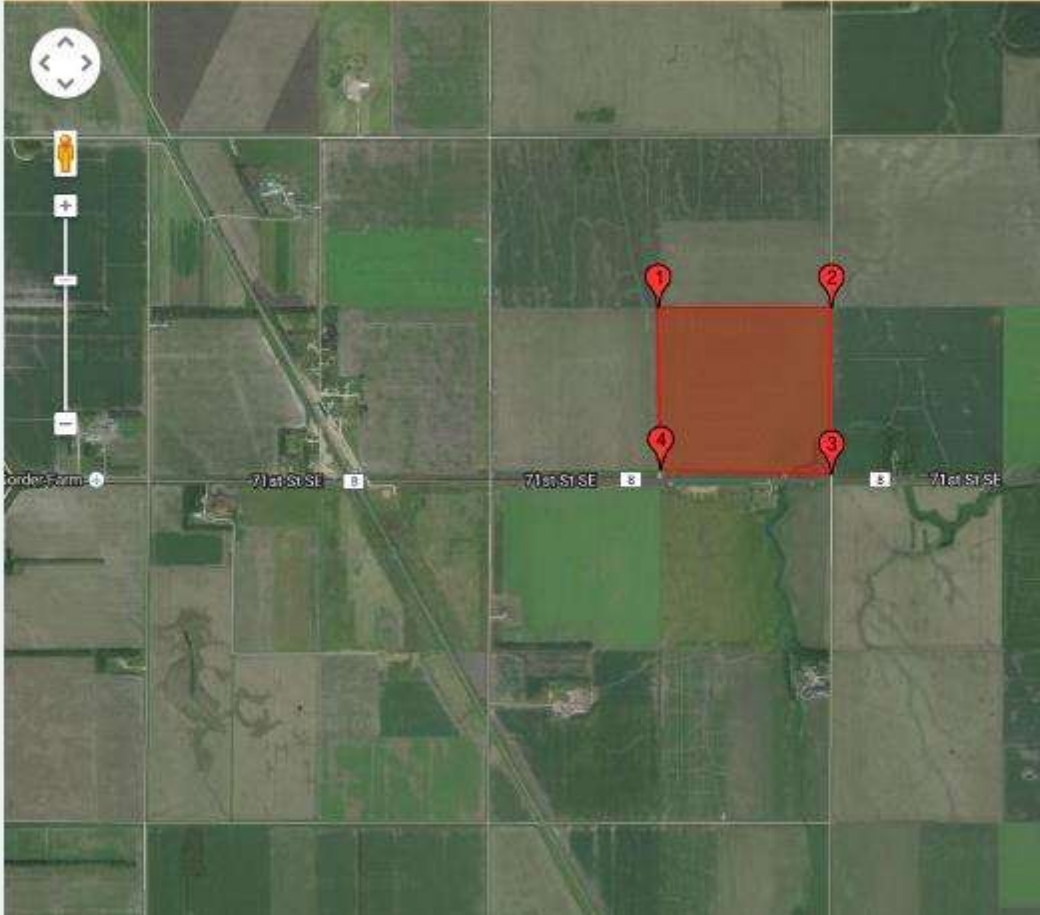
Date Range Result Options

Search from: 01/01/1920 to: 02/09/2014

Search months: (all)

Data Sets » Additional Criteria » **Results »**

Search Criteria Summary (Show)



http://earthexplorer.usgs.gov/

EarthExplorer

Home Profile Save Criteria Load Favorite Manage Criteria

Search Criteria Data Sets Additional Criteria **Results**

4. Search Results

If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.





Show Result Controls

Data Set [Click here to export your results](#)

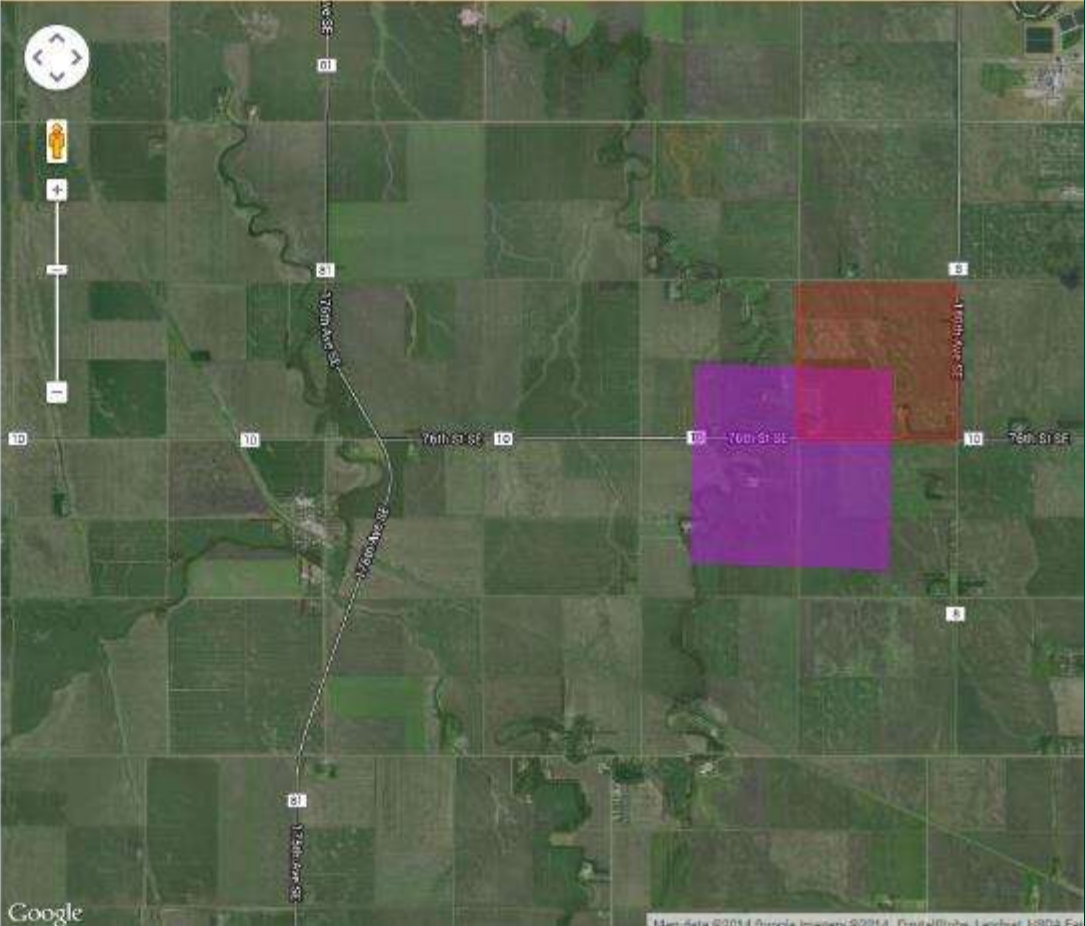
LIDAR

« First Previous 1 Next Last »

Displaying 1 - 4 of 4

1	 LIDAR Entity ID: IW1_REDRIVER-DL_2009_000085 Acquisition Date: 21-APR-09 State: ND-SD-MN Project: IW1_REDRIVER-DL_2009
2	 LIDAR Entity ID: IW1_REDRIVER-DL_2009_000086 Acquisition Date: 21-APR-09 State: ND-SD-MN Project: IW1_REDRIVER-DL_2009
3	 LIDAR Entity ID: IW1_REDRIVER-DL_2009_000129 Acquisition Date: 21-APR-09 State: ND-SD-MN Project: IW1_REDRIVER-DL_2009
4	 LIDAR Entity ID: IW1_REDRIVER-DL_2009_000130 Acquisition Date: 21-APR-09 State: ND-SD-MN Project: IW1_REDRIVER-DL_2009

Search Criteria Summary (Show)



Google

Map data ©2011 Google, Imagery ©2011 DigitalGlobe, GeoEye, AeroGRID, IGN, SIA, Airphoto, USDA, Landsat




Downloading LiDAR Data


- USGS
- [http](http://...)

LIDAR

« First < Previous 1 > Next > Last »

Displaying 1 - 10 of 100 ⓘ

1  LiDAR Entity ID: SD_MINNEHAHACO_2008_000075
 Acquisition Date: 13-MAY-08
 State: SD
 Project: SD_MINNEHAHACO_2008

2  LiDAR Entity ID: SD_MINNEHAHACO_2008_000147
 Acquisition Date: 13-MAY-08
 State: SD

154

 SD_MinnehahaCo_2008_000075

Download Scene ✕

Click the download button to download Scene ID: 296222

Download Close

File name:

Save as type:

Hide Folders Save Cancel

Minnesota

ftp://lidar.dnr.state.mn.us/

FTP root at lidar.dnr.state.mn.us

To view this FTP site in Windows Explorer: press Alt, click View, and then click **Open FTP Site in Windows Explorer**.

"Welcome to the State of Minnesota High Resolution Elevation download site.
Due to the size of the files that are located on this server, users are encouraged to use ftp client software to download the elevation data. Examples are WSFTP and FileZilla client ftp software.
The use of Windows or Internet Explorer is discouraged as they do not work.
for data proceed to the /data folder,
for documentation proceed to the /documentation folder
for samples of LiDAR products proceed to the /examples folder
for training and information materials proceed to the /training folder
For more information go to <http://www.mngeo.state.mn.us/committee/elevation>"

02/05/2013 08:29AM	Directory	data
11/06/2013 10:52AM	Directory	documentation
07/10/2012 02:34PM	Directory	examples
11/16/2012 09:01AM	222,503	lasintensity.txt
12/11/2012 03:50PM	40,956	LiDAR Data Change Log.docx
12/11/2012 04:06PM	303,450	LiDAR Data Change Log.pdf
10/10/2012 01:49PM	276	lidar_xcopy.bat
06/22/2011 10:51AM	56,343	readme_first.rtf
12/12/2013 02:32PM	Directory	tools
10/28/2013 07:51AM	Directory	training
04/06/2011 03:03PM	9,799,985	watchme_first.swf

Getting Started

- LiDAR Viewer
 - Fugro Viewer
- GIS Software



Fugro Viewer

- <http://www.internationalwaterinstitute.org/lidar.htm>
- <http://www.fugroviewer.com/>



Center for Flood Damage
And Natural Resources International Water Institute

Home | Red River Center for Watershed Education | Center for Flood Damage Reduction and Natural Resources | Contact Us

Project Specifications

Project Background

Project Map

LIDAR Download Portal

LIDAR Viewers

LIDAR Applications

Areas Acquired pdf+sh

Quality Control Reports

Iceberg Tracks RRV



features demo download

home corporate website contact

FugroViewer™

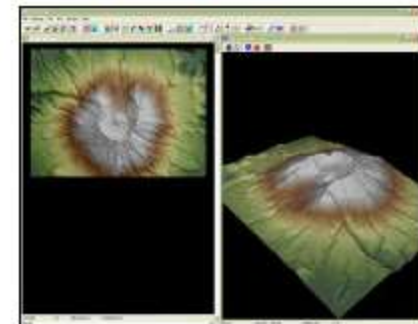
**View your data. Analyze your data. Communicate your data.
Do it all with FugroViewer.™**

FugroViewer is a robust, easy-to-use freeware designed to help users make the most of their geospatial data. Developed by Fugro Geospatial Services, FugroViewer is designed for use with various types of raster- and vector-based geospatial datasets, including data from photogrammetric, LiDAR, and IFSAR sources.

FugroViewer...just another example of how Fugro is turning spatial data into knowledge.

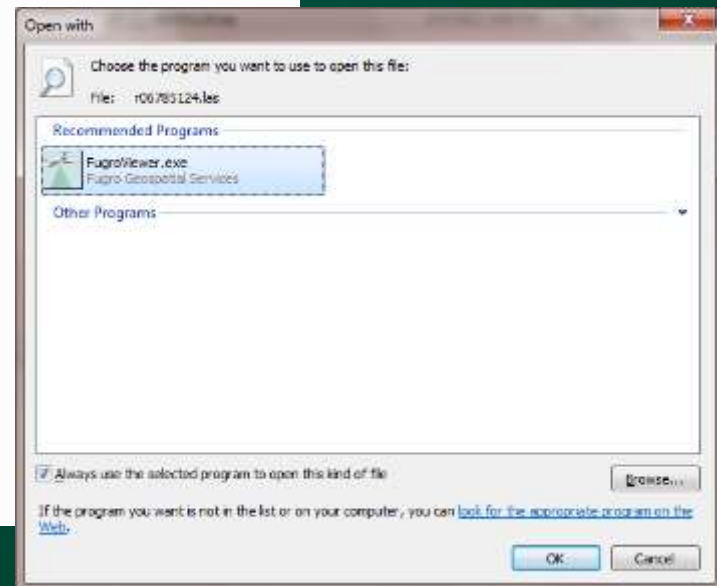
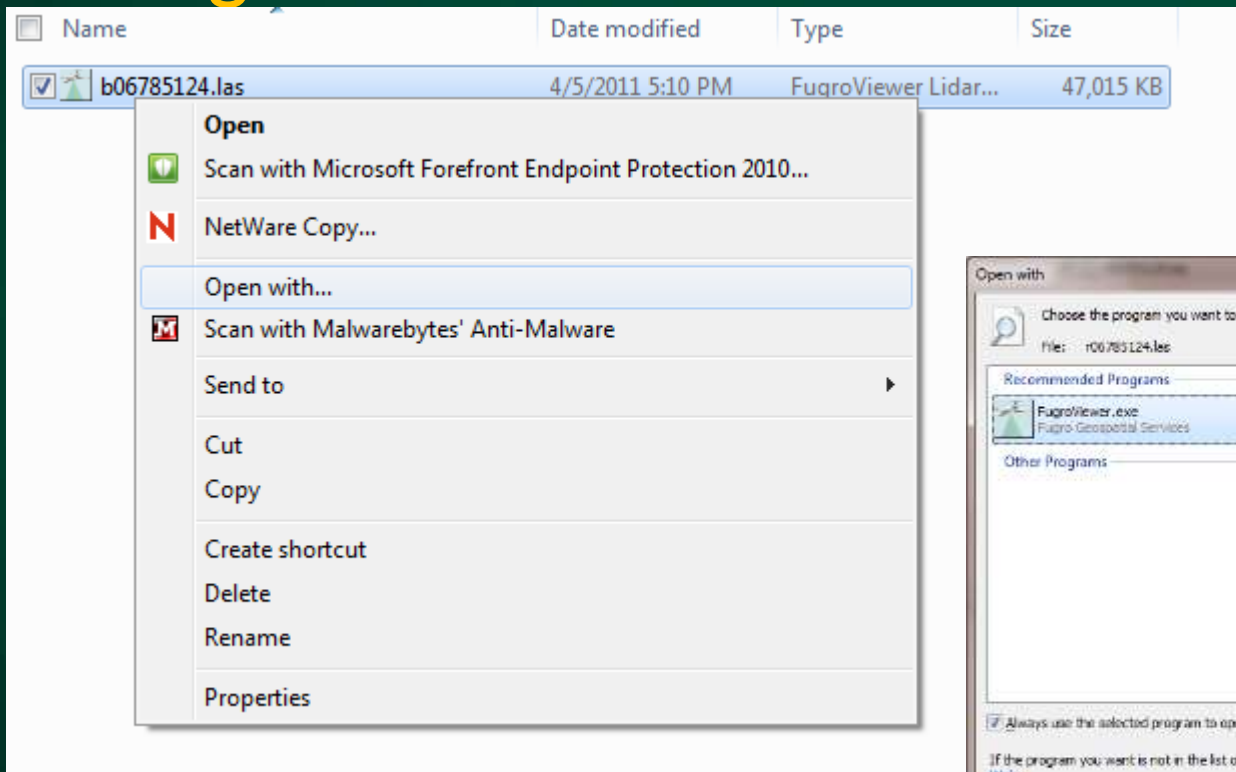
DISCOVER FUGROVIEWER

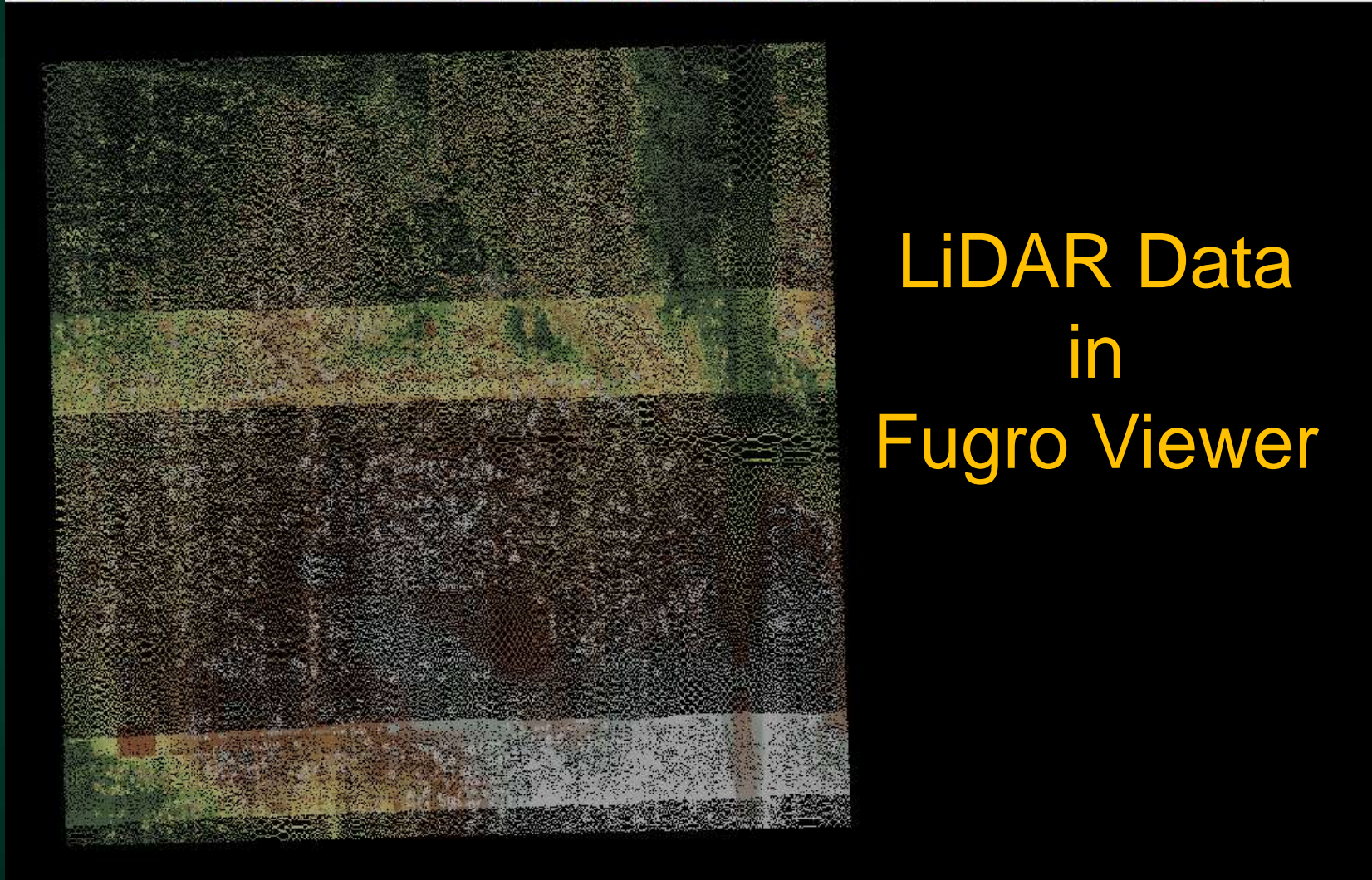
- Features
- Demo
- Download



NDSU

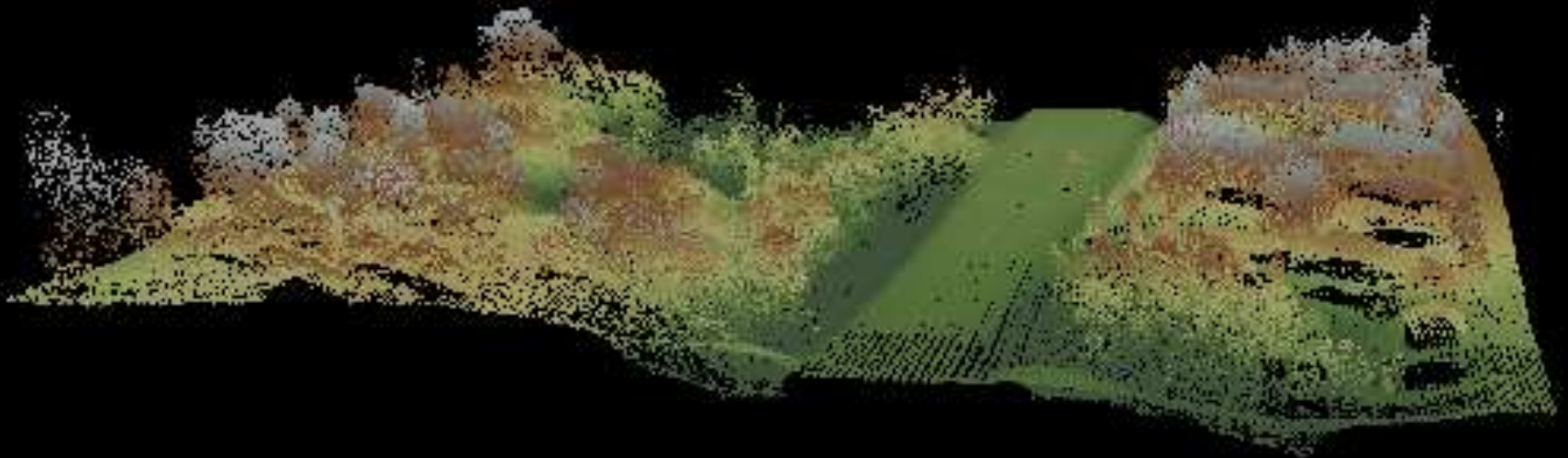
Fugro Viewer



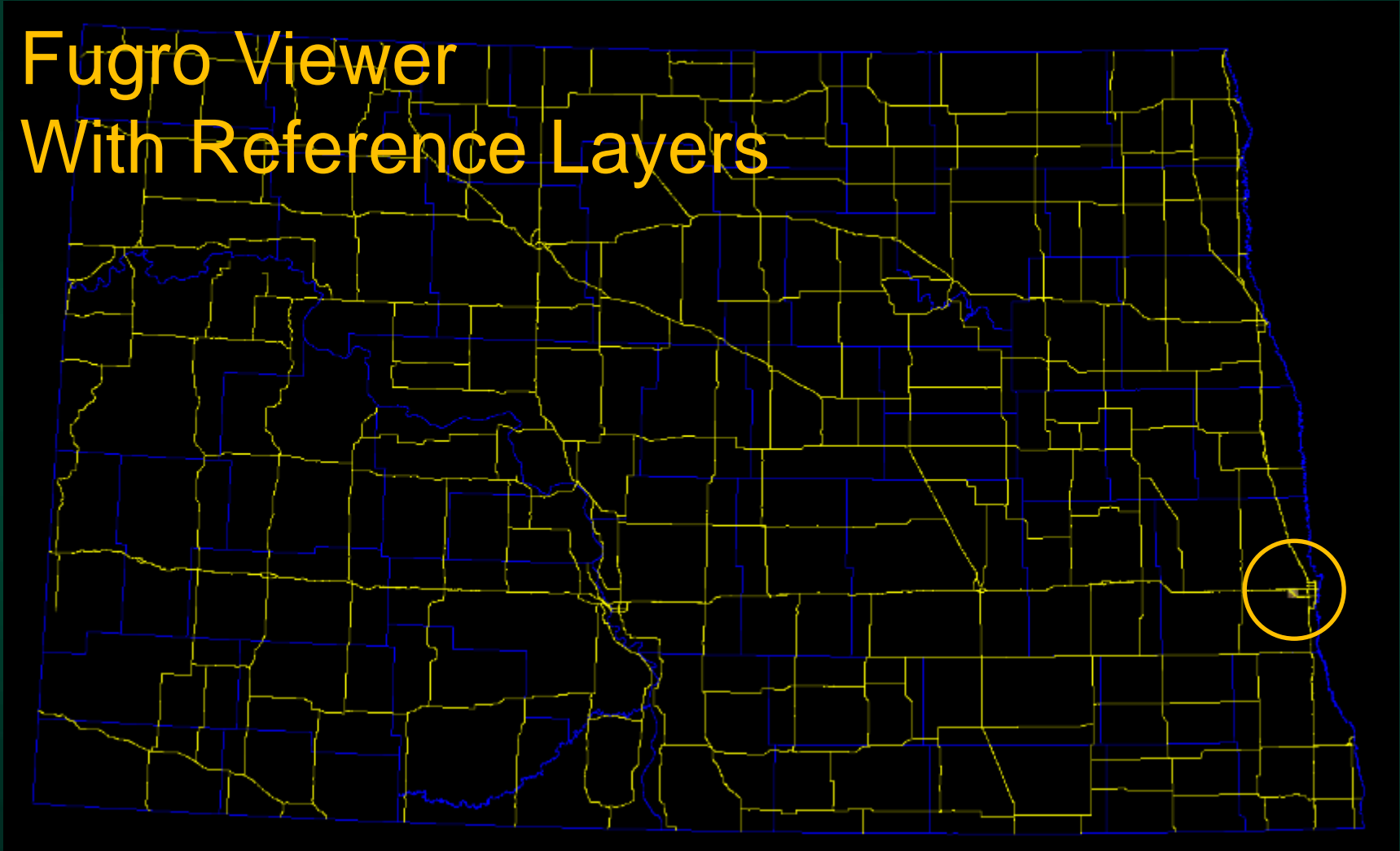


LiDAR Data in Fugro Viewer

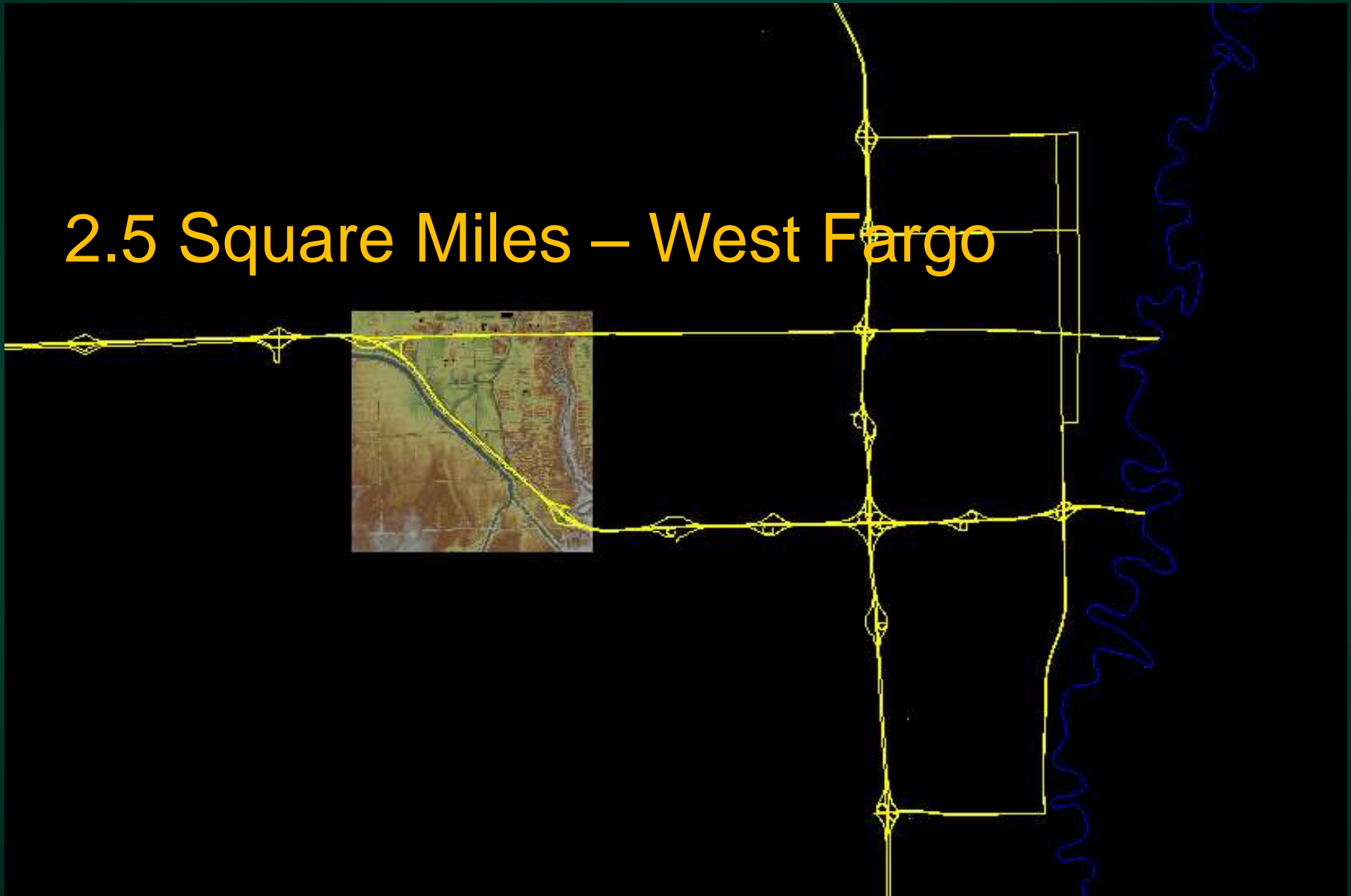
3D View in Fugro Viewer



Fugro Viewer With Reference Layers



2.5 Square Miles – West Fargo



2.5 Square Miles – West Fargo





160 Acres – 65 Acres



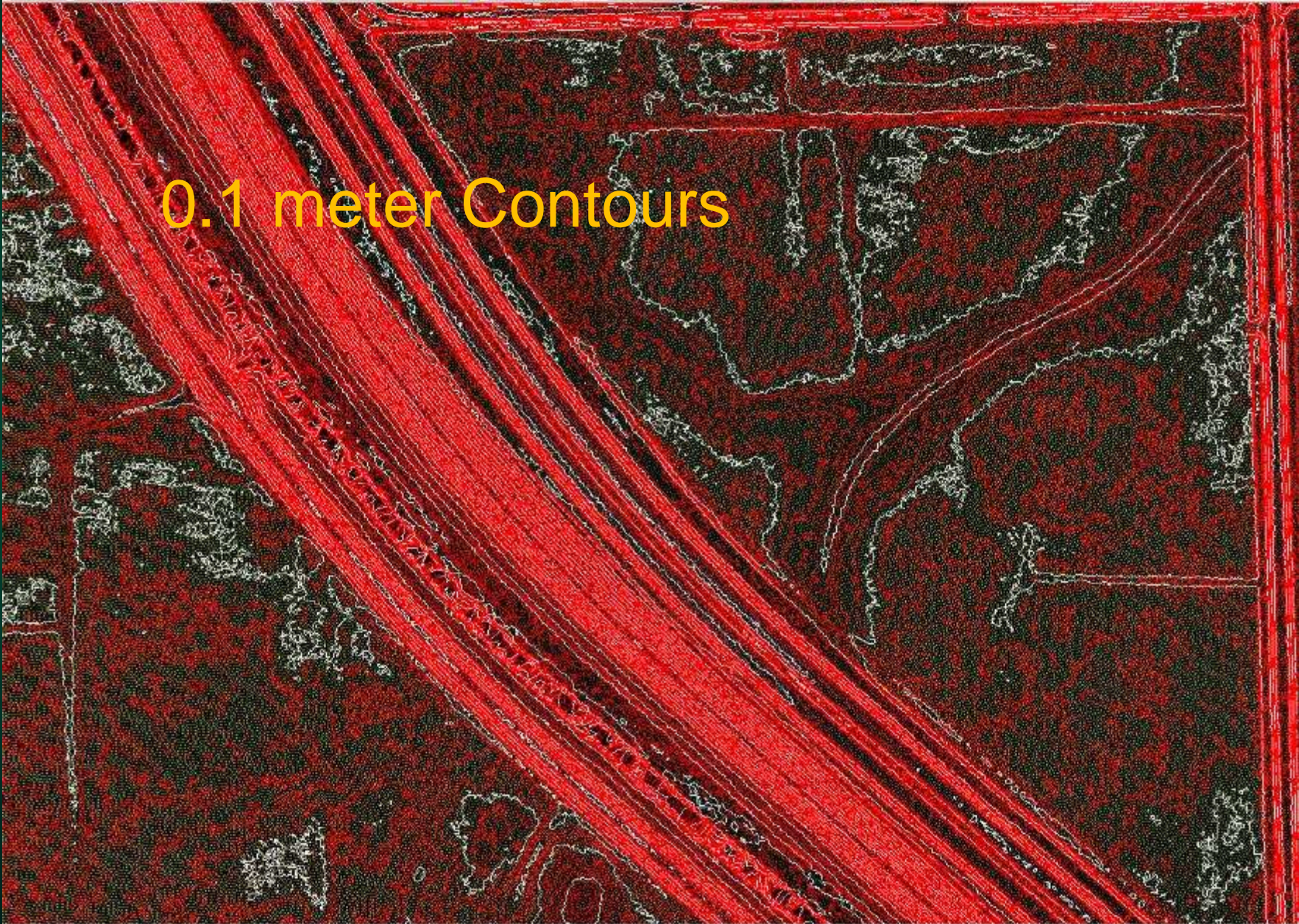
2 meter Contours

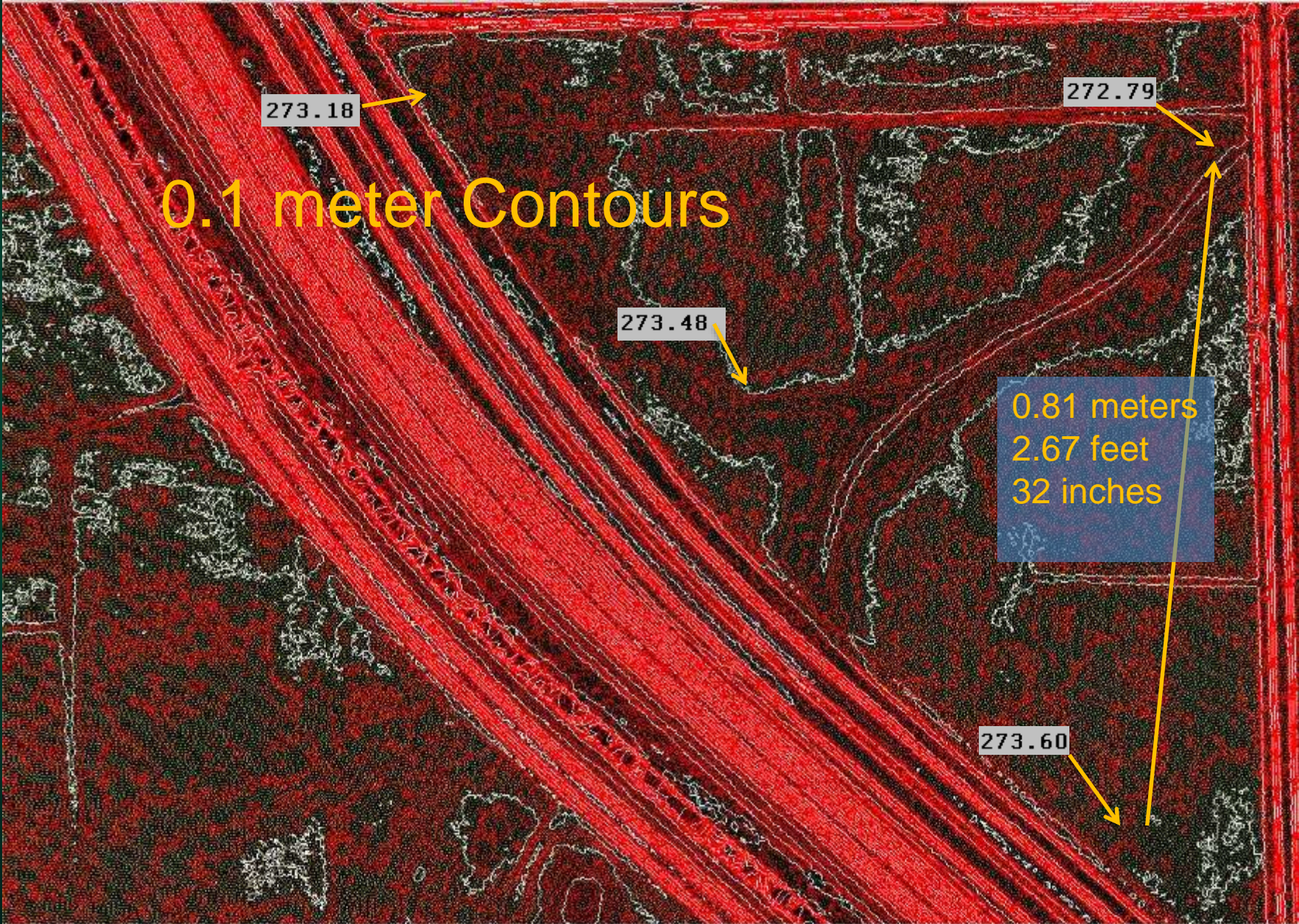


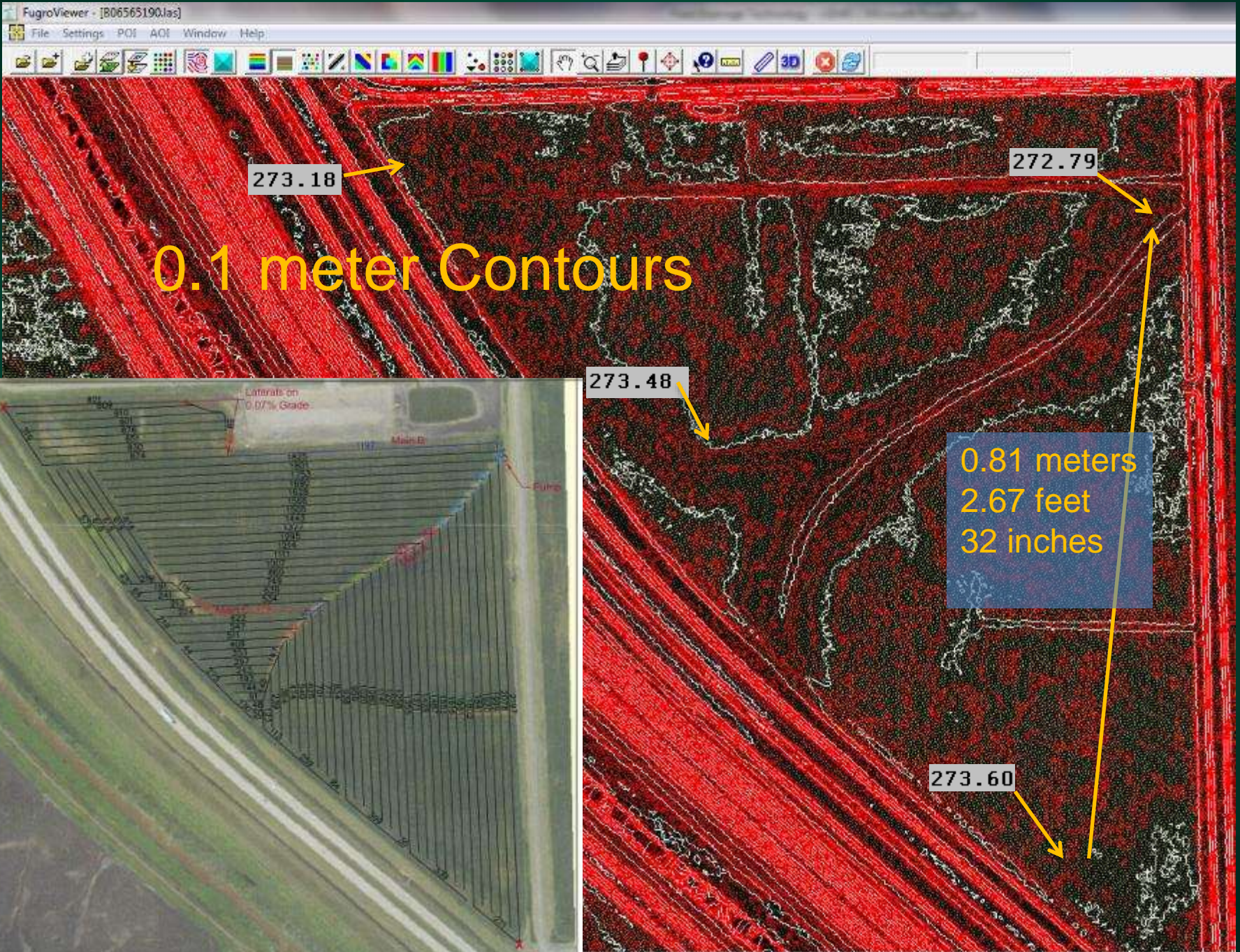
0.3 meter Contours



0.1 meter Contours







You Need GIS Software to Prepare Drainage Plan

- Available from Area Consultants
- Consultants will Prepare Plans

ArcMAP GIS Software – with GeoCue Laser Reader

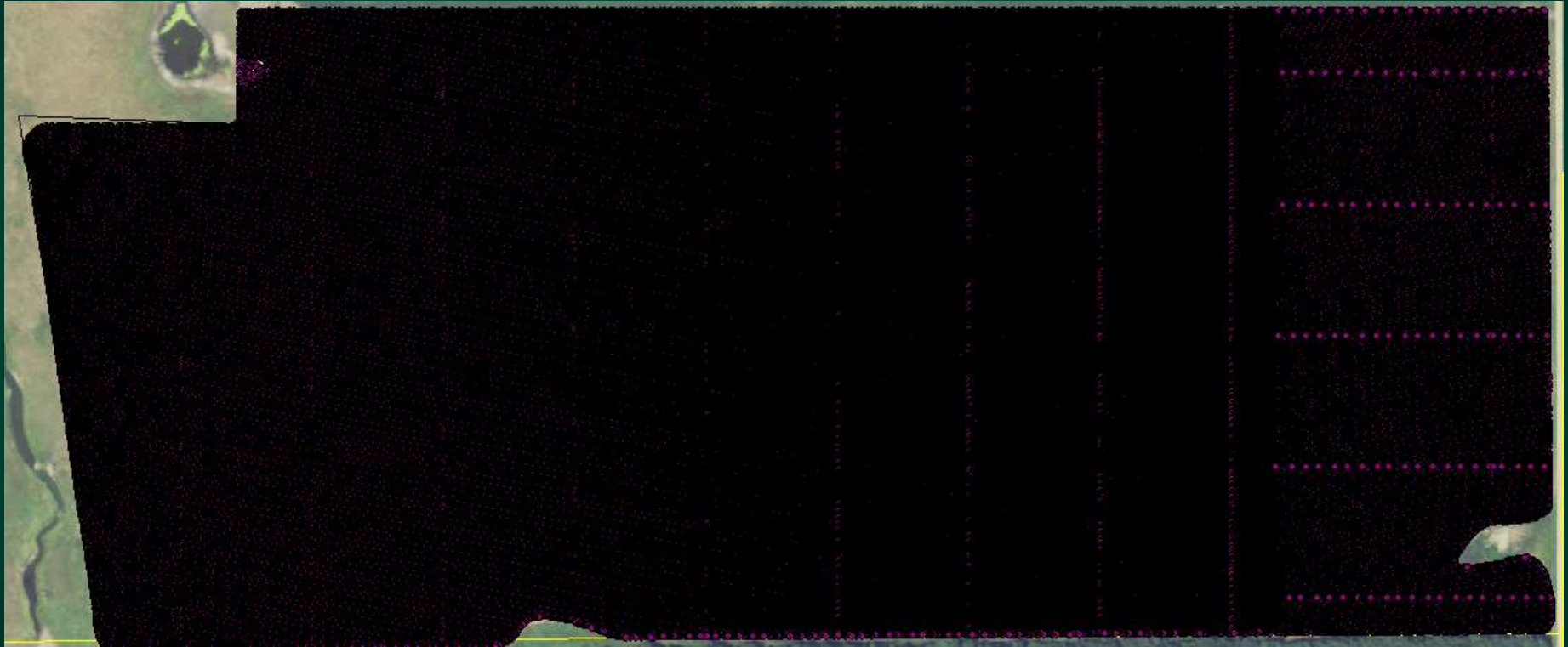
- <http://www.geocue.com/support/utilities.html>
- FREE utility adds las read capability to ArcGIS.
- Point x, y, z, intensity, return and classification values are read from the file and presented as a standard 3-D point data layer which can then be used as input to extensions such as 3-D Analyst.

ArcMAP GIS Software – Field in Central ND



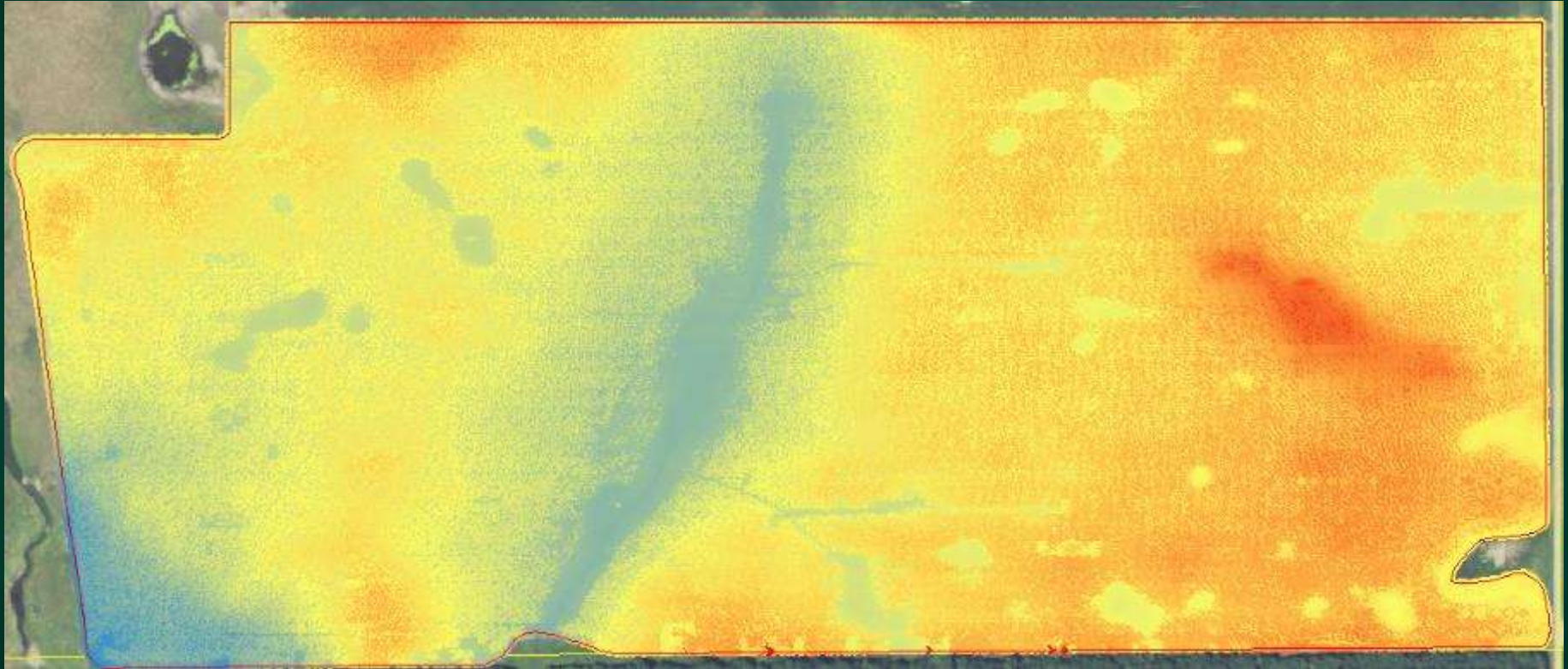
Aerial Image

ArcMAP GIS Software – Bare Earth LAS



LAS to ArcGIS Point Shapefile

ArcMAP GIS Software – Elevation Model



Meters Above Sea Level

◆ 454.72

◆ 460

◆ 465

◆ 470.01

◆ 472.81

Earth Point Townships in Google Earth



<http://www.earthpoint.us/Townships.aspx>

Summary

- Light Detection And Ranging
- Need Computer and GIS Viewer to use LiDAR
- <http://seamless.usgs.gov>
- <http://www.internationalwaterinstitute.org>
- Need GIS Software to Prepare Drainage Plan

Questions - Comments

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<http://www.ag.ndsu.edu/agmachinery>