

# LiDAR

## What do you do with all that data?



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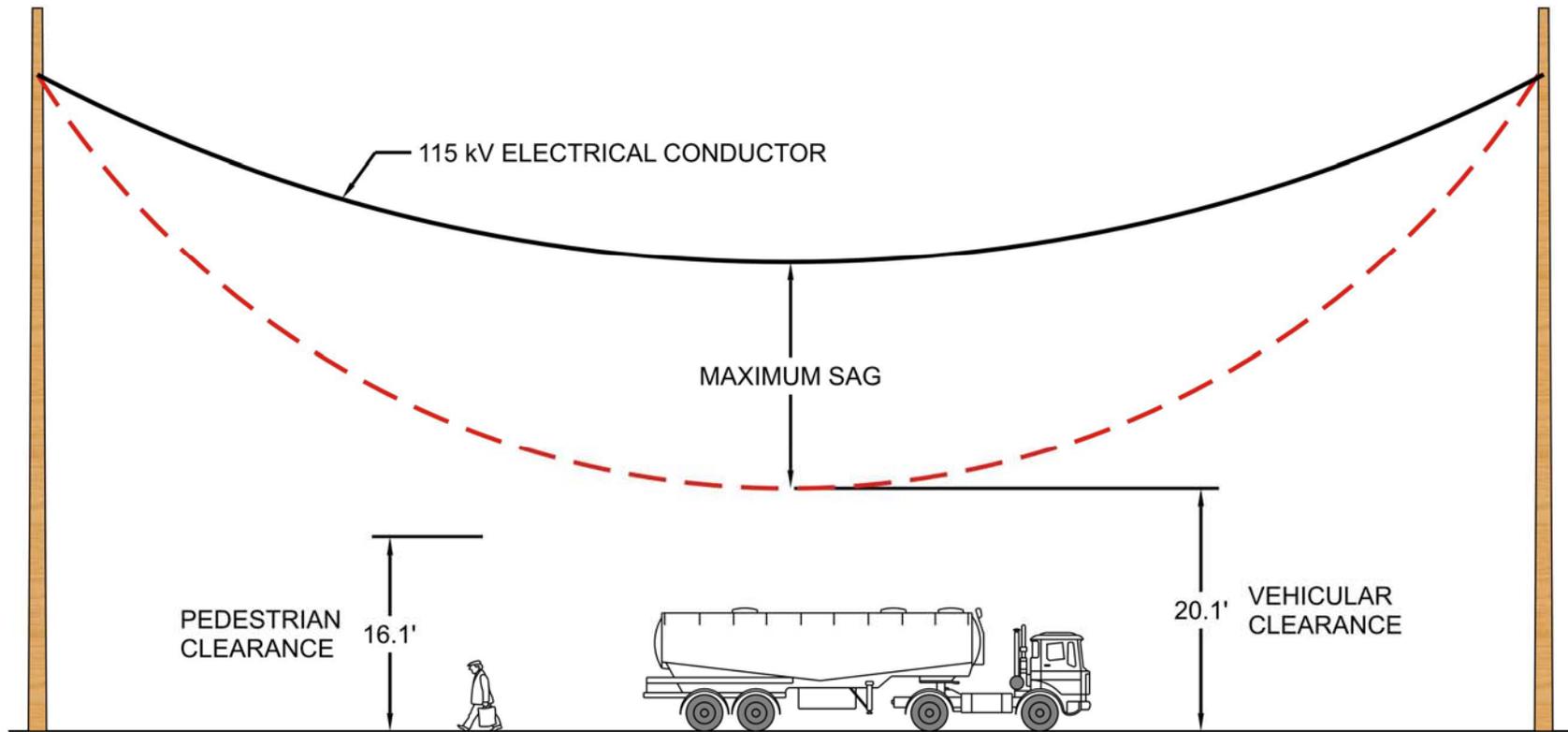
# Why Did We Decide to use LiDAR to Analyze our System

On **October 7, 2010** the North American Electric Reliability Council (NERC) released the **Facilities Ratings NERC Alert**.

“The alert recommends that entities review their current facilities rating methodology to verify that the methodology is based on actual field conditions, rather than solely on design documents, and take corrective action if necessary.”

“The Alert requires entities to develop a plan to identify and implement any necessary actions to correct their ratings and report that plan to NERC and regional entities by **Dec. 15**. There are more than 450,000 miles of transmission lines greater than 100 kV in North America, many decades old. It is understandable that there could be discrepancies between design and actual field conditions. Many of these transmission lines are in hard-to-access places. Fortunately, new technologies, such as **Light Detection and Ranging (LiDAR)** and Power Line Systems-Computer Aided Design and Drafting (PLS-CADD) allow entities to more easily assess their lines.”

# Electrical Clearances for a 115 kV Transmission Line



A total of 31 feature codes were used to classify the LiDAR data, and each was assigned a clearance value.

# Scope of Project

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Data Collection and Vegetation Management of a 600' swath of the VELCO Transmission System (585 Circuit Miles).

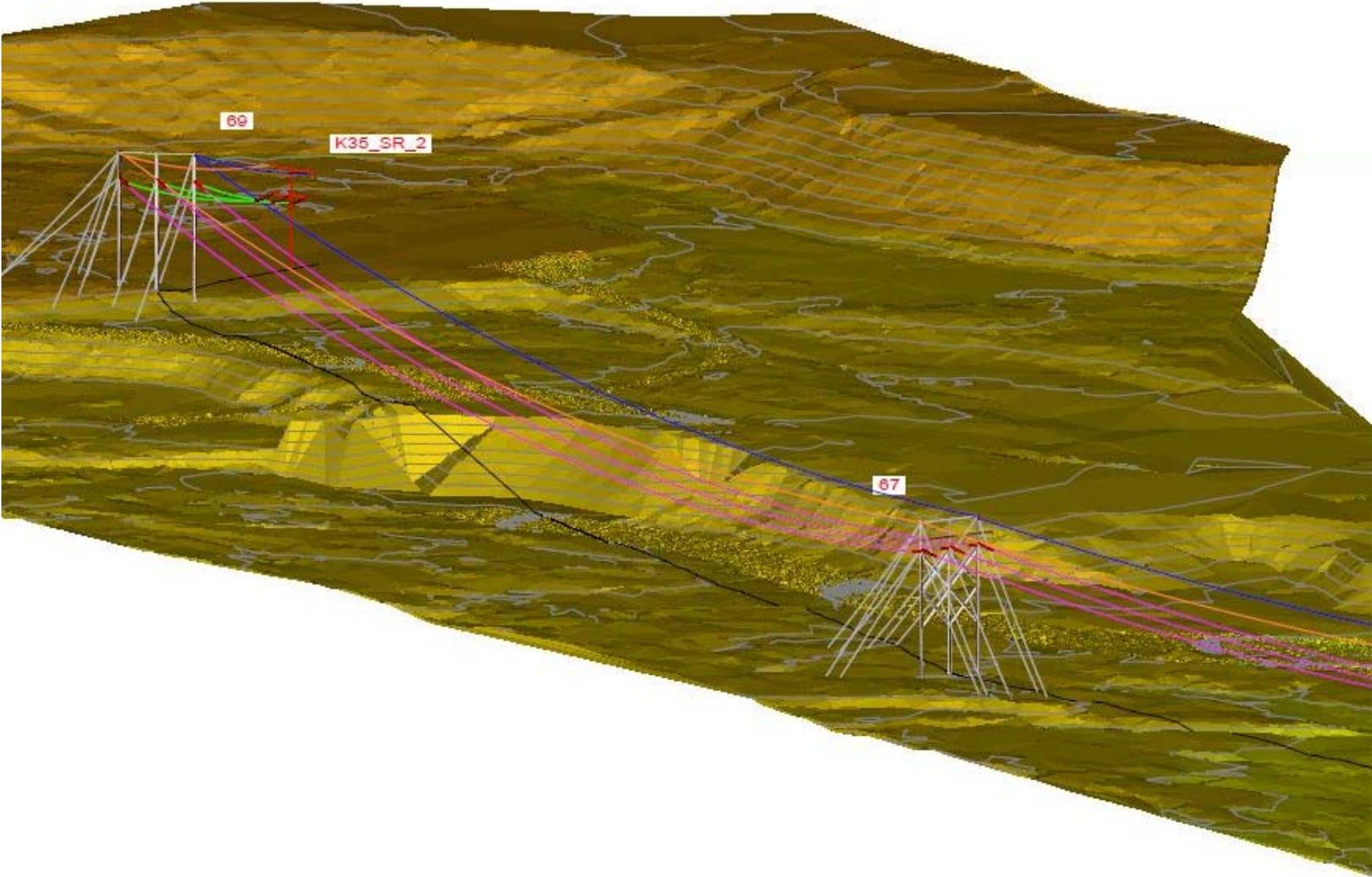
## Deliverables:

- [PLS-CADD Line Models](#)
- RGB Ortho-Rectified Imagery
- Vegetation Clearance Report
- Survey Point Clearance Reports
- GIS Data, including:
  - Infrastructure Geodatabase
  - Vegetation Polygons
  - Vegetation and Infrastructure Interactions

## Schedule:

- Data Collection:  
10-30-2010 through 11-13-2010
- Data Delivery Complete:  
1-21-2011

# PLS CAD Example



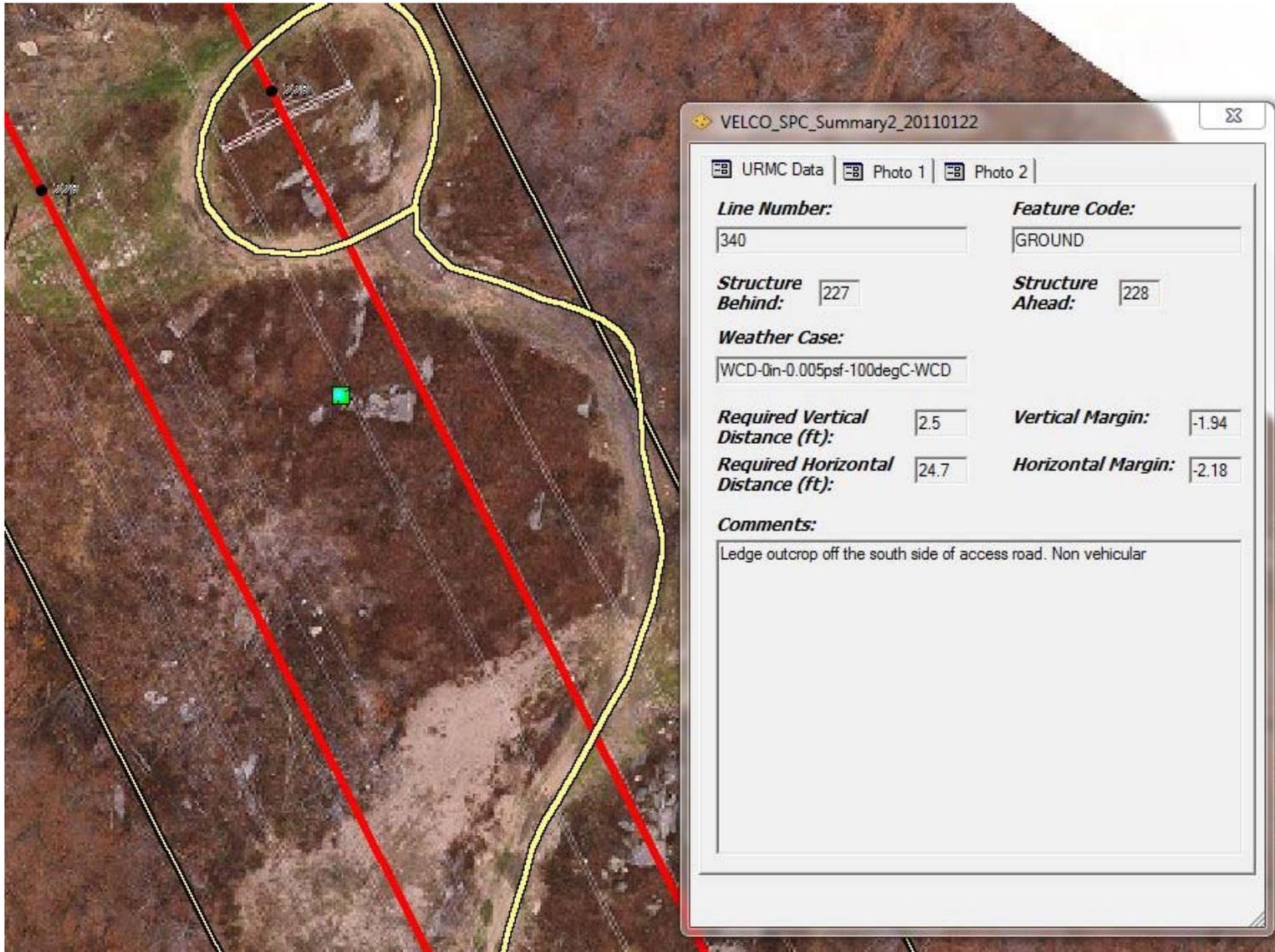
# Data Delivery and Analysis

- **51 PLS CADD Models**
- **794 Point Cloud Files**
- **468 Clearance Points of Interest**
- **5,107,204 Vegetation Interaction Polygons**
- **1,909 Color Ortho-Rectified Images**
- **57.2 Gigabytes of data**

**The Asset Maintenance and Vegetation Management group were responsible for validating the clearance points and vegetation interactions.**

**A custom ArcPad application was used by both groups to field verify and document their findings.**

# Data Validation: Asset Maintenance



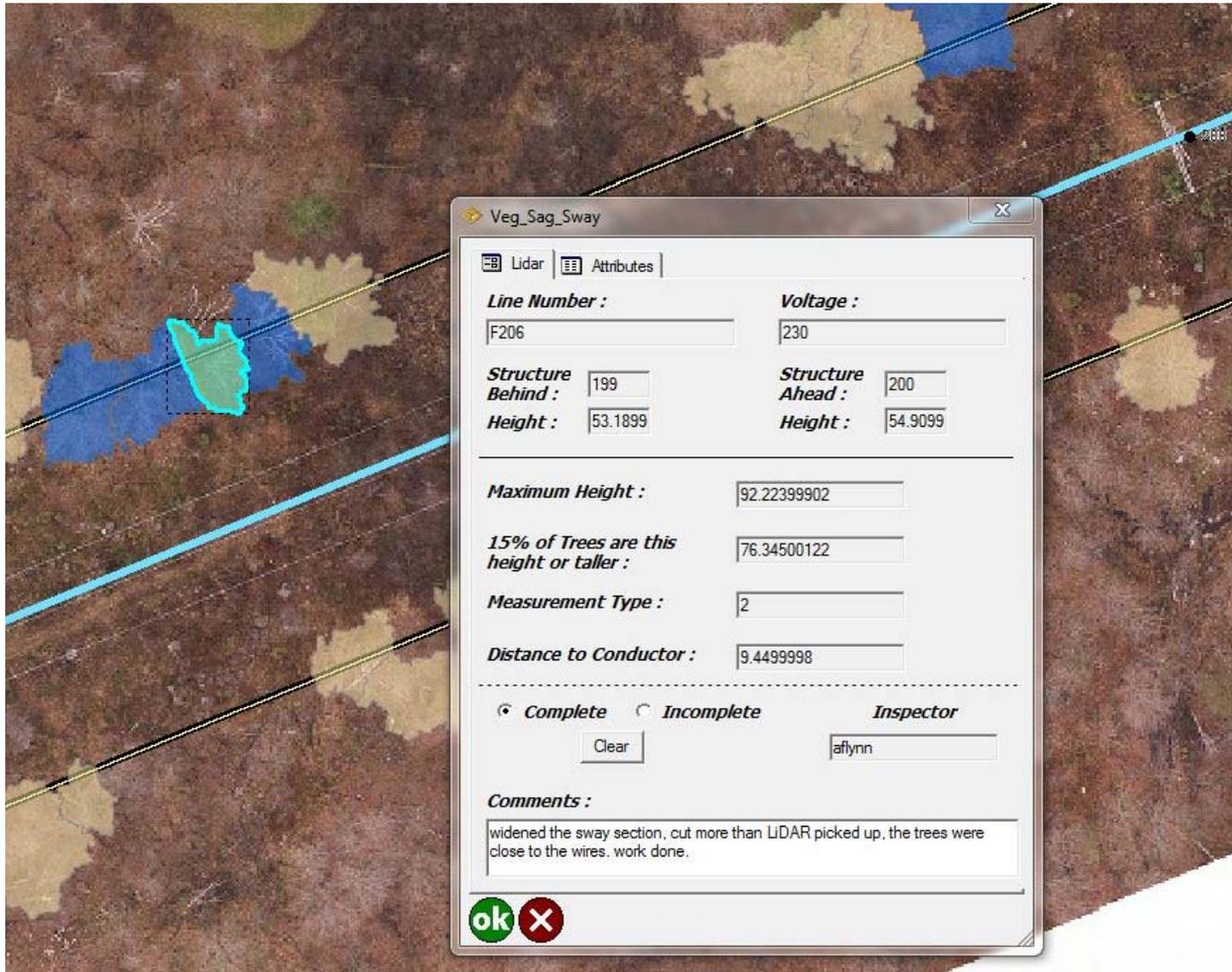
VELCO\_SPC\_Summary2\_20110122

URMC Data | Photo 1 | Photo 2

<b>Line Number:</b>	340	<b>Feature Code:</b>	GROUND
<b>Structure Behind:</b>	227	<b>Structure Ahead:</b>	228
<b>Weather Case:</b>	WCD-0in-0.005psf-100degC-WCD		
<b>Required Vertical Distance (ft):</b>	2.5	<b>Vertical Margin:</b>	-1.94
<b>Required Horizontal Distance (ft):</b>	24.7	<b>Horizontal Margin:</b>	-2.18

**Comments:**  
Ledge outcrop off the south side of access road. Non vehicular

# Data Validation: Vegetation Maintenance



# Clearance Point Examples: Man made



# Clearance Point Examples: Agriculture

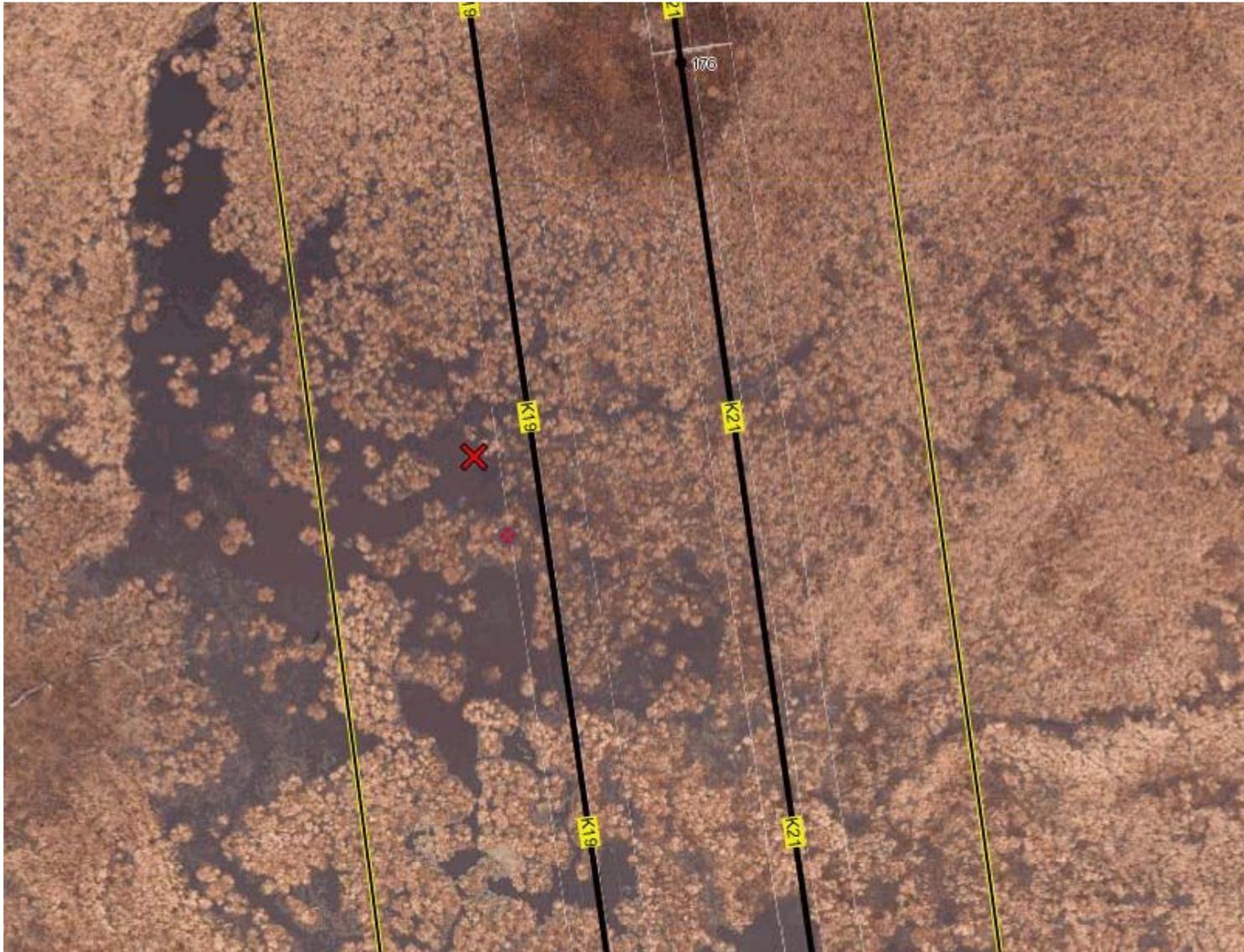


# Clearance Point Examples: Invasive Species



- **Misclassification of LiDAR Ground Points**
  - **Conductor Buffer Widths**
  - **Misinterpretation of Data**
  - **Software Limitations**
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- **Resetting the conductor buffer widths to 2.5' reduced the total clearance points by 8.4%**
  - **Of the lines reviewed in 2011, 15% of the vehicular clearance points were reclassified to pedestrian.**

# Misclassification Examples: Navigable Waterways



# Misclassification Examples: Vehicular



# Misinterpretation Example: Danger Trees



# What are we doing in 2012 and beyond?

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- **Sections of a 115 kV transmission line in Northern Vermont are being rebuilt to eliminate clearance issues.**
- **The asset management group will continue field verification and mitigation of clearance issues on more lines.**
- **The vegetation management group is using the vegetation interaction polygons to help improve their inventory work.**
- **More LiDAR work may be done to assess our vegetation management practices.**
- **Having the high resolution imagery gives us a good snapshot in time to deal with future right of way encroachments.**

Please feel free to contact me

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