

Unmanned Aircraft Systems (UAS) – Bridge Inspection Implementation

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EDC-5 UAS

2018

Overview

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senseFly albris
\$35k...now \$15k

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Flyability Elios
\$35k

- Confined Space

Items to Address

-

ments, steep slopes, piers in traffic
ly assessed

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ction vehicles, ladders, lifts, rope access (LIMITED
rements

-

- SCOPE CREEP

System Bridge Age



<http://www.dot.state.mn.us/aero/drones/index.html>

Solution – Project GOALS

1. **Program Implementation**– based on the MnDOT's and all previous research completed since
2. **Output**– report generated by parameters set in factors
3. **Requirements**– required by MnDOT Aeronautics
4. **Funding**– Federal, State, Local, etc.

type to serve as model for all other agencies governed by the MnDOT Bridge Office Inspection Unit

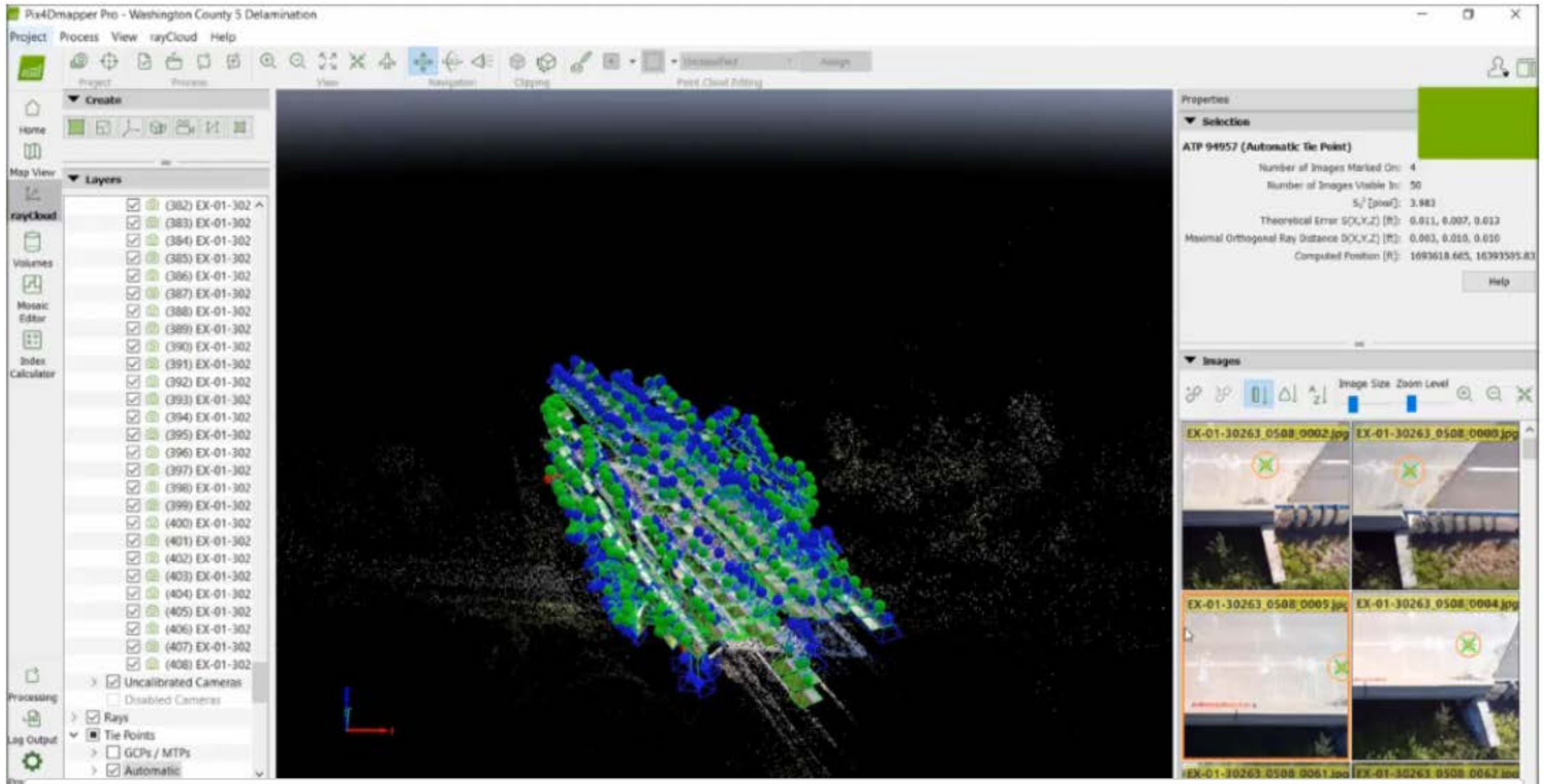
Benefits

- **Improve Quality of Bridge Inspection Data – ACCESS**
- **Improve Data Quality**
 - Point clouds
 - Maps & Orthoplanes
 - 3D Models/CAD
 - Virtual Reality
 - Web Sharing & Mobile Devices
- **Improve Bridge Inspection Safety – Minimal Work Zones**
- **Reduce Traffic Impacts**
- **Reduce Costs:**
 - Time
 - Staffing – two drone personnel, minimal to no work zone staff
 - Equipment

3D Model



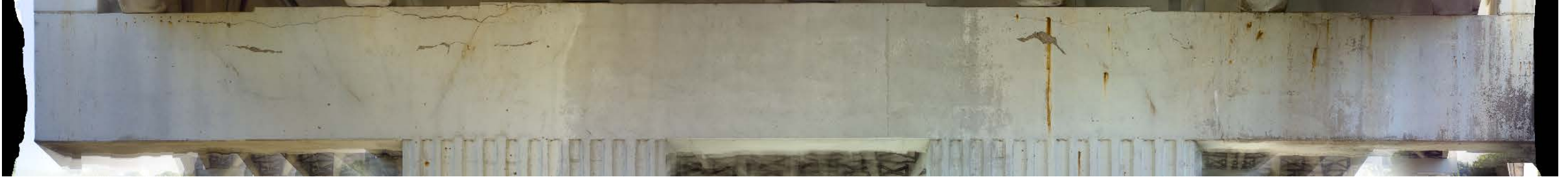
3D Photo Log



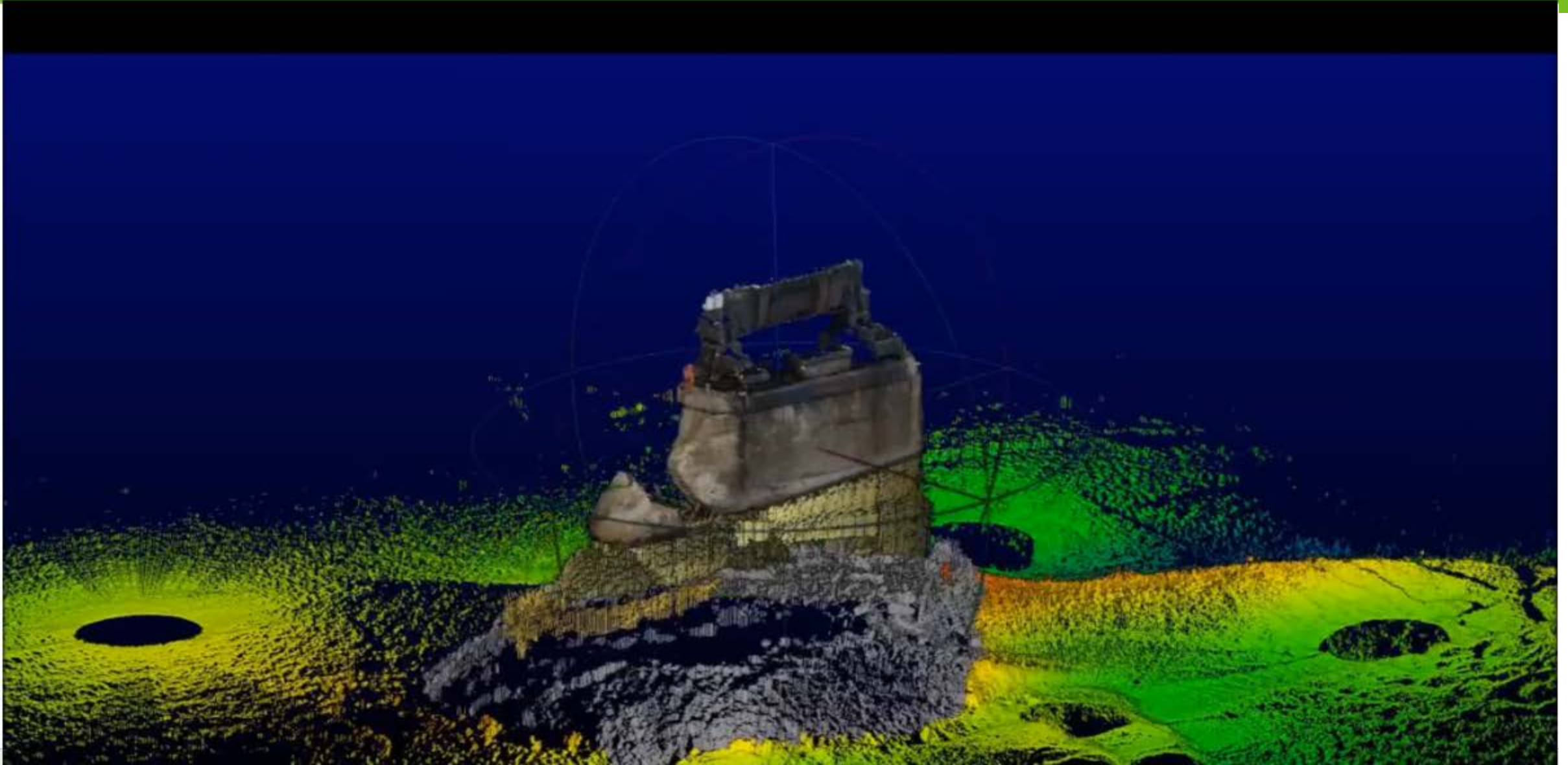
Pier Modeling

The screenshot displays the InspectAR web application interface. At the top, a green header bar contains a menu icon, the title "Dunwoody Pier 37", and "DOWNLOAD" and "SHARE" buttons. Below the header, the left sidebar shows the date and time "Feb 5, 2018 9:43 AM", a status "Processed", and tabs for "FILES", "MAP", and "3D MODEL". Under the "Annotations" section, a list of delamination points is visible, from #1 to #10. The main area features a 3D point cloud model of a bridge pier with blue circular annotations and a red 'X' mark. A vertical toolbar on the right side of the model includes icons for navigation and measurement. On the far right, a panel titled "Inspection" shows a selected image "DSC01861.JPG" with a zoomed-in view of a concrete surface marked with a red 'X'. Below this, a button reads "SAVE INSPECTION AS ANNOTATION", followed by a message stating "We found 6 images matching the selected point of the model. They will be included in the inspection annotation." The bottom right corner has fields for "Description" and "No description".

Defect Detail



Underwater 3D Pier Modeling



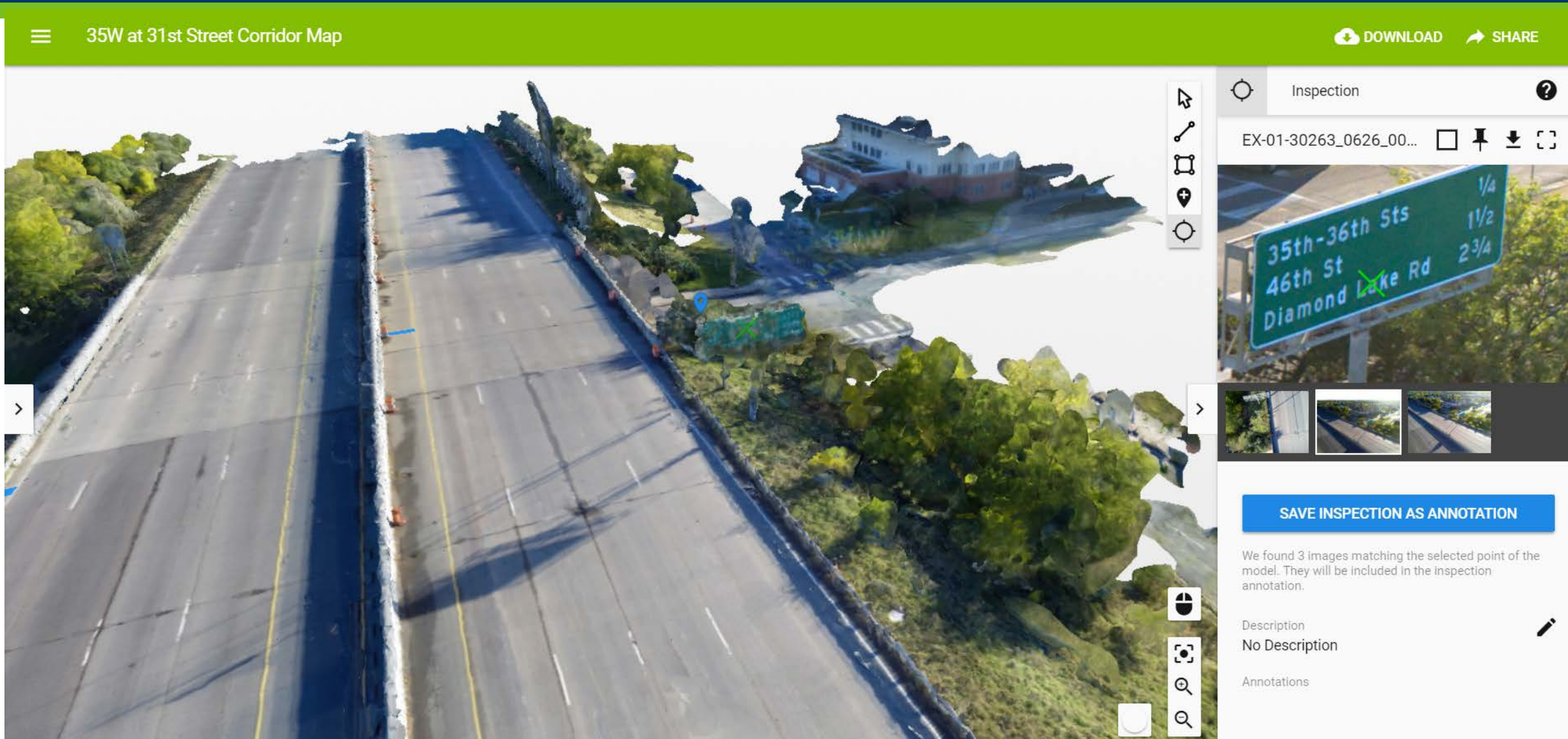
Infrared



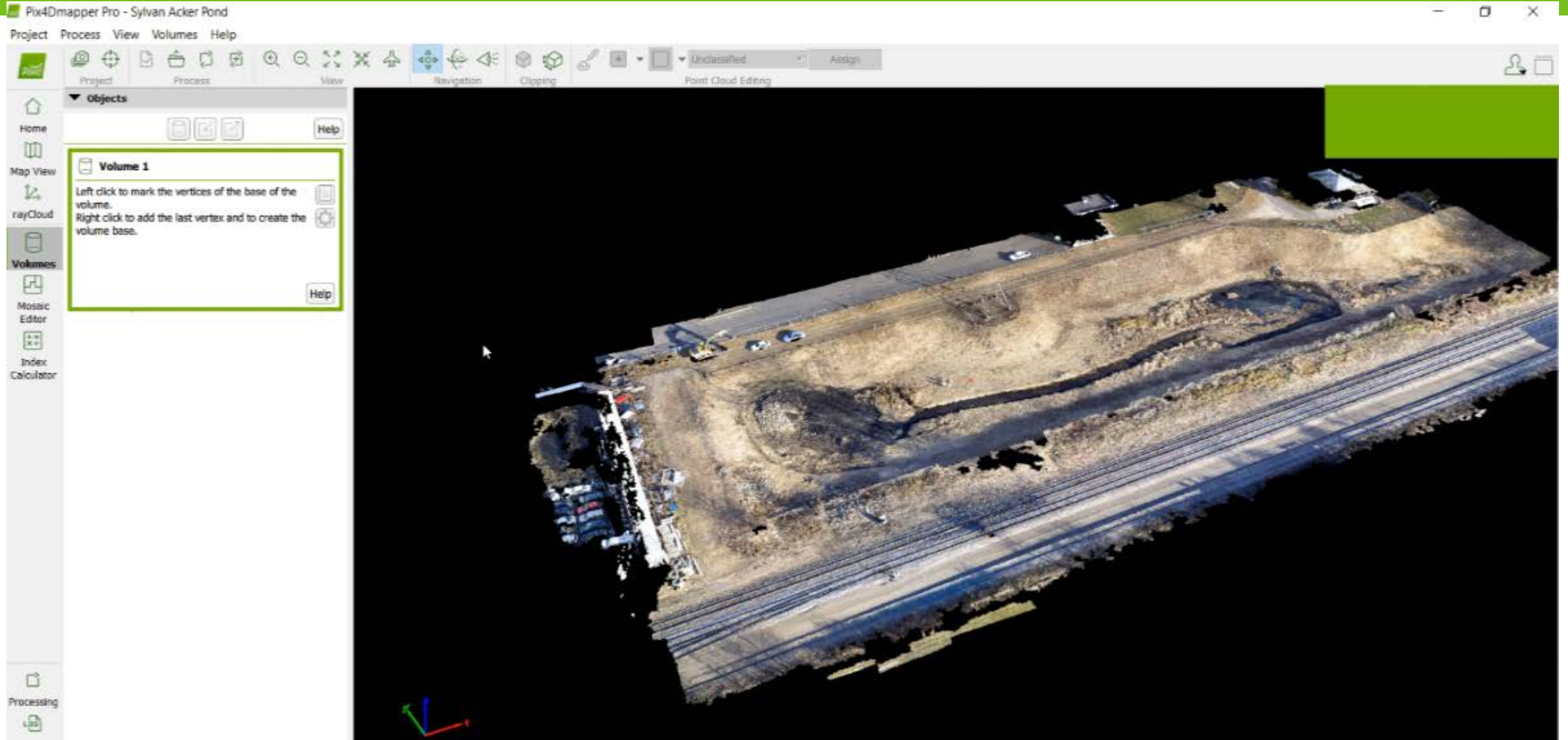
Corridor Modeling



Asset Inventory



Volume Calculations





Conclusions

- Be connected with FAA and your state Aeronautics Office.
- Know your intended purpose for the drone – “off-the-shelf” UAS has limited inspection capabilities
- Using UAS for access is important but documentation and communication of results is more compelling
- UAS can supplement inspections as a tool
- Does not need to replace entire inspection
- Collaborate with other owners to share knowledge and promote future advancement

Now What?

- FHWA EDC-5 Team
- STIC Grant
 - Aeronautics
 - Districts
 - Others (i.e. BISC)
- Software/Data
 - Pix4D (\$5k-\$10k)
- Licenses
- Field Supplies

Name	Image	Camera	Range	Time	<u>COST</u>
5. Yuneec Typhoon H		4K	1500m	25min	\$1,500
4. Autel Robotics X-Star Premium		4K	2000m	25min	\$800
3. Yuneec Tornado H920		Panasonic GH4	1500m	24min	\$2,800
2. DJI Mavic Pro		4K	7000m	27min	\$1,000
1. DJI Inspire 2		5.2K	7000m	27min	\$3,600

Questions?

UA

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