Inspector Positioning Tablets

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Who am I?

- “New-ish guy” to Engineering Automation
- BS in GIS & Remote Sensing
- Imposter!
Inspecting Digital Construction

PROBLEM:

- Less stakes to reference
- AMG is fast, hard to keep up
- Survey crew too costly, can be weeks out

ANSWER: Precision GNSS For All!

(turns out it helps for a million other things too)
How did we get here?

- Oregon DOT's path to Digital Construction Inspection
  - It didn’t happen over night
  - It wasn’t always easy
  - It isn’t finished
  - It’s worth it!
Fully Committed to 3D Design

Have delivered over 100 3D Design projects since 2014
Required on DOT and Consultant designed projects
But the Design side got ahead of the Construction Administration side...
Program Foundations

- GNSS tablet for inspectors
- Real-Time Network & standardized projections
- Training: initial, advanced, recurrent
- Support
- Feedback loops: internal & external
  - Users & Super-Users
  - Hardware
  - Software
Inspector Tablets

- Rugged Tablet with built in Hemisphere GNSS antenna
- Can be used “handheld” or a rod
- Touch screen
- Windows 10
- Cell modem
- +/- $8200
Software

- MicroSurvey FieldGenius Software
  - Easy to use
  - Intuitive touchscreen based interface
  - Connects to RTN’s
  - Import/Export options
  - Demo outside at lunch
Accuracy

- 3-5 second RTK observations (or longer)
- +/- 0.04’ horizontal & +/- 0.07 vertical
- Exact same as surveyors’ GNSS tools
Capabilities: Measurement

Seeding Area
Capabilities: Measurement

Linear features
Capabilities: Measurement

View 3D
That’s great, but how accurate is it really?

<table>
<thead>
<tr>
<th>Method</th>
<th>Collection Time</th>
<th>Analysis Time</th>
<th># of Staff</th>
<th>Volume (cu. yard)</th>
<th>% Difference from Scanner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Scanner</td>
<td>2 hours</td>
<td>2 hours</td>
<td>2</td>
<td>4079</td>
<td>-</td>
</tr>
<tr>
<td>GPS Tablet</td>
<td>40 mins.</td>
<td>5 mins.</td>
<td>1</td>
<td>4013</td>
<td>-1.6%</td>
</tr>
<tr>
<td>Stockpile Reports</td>
<td>4 mins.</td>
<td>5 hours</td>
<td>1</td>
<td>3899</td>
<td>-4.4%</td>
</tr>
</tbody>
</table>
Capabilities: Positioning

Utility Locates/As-Builts

Night Time Paving Project
Capabilities: Positioning
Capabilities: Surfaces

Design Elev: 218.35'
Elev: 211.98'
Fill To: 6.38'

Design Surface: TLC-D-KAL
What are we NOT measuring?

- Staking contractor work
- Setting control or benchmarks
- Locating/defining property lines, right of way, easements, ownership, etc.
- Locating items closer than ½” horizontally or ¾” vertically
- Disagreeing with a contractor measurement closer than a 0.10 ft
Program Development
Training

- GNSS Tablet 101 @ construction offices
- Survey Fundamentals for Construction Inspection
GNSS Tablet 101

- Outdoor classroom at every office
GNSS Tablet 101

- Outdoor classroom at every office
Survey Fundamentals for Construction Inspection

Hand levels

Leveling Road sections

100’ pacing
Support

- On-call, in-field technical and managerial support

- SUPER – USERS!!!
Feedback Loops

- **Internal:**
  - Super-users develop use cases & test processes
  - Discover bugs, problems, ask questions, etc
  - Const Offices: how can we make the whole process better?

- **External:**
  - Hardware: fixed battery terminals
  - Software: fixed JPEG related crash
The Pros – so far

- Almost 100% acceptance
- Easy to use and easy to train/support
- Inspectors CAN and will use GPS
- Tons of features – yet simple to do the basics
- Wide user base
The Cons—so far

- Initial buy in at all levels
- Backbone/supporting items (Specs)
- IT/IS Computer Support Hurdles
- Fitting new tool/process into old ‘system’
- Greater demand than anticipated
- Initial Funding of the project
Unexpected Uses

Biological Restoration Monitoring
Unexpected Uses

Wetland Mitigation
Unexpected Uses

Landslide Repair Inspection
Future Options?

- MicroSurvey about to release android version for any tablet ($ unknown)
- Emlid GNSS rover $1900

MicroSurvey
GNSS Rover
Basic Android Tablet
+ GIS Collection Apps
Ultimate field data collector
Final Advice

- Get all the BIG pieces set before you start
- Find a tool that works and you can support
- Start small – learn as you go
- Training, training, training!
- Find and leverage your super users
- Do it!
How do I get more info?

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So... we have more time?

- Shameless self-promotion
UAS Case Study: Minam Curve

● Before: Overview_Orbirt_Fall_2018.mp4

● After: Minam_June_ORBIT.mp4

● Who wants to see stuff blow up? Minam_Blasting.mp4