Use of Mobile Technology for Evaluating the Landslide and Geo-Hazards Risks on Ohio Turnpike Projects using ODOT’s Rating Matrix
Introduction

- Landslides cause public risk, from 25 to 50 deaths annually
- Impact on economy, up to $2 billion in damages annually
- Limited fund in fixing highway slope failure
- Demand of an effective resource and asset management
# Study background

<table>
<thead>
<tr>
<th>Rating/Management System</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOT Rockfall Hazard Rating System (RHRS)</td>
<td>1993</td>
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<tr>
<td>ODOT Landslide Rating System</td>
<td>2007</td>
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<tr>
<td>WSDOT Unstable Slope Management System</td>
<td>1991</td>
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<tr>
<td>NYSDOT Rock Slope Rating System</td>
<td>1988</td>
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<tr>
<td>NYSDOT Rock Slope Rating System</td>
<td>1992</td>
</tr>
<tr>
<td>UDOT Rockfall Hazard Inventory</td>
<td>2002</td>
</tr>
<tr>
<td>GIS Landslide Inventory Along Tennessee Highway</td>
<td>2000</td>
</tr>
<tr>
<td>INDOT Landslide Remediation Using Unconventional Methods</td>
<td>1999</td>
</tr>
</tbody>
</table>
Ohio Hazard Rating System

- Developed based on synthesis of ODOT in-house expertise and the existing systems of the other agencies.

- Based on an exponential scale system to heighten the severity of risk for each risk factor.

- Scores of 3, 9, 27, and 81 are assigned to four rating criteria for each risk factor.

Final hazard is a summation of the scores of six risk factors:

- > 250: high hazard
- 150 < < 250: moderate hazard
- < 150: low hazard
Composite Numerical Hazard Score

[Diagram showing the composite numerical hazard score with factors such as Accident History, Movement Location/impact, Decision Sight Distance (DSD), Hazard to Traveling Public, Average Daily Traffic (ADT), Maintenance.]
<table>
<thead>
<tr>
<th>Hazard Rating Matrix Category</th>
<th>Points 3</th>
<th>Points 9</th>
<th>Points 27</th>
<th>Points 81</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Movement location/Impact</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on roadway</td>
<td>Low hazard on shoulder</td>
<td>Low hazard on roadway</td>
<td>Medium hazard on roadway</td>
<td>High hazard on roadway/structure</td>
</tr>
<tr>
<td>Impact on area beyond right of way</td>
<td>Low hazard on area beyond right of way</td>
<td>Moderate hazard on area beyond right of way</td>
<td>High hazard on area beyond right of way</td>
<td>High hazard on area beyond right of way/structure</td>
</tr>
<tr>
<td><strong>Hazard to traveling public</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of displacement</td>
<td>&lt; 1 in/year</td>
<td>1-3 in/year, No single event &gt; 1 in</td>
<td>3-6 in/year, No single event &gt; 3 in</td>
<td>6 in/year, No single event &gt; 3 in</td>
</tr>
<tr>
<td>Evidence of displacement</td>
<td>Visible crack or dip</td>
<td>&lt;1 in of displacement</td>
<td>1-3 in of displacement</td>
<td>&gt;3 in of displacement</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>None to rare</td>
<td>Once a year</td>
<td>1-3 time/ year</td>
<td>&gt; 3 time/ year</td>
</tr>
<tr>
<td>Response</td>
<td>No response</td>
<td>Periodic maintenance</td>
<td>Routine maintenance</td>
<td>Immediate maintenance</td>
</tr>
<tr>
<td><strong>ADT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 2000</td>
<td>2001 - 5000</td>
<td>5001 - 15000</td>
<td>&gt; 15001</td>
<td></td>
</tr>
<tr>
<td>Decision sight distance (DSD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 90</td>
<td>89 &lt; &lt; 50</td>
<td>49 &lt; &lt; 35</td>
<td>&lt; 34</td>
<td></td>
</tr>
<tr>
<td><strong>Accident history</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No accident</td>
<td>Vehicle or property damage</td>
<td>Injury</td>
<td>Fatality</td>
<td></td>
</tr>
</tbody>
</table>
Use of iiCollector™ for Landslide and Geo-Hazard Rating Matrix
ProjectGrid.com® iiCollector™
Collaboration of Rii and Google Maps, API

ProjectGrid.com Web Based Solutions

- An Award winning web-based solution for project and program management
- Winner of Gold Software Enabler Award, Gold Technology Award & IRF Global Road Achievement Award

iiCollector™ Mobile / Wearable Devices

- Creates interactive maps and embodies the functionality of Google maps into ProjectGrid.com website and the mobile asset manager

Google Maps, API

Google
Real Time Communication using Innovative Technology

Google Maps help to integrate field and office documentation
The iiCollector™ has Everything you Need for Data Collection

- Intelligent integration of field and office documents
- Real-time access to specifications and data as it is collected in the field
- Interpretive software that analyzes and prioritizes data
- Ability to integrate GIS data with other asset management systems
- Real-time communication, sharing and data review among the project team
iiCollector™ for Transportation
Available Maintenance Categories

**Roadside Features Module 1**
- Pavements (Deterioration, Drop off and Obstruction)
- Guardrails, Impact Attenuator and End Assembly
- Drainage (Ditches and Drainage Pipes)
- Planted Surface
- Unpaved Shoulder
- Median
- Pavement Surface Cleanliness
- Vegetation Obstruction
- Traffic (Signs and Pavement Markings)
- Landslide (Geohazards)

**Infrastructure Structural Assets, Module 2**
- Structure (MSD walls, Noise walls, Barrier walls and Fences)*
- Rest Area (Plazas, Parking Lots)*
- Assets (Sidewalks, ADA Ramps, Curb and Gutters)
- Traffic (Overhead Signs and Traffic Control Device)
- Light Poles
- Culverts
- Bridge Structures

* Available for single asset or multiple assets
** Customizable
An Intelligent Integration of Office & Field

- Asset inspection
- Data condition collection
- Data analysis and reports
- Real-time access to relevant operational manuals, standards, specifications
  - Geo-hazard rating matrix, ASTM, DOTs, City, AASHTO, etc.
- Reports the status of maintenance and project management
- Available for a single asset or multiple assets
- Creates documents and reports
- Self audit, feedback and compliance reports

Landslides, Asset ID 1706452
Rii performed a visual evaluation and rating of more than 40 embankment failure locations along the Ohio Turnpike using the iiCollector.
Project Demonstration

www.projectgrid.com
iiCollector™ for Wearable Devices

• Rii’s Information Technology Team is working to develop the iiCollector™ on wearable devices to collect data more quickly and efficiently.
What Others Are Saying

“This sounds like a great app, and something that [we] have looked favorably upon.”

– Kathleen Bergeron, APR
USDOT, Federal Highway Administration

“In essence, the technology is playing a strong role in eliminating the lag time between when information is discovered and reported.”

– ConstrucTech Magazine
July 2013

“This technology promotes a paperless environment, significantly increases efficiency, and saves time and money with fewer communication bottlenecks, thus ensuring projects are completed on time and within budget.”

– Construction Executive Tech Trends Magazine, April 2014

iiCollector Video
Thank You

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