



Technology Efforts Related to Asset Management Integration

Presented to the Institute of Navigation GNSS 2011 Conference

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Short History

- Previous focus of Asset Management predominantly:
 - Pavements and bridges
 - Safety and congestion
- Location methods:
 - Local landmarks and odometers
 - Linear referencing system
 - Routes and mile post markers



About Five Years Ago

- ODOT efforts building for more robust Asset Management
 - Steering committees in place
 - Strategic and implementation plans
 - Pilot project



2006 Pilot Revealed

- ODOT had a significant lack of reliable transportation infrastructure data
- Staff collected a lot of data, but typically for single use
- New thinking and approach could reinvent these processes



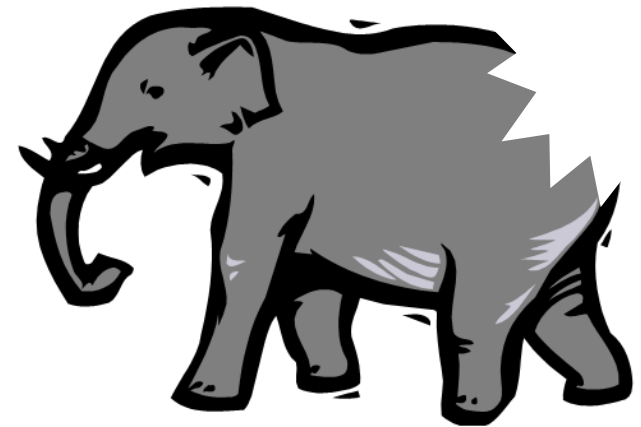
Search for Best Practices

- Research
- Trying it ourselves via 2006 pilot
- Web-based tool for accessible, integrated data
- New programs use data for decisions



The "Elephant" – one bite at a time

Asset	Asset	Basic Inventory Information				Details				Financial Information			Performance & Goals		Forecast/Planning Information			
		Type / Location	First Level Inventory Detail	Appropriate Installation Date	Regular Update Cycle	Tied to Maintenance	P.D. & Const.	Original or Replacement Cost	Maintenance Investment	Depreciation Rate	Performance Measures	Diagnostics & Targets	Service Levels, Standards	Deterioration Rate	Full Condition Assessment Program	Inspection Date	Decommission Date	
Priority Features	Bridges - General	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	
	Retaining Walls	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Drainage Structures - Culverts	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Pavements - General	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	
	Approaches	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Roadside - Right of Way	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Barriers	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Aggregate Sites	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	
	Special Features - Wetlands Mitigation	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Traffic - All but single structure, sign posts & signs	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
Sound Barriers	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow		
Non-Priority Features	Storm Water Control Facilities - Bikes	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	BikePed Facilities - Paths	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Signs	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Traffic Signals & Signs	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Illumination	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	ITS Sites	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	
	Rumblestrips	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Pavement Markings	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Utility Lines	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
	Slopes, etc. - Rock Mitigation	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
Performance & Diagnostic Information	Crash Rates	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	
	Seismic Lifetime Performance	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Freight Routes	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Geometry	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Traffic Volume	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
Future Needs or Conditions	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red		



Get to "Green"

Staged process to build capacity

Working across and down based on resources and priority



Progress!

Asset	Statewide data available in 2005?	Statewide data available now?	Included in 1R Roadside Inventory
Bridges	X	X	X
Tunnels		X	
ITS	X	X	
Pavement	X	X	
Right of Way	X	X	
Signs		X	X
Traffic Barriers		X	X
Sidewalks		X	X
ADA Ramps		X	X
Bike Facilities		X	X
Culverts 6ft and over	<i>NBI</i>	<i>in progress</i>	X
Culverts under 6ft		<i>in progress</i>	X
WIM Sites		X	
Sound Barriers		X	
Wetland Mitigation Sites		X	
Material Sources		X	
Signals and Beacons	<i>Tri-color only</i>	<i>Tri-color only</i>	
Retaining Walls		<i>in progress</i>	
Unstable Slopes		<i>in progress</i>	
Approaches		<i>in progress</i>	
Major Traffic Support		<i>just starting</i>	
Storm Water Facilities		<i>just starting</i>	
Illumination			

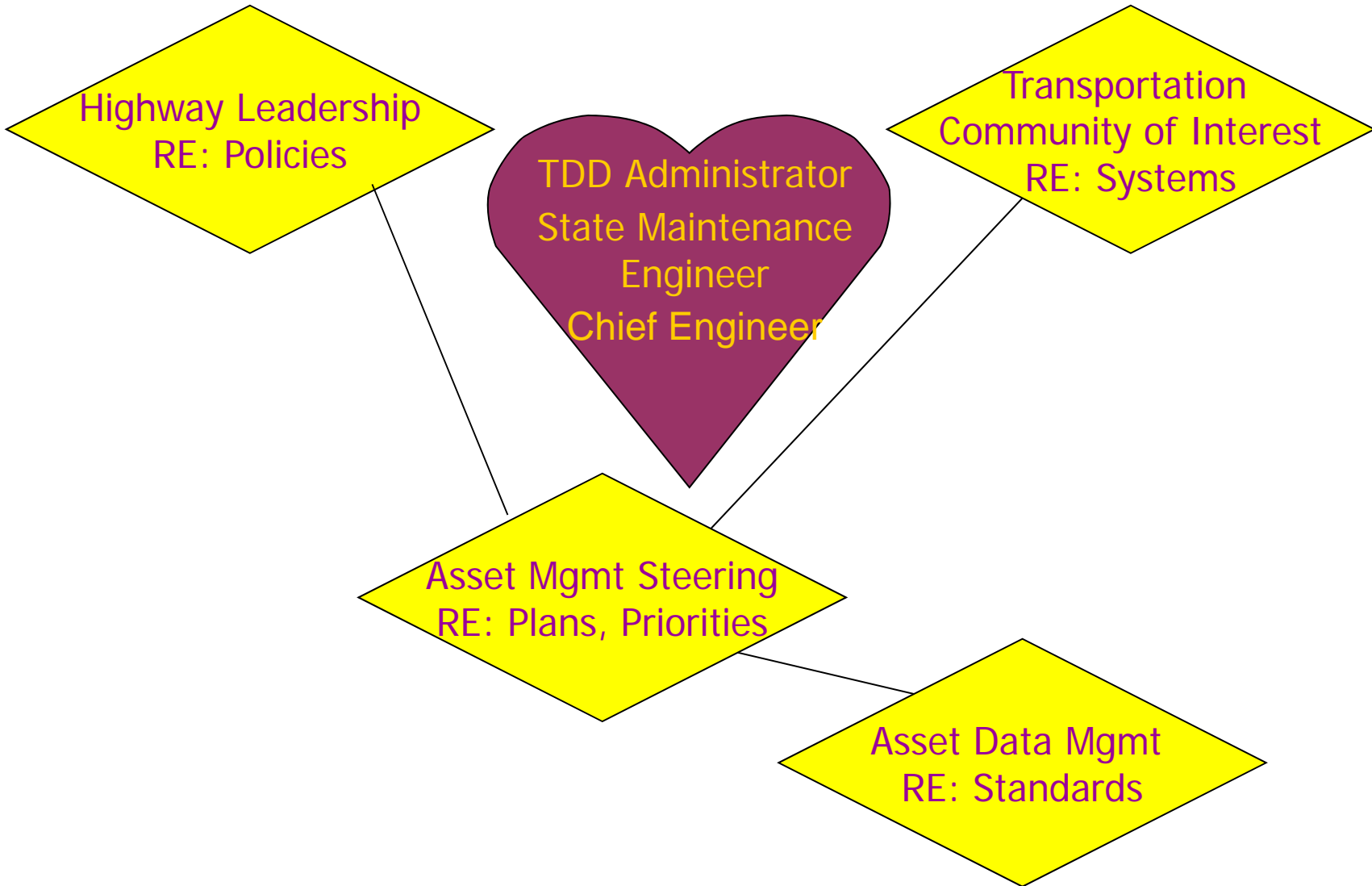


Location, Location, Location

- Management of transportation infrastructure beyond pavements and bridges requires:
 - Reliable locations for reliable integration
 - Degree of reliability is next question



Governance Structure





Some Things We're Doing/Trying

- FACS-STIP Tool (2009)
- Mobile GPS Applications (2010)
- *earthmine* Pilot (2010)
- Field Data Collection Unit Pilot (2011)
- Custom-built Field Data Collection Application (June 2011)
- Purchase of Mobile Scanner (June 2011)



FACS-STIP Tool

ODOT Tools



X: -123.0599 | Y: 44.9545

ODOT © 2009



FACS-STIP Tool

Data2Go

1. Click Map for Start Milepoint
 Start Milepoint:
 Highway Number:
 Roadway Id:

2. (Optional) Click Map for End Milepoint
 End Milepoint:
 Highway Number:
 Roadway Id:

3. Select Buffer Distance:

4. Select Asset Filter:
 Include all assets
 Include known unsatisfactory assets



X: -123.0523 | Y: 44.9523

ODOT © 2009

FACS-Data To Go

- View Asset Reports**
- ADA Ramps [View](#) [Export](#)
 - Approaches [View](#) [Export](#)
 - Bicycle Facilities [View](#) [Export](#)
 - Bicycle Facility Needs [View](#) [Export](#)
 - Bridges [View](#) [Export](#)
 - Culverts [View](#) [Export](#)
 - Culverts-District [View](#) [Export](#)
 - Culverts-MS4 Permits [View](#) [Export](#)
 - Fish Passage-ODFW [View](#) [Export](#)
 - Fish Passage-DSL [View](#) [Export](#)
 - Intel. Trans. Sys. (ITS) [View](#) [Export](#)
 - Pavement [View](#) [Export](#)
 - Retaining Walls [View](#) [Export](#)
 - Safety-Crashes [View](#) [Export](#)
 - Safety-SIP [View](#) [Export](#)
 - Safety-SPIS [View](#) [Export](#)
 - Safety-Crash Rates '08 [View](#) [Export](#)
 - Sidewalks [View](#) [Export](#)
 - Sidewalk-Needs [View](#) [Export](#)

Reports Generated Use the Following Criteria:

Start Milepoint: 0.76
 End Milepoint: 11.28
 Highway Name: ALBANY-CORVALLIS (031)
 Highway Suffix: 00
 Roadway Number: 1
 Buffer Distance: 0.1
 Asset Filter Type: All Assets

Traffic-AADT (aadt_state)

Records Returned: 25

Highway Number	Highway Suffix Code	Roadway ID	Milepoint	Begin Milepoint	End Milepoint
031	00	1	2.2	1.32	2.21
031	00	1	2.45	2.21	2.92
031	00	1	5.61	2.92	5.63
031	00	1	6.4	5.63	6.4
031	00	1	8.52	6.4	8.52
031	00	1	9.09	8.52	9.47
031	00	1	9.89	9.47	9.97
031	00	1	9.98	9.97	10.28
031	00	1	10.43	10.28	10.56
031	00	2	10.44	10.28	10.57



Data Available

Data2Go Tool

- ADA Ramps
- Approaches
- Auto Traffic Recorder Sites
- Bike Facilities
- Bridges
- Culverts
- Fish Passage
- ITS Sites
- Pavement
- Place to Record Special Problems
- Retaining Walls
- Safety (Crashes, SPIS, SIP)
- Sidewalks
- Traffic (Volume - Posted Speed)
- Traffic Barriers
- Traffic Signals
- Traffic Support (Signs)
- Tunnels
- Unstable Slopes
- Weight in Motion Sites

Map Tool

- Aggregate Sites
- Bridge and Culvert Locations
- Bridge, Pavement, and Safety Project Lists
- Counties and Cities
- Crash Rates
- Number of Lanes, Right & Left Shoulder
- Pavement Conditions
- PLSS (Township/Range/Section)
- Regions and Districts
- Signed Routes & Road Networks
- SIP 2005-2007
- STIP 2008-2011
- Traffic Flow
- Traffic Projections



Mobile GPS Field Applications

- Asset Data Management Committee
 - Determined ArcPad to be the ODOT application platform of choice
 - Field Applications
 - Draft Applications



Signs Juno Pilot

Working with sign maintenance staff:

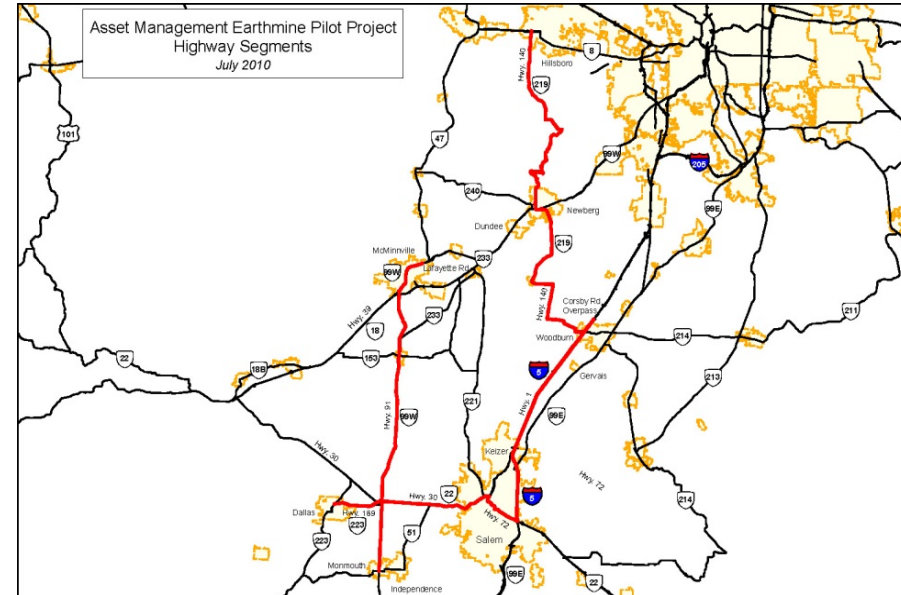
- Building on efforts for consistent statewide enterprise sign data to
 - Test utility of a more affordable mobile GPS unit while:
 - Adhering to ODOT approved standards, procedures, and equipment
 - Allowing collection of reliable, cost effective, accurate data
 - Custom data entry forms streamline field data collection
 - Building capacity to automate data updates
 - Manual entry right now





earthmine Pilot

- Kick off September 2010
- Mobile Interactive Mapping System
- Scope of project approximately 100 centerline miles
- Able to “tag” assets





earthmine Assets Tagged

- ADA Ramps
- Approaches
- Bike Facilities
- Illumination Installation
- Retaining Walls
- Roadbed Centerline
- Roadbed Edge of Pavement
- Sidewalks
- Traffic Signal Installation
- Sign Installation
- Special Problems
- Traffic Barriers
- Traffic Structures
- Roadbed Fog Line



- Table Of Contents
- Layers
 - ADA_Ramps
 - Approaches
 - Illumination_I
 - Retaining_Wa
 - Roadbed_Ce
 - Roadbed_Ed
 - Roadbed_Fo
 - Sign_Installat
 - Signals
 - Special_Probl
 - Bike_Facilities
 - Sidewalks
 - Traffic_Signa
 - Traffic_Barrie
 - Traffic_Struc
 - Supporting D
 - highway_
 - Signed R
 - State Hig

Create Features

<Search>

Traffic_Barriers

— Traffic_Barriers

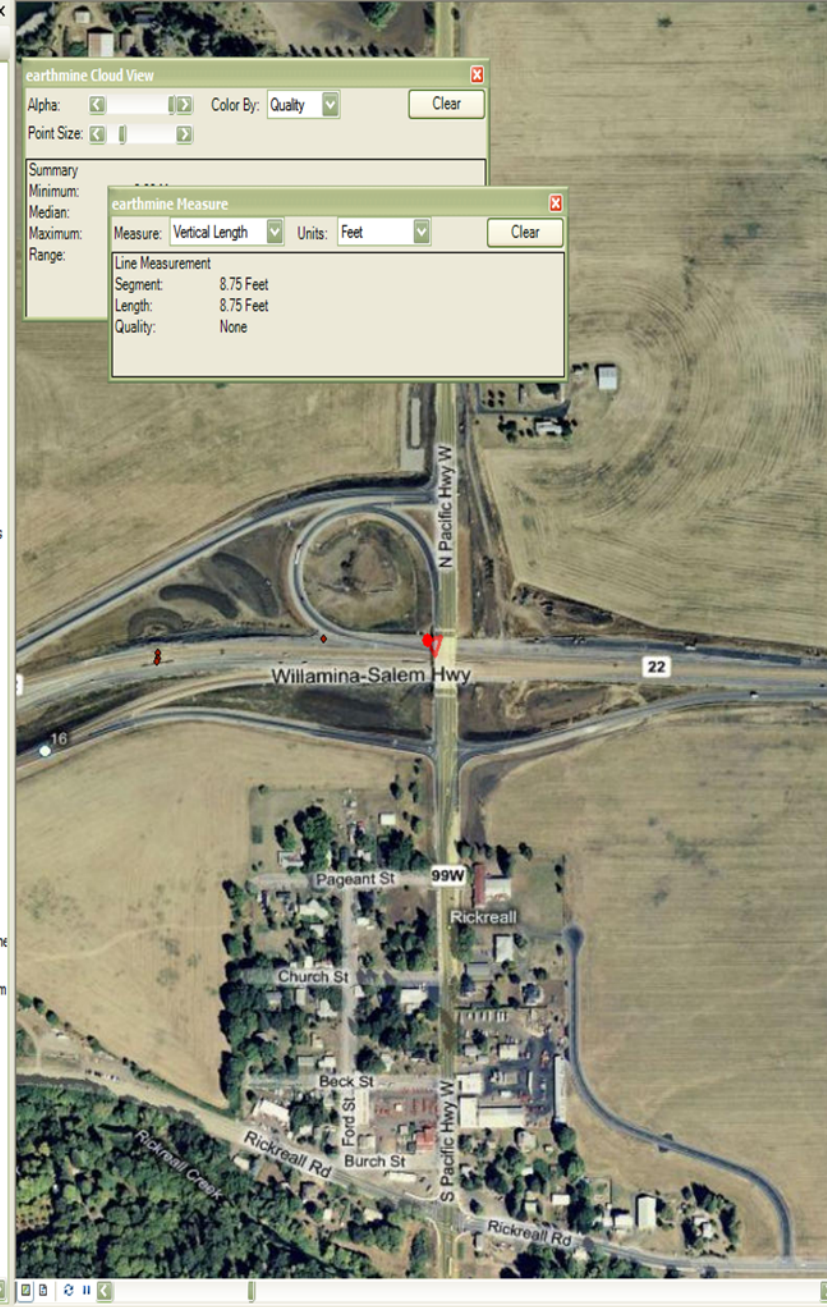
Construction Tools

Select a template.

Height	L
Phys_Cond	Good
Side_Road	Right
Beg_Terminal_Type	Blunt A
End_Terminal_Type	Blunt A
DataSource	Earthmine
OBJECTID	0.00000

OBJECTID
Object ID
Null values not allowed

- Layers
 - ADA_Ramps
 - Approaches
 - Illumination_Installations
 - Retaining_Walls
 - Roadbed_Centerline
 - Roadbed_EdgePavement
 - Roadbed_Fogline
 - Sign_Installations
 - Special_Problems
 - Traffic_Signal_Installations
 - Traffic_Structures
 - Bike_Facilities
 - Sidewalks
 - Traffic_Barriers
 - highway_hundredths
 - Signed_Routes
 - Route Type
 - Interstate
 - U.S. Routes
 - Oregon Routes
 - ODOT.ODOTEDITOR.hwyne
 - ODOT.ODOTEDITOR.citylim
 - Basemap
 - Bing Maps Hybrid



earthmine Cloud View

Alpha: [Slider] Color By: Quality [Dropdown] Clear

Point Size: [Slider]

Summary

Minimum: [Slider]
Median: [Slider]
Maximum: [Slider]
Range: [Slider]

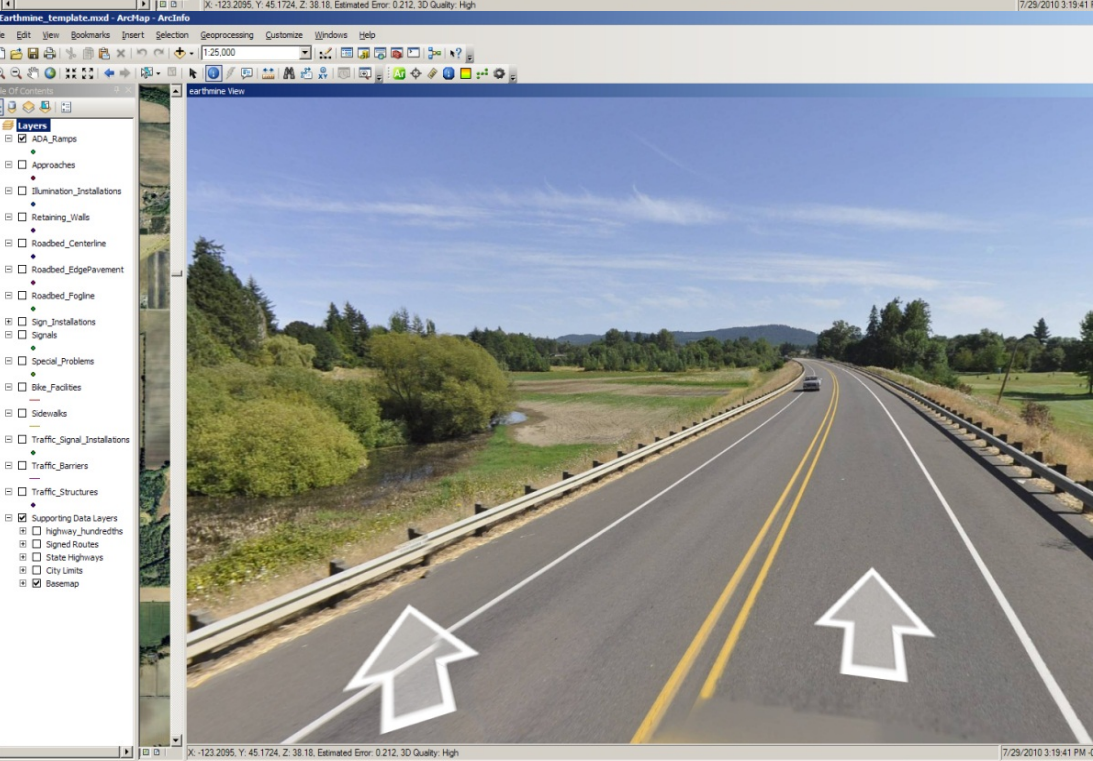
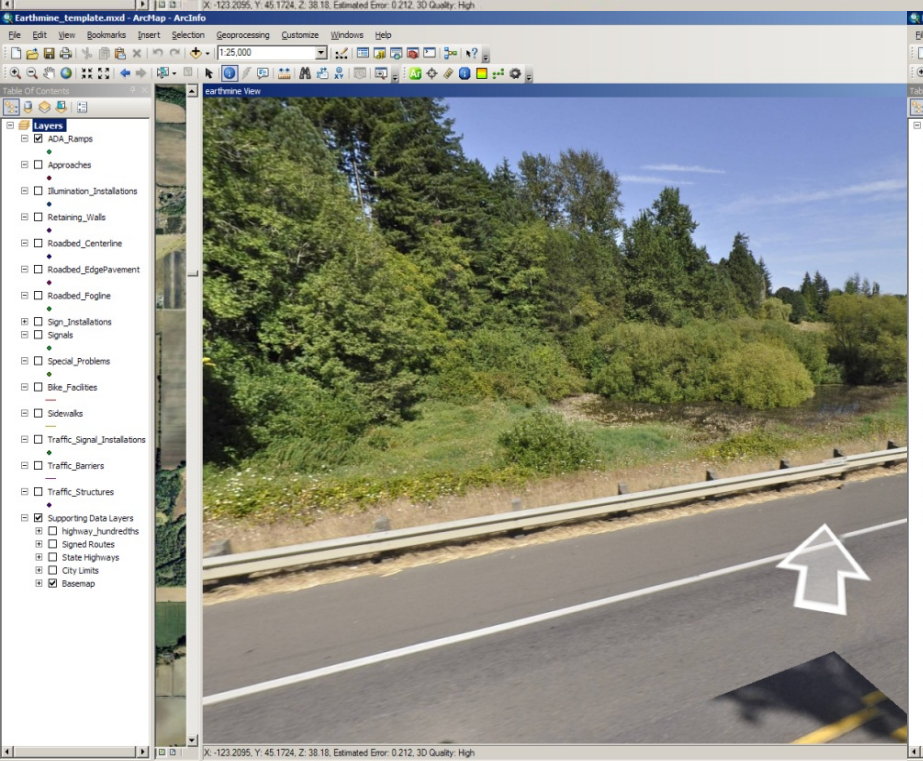
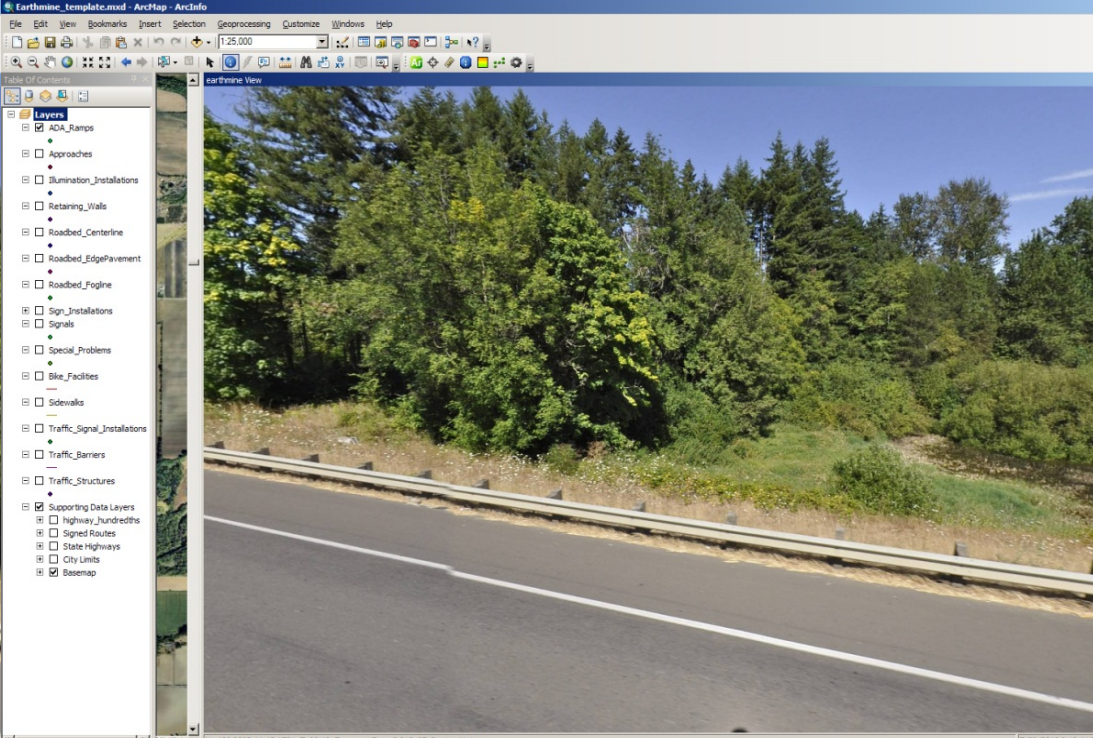
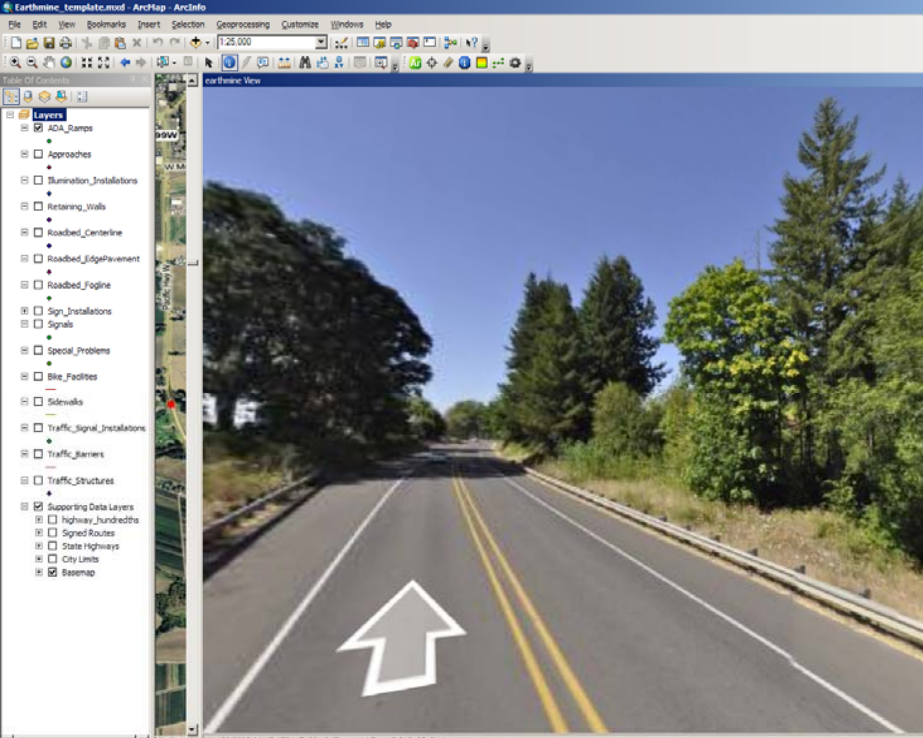
earthmine Measure

Measure: Vertical Length [Dropdown] Units: Feet [Dropdown] Clear

Line Measurement

Segment: 8.75 Feet
Length: 8.75 Feet
Quality: None







New, Robust Asset Database with Field Data Collection Unit

- Exor-Bentley product offers:
 - Robust options to house infrastructure data
 - Use of linear referencing methods (LRM) and coordinates
 - Field Data Collection Unit option
 - Pilot failed



Custom-Built GPS Data Tool RAZ Mobile Mapper

- Provide more current information to highway maintenance crews than available in hardcopy publications
- Create compact portable version of current data normally accessed within office enterprise environment
- Provide complete spatial awareness through live GPS connection



Custom-Built GPS Data Tool RAZ Mobile Mapper

- Connect to GPS
- Three visual components similar to existing hardcopy products
 - Cartographic display
 - Road Inventory as straightline chart
 - Maintenance guidelines as Restricted Activity zones (RAZ)
- Meets regulators requirements to support threatened and endangered species protection while performing routine road maintenance



Custom-Built GPS Data Tool

RAZ Mobile Mapper

ODOT In-Vehicle RES/RAZ Viewer Prototype (BETA 1.0)

Main Display | Map Detail | Settings | References

0.50
Extent (mi.)

GPS Disconnected

SLC Mode

- Auto (SLC drawn for closest highways)
- Lock (SLC drawn only for locked highway)

Hwy 001 / PACIFIC
Hwy 002 / COLUMBIA RIVER
Hwy 003 / OSWEGO
Hwy 004 / THE DALLES-CALIFORNIA
Hwy 005 / JOHN DAY
Hwy 006 / OLD OREGON TRAIL
Hwy 007 / CENTRAL OREGON
Hwy 008 / OREGON-WASHINGTON

Location Information

Road Name: **N/A**
Current Mile Point: **N/A**
Mile Marker From: **N/A**
Mile Marker To: **N/A**
Moving direction: **N/A**

Blue Book Information

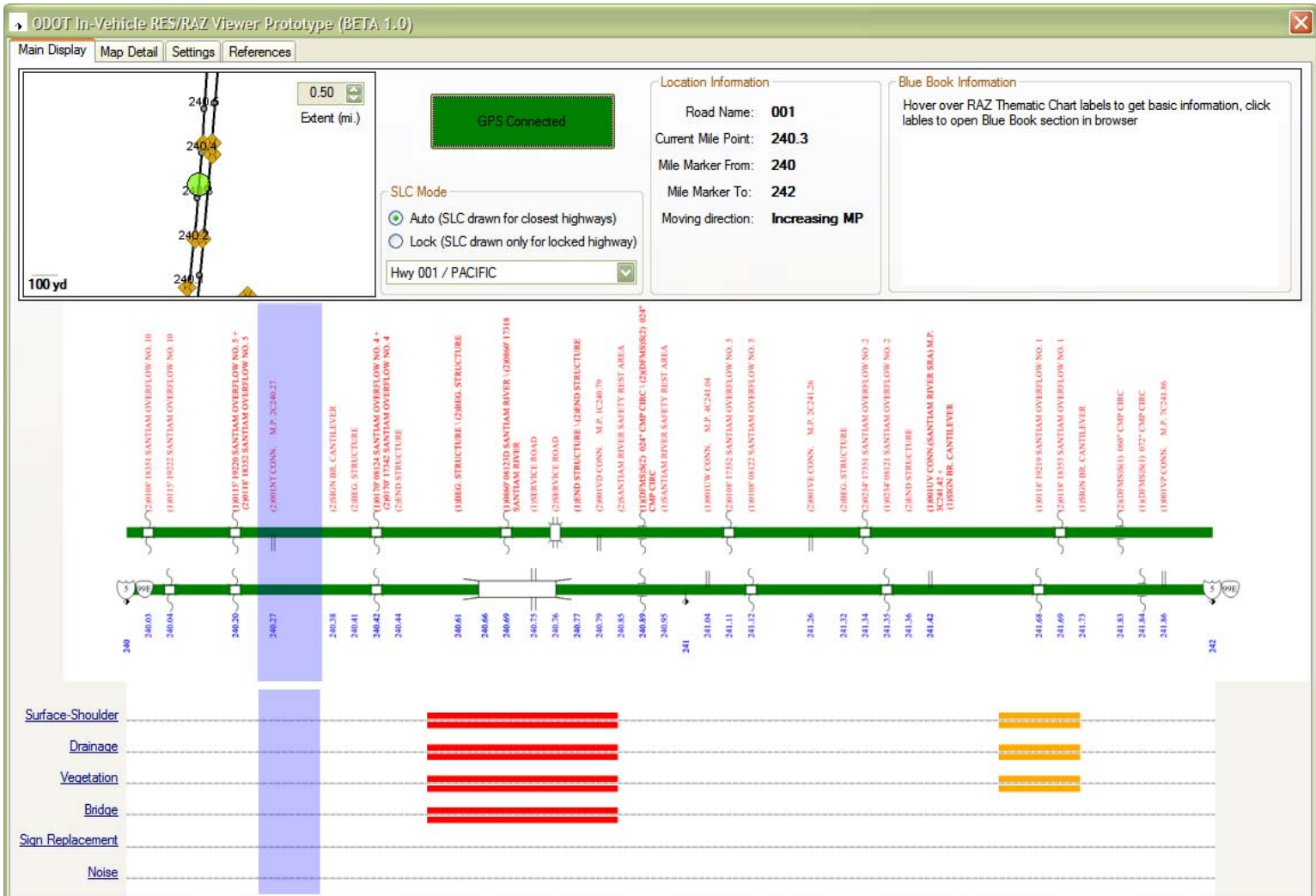
Hover over RAZ Thematic Chart labels to get basic information, click labels to open Blue Book section in browser

1,500 yd

[Surface-Shoulder](#)
[Drainage](#)
[Vegetation](#)
[Bridge](#)
[Sign Replacement](#)
[Noise](#)



Custom-Built GPS Data Tool RAZ Mobile Mapper





Mobile Scanner

- Surveyor safety and efficiency justified purchase
- Bonus potential is use for asset data collection
 - Questions:
 - Data alignment, storage and management?
 - Best practice vs. data “overkill?”
 - Best set of tools – what is the right tool for the job?



Conclusion

- A lot of transportation infrastructure asset data related technology is being used at ODOT
 - FACS-STIP Tool
 - GIS
 - Mobile GPS

but...



The Question for ODOT is....

- ***What is the right mix of tools that substantially – and efficiently - meets most needs and supports our movement toward reliable enterprise data?***

....the answers are still to be revealed



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