

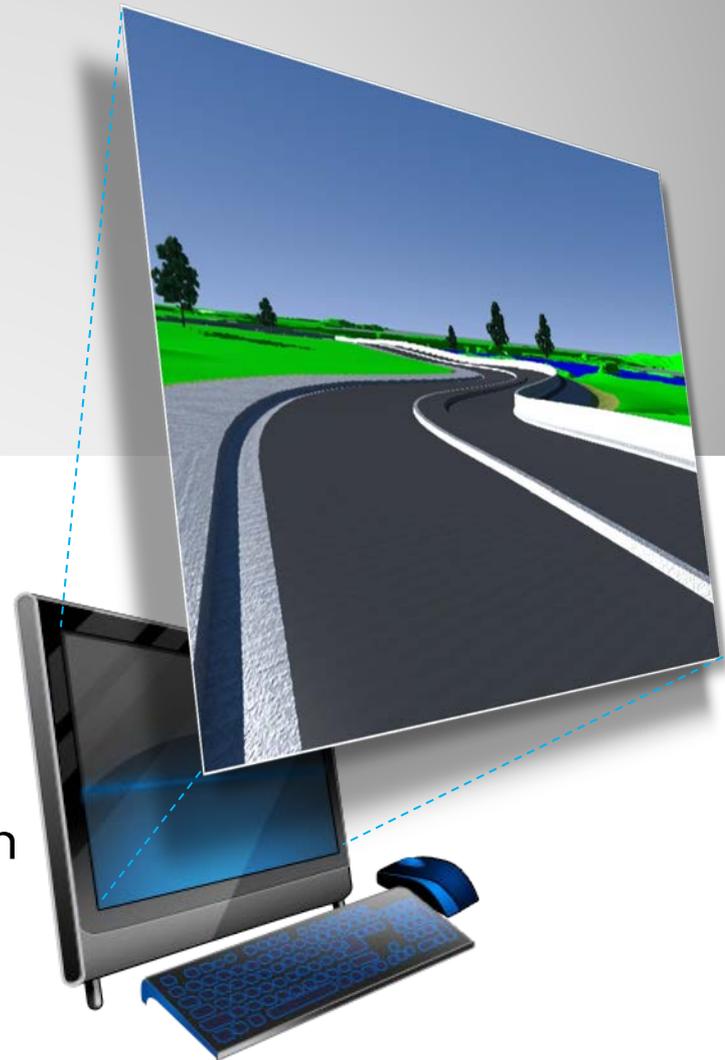
Engineering Automation Section

Positioning for the Future

Ron Singh, PLS

Engineering Automation Manager
Chief of Surveys

Oregon Department of Transportation
4 May, 2016



Highway Lifespan

Maintenance and Operation

Maintenance and Operation

Engineering Automation

STIP Project Lifespan

Engineering Documents

and

Engineering Data

Survey

Design

Construction

Mission

- ❖ To Provide Leadership in all Aspects of Engineering Automation
 - Survey
 - Design
 - Construction
 - Supporting Systems
- ❖ Research New Technology
 - Stay Informed of Industry Trends
 - Plan for the Future
- ❖ Initiate, Develop, and Implement New Initiatives
- ❖ Provide Training, Technical Support and Guidance

In Collaboration with Regions, Technical Services Sections, other ODOT Partners, FHWA, Industry, and Academia.

By

❖ Inspiring

- Informing (visiting Regions/webinars)
- Exciting (hands-on demonstrations)
- Fostering Collaboration (involving users)

❖ Leading

- Taking Input from Regions
- Making Decisions to Standardize Across ODOT

❖ Advising

- Providing Direct Consultation

By

❖ Removing Obstacles

- Understanding Region and Industry Needs
- Developing Systems and Processes to Meet Needs

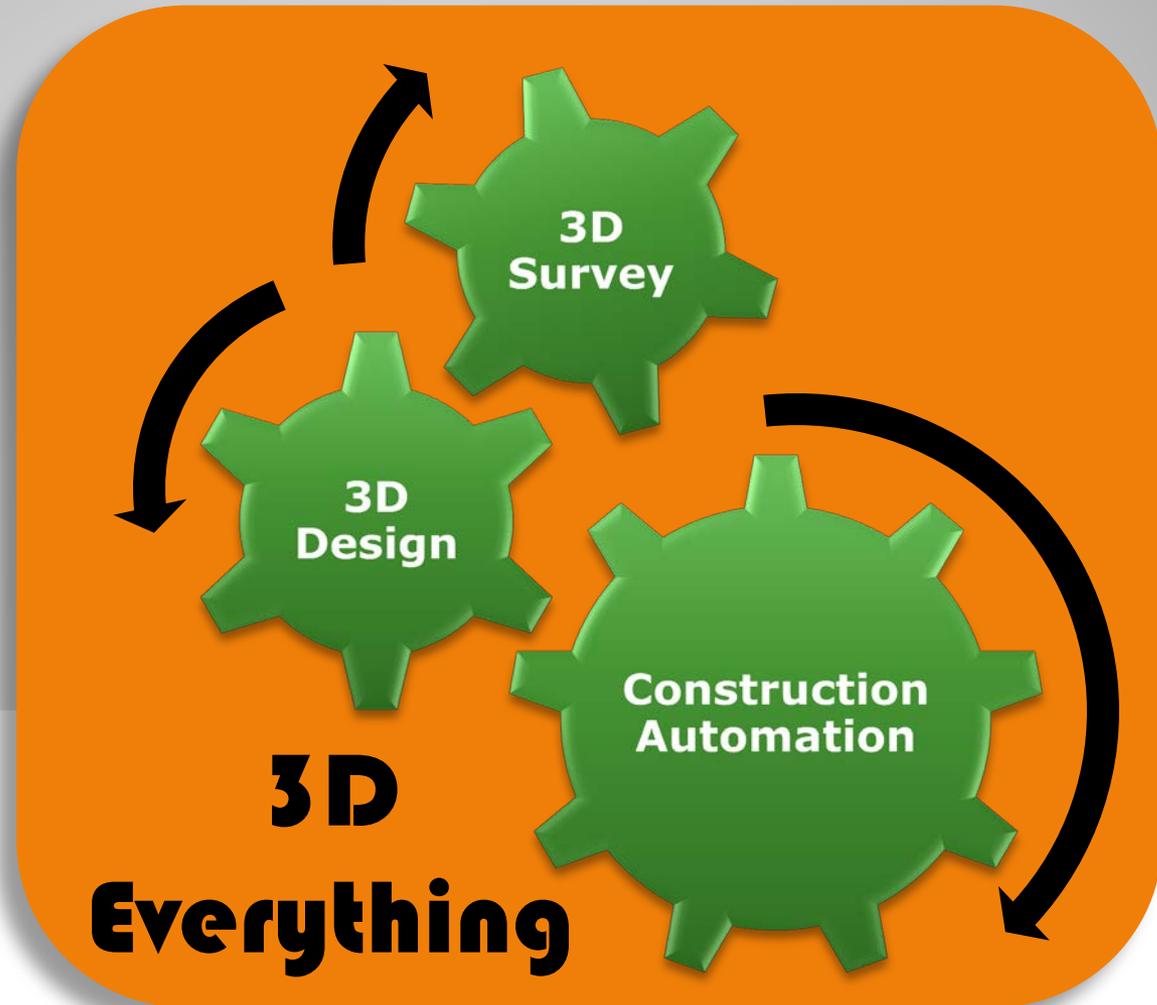
❖ Implementing Initiatives

- Providing Training and Guidance
- Reviewing Work Performed
 - Modifying Standards
 - Updating Training

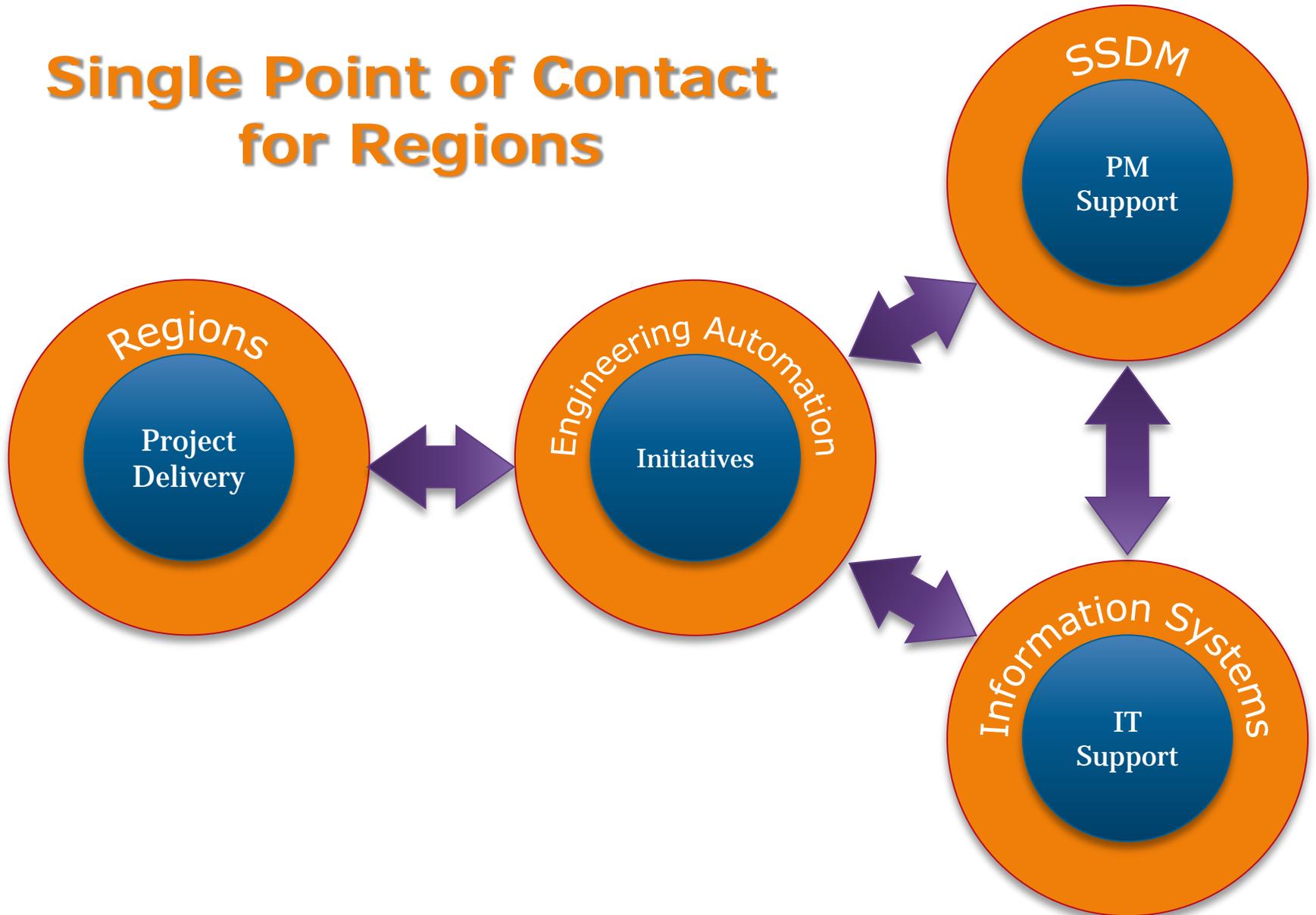
❖ Taking Responsibility

- Customer Feedback
- Improving

Engineering Automation



Single Point of Contact for Regions

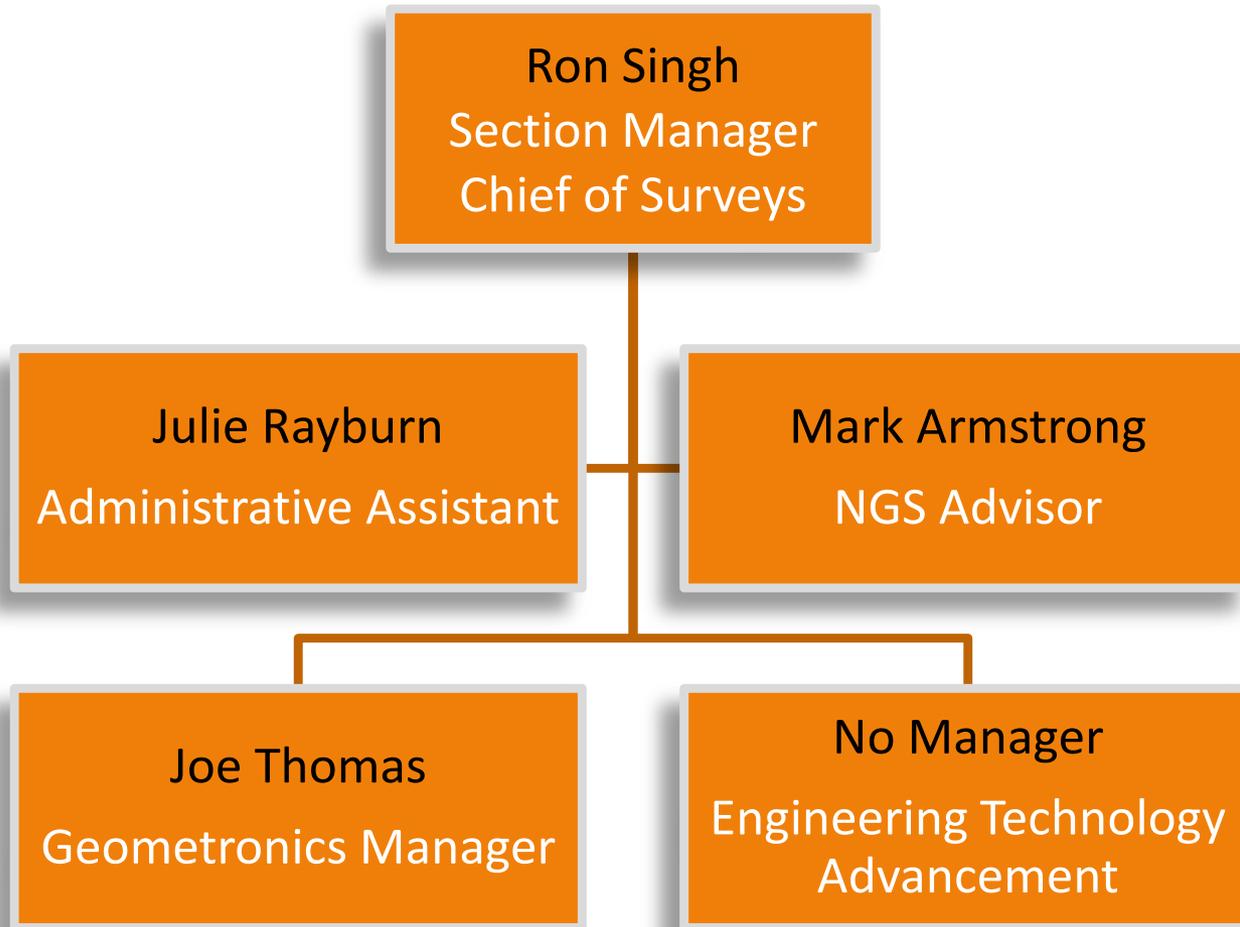


Engineering Automation
Section

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graph TD; A[Engineering Automation Section] --> B[Geometronics Unit]; A --> C[Engineering Technology Advancement Unit];
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Geometronics
Unit

Engineering Technology
Advancement
Unit



Geometronics
Unit

Office Specialist

Survey
Operations

(4)

Geodetic
Control

(3)

Remote
Sensing

(4)

Right-of-Way
Engineering

(2)

Engineering Technology Advancement

3D Surveying, Design, Construction

Ray Thwaites
PE

Chris Harris
PE

Chris Pucci
PLS

Jorge Jimenez
PE

Gary Holeman
PE

Vanessa Baker

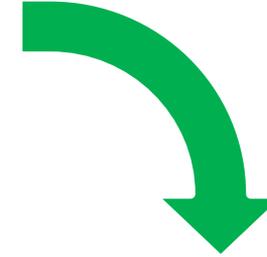
Raghu Namburi

Donna Ferry

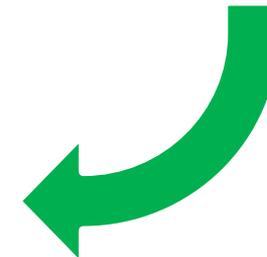
Supporting Systems

TRADITIONAL PROJECT DEVELOPMENT

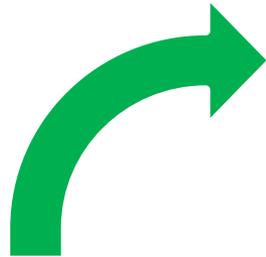
SURVEY



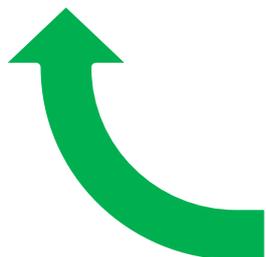
DESIGN



CONSTRUCTION



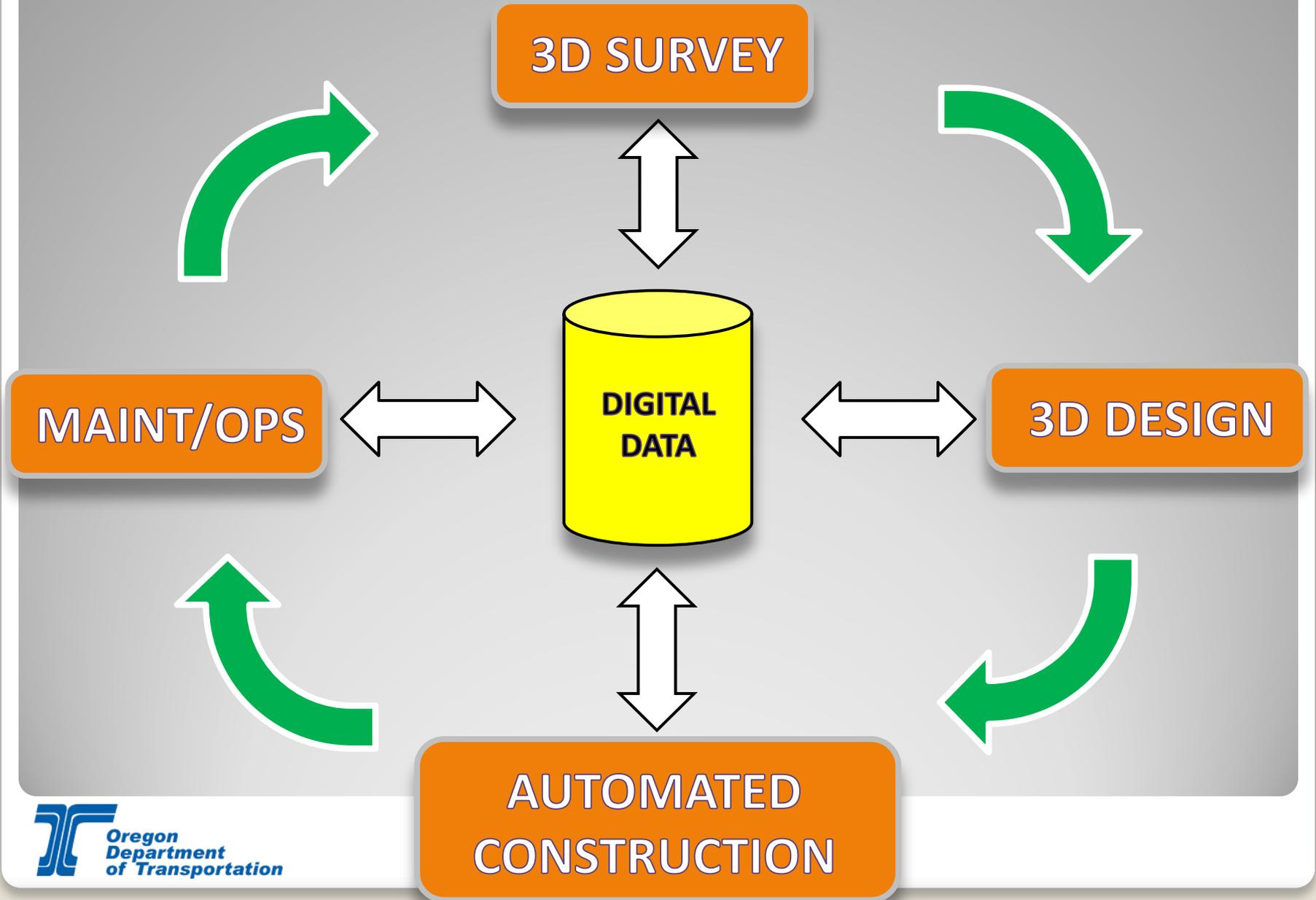
MAINT/OPS



**DOCUMENT
MANAGEMENT**



EMERGING PROJECT DEVELOPMENT

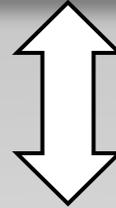


ENGINEERING AUTOMATION

Key Concepts

- Low Distortion Coordinates (Oregon Coordinate Reference System)
- Real-Time Network (Oregon Real-Time GPS Network)
- Digital Terrain Models
- 3D Model of Underground Utilities
- Advanced Survey Technology tools
 - Real-Time Kinematic GPS
 - Robotic Total Stations
 - LiDAR
 - Other Remote Sensing technologies
- Required for 3D Design
- Requires Digital Signatures

3D SURVEY



Benefits

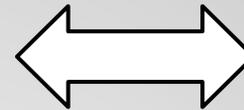
- Less Distortion / High Performance Coordinates
- Greater Accuracy
- More Efficient
- Better Product
- Higher Levels of Detail
- Reusable Data
 - Reliable
 - Retrievable
 - Traceable
 - Geospatial
 - Secure
- Content / Signatory Authentication

ENGINEERING AUTOMATION

- Utilizes 3D Survey Data
- 3D Model of Roadbed Prism
- 3D Model of Design Elements
- Underground Utility Clash Detection

- Material Assignment and Rendering
- Enables 4D and 5D Design
- Required for Automated Construction
- Requires Digital Signatures

Key Concepts



3D DESIGN

Benefits

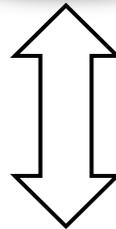
- Simpler, More Effective Design Process
- 3D Design Is All Encompassing
- Detects Conflicts In Design Elements
- Facilitates Construction Machine Automation
- Realistic Visualization of Design
- Beneficial When Displaying to Public / Stakeholders

- More Cost Effective to Design
- Facilitates Collaboration Among Designers
- Speeds Up Construction
- Enables Significant Savings During Construction
- Minimizes Errors and Omissions During Design
- Easily Conveys Design Intent
- Produces Materials List and Quantities

ENGINEERING AUTOMATION

Key Concepts

- e-Construction (paperless project documentation)
- Automated Machine Guidance(AMG)
- Post Construction Surveys
- Handheld Computers for Inspectors
- Remote Construction Site Monitoring
- Materials Delivery and Certification
- Requires Digital Signatures



**AUTOMATED
CONSTRUCTION**

Benefits

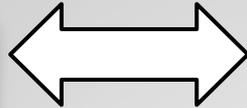
- Reduces Paper
- Enables Digital Archiving
- Better, Longer Lasting Roadway
- Better Management of Materials Quantities
- Utilizes Real-Time Tracking, Monitoring and Recording of Construction Equipment

ENGINEERING AUTOMATION

- Geospatial Data
- Asset Management
- Electronic As-Built Drawings
- Photographic Record Retention
- One Source of Truth

Key Concepts

MAINT/OPS

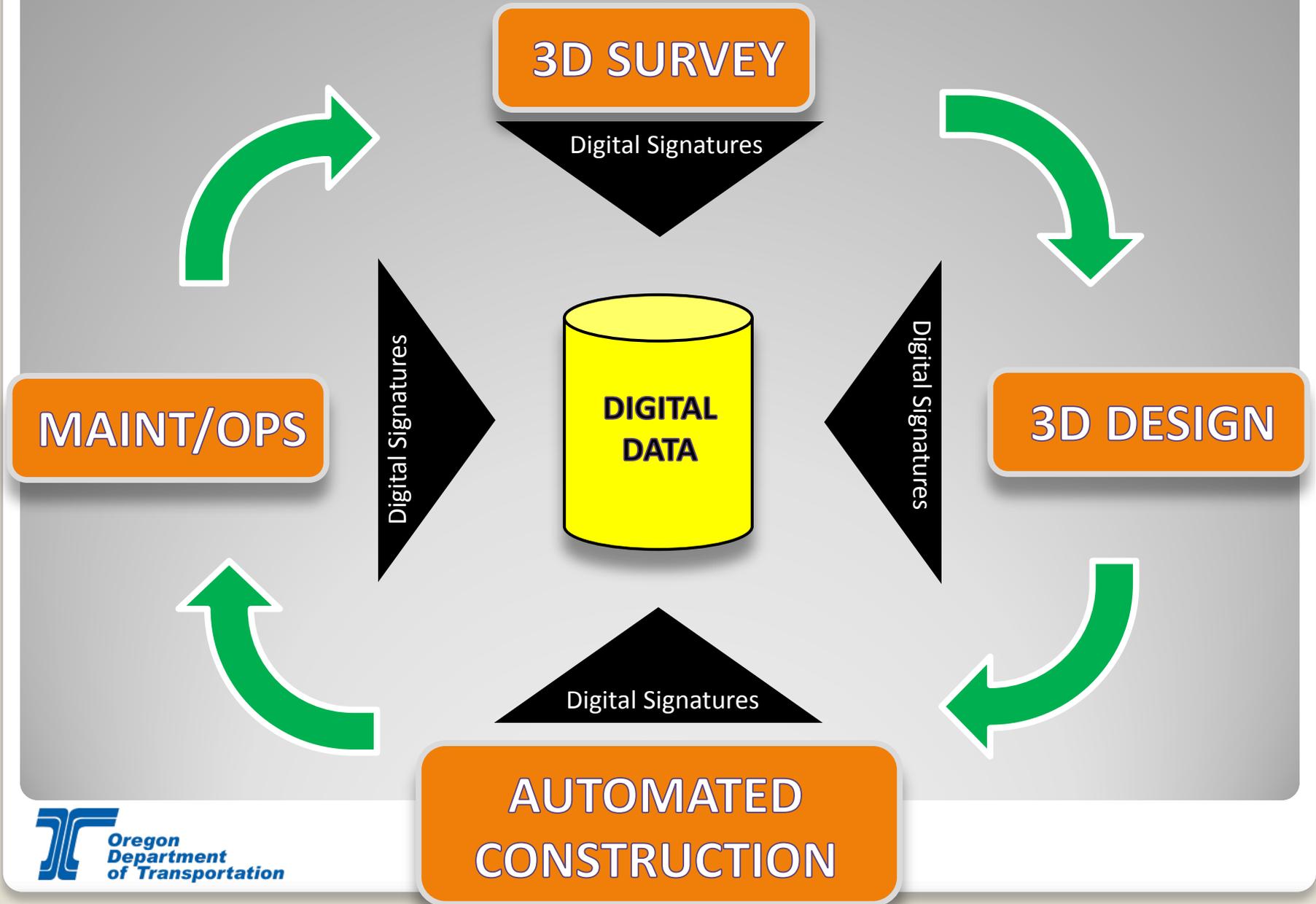


**DIGITAL
DATA**

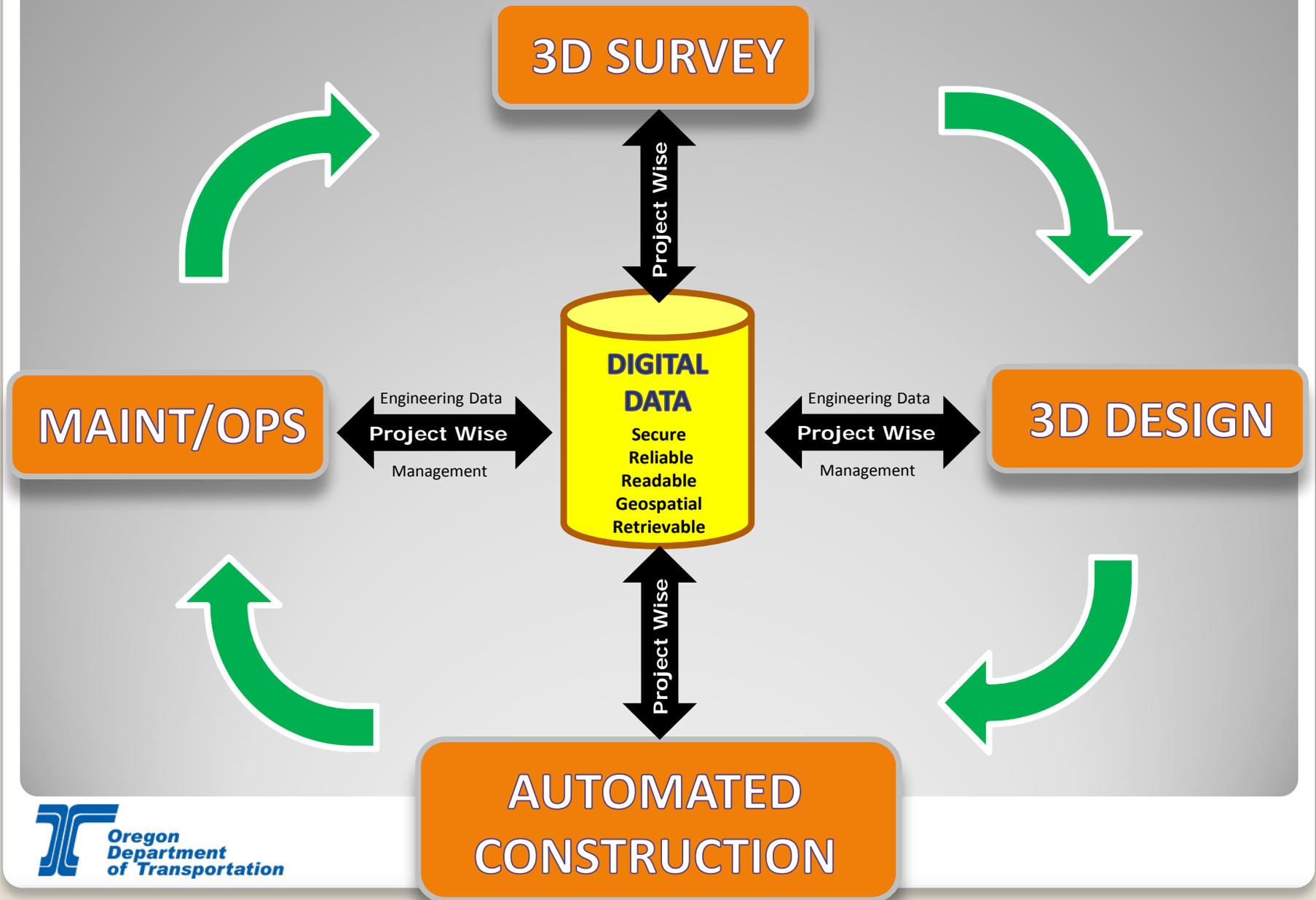
Benefits

Virtual Transportation Corridor System

ENGINEERING AUTOMATION



ENGINEERING AUTOMATION



Current Initiatives

3D Survey

- ❖ LiDAR
 - Static
 - Mobile
 - Survey Grade
 - Statewide

3D Design

- ❖ Roadway Prism
- ❖ eBids (Preliminary Data at Bid Letting)
- ❖ Survey Handoff Package
- ❖ 3D InRoads Training

Construction Automation

- ❖ Automated Machine Guidance (AMG) – Limited Features
- ❖ Positioning Tools for Inspectors
- ❖ eConstruction (Paperless Construction Documentation)
- ❖ Intelligent Compaction
- ❖ 3D Milling

Supporting Systems

- ❖ Engineering Data Management (ProjectWise)
 - Document Management
- ❖ Digital Signatures

Near Future Initiatives

3D Survey

- ❖ Unmanned Aircraft
 - Quarry Mapping
 - Bridge Inspection
- ❖ Subsurface Utility Engineering (SUE)

Construction Automation

- ❖ Automated Machine Guidance (AMG) – More Features
- ❖ Post-Construction Surveys
- ❖ Data Integration
 - ❖ Asset Management
 - ❖ GIS/TransInfo

3D Design

- ❖ Beyond Roadway Prism
- ❖ Bridge
- ❖ Subsurface Features

Supporting Systems

- ❖ Engineering Data Management (ProjectWise)
 - Workflow Management
 - Geospatial Attributes and Search Capabilities

Other Studies Underway

Return on Investment

- ❖ Oregon State University
- ❖ Commissioned to study ROI on ODOT's Engineering Automation Initiatives
- ❖ Report due Q1 2017

Risk Assessment

- ❖ Public Knowledge, LLC
- ❖ Commissioned to assess ODOT's Engineering Automation Program
- ❖ Released Initial Report on 25 April, 2016

Thank You!



Ron Singh

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