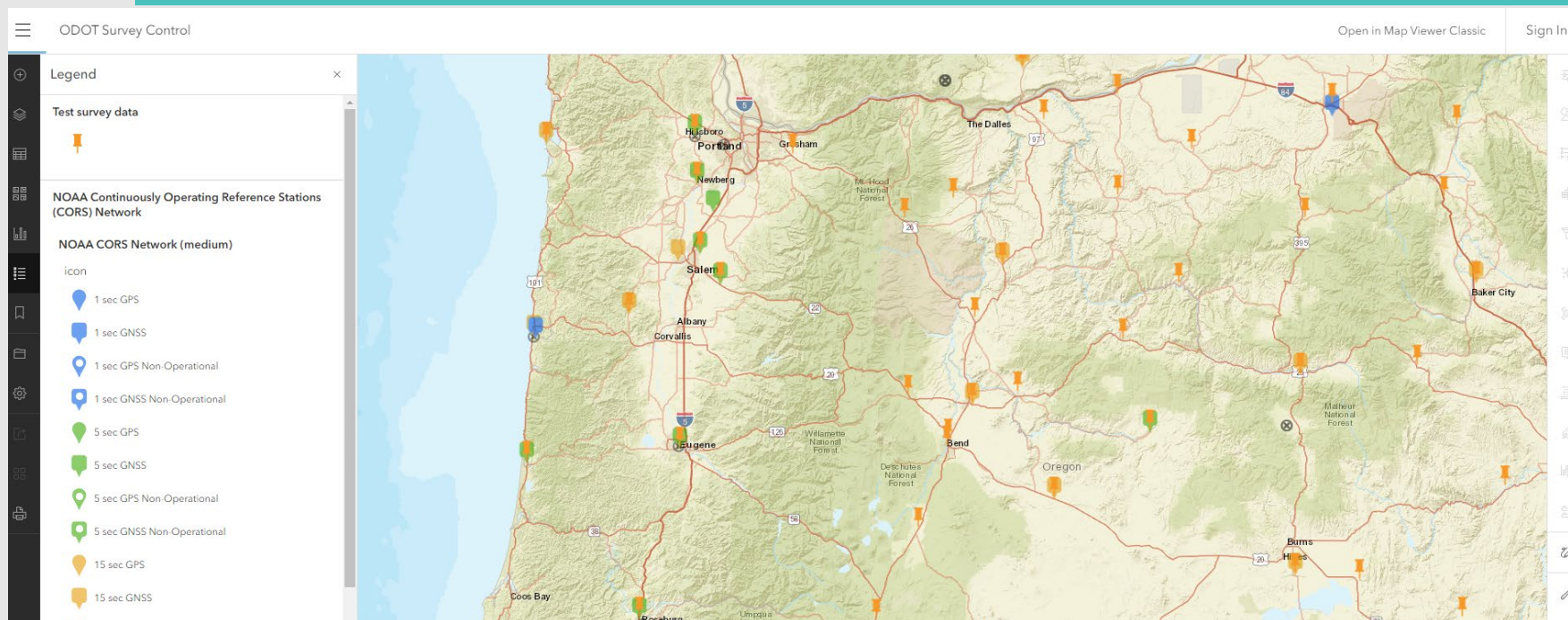


# ODOT Online Geodetic Control Database



Chris Pucci, PLS  
ODOT Engineering  
Automation Section  
Framework Forum  
October 25, 2022

# ODOT Project with Statewide Implications

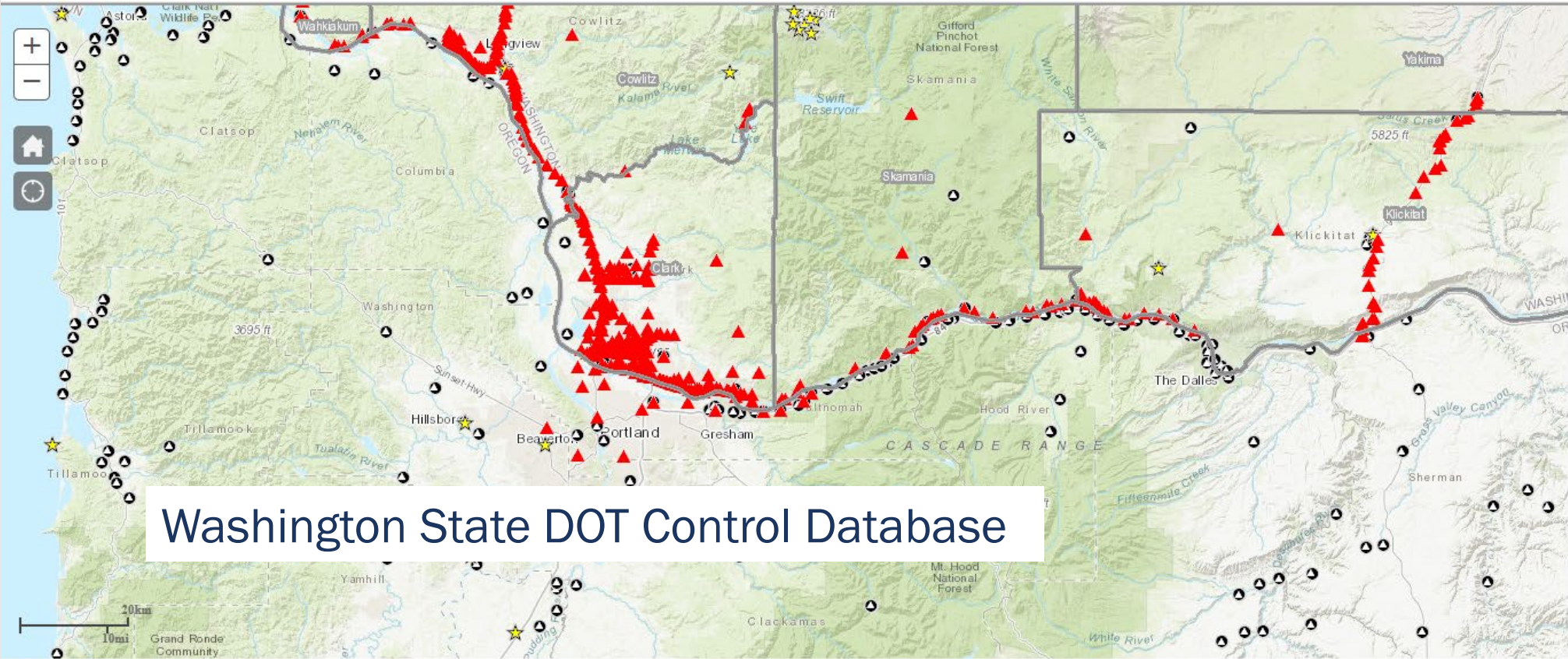
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- Project is underway!
- Goal is to create a database driven / GIS accessible geodetic control and monument database
- Start with ODOT project data
- Add in other state and local agencies
- Make it useful for the entire surveying/geospatial community





Inspiration!



Washington State DOT Control Database

Minimize/Maximize/Help

Tools and Printing

Select Active Layer:  
 WSDOT  NGS

Search Distance:  
3 pixels  
1003.1086011953125 Yards

Search Active Layer for Name or ID:  
KURT  
[Search] [Clear Selection]

GeoLocation Search:  
Olympia, WA

Create a Map and Print:  
[Print] [Dropdown]

Measurement Tools:  
[Icons]

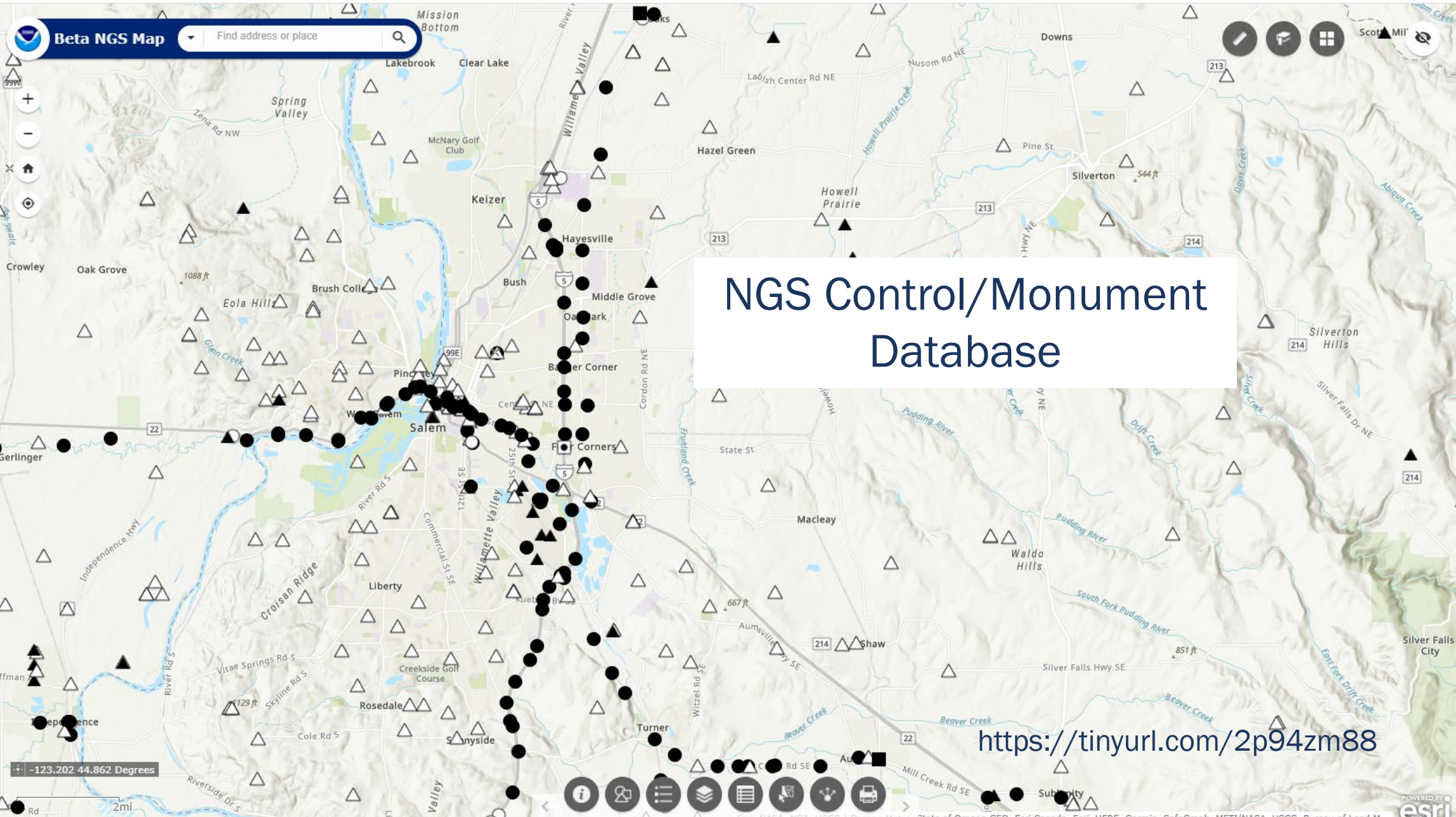
Measurement Result

Basemaps

Layers

DISCLAIMER: This map is for display purposes only and is not intended for any legal representation.



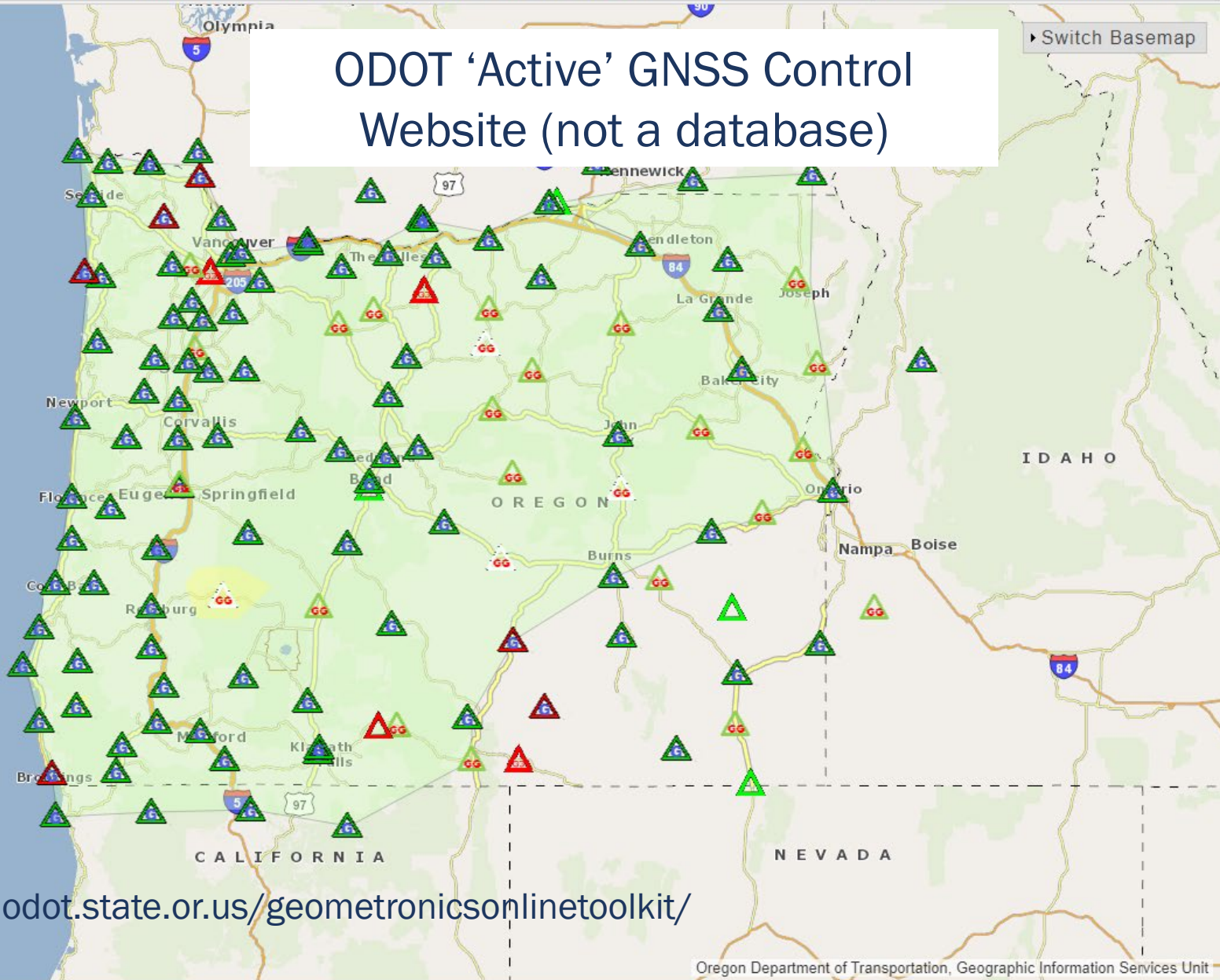


# NGS Control/Monument Database

<https://tinyurl.com/2p94zm88>

-123.202 44.862 Degrees

# ODOT 'Active' GNSS Control Website (not a database)

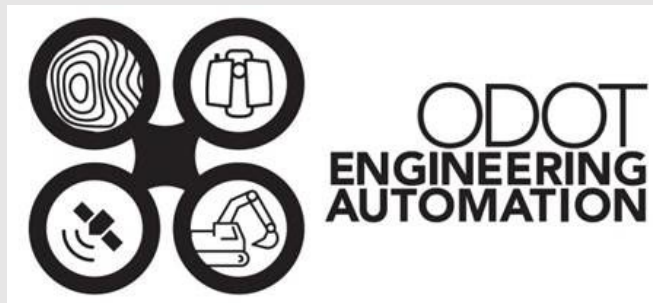


<https://gis.odot.state.or.us/geometronicsonlinetoolkit/>

# How are we going to do it?

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- Oregon State University as a contractor
- ODOT Research as contract administrator/project manager
- ODOT Engineering Automation as project Champion
- Chris Pucci as Project 'Driver' / The guy that wants it done!





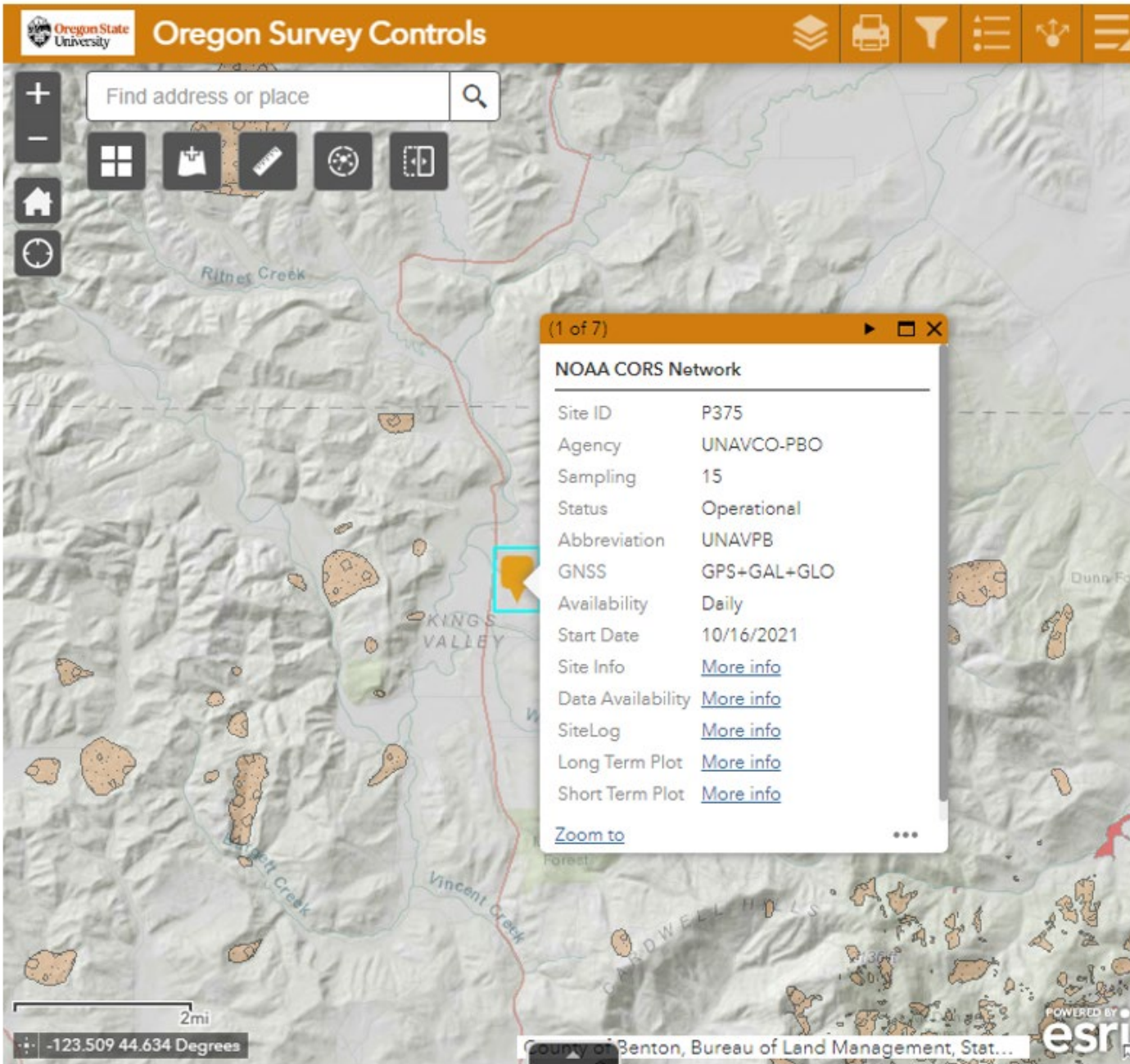
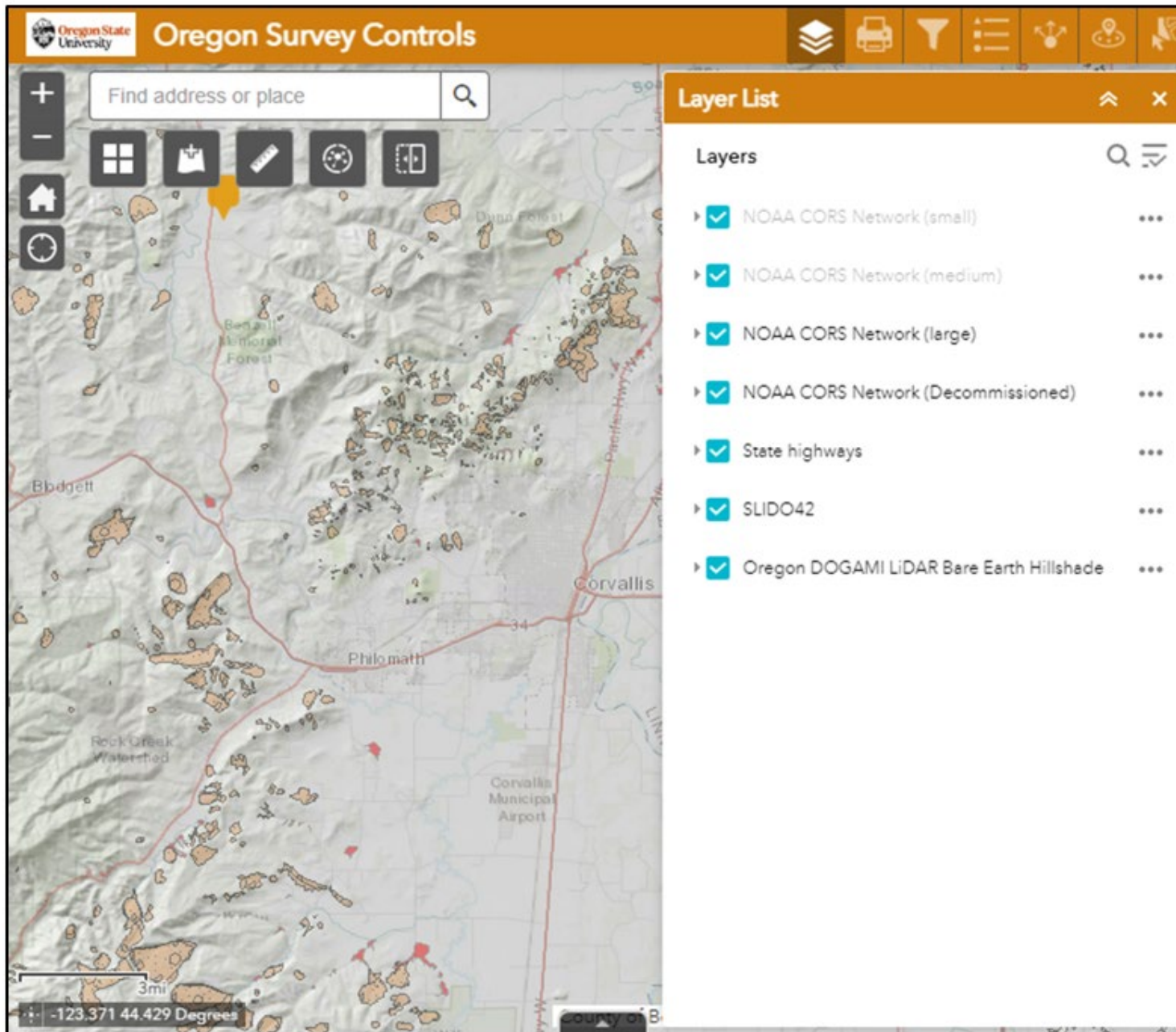


Figure 3-1: Screenshot of the Oregon Control Database WebApp Prototype Interface.

# Beta Web Interface

Table 2.1: Data fields to be incorporated in database for the passive control layer in the proposed Survey Control Database.

FIELD NAME	DATA TYPE	DESCRIPTION	EXAMPLE
ObjectID	Int	Unique identifier of the rows in the geodatabase	1
Shape	*	Internal field to GIS to hold the coordinates. Not directly accessible to the user.	N/A
Station_ID	String	Point identifier for survey control station	MAG
Site_Code	String	Survey controls in the NGS database. 2 uppercase letters followed by 4 numbers	QEO637
NGS_ID	String	Indicates if the point is part of the NGS database. Can include 6 chars; 4 chars are upscaled	00U266
Date_Obs	Date	The date and time the data was collected in the field	08/21/2005 1:50:19 PM
Date_Up	Date	The date and time the data was updated in the database (Auto-populated)	08/21/2020 6:15:02 PM
Lon	Double	Easting x-coordinate value expressed in decimal degrees with a sufficient number of decimal digits to support the horizontal positional accuracy estimation (e.g., 12 decimal places)	122.820842745633



**Ability to  
display other  
data layers**

**Figure 3-9: Screenshot showing layer list widget.**

# Other potential data layers

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- Oregon Real Time GNSS Network stations
- Oregon Coordinate Reference System zones
- ODOT Vertical benchmarks
- Other state agency control
- ODOT Mobile Lidar data
- Data we don't even know about yet!

# Merge everything from this webpage...

Oregon Department of Transportation  
**ODOT TransGIS**

print | about

Display | Navigation | Analysis | OCRS Tools | Admin | Point Probe | Line Profile | Polygon | Hide OCRS Projection Zones | Show Distortion Raster | PLSS... | Clear Graphics

About TransGIS Legend

Introduction

### Geometronics Online Toolkit Introduction

The ODOT Geometronics Online Toolkit is a tool that works within the ODOT TransGIS website.

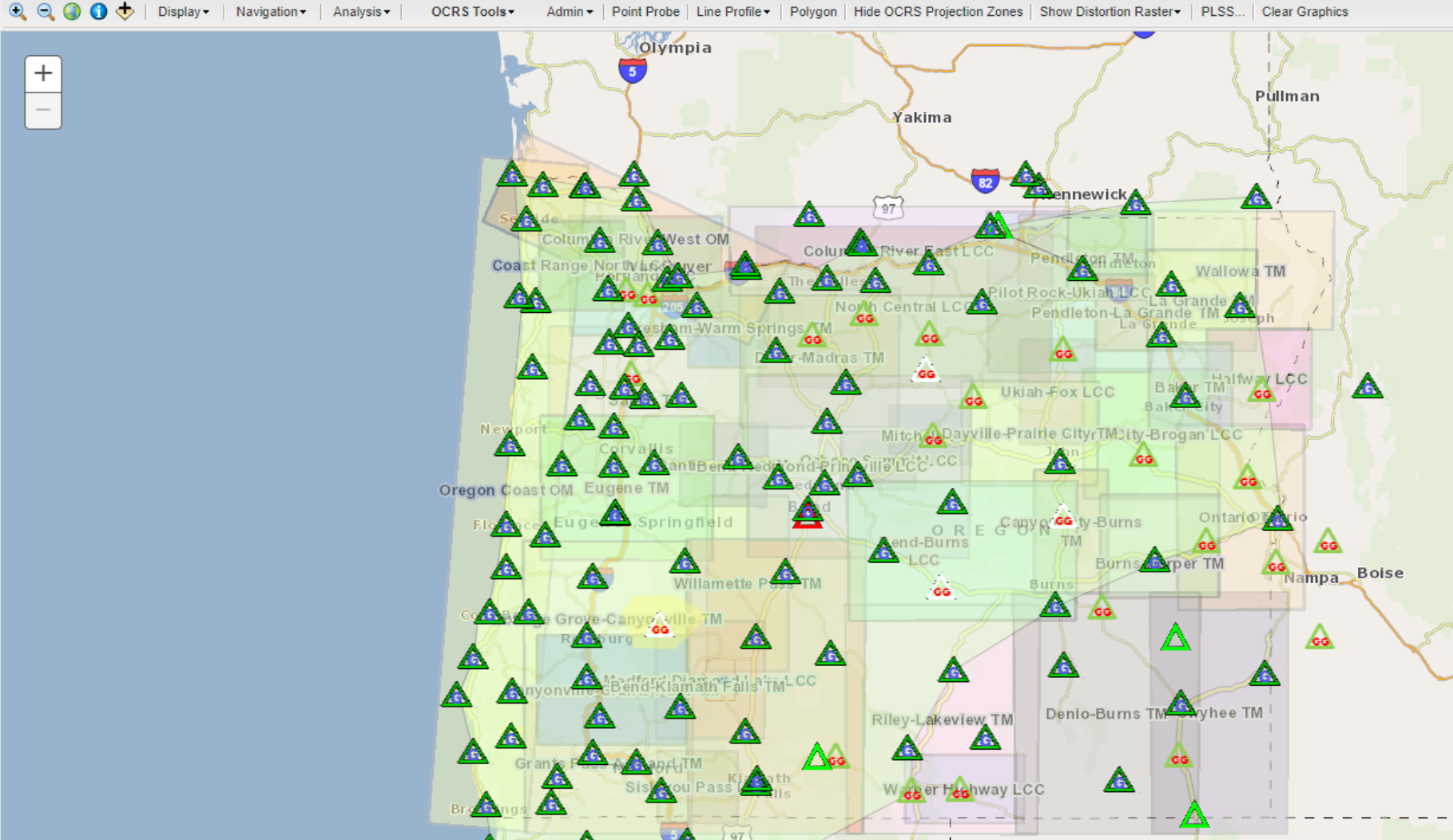
There are three components of the Online Toolkit:

1. Oregon Real-time GPS Network (ORGN)
2. Oregon Coordinates Reference System (OCRS)
3. Benchmarks

The Oregon Real-time GPS Network (ORGN) component allows users to view the status of the ORGN continuously operating reference stations, view a map of areas in Oregon where real-time GNSS correctors from the ORGN are available, and display/download a list of ORGN stations with the current coordinates for each station and a link to the particular website for each station. For general information about the ORGN, not this web tool, please see: [www.TheORGN.net](http://www.TheORGN.net)

The Oregon Coordinate Reference System (OCRS) component allows users to determine the best Oregon Coordinate Reference System low-distortion projection zone for their project. Users can display all of the OCRS zones on a map, and they can also determine the actual distortion of a point in various zones by placing a point, line or polygon on the map in their vicinity of interest. For general information about the OCRS low distortion projection zones, not this web tool, please see: <http://www.oregon.gov/ODOT/HWY/GEOMETRONICS>

Because the Geometronics Online Toolkit works within the ODOT TransGIS website, the user will see some function buttons, and menu items that



The screenshot displays the ODOT TransGIS web application interface. The main map shows the state of Oregon with various colored overlays representing different OCRS projection zones. Numerous green triangles with a 'G' inside are scattered across the map, representing GPS stations. Major cities like Olympia, Yakima, Pullman, and Boise are labeled. The interface includes a top navigation bar with various tool options, a left sidebar with a legend and introduction text, and a main map area with zoom controls.

# Link to all the standard ODOT data...

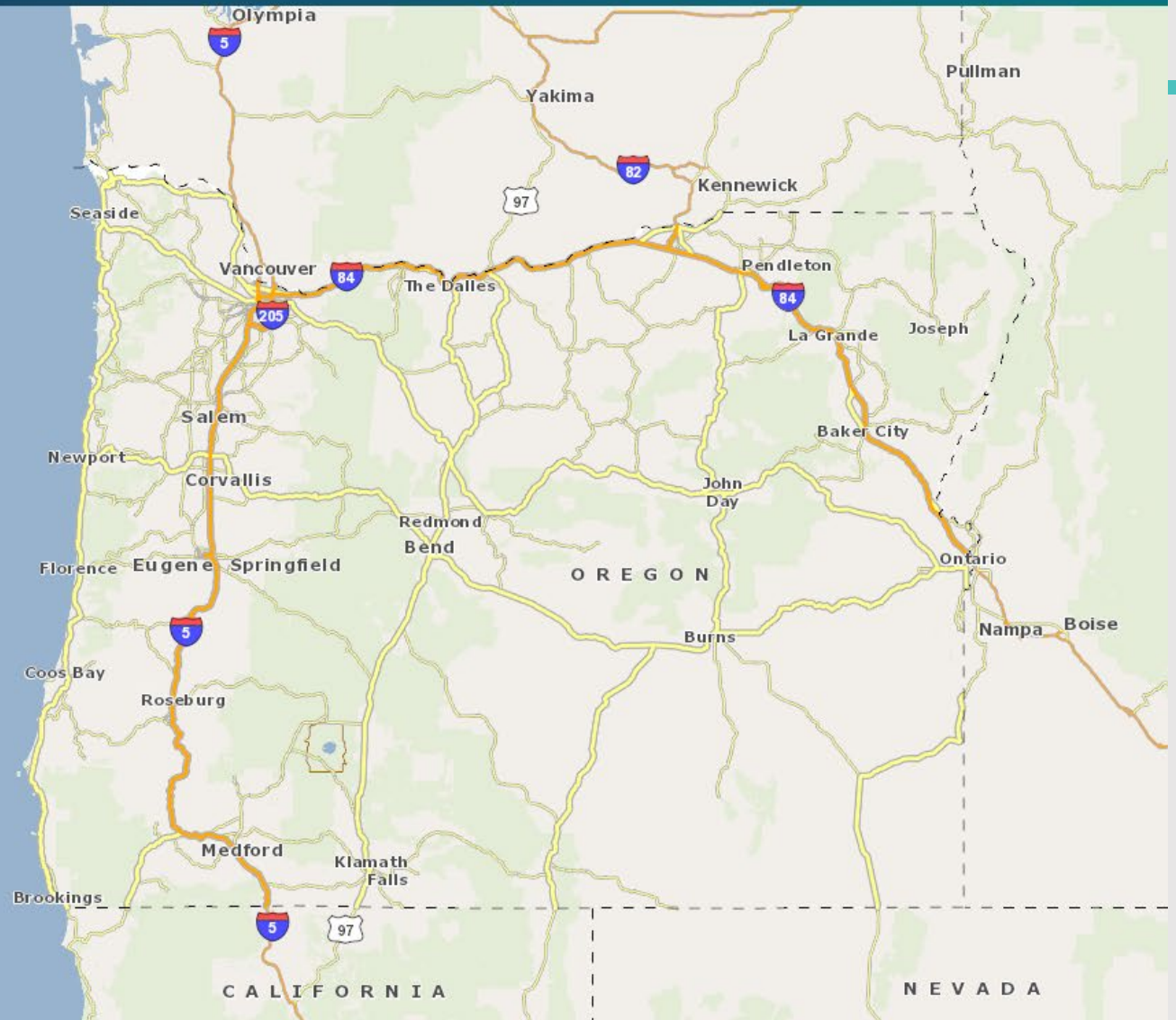


Layers Basemaps Legend



### Select a layer category

- Structures
- Drainage
- Equipment - Highway
- Roadway
- Roadside
- Freight
- Rail
- Public Transportation
- Traffic Data
- Road Network
- Classifications
- Safety
- Projects & Needs for Scoping
- Geology
- Maintenance and Facilities
- Environmental
- Boundaries



# ODOT data layers

- If it is public facing data, we can display it
- Make it a one-stop location for geodetic/survey data/project scoping/etc.



## Structures

- Bridges
- Structurally Deficient Bridges
- Scour Critical Bridges
- Review for Emergency Vehicle Loads
- Review for SHV Loads
- Weight Restricted Bridges
- Posted Bridges
- Low Clearance Bridges
- Retaining Walls
- Major Traffic Structures
- Tunnels

## Drainage

- DFMS Culverts (Advanced Inspection)
- DFMS Culverts (From Plans – No Inspection)
- Stormwater Management Facilities
- Underground Injection Control Systems (No Inspection)
- Tidegates

## Equipment – Highway

- Signs
- Signals
- Flashing Beacons
- Intelligent Transportation System (ITS) – Camera
- Intelligent Transportation System (ITS) – Signs
- Intelligent Transportation System (ITS) – Detector Stations
- Intelligent Transportation System (ITS) – Weather Systems
- Weigh-In Motion (WIM) Sites
- Automatic Traffic Recorder (ATR) Stations

## Roadway

- Pavement Condition
- Number of Lanes
- Shoulder Width and Type
- Lane Width

## Roadside

- ADA Ramps
- ADA Push Button
- ADA Corners
- Sound Barrier
- Marked Crosswalks (no connecting ADA ramps)
- Marked Crosswalks (connecting ADA ramps)
- Sidewalks
- Bicycle Facilities
- Traffic Barriers

## Freight

- National Highway Freight Routes
- OHP Freight Routes
- High Clearance Routes
- Reduction Review Routes
- National Network – State
- National Network – Non-State

## Rail

- Rail Crossings
- Rail Network
- State Owned Railroad Right of Way
- Rail Bridges
- Rail Mile Posts
- Rail Tunnels

## Public Transit

- Park and Ride Lots
- Oregon POINT Bus Stops (Fixed Route)
- Oregon POINT Bus Routes (Fixed Route)
- Transit Stops (Fixed Route)
- Transit Routes (Fixed Route)
- ODOT Transit Regions

## TransGIS Layer List

### Traffic Data

- Automatic Traffic Recorders (ATR) Data
- Annual Average Daily Traffic (AADT) - State
- Annual Average Daily Traffic (AADT) – Non-State
- Annual Average Daily Traffic (AADT) Future Projected (20 Years)
- Posted Speed
- Traffic Flow (AADT)
- Truck Flow (AADT)

### Road Network

- Highway Mile Posts
- Highway Mile Point – Tenth
- Highway Mile Point – Hundredths
- All Public Roads
- All Public Road Names
- Signed Routes
- Highway Connections
- Highway Frontage Roads
- Highway Network
- Highway Network - by ODOT Highway Number

### Classifications

- Federal Functional Class – State
- Federal Functional Class – Non-State Mile Point – Hundredths
- Federal Functional Class – Non-State
- Federal Aid Eligible Road Network
- OHP Expressways
- OHP Highway Classification
- National Highway System (NHS) – State
- National Highway System (NHS) – Non-State
- Seismic Program Highways
- Oregon Scenic Bikeways
- Oregon Scenic Byways
- Special Transportation Areas (STA); Urban Business Areas (UBA); Commercial Centers (CC)
- Low Volume Road (LVR) Pavement Routes

### Safety

- Crashes 2019
- Crashes 2018
- Crashes 2017
- Crashes 2016
- Crashes 2015
- SPIS 2019 (2016-18 crashes)
- SPIS 2018 (2015-17 crashes)
- SPIS 2017 (2014-16 crashes)
- SPIS 2016 (2013-15 crashes)
- SPIS 2015 (2012-14 crashes)

### Projects & Needs for Scoping

- Safety Scoping Projects
- Fix It Priority Corridor STIP 2015-2018
- Fix It Priority Corridor STIP 2018-2021
- Fix It Priority Corridor STIP 2021-2024
- Fix It Priority Corridor STIP 2024-2027
- STIP 2021-2024 Points – Current
- STIP 2021-2024 Lines - Current
- STIP 2018-2021 Points
- STIP 2018-2021 Lines
- STIP 2012-2015 Points
- STIP 2012-2015 Lines
- STIP 2008-2011 Final
- STIP 2006-2009 Final
- Bicycle Facility Needs
- Sidewalk Needs
- ATNI Rural Unincorporated Communities

### Land & Facilities

- Aggregate Sites
- Unstable Slopes
- ODOT Maintenance Stations
- ODOT Facilities
- ODOT Leased Buildings
- Faults OGDC v6
- Folds OGDC v6
- Geological Units Map OGDC v6

### Environmental

- Animal Incidents
- FAHP ESA Programmatic Projects
- Fish Barriers
- Fish Passage
- Animal Incidents Density
- EPA Nonattainment Areas and Maintenance Areas
- Oregon Wetlands
- Hydric or Wetland Soils
- Climate Divisions
- Average Annual Precipitation
- 6-Month 24-Hour Precipitation (in)
- 2-Year 24-Hour Precipitation (in)
- 10-Year 24-Hour Precipitation (in)
- 25-Year 24-Hour Precipitation (in)
- 50-Year 24-Hour Precipitation (in)
- 100-Year 24-Hour Precipitation (in)
- 500-Year 24-Hour Precipitation (in)
- 1000-Year 24-Hour Precipitation (in)

### Boundaries

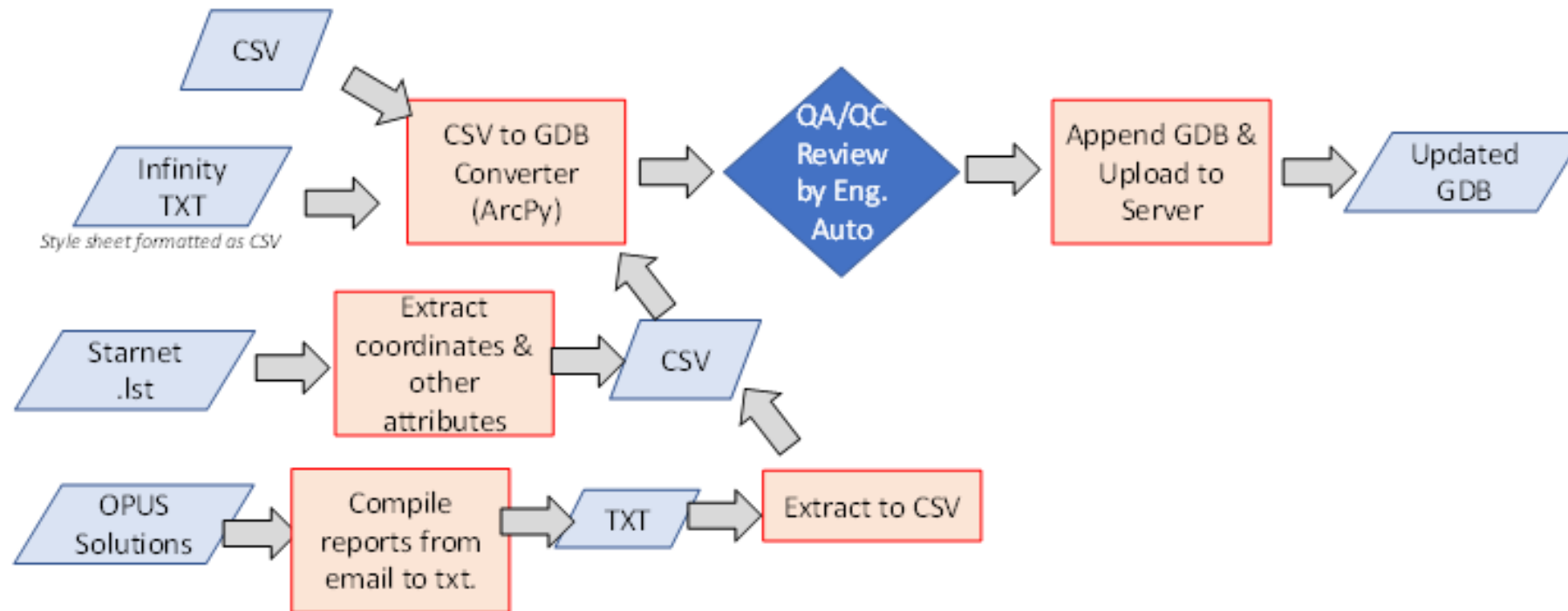
- City Limits
- Federal Aid Urban Boundaries (FAUB)
- Urban Growth Boundaries (UGB)
- PLSS (Township & Range)
- PLSS (Sections)
- ODOT Maintenance Districts
- ODOT Areas
- ODOT Regions
- Area Commissions on Transportation (ACT)
- Metropolitan Planning Area (MPA)
- Environmental Justice
- US Congressional Districts
- State Senate Districts
- State House Districts
- Bricklayer Zones
- Electrician Zones
- Power Equipment Operator Zones
- Travel Oregon Regions
- Zip Codes
- County Boundaries
- Lidar Point Cloud Index
- Lidar Imagery Index
- USGS Quads Index

### Taxlots

- Taxlots by County

*Note: Taxlots are only available through the internal TransGIS application due to privacy laws.*

# 'Automated' Process from data to database



**Figure 4-1: Workflow and scripts to convert data outputs from different processing packages into the geodatabase (GDB)**

# Wish List Items

- Statewide data (Lots of participants!)
- Housed in state managed database
- Live links to ‘other’ data sources – not copies
- Easy upload of data (with QA/QC function)
- Viewable in ArcGIS Online or similar non-custom application
- Easy download of data (Excel, ‘datasheets’, maps)
- Easy to search and filter

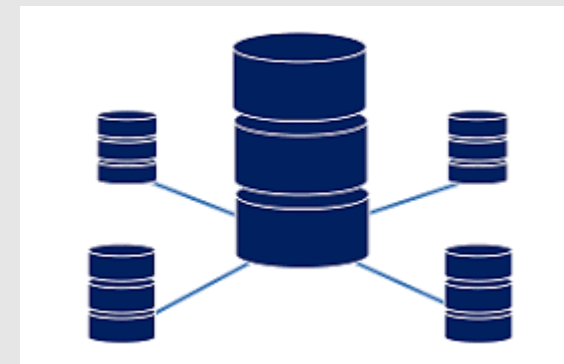




# METADATA!!

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- Not just points and coordinates
- As much metadata as we can get for each point
- Descriptions that go beyond 'GPS Point'
- Datums, epochs, original collection date, etc.
- Agency, project, survey number, web link to more info
- Pictures?



# Timeline

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- 9 to 12 months for first online tools
- 2 years to a complete working 'system'?



# What am I missing?

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“Great discoveries and improvements invariably involve the cooperation of many minds.”

Alexander Graham Bell

# Questions?

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Chris Pucci, PLS

Project Surveyor

Engineering Automation Section

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