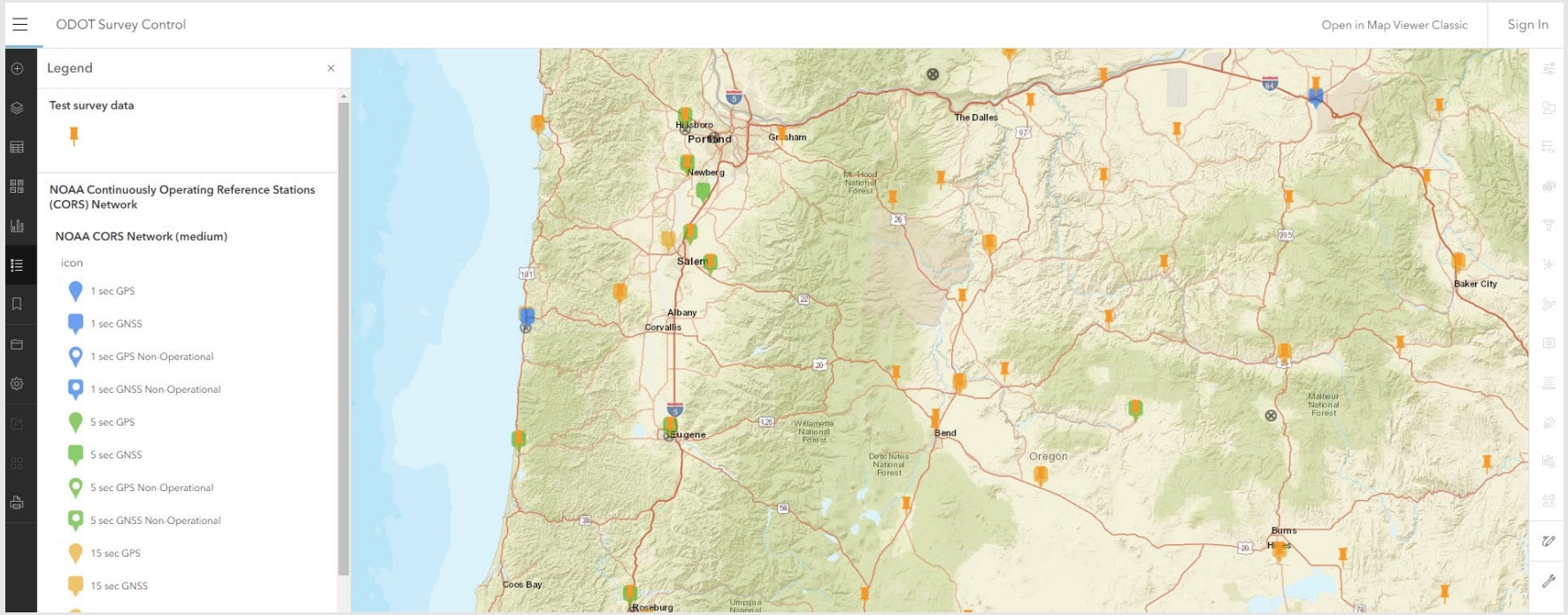
ODOT Online Geodetic Control Database



Chris Pucci, PLS

OGUG Winter Meeting

January 20, 2023

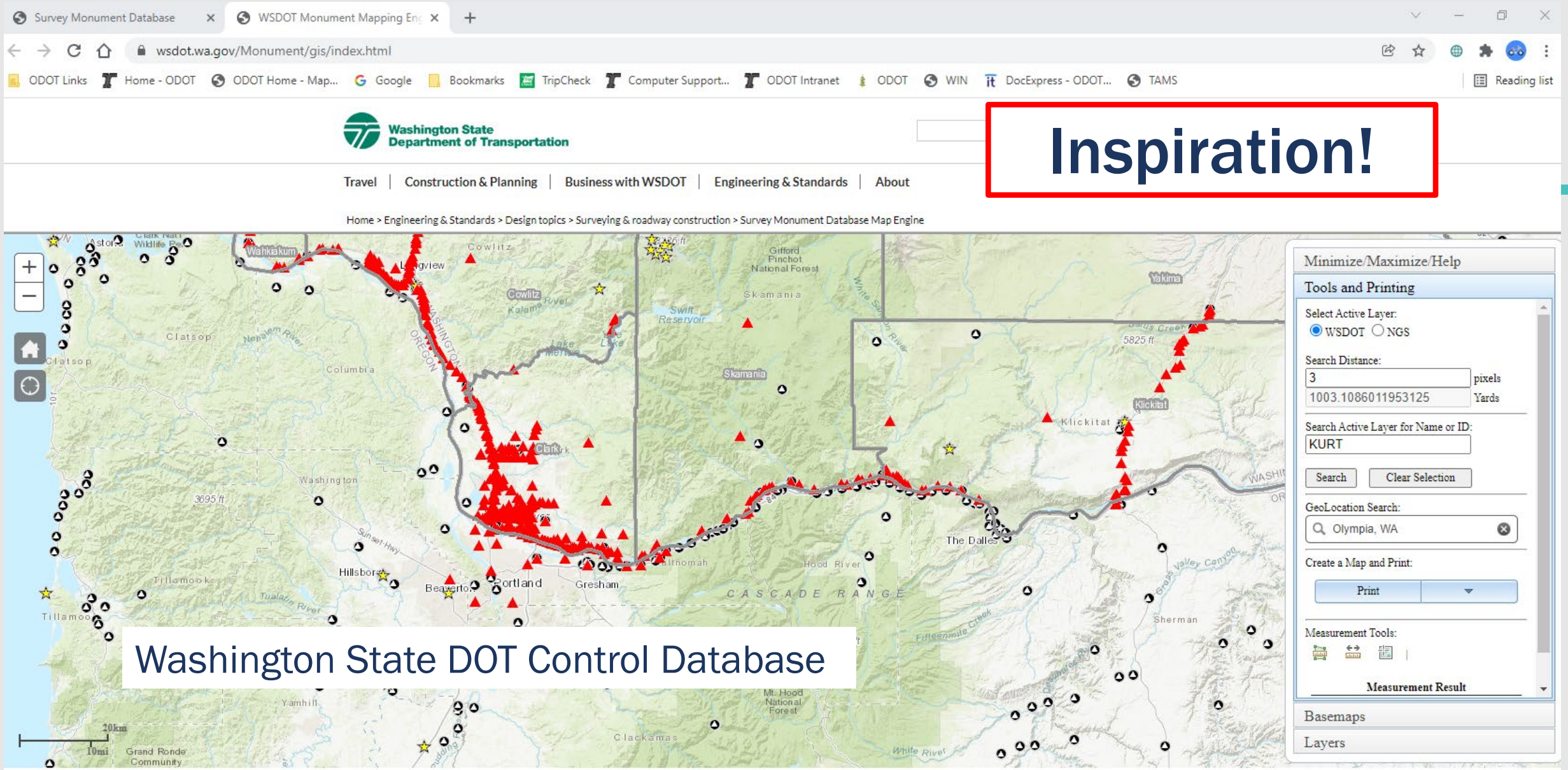
ODOT Project with Statewide Implications

- 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

Oregon Department of Transportation

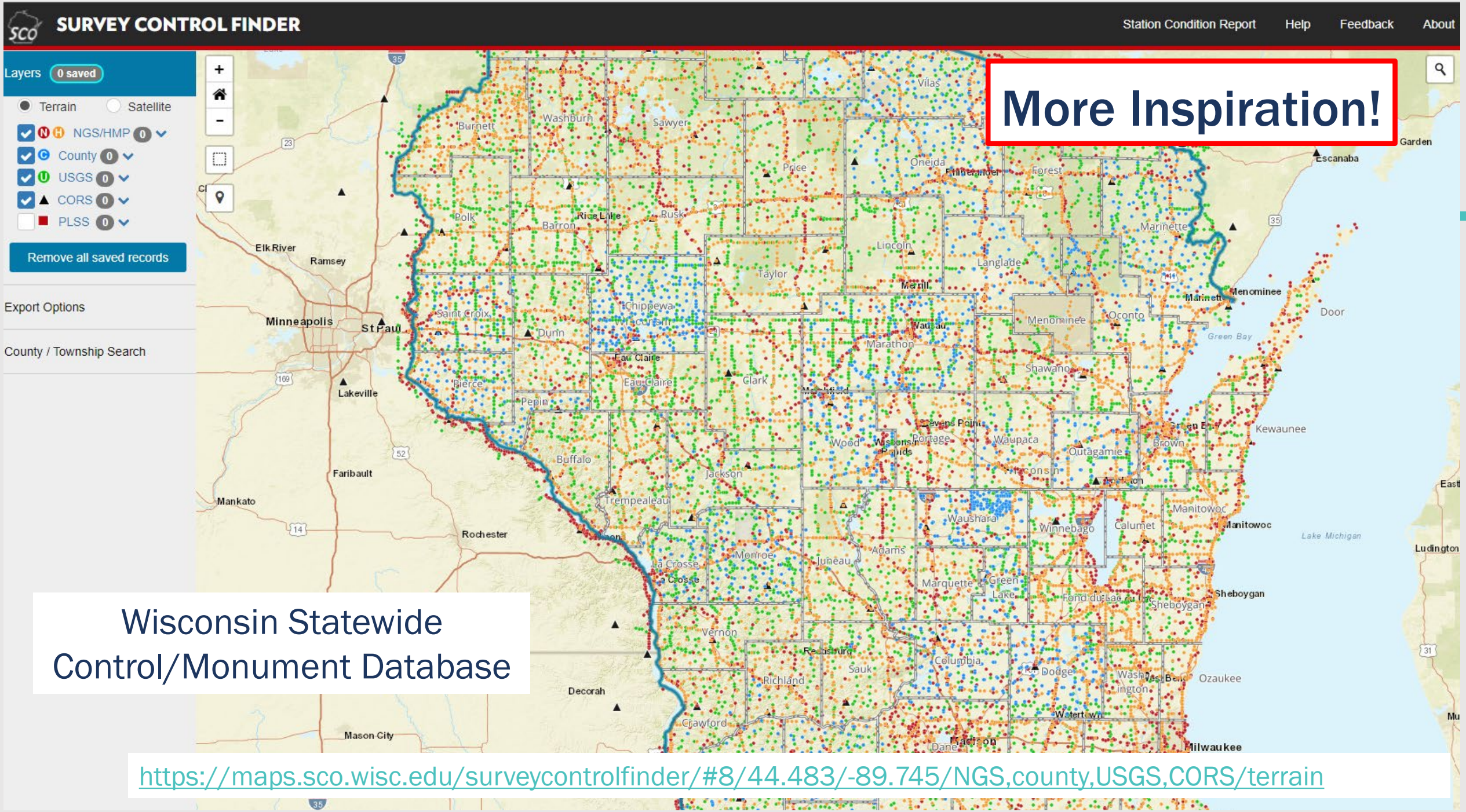
Current ODOT Control ‘database’

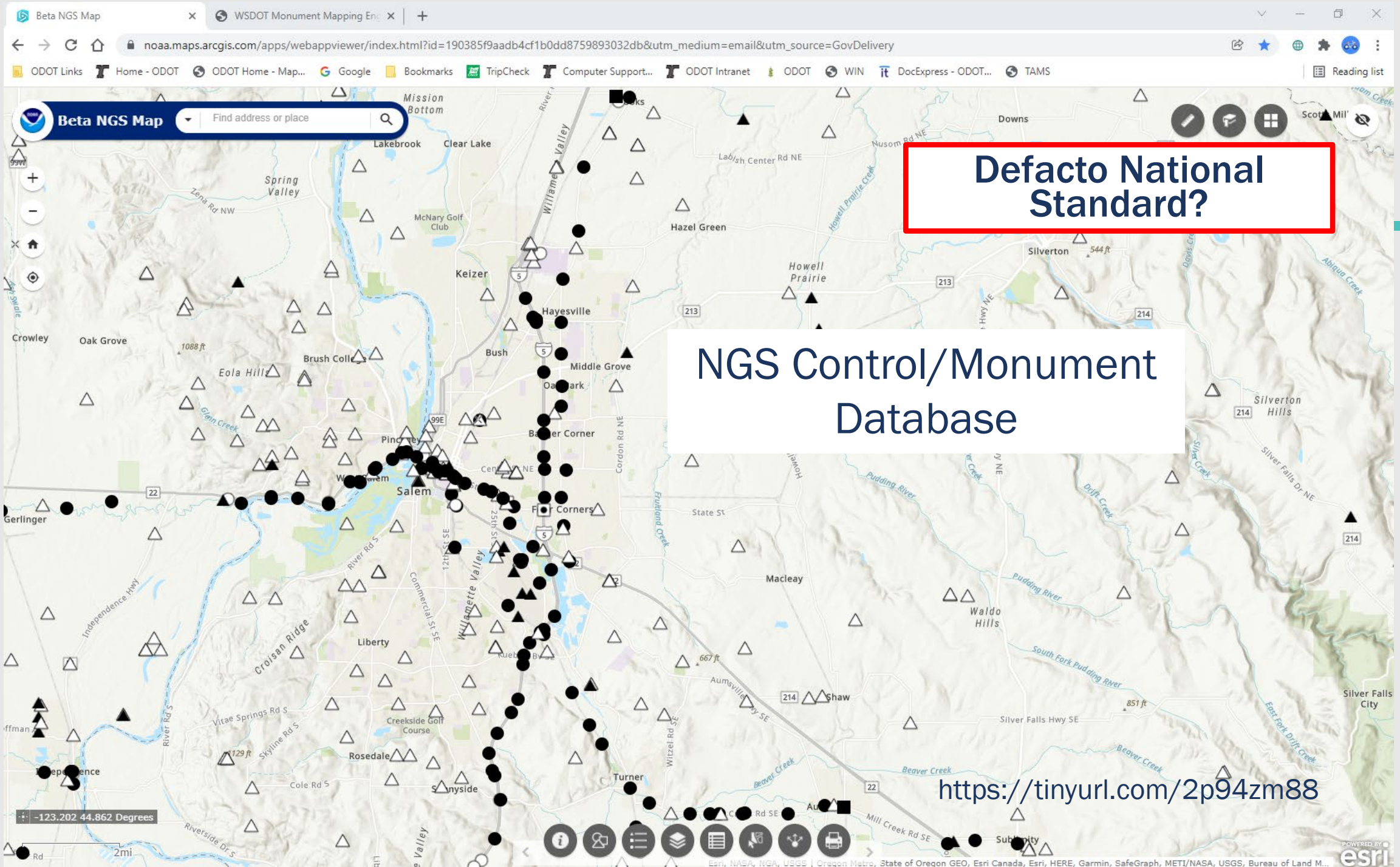
	A	B	C	D	E	F	G	H	I	J	K
1	Point Id	Point Role	X	Y	Z	Latitude	Longitude	Ellip. Heigh	Northing	Easting	Ortho. Hei
2	100	Averaged	-2459624	-3761970	4510195	45 17 28.0	123 10 37.	37.7741	26874.38	66489.77	59.6935
3	101	Averaged	-2459578	-3761904	4510273	45 17 31.6	123 10 37.	37.647	26986.24	66492.85	59.565
4	102	Averaged	-2459541	-3761869	4510323	45 17 33.9	123 10 37.	38.161	27056.95	66505.32	60.0786
5	103	Averaged	-2459528	-3761830	4510364	45 17 35.8	123 10 37.	39.103	27113.99	66495.06	61.0193
6	104	Averaged	-2459556	-3761800	4510373	45 17 36.2	123 10 39.	38.1459	27127.32	66454.52	60.0597
7	105	Averaged	-2459528	-3761737	4510441	45 17 39.3	123 10 39.	39.2869	27224.01	66444.69	61.1988
8	106	Averaged	-2459472	-3761787	4510430	45 17 38.8	123 10 36.	39.4733	27207.5	66518.32	61.3896
9	107	Averaged	-2459657	-3761661	4510435	45 17 39.0	123 10 46.	39.6132	27215.94	66294.8	61.5168
10	108	Averaged	-2459621	-3761605	4510500	45 17 42.0	123 10 46.	39.0108	27308.9	66294.6	60.913
11	109	Averaged	-2459552	-3761528	4510598	45 17 46.6	123 10 46.	36.3223	27449.85	66311.46	58.2235
12	111	Averaged	-2459489	-3761400	4510737	45 17 53.0	123 10 46.	36.1836	27647.93	66294.95	58.081
13	112	Averaged	-2459468	-3761342	4510800	45 17 55.8	123 10 47.	38.465	27735.09	66281.29	60.3605
14	113	Averaged	-2459543	-3761641	4510513	45 17 42.6	123 10 42.	39.6161	27326.33	66379.91	61.5229
15	114	Averaged	-2459495	-3761645	4510536	45 17 43.6	123 10 41.	39.5381	27357.75	66422.32	61.4469
16	115	Averaged	-2459434	-3761683	4510538	45 17 43.7	123 10 37.	39.9574	27360.8	66494.44	61.8702
17	116	Averaged	-2459462	-3761747	4510470	45 17 40.6	123 10 37.	39.9443	27263.31	66505.16	61.8591
18	117	Averaged	-2459587	-3761710	4510432	45 17 38.9	123 10 42.	39.6094	27211.16	66380.07	61.5178
19	118	Averaged	-2459630	-3761755	4510367	45 17 36.0	123 10 43.	36.7301	27121.84	66368.27	58.6391
20	119	Averaged	-2459683	-3761720	4510369	45 17 36.0	123 10 46.	37.9603	27123.55	66304.7	59.8657
21	120	Averaged	-2459745	-3761590	4510445	45 17 39.5	123 10 52.	39.1734	27230.91	66182.16	61.0703
22	124	Averaged	-2459487	-3761588	4510587	45 17 46.0	123 10 42.	38.8687	27431.34	66398.04	60.775
23	999	Averaged	-2459495	-3761417	4510720	45 17 52.2	123 10 46.	36.1248	27623.91	66298.6	58.0228
24	U98	Averaged	-2459464	-3761777	4510443	45 17 39.4	123 10 36.	39.7216	27225.4	66519.8	61.6377
25											
26											



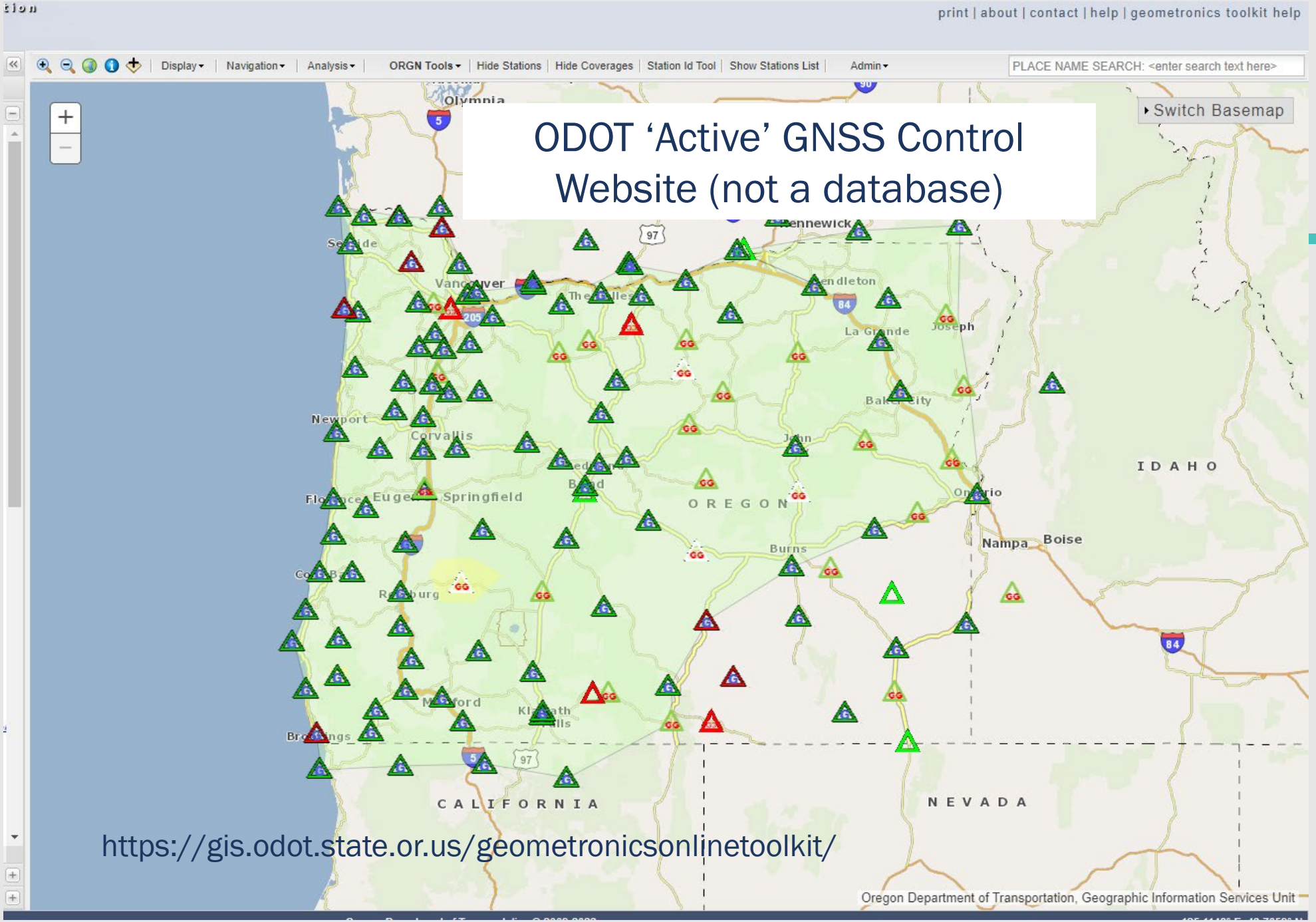
Washington State DOT Control Database

https://www.wsdot.wa.gov/Monument/gis/index.html


SURVEY CONTROL FINDER
Station Condition Report
Help
Feedback
About
Layers
0 saved
Terrain
Satellite
NGS/HMP 0
County 0
USGS 0
CORS 0
PLSS 0
Remove all saved records
Export Options
County / Township Search
More Inspiration!
Wisconsin Statewide Control/Monument Database
https://maps.sco.wisc.edu/surveycontrolfinder/#8/44.483/-89.745/NGS,county,USGS,CORS/terrain


Beta NGS Map
Find address or place
Defacto National Standard?
NGS Control/Monument Database
https://tinyurl.com/2p94zm88
-123.202 44.862 Degrees
Salem
Keizer
Hayesville
Bush
Middle Grove
Hazel Green
Howell Prairie
Silverton
Downs
Macleay
Waldo Hills
Silverton Hills
Silver Falls City
Shaw
Turner
Rosedale
Liberty
Creekside Golf Course
McNary Golf Club
Lakebrook
Clear Lake
Spring Valley
Crowley
Oak Grove
Eola Hills
Gerlinger
Croisan Ridge
Pudding River
South Fork Pudding River
Beaver Creek
Mill Creek Rd SE
Silver Falls Hwy SE
Esri, NASA, NGA, USGS | Oregon Metro, State of Oregon GEO, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, Bureau of Land M...

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



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

How are we running the project?

- 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!

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ODOT ENGINEERING AUTOMATION

Oregon State University

Beta Web Interface

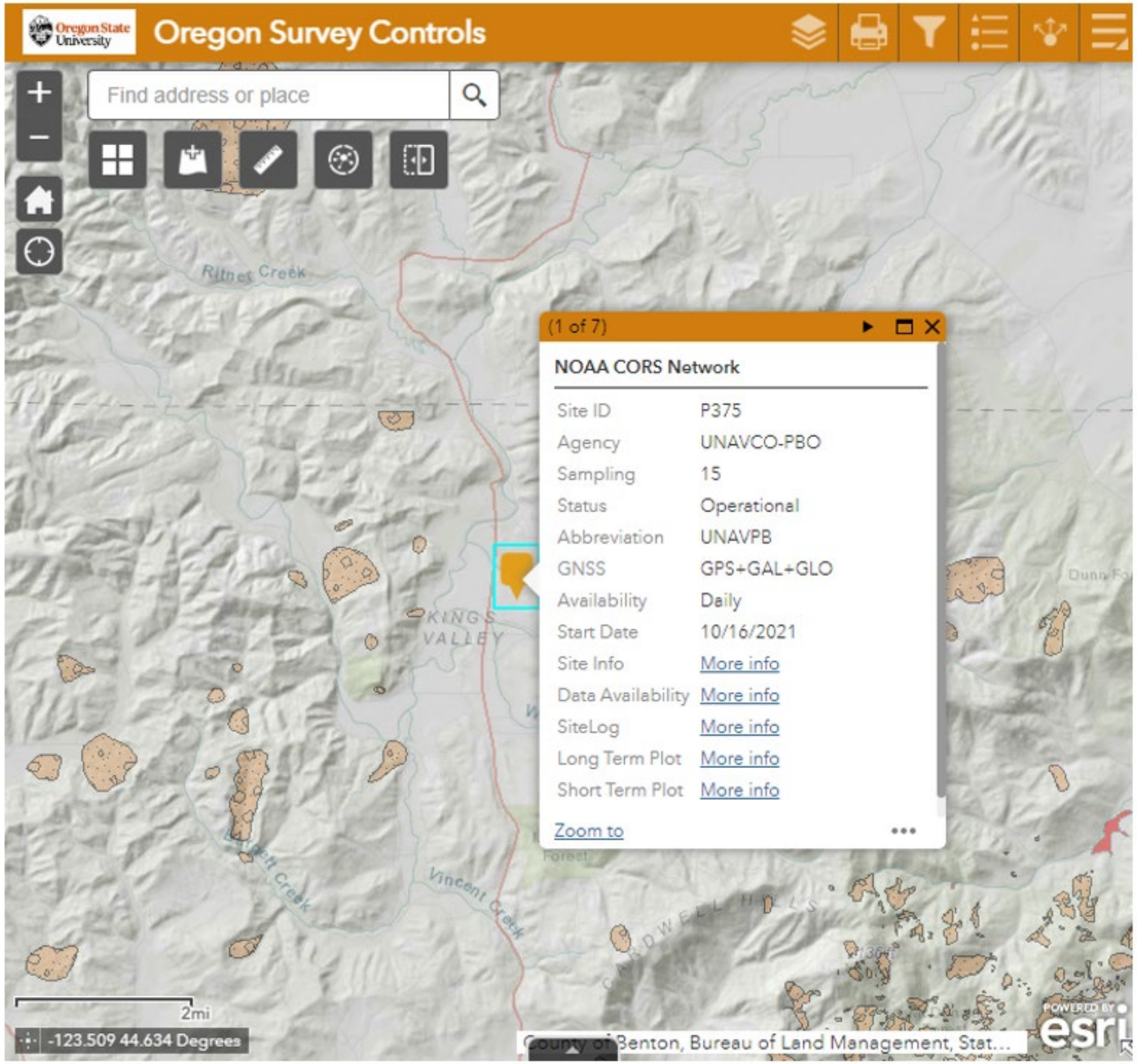
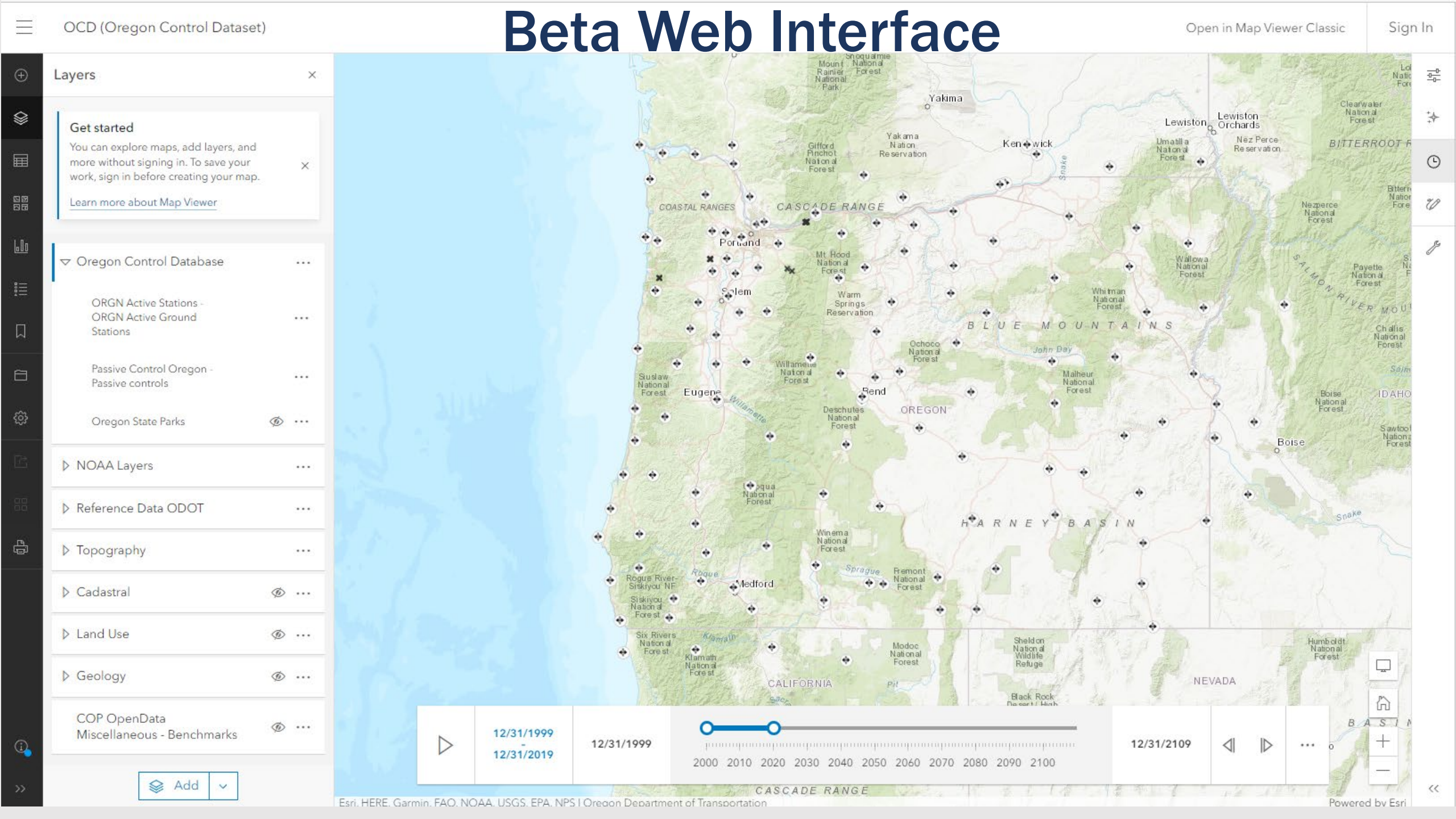


Figure 3-1: Screenshot of the Oregon Control Database WebApp Prototype Interface.

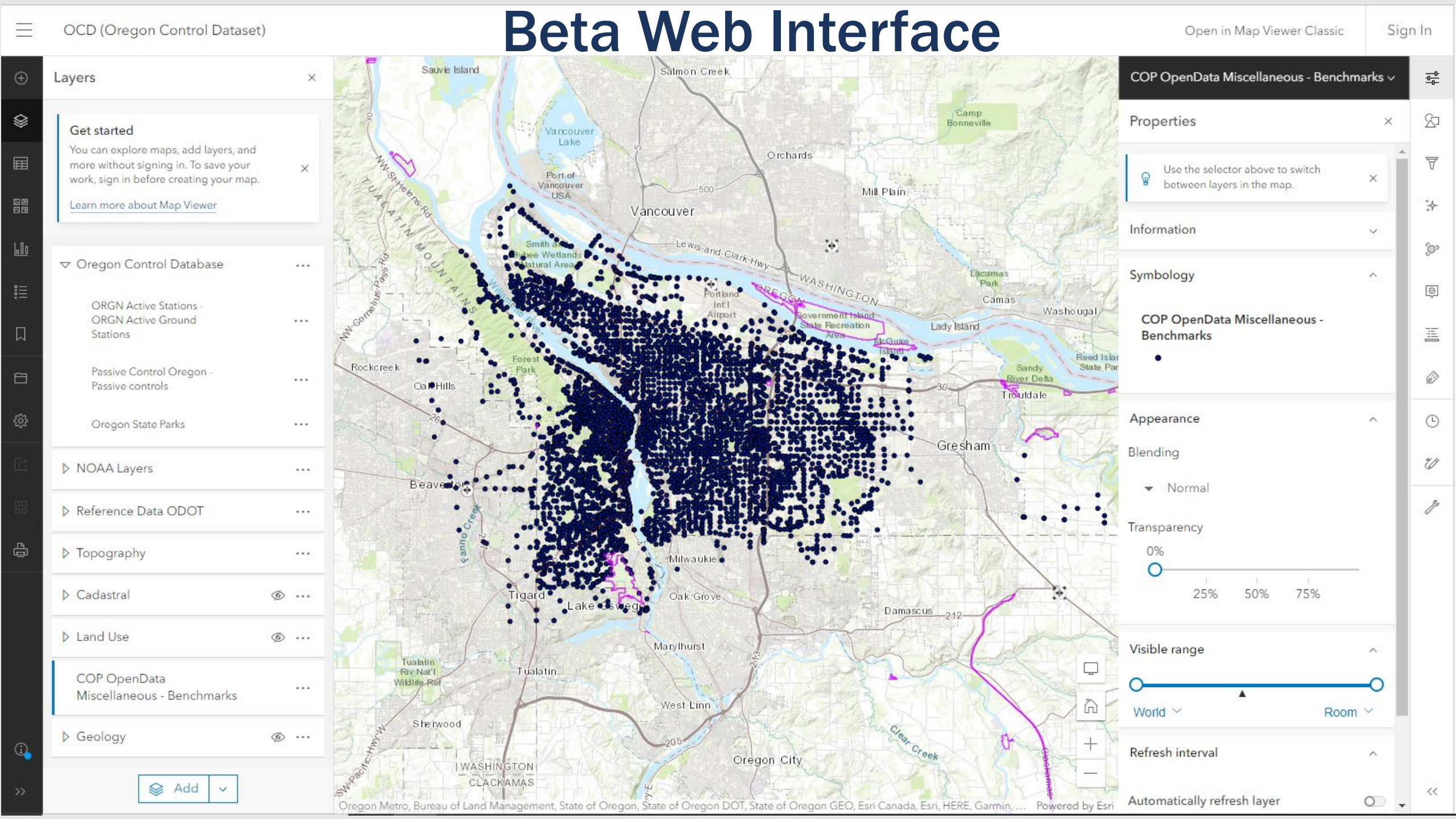
Table 2.1: Data fields to be incorporated in database for the passive control layer in the proposed Survey Control Database.

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

Beta Web Interface



Beta Web Interface



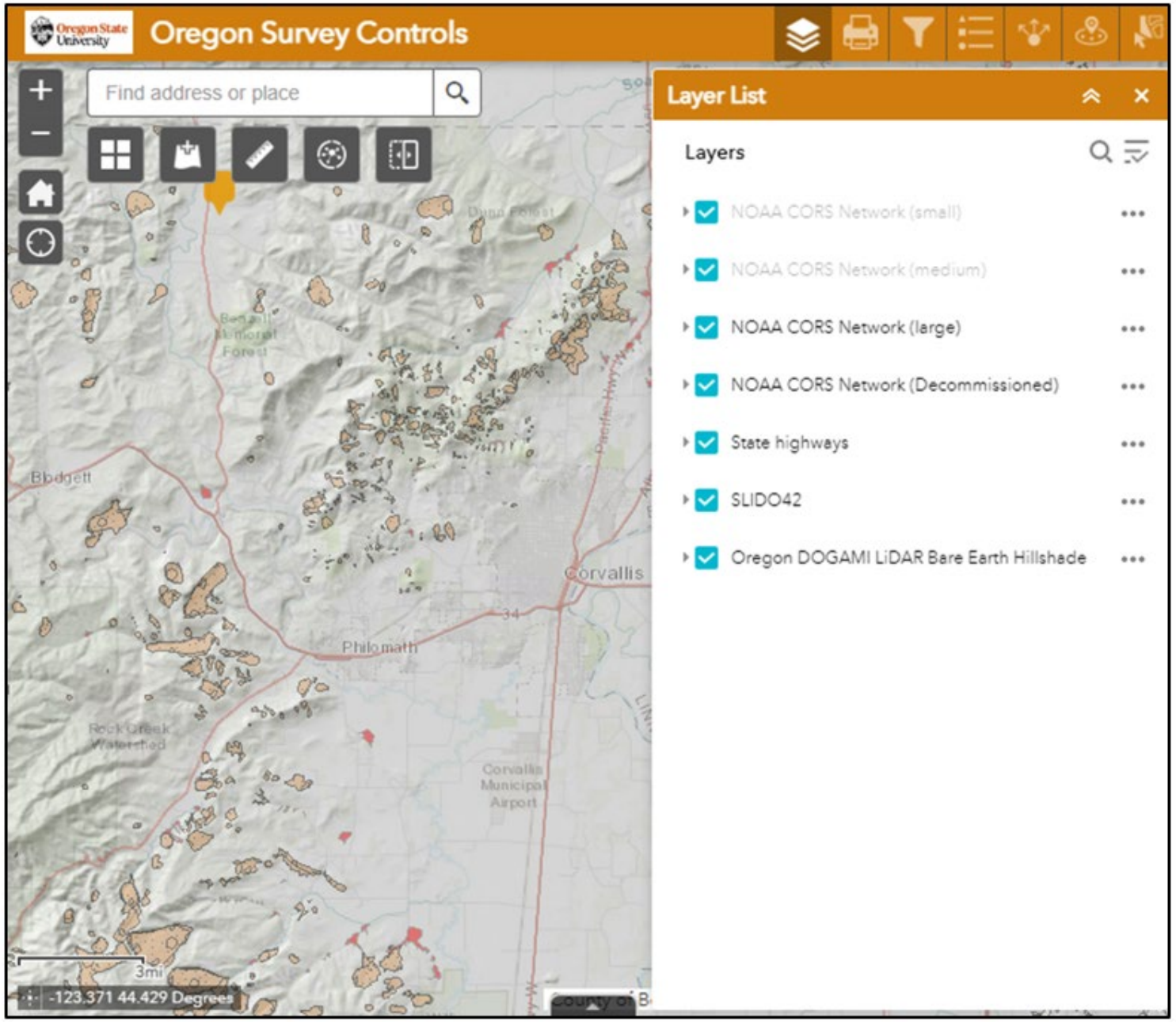


Figure 3-9: Screenshot showing layer list widget.

Beta Web Interface

Ability to display other data layers

Other potential data layers

- 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!

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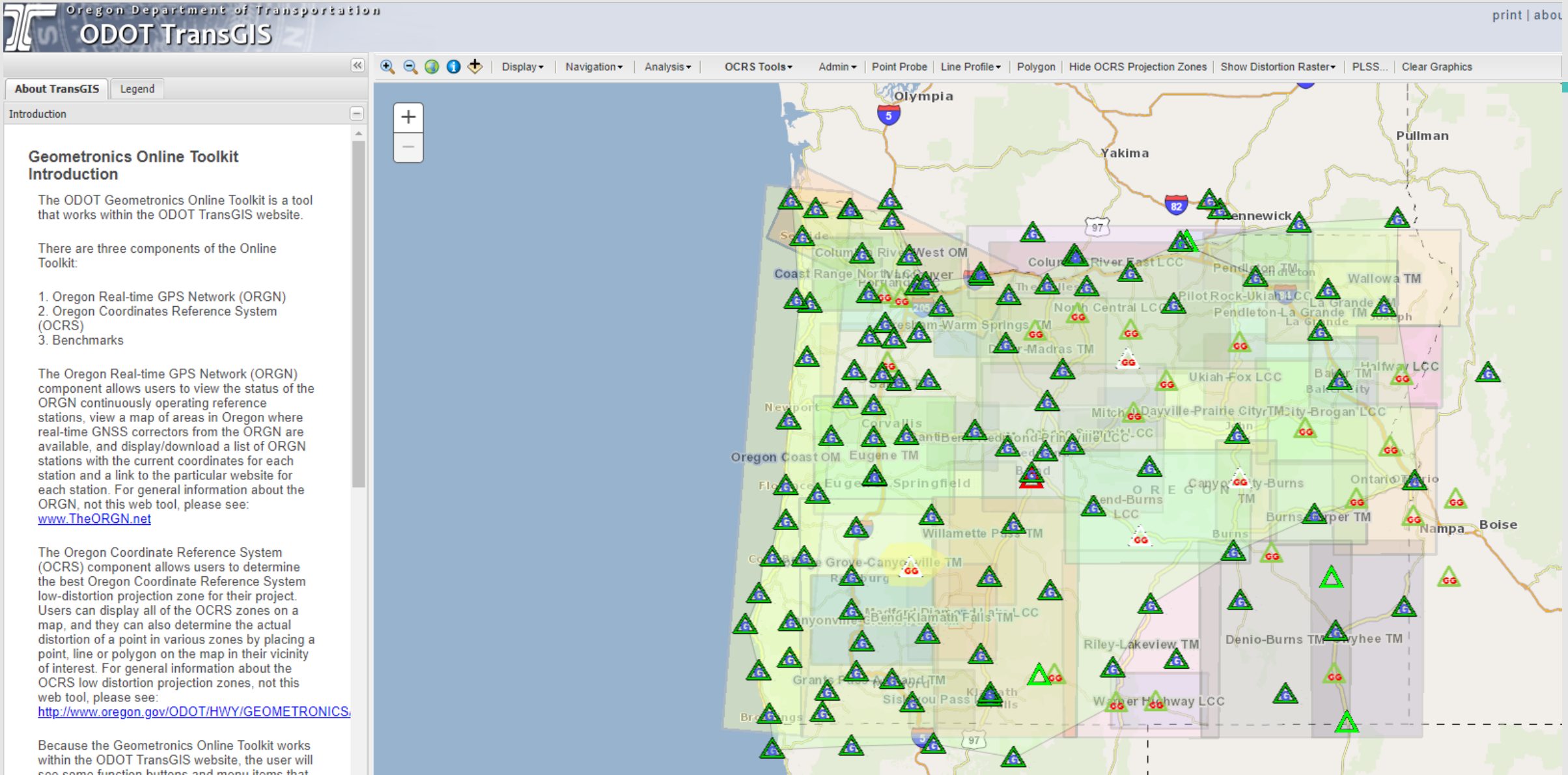
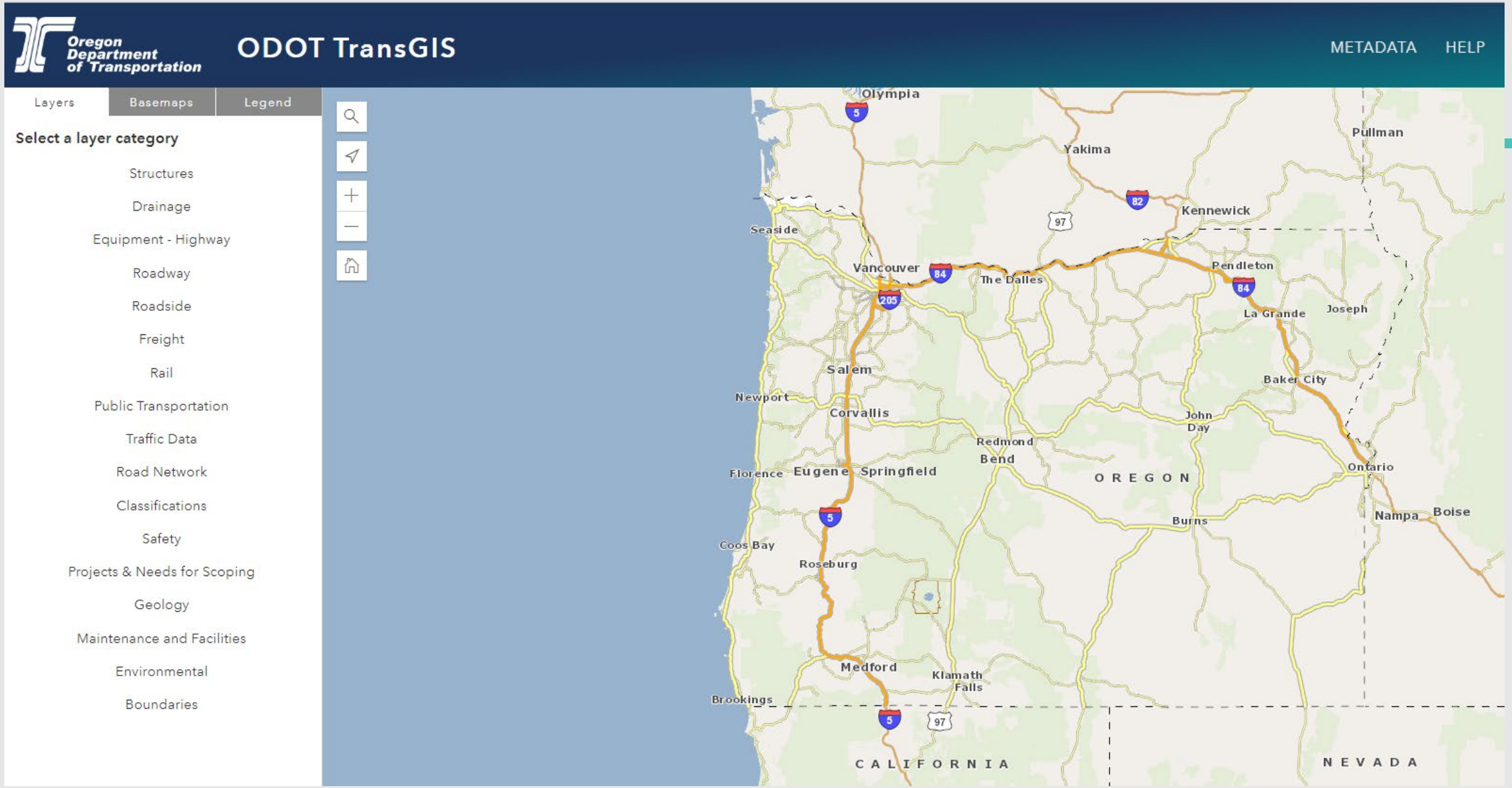
Merge everything from this webpage…

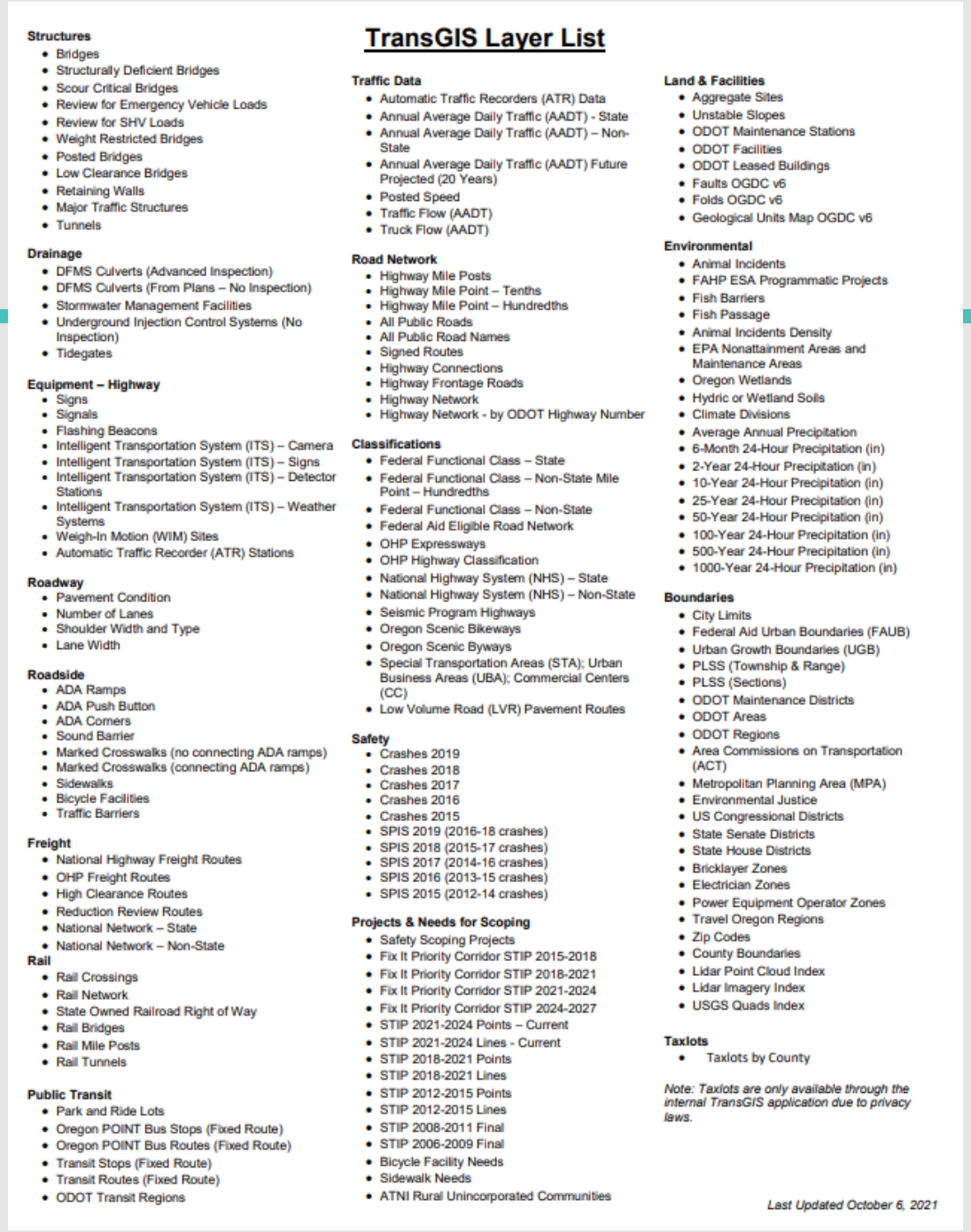


Link to all the standard ODOT data...



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.



TransGIS Layer List

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

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 – Tenths
- 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.

Last Updated October 6, 2021

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‘Automated’ Process from data to database

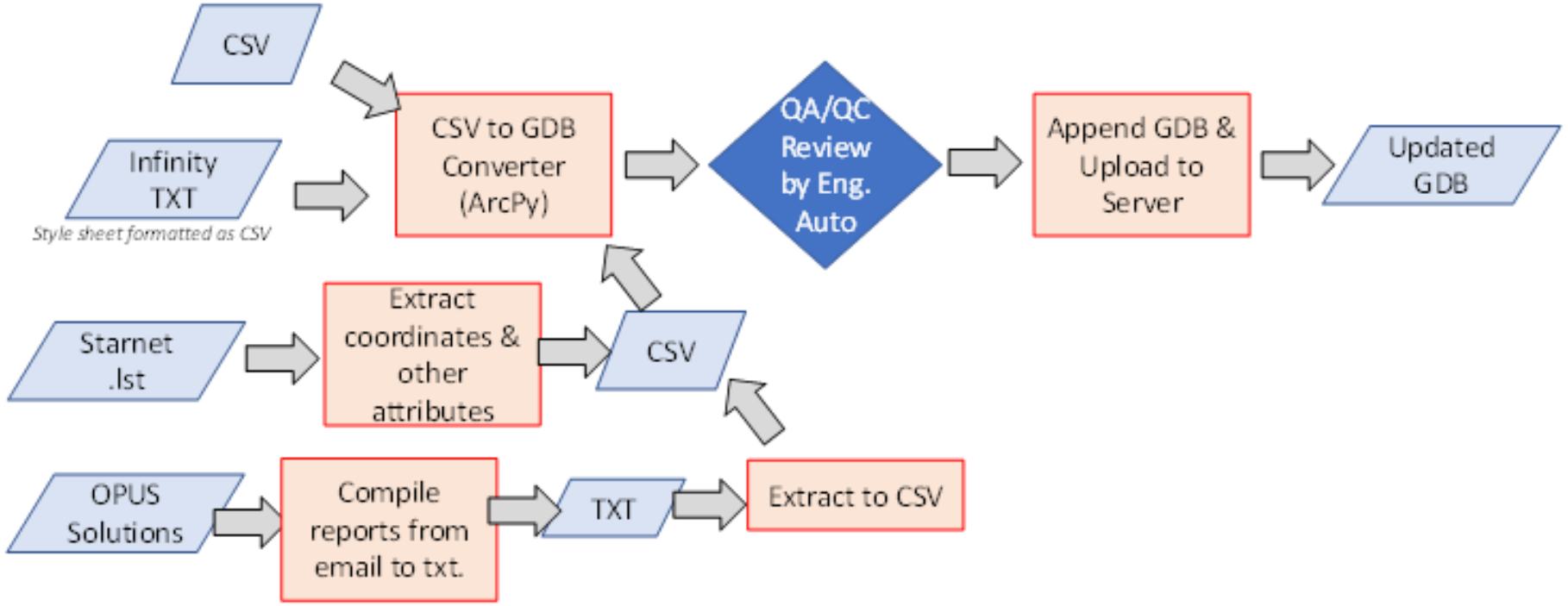

Figure 4-1: Workflow and scripts to convert data outputs from different processing packages into the geodatabase (GDB)

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

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METADATA!!

- 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?

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Timeline

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

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What am I missing?

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

Alexander Graham Bell

Oregon Department of Transportation

Questions?

Chris Pucci, PLS

Senior Surveyor

ODOT Region 1

Christopher.Pucci@odot.oregon.gov

Phone:503-302-5474

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