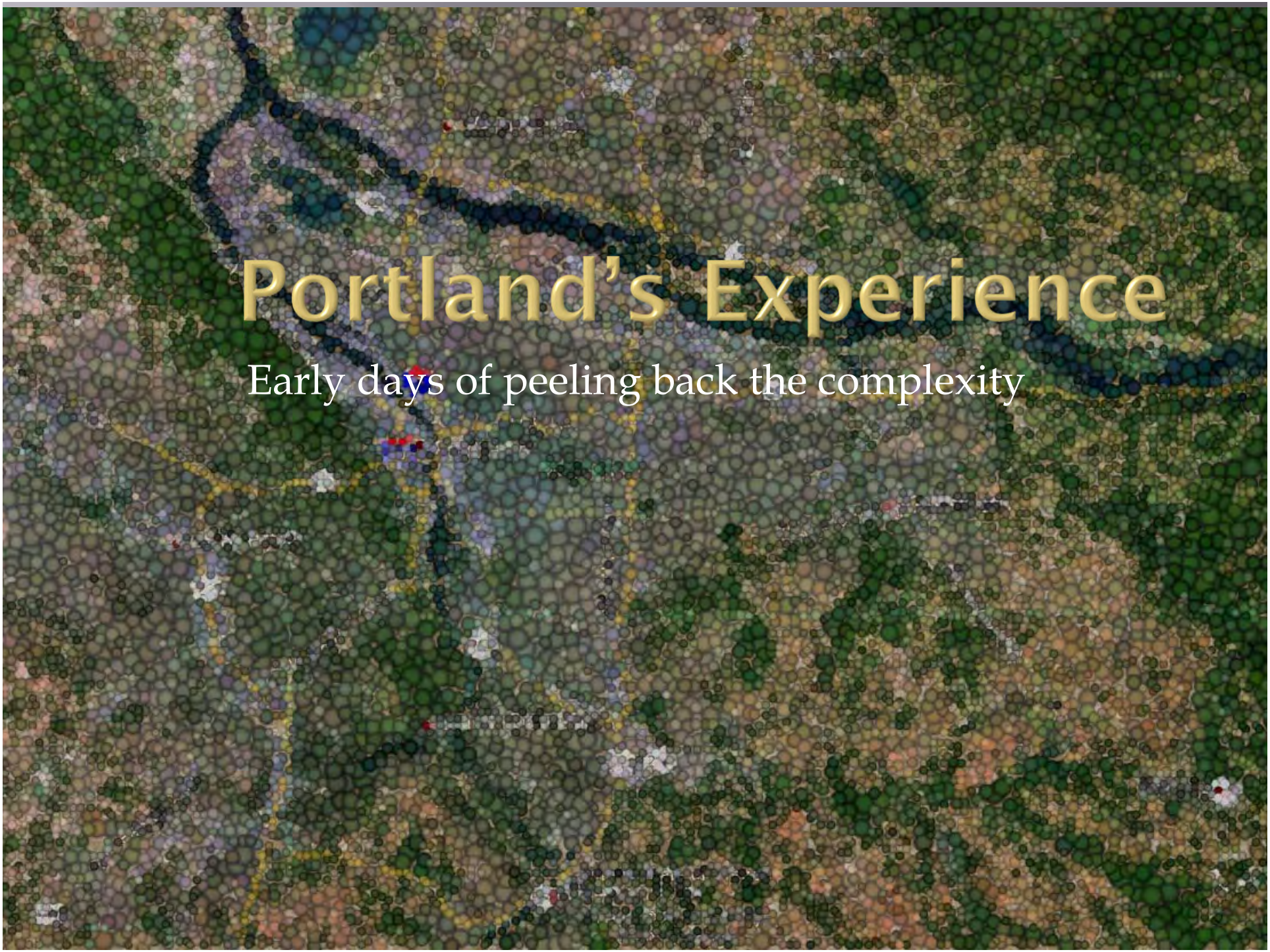
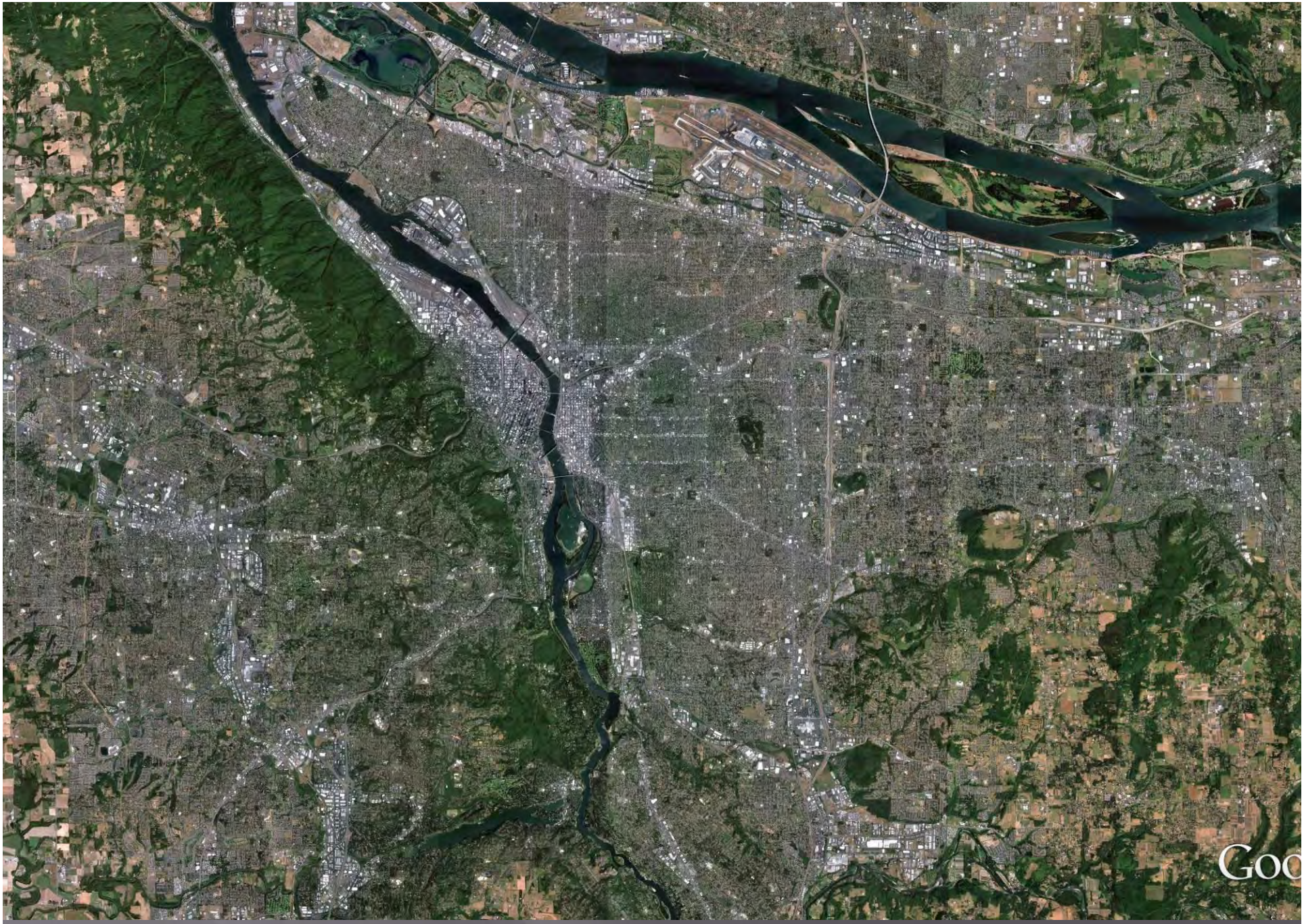
PEELING BACK THE URBAN LANDSCAPE:

COMPLEXITY AND ITS IMPACT ON THE PLANNING AND MANAGEMENT OF A MUNICIPALITY'S INFRASTRUCTURE AND NATURAL RESOURCES

Mark A. Liebe, P.E., Ph.D., CSM
City of Portland – Bureau of Environmental Services

September 27, 2019


Portland's Experience
Early days of peeling back the complexity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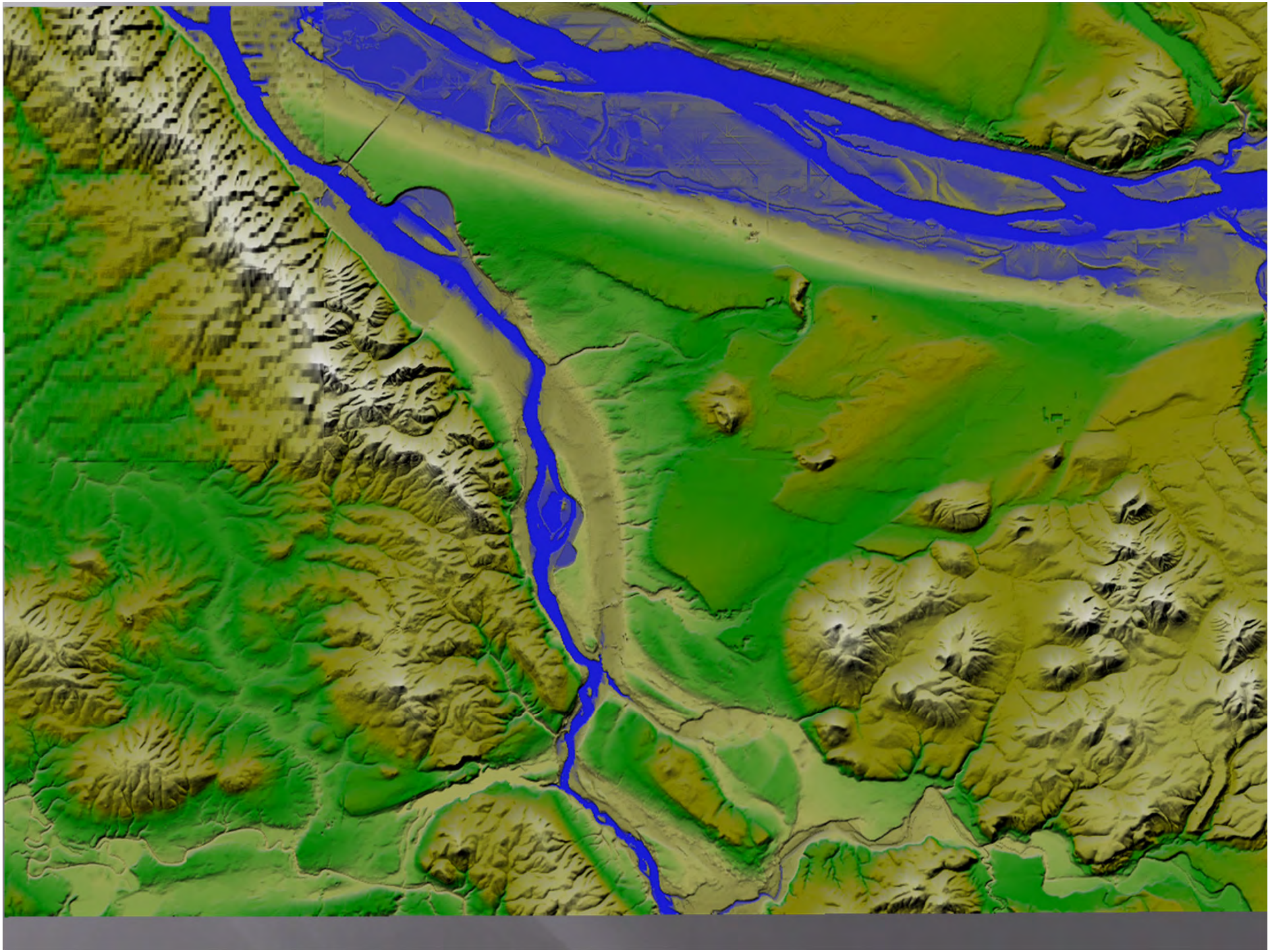

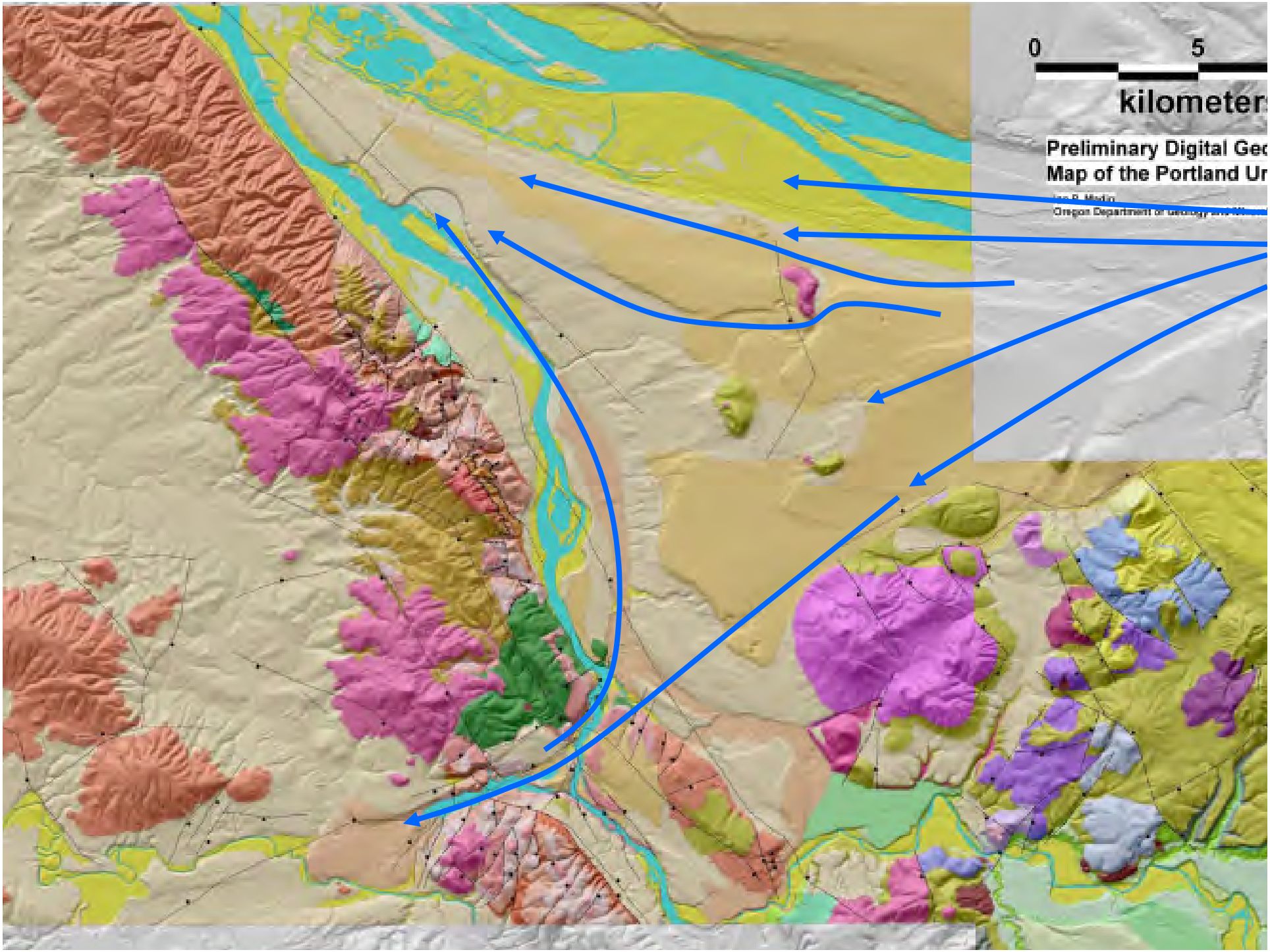
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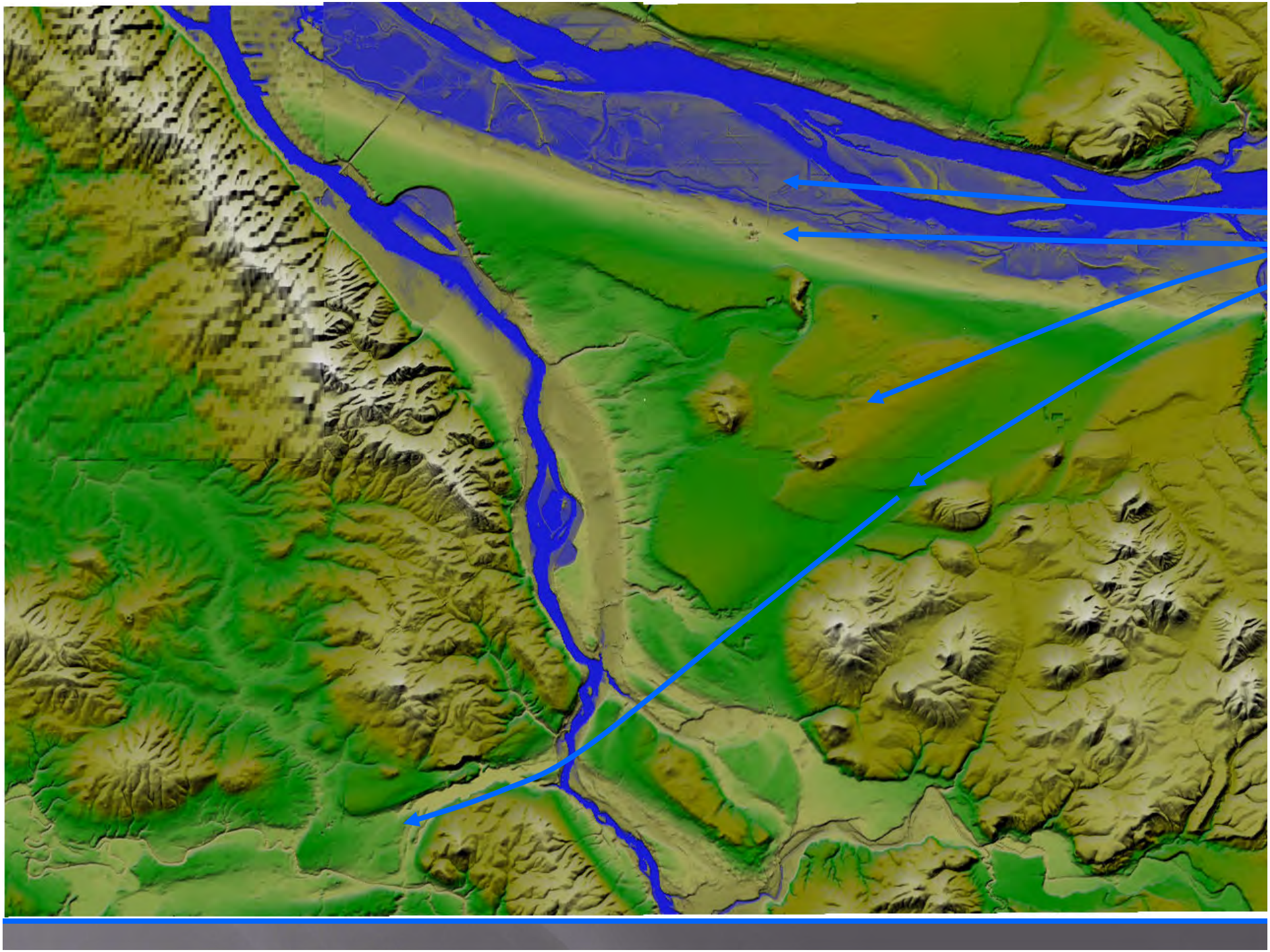

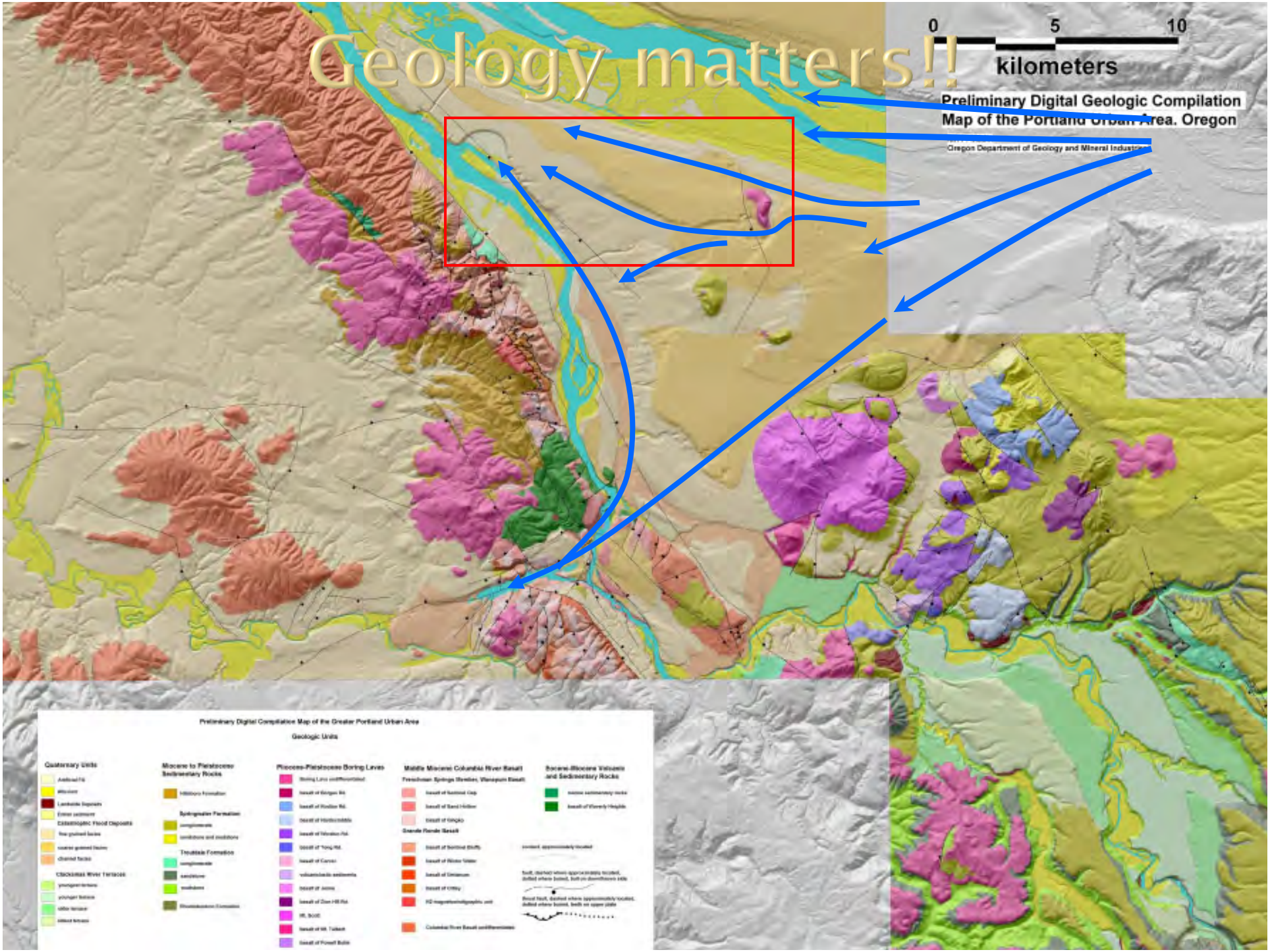
Geology matters!!
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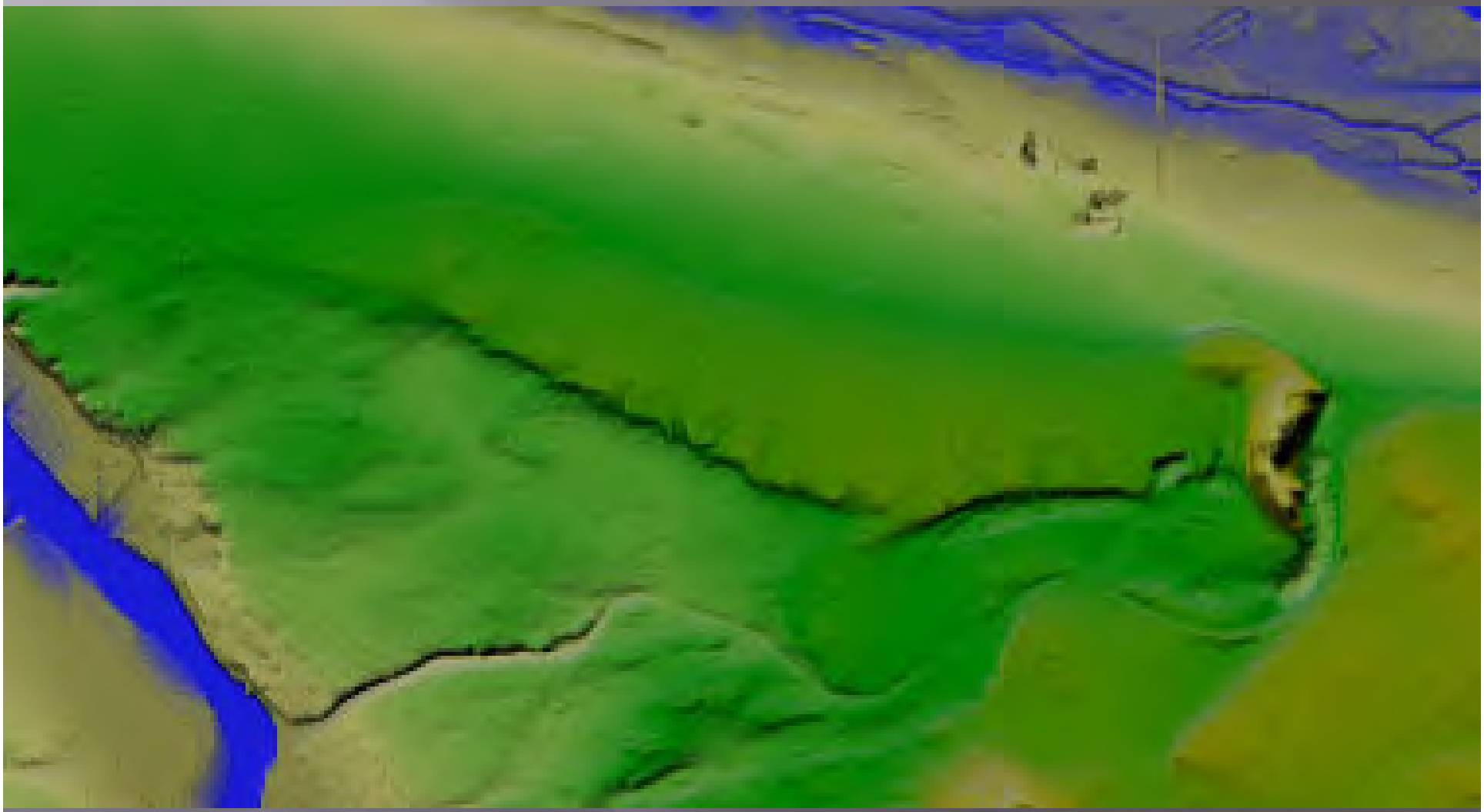
Preliminary Digital Geologic Compilation
Map of the Portland Urban Area, Oregon
Oregon Department of Geology and Mineral Industries
Preliminary Digital Compilation Map of the Greater Portland Urban Area
Geologic Units
Quaternary Units
Miocene to Pleistocene Sedimentary Rocks
Pliocene-Pleistocene Boring Lavas
Middle Miocene Columbia River Basalt
Eocene-Miocene Volcanic and Sedimentary Rocks

Alameda Ridge



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CrystalSprings
SW Barbur Blvd
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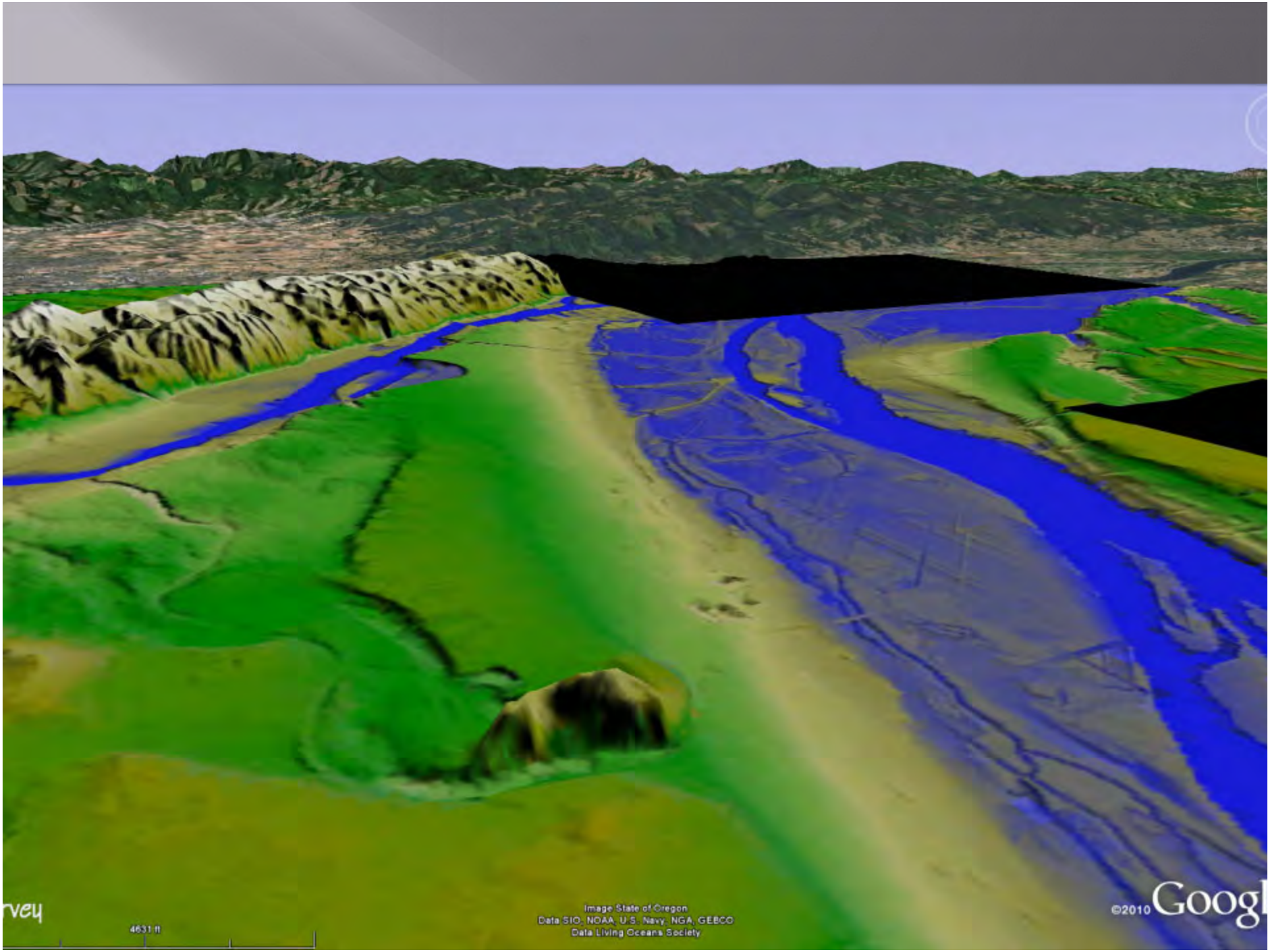
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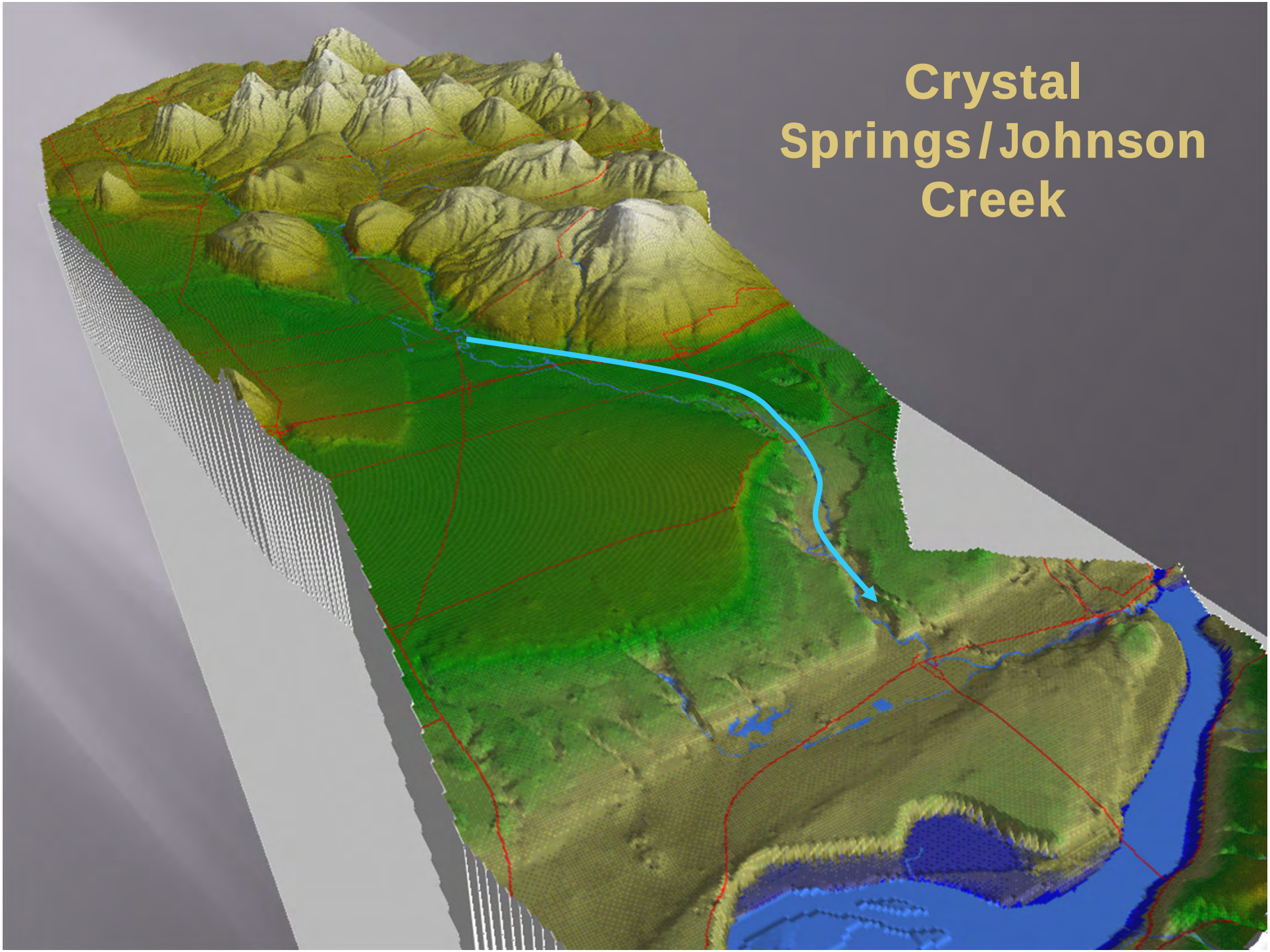
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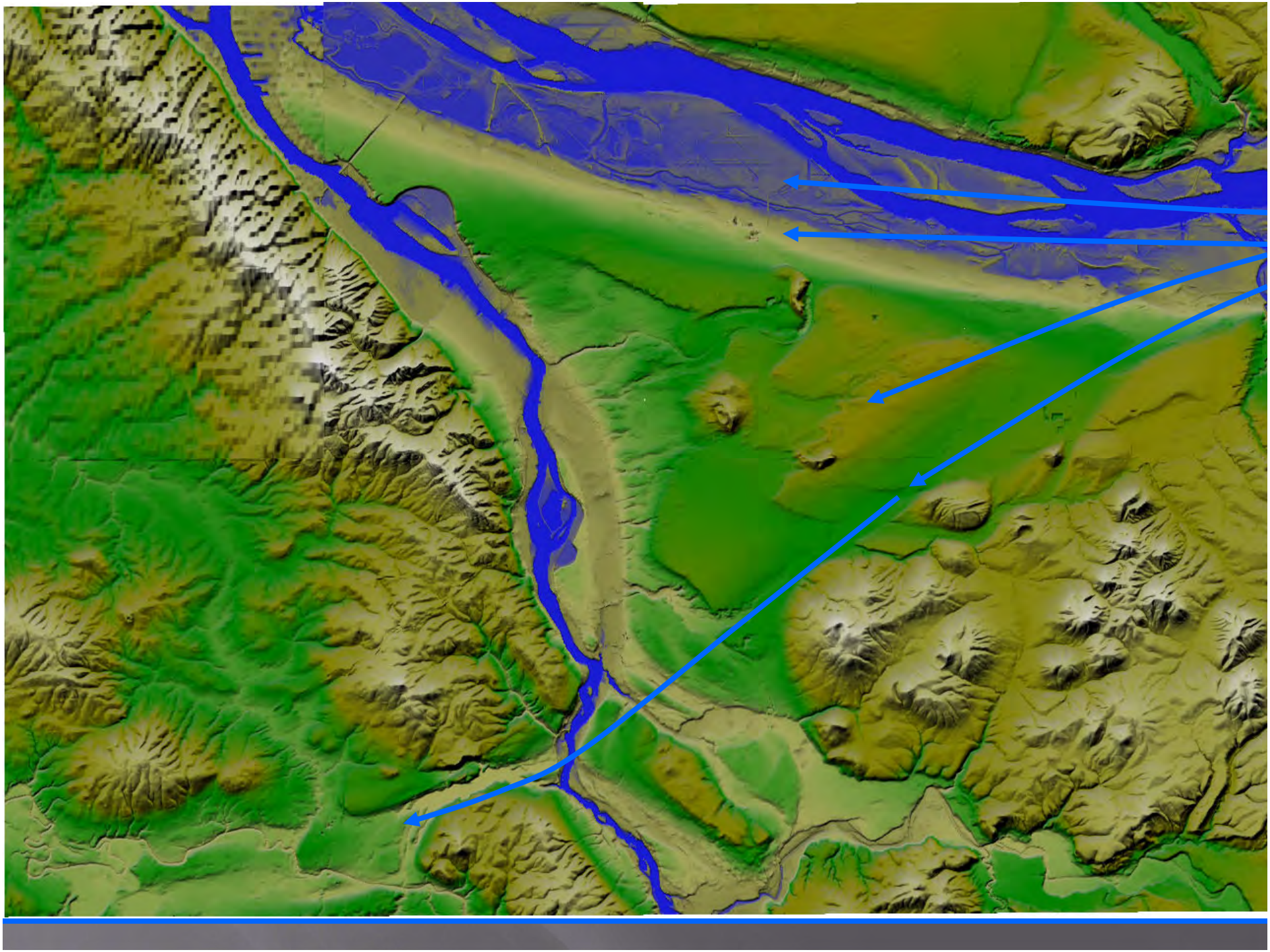
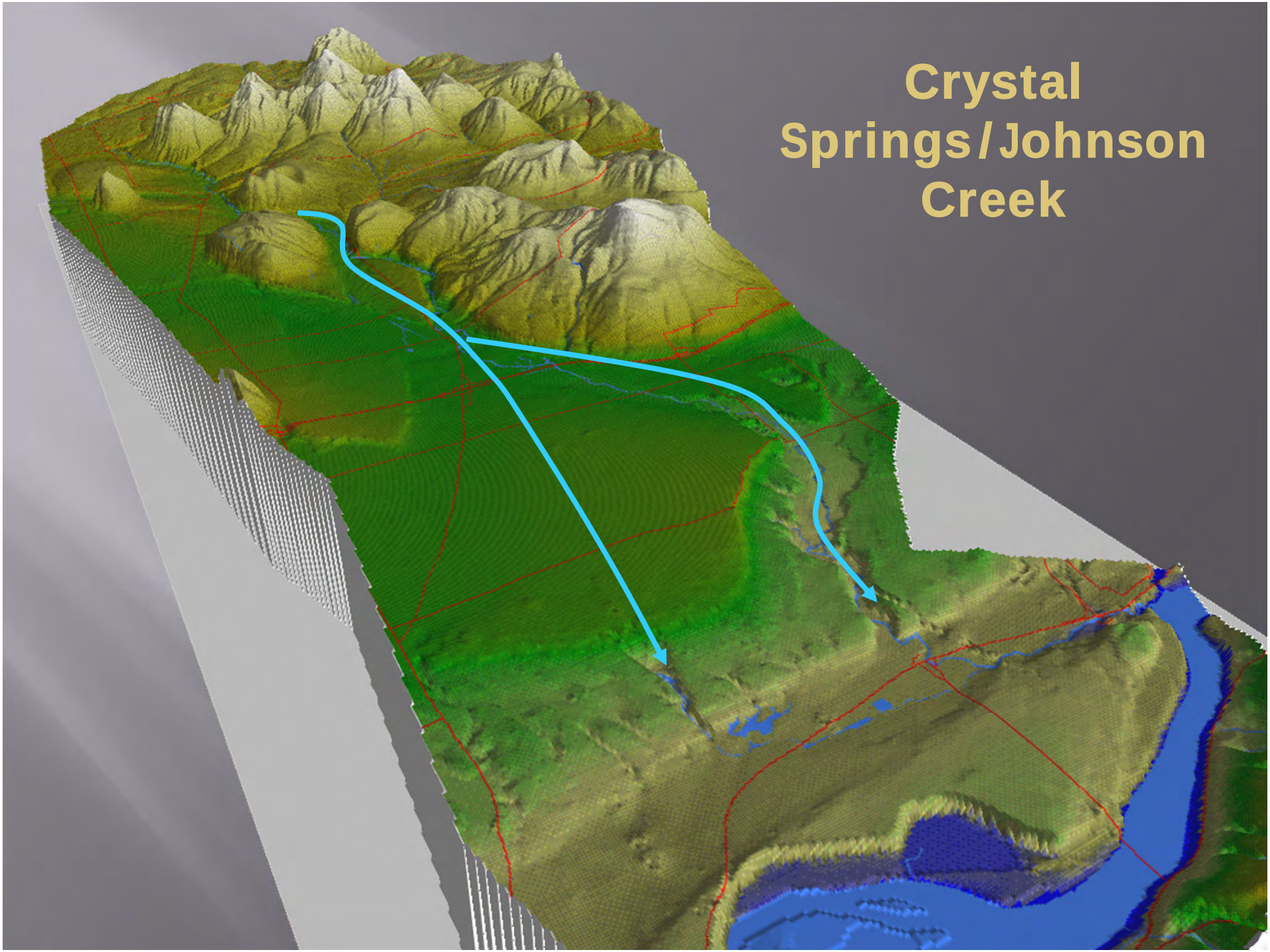
Creek

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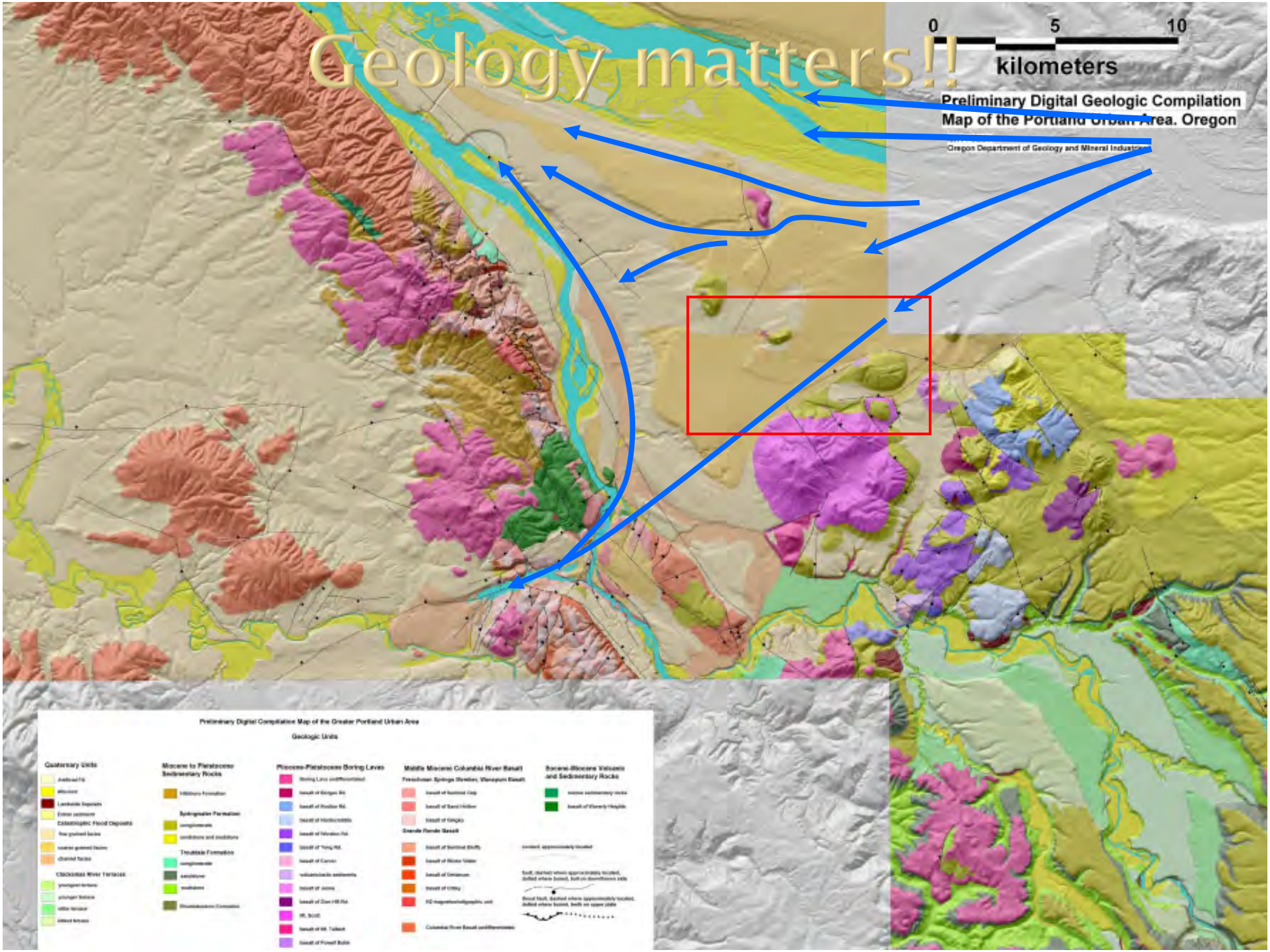
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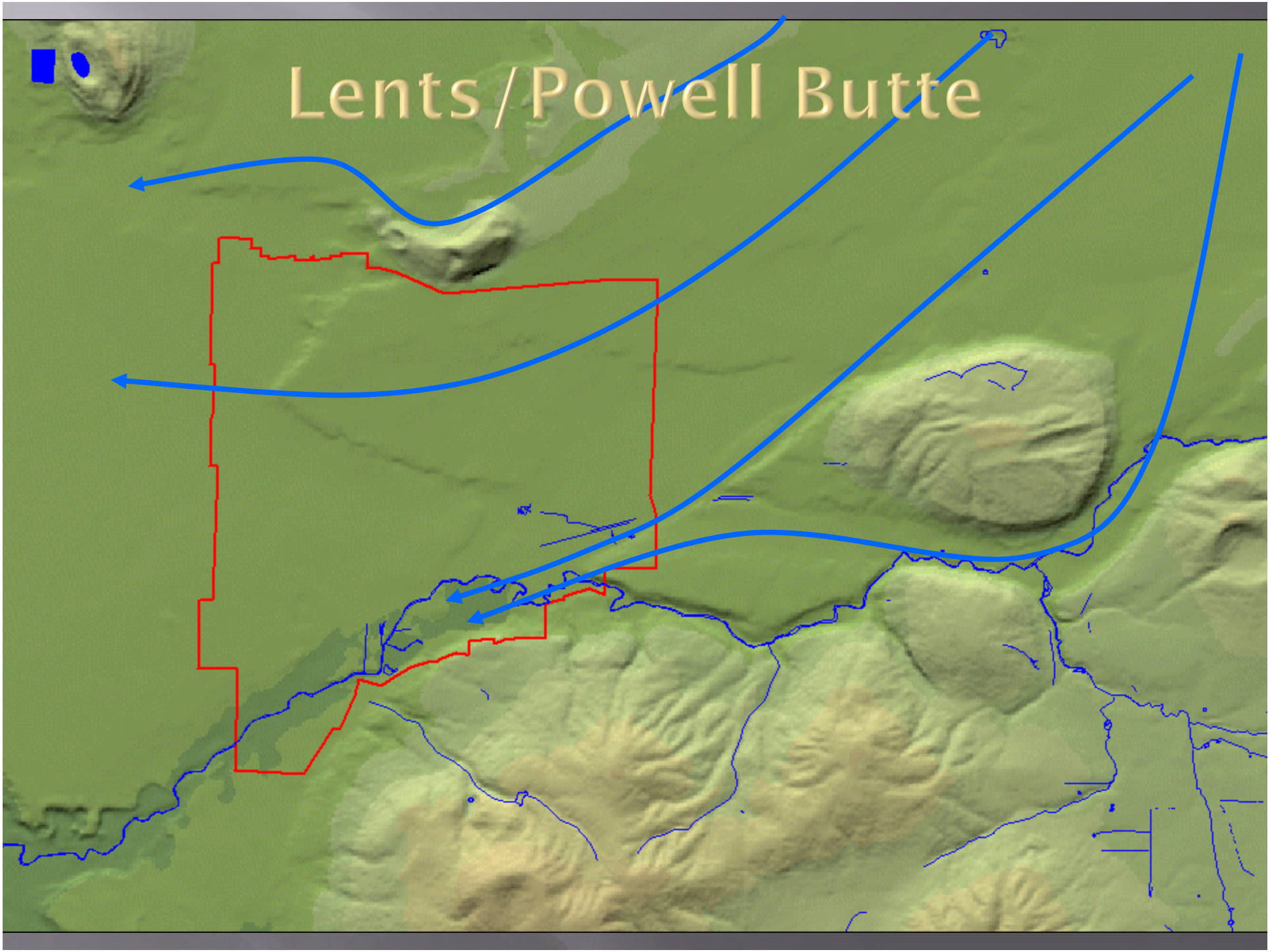
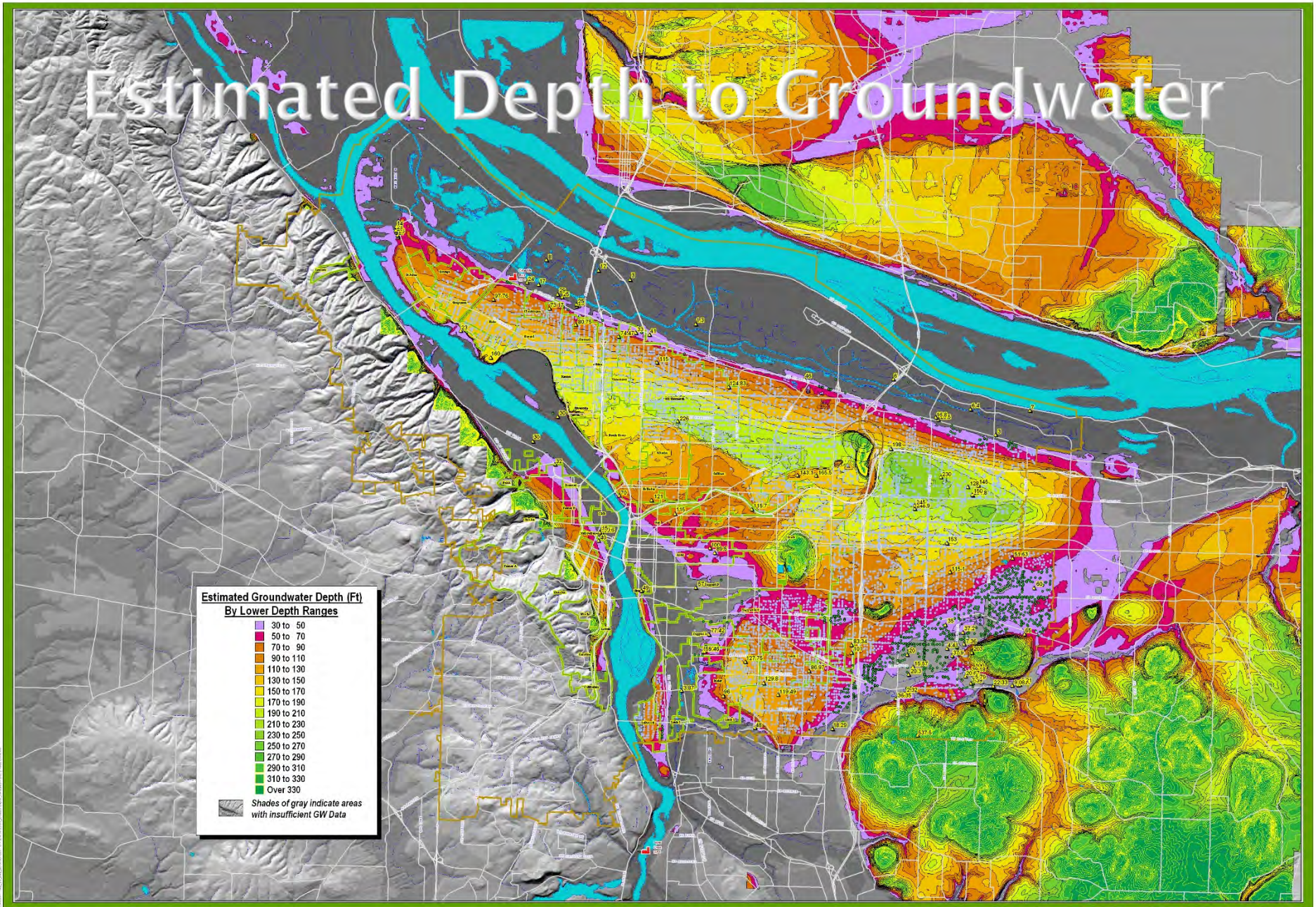

Lents/Powell Butte

Estimated Depth to Groundwater



LEGEND

Columbia Blvd Wastewater Treatment Plant

Cobsail Legend

aterial Legend

city_Sib Legend

city_Mb Legend

Sump Location by Depth to GW

USGS Monitoring Well Data

Depth to groundwater (ft)

Well location

Notes on Map:

Groundwater depth contours derived from City of Portland Water Bureau groundwater flow model use for well head protection, USGS monitoring well data for the Johnson Creek area, and USGS 10-meter DTM data;

This data is approximate from numerical modeling and portions are from seasonal maximums from actual measured data.

Estimated Depth to Groundwater

N W E S

0 3000 6000 9000 ft

CITY OF PORTLAND
Bureau of Environmental Services

Description:
Map showing depth to groundwater contours for certain areas of City of Portland and surrounding county.

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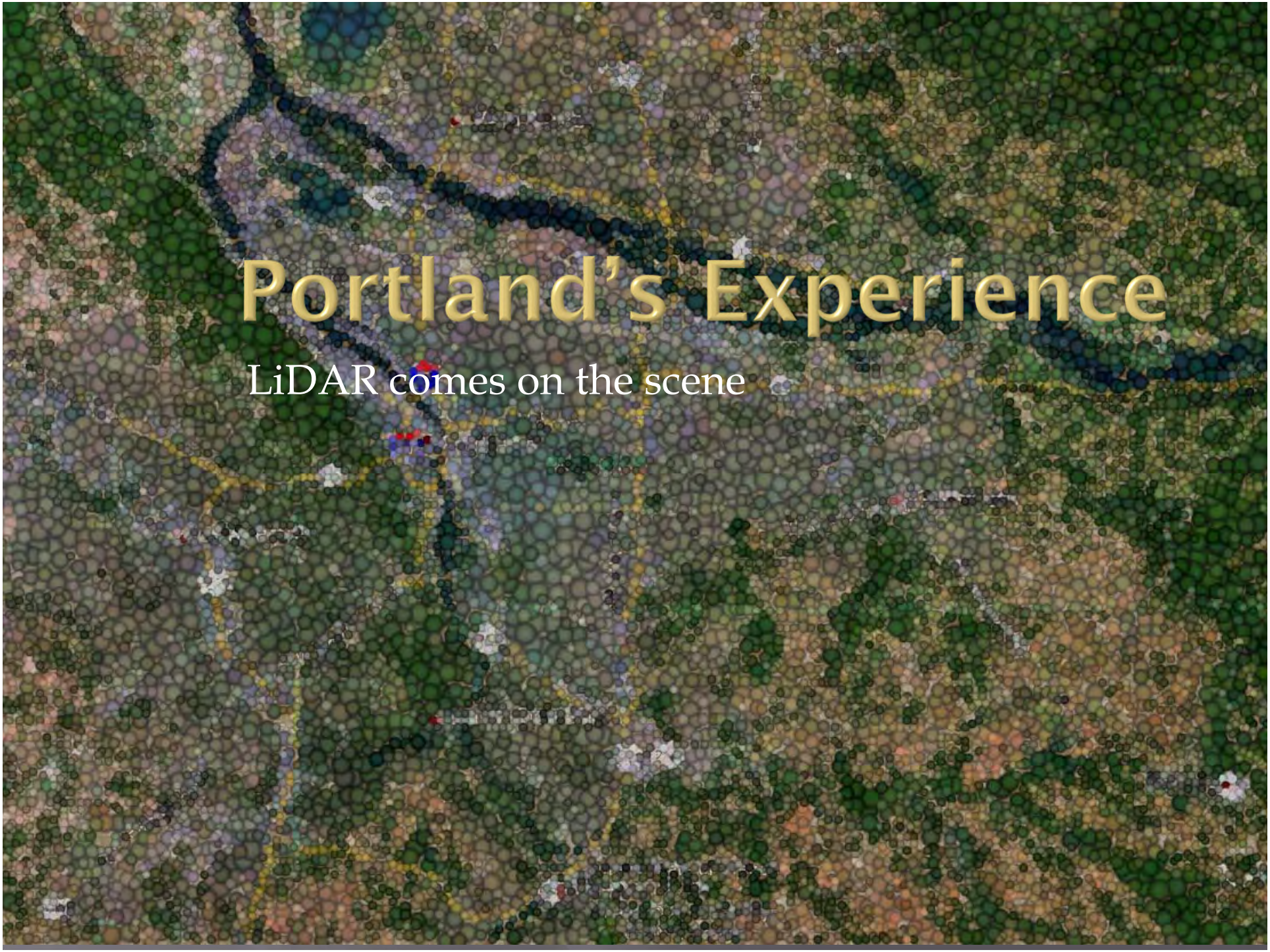
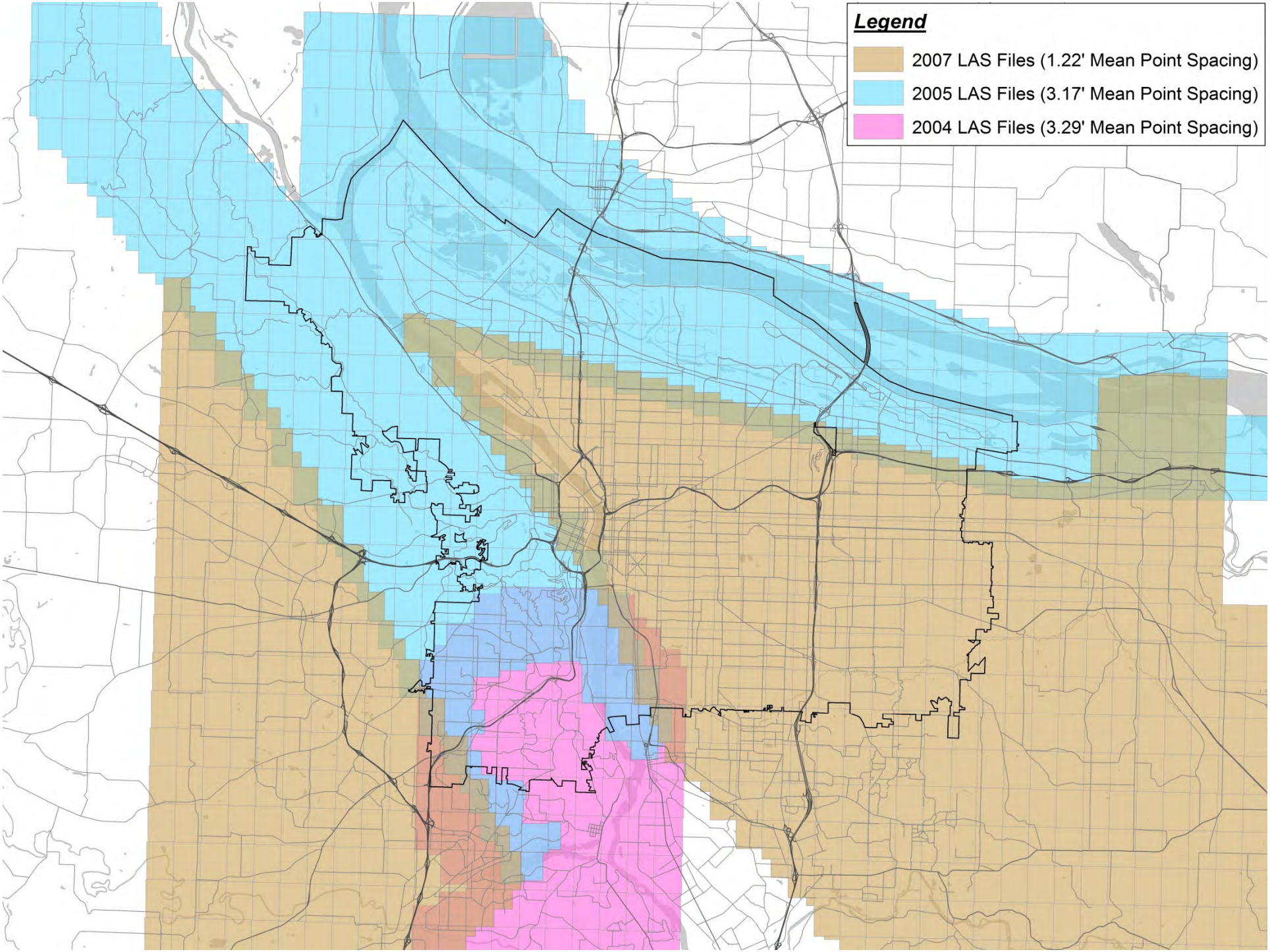
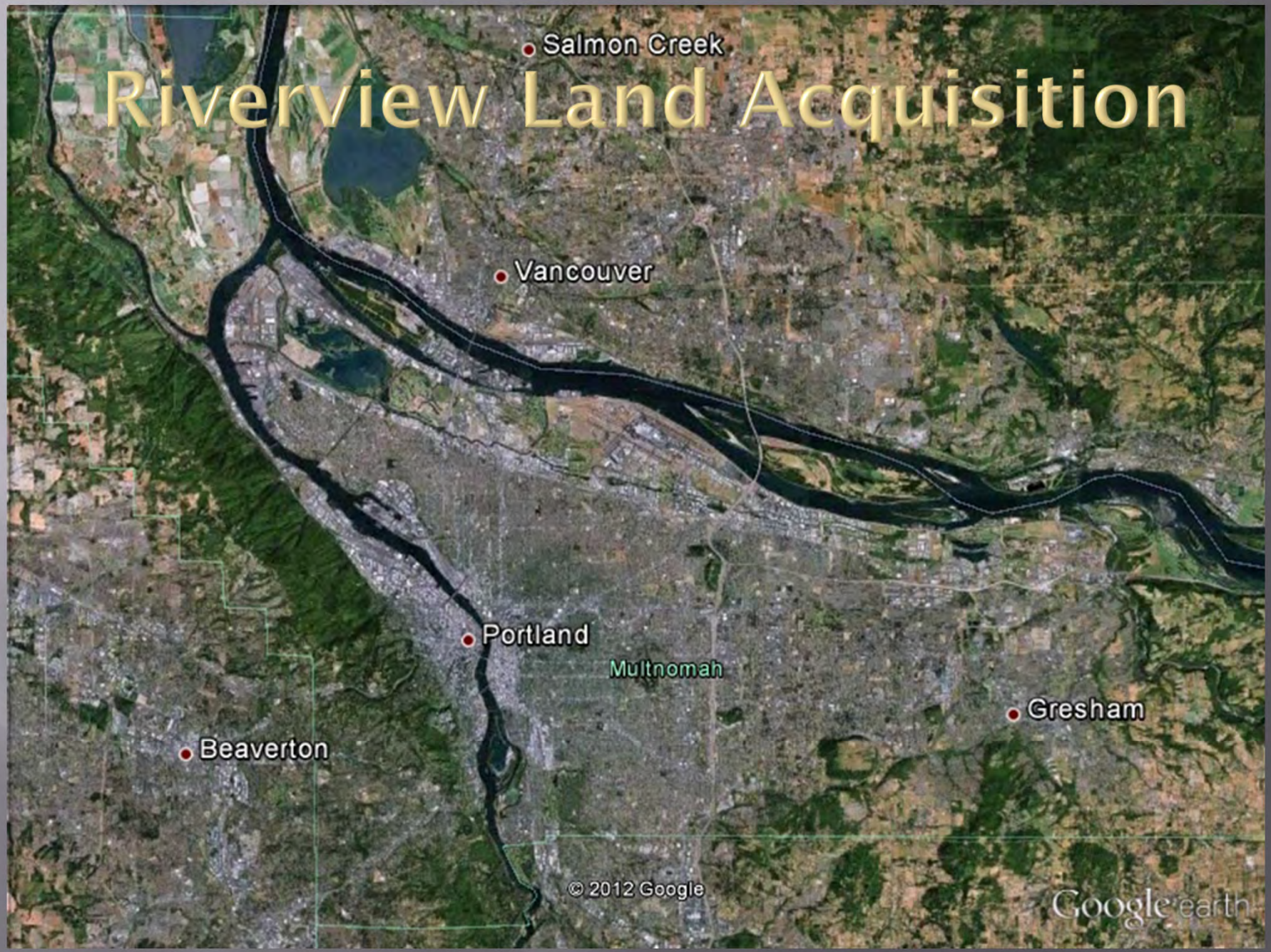
Systems Analysis

Date Printed:
A11 February 26, 2003


Portland's Experience
LiDAR comes on the scene


Legend
2007 LAS Files (1.22' Mean Point Spacing)
2005 LAS Files (3.17' Mean Point Spacing)
2004 LAS Files (3.29' Mean Point Spacing)


Riverview Land Acquisition
Salmon Creek
Vancouver
Portland
Multnomah
Gresham
Beaverton
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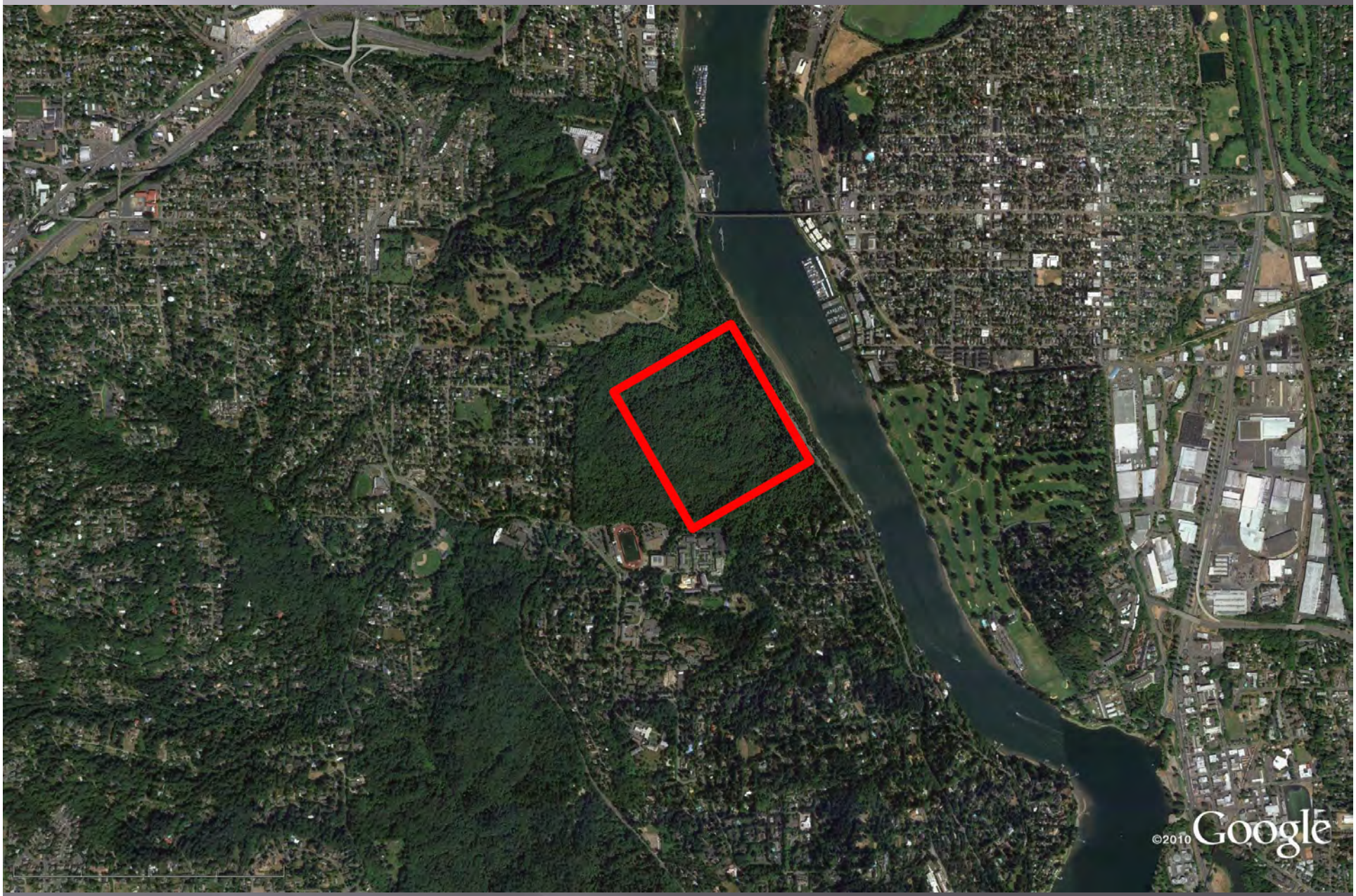
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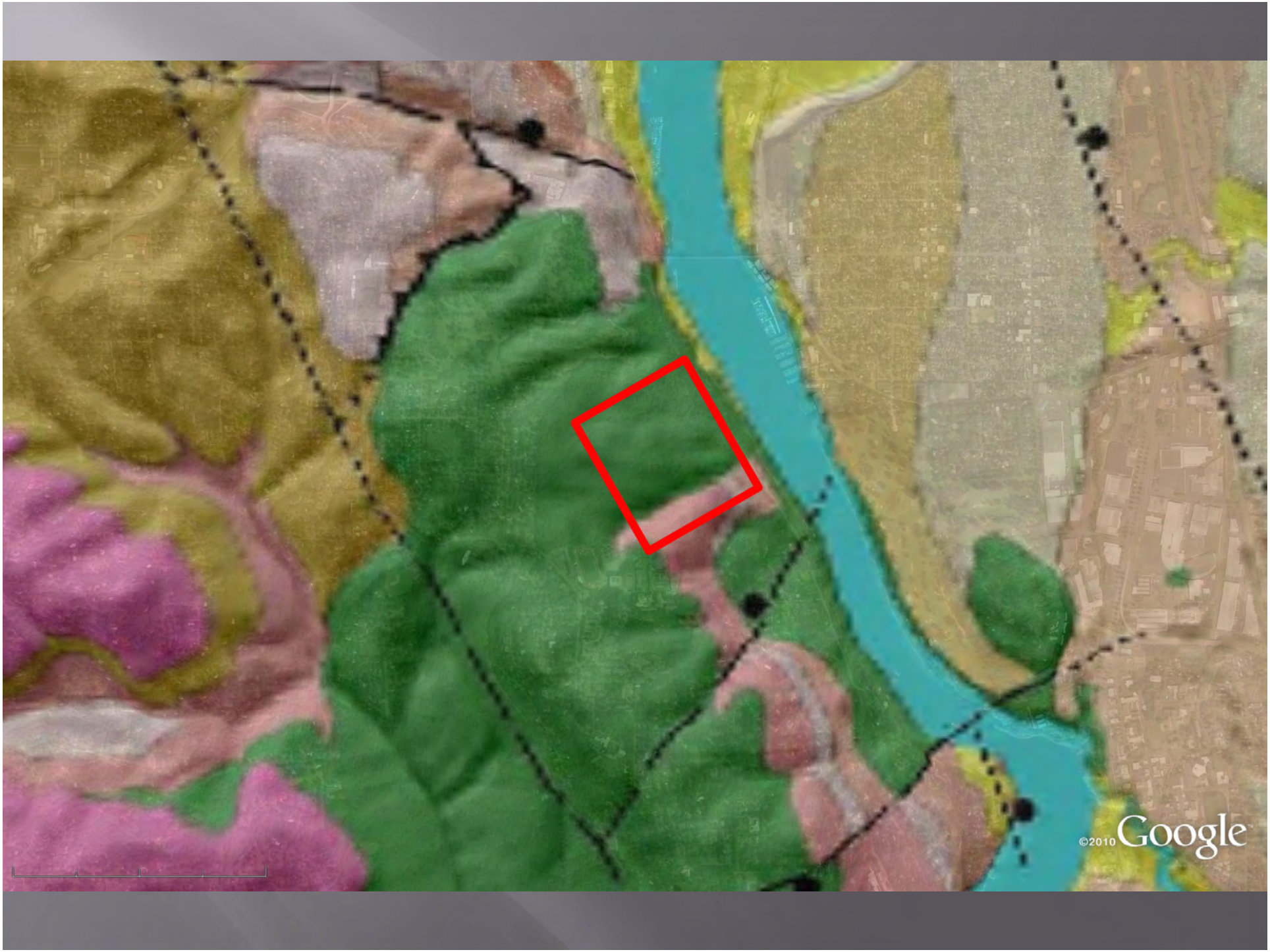
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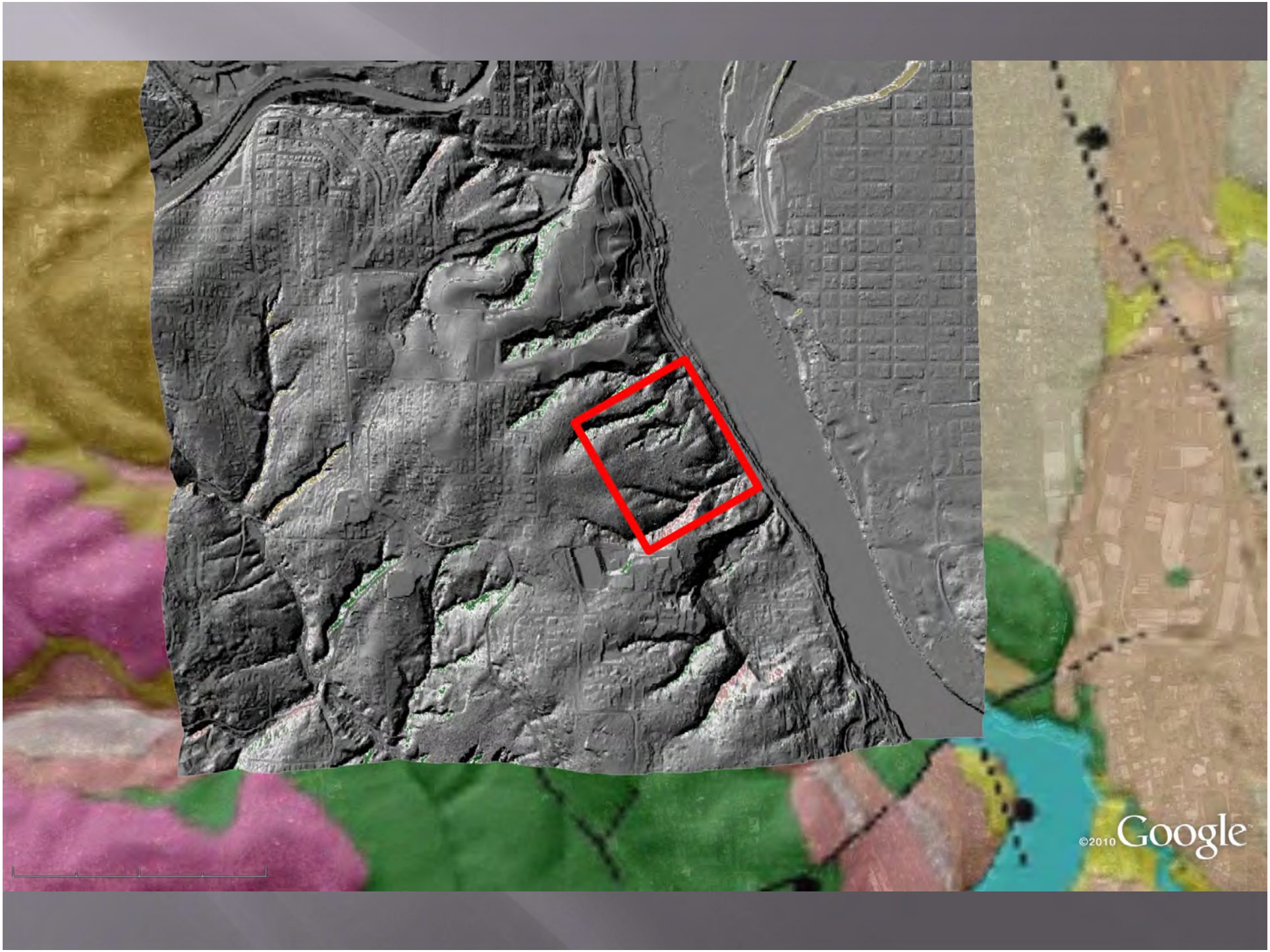
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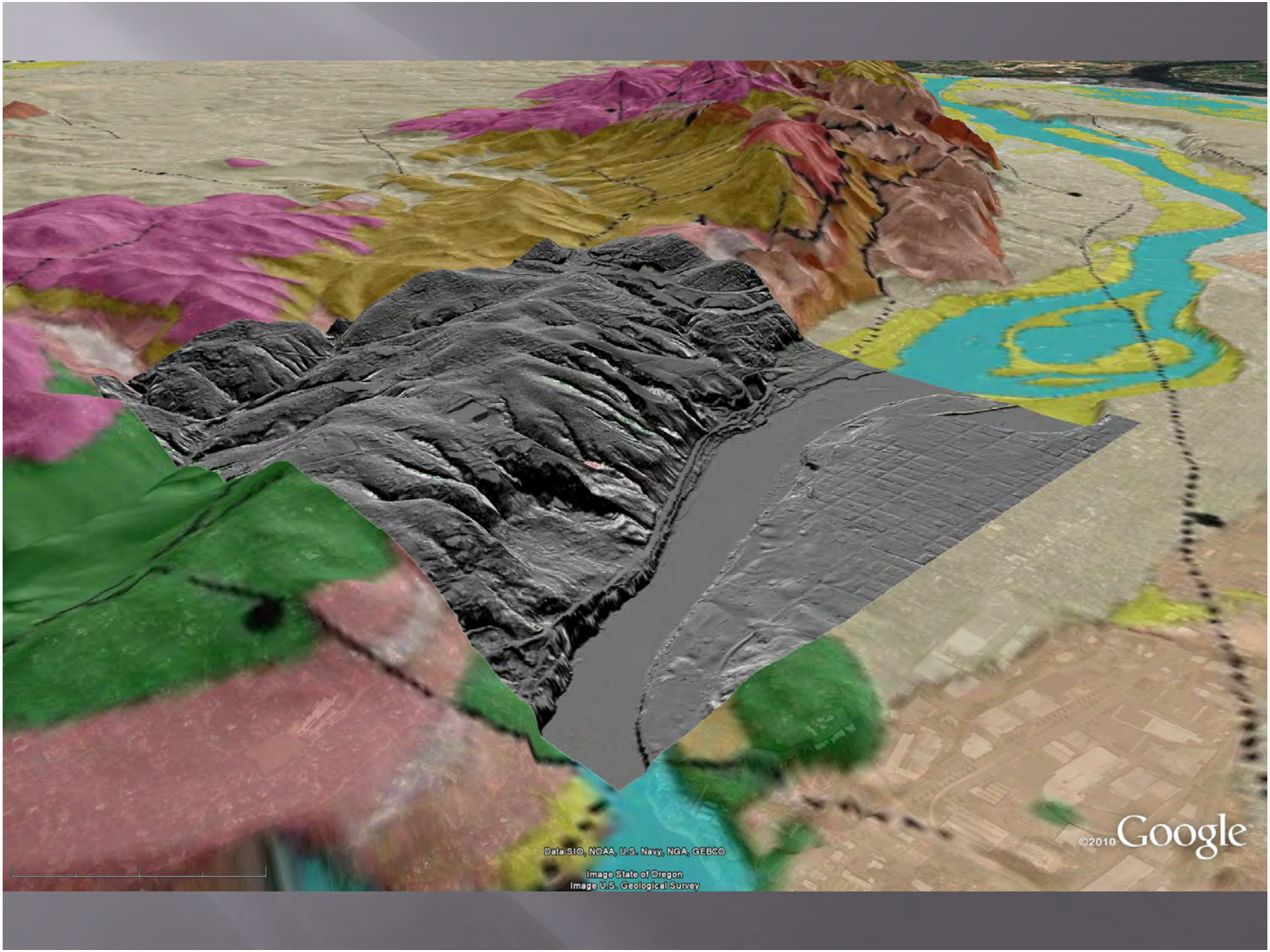
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Image U.S. Geological Survey
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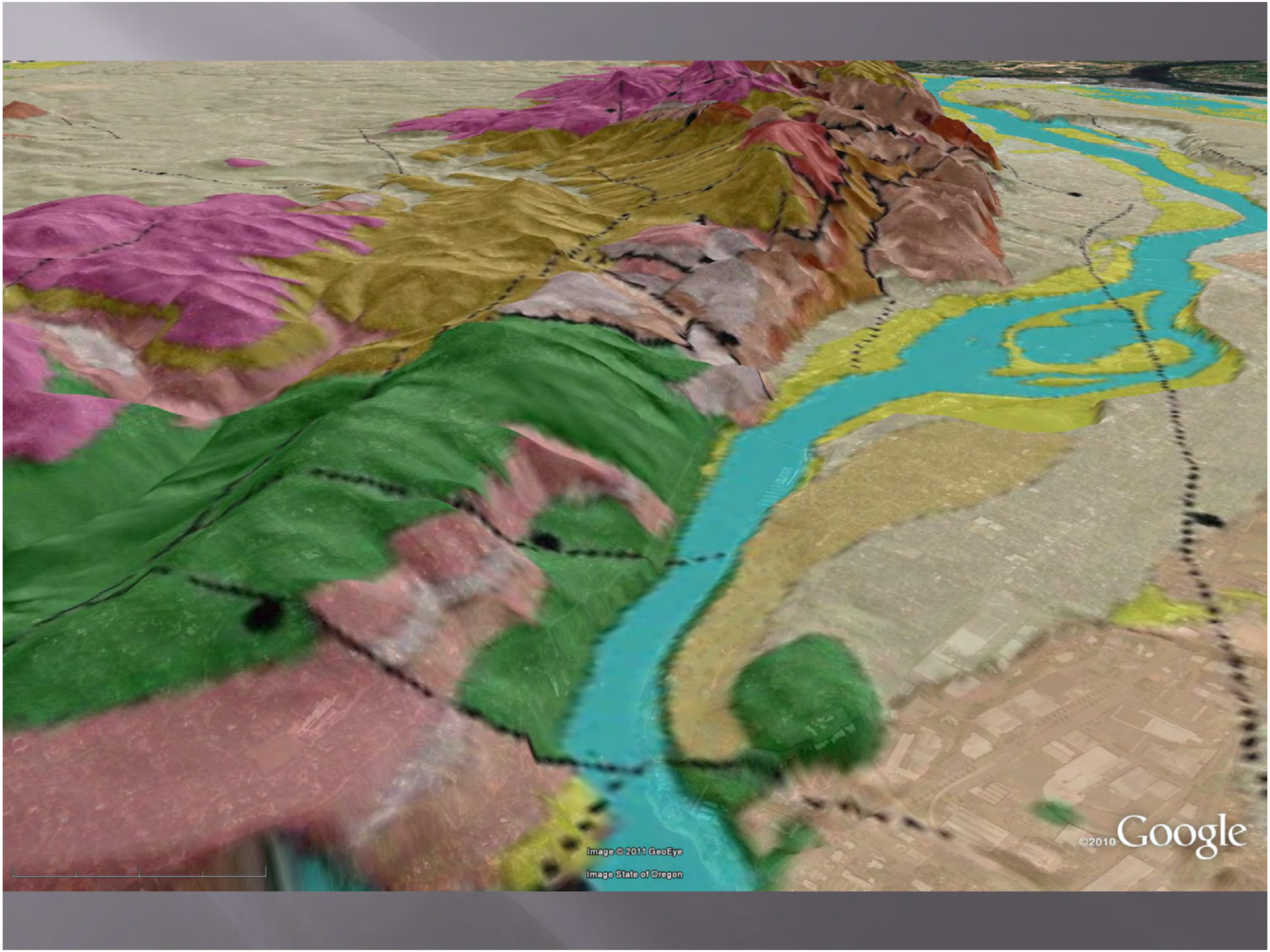
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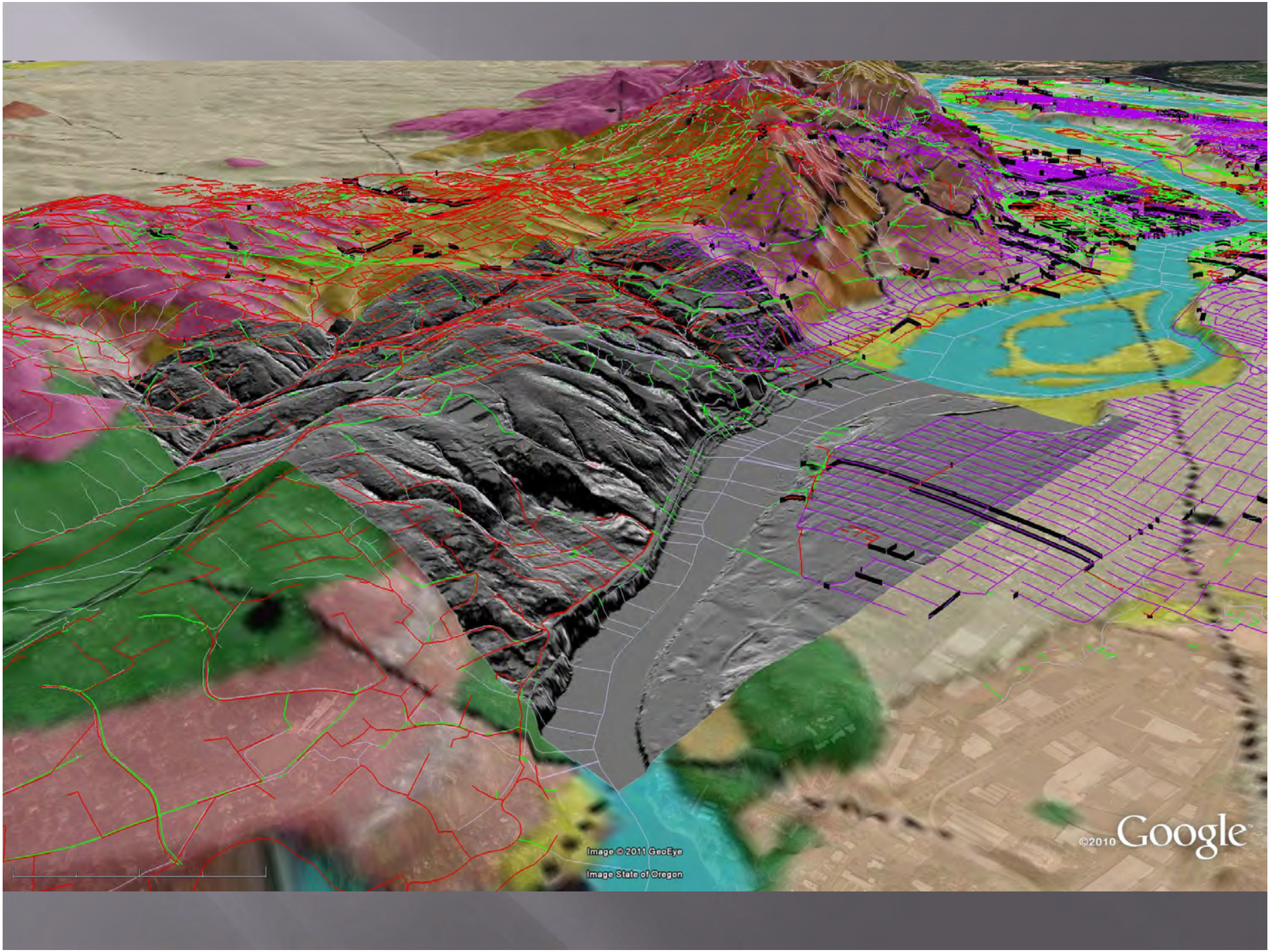
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Klickitat Green Streets
SW Riverside Dr
SE 17th Ave
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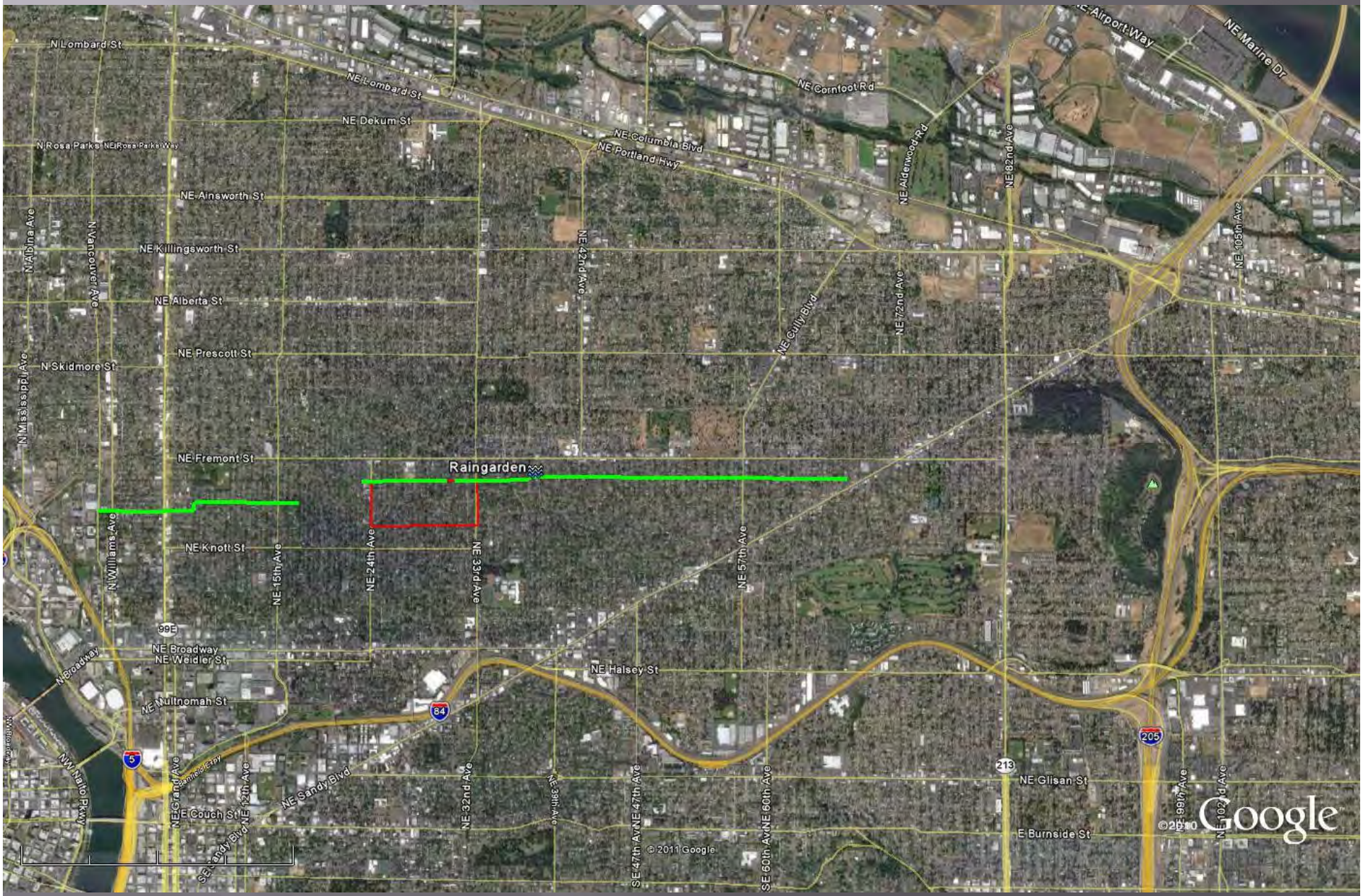

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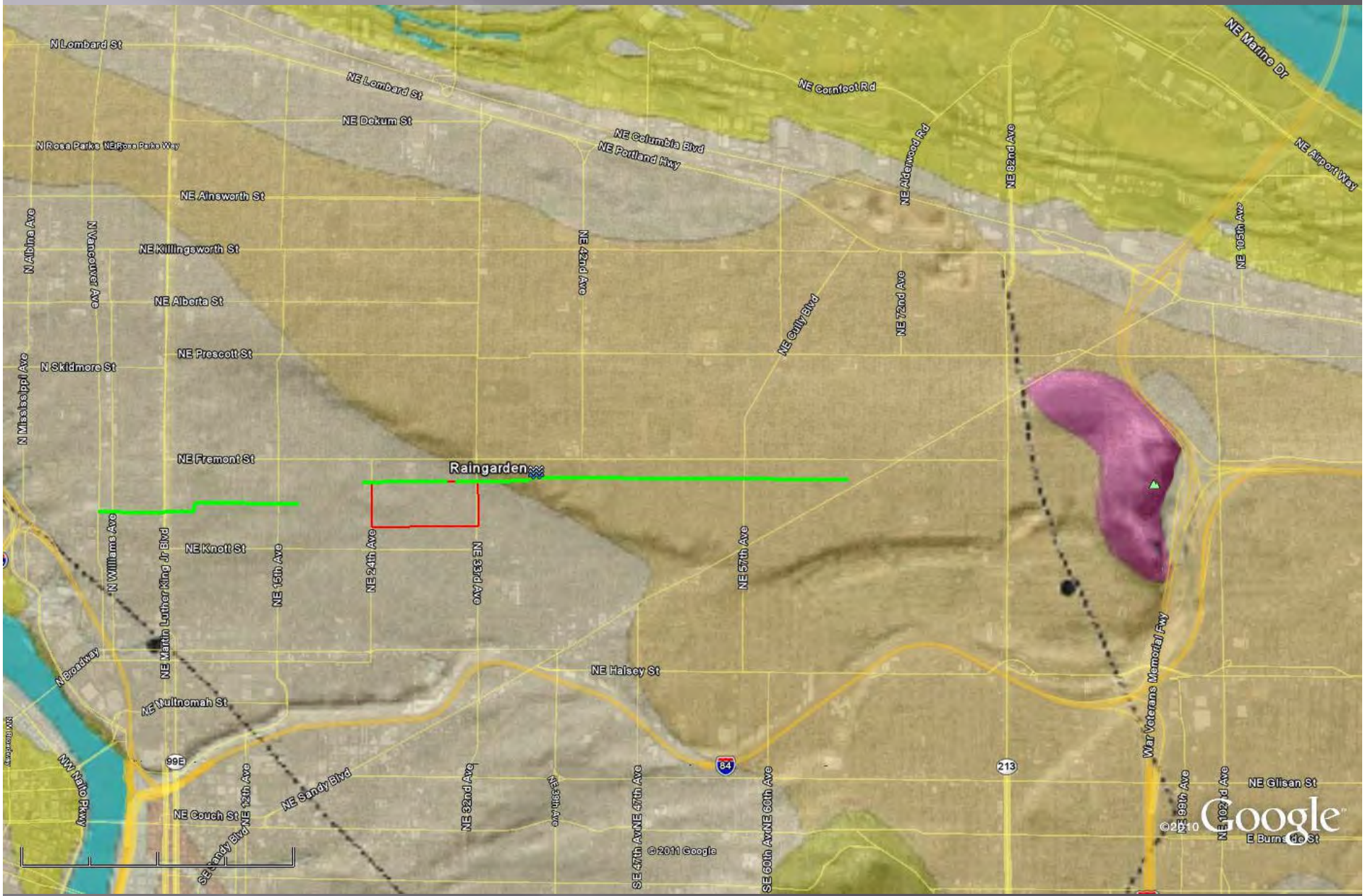
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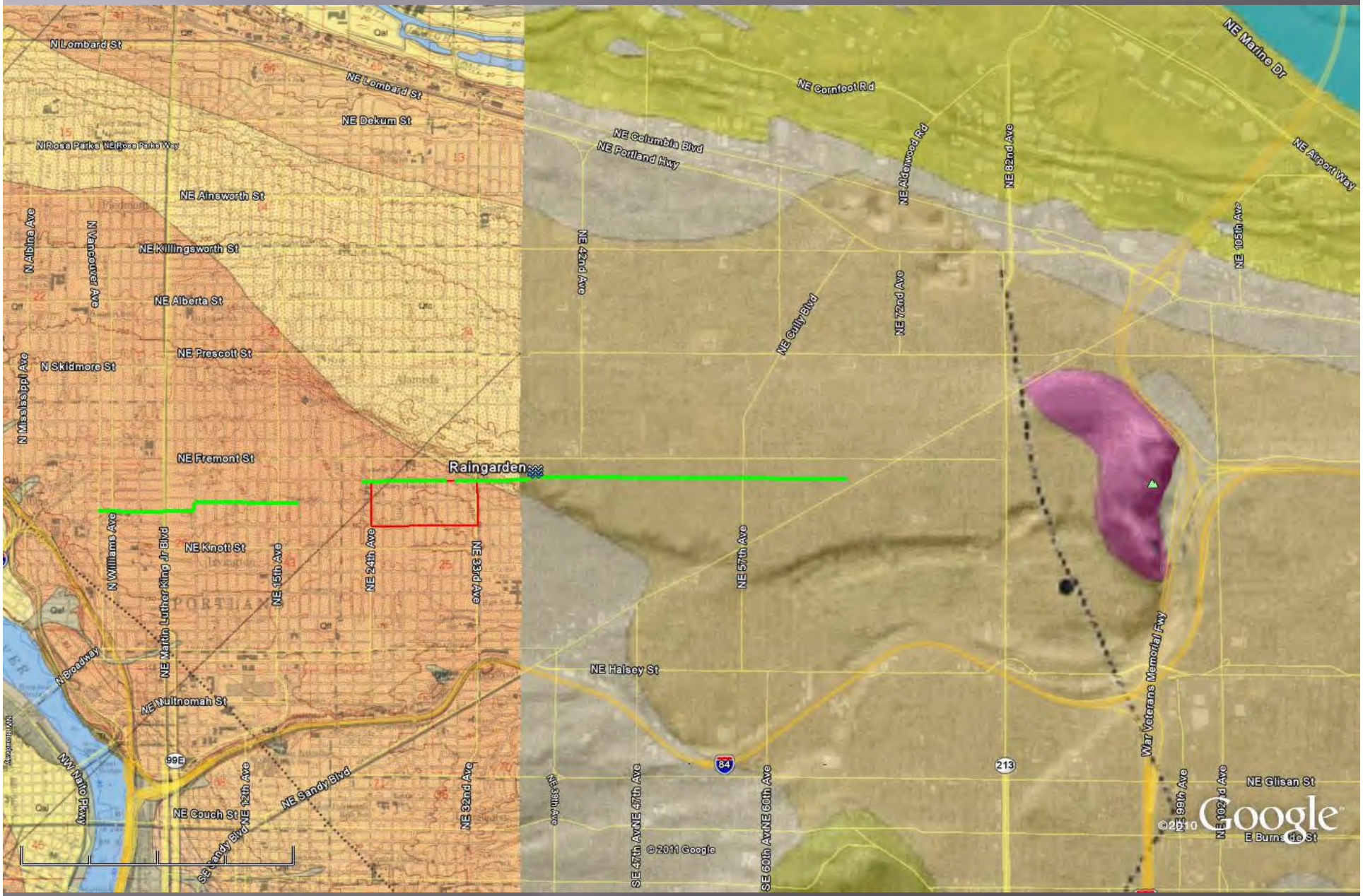

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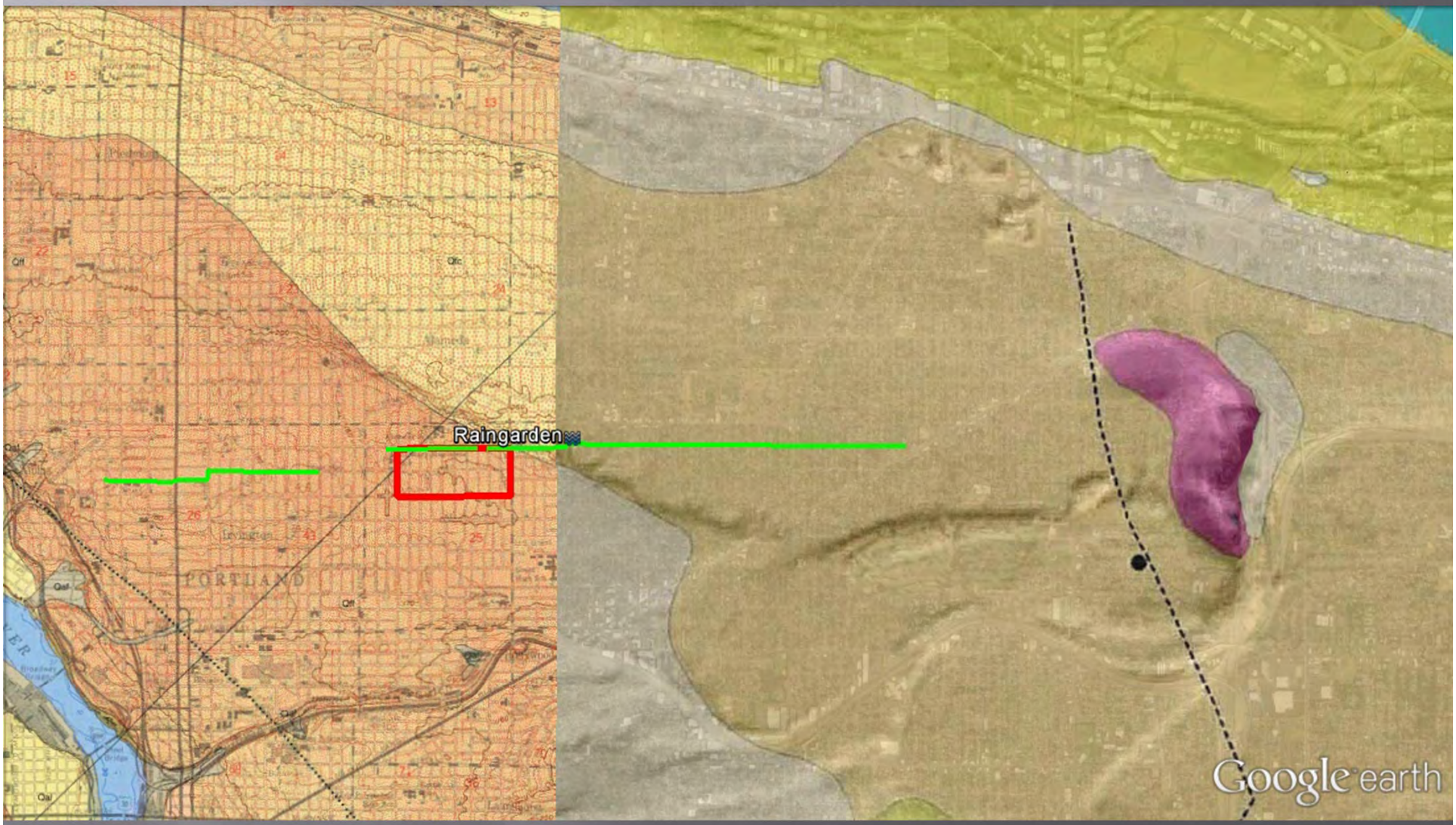
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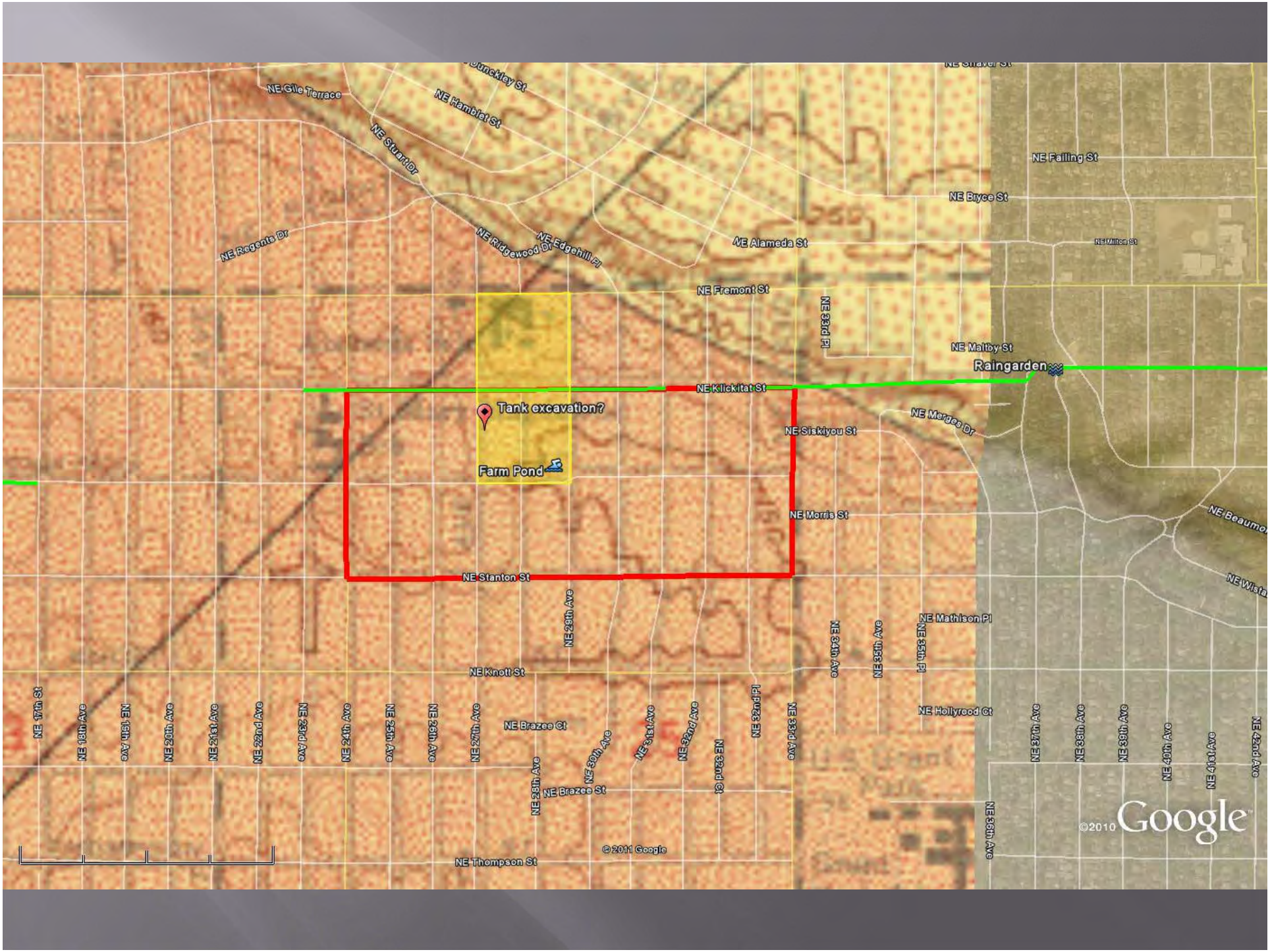
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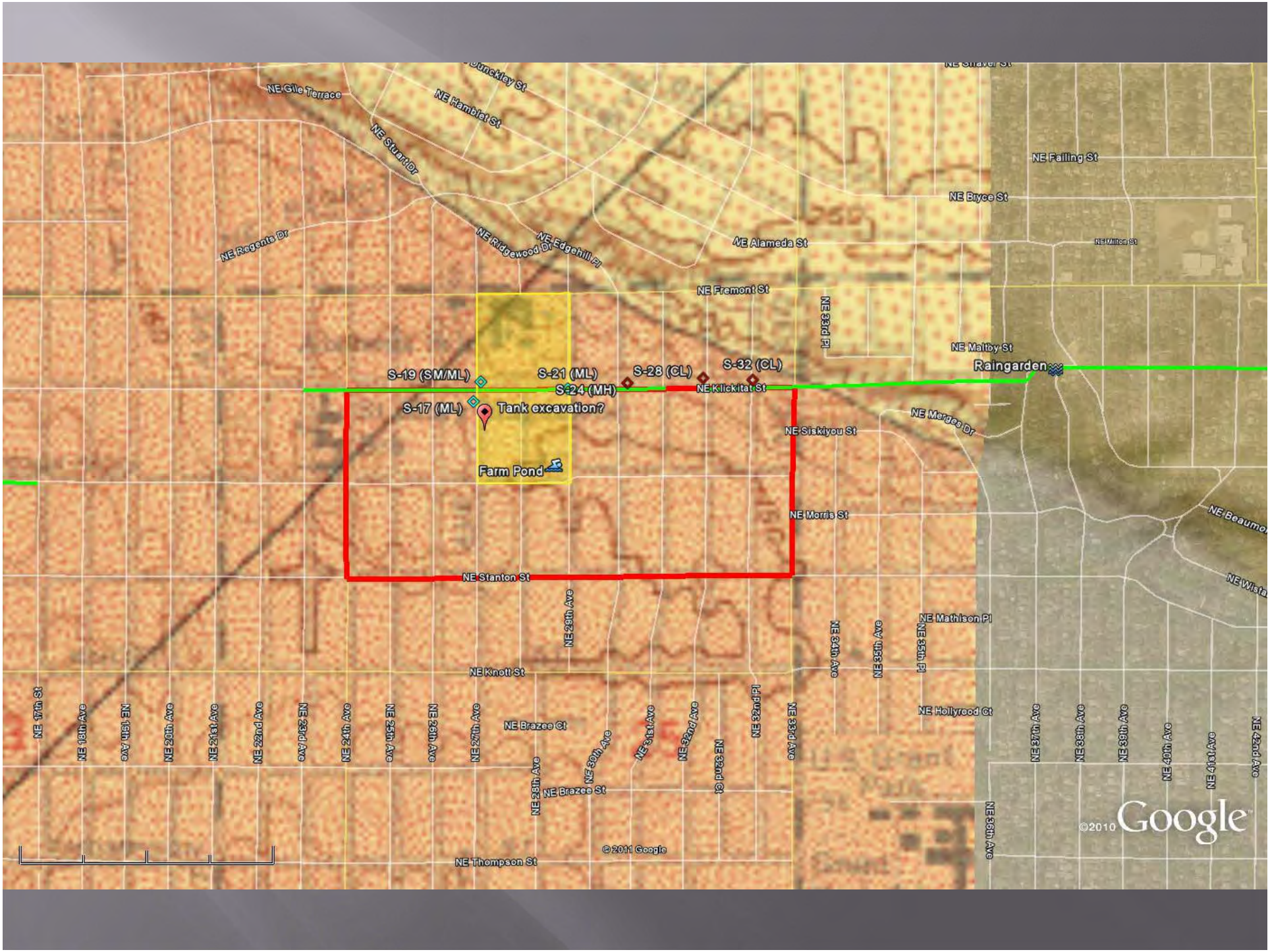
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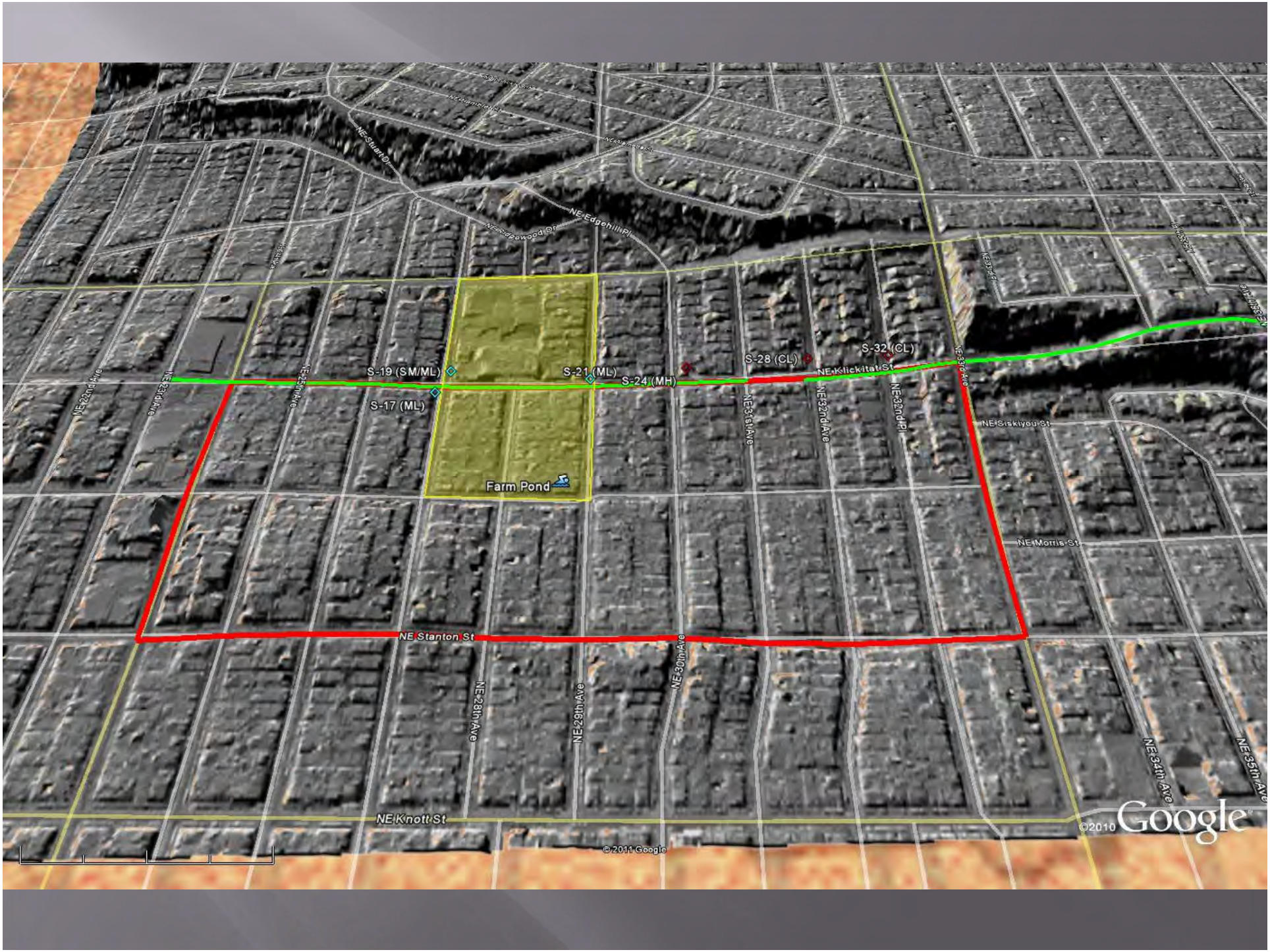
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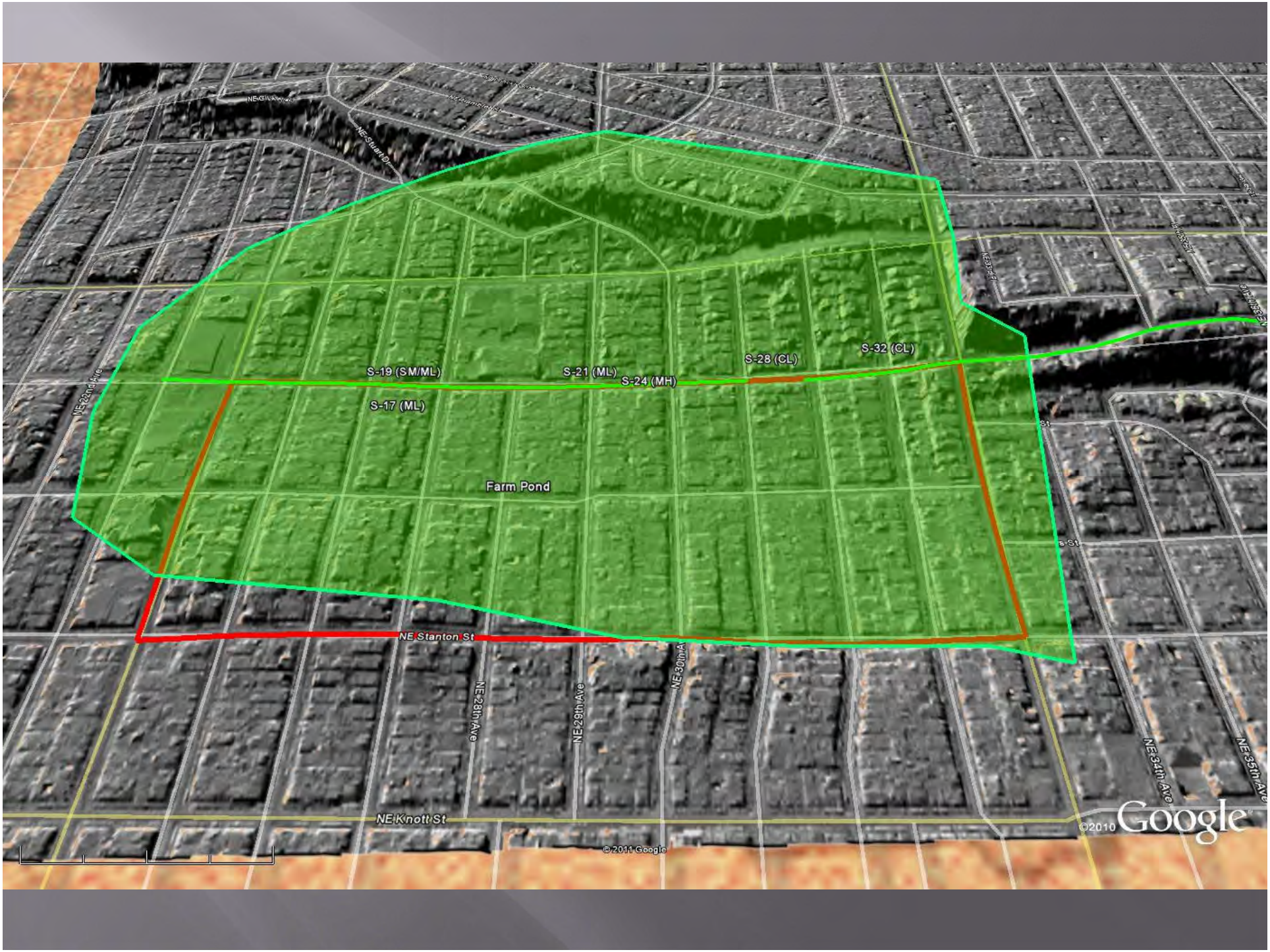
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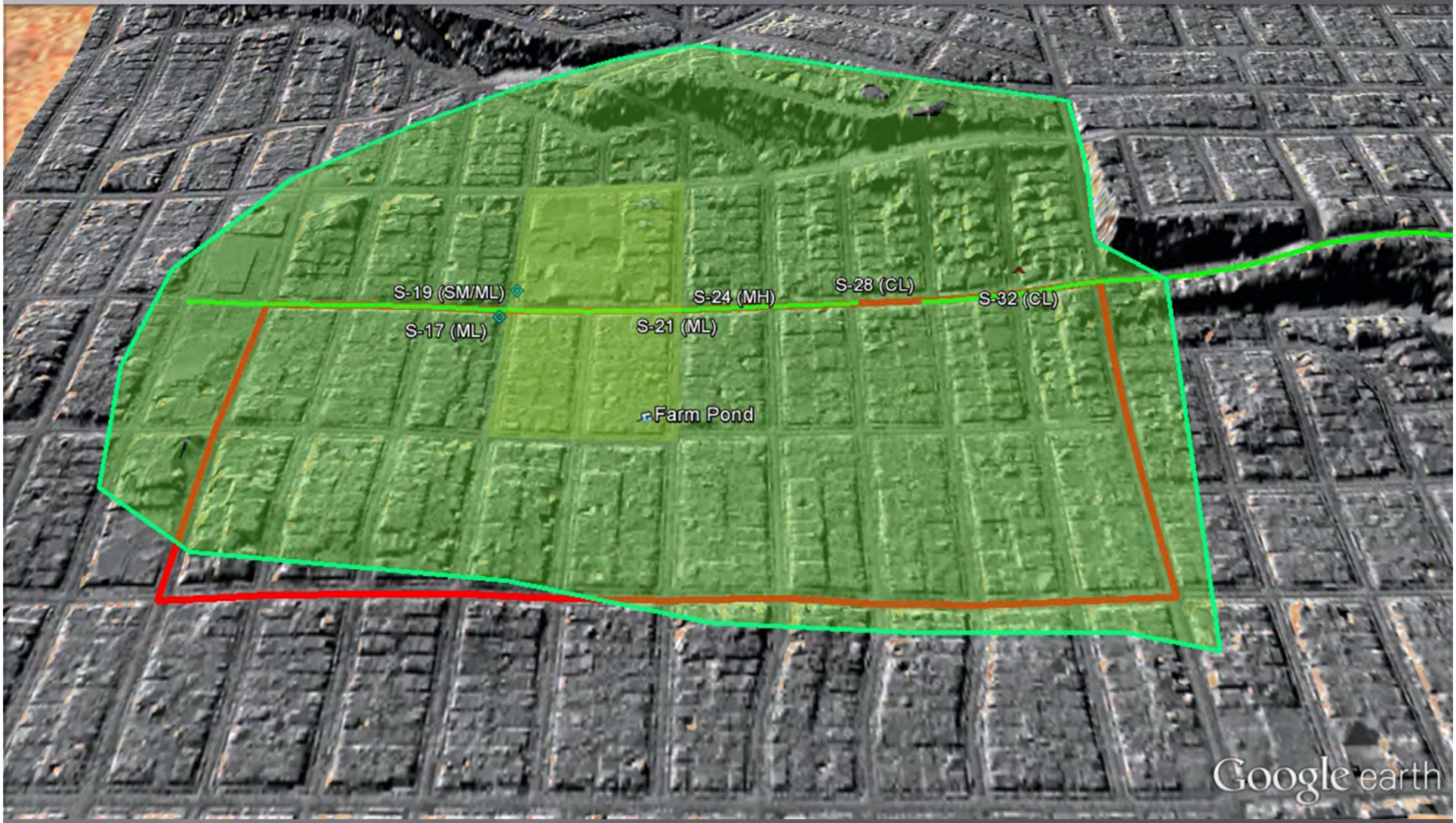
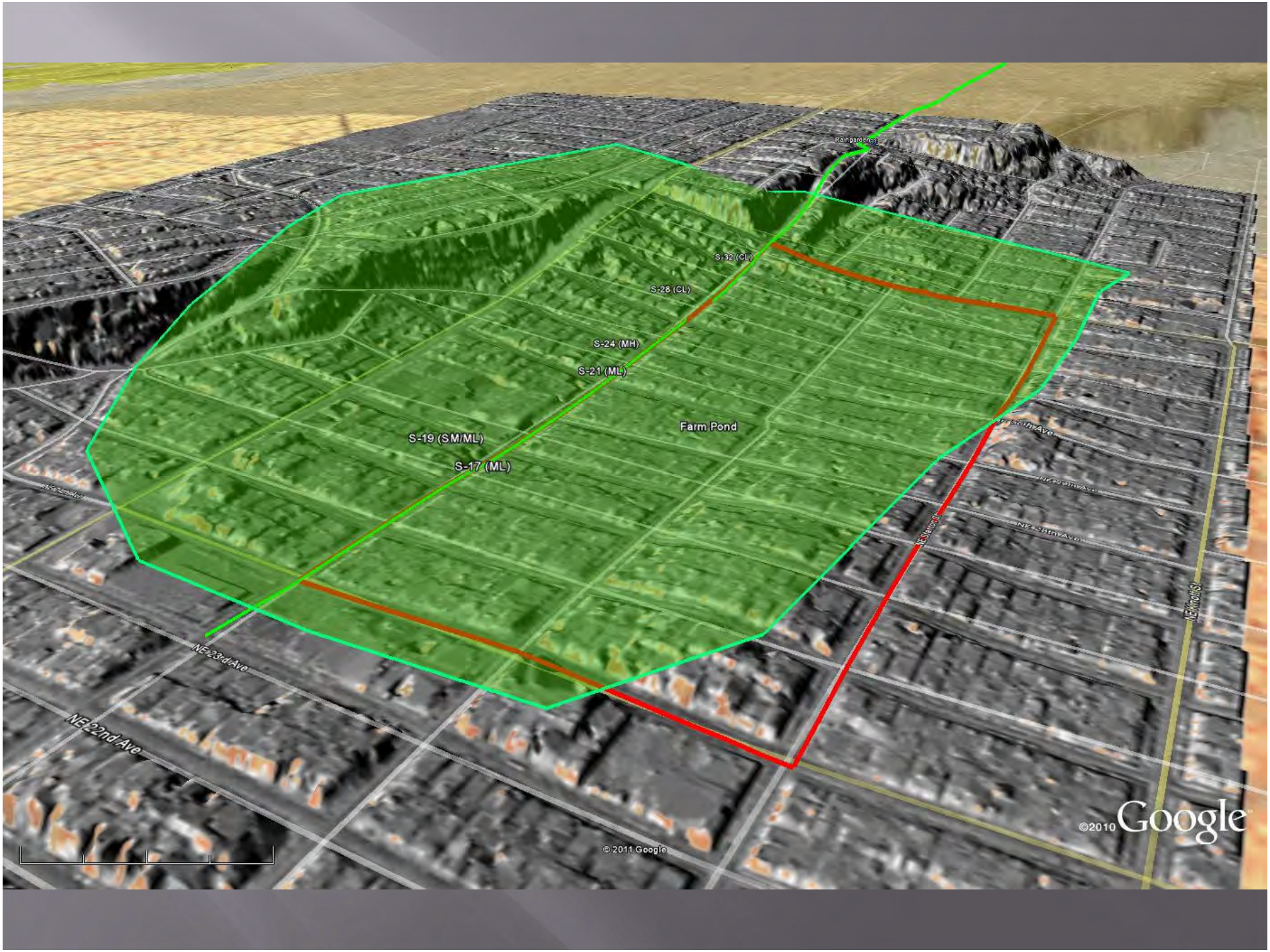

S-19 (SM/ML)
S-17 (ML)
S-24 (MH)
S-21 (ML)
S-28 (CL)
S-32 (CL)
Farm Pond
Google earth


S-32 (CL)
S-28 (CL)
S-24 (MH)
S-21 (ML)
Farm Pond
S-19 (SM/ML)
S-17 (ML)
NE 23rd Ave
NE 22nd Ave
NE Knott St
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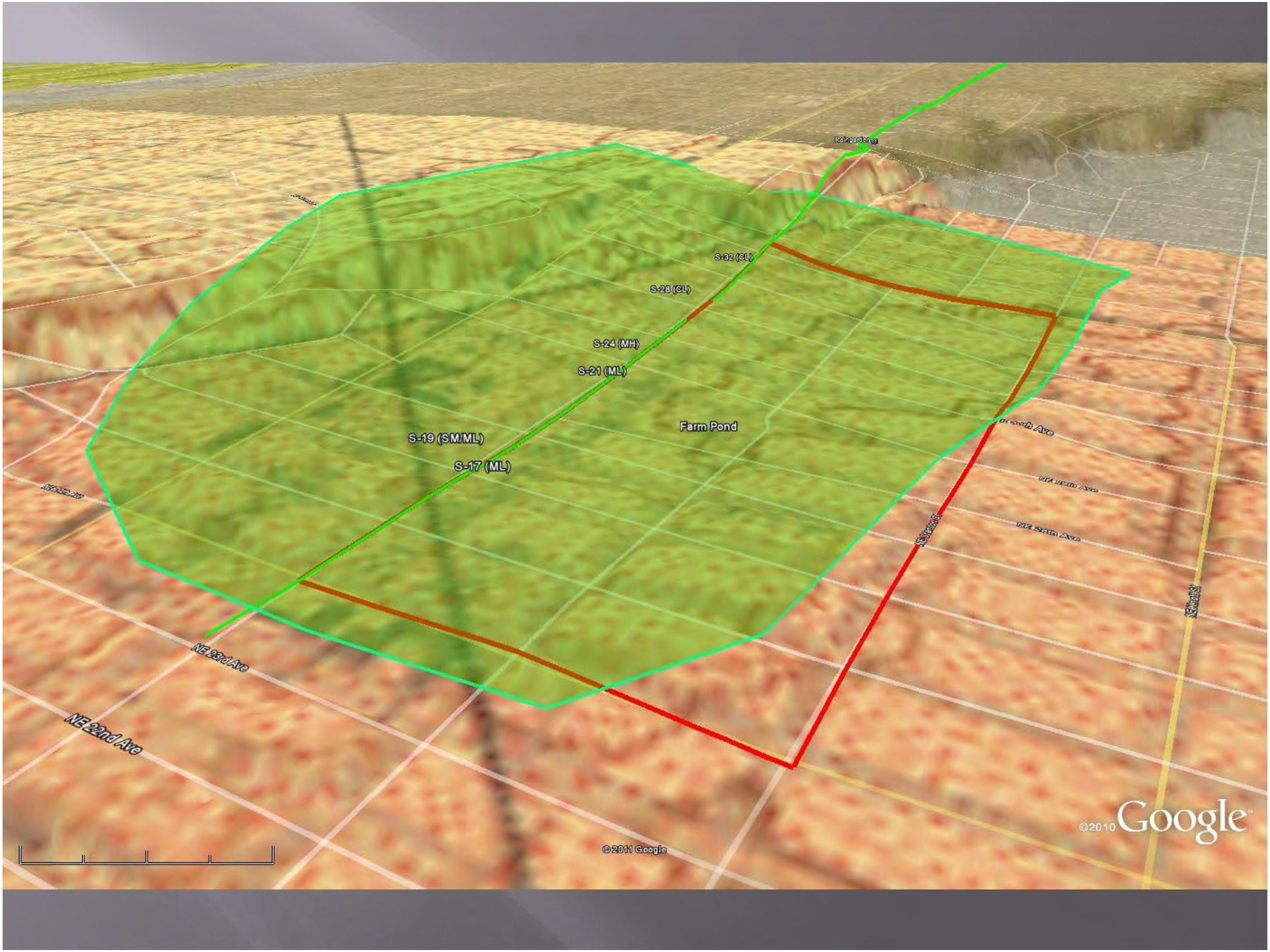
S-31 (SL)
S-28 (CL)
S-24 (MH)
S-21 (ML)
S-19 (SM/ML)
S-17 (ML)
Farm Pond
NE 23rd Ave
NE 22nd Ave
©2010 Google
© 2011 Google

S-32 (CL)
S-28 (CL)
S-24 (MH)
S-21 (ML)
Farm Pond
S-19 (SM/ML)
S-17 (ML)
NE 23rd Ave
NE 22nd Ave
NE 28th Ave
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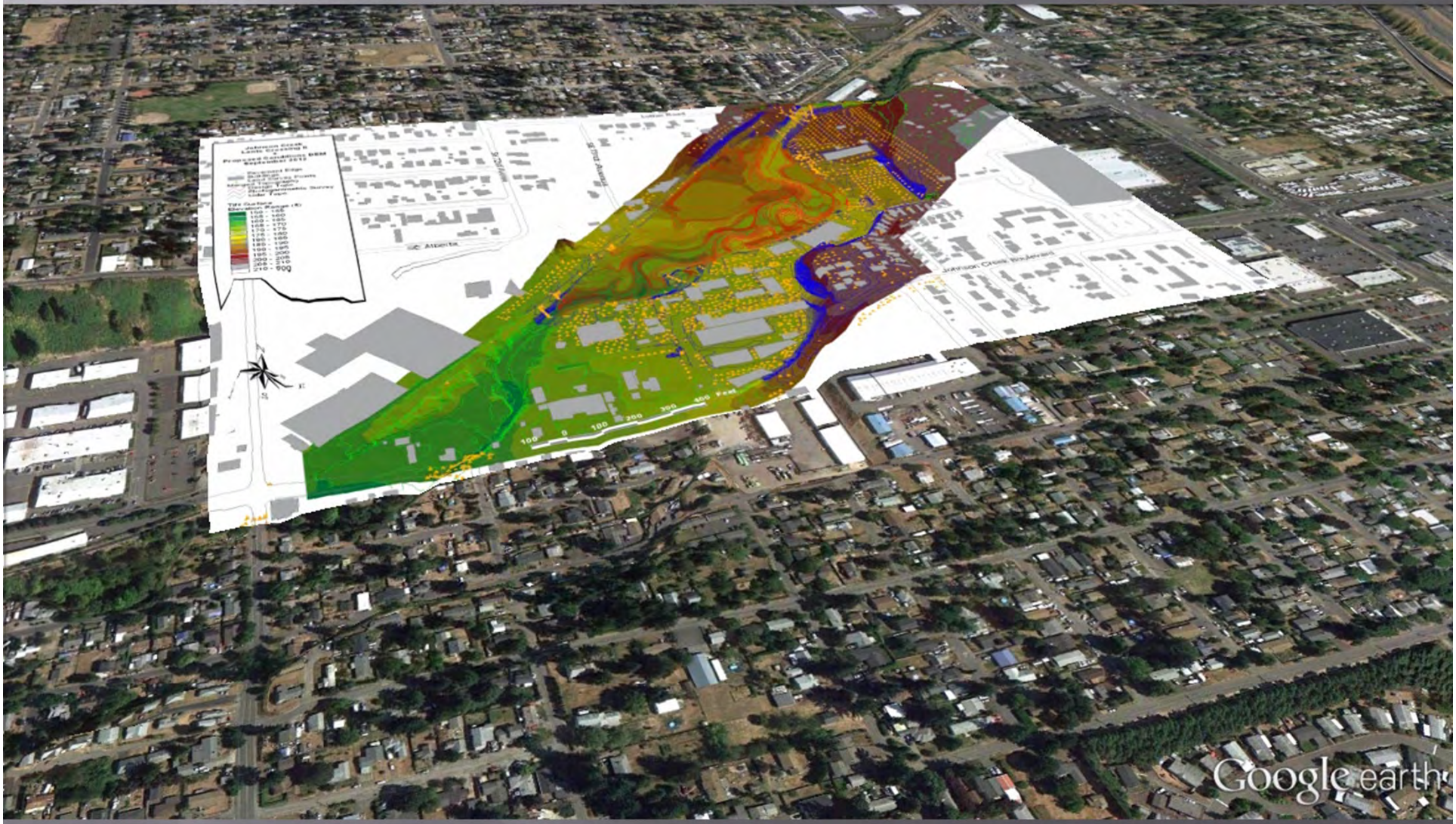
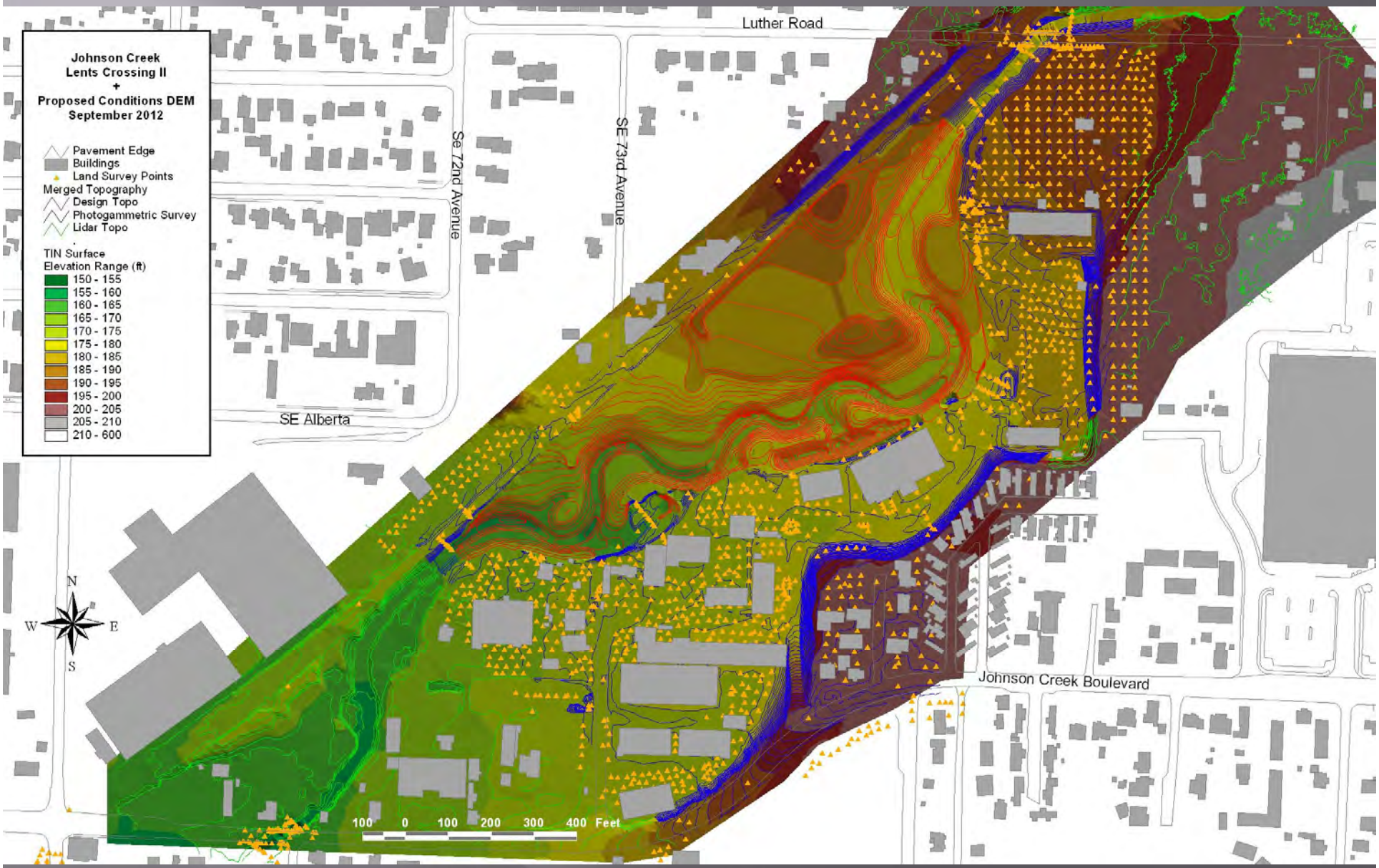
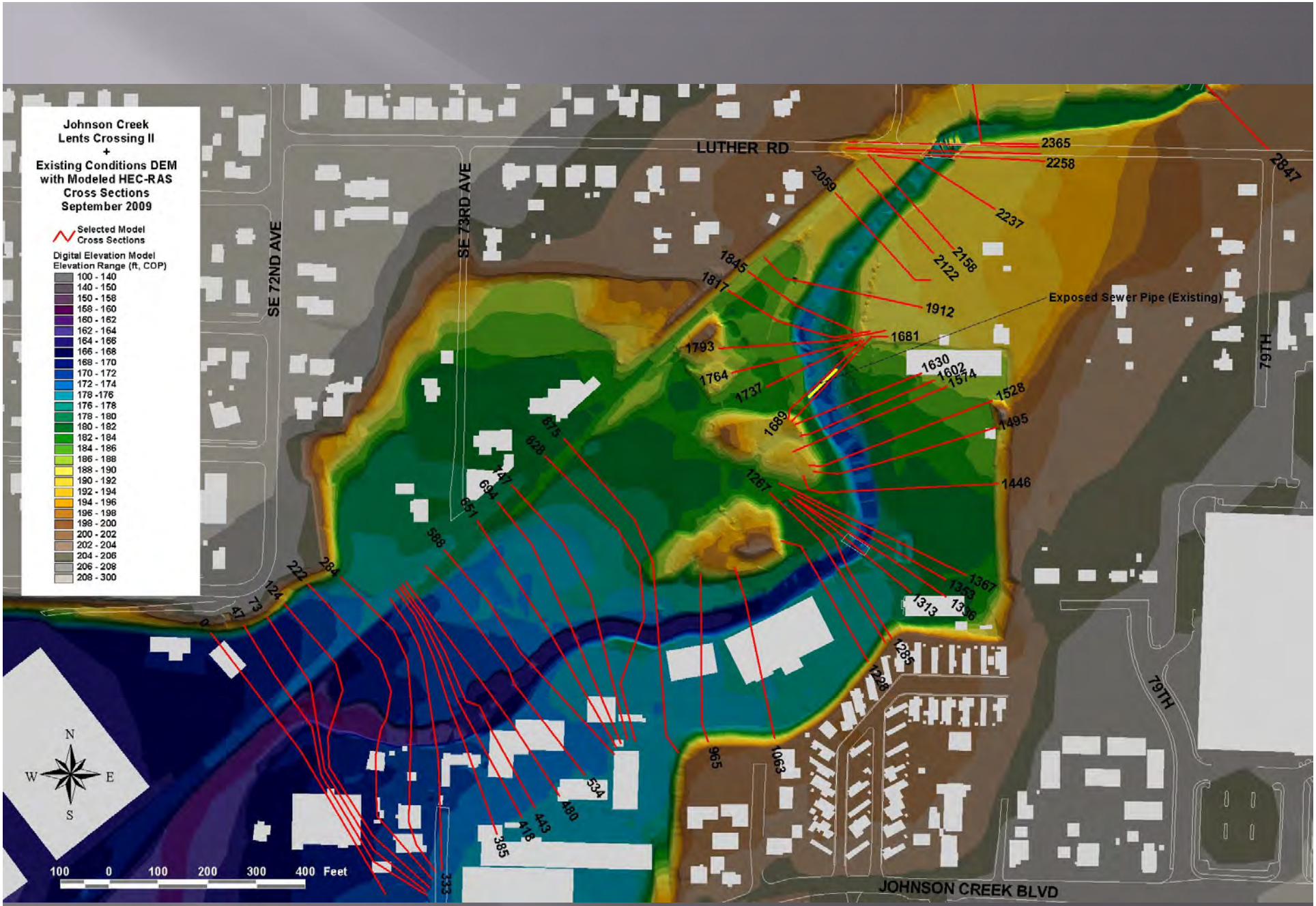
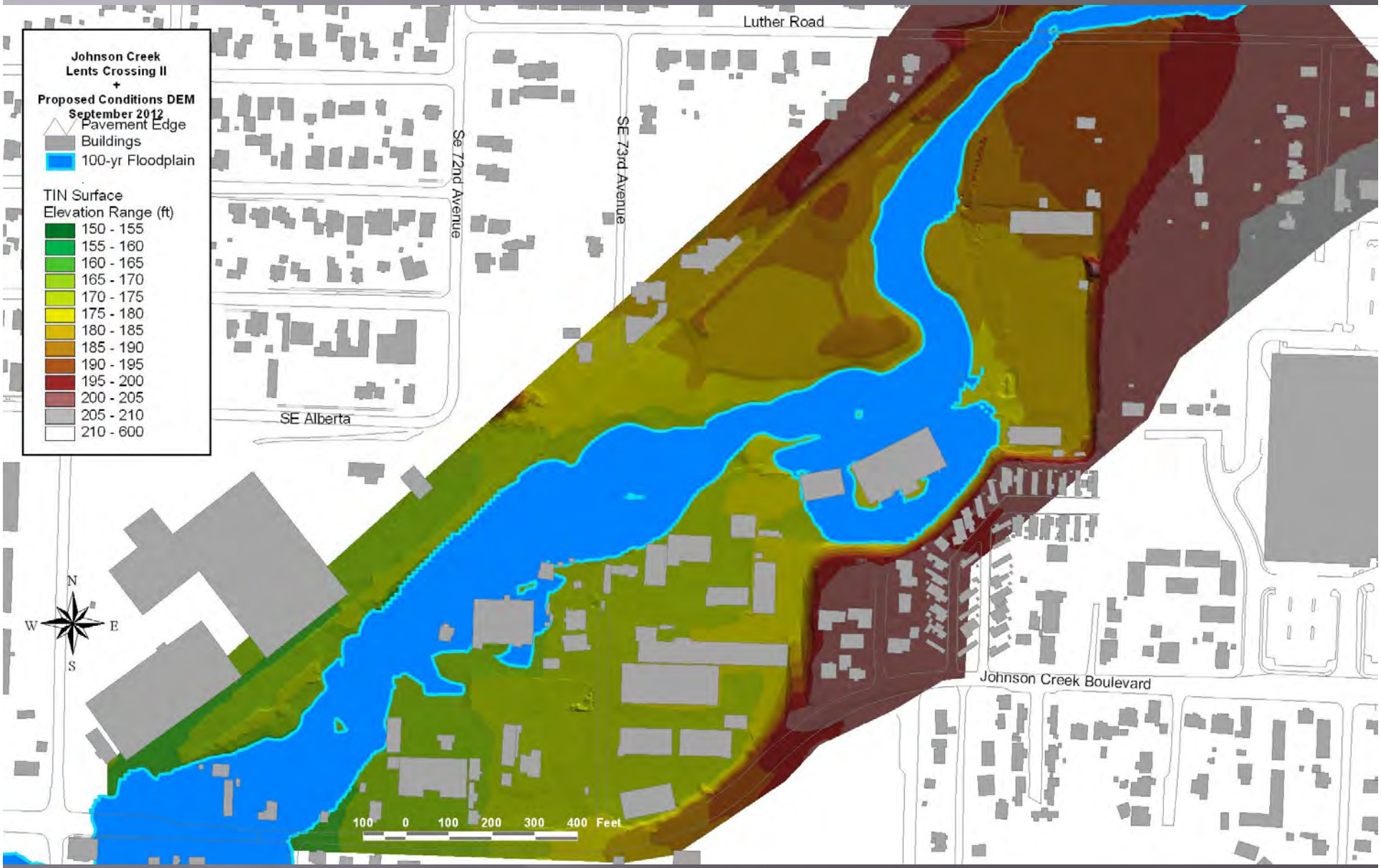
Lents II

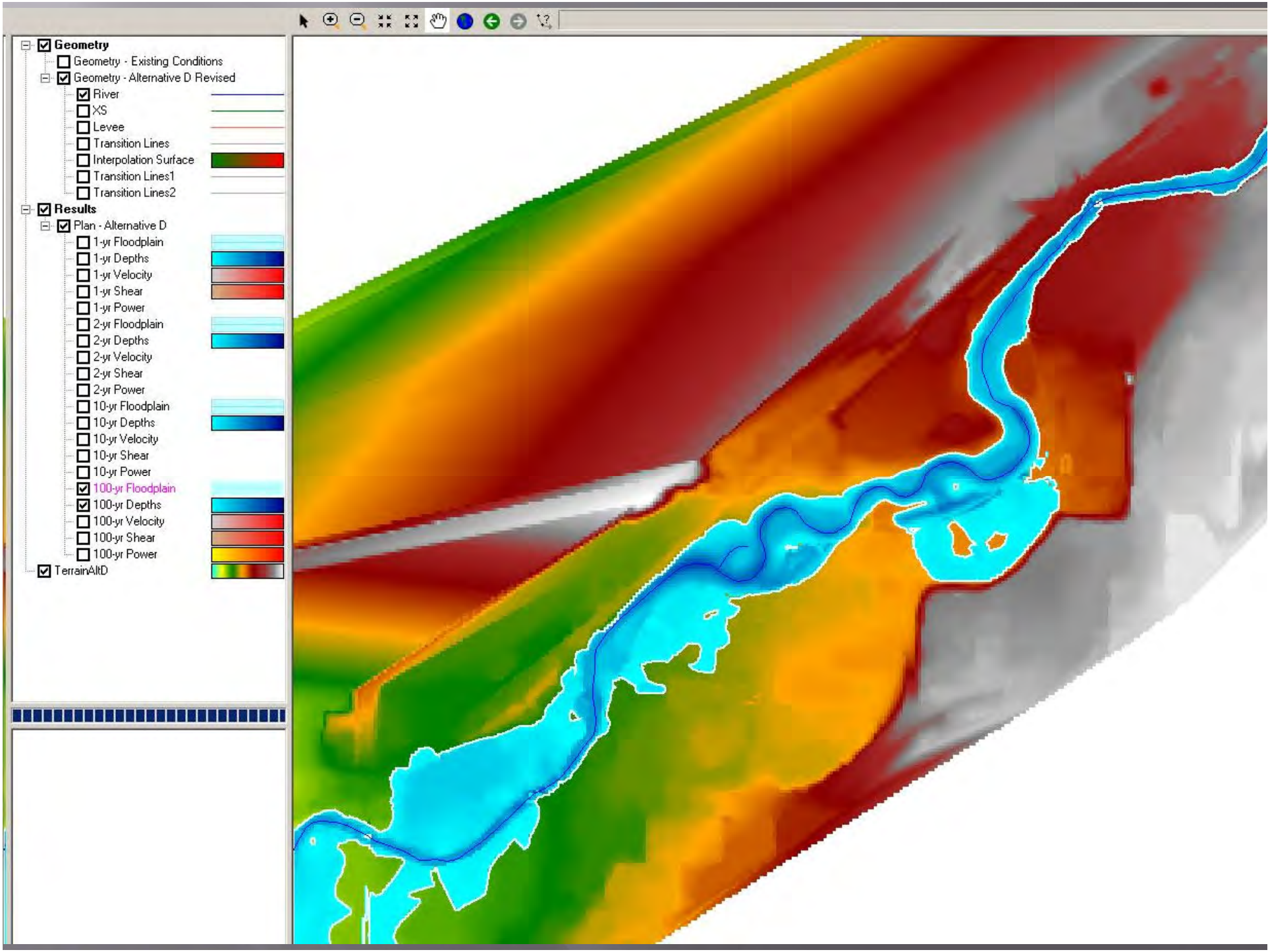
Lents II




Johnson Creek
Lents Crossing II
+
Proposed Conditions DEM
September 2012
Pavement Edge
Buildings
Land Survey Points
Merged Topography
Design Topo
Photogammetric Survey
Lidar Topo
TIN Surface
Elevation Range (ft)
150 - 155
155 - 160
160 - 165
165 - 170
170 - 175
175 - 180
180 - 185
185 - 190
190 - 195
195 - 200
200 - 205
205 - 210
210 - 600
Luther Road
Se 72nd Avenue
SE 73rd Avenue
SE Alberta
Johnson Creek Boulevard
N
W
E
S
100 0 100 200 300 400 Feet


Johnson Creek
Lents Crossing II
+
Existing Conditions DEM
with Modeled HEC-RAS
Cross Sections
September 2009
Selected Model Cross Sections
Digital Elevation Model
Elevation Range (ft, COP)
100 - 140
140 - 150
150 - 158
158 - 160
160 - 162
162 - 164
164 - 166
166 - 168
168 - 170
170 - 172
172 - 174
178 -176
176 - 178
178 - 180
180 - 182
182 - 184
184 - 186
186 - 188
188 - 190
190 - 192
192 - 194
194 - 196
196 - 198
198 - 200
200 - 202
202 - 204
204 - 206
206 - 208
208 - 300
LUTHER RD
SE 72ND AVE
SE 73RD AVE
79TH
JOHNSON CREEK BLVD
Exposed Sewer Pipe (Existing)
2365
2258
2847
2059
2237
2158
2122
1845
1817
1912
1681
1793
1764
1737
1689
1630
1602
1574
1528
1495
1446
1261
1367
1353
1313
1336
1285
1228
965
1063
875
828
747
694
851
588
534
480
443
418
385
333
284
222
124
73
47
0
N
W
E
S
100 0 100 200 300 400 Feet


Johnson Creek
Lents Crossing II
+
Proposed Conditions DEM
September 2012
Pavement Edge
Buildings
100-yr Floodplain
TIN Surface
Elevation Range (ft)
150 - 155
155 - 160
160 - 165
165 - 170
170 - 175
175 - 180
180 - 185
185 - 190
190 - 195
195 - 200
200 - 205
205 - 210
210 - 600
Luther Road
Se 72nd Avenue
SE 73rd Avenue
SE Alberta
Johnson Creek Boulevard
N
W
E
S
100 0 100 200 300 400 Feet


Geometry
Geometry - Existing Conditions
Geometry - Alternative D Revised
River
XS
Levee
Transition Lines
Interpolation Surface
Transition Lines1
Transition Lines2
Results
Plan - Alternative D
1-yr Floodplain
1-yr Depths
1-yr Velocity
1-yr Shear
1-yr Power
2-yr Floodplain
2-yr Depths
2-yr Velocity
2-yr Shear
2-yr Power
10-yr Floodplain
10-yr Depths
10-yr Velocity
10-yr Shear
10-yr Power
100-yr Floodplain
100-yr Depths
100-yr Velocity
100-yr Shear
100-yr Power
TerrainAltD

Geology / Geomorphology

Highway 35 Bridge – Mt. Hood Oregon

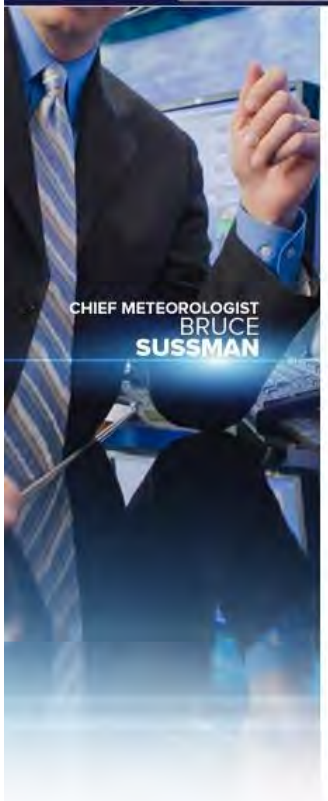
Hwy 35 – White River Canyon

B. September 8, 1998

A. November 7, 2006

www.djc.com/news/ae/11 | Tacoma Narrows Bridge - | Weird Location For A Mt. | DOGAMI Lidar Viewer | New Tab

www.brucesussman.com/earthquakes-volcanoes/a-mt-hood-earthquake/



Nov
07

Weird Location For A Mt. Hood Earthquake

November 7th, 2011 | Earthquakes / Volcanoes

by Bruce Sussman

Like 22 people like this. Sign Up to see what your friends like.

retweet 1

So I'm getting gas this morning when I open our KOIN Local 6 PinPoint Weather App to see if we have any showers going. We did not.

But right on the App I saw 4 red circles and learned instantly we had a micro-quake under the slopes of Mt. Hood!

And to tell where, exactly, I zoomed in on the map to the main image here–and wow, this earthquake was right under the ***White River Glacier***–just up the mountain from the Highway 35 bridge that crosses it.

Just to make sure our PinPoint Weather App was right on–I went to a different quake site and sure enough, our App nailed the location.

Rare Earthquake Right Under A Glacier

Having been in Portland for 15 years covering weather and earthquakes–this is the first time I've ever seen an earthquake right under a glacier. Kinda crazy.

My initial thought was more of a question: could one of the vast under-ice lakes inside the glacier have shifted suddenly, which was detected as an earthquake? Was there a 'glacial outburst' that suddenly caused flooding? One that could cause something similar to the Highway 35 flooding and slide we saw in 2006? Heavy rain likely helped release an outburst of water stored inside the glacier creating an incredible scene. I'll never forget these images, for sure!

7-Day Forecast & NW Radar

Fall Starts In:

Fall Starts In:
9 days
On September 22, 2012

Latest Tweets

Rare moment in time: Portland & Astoria are both 80 degrees now. Hotter? Tillamook is 84! #pdxtst about 9 hours ago

It's the windblown look! RT @SallyKOIN: Crown Pointe rocks today. Warm east wind. Peak gust around 60mph. http://t.co/oH8miCu9 about 9 hours ago

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Tacoma Narrows Bridge -
Eugene Register-Guard - G
DOGAMI Lidar Viewer
New Tab
news.google.com/newspapers?nid=1310&dat=19980907&id=mE9WAAAAIBAJ&sjid=t-sDAAAAIBAJ&pg=3249,1893952
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Google
Sign in
Google news
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Archive Search Help
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Browse all newspapers »
Page 12 of 20
Link to article
Mt. Hood runoff threatens bridge
By The Associated Press
GOVERNMENT CAMP — Hot weather on Mount Hood is melting White River Glacier and causing a torrent of water, silt and debris — including boulders as big as Volkswagens — to cascade into a river.
The flow, which slowed slightly Sunday, has been forming dams, then rushing down the White River in intense surges.
"It's phenomenal to see this," said Kim Titus, ranger for the Hood River Ranger District on the Mount Hood National Forest. "You're really getting to see several months' worth of river activity in one surge."
Highway contractors noticed high water in White River last week, said Charlie Sciscione, a district manager for the Oregon Department of Transportation.
The river subsequently undermined a dike built to keep it out of flood plains. Surging water reduced a two-lane road on the dike to a six-foot-wide path.
Heavy equipment operators have been trying to keep the water from switching channels and undermining the footings of an Oregon Highway 35 bridge built in 1964 to replace one that washed out in a flood.
The debris flows are coming in surges because the melting glacial ice is clogged with sediment and other material, said Darcy Morgan, an information assistant for Mount Hood National Forest in Parkdale.
"The sediment creates a dam, the water pressure builds up behind it, then blows it out," she said.
The river has so much sediment in it that the water is opaque and dark gray. An estimated 1 million cubic yards of material have come down the stream in the past few days, with the last of the largest surges recorded Saturday evening.
A dump truck and a loader pushed dirt and boulders over the riverbank and the north end of the bridge to keep the water away from the footings. The transportation agency has someone watching a stretch of Oregon 35 and it could be closed quickly if the threat increases, officials said.
The Register-Guard
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Image State of Oregon
Image © 2012 DigitalGlobe
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Image State of Oregon
Image © 2012 GeoEye
Image © 2012 TerraMetrics
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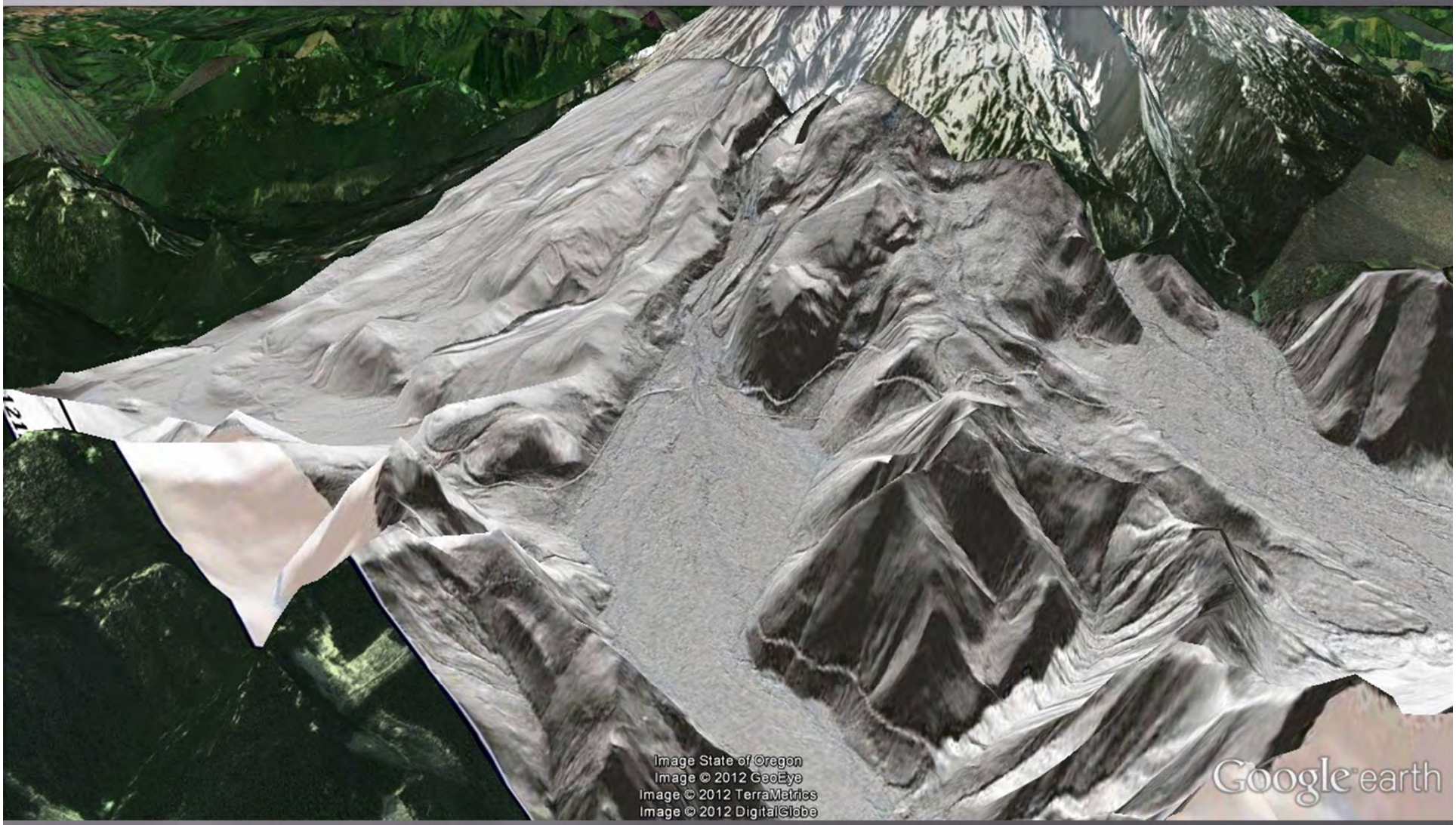
Image State of Oregon
Image © 2012 GeoEye
Image © 2012 TerraMetrics
Image © 2012 DigitalGlobe
Google earth

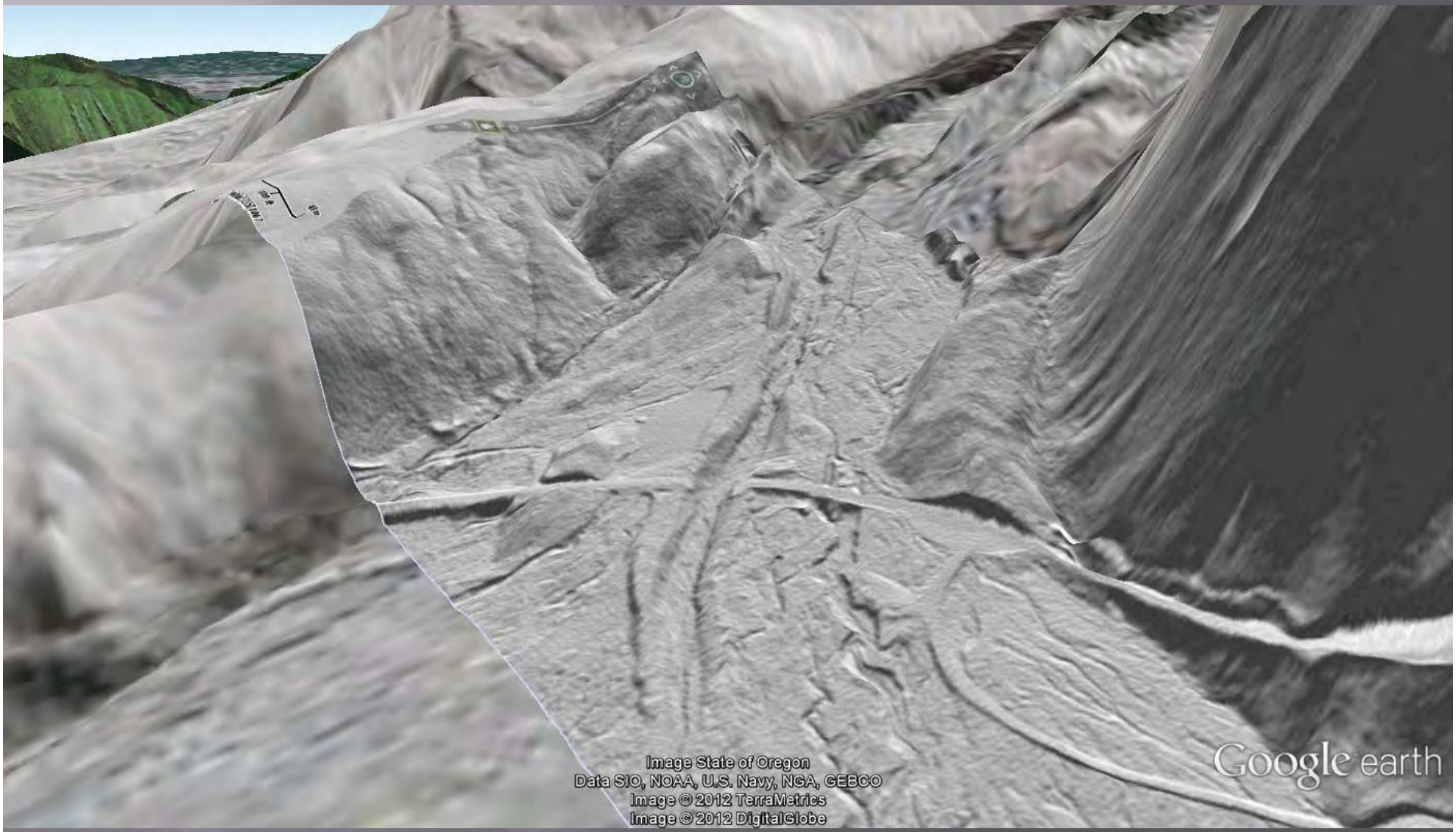
Image State of Oregon
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2012 TerraMetrics
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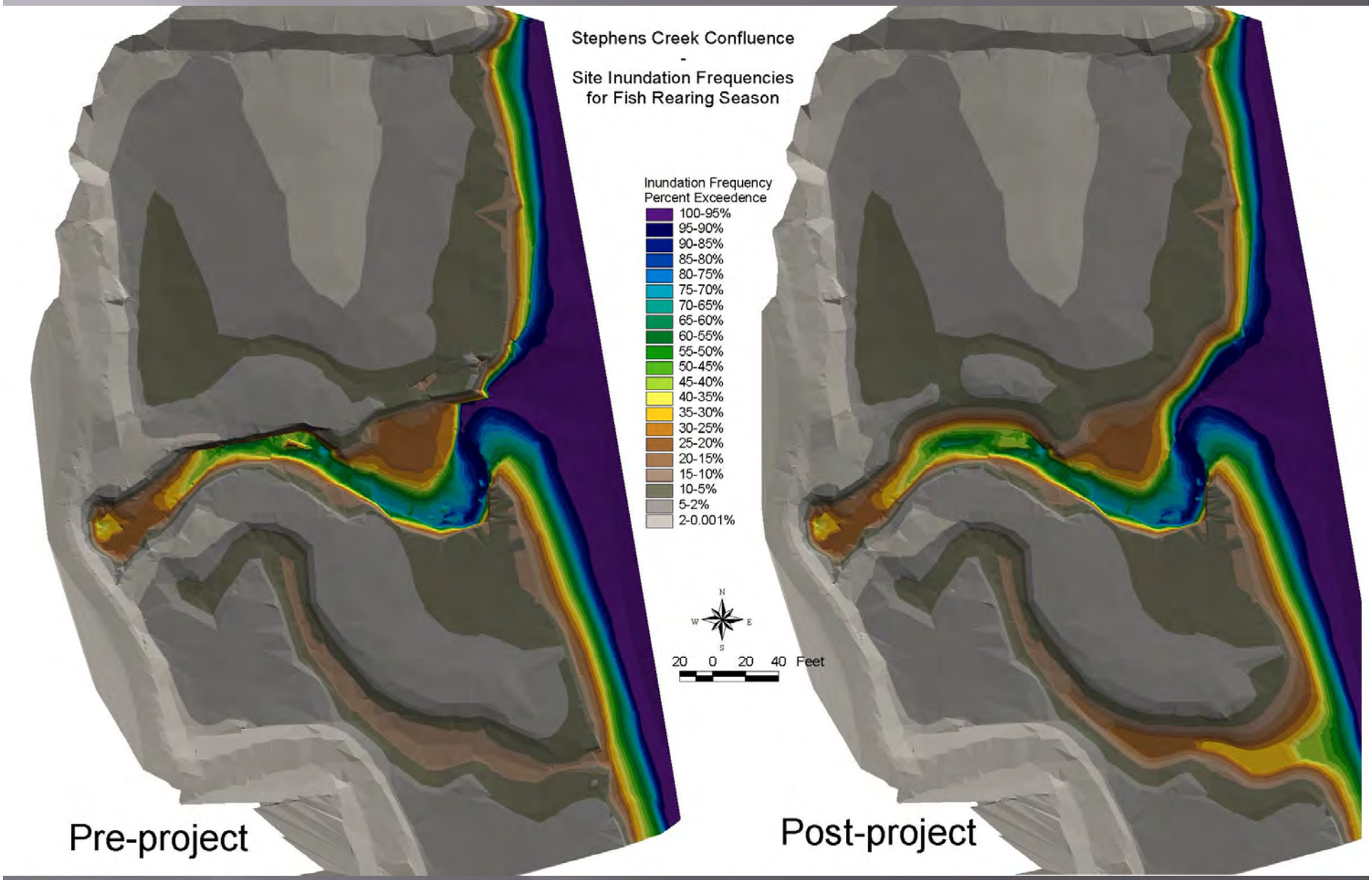
A. November 7, 2006

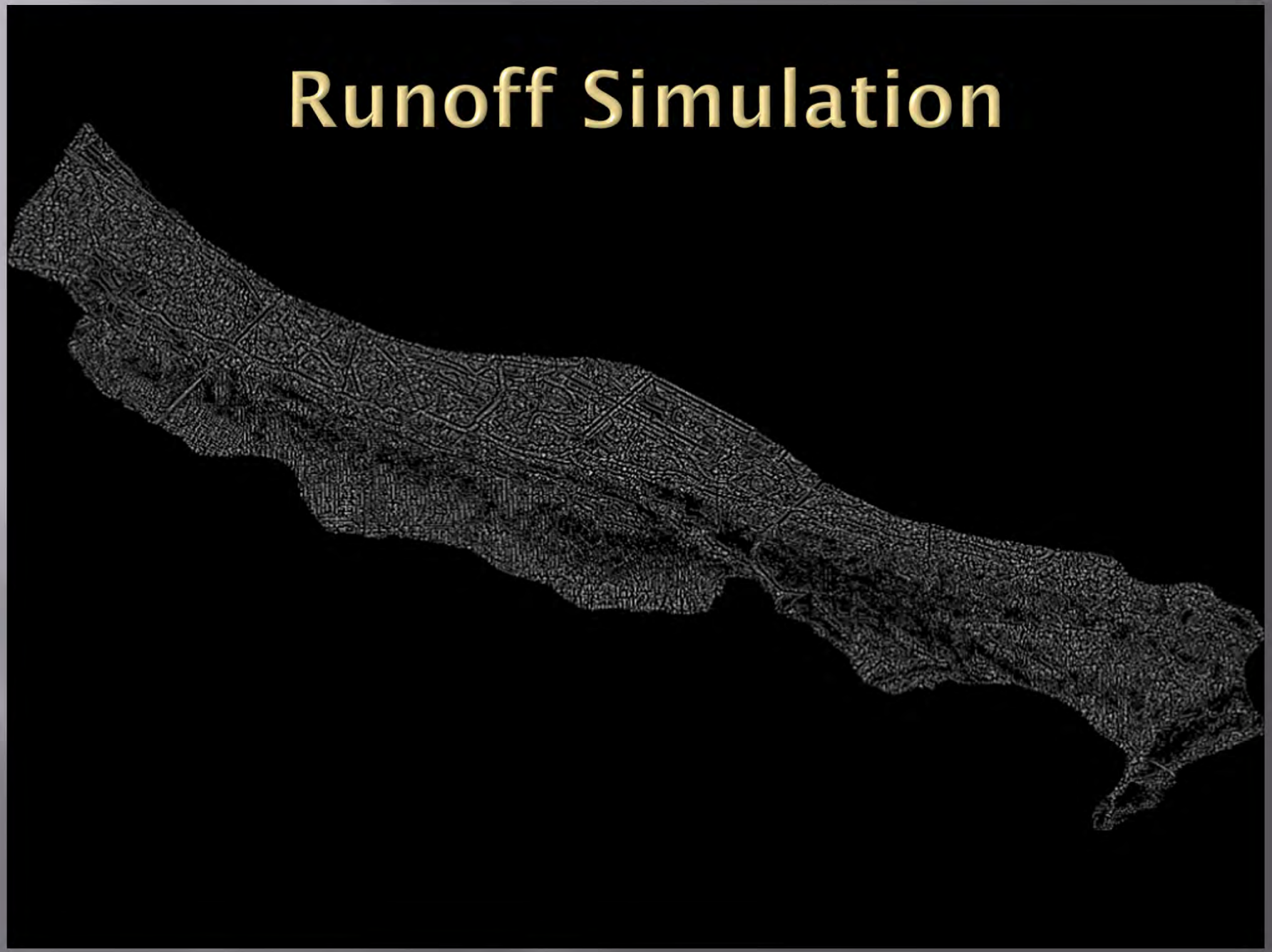
Salmon Creek
Stephens Creek
Vancouver
Portland
Multnomah
Gresham
Beaverton
Lake Oswego
Sandy
Oregon City
© 2012 Google
Image © 2012 TerraMetrics
Image State of Oregon
Google earth

Stephens Creek Confluence
© 2012 Google
Google earth


Stephens Creek Confluence
-
Site Inundation Frequencies
for Fish Rearing Season
Inundation Frequency
Percent Exceedence
100-95%
95-90%
90-85%
85-80%
80-75%
75-70%
70-65%
65-60%
60-55%
55-50%
50-45%
45-40%
40-35%
35-30%
30-25%
25-20%
20-15%
15-10%
10-5%
5-2%
2-0.001%
N
W
E
S
20 0 20 40 Feet
Pre-project
Post-project

Columbia Slough
Salmon Creek
Vancouver
Portland
Multnomah
Gresham
Beaverton
Lake Oswego
Sandy
Oregon City
© 2012 Google
Image State of Oregon
Image © 2012 TerraMetrics
Google earth

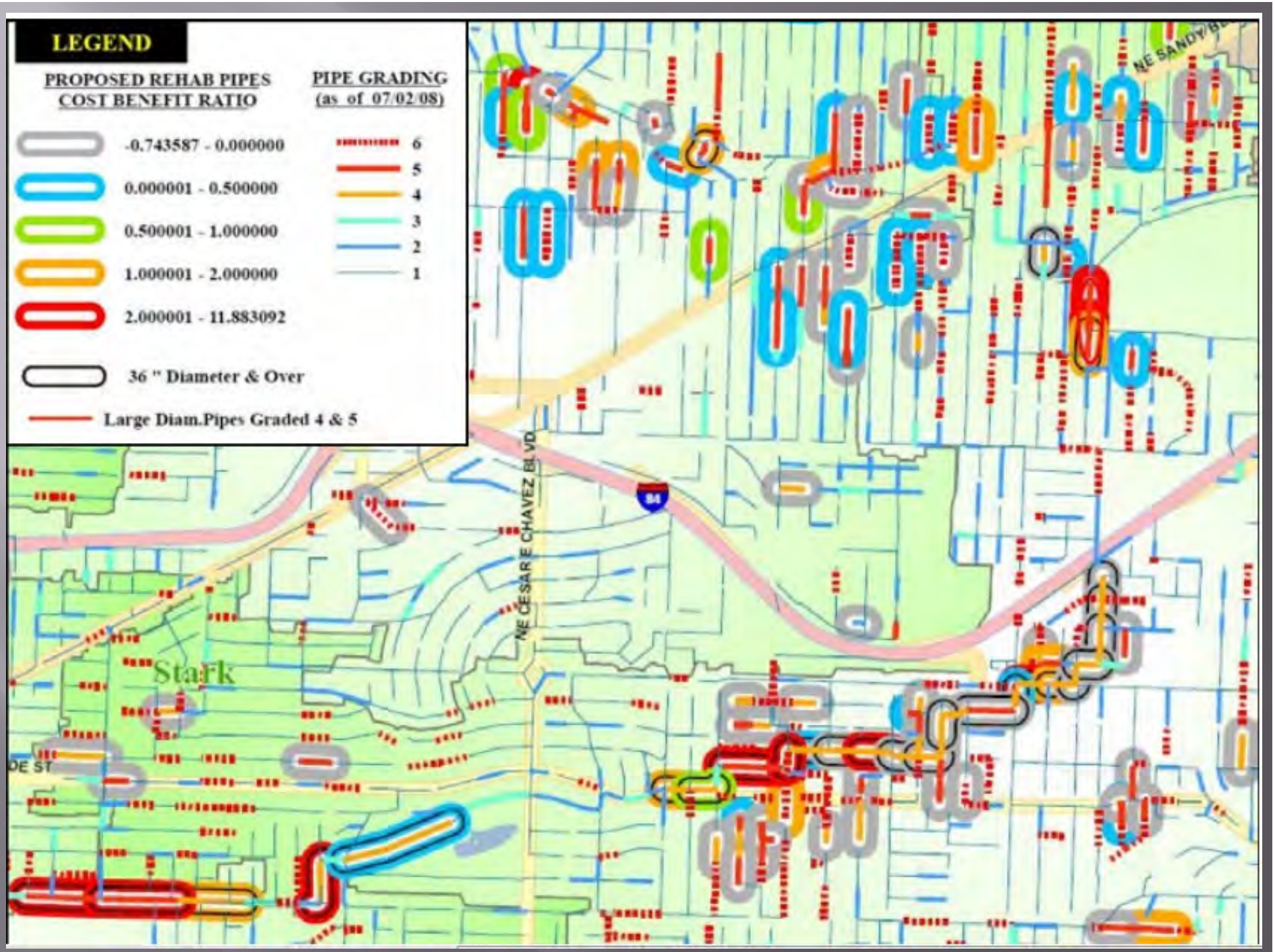
Runoff Simulation

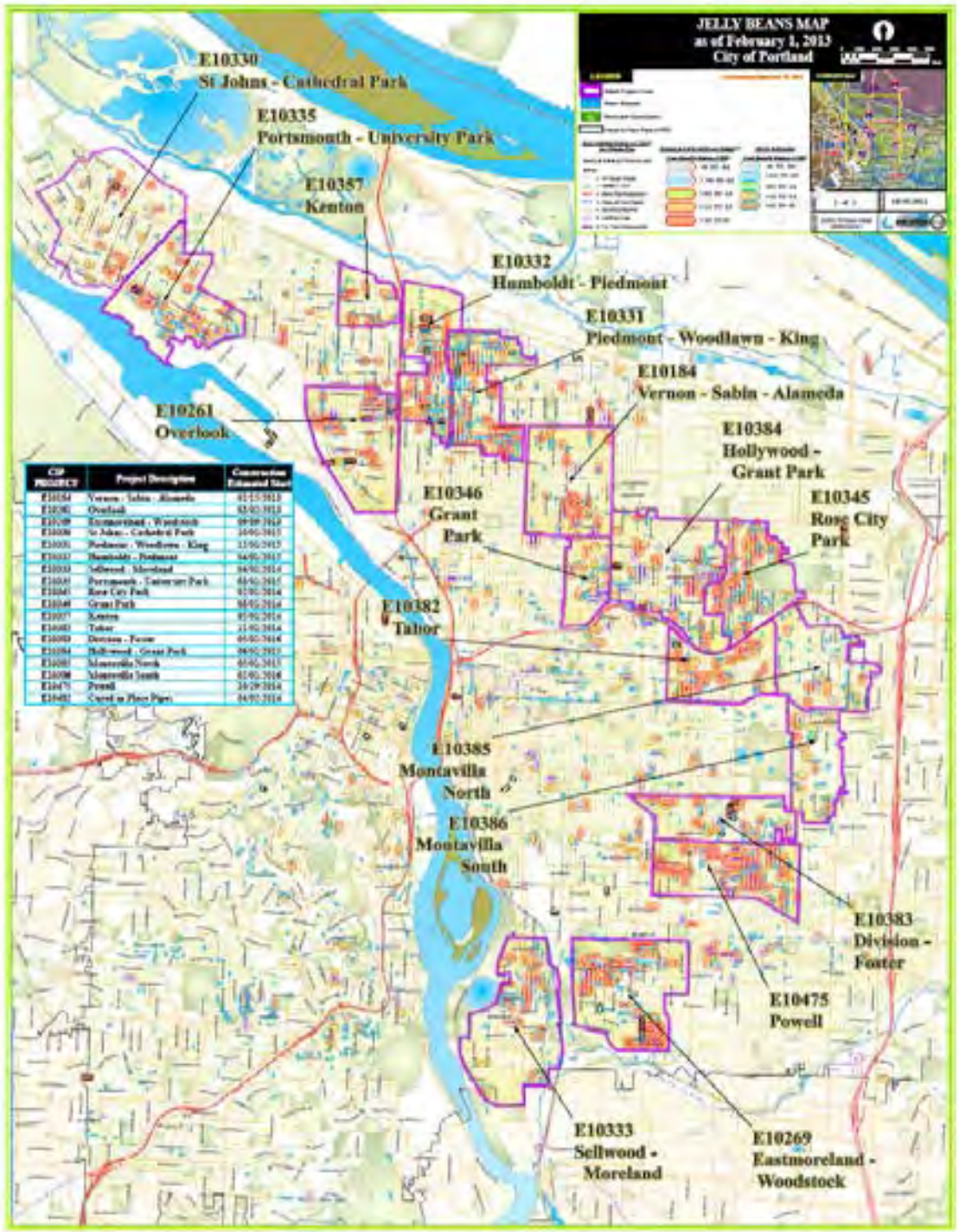


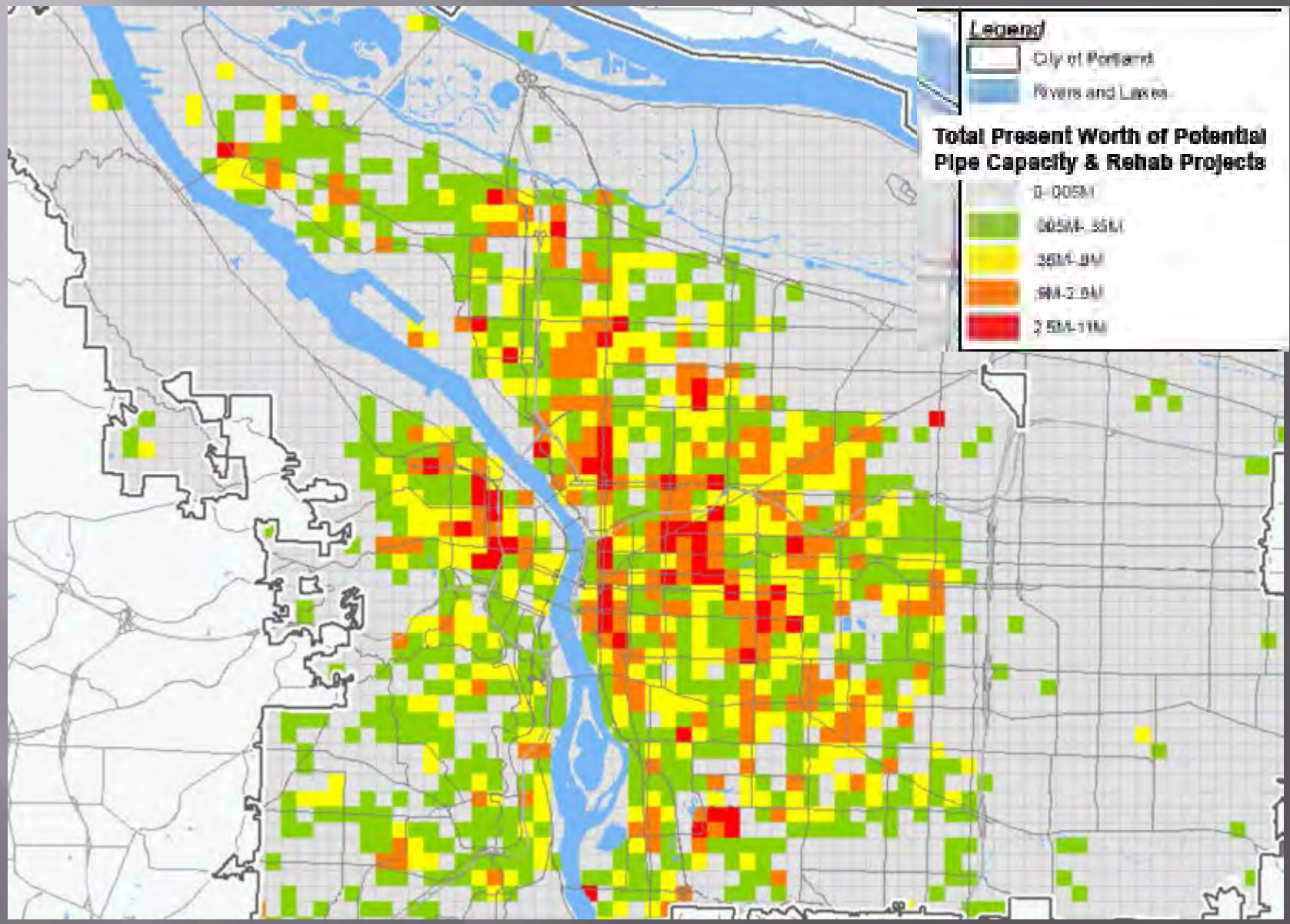
Peeling further back

Going underground

Out of sight . . .
STOP
out of mind.


LEGEND
PROPOSED REHAB PIPES
COST BENEFIT RATIO
-0.743587 - 0.000000
0.000001 - 0.500000
0.500001 - 1.000000
1.000001 - 2.000000
2.000001 - 11.883092
36 " Diameter & Over
Large Diam.Pipes Graded 4 & 5
PIPE GRADING
(as of 07/02/08)
6
5
4
3
2
1
NE CESAR E CHAVEZ BLVD
84
Stark
NE SANDY BL


JELLY BEANS MAP
as of February 1, 2013
City of Portland
E10330
St Johns - Cathedral Park
E10335
Portsmouth - University Park
E10357
Kenton
E10332
Humboldt - Piedmont
E10331
Piedmont - Woodlawn - King
E10184
Vernon - Sabin - Alameda
E10261
Overlook
E10384
Hollywood -
Grant Park
E10346
Grant
Park
E10345
Rose City
Park
E10382
Tabor
E10385
Montavilla
North
E10386
Montavilla
South
E10383
Division -
Foster
E10475
Powell
E10333
Sellwood -
Moreland
E10269
Eastmoreland -
Woodstock


Legend
City of Portland
Rivers and Lakes
Total Present Worth of Potential
Pipe Capacity & Rehab Projects

08/30/2011

2011/2/24

Salmon Creek
Oaks Bottom
Vancouver
Portland
Multnomah
Gresham
Beaverton
Lake Oswego
Sandy
Oregon City
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Image State of Oregon
Google earth

0+00
1+00
3+00
2+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
14+00
13+00
15+00
17+00
18+00
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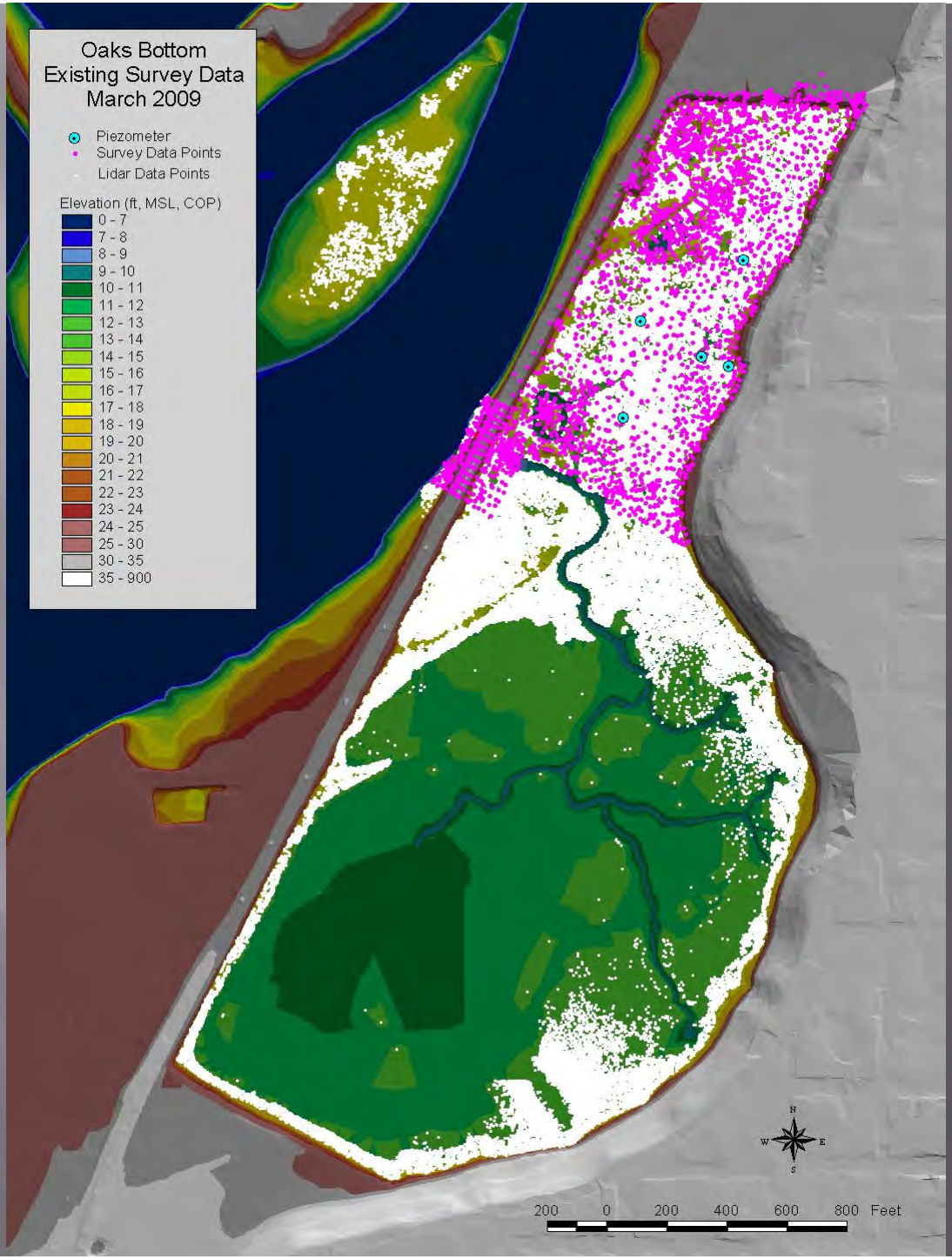
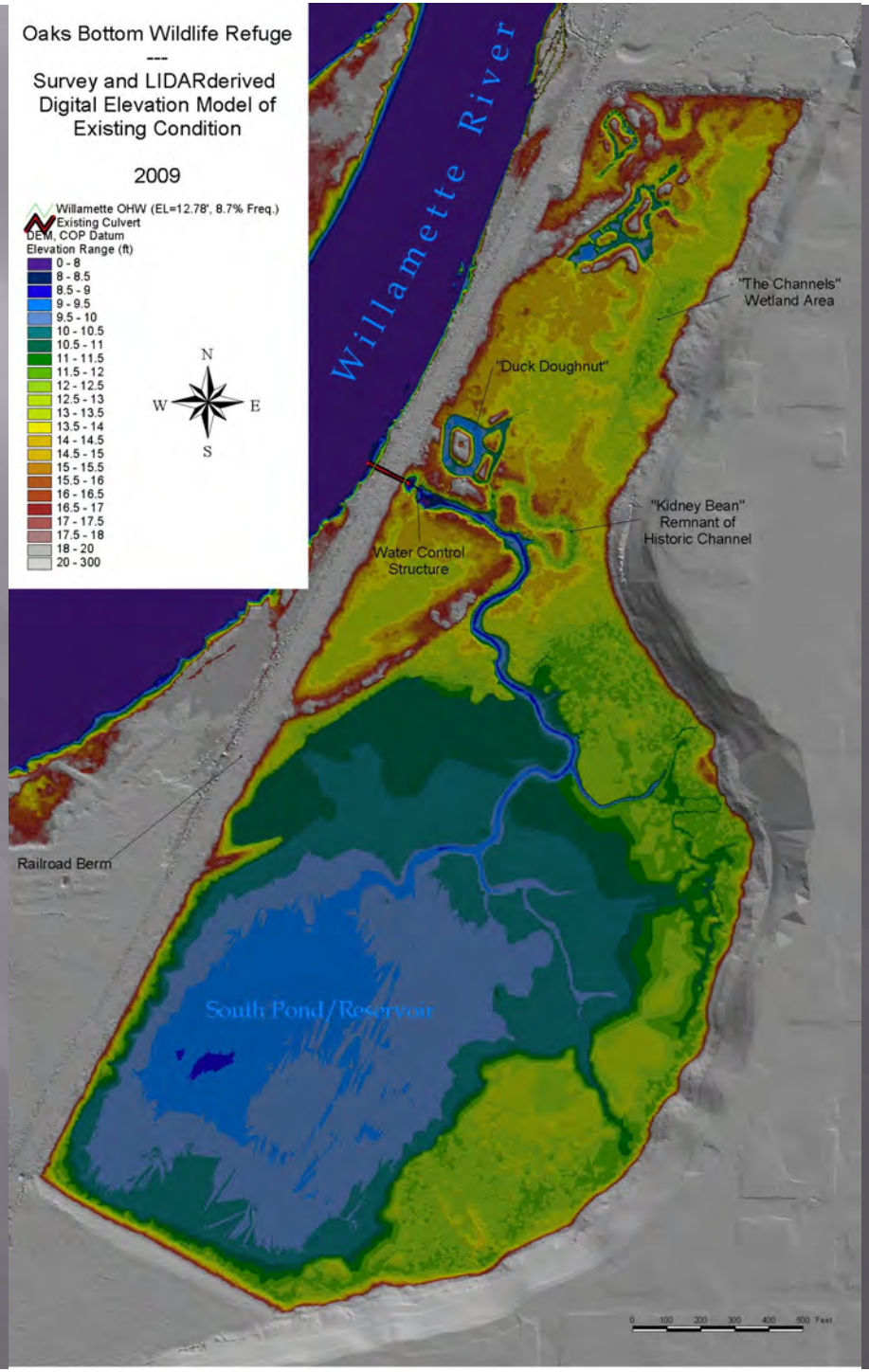
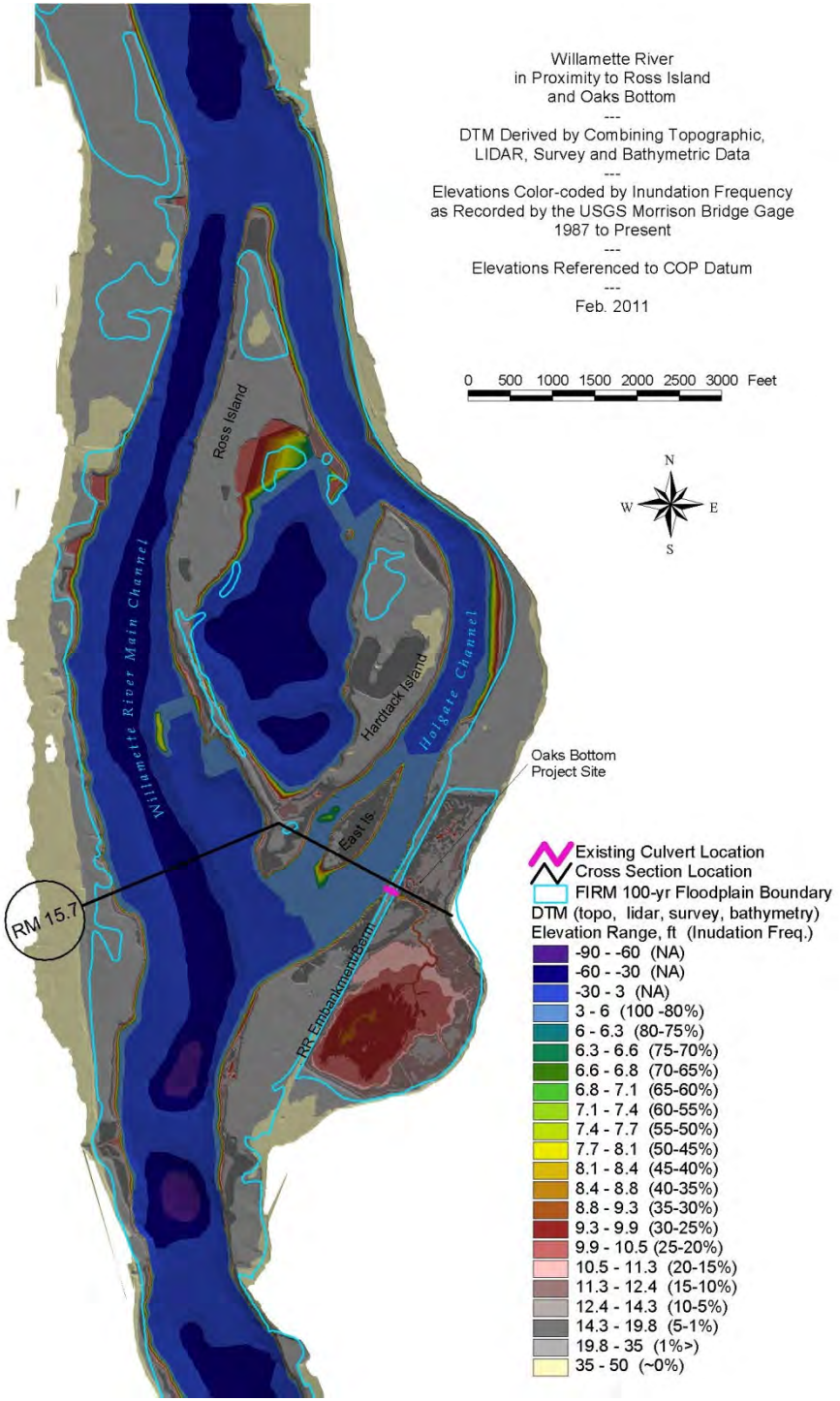
25+00
26+00
27+00
28+00


Oaks Bottom
Existing Survey Data
March 2009
Piezometer
Survey Data Points
Lidar Data Points
Elevation (ft, MSL, COP)
0 - 7
7 - 8
8 - 9
9 - 10
10 - 11
11 - 12
12 - 13
13 - 14
14 - 15
15 - 16
16 - 17
17 - 18
18 - 19
19 - 20
20 - 21
21 - 22
22 - 23
23 - 24
24 - 25
25 - 30
30 - 35
35 - 900
N
W
E
S
200 0 200 400 600 800 Feet


Oaks Bottom Wildlife Refuge

Survey and LIDARderived Digital Elevation Model of Existing Condition
2009
Willamette OHW (EL=12.78', 8.7% Freq.)
Existing Culvert
DEM, COP Datum
Elevation Range (ft)
0 - 8
8 - 8.5
8.5 - 9
9 - 9.5
9.5 - 10
10 - 10.5
10.5 - 11
11 - 11.5
11.5 - 12
12 - 12.5
12.5 - 13
13 - 13.5
13.5 - 14
14 - 14.5
14.5 - 15
15 - 15.5
15.5 - 16
16 - 16.5
16.5 - 17
17 - 17.5
17.5 - 18
18 - 20
20 - 300
N
W
E
S
Willamette River
"The Channels" Wetland Area
"Duck Doughnut"
"Kidney Bean" Remnant of Historic Channel
Water Control Structure
Railroad Berm
South Pond / Reservoir
0 100 200 300 400 500 Feet


Willamette River
in Proximity to Ross Island
and Oaks Bottom

DTM Derived by Combining Topographic,
LIDAR, Survey and Bathymetric Data

Elevations Color-coded by Inundation Frequency
as Recorded by the USGS Morrison Bridge Gage
1987 to Present

Elevations Referenced to COP Datum

Feb. 2011
0 500 1000 1500 2000 2500 3000 Feet
N
W
E
S
Ross Island
Willamette River Main Channel
Hardtack Island
Holgate Channel
Oaks Bottom
Project Site
East Is.
RM 15.7
RR Embankment/Berm
Existing Culvert Location
Cross Section Location
FIRM 100-yr Floodplain Boundary
DTM (topo, lidar, survey, bathymetry)
Elevation Range, ft (Inudation Freq.)
-90 - -60 (NA)
-60 - -30 (NA)
-30 - 3 (NA)
3 - 6 (100 -80%)
6 - 6.3 (80-75%)
6.3 - 6.6 (75-70%)
6.6 - 6.8 (70-65%)
6.8 - 7.1 (65-60%)
7.1 - 7.4 (60-55%)
7.4 - 7.7 (55-50%)
7.7 - 8.1 (50-45%)
8.1 - 8.4 (45-40%)
8.4 - 8.8 (40-35%)
8.8 - 9.3 (35-30%)
9.3 - 9.9 (30-25%)
9.9 - 10.5 (25-20%)
10.5 - 11.3 (20-15%)
11.3 - 12.4 (15-10%)
12.4 - 14.3 (10-5%)
14.3 - 19.8 (5-1%)
19.8 - 35 (1%>)
35 - 50 (~0%)

DOGAMI Images

LIDAR on steroids

Image: Daniel E. Coe

Little Deschutes River, Near Sun River, Oregon

The Little Deschutes River in Central Oregon originates in the High Cascades of Klamath County. The image above, located south of Sunriver, has been enhanced to reveal the river's myriad of abandoned channels. OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Willamette River Historic Channels, North of Corvallis, Oregon

L I D A R

Revealing Oregon's Dynamic Landscape

The Willamette River and it former channels near Corvallis, Oregon. For thousands of years, the Willamette River wandered widely across the valley floor.
Only in recent times have humans managed to confine it to a single course. This 3D enhanced image was created using a combination of lidar-derived elevation data and aerial orthophotography.

2010 Oregon Department of Geology and Mineral Industries Lidar imagery and graphic design by Daniel Coe

WILLAMETTE RIVER FLOODPLAIN, NORTH OF SALEM, OREGON

Proposed DOGAMI LiDAR Spec – 2006

PEELING BACK THE URBAN LANDSCAPE:

COMPLEXITY AND ITS IMPACT ON THE PLANNING AND MANAGEMENT OF A MUNICIPALITY'S INFRASTRUCTURE AND NATURAL RESOURCES

Mark A. Liebe, P.E., Ph.D., CSM
City of Portland – Bureau of Environmental Services

September 27, 2019