Channel Portfolio Tool
Module 4: Map outputs to GoogleEarth

ERDC
Engineer Research and Development Center

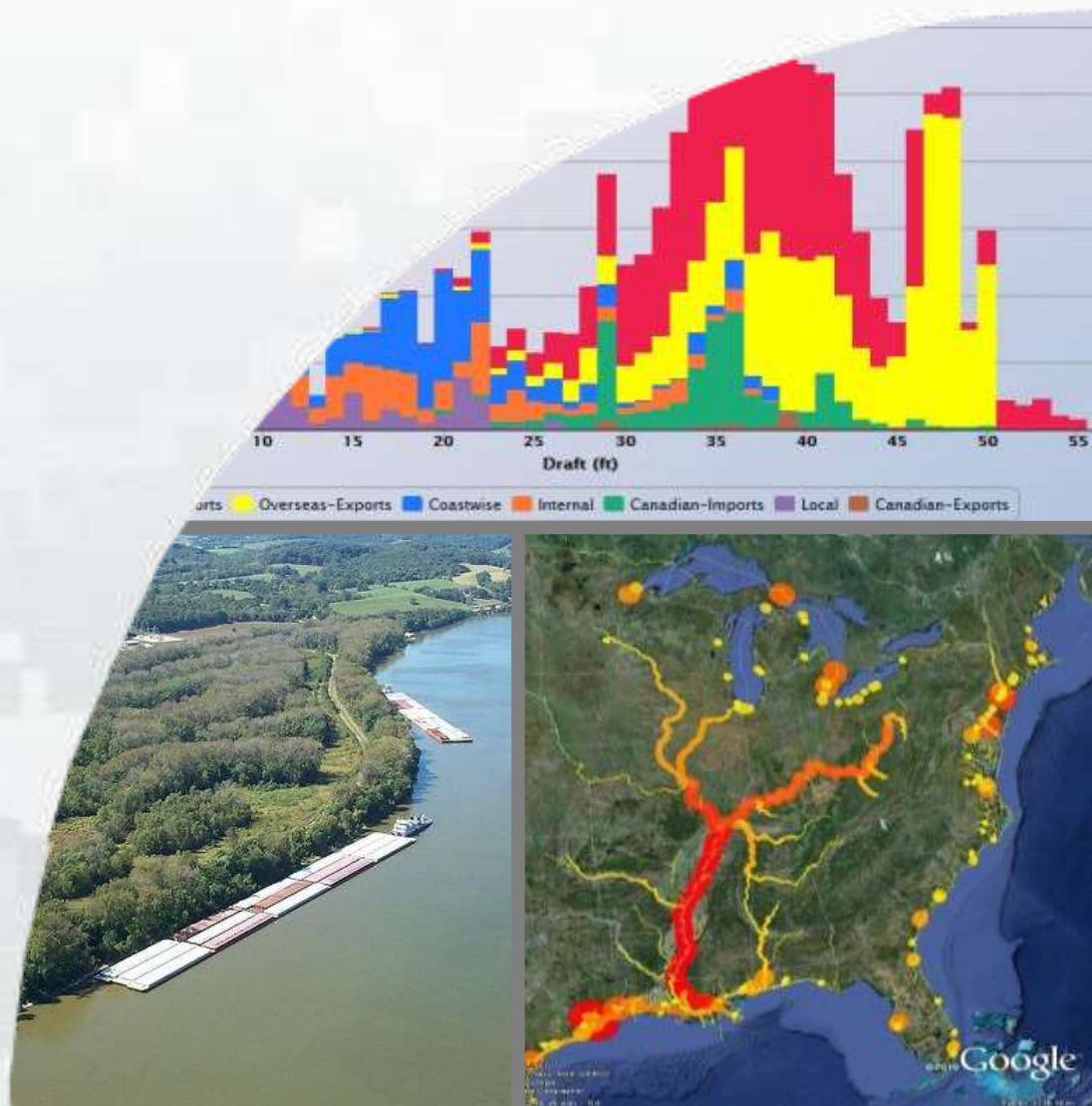https://cpt.usace.army.mil

K. Ned Mitchell, PhD
Research Civil Engineer
CPT Program Manager

Marin Kress, PhD
Research Physical Scientist

Development Team
Tim Garton - Lead Programmer;
SAM-OPJ technical staff

NAVSYS
Navigation Systems Research Program

CIRP
Mission Support · Technology Transfer
Research & Development

US Army Corps of Engineers®

Overseas-Exports · Coastwise · Internal · Canadian-Imports · Local · Canadian-Exports

Draft (ft)

Module Topics

o   Example of default and customized map
o   Customizing GIS filters within CPT to affect the GoogleEarth map appearance
  o   Colors
  o   Color scale orientation
  o   Line width

o   Viewing maps within GoogleEarth
  o   Places – adding useful notes to your CPT-generated kmz file
  o   Layers – optional map elements available in GoogleEarth

o   Reminder about exporting from CPT at different organizational levels
  o   Example polygon-style maps from Division, District, Project and Reach
  o   Example line-style maps from Division, District, Project and Reach

o   Flow Maps – subtle differences to be aware of

➢   Associated Exercise – Export custom query results to GoogleEarth
To do the associated exercise for this module you need to have GoogleEarth installed on your computer

CPT can output your query results into a map file (.kmz or .kml) that opens in GoogleEarth. Users can then take advantage of the features in G-Earth to visualize results and create useful communication products.

Sample GoogleEarth map, showing reach-level tonnage rankings for all MVD reaches in year 2014.

By default, lower values (including 0s) are shown as narrower and whiter lines.

Higher values are shown in thicker red shades, calculated automatically using a log scale. The rest of this module will describe ways to customize your map appearance.

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image IBCAO

Google earth

Tip: Make note of what your map is displaying as soon as possible. Maps are drawn on a relative scale based on your query, so similar-looking maps may represent very different data.

GIS filter – default settings

GIS filter settings
Scale = Linear ; Scale Display = Both
Min Gradient Color = White
Max Gradient Color = Orange
All others to default

Reach level tonnage ranking, 2014

WCSC data, processed via Channel Portfolio Tool, displayed in GoogleEarth

Reach level **flow** results for commodity category "Barley, Rye, Oats, River and Sorghum Grains (64)" 2014.

WCSC data, processed via Channel Portfolio Tool, displayed in GoogleEarth

CPT users can customize settings for GoogleEarth outputs using the GIS filter

Customization choices include the following:

- Polygon or Line style

- Log or Linear scale for line width

- Maximum line width (number of pixels)

- Colors representing maximum and minimum values

On the **Preferences** page you will use the **GIS** filter to customize the appearance of your exports to GoogleEarth

How to customize GIS filter settings in CPT

Example: Rollup of tonnage and dollars for all reaches within MVD, all commodities, all traffic types, year 2014.

Click on the GIS filter to expand the options and view the GIS toggles

Grid, Charting, and GIS Calculation/Display

Commodity Details

Group By:	☐ Draft ☐ System ☐ Vessel Type ☑ Traffic
Order Grid By:	○ Trips ◉ Tons ○ Dollars
Order Chart By:	○ Trips ○ Tons ○ Dollars ◉ Chart Dependent
Year Rollup:	○ Details By Year ○ Years Summed ◉ Years Averaged
Top N Locations:	15
Top N Commodities:	5
Show Columns:	☐ Ton Miles ☐ Dollar Miles ☐ System Ton Miles ☐ System Dollar Miles

Work Package Details
Budget Details
X-Axis
Y-Axis
GIS

GIS

Style:	◉ Line ○ Polygon
Scale:	○ Linear ◉ Logarithmic
Scale By:	○ Trips ◉ Tons ○ Dollars
Scale From:	○ Minimum ◉ Maximum
Scale Display:	○ Color ○ Line Width ◉ Both
Min Line Width (pixels):	2
Max Line Width (pixels):	20
Min Polygon Width (miles):	1
Max Polygon Width (miles):	10
Min Gradiant Color:	◉ White ○ Red ○ Orange ○ Yellow ○ Green ○ Blue ○ Indigo ○ Violet
Max Gradiant Color:	○ White ◉ Red ○ Orange ○ Yellow ○ Green ○ Blue ○ Indigo ○ Violet

Style is the first toggle choice under the GIS filter.

GIS▲	
Style:	◉ Line ○ Polygon

Will you want a Line or Polygon output for your map?

The answer depends on what your final spatial scale will be.

If you want to show National-, Division-, or District-level differences a polygon overlay can be useful.

Examples of Style:Line and Style:Polygon map outputs start on next slide.

Polygons can be useful when comparing across large spatial scales, e.g. all Divisions or all Districts
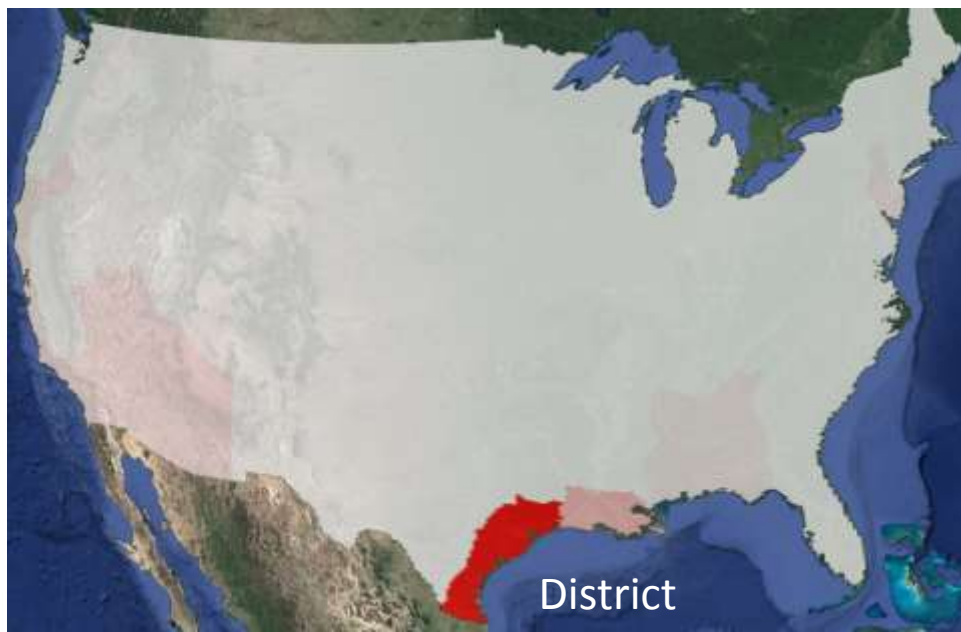

Division

District

Query parameters
2014
Traffic: Overseas-Imports,
Commodity: Crude Petroleum
GIS Style: Polygon
All others at defaults

Rankings tab results, exported to GoogleEarth

Polygons are *less* useful when viewing **many** results at the Project or Reach level, especially if one record has far higher numbers than the rest. Examples below are the results from the same query. Note the difference in display coloration for the Houston area channels at project vs. reach level.

(Query settings: 2014, Overseas-Imports, Crude Petroleum, GIS Style: Polygon)

Project level rankings

Reach level rankings

When comparing only a few reaches in close proximity the Style: Line setting is probably a better choice

Ex: Delaware River between Philadelphia and Trenton
Same data, exported from Reach: Rankings tab

Style: Polygon

Style: Line

View of GIS filter menu

Style:	◉ Line ○ Polygon
Scale:	○ Linear ◉ Logarithmic
Scale By:	○ Trips ◉ Tons ○ Dollars
Scale From:	○ Minimum ◉ Maximum
Scale Display:	○ Color ○ Line Width ◉ Both
Min Line Width (pixels):	2
Max Line Width (pixels):	20
Min Polygon Width (miles):	1
Max Polygon Width (miles):	10
Min Gradiant Color:	◉ White ○ Red ○ Orange ○ Yellow ○ Green ○ Blue ○ Indigo ○ Violet
Max Gradiant Color:	○ White ◉ Red ○ Orange ○ Yellow ○ Green ○ Blue ○ Indigo ○ Violet

Scale By toggle allows you to choose between displaying Trips, Tons, or Dollars on the map. Default is Tons.

Scale Display allows you to decide if you want a higher value line to be thicker, brighter, or <u>both</u> thicker and brighter. Default is Both.

View of GIS filter menu

GIS	
Style:	⦿ Line ◯ Polygon
Scale:	◯ Linear ⦿ Logarithmic
Scale By:	◯ Trips ⦿ Tons ◯ Dollars
Scale From:	◯ Minimum ⦿ Maximum
Scale Display:	◯ Color ◯ Line Width ⦿ Both
Min Line Width (pixels):	2
Max Line Width (pixels):	20
Min Polygon Width (miles):	1
Max Polygon Width (miles):	10
Min Gradiant Color:	⦿ White ◯ Red ◯ Orange ◯ Yellow ◯ Green ◯ Blue ◯ Indigo ◯ Violet
Max Gradiant Color:	◯ White ⦿ Red ◯ Orange ◯ Yellow ◯ Green ◯ Blue ◯ Indigo ◯ Violet

Increasing the difference between these numbers will allow for more gradations on the final map.

Tip: Setting the minimum line width to 1 pixel improves the visual clarity of map results.

Select the colors to represent minimum and maximum value on your map.

Note: White is the default choice for minimum values (including 0.00), and default maximum color value is red.
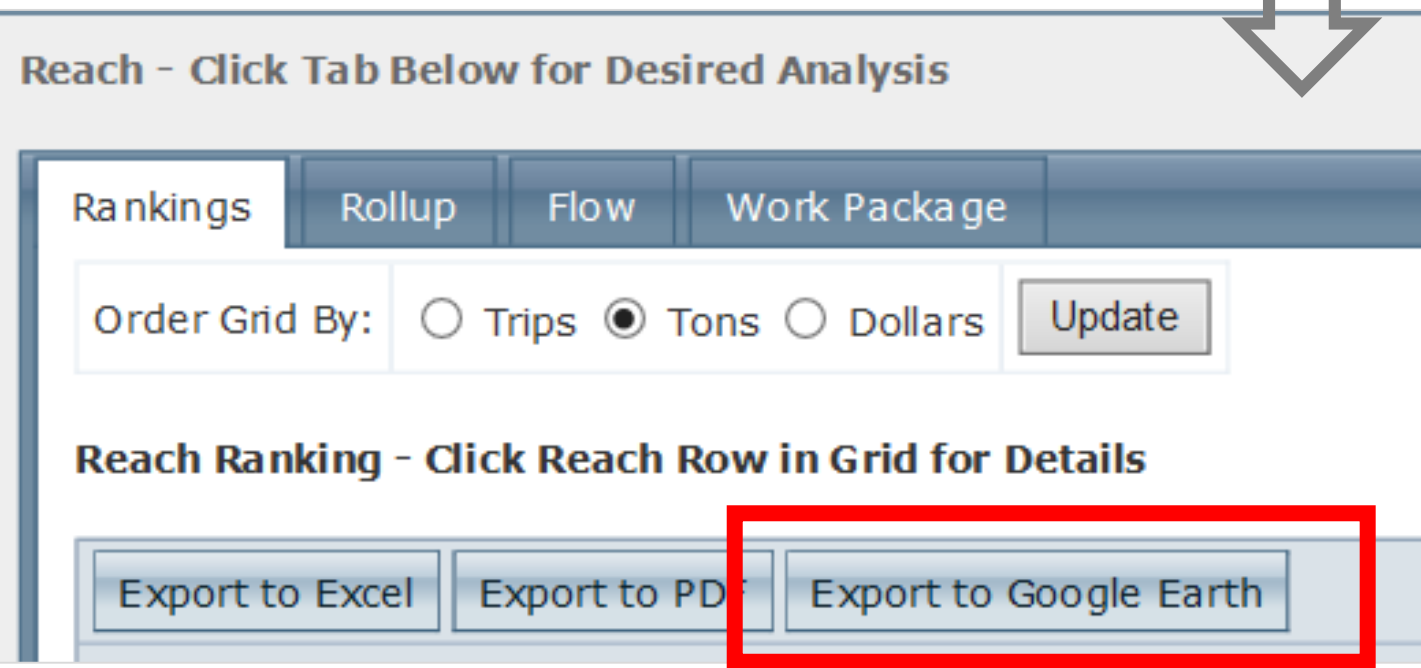
After setting the **Preferences** page filters, click on the Continue button.

Select reaches for your query from the **Locations** page, then click the Continue button.
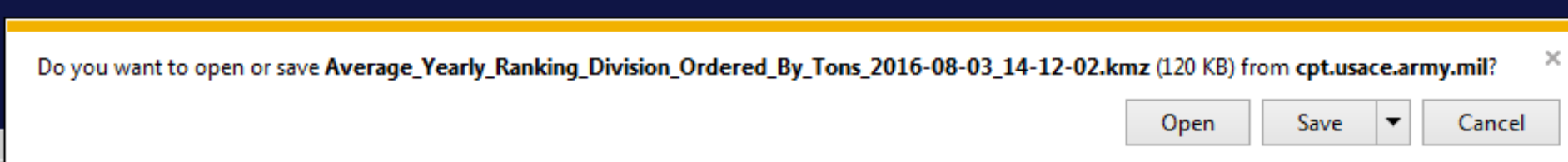
When viewing your query results, make sure you are at the desired organizational level (Division, District, Project, or Reach). Navigate between levels using the **Reports** menu.

After arriving at the desired results page, click on the Export to Google Earth button.

After clicking 'Export to Google Earth' a decision window will appear.
(your window may look different depending on your web browser)

Do you want to open or save **Average_Yearly_Ranking_Division_Ordered_By_Tons_2016-08-03_14-12-02.kmz** (120 KB) from **cpt.usace.army.mil**?

Open   Save   ▼   Cancel

Click on 'Open' to open immediately in GoogleEarth.

Click 'Save As' if you want to alter the file name to include more information.
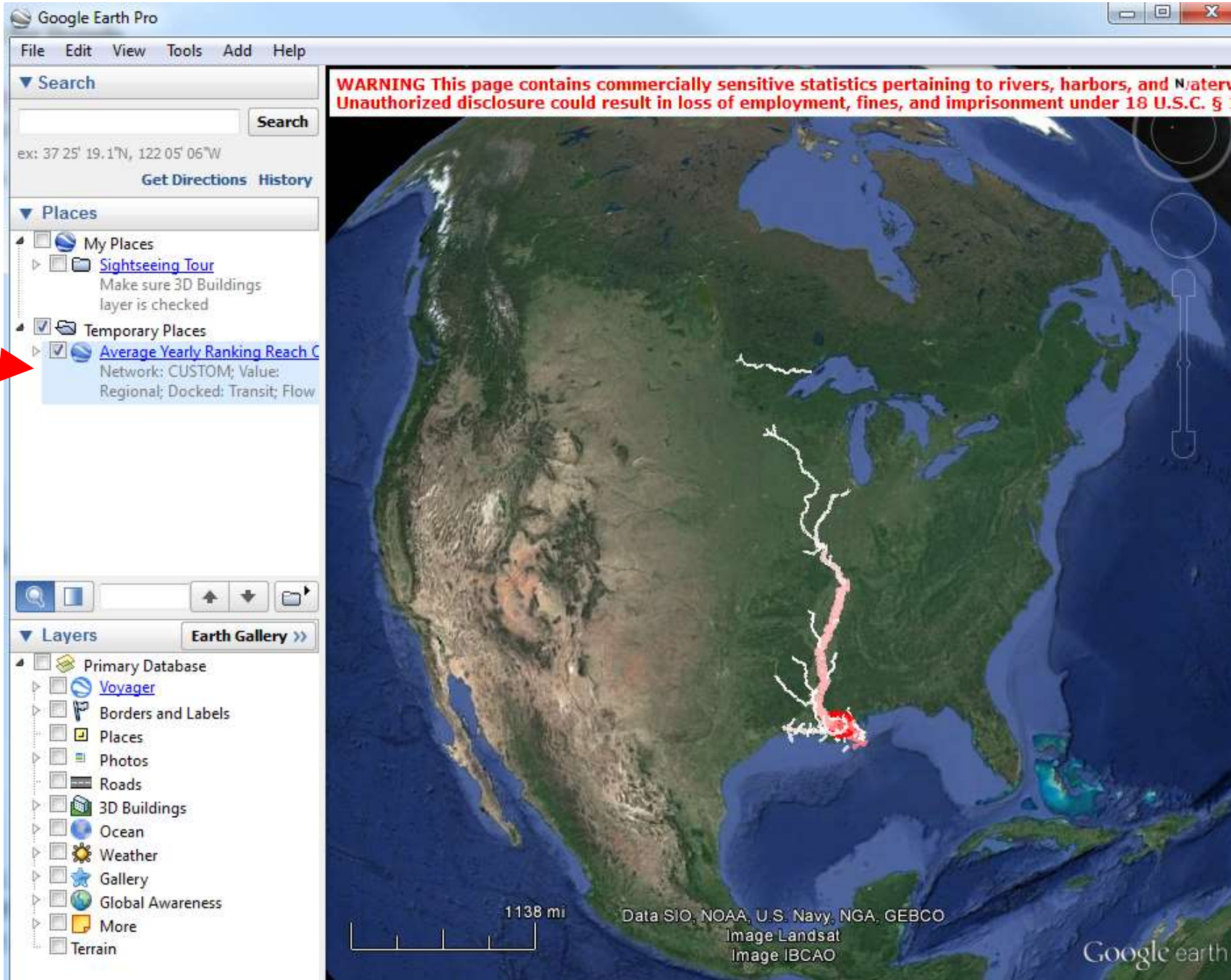
Viewing your maps in GoogleEarth

Your GoogleEarth display will look something like the image below, note control panel on left.

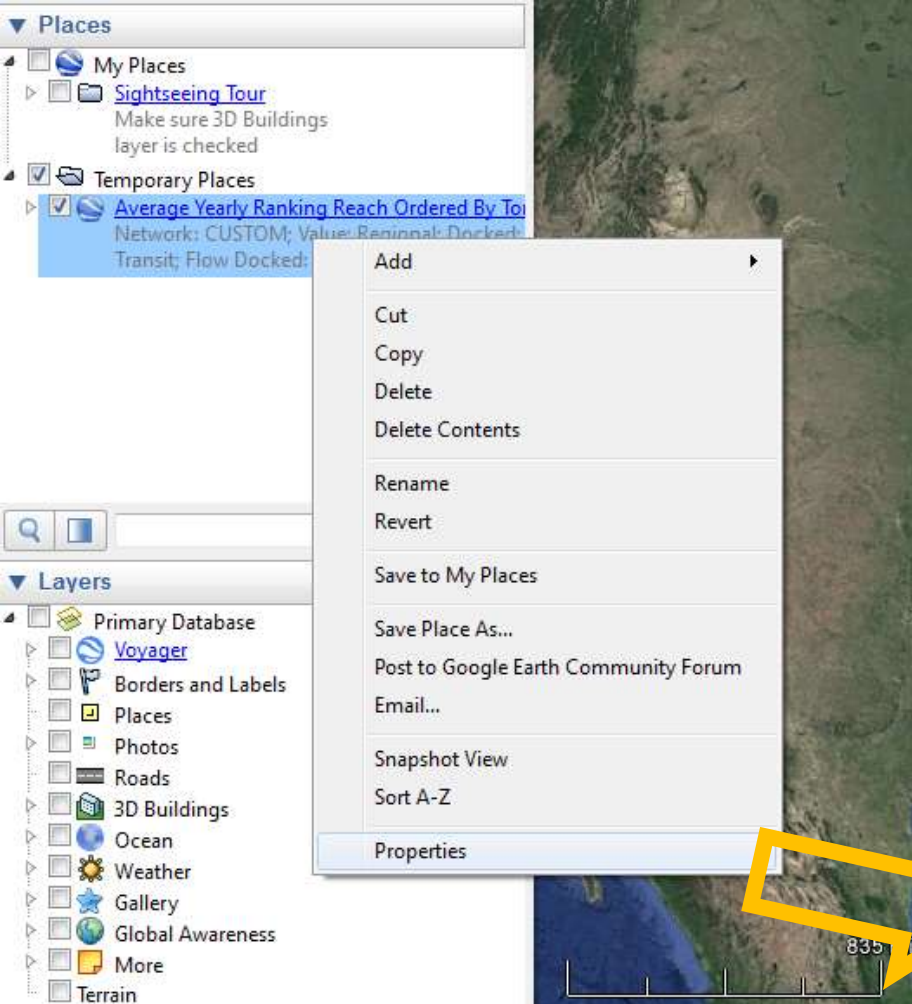Your CPT results will be displayed as the last record under the PLACES menu

Turn off/on individual GoogleEarth LAYERS to display features such as state boundaries on your map.
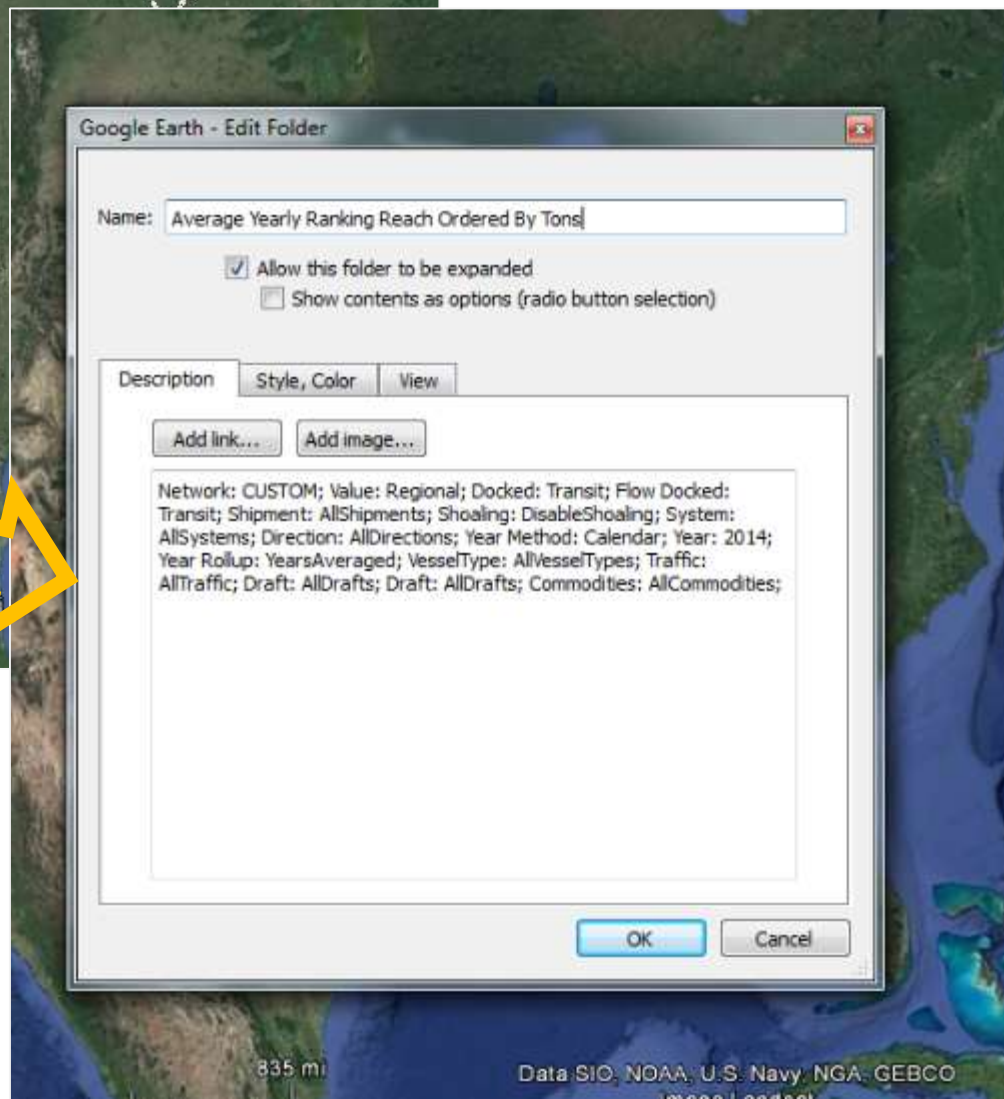
To add notes about a CPT-generated places file, right click on the name and select Properties, then edit the Description box. Users are also encouraged to save all files before closing GoogleEarth.

Click on a reach to view a pop-up box with associated information for that reach. Note that the pop-up box does not display all relevant info (e.g., year) but more query information is available under the Places menu (see previous slide).

Reminder: Exporting from different organizational levels within CPT will give you different results.

Exporting from the Division, District, Project, or Reach level tab will generate different GoogleEarth graphics. Examples in the following slides.

Example: S**ame query results** generated from different organizational levels in CPT.
Query parameters: All MVD reaches, 2014
GIS setting: **Style = Polygon**
Map: Rankings by Tonnage

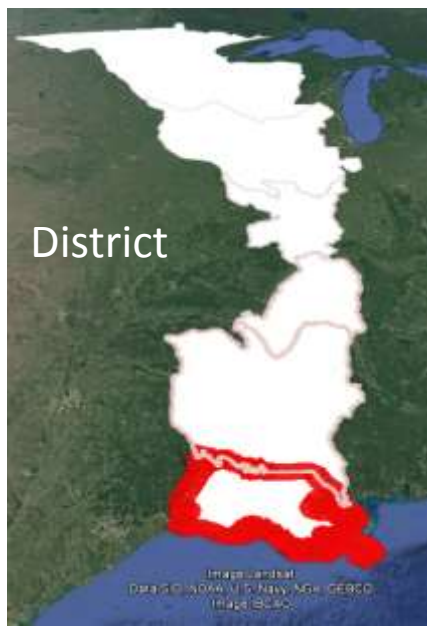Example: Same query results generated from different organizational levels
Query parameters: All MVD, 2014, Tonnage, GIS setting: **Style = Line**
Map: Rankings by Tonnage

You can navigate between organizational levels in the **Reports** menu

Reach level, **Rankings** tab
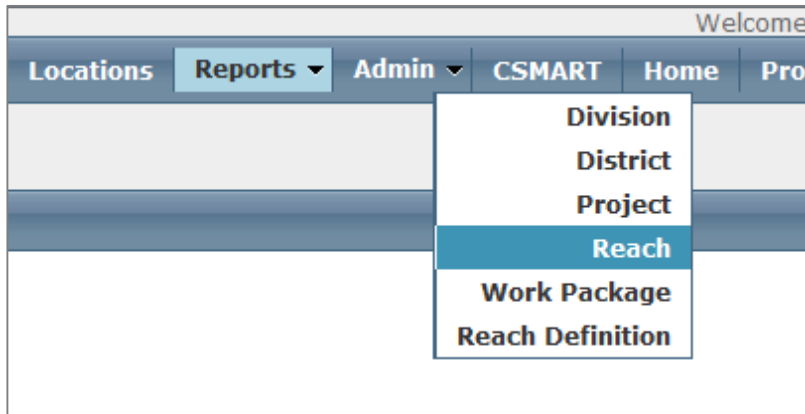
The **Reach** view provides the most detail for this query of all reaches within MVD for the year 2014.

Style: Line

Flow maps

Flow maps can display origin-to-destination tracks for tonnage that **moved through** the reaches you selected in the query, even if the tonnage **did not stop** in those reaches. The goal of a flow map is to show how tonnage moved through the waterway network. Queries can be customized to show only origins, only destinations, or only through-traffic on the resulting flow map.

Caution: Flow maps have the same design as rankings maps (i.e., default red-white color scale), but they answer a different question.

Tip: Include explanatory notations on any flow map, and remember the non-disclosure restrictions.

St. Louis District, all reaches, 2014. Reach-level FLOW map.

WCSC data, processed via Channel Portfolio Tool, via GoogleEarth
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
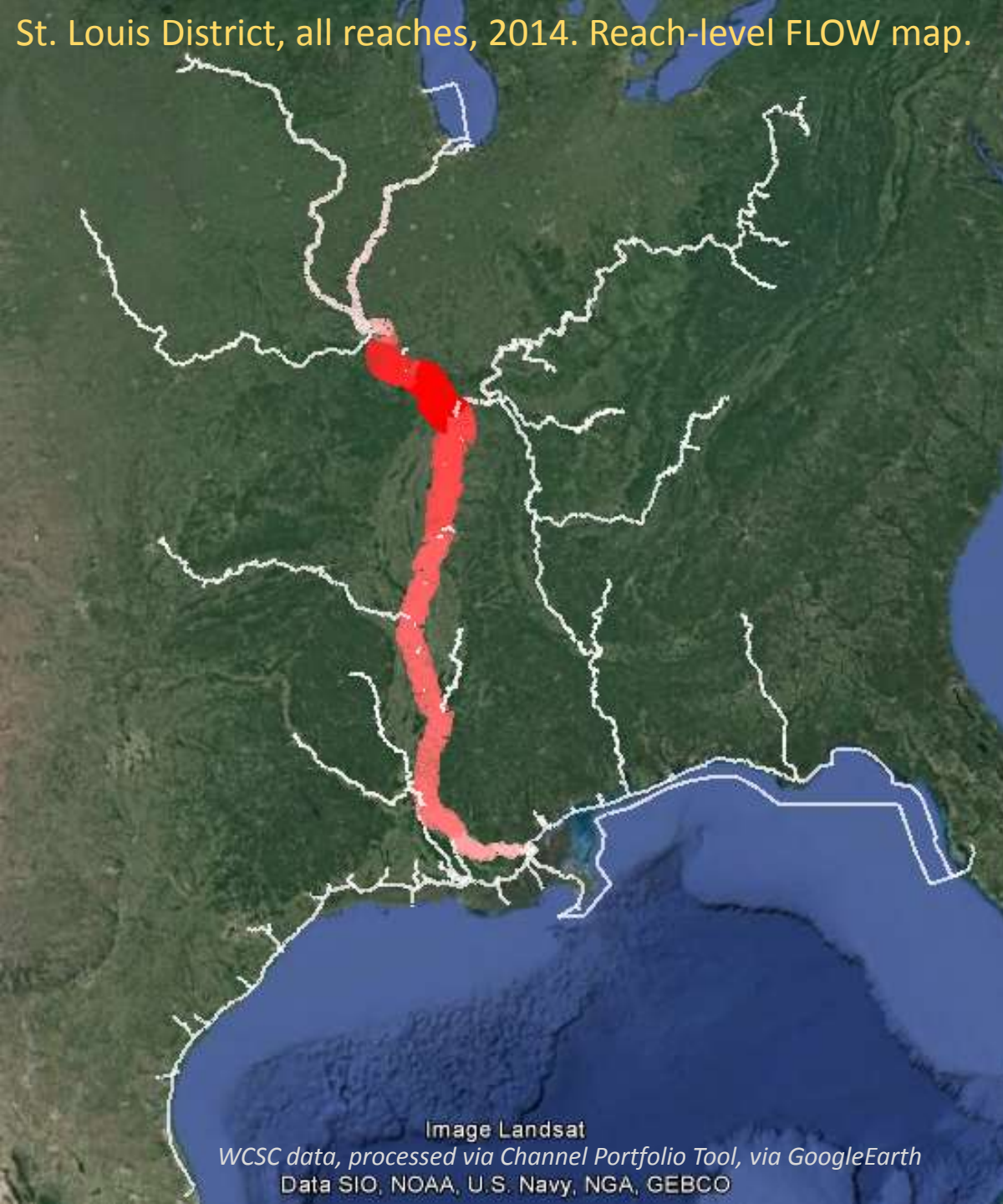
This map shows the origin or destination of tonnage that flowed **through any of the St. Louis District reaches** in the year 2014.

Readers can see that tonnage starting, stopping, or passing through St. Louis reaches had its origin or destination across a wide geographic area --spanning the Great Lakes, upper Ohio River, and the Gulf Coast from Texas to Florida.

Locations
- ☐ Lakes and Rivers
- ☐ Mississippi Valley*
  - ☐ Memphis
  - ☐ New Orleans
  - ☐ Rock Island
  - ☑ St. Louis
  - ☐ St. Paul
  - ☐ Vicksburg
- ☐ North Atlantic
- ☐ Northwestern
- ☐ Pacific Ocean
- ☐ South Atlantic
- ☐ South Pacific
- ☐ Southwestern

To Alaskan ports

Portland District, all reaches, 2014. Reach-level Flow map

To Hawaii

WCSC data, processed via Channel Portfolio Tool, via GoogleEarth

Image Landsat
Data LDEO-Columbia, NSF, NOAA
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
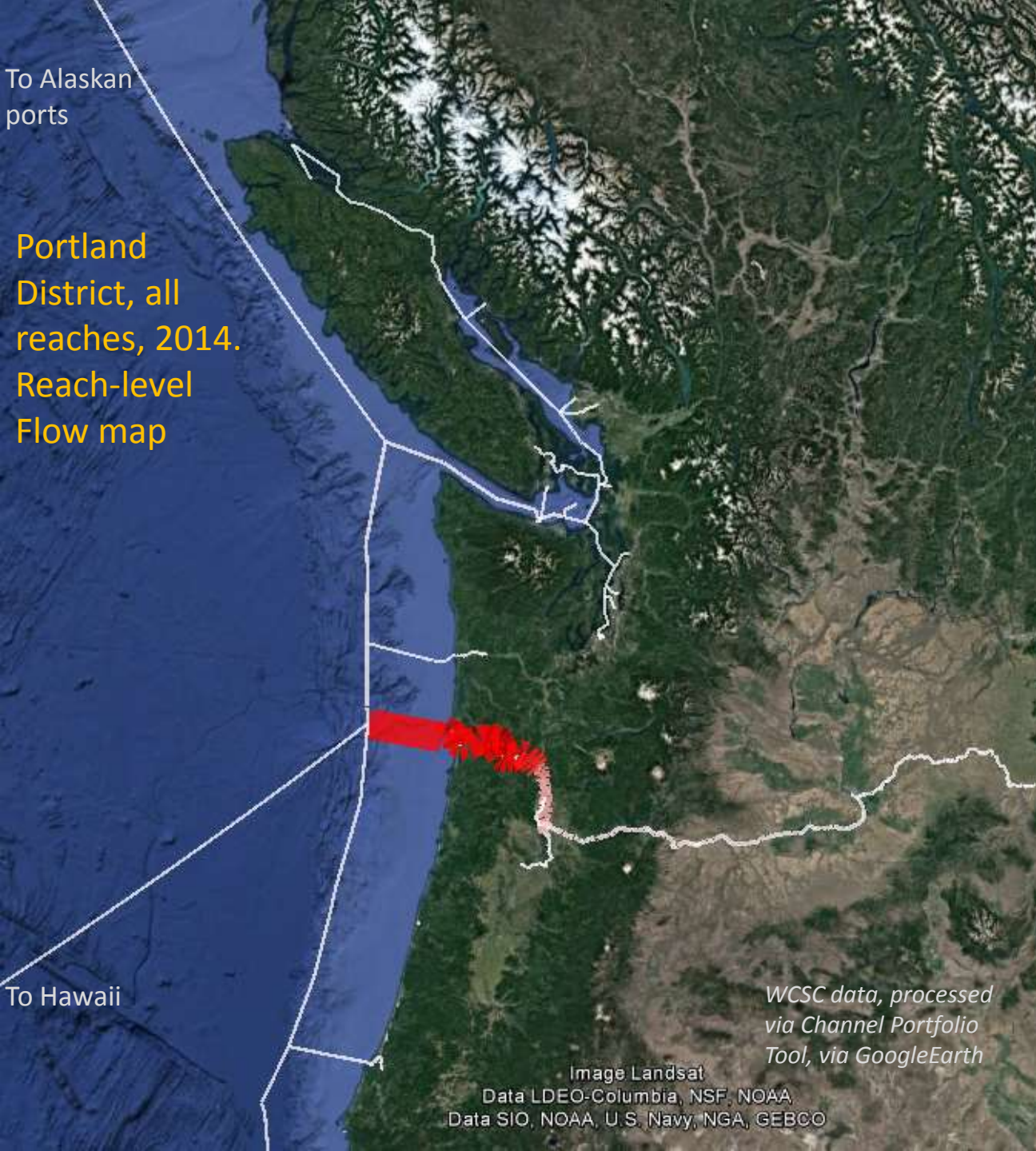
Why does the line transition abruptly from red to white at the offshore spine?

It's not that all the traffic goes back and forth along the Columbia River entrance channel. Rather, CPT does not *yet* have perfect overseas origin-destination routing built in to CPT, but it is in the works.

Locations

- ☐ Lakes and Rivers
- ☐ Mississippi Valley
- ☐ North Atlantic
- ☐ Northwestern*
  - ☐ Kansas City
  - ☐ Omaha
  - ☑ Portland
  - ☐ Seattle
  - ☐ Walla Walla

Warning: You may see unconnected segments on your maps when looking across the globe.

Portland District, All reaches, 2014 tonnage
Reach level FLOW map

WCSC data, processed in Channel Portfolio Tool, displayed in GoogleEarth

Image Landsat
Image U.S. Geological Survey
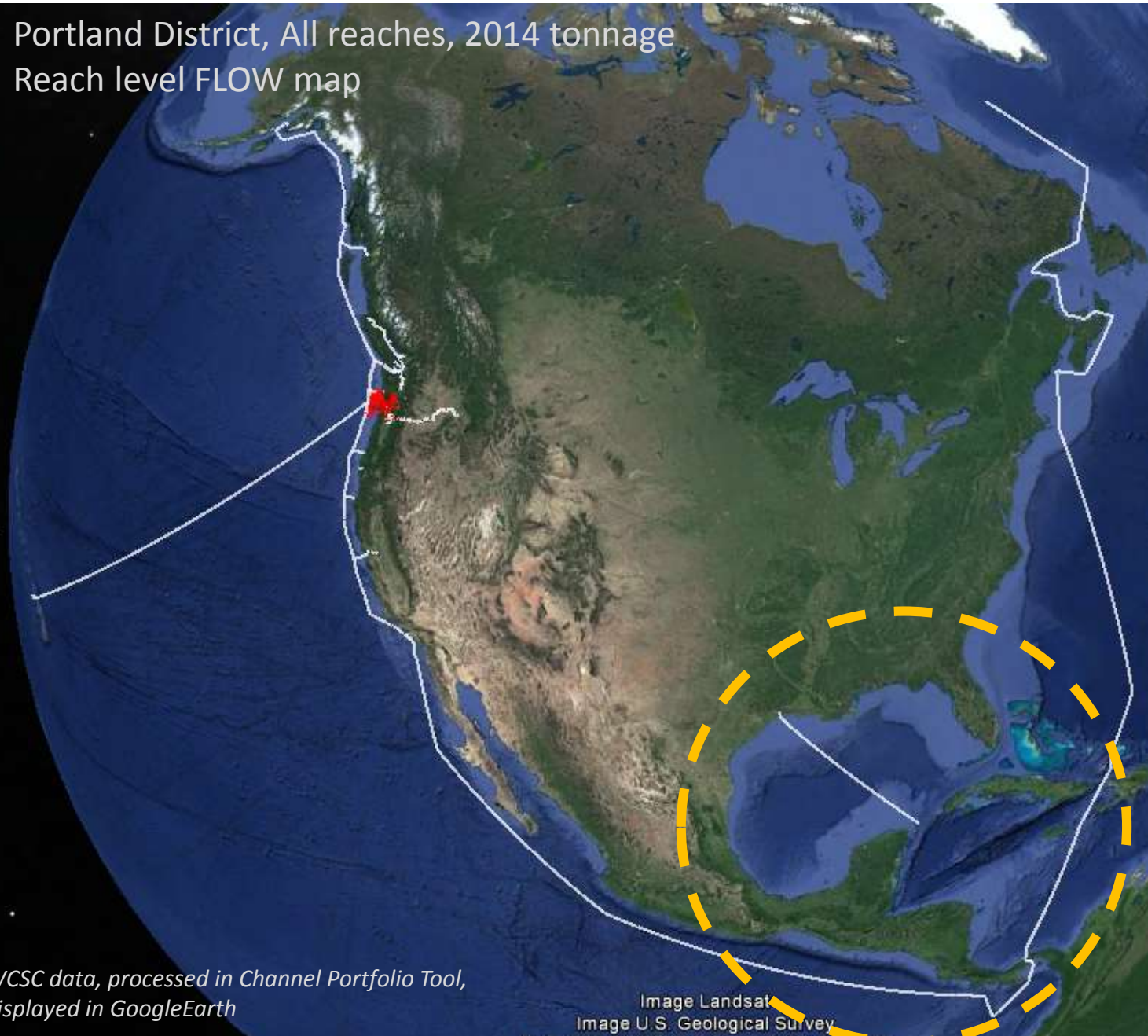
Why is that link stretching from Texas into the Gulf Deepwater not connected to anything else?

The link between Gulf Deepwater reach and the Panama canal has problems being displayed in the network because the file name is too long, but the routing information is still correct.
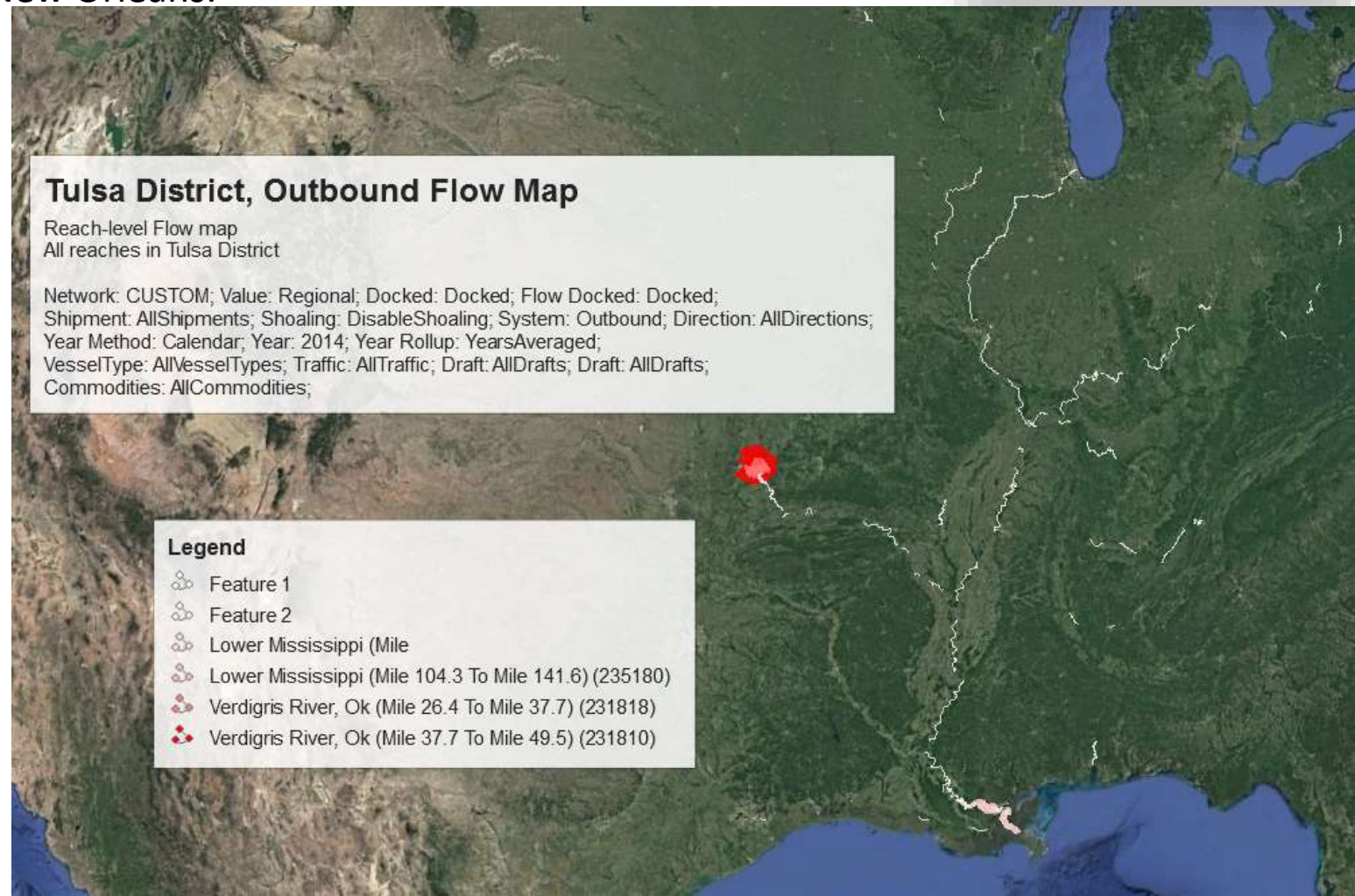
Flow maps can show final destinations of traffic that originated in a single project or District *without* showing the total route. This example shows where tonnage outbound from Tulsa District (red area) ultimately docked (white or pink lines). Readers can see that tonnage originating in Tulsa traveled up the Mississippi and into other river systems, but that the largest fraction of tonnage traveled towards New Orleans.

Filters and Selections

Network

Network:	⦿ Custom	○ Ombil
Docked:	⦿ Docked	○ Transit (Docked + Thru)
Flow Docked:	⦿ Docked	○ Transit (Docked + Thru)

Min Line Width (pixels):   1

Flow maps are not as straightforward to generate as rankings maps. If you have questions about generating the right kind of flow map for your question please email us.

Tulsa District, Outbound Flow Map

Reach-level Flow map
All reaches in Tulsa District

Network: CUSTOM; Value: Regional; Docked: Docked; Flow Docked: Docked;
Shipment: AllShipments; Shoaling: DisableShoaling; System: Outbound; Direction: AllDirections;
Year Method: Calendar; Year: 2014; Year Rollup: YearsAveraged;
VesselType: AllVesselTypes; Traffic: AllTraffic; Draft: AllDrafts; Draft: AllDrafts;
Commodities: AllCommodities;

Legend

Feature 1
Feature 2
Lower Mississippi (Mile
Lower Mississippi (Mile 104.3 To Mile 141.6) (235180)
Verdigris River, Ok (Mile 26.4 To Mile 37.7) (231818)
Verdigris River, Ok (Mile 37.7 To Mile 49.5) (231810)

End of module!

Please proceed to the associated exercise where you will practice making maps and using GoogleEarth.

Questions?

Marin.M.Kress@usace.army.mil