Module 5: Automatic Identification System Analysis Package (AISAP) Analysis Capabilities

ERDC
Engineer Research and Development Center

http://ais-portal.usace.army.mil/

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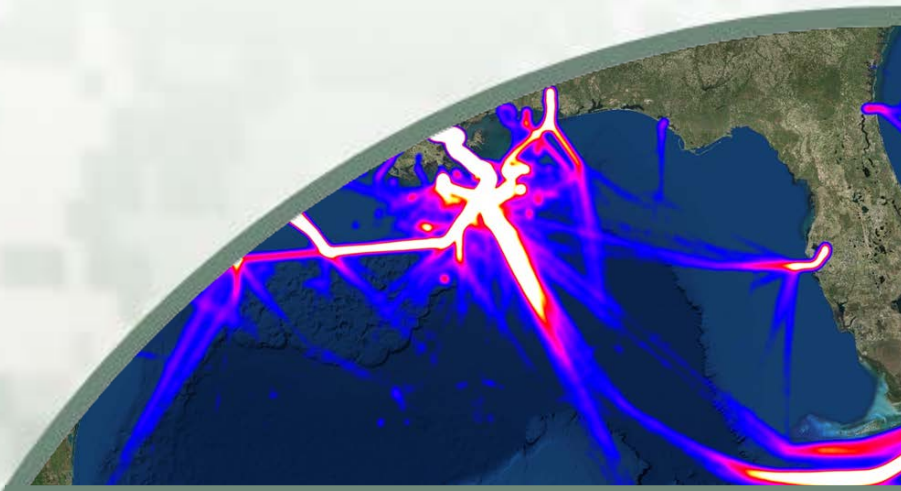


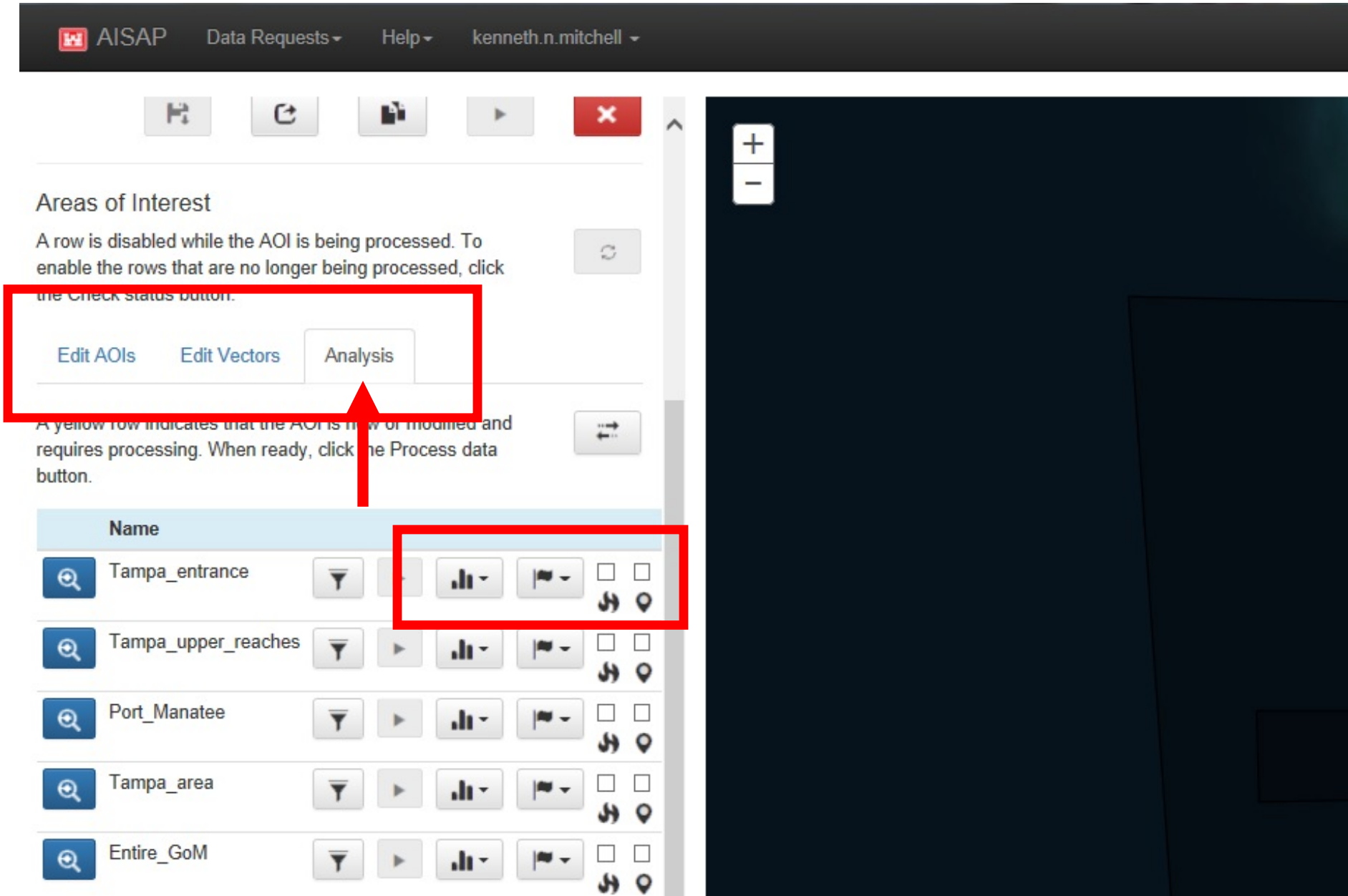
AISAP User Workshop
SWD – Dallas, TX
31 AUG 2016

US Army Corps of Engineers
CIRP Research & Development
COASTAL & HYDRAULICS LABORATORY
NAVSYS Navigation Systems Research Program

AISAP Analysis and Visualizations

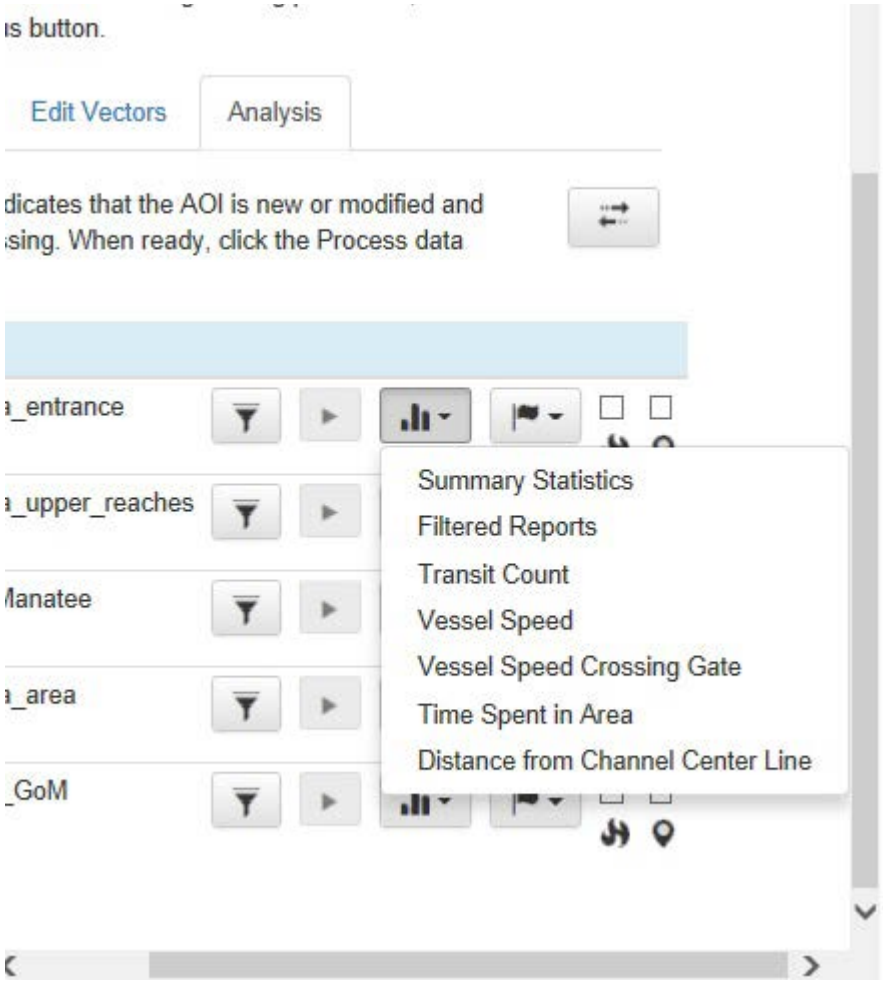
- Several built-in capabilities for broad user base
  - Heat maps and cluster plots of traffic density
  - Vessel track lines
  - Summary statistics for vessel classes and movements
  - Transit counts and avg. vessel speeds through time
  - Travel times between and dwell times within AOIs
  - Point-specific vessel speeds and vessel distances from reference datum
- NOT the entirety of analysis that's possible with AIS data.

AISAP Analysis Features



AISAP Analysis Features

- Analysis results based on the AOI-specific filter settings and bounded area.
- Each selection will open a new AISAP window with summary charts, graphs, and data export buttons.



Summary Statistics

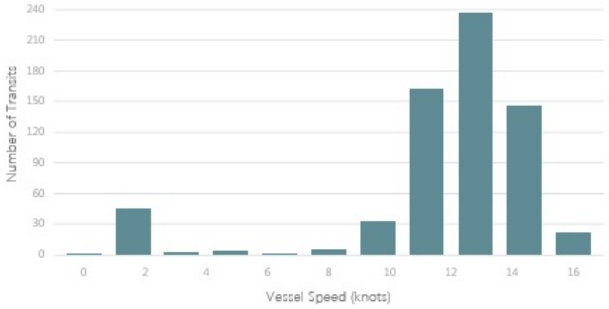
Charts | Data | Vessel Data | Transit Data

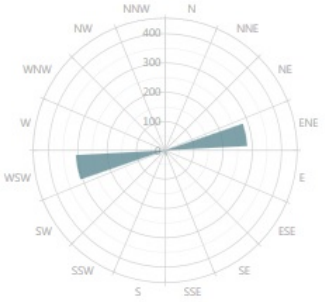
Summary

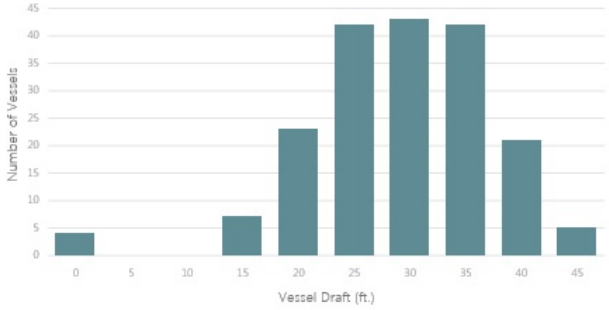
Report Date Range: 2015-06-01T00:05:00 to 2015-08-31T23:55:00
Num Reports: 31302
Num Unique Vessels: 187
Num Transits: 658

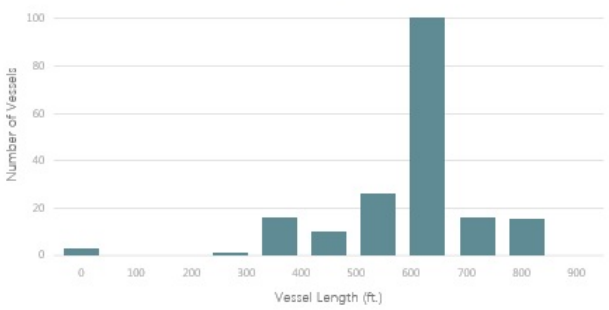
Traffic Sample Statistics

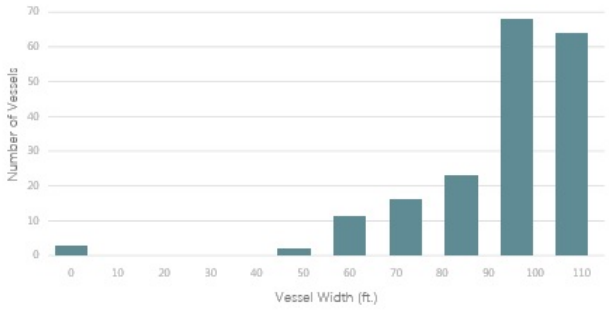
Metric	Mean	StdDev
Vessel Draft (ft.)	26.56	8.11
Vessel Length (ft.)	556.87	127.51
Vessel Width (ft.)	87.23	18.69
Vessel Speed (knots)	10.85	1.07



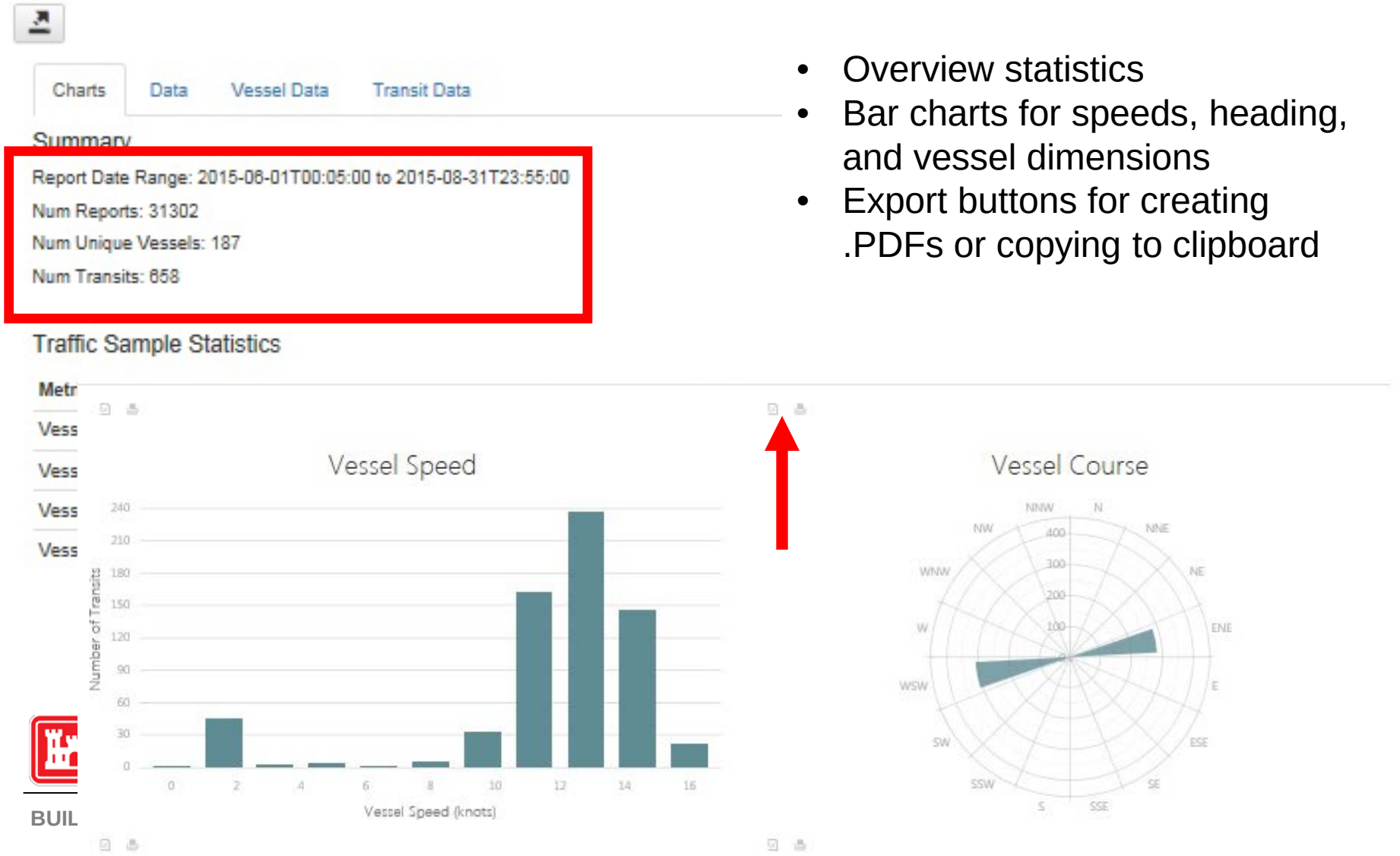








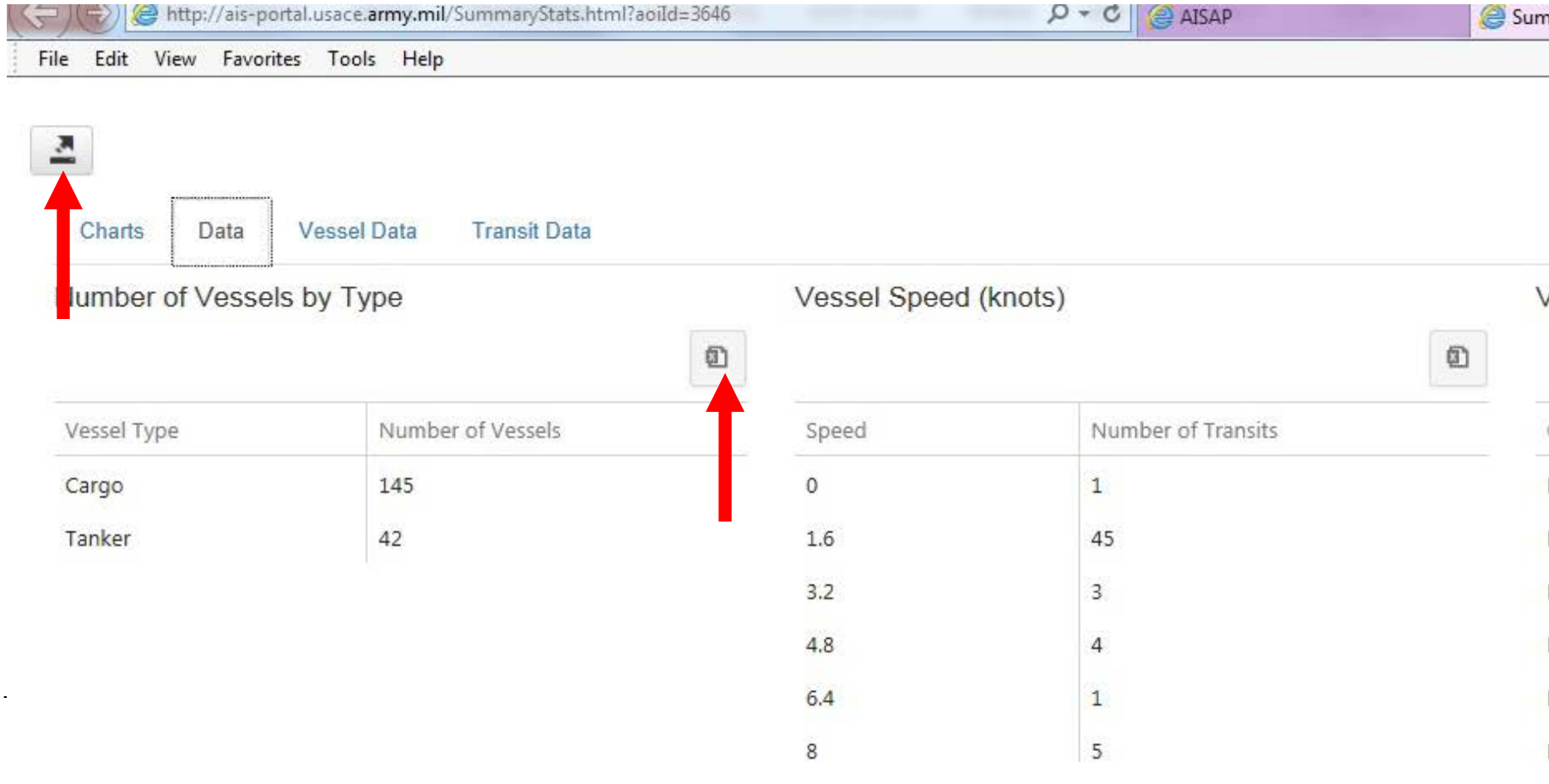
Summary Statistics



- Overview statistics
- Bar charts for speeds, heading, and vessel dimensions
- Export buttons for creating .PDFs or copying to clipboard

Summary Statistics

- Data tab lets you see the numbers behind each bar chart from the Charts tab.
- Export to Excel buttons can be used for each individual table or for entire slate of results.



Summary Statistics

- Vessel data tab provides the dimensions of every vessel observed through applied filters.
- User can make their own histograms or export data for custom analysis.

MMSI	Name	Draft (ft.)	Length (ft.)	Width (ft.)
538004267	AAL KEMBLA	22	633.2	91.9
229011000	ADFINES SOUTH	34.1	623.4	95.1
249684000	AGHIA MARINA	31.8	561	88.6
352832000	ALERCE	24.9	561	88.6
477243400	AMBER CHAMPION	36.4	656.2	105

Summary Statistics

- Transit Data tab provides details for each transit observed (recall the transit gap parameter) through filter settings.
- Transit durations, avg. speeds, and avg. course all provided.
- User can make their own histograms or export data for custom analysis.

Charts | Data | Vessel Data | Transit Data

Transits

MMSI	Name	Transit	Start Date	End Date	Average Speed (knots)	Average Course
538004267	AAL KEMBLA	1	07-JUL-15 05.50.00.00...	08-JUL-15 12.55.00.00...	.01	193.24
538004267	AAL KEMBLA	2	13-JUL-15 05.30.00.00...	13-JUL-15 06.35.00.00...	13.23	261.92
229011000	ADFINES SOUTH	1	03-JUN-15 11.25.00.0...	04-JUN-15 12.35.00.0...	11.33	91.07
229011000	ADFINES SOUTH	2	07-JUN-15 08.35.00.0...	07-JUN-15 09.45.00.0...	11.07	266.07
249684000	AGHIA MARINA	1	04-AUG-15 11.45.00.0...	04-AUG-15 01.05.00.0...	9.93	85.33
249684000	AGHIA MARINA	2	08-AUG-15 03.35.00.0...	08-AUG-15 04.55.00.0...	10.56	267.19
352832000	ALERCE	1	19-JUL-15 12.25.00.00...	19-JUL-15 01.35.00.00...	11.57	91.21
352832000	ALERCE	2	29-JUL-15 01.50.00.00...	29-JUL-15 03.10.00.00...	10.63	268.13

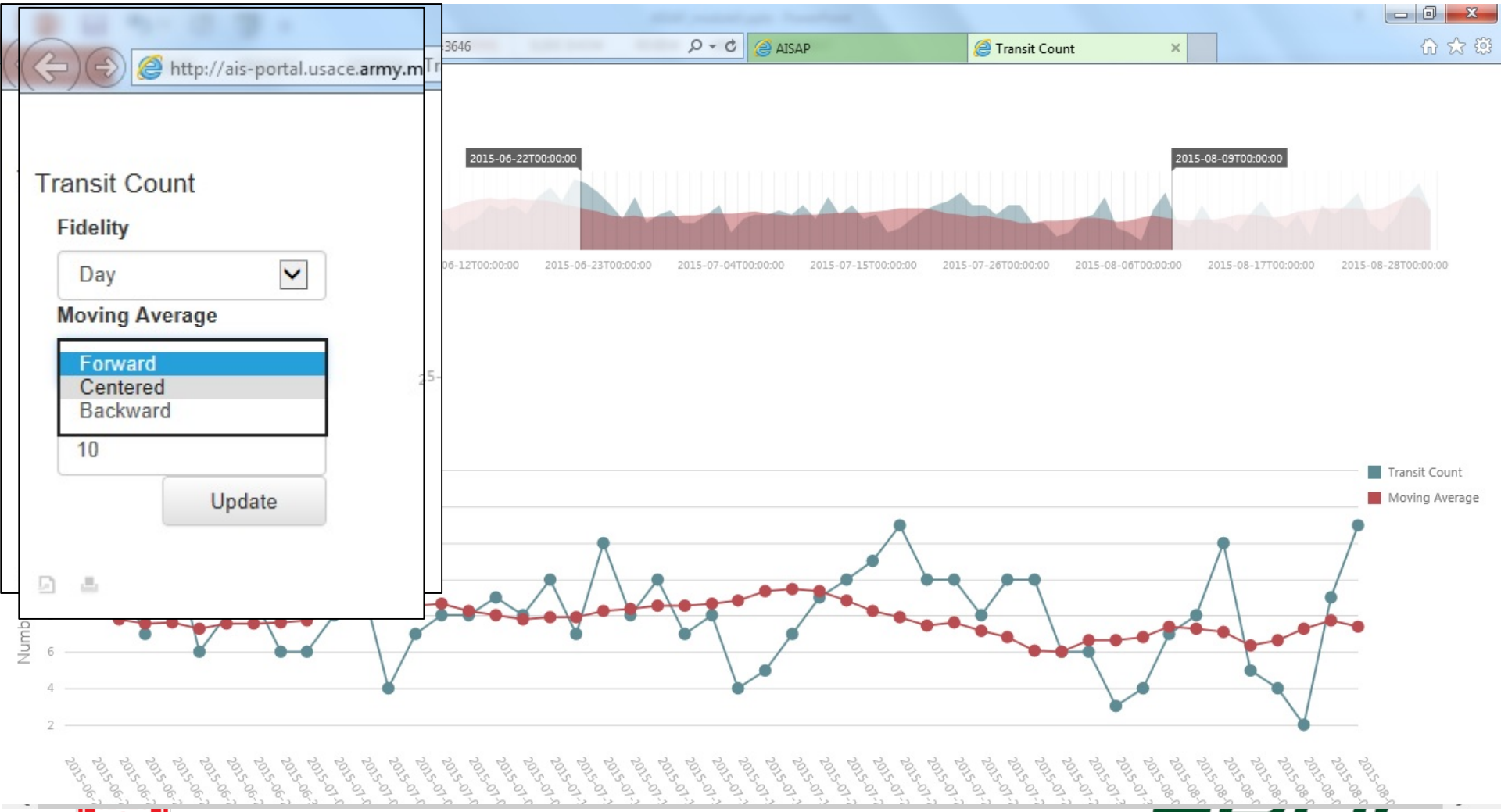
Filtered Reports

- Filtered reports are the most granular data possible; simply the AIS vessel position reports that met all filter criteria.
- These can be exported as .CSV files for custom analyses independent of AISAP.

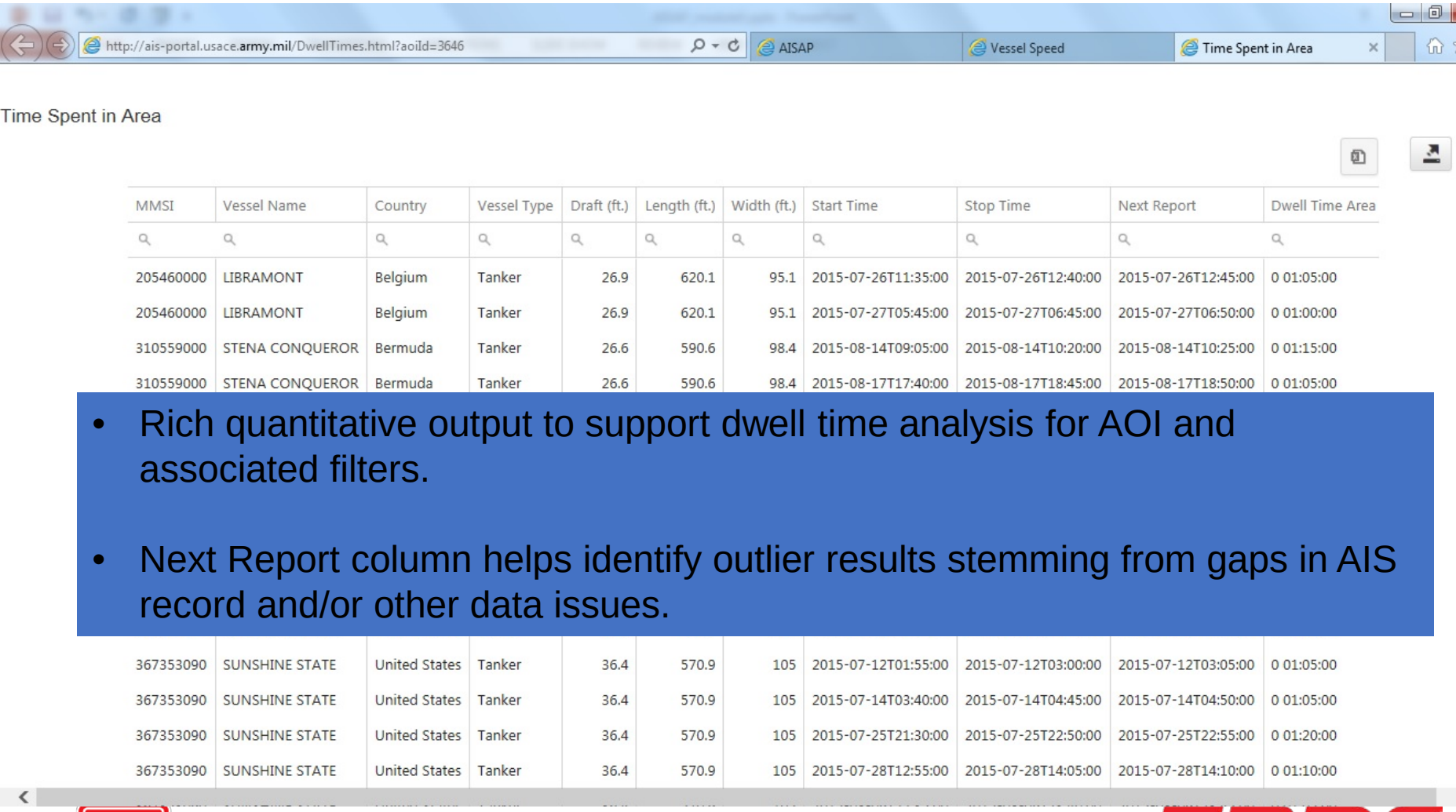
Vessel Positions

MMSI	Date	Latitude	Longitude	Course	Rate of Turn	Speed over Ground	Heading
205460000	2015-07-26T11:35:00	27.590978	-82.986694	83	0	13	82
205460000	2015-07-26T11:40:00	27.593466	-82.964883	82	0	14	82
205460000	2015-07-26T11:45:00	27.595898	-82.942865	84	0	14	84
205460000	2015-07-26T11:50:00	27.597966	-82.920813	84	0	13	84
205460000	2015-07-26T11:55:00	27.599973	-82.899691	84	0	12	84
205460000	2015-07-26T12:05:00	27.603178	-82.866755	84	0	10	84
205460000	2015-07-26T12:10:00	27.605173	-82.847928	83	0	12	84
205460000	2015-07-26T12:15:00	27.607358	-82.826608	84	0	14	84
205460000	2015-07-26T12:20:00	27.609512	-82.804024	83	0	14	83
205460000	2015-07-26T12:25:00	27.610956	-82.780344	94	23	15	94
205460000	2015-07-26T12:30:00	27.607107	-82.75641	102	0	15	101
205460000	2015-07-26T12:35:00	27.604713	-82.734129	84	-28	14	84
205460000	2015-07-26T12:40:00	27.60821	-82.709863	80	0	14	81
205460000	2015-07-27T05:45:00	27.606041	-82.725982	264	16	14	264
205460000	2015-07-27T05:50:00	27.606802	-82.749396	281	11	14	280
205460000	2015-07-27T05:55:00	27.610494	-82.771616	279	-21	14	278

Transit Counts



Dwell Times



MMSI	Vessel Name	Country	Vessel Type	Draft (ft.)	Length (ft.)	Width (ft.)	Start Time	Stop Time	Next Report	Dwell Time Area
205460000	LIBRAMONT	Belgium	Tanker	26.9	620.1	95.1	2015-07-26T11:35:00	2015-07-26T12:40:00	2015-07-26T12:45:00	0 01:05:00
205460000	LIBRAMONT	Belgium	Tanker	26.9	620.1	95.1	2015-07-27T05:45:00	2015-07-27T06:45:00	2015-07-27T06:50:00	0 01:00:00
310559000	STENA CONQUEROR	Bermuda	Tanker	26.6	590.6	98.4	2015-08-14T09:05:00	2015-08-14T10:20:00	2015-08-14T10:25:00	0 01:15:00
310559000	STENA CONQUEROR	Bermuda	Tanker	26.6	590.6	98.4	2015-08-17T17:40:00	2015-08-17T18:45:00	2015-08-17T18:50:00	0 01:05:00
367353090	SUNSHINE STATE	United States	Tanker	36.4	570.9	105	2015-07-12T01:55:00	2015-07-12T03:00:00	2015-07-12T03:05:00	0 01:05:00
367353090	SUNSHINE STATE	United States	Tanker	36.4	570.9	105	2015-07-14T03:40:00	2015-07-14T04:45:00	2015-07-14T04:50:00	0 01:05:00
367353090	SUNSHINE STATE	United States	Tanker	36.4	570.9	105	2015-07-25T21:30:00	2015-07-25T22:50:00	2015-07-25T22:55:00	0 01:20:00
367353090	SUNSHINE STATE	United States	Tanker	36.4	570.9	105	2015-07-28T12:55:00	2015-07-28T14:05:00	2015-07-28T14:10:00	0 01:10:00

- Rich quantitative output to support dwell time analysis for AOI and associated filters.
- Next Report column helps identify outlier results stemming from gaps in AIS record and/or other data issues.

Travel Times Between AOIs Methodology Illustration

Bayonne, NJ

Savannah, GA

1. A vessel's position reports corresponding to two AOIs are sorted by timestamp

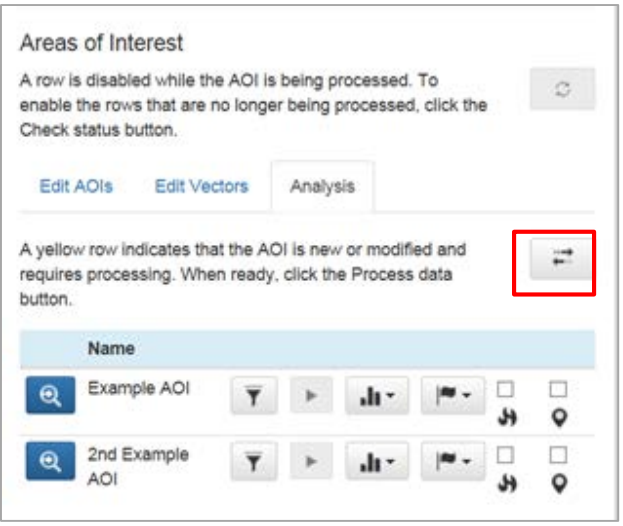
TX_DTTM	LAT	LON	AOI
12/28/2014 19:30	40.6701	-74.0783	Bayonne
⋮	⋮	⋮	Bayonne
12/31/2014 3:50	40.6679	-74.0750	Bayonne
1/2/2015 5:15	32.1295	-81.1391	Savannah
1/2/2015 5:20	32.1295	-81.1391	Savannah
⋮	⋮	⋮	Savannah
1/4/2015 15:45	32.1294	-81.1389	Savannah

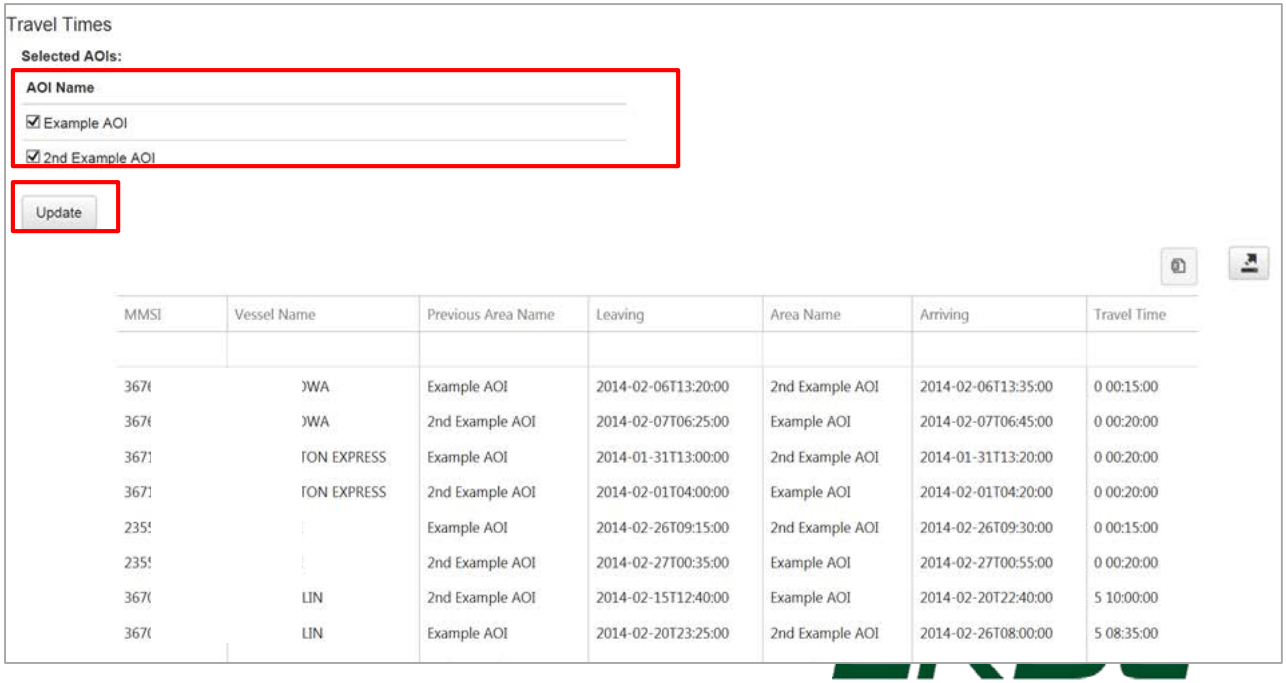
2. Consecutive entries that correspond to two different AOIs indicate an inferred transit between the two AOIs

3. Estimated travel time = Difference in records' time stamps = 49.42 hours

Travel Times Between AOIs

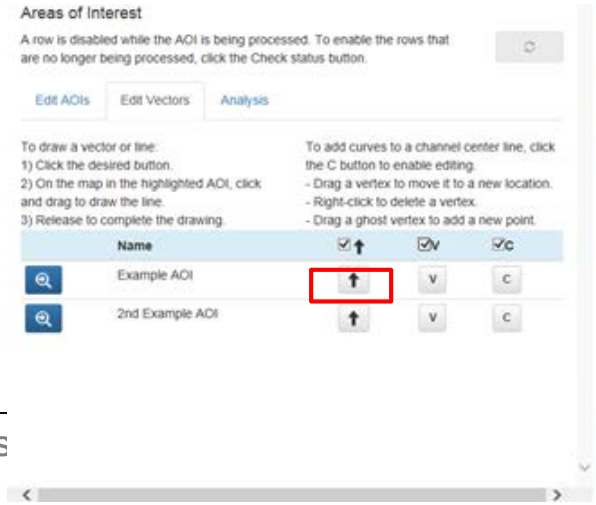
- Results can be found from the Analysis tab, the Travel Time Between AOIs button.
- Analysis opens in new tab.
- Check which AOIs to include in the analysis. Can include more than two AOIs.
- Click the Update button to see the results.

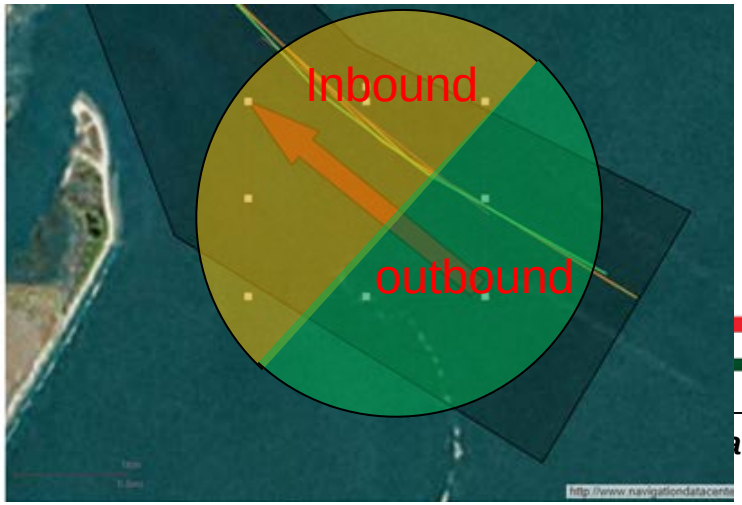




AOI Vectors- Inbound Vector

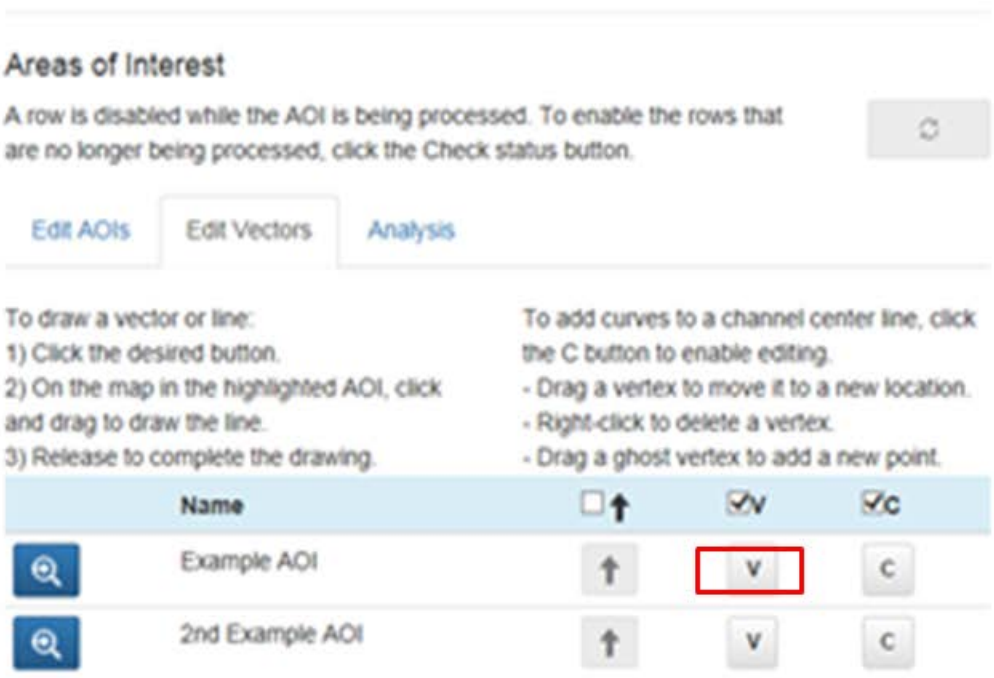
- Enables the user to identify the inbound direction of travel if applying the Specific Direction Filter, for each AOI individually.
- Draw an arrow to identify inbound direction of travel:
  - Click on the add inbound vector button.
  - On the map in the highlighted AOI, click and drag to draw the line.
  - Release to complete the vector. You will see a red arrow indicating the direction of the inbound vector.
  - To edit the arrow, click on the add inbound vector button again.
- A vessel position report is classified as inbound if its course over ground is within +/- 90 degrees of the arrow and as outbound if it is outside +/- 90 degrees of the arrow.
- Consider applying to reaches where the one-way direction of travel is all within 180 degrees of each other (be cautious when applying to waterway bends).

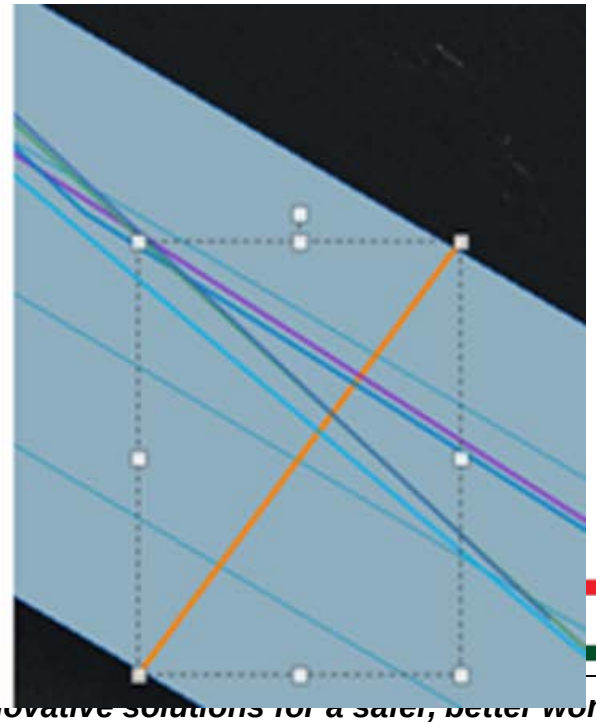




AOI Vectors- Velocity Gate

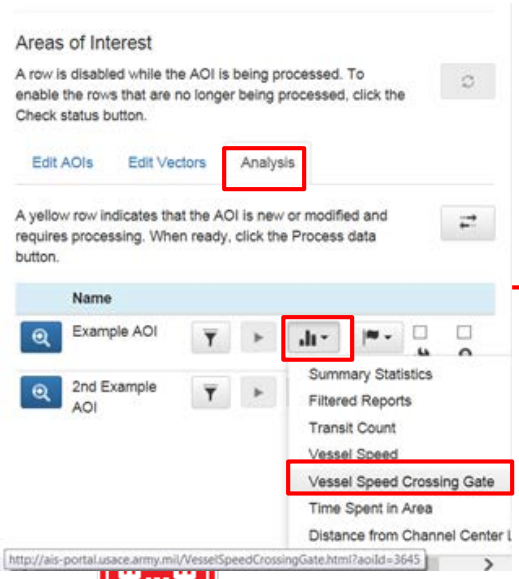
- Used to determine the average vessel speed across a channel (trip line).
- Draw the velocity gate or trip line:
  - Click on the add velocity gate button.
  - On the map in the highlighted AOI, click and drag to draw the line.
  - Draw perpendicular to the traffic flow/channel.
  - Release to complete the vector. You will see a orange line in the AOI.
  - To edit the line, click on the add velocity gate button again.





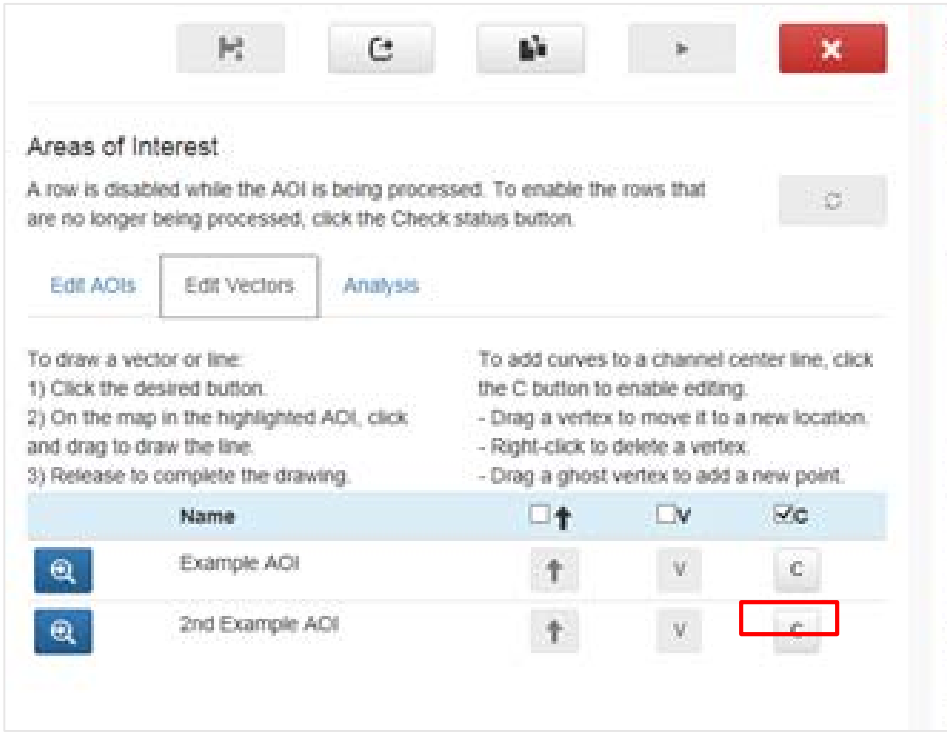
Velocity Gate Results

- Results can be found from the Analysis tab, under the statistical results drop down menu, Vessel Speed Crossing Gate.
- Results open in a separate tab.
- The period length is the number of data points included in calculating the moving average.



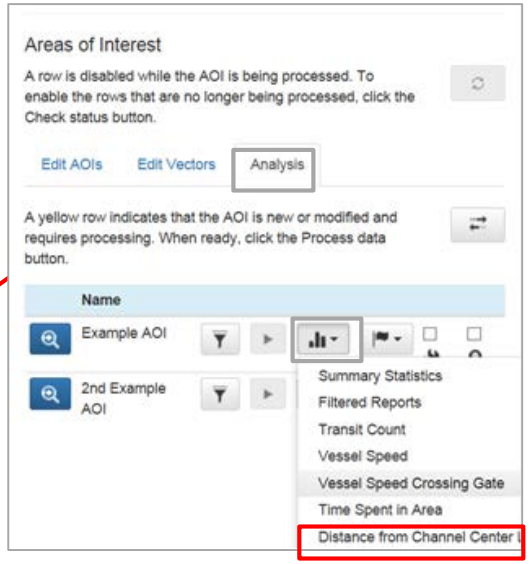
AOI Vectors- Channel Center Line

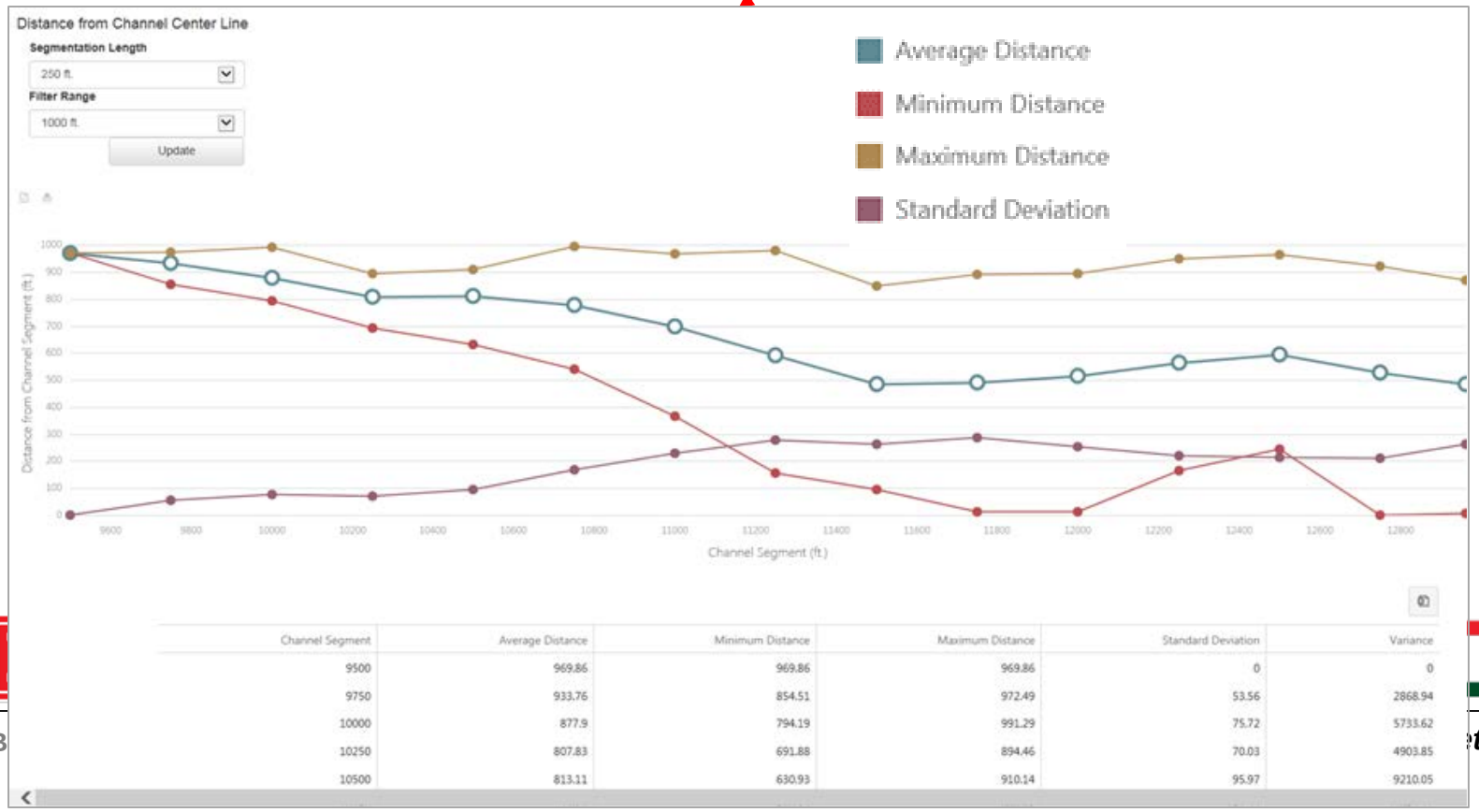
- Used to determine the distances transits are away from a user designated line.
- Draw the channel center line:
  - Click on the add channel center line button.
  - On the map in the highlighted AOI, click and drag to draw the line.
  - Release to complete the line. You will see a green line in the AOI.
  - To edit the line, click on the add channel center line button again. Click and drag to add more vertices. Click and drag any of the border points to stretch or shrink the line.



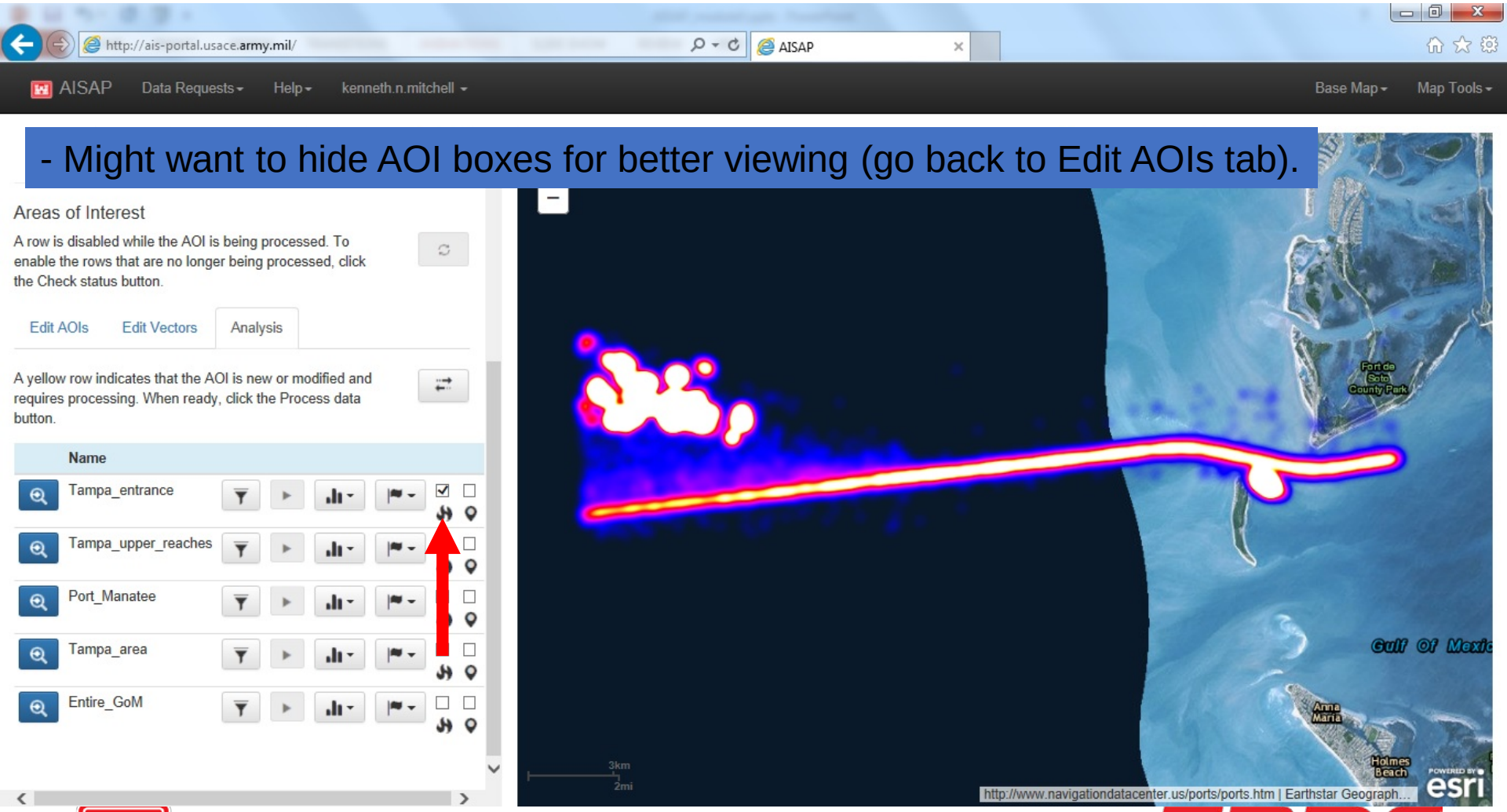
Channel Center Line Results

- Results can be found from the Analysis tab, under the statistical results drop down menu, Distance from Channel Center Line.
- Results open in a separate tab.
- Results are in absolute value.



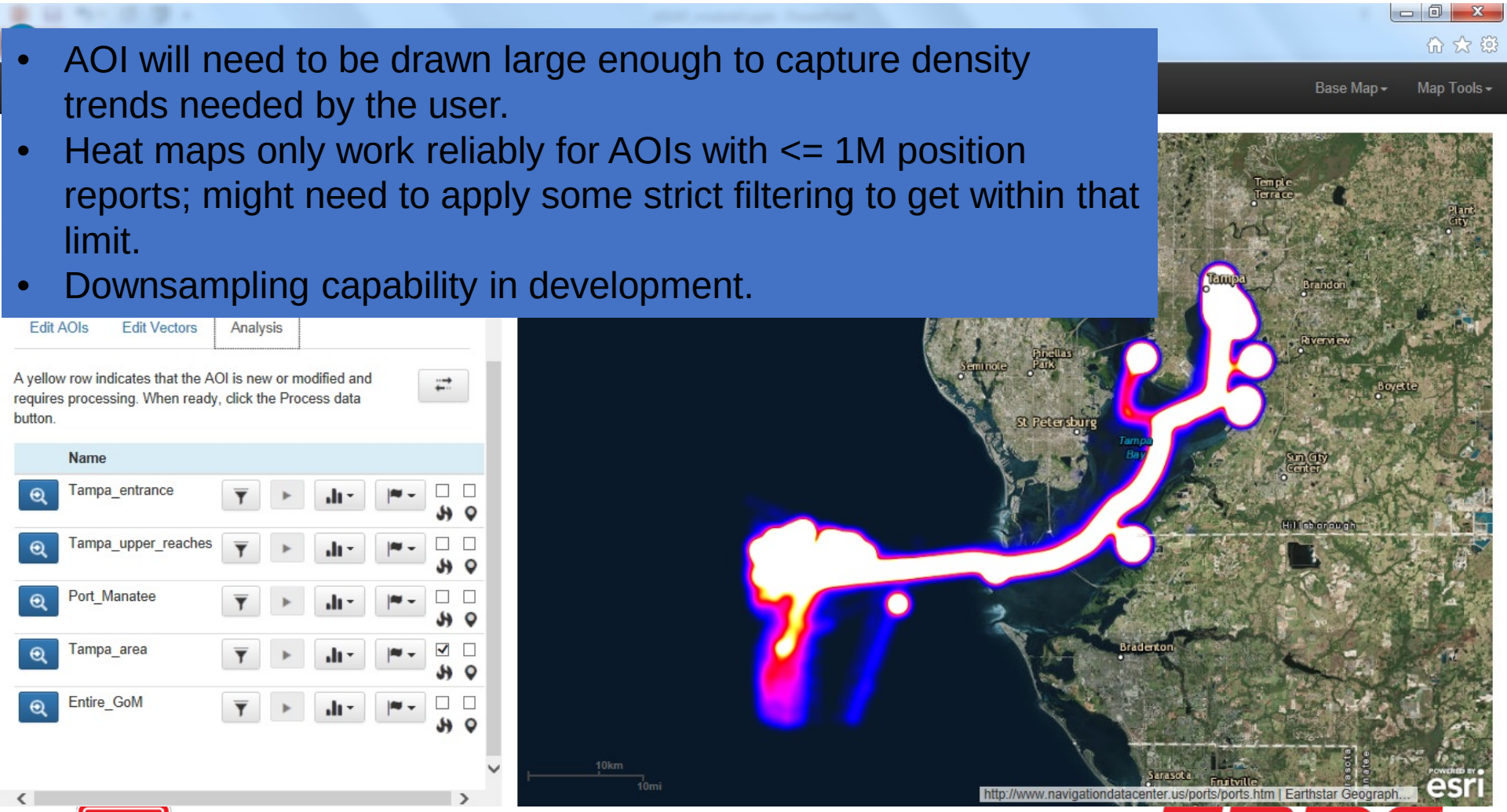


Heat Maps

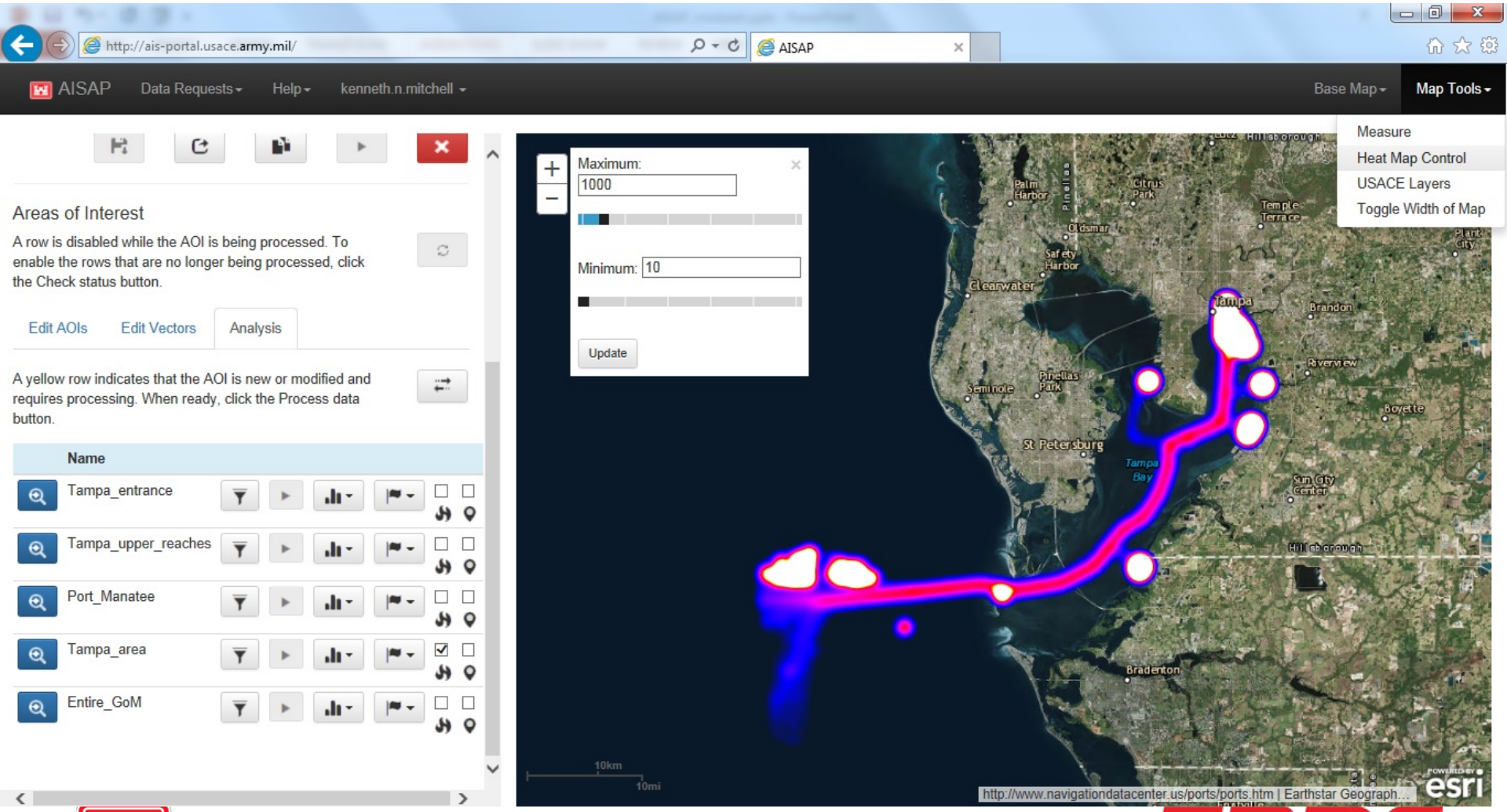

http://ais-portal.usace.army.mil/
AISAP
AISAP
Data Requests
Help
kenneth.n.mitchell
Base Map
Map Tools
- Might want to hide AOI boxes for better viewing (go back to Edit AOIs tab).
Areas of Interest
A row is disabled while the AOI is being processed. To enable the rows that are no longer being processed, click the Check status button.
Edit AOIs
Edit Vectors
Analysis
A yellow row indicates that the AOI is new or modified and requires processing. When ready, click the Process data button.
Name
Tampa_entrance
Tampa_upper_reaches
Port_Manatee
Tampa_area
Entire_GoM
Fort de Soto County Park
Gulf Of Mexic
Anna Maria
Holmes Beach
3km
2mi
http://www.navigationdatacenter.us/ports/ports.htm | Earthstar Geograph...
esri

Heat Maps

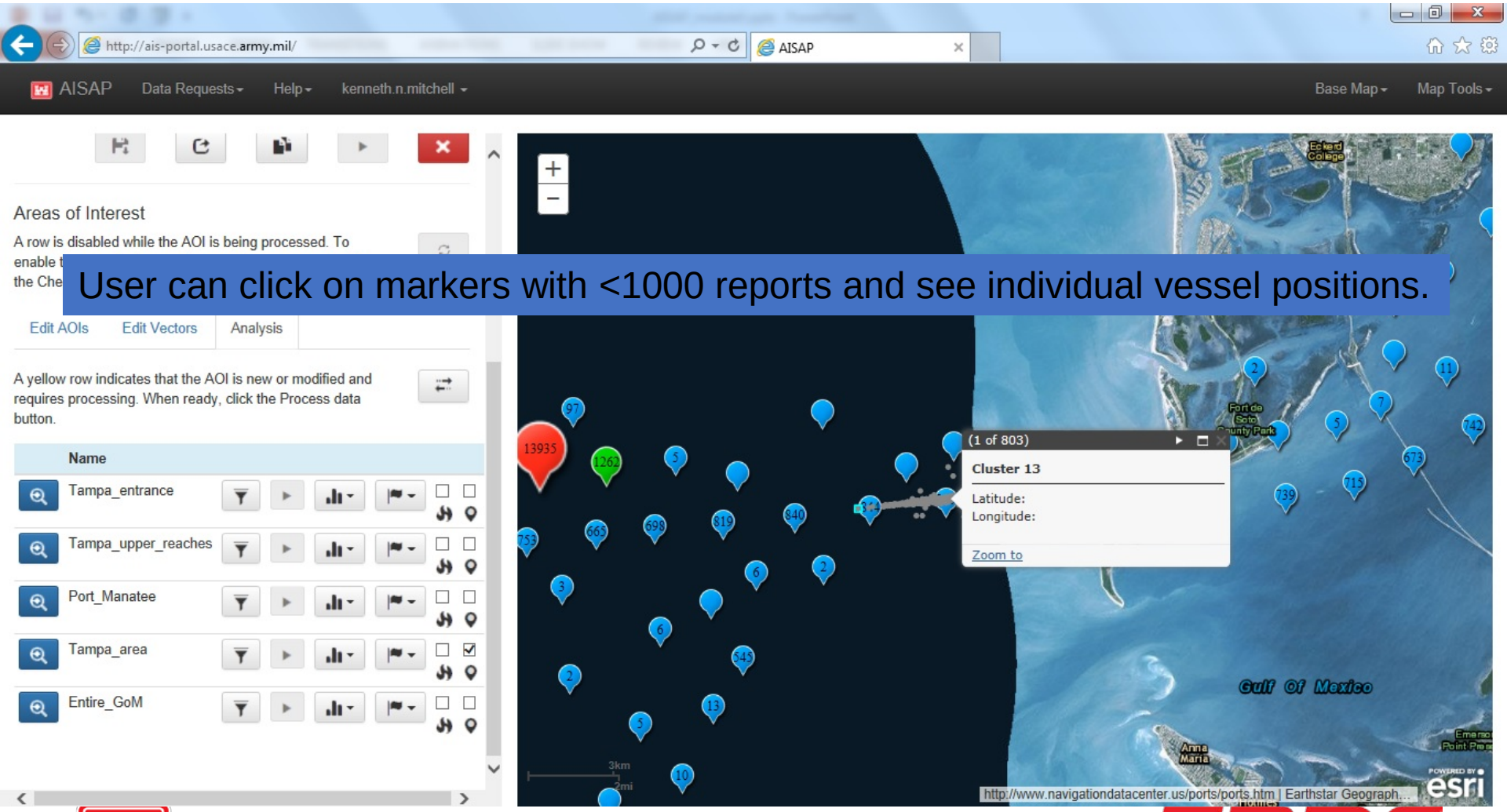
- AOI will need to be drawn large enough to capture density trends needed by the user.
- Heat maps only work reliably for AOIs with <= 1M position reports; might need to apply some strict filtering to get within that limit.
- Downsampling capability in development.



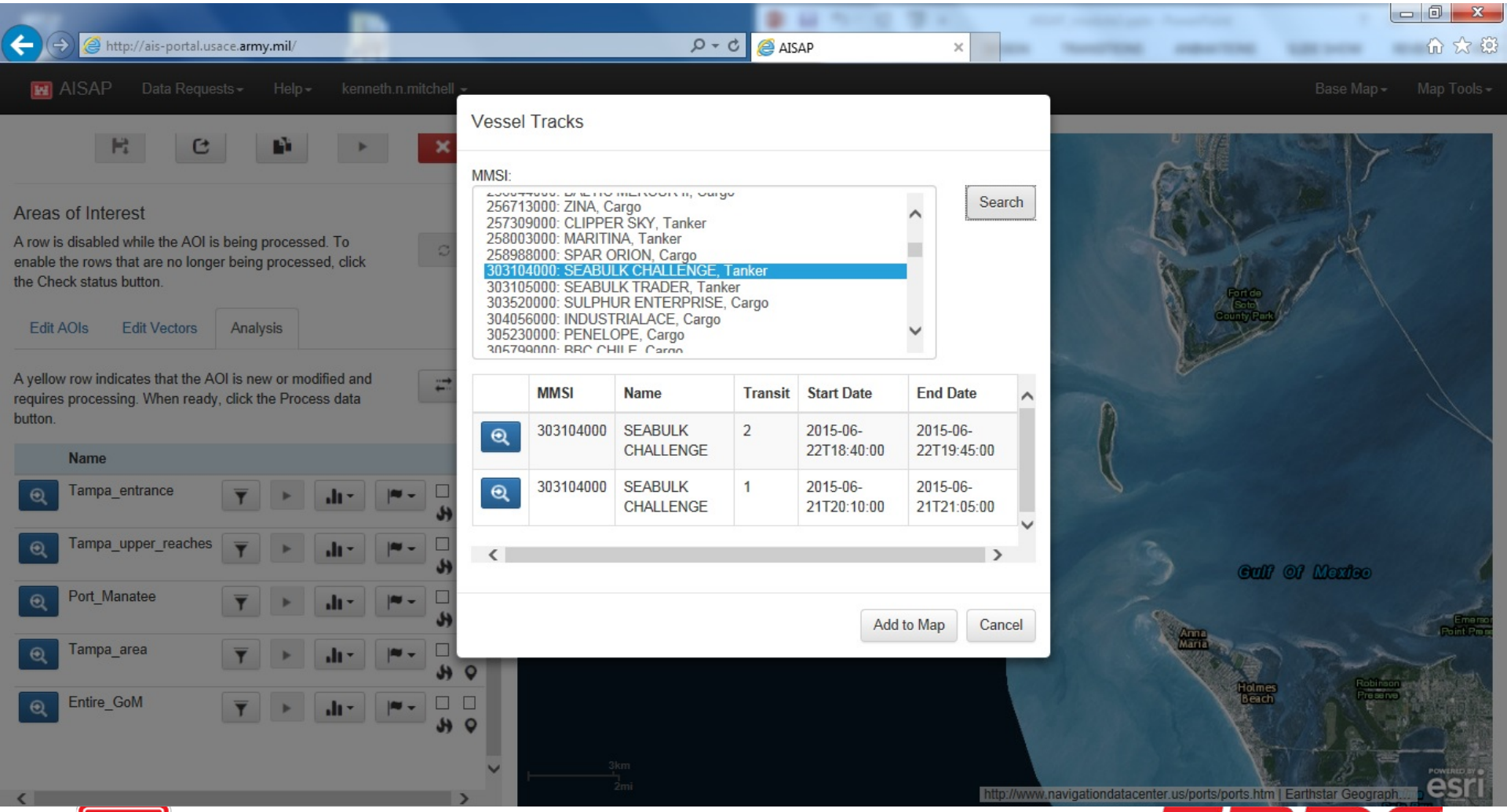
Heat Map Control



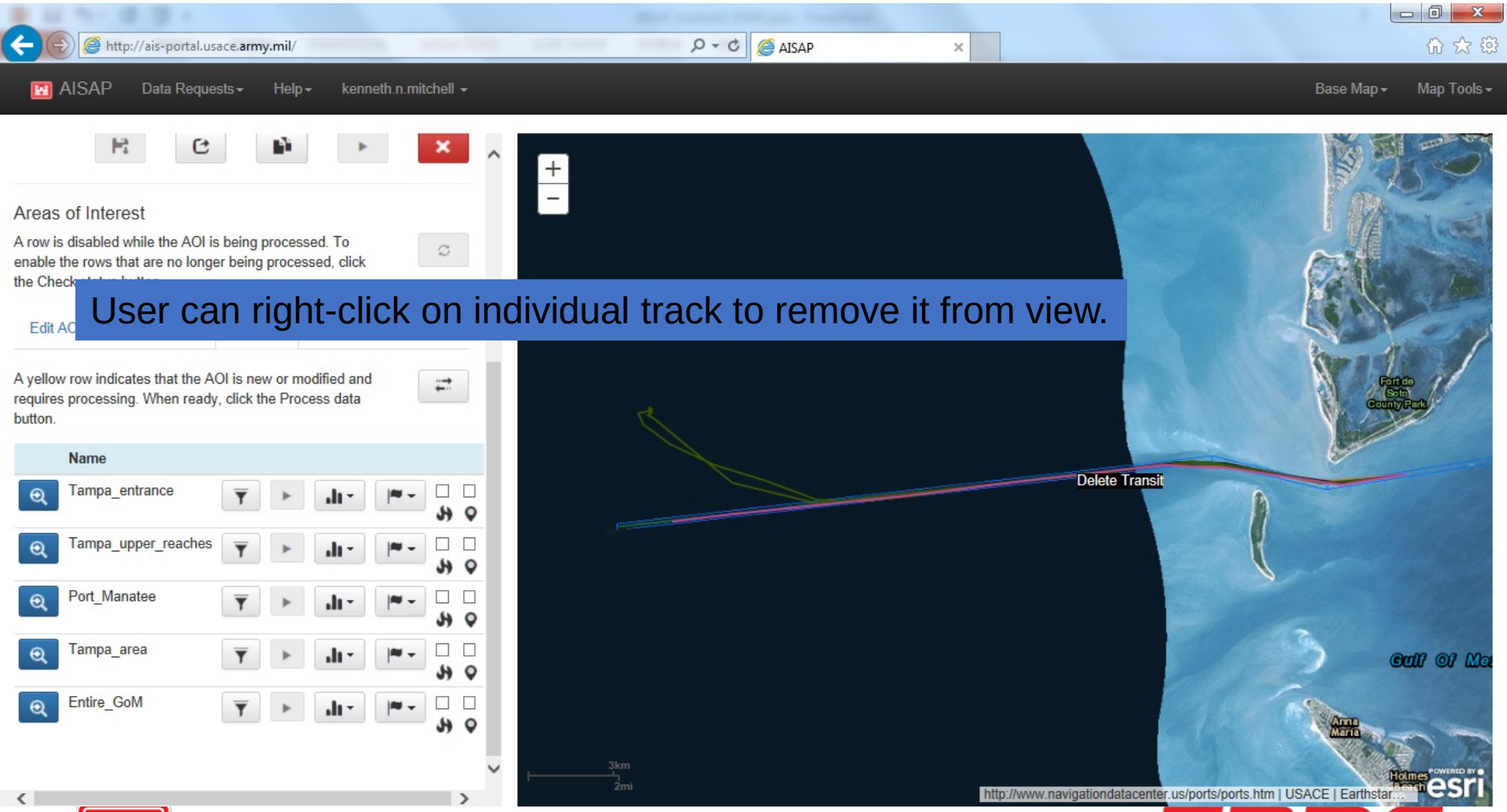
Cluster Plots



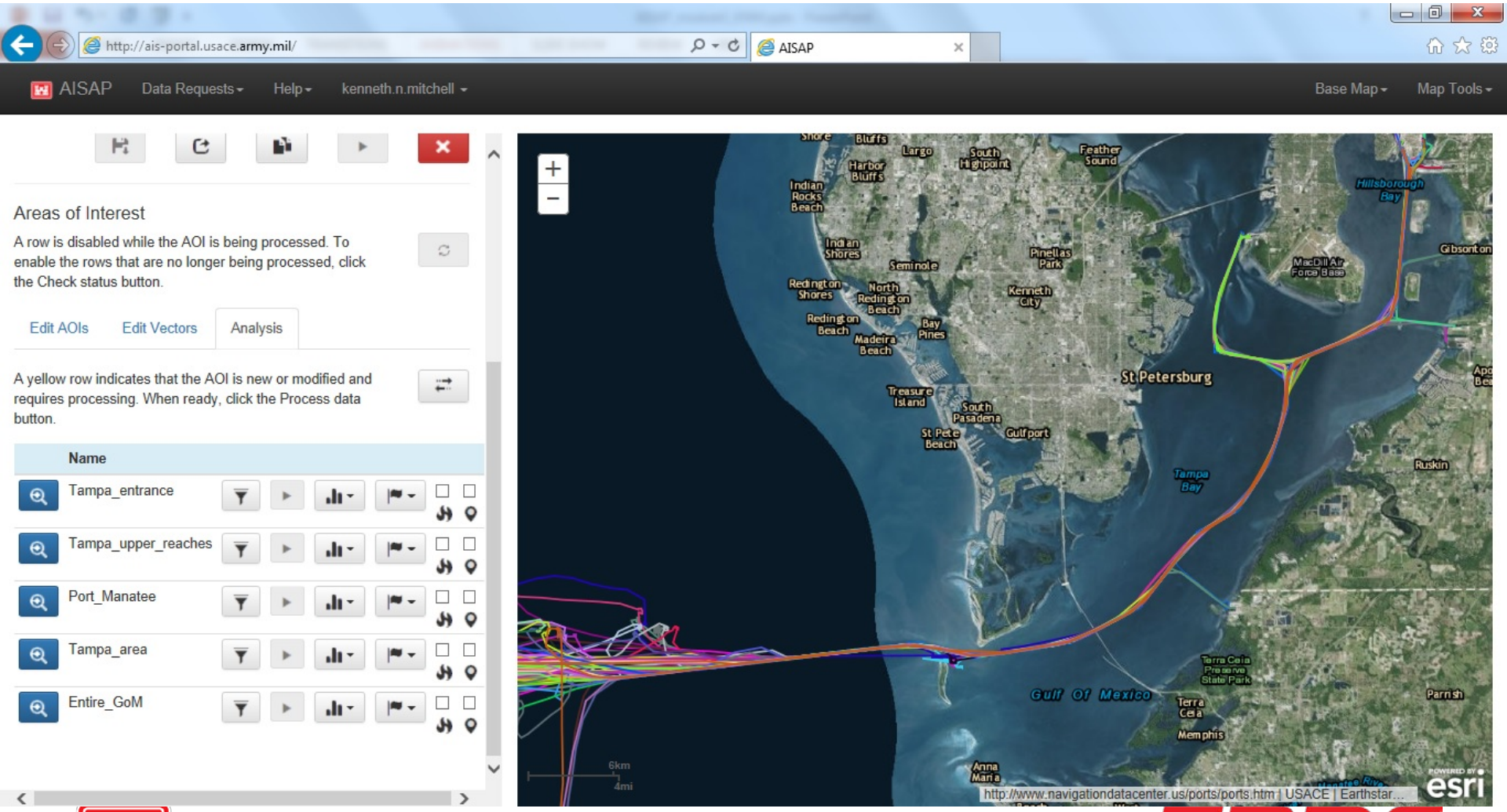
Vessel Tracks



Vessel Tracks



Vessel Tracks



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