

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

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

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Team Members:

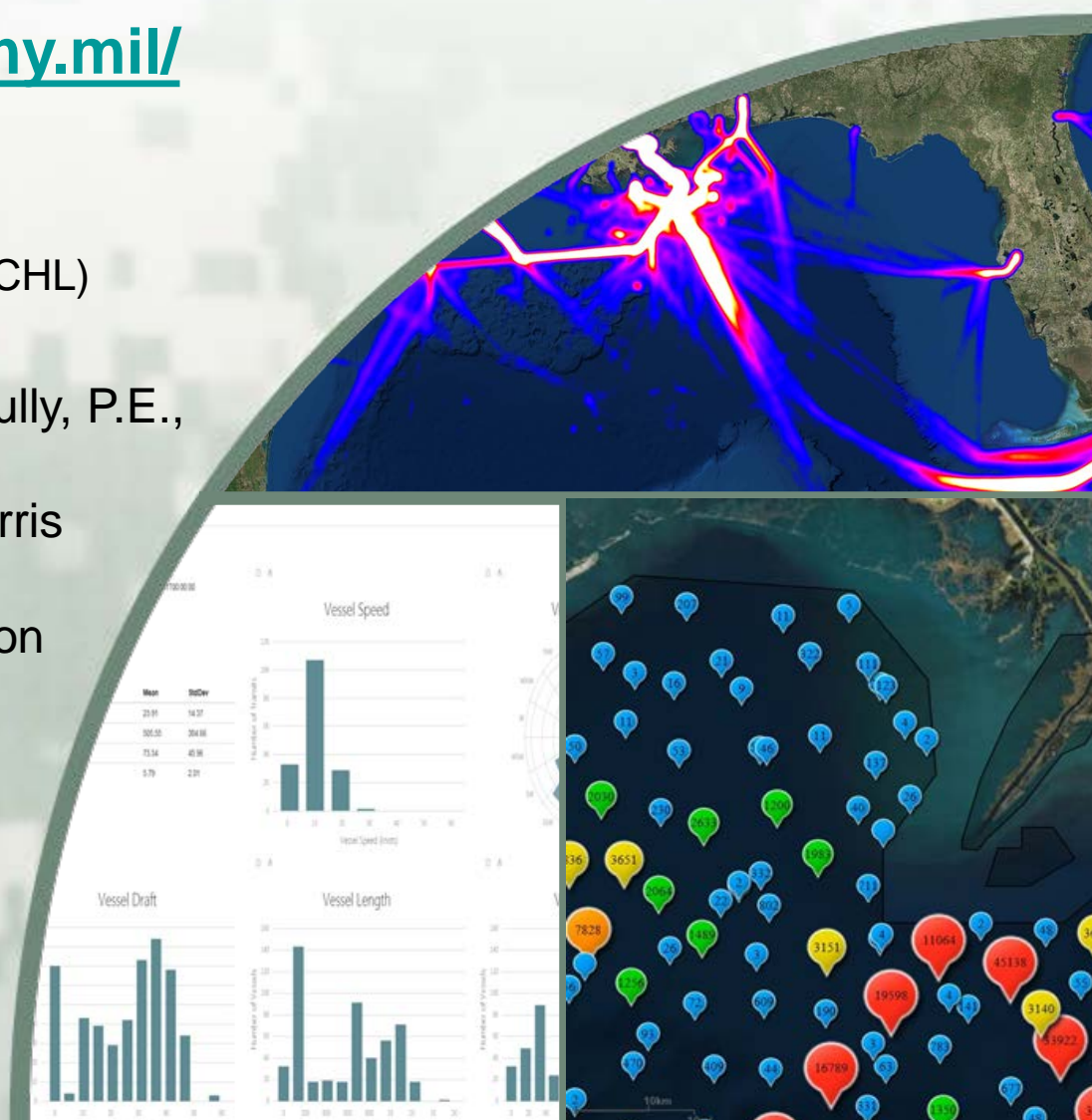
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AISAP User Workshop

SWD – Dallas, TX
31 AUG 2016









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 Data Requests ▾ Help ▾ kenneth.n.mitchell ▾


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.

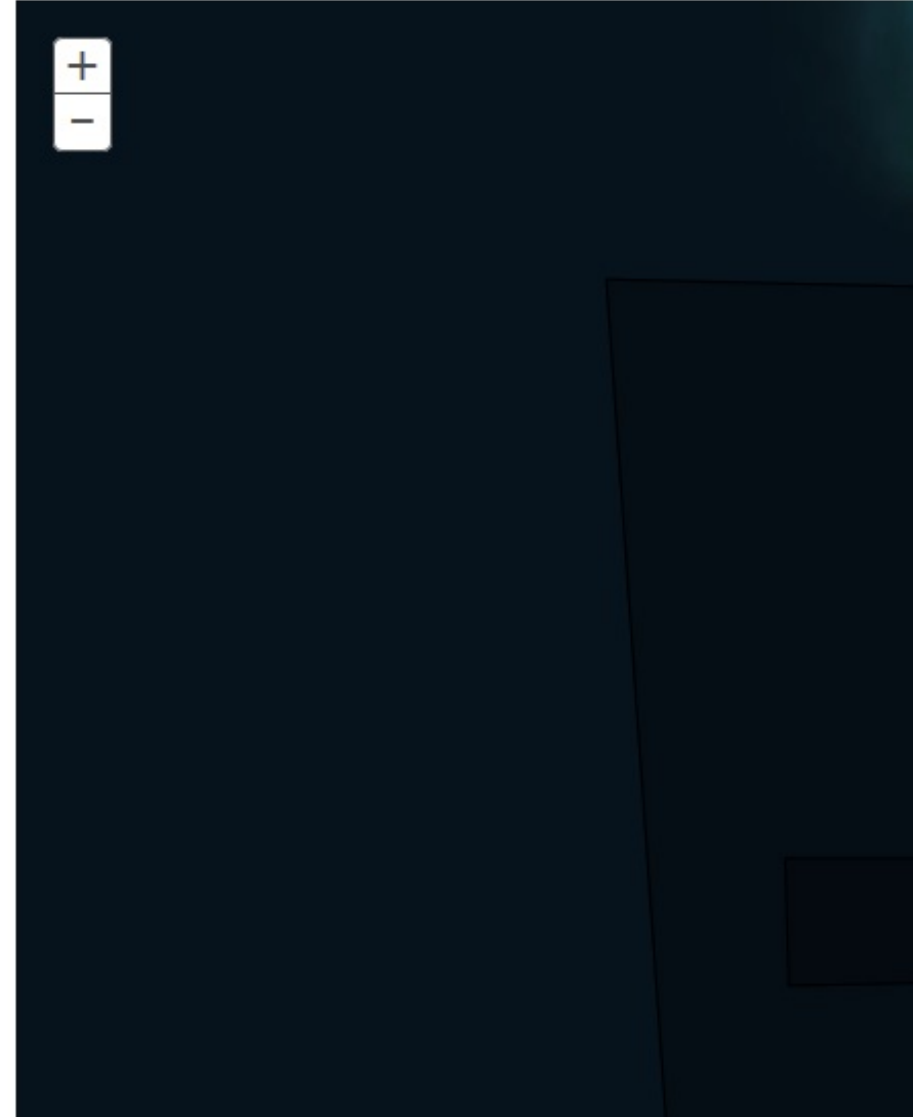


[Edit AOIs](#) [Edit Vectors](#) [Analysis](#)

A yellow row indicates that the AOI is new or modified and requires processing. When ready, click the Process data button.

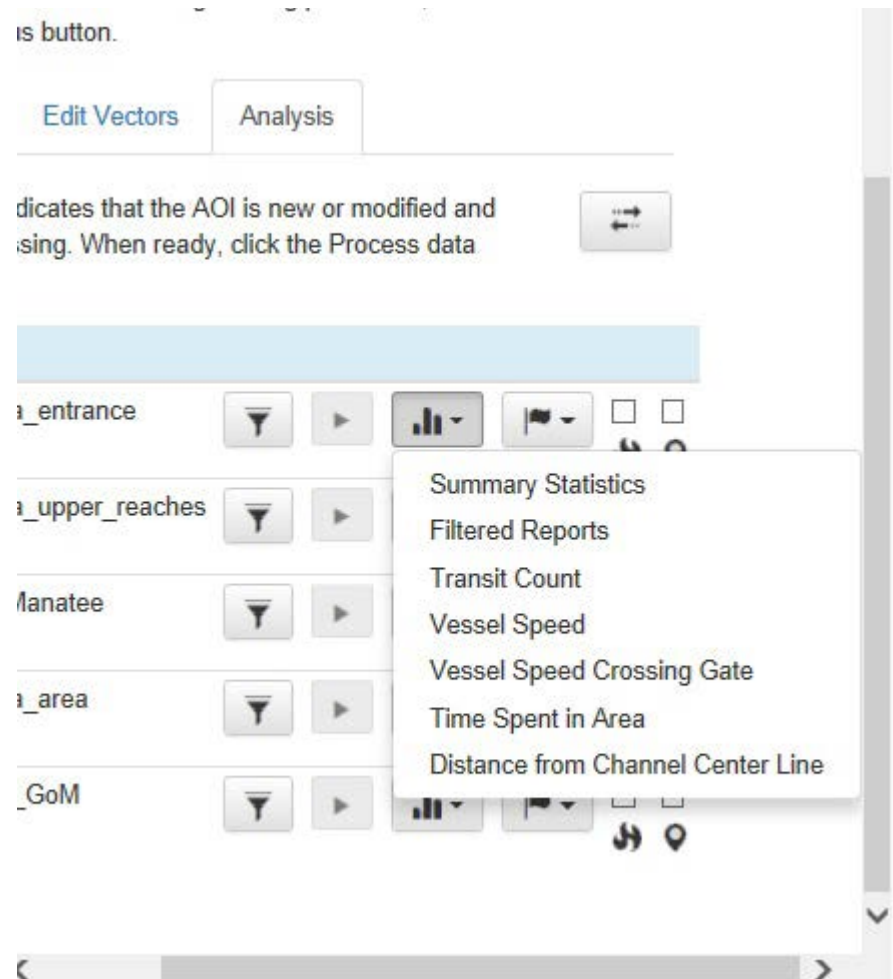


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 Tampa_entrance	    <input type="checkbox"/> <input type="checkbox"/>
 Tampa_upper_reaches	    <input type="checkbox"/> <input type="checkbox"/>
 Port_Manatee	    <input type="checkbox"/> <input type="checkbox"/>
 Tampa_area	    <input type="checkbox"/> <input type="checkbox"/>
 Entire_GoM	    <input type="checkbox"/> <input type="checkbox"/>



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



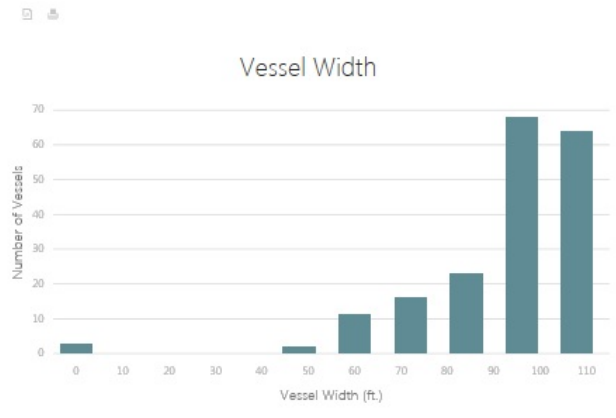
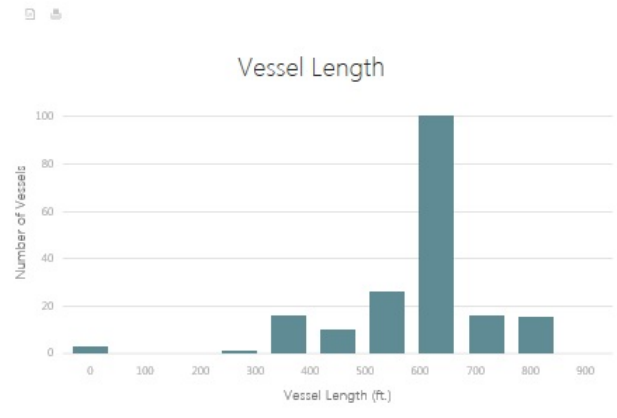
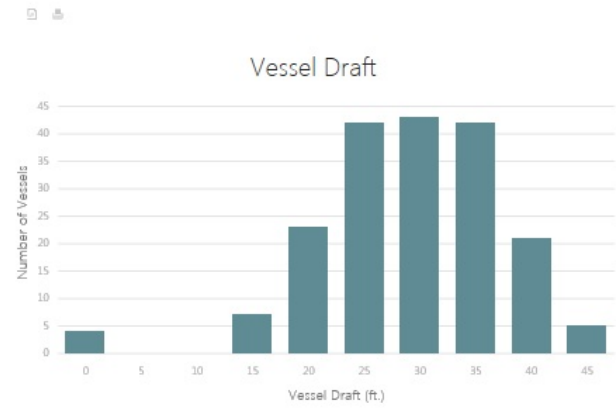
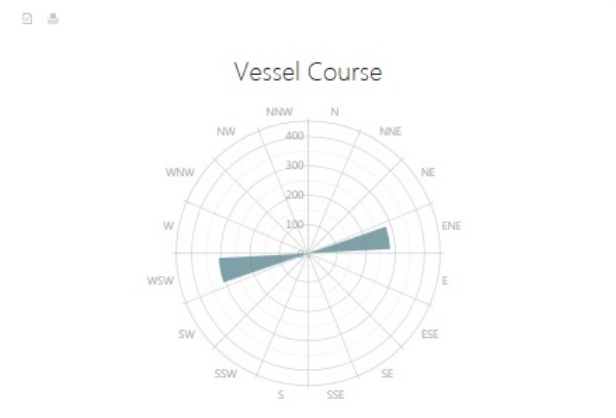
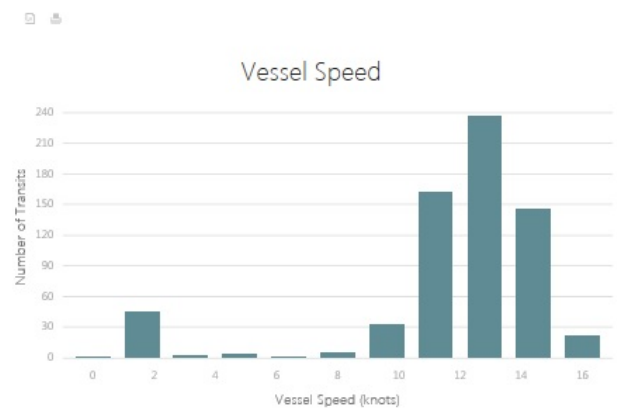
Charts Data Vessel Data Transit Data

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.)	565.87	127.51
Vessel Width (ft.)	87.23	18.69
Vessel Speed (knots)	10.85	1.07



Summary Statistics



Charts

Data

Vessel Data

Transit Data

Summary

Report Date Range: 2015-08-01T00:05:00 to 2015-08-31T23:55:00

Num Reports: 31302

Num Unique Vessels: 187

Num Transits: 858

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

Traffic Sample Statistics

Metr

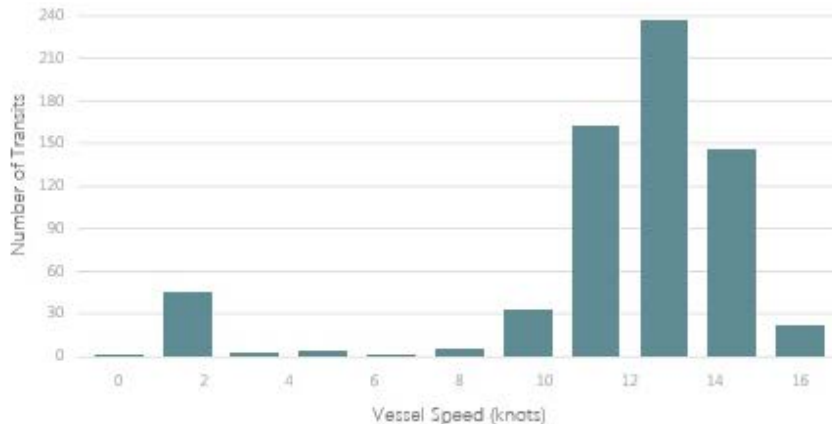
Vess

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Vessel Speed



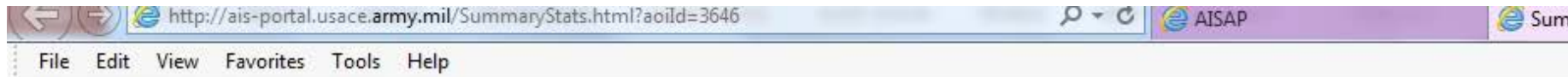
Vessel Course



BUIL

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.



Charts Data Vessel Data Transit Data

Number of Vessels by Type

Vessel Type	Number of Vessels
Cargo	145
Tanker	42



Vessel Speed (knots)

Speed	Number of Transits
0	1
1.6	45
3.2	3
4.8	4
6.4	1
8	5



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.



Charts Data **Vessel Data** Transit Data

Vessels

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 11.25.00.00...	04-JUN-15 12.35.00.00...	11.33	91.07
229011000	ADFINES SOUTH	2	07-JUN-15 08.35.00.00...	07-JUN-15 09.45.00.00...	11.07	266.07
249684000	AGHIA MARINA	1	04-AUG-15 11.45.00.00...	04-AUG-15 01.05.00.00...	9.93	85.33
249684000	AGHIA MARINA	2	08-AUG-15 03.35.00.00...	08-AUG-15 04.55.00.00...	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

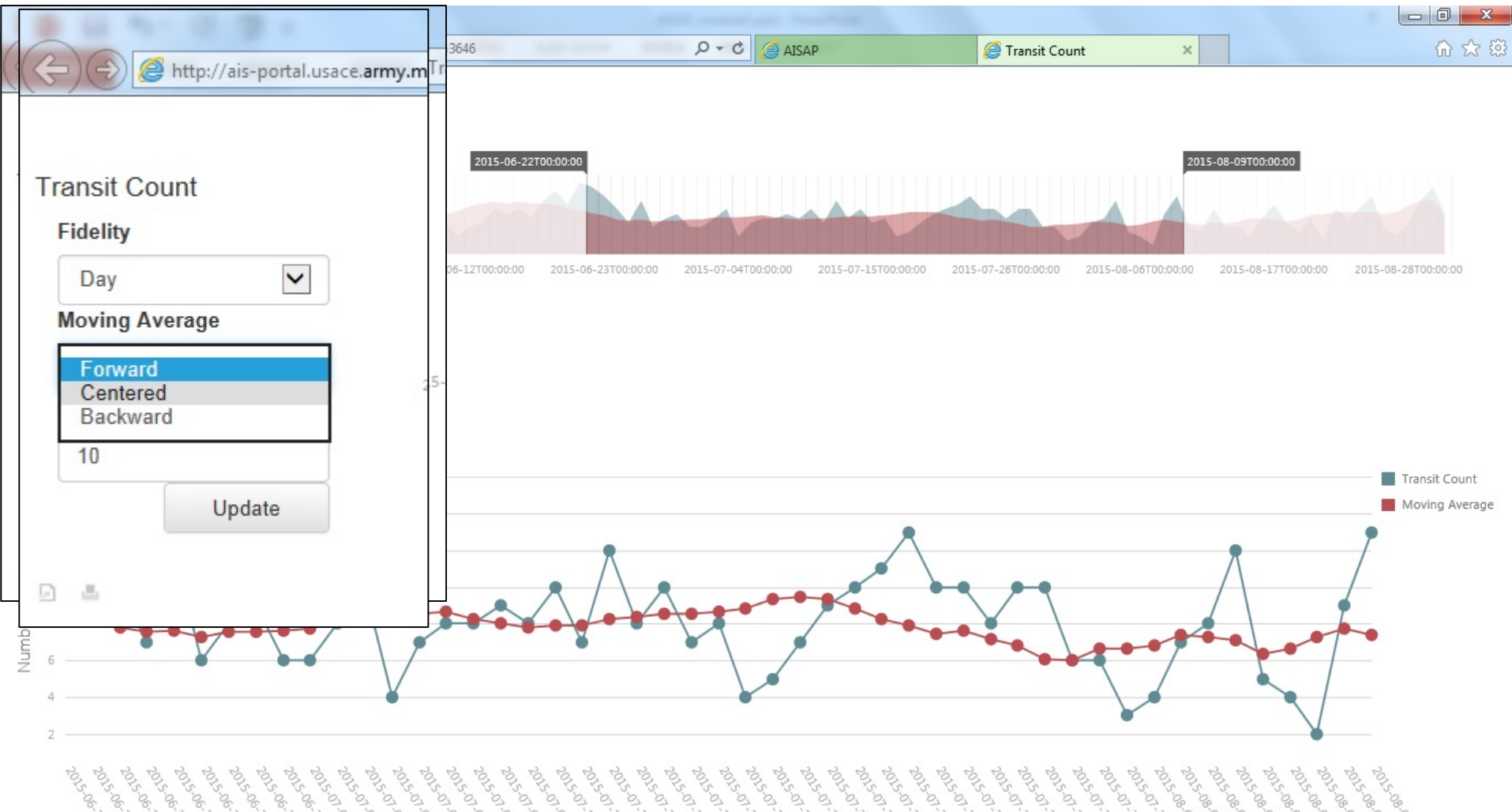
- Filtered reports are the most granular data possible; simply the AIS vessel position reports that met all filter criteria.
- These can be exported as .CSV files for custom analyses independent of AISAP.

Vessel Positions

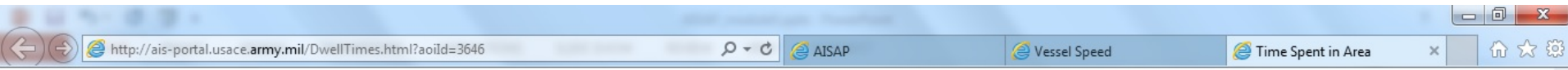


MMSI	Date	Latitude	Longitude	Course	Rate of Turn	Speed over Ground	Heading
205460000	2015-07-26T11:35:00	27.590978	-82.986694	83	0	13	82
205460000	2015-07-26T11:40:00	27.593466	-82.964883	82	0	14	82
205460000	2015-07-26T11:45:00	27.595898	-82.942865	84	0	14	84
205460000	2015-07-26T11:50:00	27.597966	-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	27.610404	-82.771616	270	-21	14	270

Transit Counts



Dwell Times



Time Spent in Area

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

- 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.

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



Travel Times Between AOIs Methodology Illustration



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.

The screenshot displays the software interface for analyzing travel times between Areas of Interest (AOIs). On the left, the 'Areas of Interest' panel shows a list of AOIs: 'Example AOI' and '2nd Example AOI'. A red box highlights the 'Process data' button for the '2nd Example AOI'. The main 'Travel Times' panel shows a table of results with columns for MMSI, Vessel Name, Previous Area Name, Leaving, Area Name, Arriving, and Travel Time. A red box highlights the 'Update' button in the 'Selected AOIs' section.

Selected AOIs:

- Example AOI
- 2nd Example AOI

Update

MMSI	Vessel Name	Previous Area Name	Leaving	Area Name	Arriving	Travel Time
3674	YWA	Example AOI	2014-02-06T13:20:00	2nd Example AOI	2014-02-06T13:35:00	0 00:15:00
3674	YWA	2nd Example AOI	2014-02-07T06:25:00	Example AOI	2014-02-07T06:45:00	0 00:20:00
3671	TON EXPRESS	Example AOI	2014-01-31T13:00:00	2nd Example AOI	2014-01-31T13:20:00	0 00:20:00
3671	TON EXPRESS	2nd Example AOI	2014-02-01T04:00:00	Example AOI	2014-02-01T04:20:00	0 00:20:00
2351		Example AOI	2014-02-26T09:15:00	2nd Example AOI	2014-02-26T09:30:00	0 00:15:00
2351		2nd Example AOI	2014-02-27T00:35:00	Example AOI	2014-02-27T00:55:00	0 00:20:00
3674	LIN	2nd Example AOI	2014-02-15T12:40:00	Example AOI	2014-02-20T22:40:00	5 10:00:00
3674	LIN	Example AOI	2014-02-20T23:25:00	2nd Example AOI	2014-02-26T08:00:00	5 08:35:00



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).

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

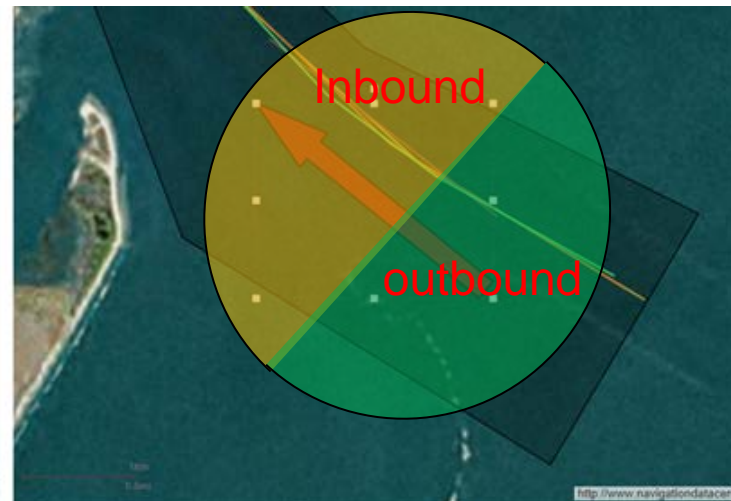
To draw a vector or line:

- 1) Click the desired button.
- 2) On the map in the highlighted AOI, click and drag to draw the line.
- 3) Release to complete the drawing.

To add curves to a channel center line, click the C button to enable editing.

- Drag a vertex to move it to a new location.
- Right-click to delete a vertex.
- Drag a ghost vertex to add a new point.

Name	✓↑	↻	✓c
Example AOI	↑	v	c
2nd Example AOI	↑	v	c



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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.



Areas of Interest

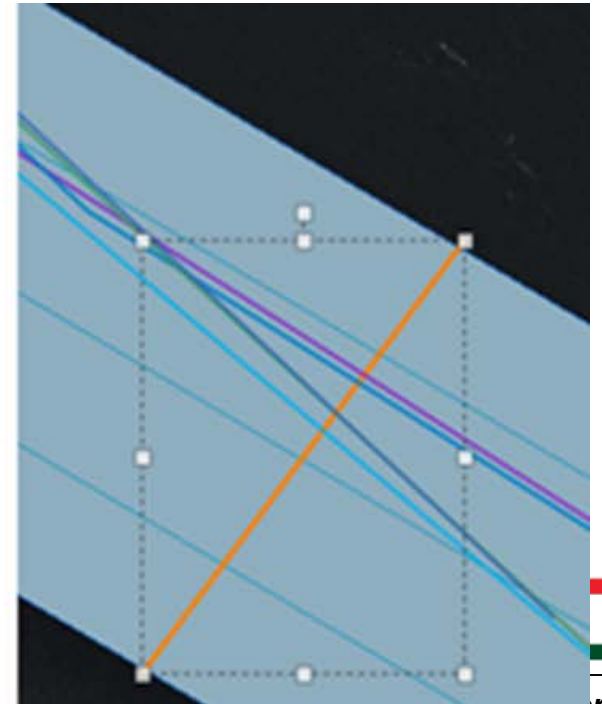
A row is disabled while the AOI is being processed. To enable the rows that are no longer being processed, click the Check status button.

[Edit AOIs](#) [Edit Vectors](#) [Analysis](#)

To draw a vector or line:
1) Click the desired button.
2) On the map in the highlighted AOI, click and drag to draw the line.
3) Release to complete the drawing.

To add curves to a channel center line, click the C button to enable editing.
- Drag a vertex to move it to a new location.
- Right-click to delete a vertex.
- Drag a ghost vertex to add a new point.

Name	<input type="checkbox"/> ↑	<input checked="" type="checkbox"/> v	<input checked="" type="checkbox"/> c
 Example AOI	↑	v	c
 2nd Example AOI	↑	v	c



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.

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	Actions
Example AOI	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2nd Example AOI	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Summary Statistics
 Filtered Reports
 Transit Count
 Vessel Speed
Vessel Speed Crossing Gate
 Time Spent in Area
 Distance from Channel Center

<http://ais-portal.usace.army.mil/VesselSpeedCrossingGate.html?aoiId=3645>



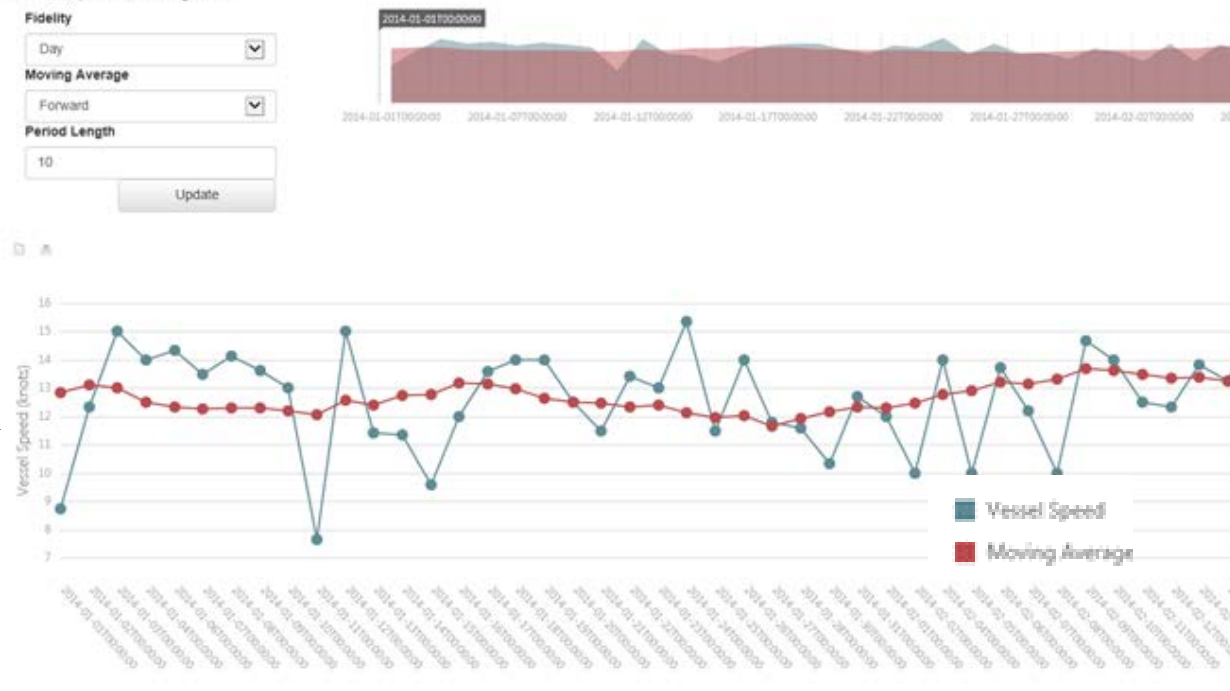
Vessel Speed Crossing Gate

Fidelity: Day

Moving Average: Forward

Period Length: 10

Update



Date	Vessel Speed Crossing Gate	Forward	Centered	Backward
2014-01-01T00:00:00	8.75	12.8501	12.9861	8.75
2014-01-02T00:00:00	12.3333	13.0936	13.1514	10.5417
2014-01-03T00:00:00	15	13.0027	13.2106	12.0278

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.

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

To draw a vector or line:

- 1) Click the desired button.
- 2) On the map in the highlighted AOI, click and drag to draw the line.
- 3) Release to complete the drawing.

To add curves to a channel center line, click the C button to enable editing.

- Drag a vertex to move it to a new location.
- Right-click to delete a vertex.
- Drag a ghost vertex to add a new point.

Name	<input type="checkbox"/> ↑	<input type="checkbox"/> V	<input checked="" type="checkbox"/> C
Example AOI	↑	V	C
2nd Example AOI	↑	V	C



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.

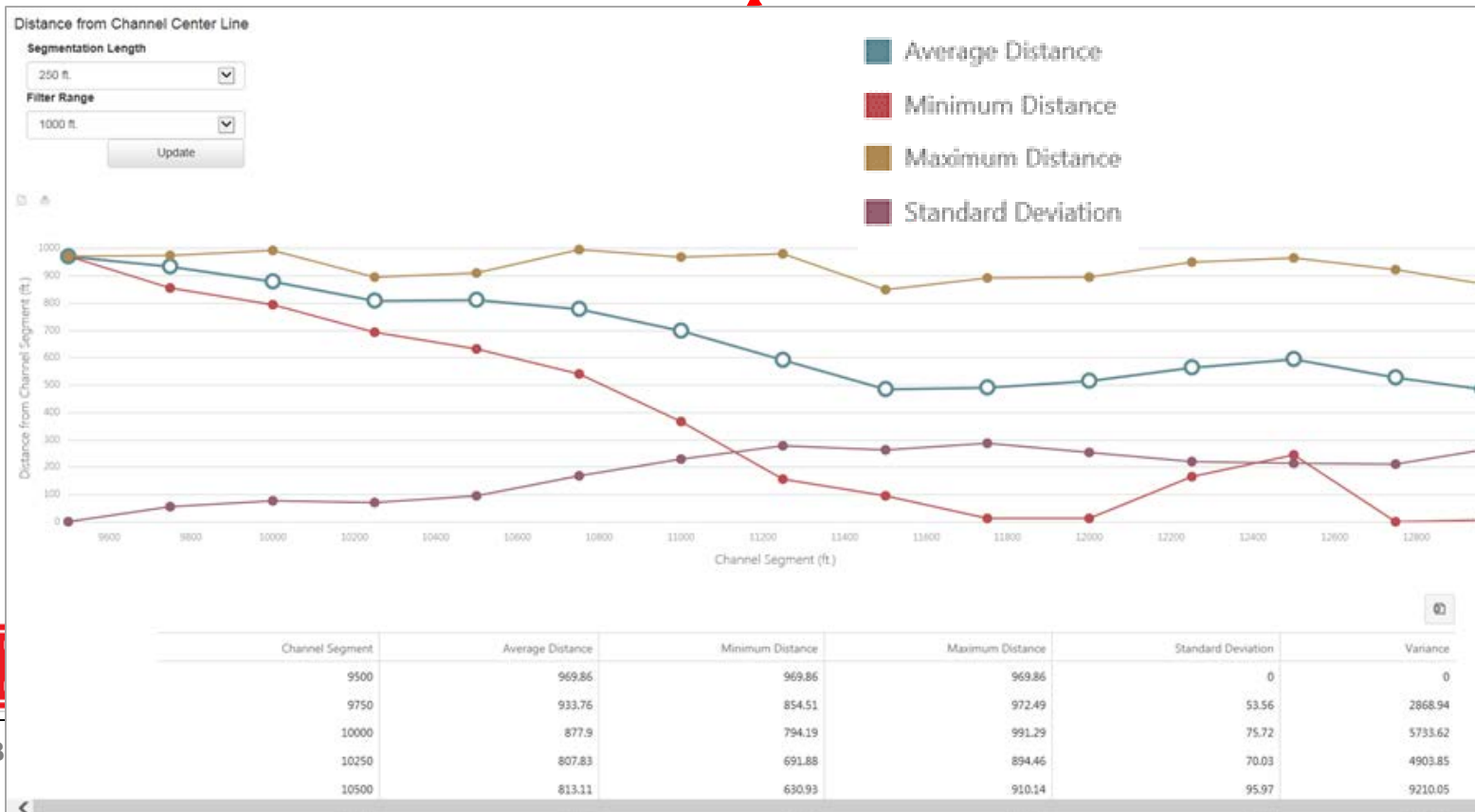
Areas of Interest

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.

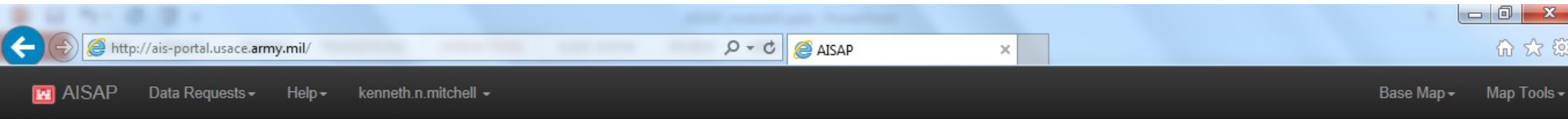
Name	Filter	Process	Summary Statistics	Filtered Reports	Transit Count	Vessel Speed	Vessel Speed Crossing Gate	Time Spent in Area	Distance from Channel Center
Example AOI									
2nd Example AOI									



B



Heat Maps



- Might want to hide AOI boxes for better viewing (go back to Edit AOIs tab).

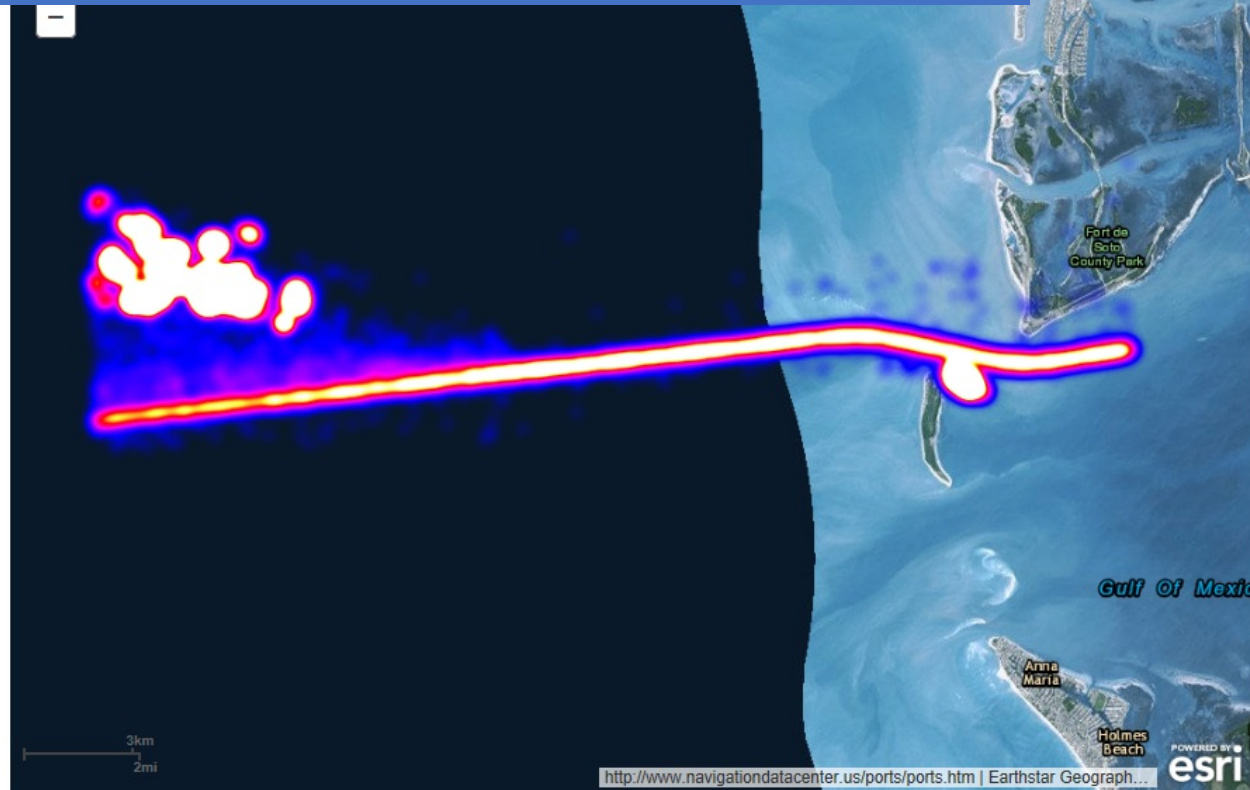
Areas of Interest

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	Filter	Play	Bar Chart	Flag	Check	Process
Tampa_entrance	▼	▶	▬	▮	<input checked="" type="checkbox"/>	⚙
Tampa_upper_reaches	▼	▶	▬	▮	<input type="checkbox"/>	⚙
Port_Manatee	▼	▶	▬	▮	<input type="checkbox"/>	⚙
Tampa_area	▼	▶	▬	▮	<input type="checkbox"/>	⚙
Entire_GoM	▼	▶	▬	▮	<input type="checkbox"/>	⚙



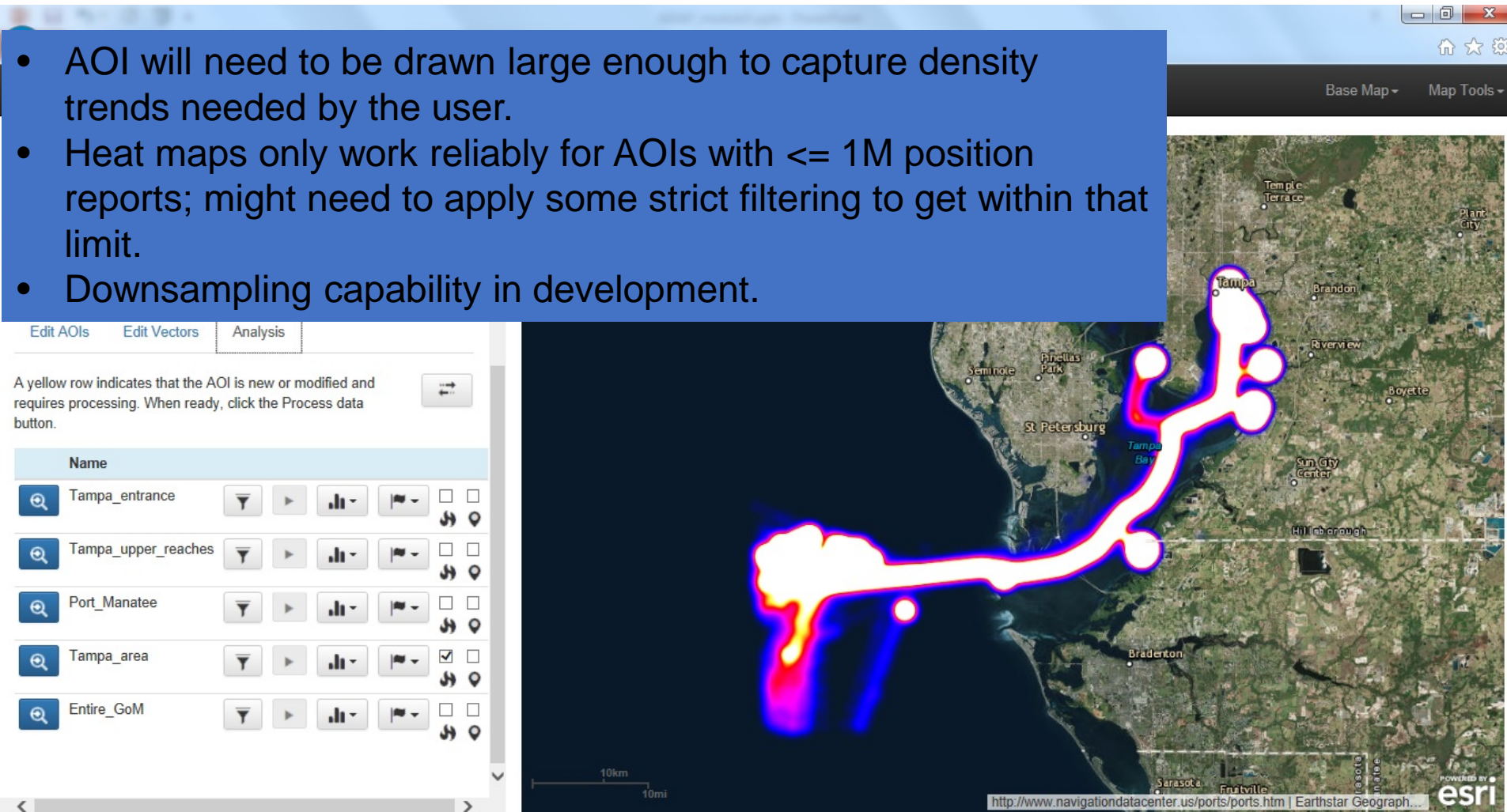
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Heat Maps

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



Heat Map Control

The screenshot displays the AISAP web application interface. The browser address bar shows <http://ais-portal.usace.army.mil/>. The application header includes "AISAP", "Data Requests", "Help", and the user name "kenneth.n.mitchell". The "Map Tools" menu is open, showing options: "Measure", "Heat Map Control", "USACE Layers", and "Toggle Width of Map".

On the left, the "Areas of Interest" section contains a table with the following data:

Name	Filter	Play	Bar Chart	Flag	Check	Refresh
Tampa_entrance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tampa_upper_reaches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port_Manatee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tampa_area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entire_GoM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The main map area shows a satellite view of Tampa Bay with a heat map overlay. A control panel is overlaid on the map, showing a "Maximum" value of 1000 and a "Minimum" value of 10. The "Update" button is visible. A scale bar at the bottom left indicates 10km and 10mi. The URL <http://www.navigationdatacenter.us/ports/ports.htm> and the "esri" logo are visible at the bottom right of the map.



Vessel Tracks

The screenshot shows the AISAP web application interface. A 'Vessel Tracks' dialog box is open, displaying a list of vessels and a table of tracks for the selected vessel, SEABULK CHALLENGE. The background shows a map of the Gulf of Mexico with various locations labeled, including Tampa, Port Manatee, and Anna Maria.

Vessel Tracks

MMSI:

- 256713000: ZINA, Cargo
- 257309000: CLIPPER SKY, Tanker
- 258003000: MARITINA, Tanker
- 258988000: SPAR ORION, Cargo
- 303104000: SEABULK CHALLENGE, Tanker**
- 303105000: SEABULK TRADER, Tanker
- 303520000: SULPHUR ENTERPRISE, Cargo
- 304056000: INDUSTRIALACE, Cargo
- 305230000: PENELOPE, Cargo
- 305799000: BRC CHIEF, Cargo

Search

	MMSI	Name	Transit	Start Date	End Date
	303104000	SEABULK CHALLENGE	2	2015-06-22T18:40:00	2015-06-22T19:45:00
	303104000	SEABULK CHALLENGE	1	2015-06-21T20:10:00	2015-06-21T21:05:00

Add to Map Cancel



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Vessel Tracks

The screenshot displays the AISAP web application interface. At the top, the browser address bar shows <http://ais-portal.usace.army.mil/>. The application header includes the AISAP logo, navigation menus for "Data Requests", "Help", and the user "kenneth.n.mitchell", along with "Base Map" and "Map Tools" options.

On the left side, there is a sidebar titled "Areas of Interest". It contains a table with the following data:

Name	Filter	Play	Chart	Flag	Check	Map
Tampa_entrance	▼	▶	▬	▮	<input type="checkbox"/>	📍
Tampa_upper_reaches	▼	▶	▬	▮	<input type="checkbox"/>	📍
Port_Manatee	▼	▶	▬	▮	<input type="checkbox"/>	📍
Tampa_area	▼	▶	▬	▮	<input type="checkbox"/>	📍
Entire_GoM	▼	▶	▬	▮	<input type="checkbox"/>	📍

Below the table, a blue callout box contains the text: "User can right-click on individual track to remove it from view." The main map area shows a satellite view of the Gulf of Mexico with several colored vessel tracks. A red track is highlighted with a "Delete Transit" label. A scale bar at the bottom left indicates 3km and 2mi. The bottom right of the map area includes a URL: <http://www.navigationdatacenter.us/ports/ports.htm> | USACE | Earthstar... and the Esri logo.



Vessel Tracks

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

Base Map - Map Tools -

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	▼	▶	▬	▮	☐	☐

6km 4mi

http://www.navigationdatacenter.us/ports/ports.htm | USACE | Earthstar... esri

