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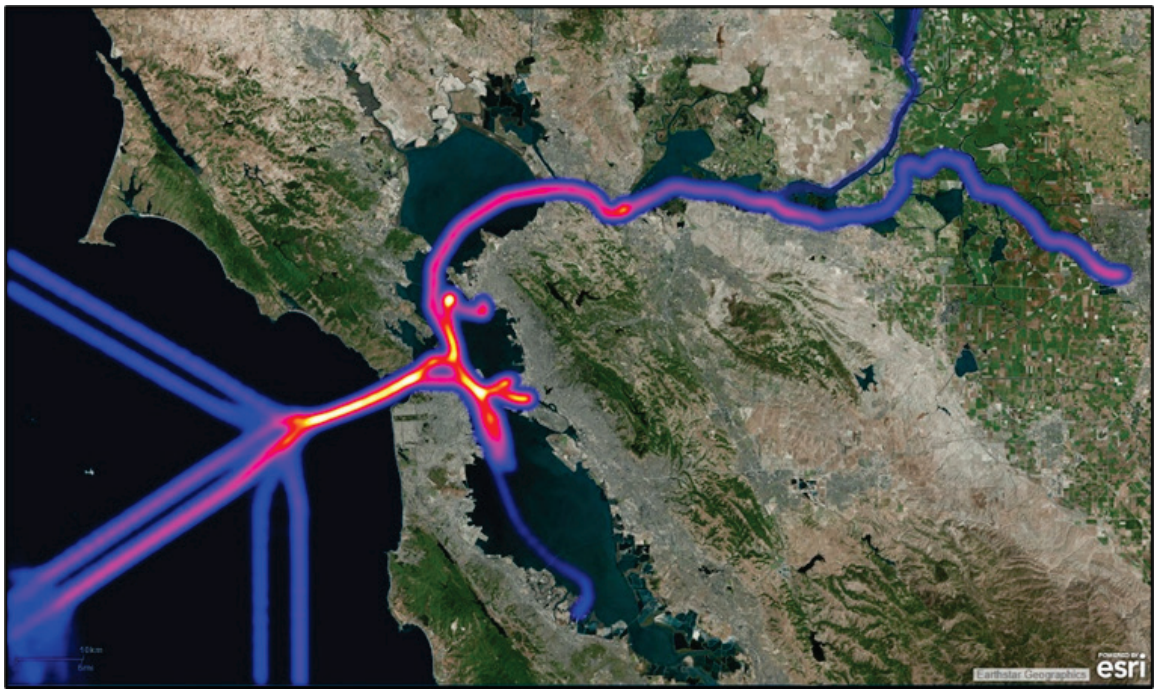
Automatic Identification System Analysis Package User Guide

Marin M. Kress, Patricia K. DiJoseph, Patrick Donohue,
and Kenneth N. Mitchell

July 2022



Coastal and Hydraulics Laboratory

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Final report

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US Army Engineer Research and Development Center
Vicksburg, MS 39180-6199

Under Account Code WIC 3CFL4F; AMSCO Code 500954

Abstract

The Automatic Identification System Analysis Package (AISAP) enables acquisition, statistical analysis, and visualization of Automatic Identification System (AIS) data from historic vessel position reports. The web-based AISAP software allows the users to choose which data they want to examine for a specific geographic area, time period, and vessel type(s). Built-in features provide vessel characteristics, arrival and departure information within a geofenced area, vessel travel time between two locations, vessel track line plots, and relative density plots of AIS data reports. AISAP accesses the Nationwide Automatic Identification System database hosted by the United States Coast Guard. This user manual provides training exercises for users to follow to familiarize themselves with AISAP procedures and workflows. These training exercises also provide examples of AISAP products.

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Preface

This document was prepared for the US Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory (ERDC-CHL), Navigation Systems Research Program, under the Port Performance and Resiliency Work Unit. The technical monitor was Ms. Morgan M. Johnston. Funding for the Automatic Identification System Analysis Package (AISAP) software development and maintenance has been provided by the Coastal Inlets Research Program; the Dredging Innovation Group Program; and Navigation Systems Research Program (Account Code WIC 3CFL4F; AMSCO Code 500954).

The work was performed by the Navigation and Coastal Engineering Branches of the Navigation Division, ERDC-CHL. At the time of publication of this ERDC-CHL special report, Ms. Lauren M. Dunkin was chief, Coastal Engineering Branch; Mr. Benjamin Burnham was chief, Navigation Branch; Ms. Ashley Frey was chief, Navigation Division; Mr. Charles E. Wiggins, CHL Technical Programs Office, was the ERDC technical director for Navigation; and Ms. Morgan M. Johnston, Navigation Branch, was the USACE Navigation Systems program manager. The deputy director of ERDC-CHL was Mr. Keith Flowers, and the director was Dr. Ty V. Wamsley.

Sincere appreciation is expressed to the AISAP technical development team members who worked on the user interface, database architecture, and data transfer protocols as the tool has evolved and expanded capabilities, especially Ms. Susan Herrle and Mr. Richard Akers. Additionally, the authors gratefully acknowledge the field users who have given valuable feedback while using AISAP to investigate their own waterway usage topics.

The commander of ERDC was COL Teresa A. Schlosser, and the director was Dr. David W. Pittman.

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1 Introduction

The Automatic Identification System Analysis Package (AISAP) is a tool that enables the user to obtain, visualize, and analyze Automatic Identification System (AIS) data for US waterways (and limited neighboring international areas) within range of the US Coast Guard and US Army Corps of Engineers terrestrial-AIS receiver locations. New data can be requested for up to 3 years (yr*) prior to the request date (details on data availability are provided in Chapter 9). This document provides exercises for the user to become familiar with the tool. Exercises need to be followed in order only when indicated.

1.1 Background

As vessels transit navigable waterways, they broadcast information via AIS transceivers on their current position, speed, course over ground, and other vessel characteristics. The broadcasts are at discrete time intervals, ranging from every 2 sec to every few minutes depending on the vessel's activity. Through the Nationwide Automatic Identification System (NAIS), the United States Coast Guard (USCG) and the United States Army Corps of Engineers (USACE) collect and store the data. Since 2016, AIS carriage requirements include most commercial self-propelled vessels on US navigable waterways including any vessel over 65 ft in length, towing vessels over 26 ft in length with greater than 600 hp engines, vessels certified to carry 150 or more passengers, dredges in or near a commercial channel, and vessels moving certain dangerous cargo (USCG 2018; US Code of Regulations 2019). AIS technical standards and history can be found online through international associations involved in setting technical standards (IALA 2008; IEC 2001; ITU-R 2014; PIANC 2019). The USACE Lock Operations Management Application (LOMA) system provides primary AIS coverage on inland waterways, and AIS messages received by LOMA AIS shore sites are routed to the USCG where they are

* For a full list of the spelled-out forms of the units of measure used in this document, please refer to *US Government Publishing Office Style Manual*, 31st ed. (Washington, DC: US Government Publishing Office 2016), 248-52, https://www.govinfo.gov/content/pkg/GPO-STYLEMANUAL-2016/pdf/GPO-STYLEMANUAL-2016.pdf.

archived with other signals received by NAIS for long-term storage (Tetreault et al. 2022).

Realizing that AIS data could support the navigation mission of the USACE, the AISAP tool was developed to acquire data from the NAIS database and provide accessible visualization and statistical analysis capabilities to USACE employees. Visualizations include the tracks of vessels through the waterways and hot spots of vessel traffic. Statistical analysis includes summaries of the vessels using a waterway project, average vessel speeds, and usage counts.

AIS data within AISAP are presented in the UTC time zone.

1.2 Objective

The objective of this document is to provide directions to AISAP users on how to utilize AISAP functions.

1.3 Approach

The document provides practice exercises for users to learn how AISAP works. Procedures and workflows are transferable to any location for which data are available.

2 Account Set Up

The following steps describe how to create a new AISAP account. AISAP is a web-based tool; no software download is required to access the program. The recommended web browser is Google Chrome.

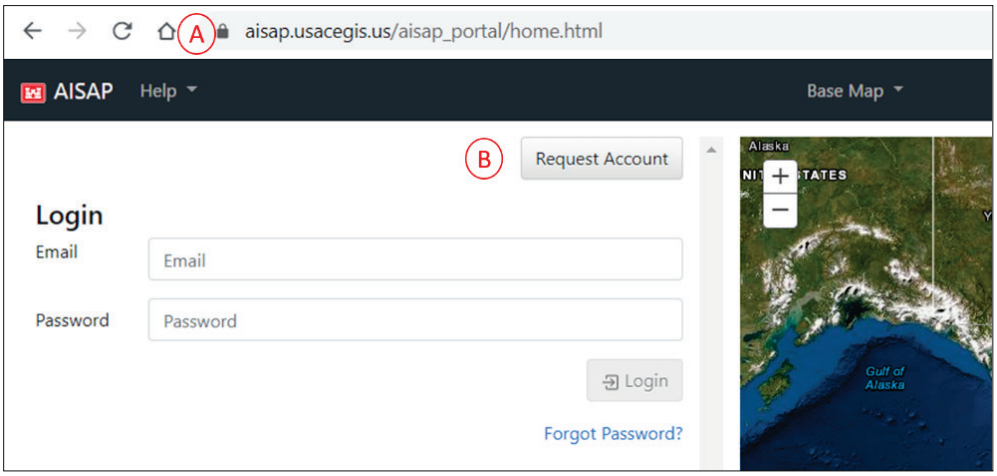
1. Access AISAP at the login page.

As of May 2022, the login URL can be found here:
https://aisap.usacegis.us/aisap_portal/home.html

The login URL might change over time due to website migrations. Please contact the authors of this user guide with any questions about site access.

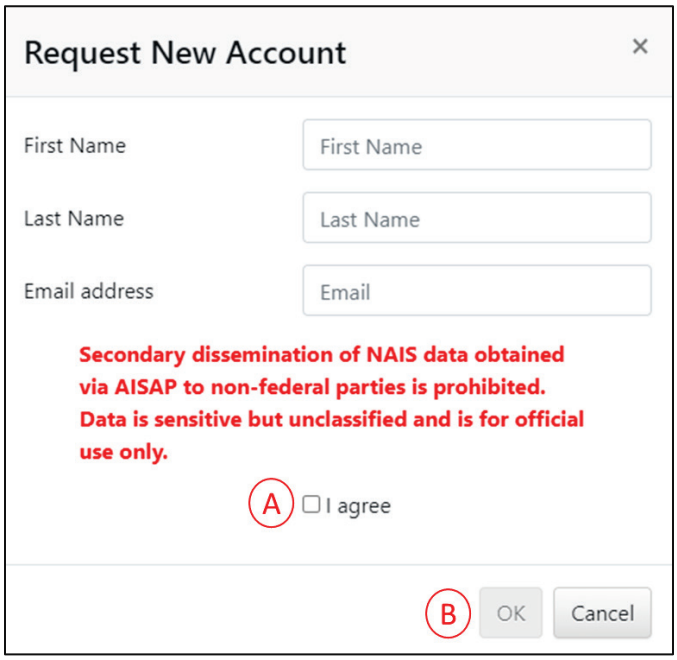
A snapshot of the homepage is shown in Figure 1, where the red "A" shows the URL and the red "B" shows the request account button.

Figure 1. AISAP login page.



2. Click on the "Request Account" button, indicated in Figure 1 with a "B". A "Request New Account" window will pop up, as shown in Figure 2.

Figure 2. Request New Account window.



3. In the "Request New Account" window, enter the requested information. For the "Email address" field, use your official work email address (.gov or .mil). Account requests from .com addresses will not be approved. Agree to the limitations on secondary dissemination of NAIS data notice by clicking on the toggle next to "I agree" (indicated in Figure 2 with an "A") before proceeding. Once you have completed all the information, click the "OK" button, indicated with a "B" in Figure 2.

You will receive an email, to the email address you registered, from *donotreply@usace.army.mil* with a unique link to set your password. This may take up to five business days depending on staff availability to review and approve accounts. Please check your spam folder if you do not see the registration email within 5 days. Note, the link expires after 72 hr once the email is sent with your unique password (this link can be regenerated by using the "Forgot Password" link on the homepage).

4. Copy and paste the unique link into a web browser to set up your password.
5. Enter a unique password in the fields, and then click "OK".

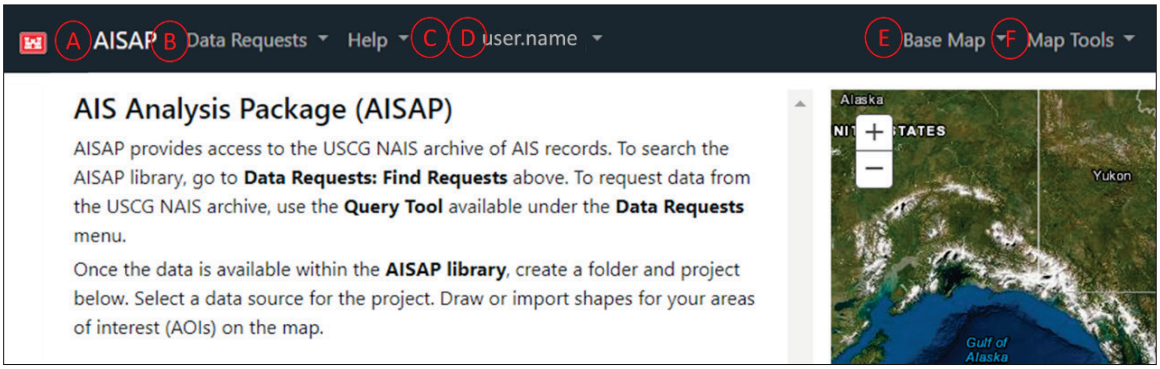
You will be taken back to the AISAP login page where you can now sign in with your email address and new unique password.

3 Home Page

This section describes the AISAP home page, as shown in Figure 3. The AISAP home page is accessed after logging in to your account.

The top, black menu bar of the homepage has many drop-down menus. These include “AISAP”, “Data Requests”, “Help”, user.name (your username), “Base Map”, and “Map Tools”, as shown in Figure 3, labeled A–F, respectively.

Figure 3. AISAP home page.



Clicking on “AISAP” (A) will return the user to the home page if they are currently in a different page within AISAP.

The “Data Requests” (B) drop-down menu includes “Find Requests”, “Query Tool”, “NAIS Web Services”, and “Request Status Lookup”, all described in detail in upcoming sections except for “NAIS Web Services” which is primarily used by system administrators and not general users.

The “Help” (C) drop-down menu includes “Documentation” about the tool and “Contact” information for the AISAP development team.

The “user.name” (D), which will be the actual username of the user, drop-down menu includes the options to “Logout” and “Change Password”.

The “Base Map” (E) drop-down menu allows the user to select from different map background displays.

The “Map Tools” (F) drop-down includes the following options:

- **Measure** menu: to measure area and distance, and to identify a location’s coordinates, with multiple unit choices available.

- **Heat Map Control**: to adjust the maximum and minimum levels on a heatmap
- **Vessel Track Settings**: to adjust the settings related to re-created track lines as displayed on the map
- **Vessel Track Legend**: to display on a single legend of vessel track-line color
- **USACE Layers***:* to the map option, such as river mile markers, channel reach boundaries, and USACE district boundaries, and
- **Toggle Pane Width**: to change the width of the control panel and map on your computer screen.

4 Project Introduction

A project is the workspace within AISAP for users to analyze AIS data of their choice. A user can have multiple projects. Projects are organized into folders.

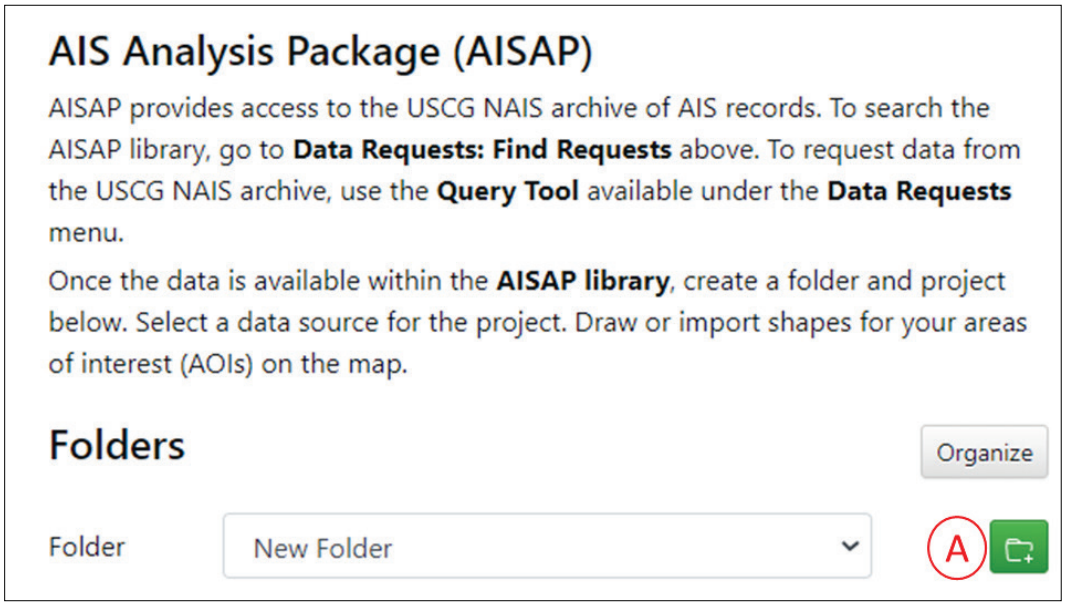
While a project is associated with the user, the user can share the project with other users for them to view and/or edit the project. You must have an AISAP account (see Section 2) to complete the exercises in this section.

4.1 Create a folder

The following steps provide an example on how to create a folder.

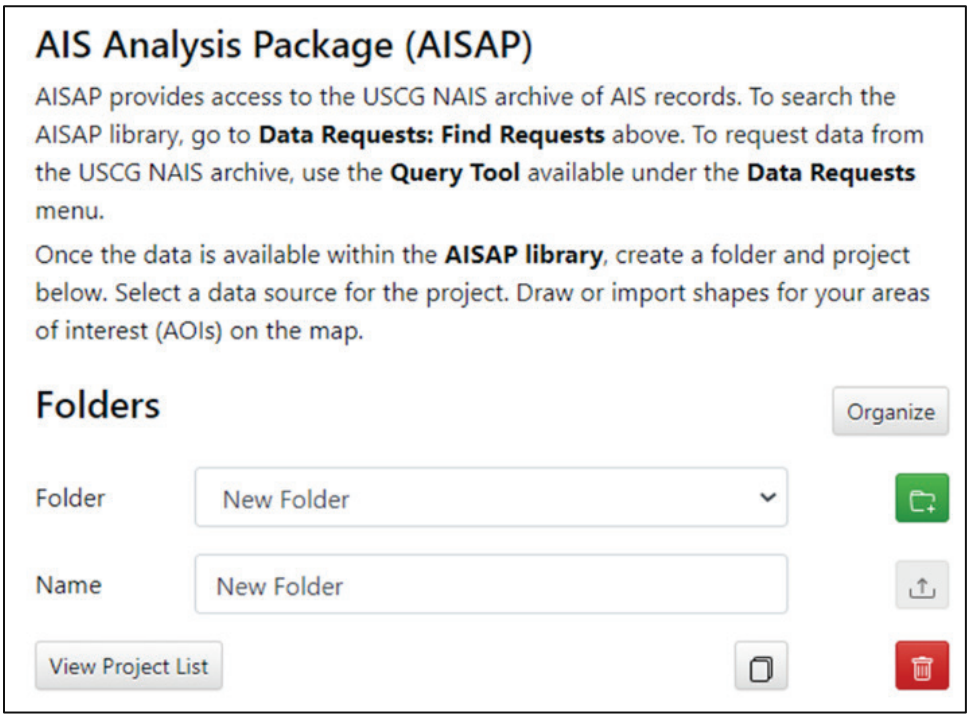
1. Go the AISAP-Cloud home page.
2. Click on the green create-new-folder button, indicated with (A) in Figure 4.

Figure 4. Create-new-folder button.



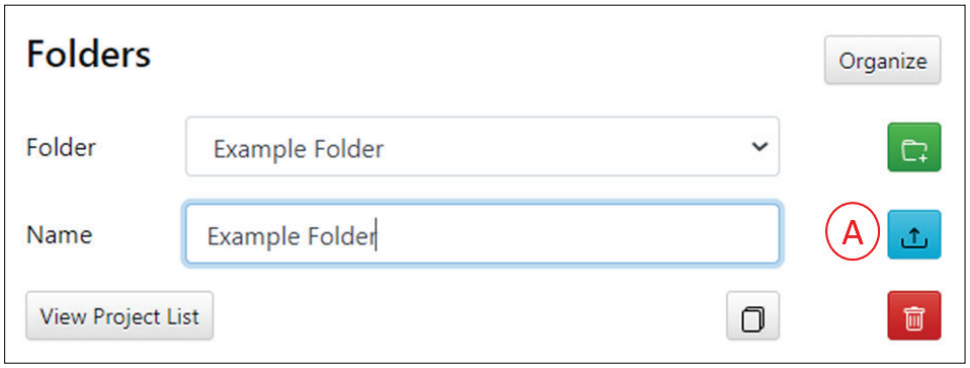
A “Name” field appears, as shown in Figure 5.

Figure 5. Name field for adding a new folder.



3. Change the folder "Name" to "Example Folder" as shown in Figure 6.

Figure 6. Name a folder.



The save button turns blue, (A) in Figure 6; this is a reminder to save your naming changes.

4. Click on the save button.

There is now a new folder in your account named "Example Folder".

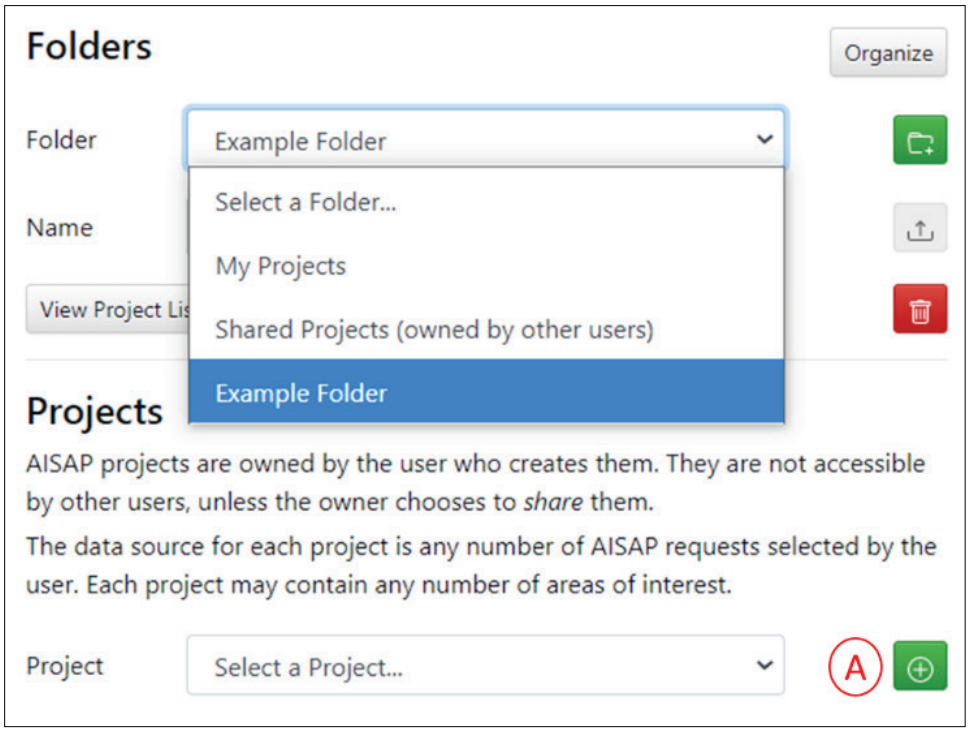
4.2 Create a project within a folder

The following steps provide an example of how to create a new project.

Complete Section 4.1 before starting this section.

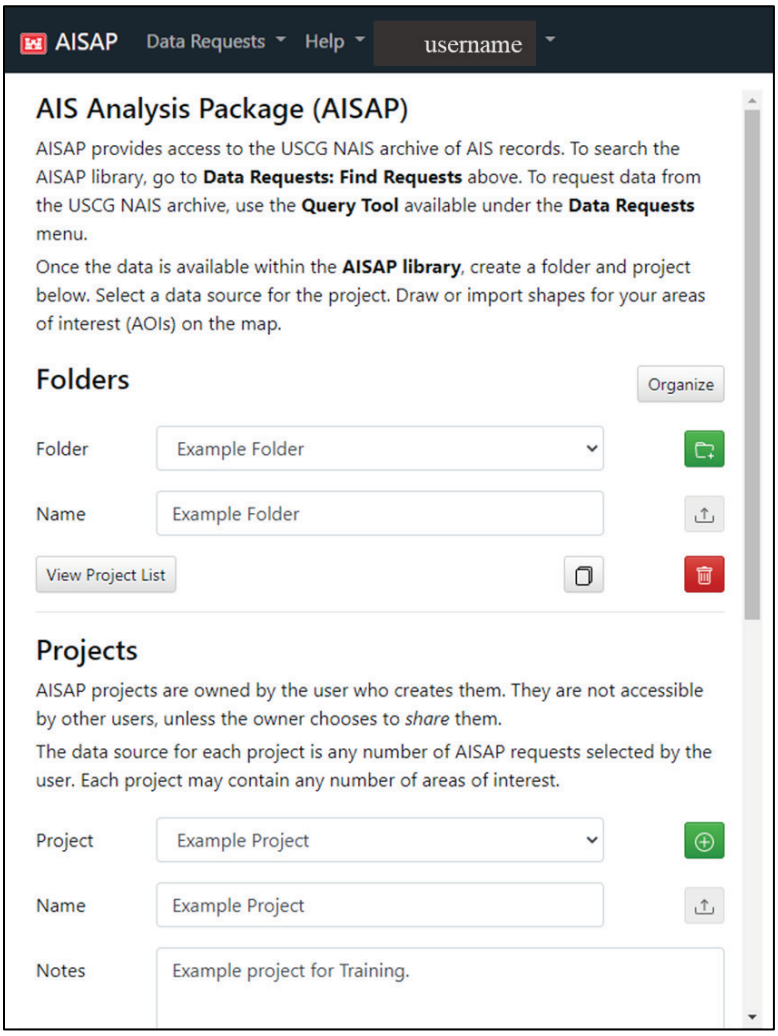
1. Go to the AISAP-Cloud home page.
2. From the "Folder" drop-down menu select the folder "Example Folder", as shown in Figure 7.

Figure 7. Selection of the Example Folder and (A) add a new project.



3. Click on the green create new project button, indicated with (A) in Figure 7.
4. Change the project name to "Example Project", as shown in Figure 8.

Figure 8. Renaming of new project.



5. In the “Notes” field, enter any information that will be useful. This can be descriptive information such as “Example project for Training.”

The save button next to the project “Name” field turns blue; this is a reminder to save your naming changes.

6. Click on the save button.

There is now a project named “Example Project” in the folder named “Example Folder”.

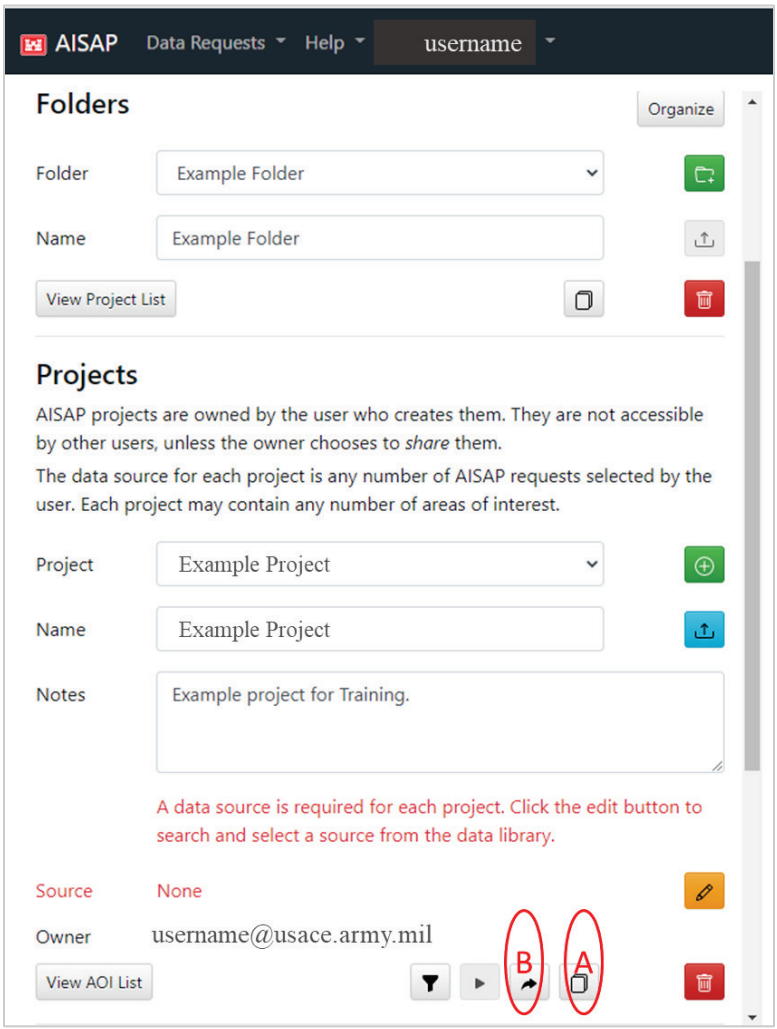
4.3 Duplicating a project

It can be helpful to create a copy of a project; this allows users to try out features and filters while retaining an original copy. This section explains how to create a copy of a project.

Complete Sections 4.1 and 4.2 before starting this section.

1. In the "Projects" section of the project page, click on the create-duplicate-project button that looks like two sheets of stacked paper, as indicated in Figure 9 with an (A).

Figure 9. The create-duplicate-project icon is indicated with an (A), and the share-project icon is indicated with a (B).



A "Create Duplicate Project" pop-up window will appear.

2. Use the drop-down menu in the pop-up window to select the folder you wish to save the project copy to. For this example, select “Example Folder”. As you create more folders, you will have more choices.
3. Once selected, click the “OK” button.
4. A copy of the project will now be in the “Example Folder”; it will be named “Copy of Example Project”.
5. Navigate back to the original project by going to the “Project” drop-down menu and selecting “Example Project”.

4.4 Sharing a project with another user

A project can be shared with other users for collaboration. The project owner can choose the level of editing power for the recipient users. Permission levels range from “read only” or full-edit capability for the project. These steps can be repeated to share one project with multiple users.

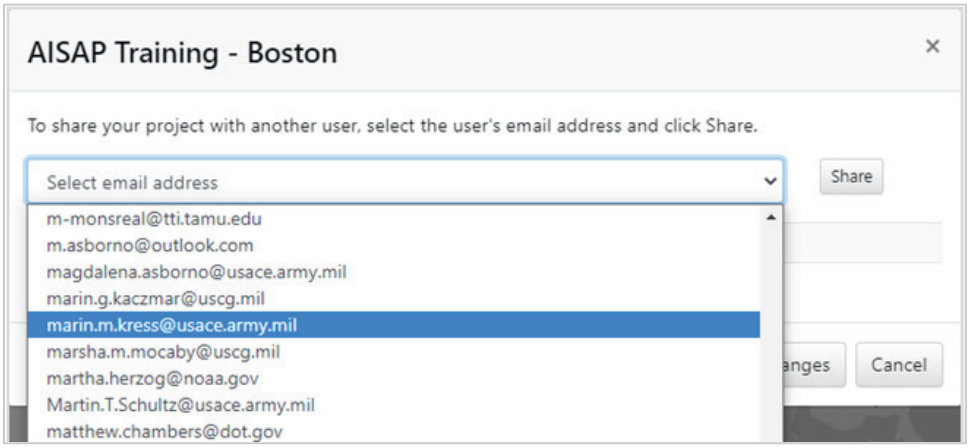
Complete Sections 4.1 and 4.2 before starting this section.

1. In the “Projects” section of the project page, click on the share-project button that looks like a right-pointing arrow, as indicated in Figure 9 with a (B).

A pop-up window will appear.

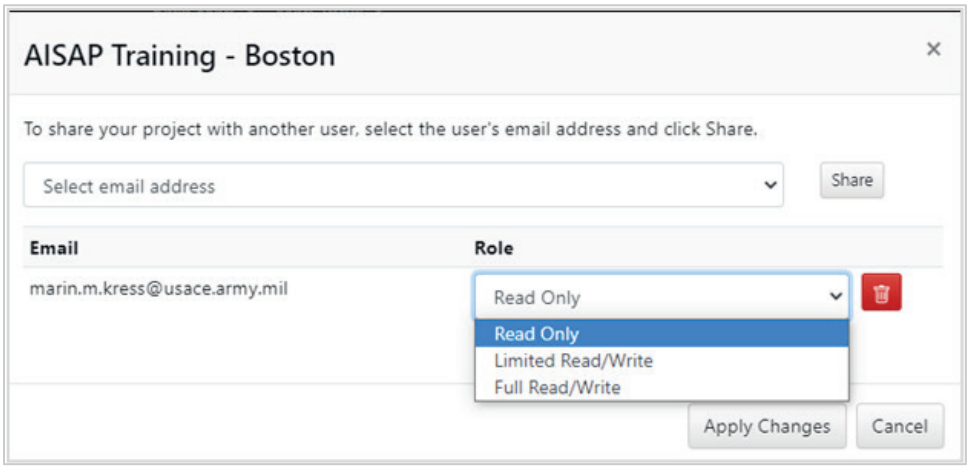
2. From the drop-down menu in the pop-up window, select the email of the person with whom you want to share the project, as shown in Figure 10. Only emails from AISAP users are shown in the list.

Figure 10. Pop-up window to share a project with another user.



3. Select the role (editing permission level) you want to assign to the person being added, shown in Figure 11.

Figure 11. Select the role (editing permission level) for a user.



The options are as follows:

Read Only – The user with whom the project is being shared can look at the project and its results but not make any changes such as drawing new areas of interest (AOIs) or editing filters.

Limited Read/Write – The user can process the AOIs and view results but not make any changes to the project such as editing the data source or editing the AOIs.

Full Read/Write – There are no restrictions on what changes to the project the user with whom the project is being shared can make. The added user can add, edit, or delete AOIs or change the project source. These changes will be reflected in the original project as viewed by anyone with whom it is shared.

4. Click the "Apply Changes" button.

The shared project will appear in the user's "Shared Projects (owned by other users)" folder.

Note: To remove a role from a user, repeat Step 1 and then click the red trash can icon next to the user's name in the pop-up window.

Note: To see all users a project is shared with, repeat Step 1.

4.5 Automatic Identification System (AIS) data

Each project needs to be joined to AIS data. The user selects available data out of the AISAP library. The library is organized by individual data requests, which can be thought of as books in a library, each containing a unique combination of spatio-temporal vessel position information.

Requests can be joined to multiple projects at once. Although each request has one requestor username associated with it, any user can use any data in the library. In addition, multiple requests can be joined to a single project.

4.5.1 AIS data request introduction

Each data request contains AIS data defined by time span (start and end date) and spatial extent (geographic area) of the request. For example, a request may include data for the area encompassing the Port of Los Angeles for December 2020. Requests can overlap in either spatial extent and/or time period. Multiple requests can be joined to a project to provide extended temporal and spatial coverage. The user does not need to be concerned with overlap or duplication since AISAP will automatically sort all data added into a project so that there is only one copy of any overlapping data.

Another characteristic of each request is *Sampling Rate*. Vessels broadcast their AIS data as often as every 2 sec. To reduce the amount of AIS data to process within a project, a data request can have a down-sampled sampling rate. For example, a sampling rate of 1 hr means a request will contain one position report for each vessel on the hour, every hour, during the request time span.

4.5.2 Adding AIS data to your project

This section provides an example for finding a request that has data for Milwaukee, WI, for August 10, 2019, and then adding that data to the "Example Project".

Complete Sections 4.1 and 4.2 before starting this section.

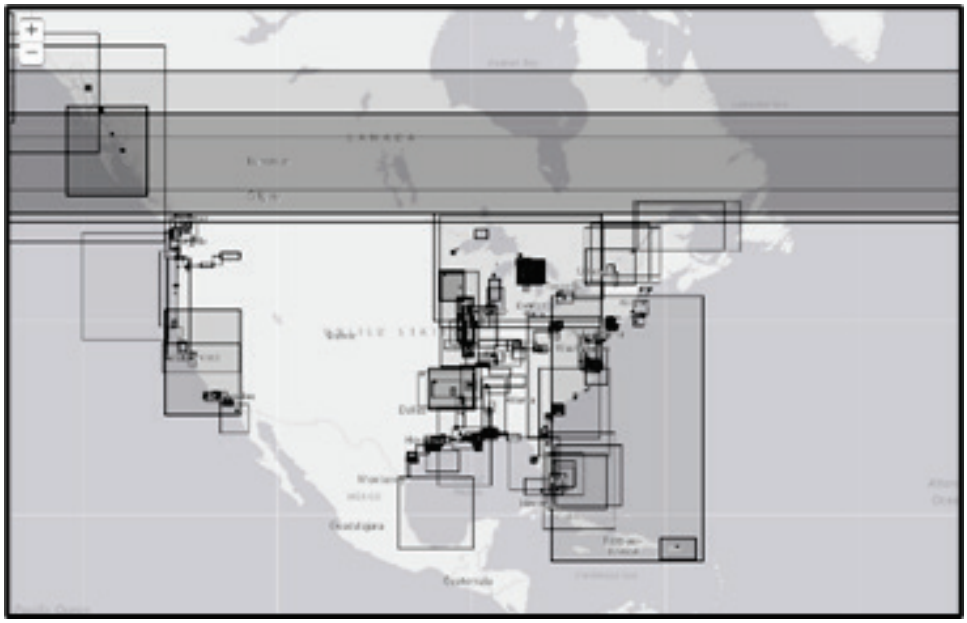
1. Navigate to the "Example Project" project within the "Example Folder" you set up in Sections 4.1 and 4.2.

2. In the “Projects” section, look for the orange pencil button next to the “Source” field. When hovering over the pencil icon button, the text “Edit data source” is displayed. Click on the pencil button. A new tab will open with the title “Find Requests in AISAP Library”.
3. Change the base map layer for easier viewing by clicking on the “Base Map” drop-down menu at the top of the screen, (E) in Figure 3, and select “gray”.

There are multiple ways to search through the AISAP data library for requests:

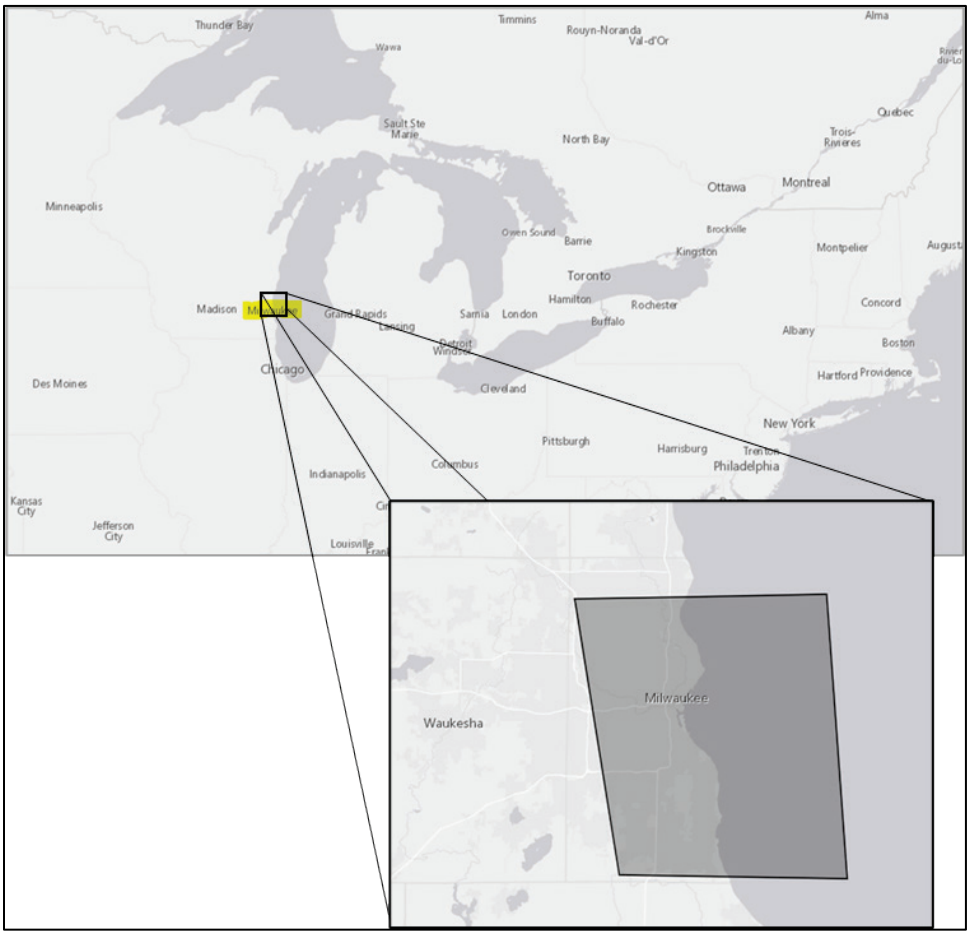
- Draw a polygon around the area for which data are needed — be generous to ensure that the polygon reaches beyond the intended area. A request may not exactly overlap with the area but may still be useful.
- Leave all fields blank and click on the “Search Library” button. This will show all the requests in the library, but it will take a few minutes to load because the library is quite large, as shown in Figure 12. Darker areas indicate there are multiple requests for that area. To clear any test searches, click on the “Clear Map” button. Figure 12 shows request boxes extending well beyond US waters; in these cases, only the portion inside the NAIS coverage area would return any results.

Figure 12. Result of clicking on “Search Library”, which shows all available requests, even if only part of the request area contained data.



4. Click on the blue “Draw Area” button; then, draw a large polygon around the study area of interest. For this example, the case study area is Milwaukee, WI, as shown in Figure 13.

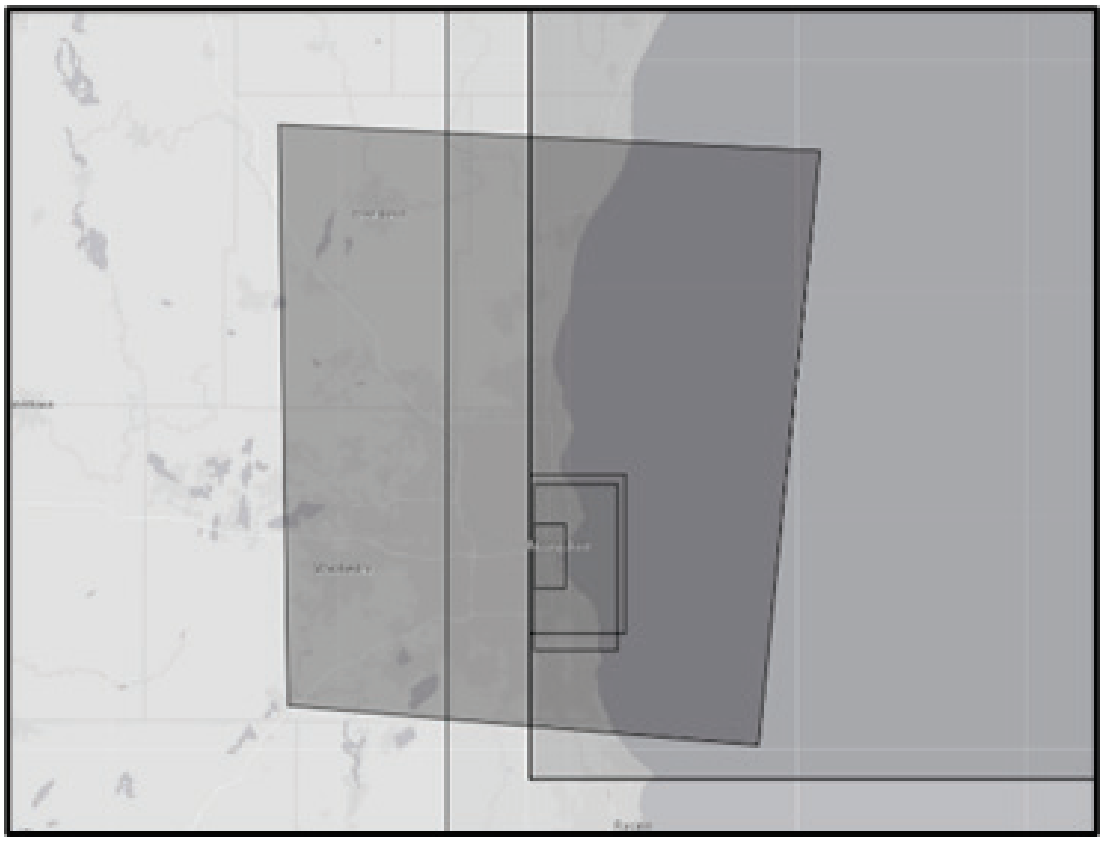
Figure 13. Case study area polygon with top figure highlighting Milwaukee, WI.



5. Double click the mouse to close the polygon.
6. Click on “Search Library”.

The screen will update to show the drawn polygon and all the requests from the library that overlap the drawn polygon, as shown in Figure 14.

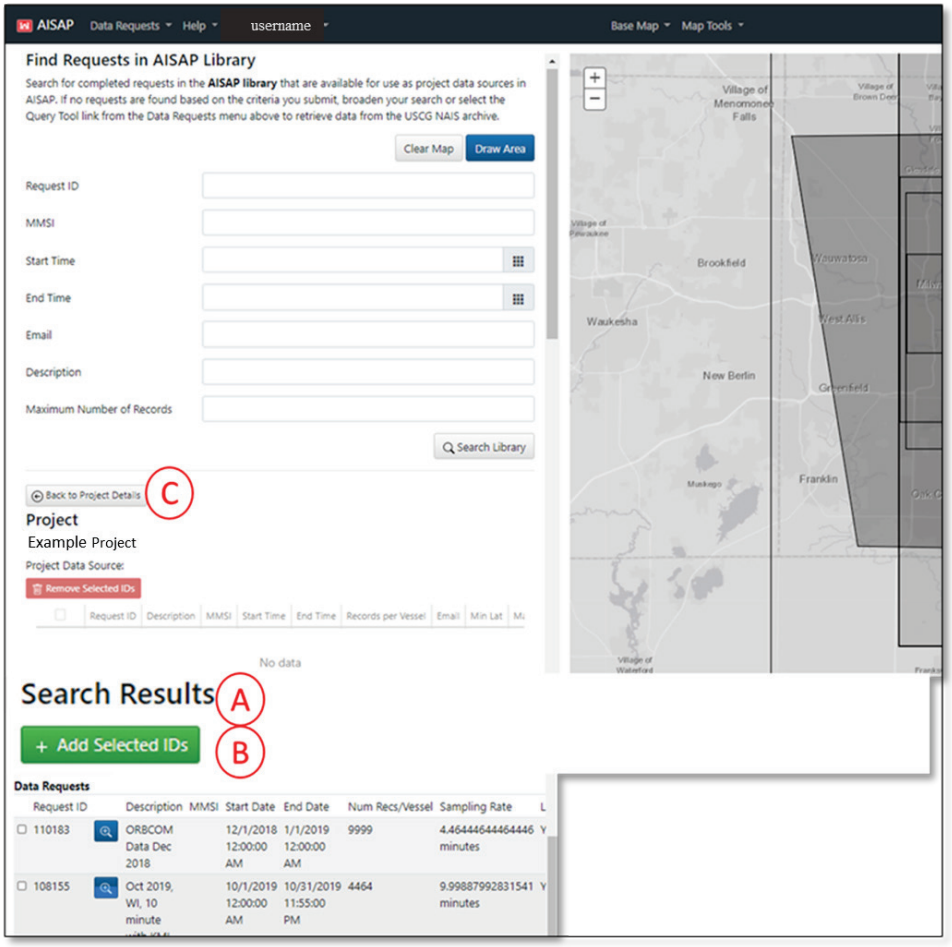
Figure 14. Requests with a geographical area that overlap with the drawn polygon.



Clicking on any of the outlined boxes will result in a pop-up that contains information about the request, such as the time period the data are for.

7. In the "Find Requests in AISAP Library" panel on your screen, scroll down until you see the "Search Results", as shown with (A) in Figure 15.

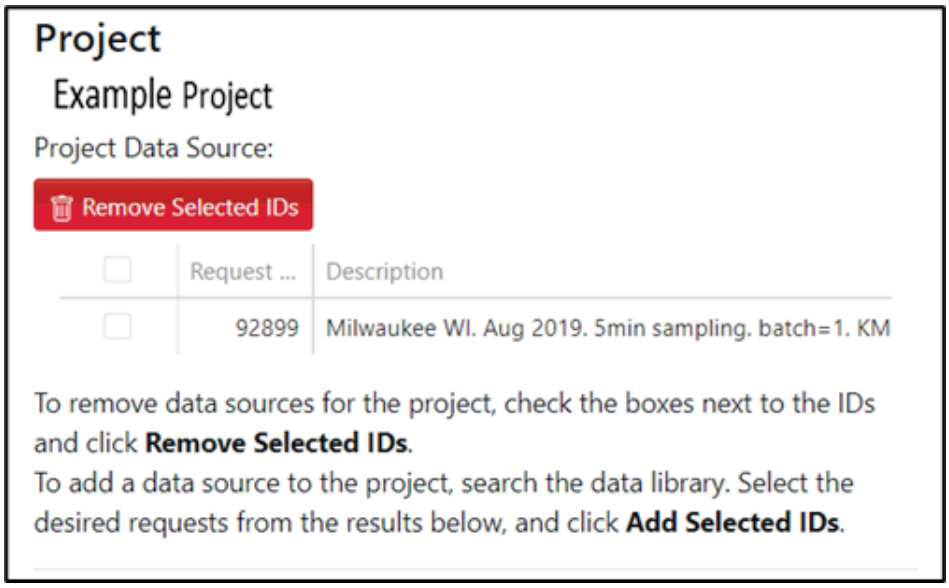
Figure 15. Location of "Search Results" (A) on the "Find Requests in AISAP Library" page.



8. Scroll down the results panel and check the box next to Request ID "92899"; this request is for August 2019, which covers the case study time period.
9. Click on the green "Add Selected IDs" button, identified with a (B) in Figure 15.

Under the "Project" section, find the "Project Data Source". The number listed is the request that was just added, "92899", as shown in Figure 16.

Figure 16. Project data source.

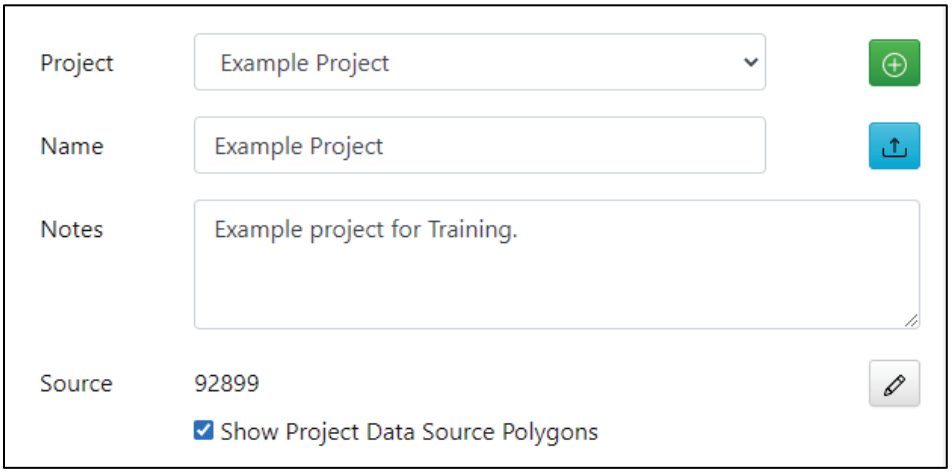


10. Click on the "Back to Project Details" button, indicated with a (C) in Figure 15.

The screen will now update to the home screen.

The "Source" field will now list "92899", and the pencil icon will no longer be orange but will instead be white, as shown in Figure 17.

Figure 17. Project with a source listed.



Users can add multiple data sources to a project by repeating these steps or by selecting multiple data sources in Step 8. If additional data sources are required, Chapter 9 of this document provides directions on how to request new data from the USCG.

5 Data Filters and Processing

Once a project has been created and a data request(s) has been associated with it, the next step is to specify which data within the request the user wants to analyze. Users can use all the data inside a request or select a subset by applying custom filters. Filters may be applied for geospatial areas, time period, vessel type, and more. Multiple filters can be set within the same project, across one or multiple areas of interest.

This example will examine vessel traffic near Milwaukee, WI, during August 10, 2019.

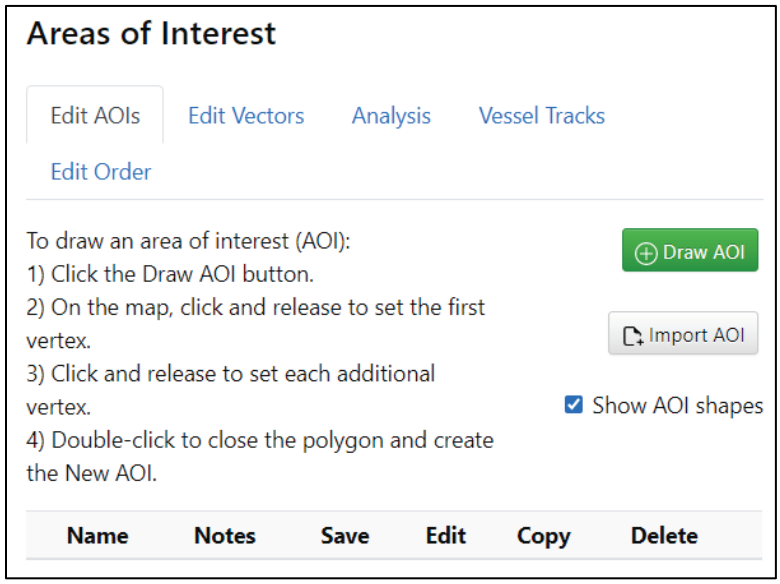
You must complete the exercises in Sections 4.1, 4.2, and 4.5.2 before working on the exercises in this section.

5.1 Draw and name an area of interest (AOI)

An AOI is a geographic filter. It specifies the spatial extent at which the user wants to visualize or analyze AIS data.

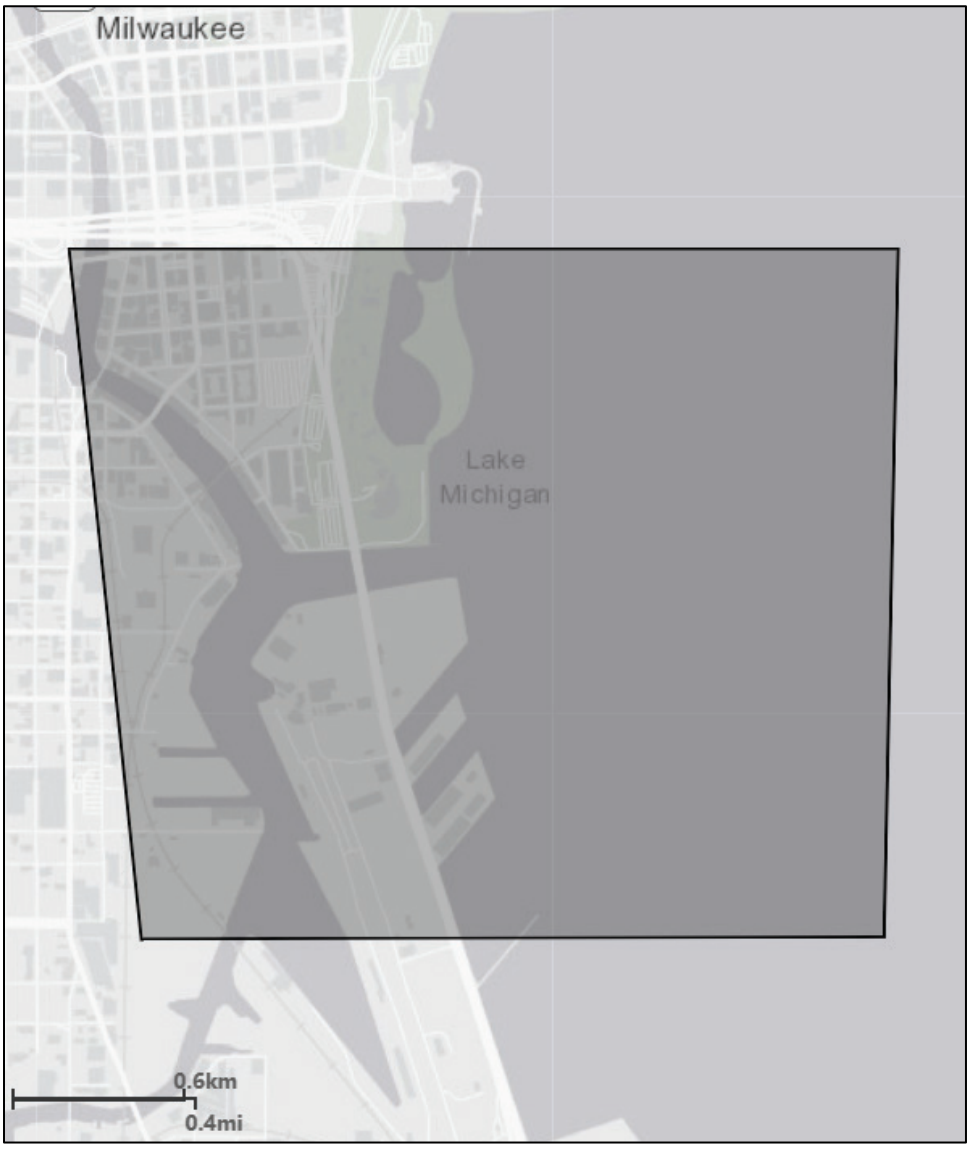
1. Navigate to the project named “AISAP Project” within the “Example Folder” you set up in Sections 4.1, 4.2, and 4.5.2.
2. Center your map in Milwaukee, WI.
3. To draw an AOI, scroll down to the “Areas of Interest” section of the home page and click on the “Edit AOIs” tab, as shown in Figure 18.

Figure 18. Areas of interest (AOIs).



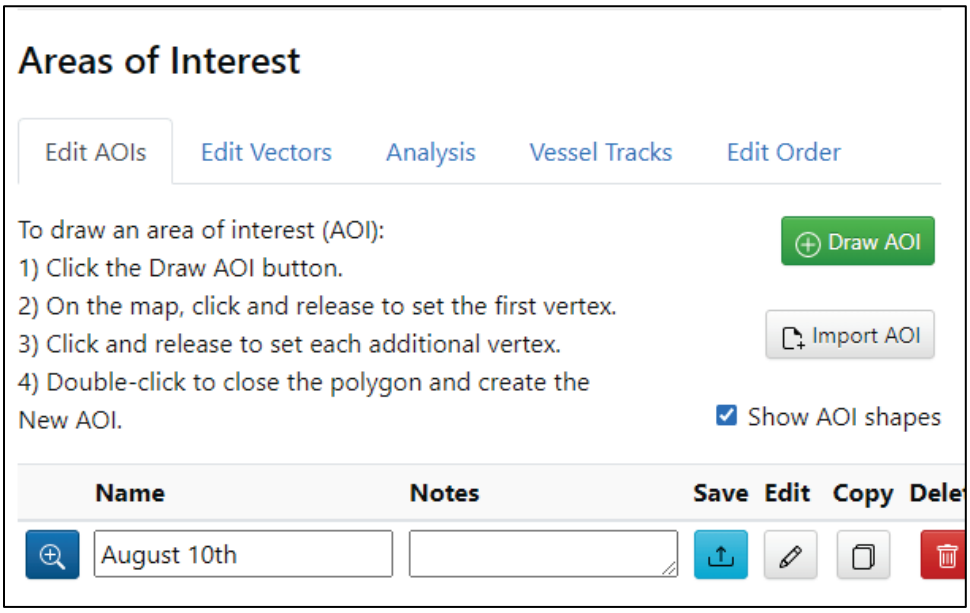
4. Click on the green “Draw AOI” button, as seen in Figure 18.
5. Draw an AOI in Milwaukee around the river confluence with Lake Michigan, shown in Figure 19, by pointing and clicking on the map to set each of the AOIs vertices. Double-click to close the polygon. It does not have to be a square.

Figure 19. Example of a drawn AOI.



6. If the shape is not suitable to the user, click on the red trash can icon to delete it, and then draw a new one.
7. Change the AOI name from “New AOI” to “August 10th” by typing in the “Name” field, as shown in Figure 20.

Figure 20. Naming an AOI.

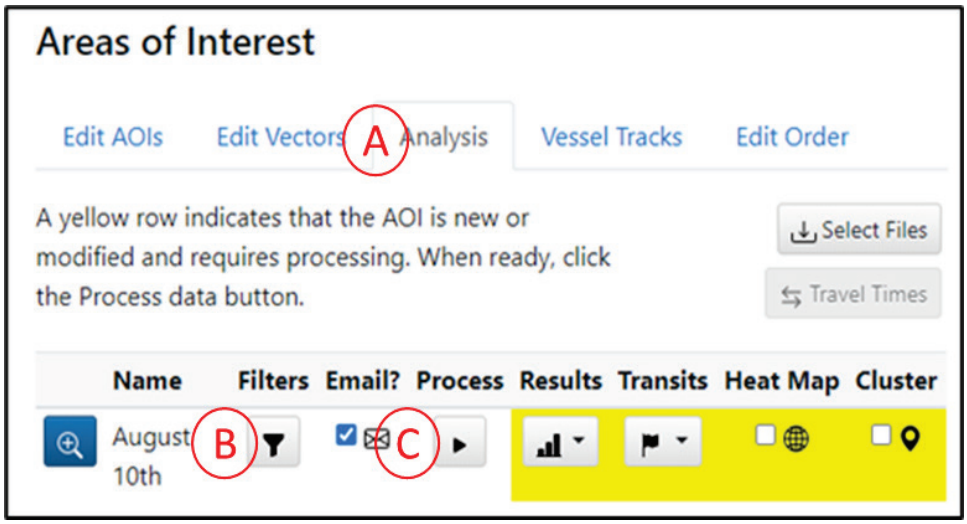


8. Save the AOI name change by clicking on the blue save button in the AOI row.

5.2 Add a filter to an AOI

1. In the "Areas of Interest" section, click on the "Analysis" tab, as shown in Figure 21 and indicated with an (A).

Figure 21. AOI "Analysis" tab at (A), "Filters" button at (B), and AOI filter processing button at (C).



The yellow highlighting means that an AOI has been created, but AISAP has not yet processed the filters for the AOI.

2. Click on the “Filters” button, as indicated with a (B) in Figure 21.

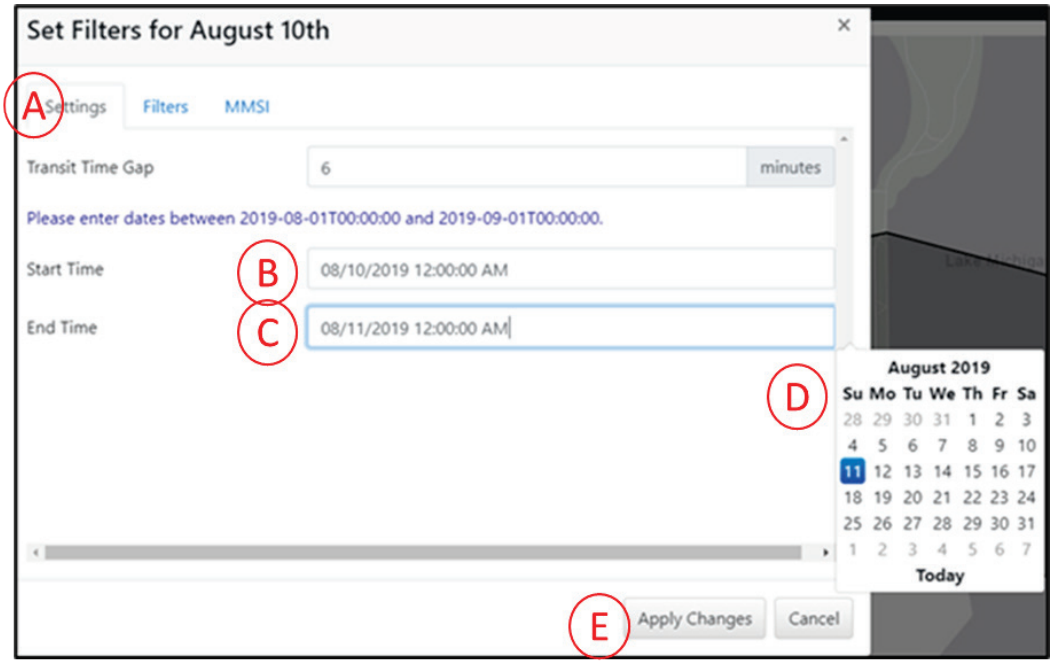
A pop-up window will appear called “Set Filters for August 10th”. There are three tabs: “Settings”, “Filters”, “MMSI” (the MMSI is a unique 9-digit identifier associated with the radio license aboard each vessel).

3. Explore the different tabs to see what types of filters can be set.

Set a date filter to just look at 1 day of data.

4. In the “Settings” tab, indicated with an (A) in Figure 22, set the “Start Time” (B) to 08/10/2019 12:00:00 AM, and the “End Time” to 08/11/2019 12:00:00 AM (C), as shown in Figure 22. One can either select the times using the pop-up calendar (D), or by typing directly into the time fields with the format YYYY-MM-DDT00:00:00. All AIS data times are in UTC, the user must complete their own conversion from local time to UTC if needed.

Figure 22. Date filtering.



5. Click on the “Apply Changes” button, (E) in Figure 22.

The pop-up box will close.

Click on the Process (play) button in the August 10th AOI row to tell AISAP to apply the filters to the Request data.

While AISAP is processing the data for an AOI, the AOI will be highlighted in gray. Once it finishes processing, it will turn to white. An auto-generated email will also be sent from AISAP to notify the user that the processing is complete.

5.3 Download the AOI geofence in KML format

Note, this tool is only available for AOIs in your project that have finished processing.

1. Navigate to the "AISAP Project" project within the "Example Folder".
2. In the "Areas of Interest" section, click on the "Analysis" tab.
3. Click on the "Select Files" button.

A new tab will open titled "Example Project".

4. Click on the "Project KML File" button.
5. Depending on your web browser settings, the file will either save into your 'Downloads' folder or a "Save As" pop-up window will appear. Navigate to the folder you wish to save the file to and then click the "Save" button.
6. Open the file in a viewer such as Google Earth to see the AOI geofence.

5.4 Change an AOI display color

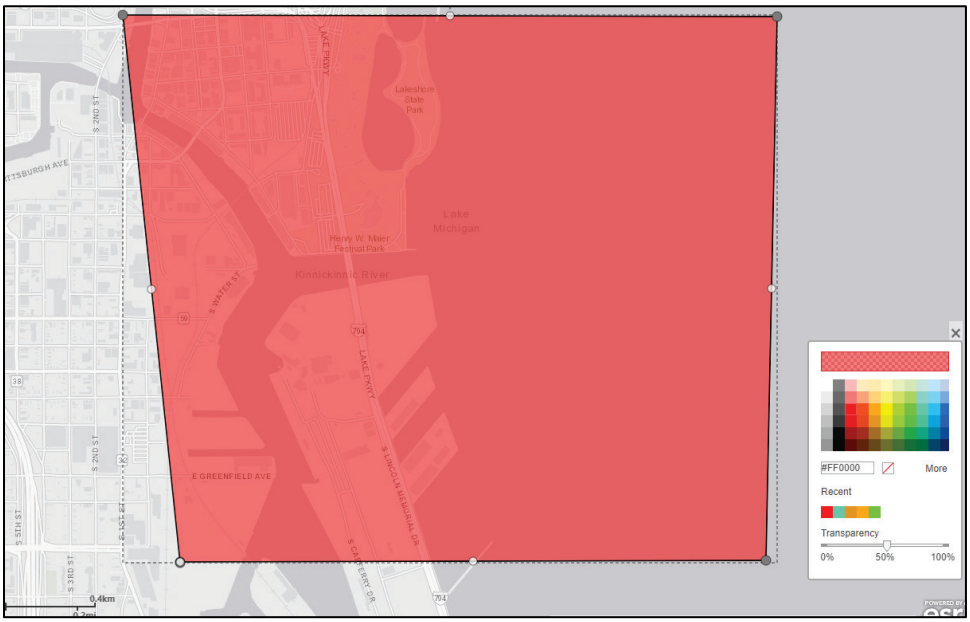
Displaying the AOI in different colors can be useful for presentation purposes.

1. Within your "Example Project", go to the "Edit AOIs" tab.
2. In the row for the AOI "August 10th", click on the Edit button that looks like a pencil icon.

A color palette will open in the lower right-hand corner of your screen.

3. Change the color of your AOI by selecting a color in the palette, as shown in Figure 23.

Figure 23. AOI color changed.



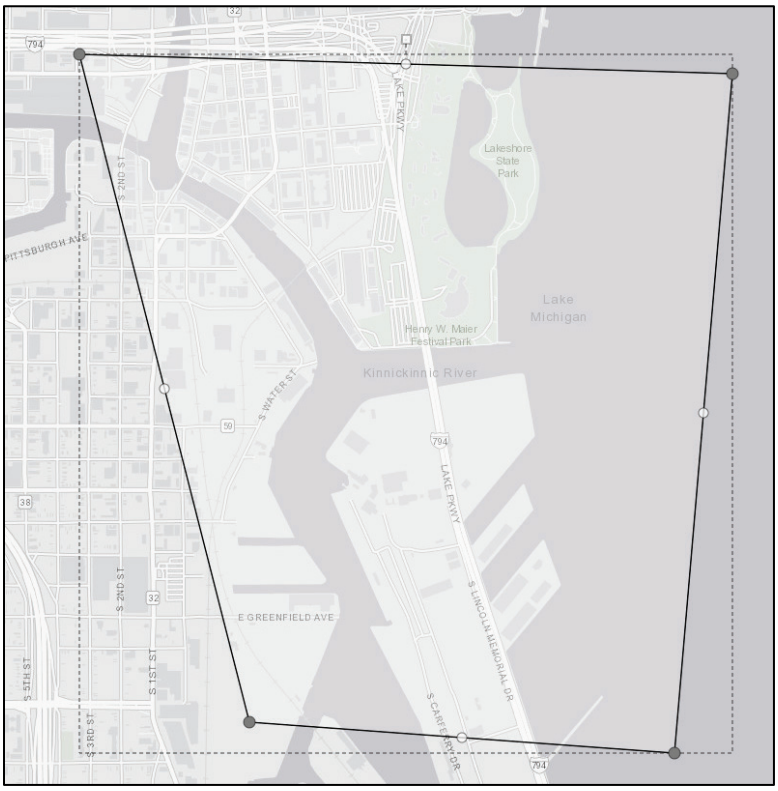
4. Change the transparency of your AOI by using the sliding bar for "Transparency" in the palette window.
5. Save your changes by double clicking within the AOI.

5.5 Edit an AOI shape

1. Within your "Example Project", go to the "Edit AOIs" tab.
2. In the row for the AOI "August 10th", click on the edit button that looks like a pencil icon.

Your AOI will now be surrounded by a box with dotted lines, and the AOI vertices will be displayed with gray circles, as shown in Figure 24.

Figure 24. AOI shape ready to be edited.



3. Move a vertex (corner) by dragging and dropping it.
4. Create a new vertex by dragging and dropping one of the white circles that is along the outline of your AOI.
5. Move the entire AOI by clicking within the AOI and dragging and dropping it.
6. To save or cancel your changes, double click within the AOI.

A pop-up window will open that asks “Are you sure you want to save the new shape for this area of interest?”

7. Click the “Cancel” button to undo your changes or the “OK” button to save your changes. For this exercise, click the “Cancel” button.

5.6 Duplicating an AOI shape

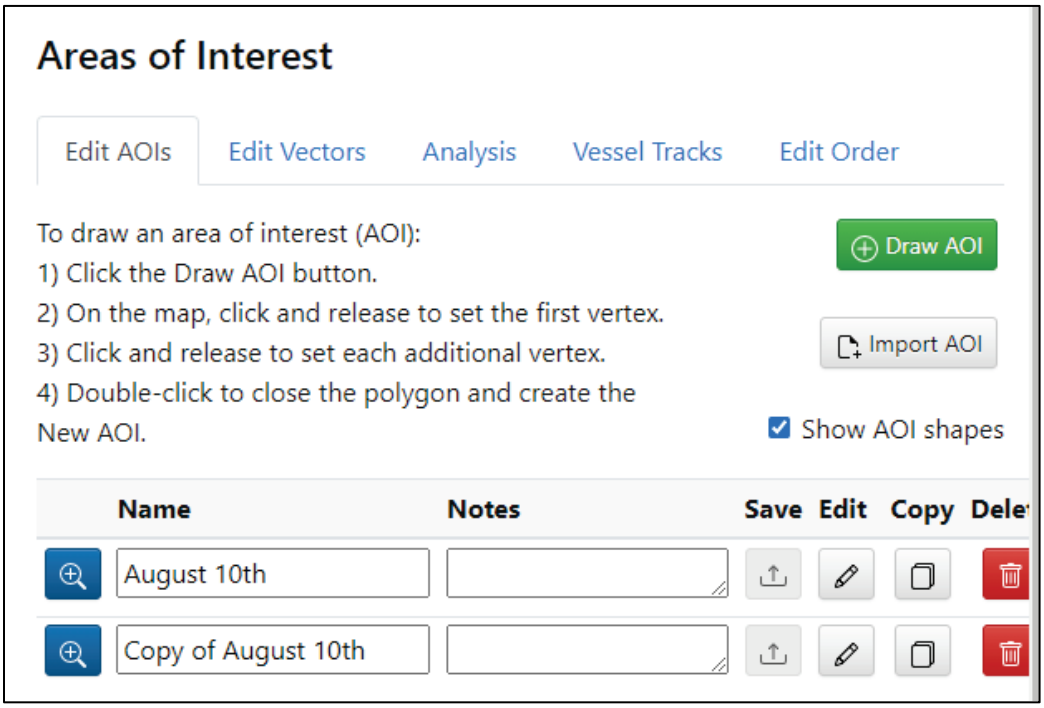
1. Within your “Example Project”, go to the “Edit AOIs” tab.
2. In the row for the AOI “August 10th”, click on the copy button that looks two stacked sheets of paper.

A pop-up window will appear called “Create Duplicate Area of Interest”.

3. Choose the folder and project where you want to save the duplicate AOI using the drop-down menus. For this example, leave the Folder as "Example Folder" and the Project as "Example Project".
4. Click "OK".

A new AOI will appear at the bottom of the list of AOI names called "Copy of August 10th", as shown in Figure 25. Note, because the new AOI is the same geoshape as the original, it will be drawn directly on top of the original AOI.

Figure 25. Copy of AOI shown.



If you have set any filters for the original AOI, those will be copied into the duplicate AOI. For example, "Copy of August 10th" has a date filtered set for a "Start Time" of 08/10/2019 12:00:00 AM and an "End Time" of 08/11/2019 12:00:00 AM.

5. Delete the "Copy of August 10th" by clicking on the red trash can delete button in its row. This will reduce confusion about which AOI is being referred to in the remaining exercises.

6 Vessel Track Line Visualization

AISAP can re-create the paths for one or multiple vessels by connecting sequential position reports with a straight line.

For the exercises in this section, the user needs to have completed the exercises in Sections 4.1, 4.2, 4.5.2, 5.1, and 5.2.

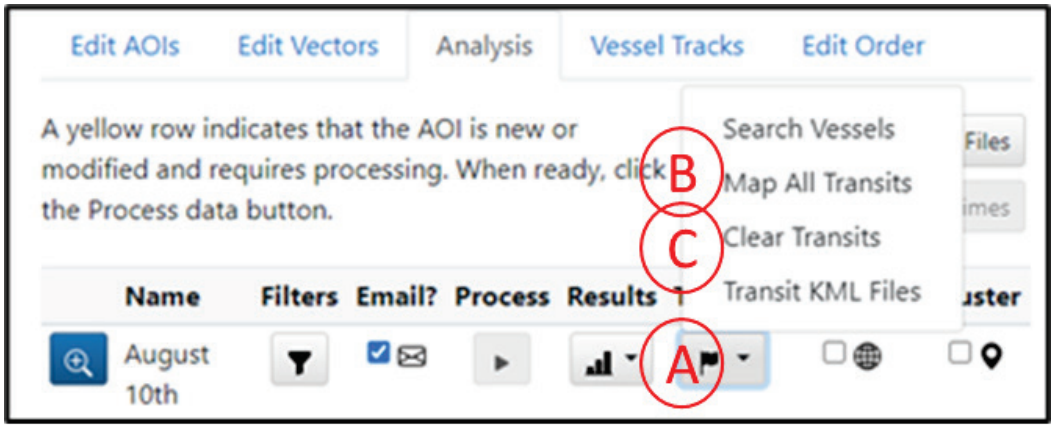
6.1 Map vessel track lines within the AISAP viewer

1. Access the “Example Project” project, located in the “Example Folder”.
2. Under the “Areas of Interest” section, click on the “Analysis” tab, as shown in Figure 21 (A).

The AOI “August 10th” should be listed. Make sure the AOI row is white (not yellow or gray), which indicates AISAP has finished processing the AOI. If the AOI row has yellow highlighting, it has not processed. Note: Changing the **color** of the AOI shown on the map will not affect the processing, but changing the **shape** of the AOI will require re-processing.

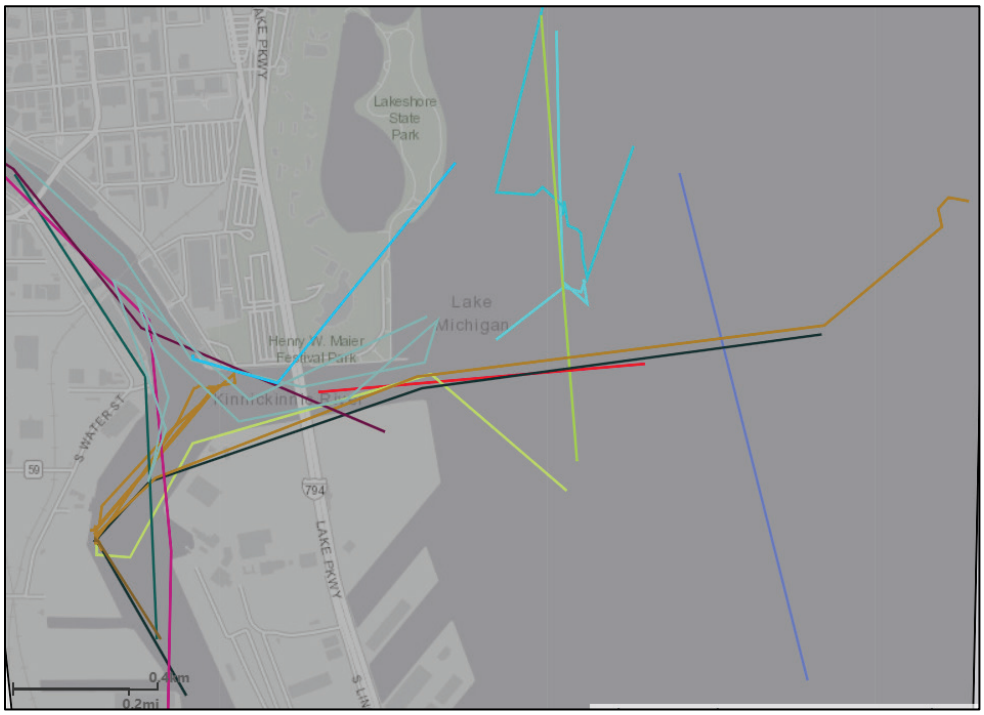
3. Click on the transits button (A) in Figure 26, which looks like a flag and select “Map All Transits” from the drop-down menu, as shown in Figure 26 (B).

Figure 26. Map transit function.



After your browser finishes processing, you should have a map of vessel track lines that looks like the image in Figure 27.

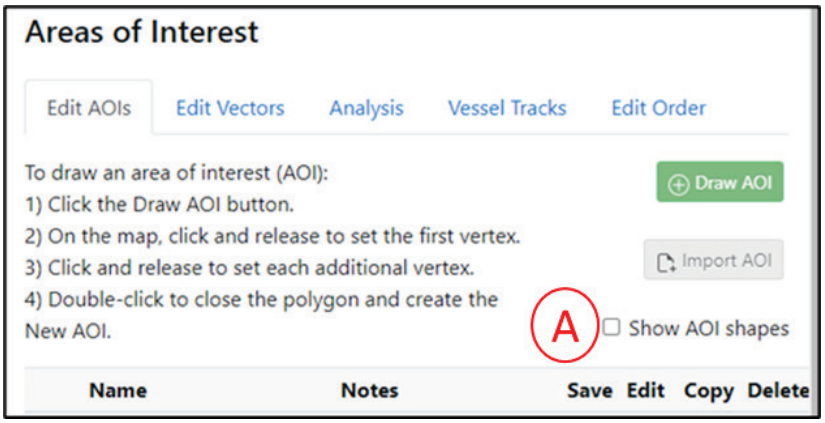
Figure 27. Mapped transits example.



Note: Sometimes the re-created tracklines make it appear as though a vessel traveled over land. This is because AISAP maps the transits via a *connect-the-dots* method by drawing a straight line between consecutive points. If higher-fidelity track lines are needed, use an AIS data request with a higher temporal resolution (e.g., a 1 min sampling rate).

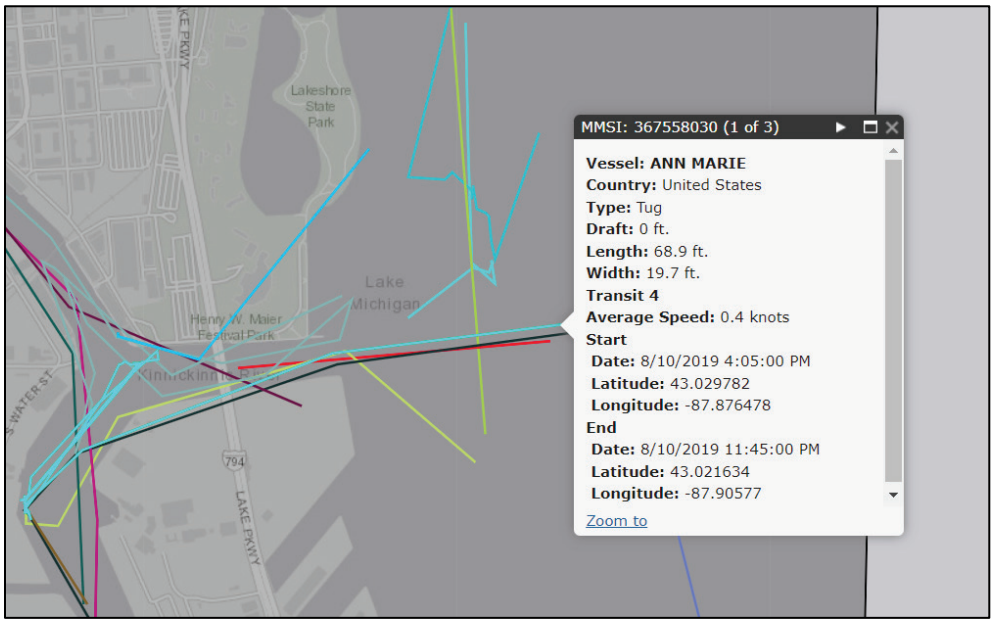
4. To make it easier to see the vessel track lines, go to the "Edit AOIs" tab and uncheck the box next to "Show AOI shapes", as shown in Figure 28, indicated with an (A). This will remove the AOI layer from being visible on the map. Turn this layer back on by checking the same box.

Figure 28. Turn on/off AOI shapes on the map.



5. Switch back to the “Analysis” tab.
6. On the map, click on any vessel track line to view the vessel information associated with the track, as shown in Figure 29. Note: On the top right of the pop-up window there might be an arrow; click on it to see information on the different layers displayed on the map.

Figure 29. Example of vessel track information.



7. To clear the vessel tracks on the map, click on the transits button, (A) in Figure 26, and select “Clear Transits” from the drop-down menu, as shown in Figure 26 (C).

6.2 Customize vessel tracks lines display by vessel type, draft, length, or speed

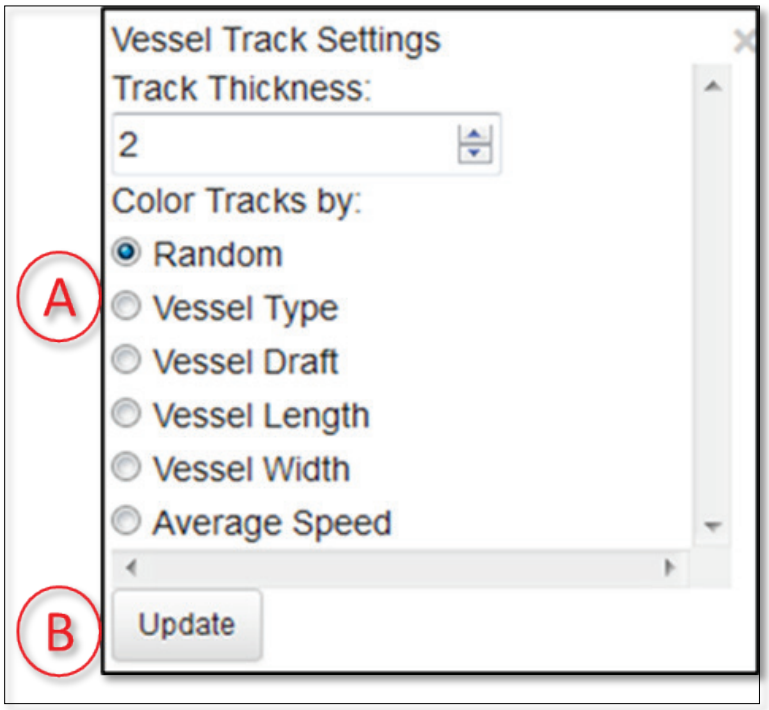
This exercise is a continuation of Section 6.1.

1. Select “Map All Transits” from the Transits drop-down menu.
2. In the “Map Tools” drop-down menu in the black menu bar at the top of the screen, select “Vessel Track Settings”.

A new window will appear on your map with a variety of vessel track line display options, as shown in Figure 30.

3. Move the radio button to “Vessel Type”, (A) in Figure 30, and then click on the “Update” button, (B) in Figure 30.

Figure 30. Vessel track settings function.



The map display will readjust.

4. Click through the other vessel track setting options to try them out. Note: You can also change the color scale by typing in the "Minimum" and "Maximum" fields. Remember to click the "Update" button after every selection.
5. To clear the vessel tracks on the map, click on the transits button, (A) in Figure 26, and select "Clear Transits" as shown in Figure 26 (C).

6.3 Vessel track line gap

AIS data are discrete points in space and time. Each one has a time stamp. To create track lines, AISAP connects consecutive points in chronological order. This feature allows the user to set a maximum amount of time that has passed between points for AISAP to connect them into one transit. If the amount of time between the points' time stamps are greater than the maximum, then AISAP will start a new track line with the latter point.

1. Access the "Example Project", located in the "Example Folder".
2. Under the "Areas of Interest" section, click on the "Analysis" tab, as shown in Figure 21 (A).

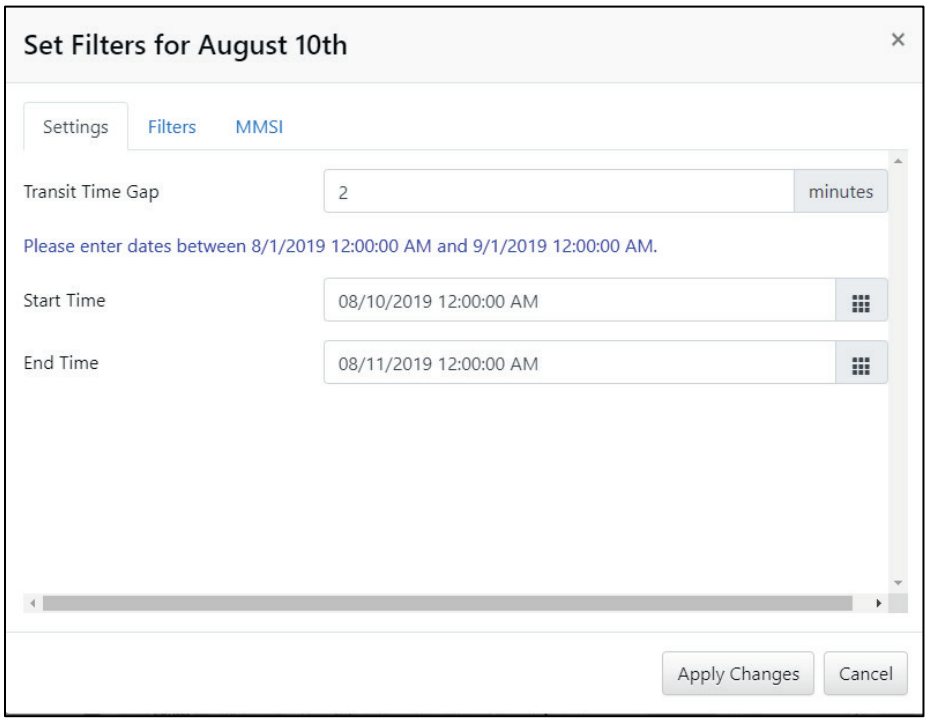
The AOI “August 10th” should be listed. Make sure it is white, which symbolizes AISAP has processed it.

3. Click on the “Filters” button, as indicated with a (B) in Figure 21.

A pop-up window will appear called “Set Filters for August 10th”.

4. Go to the “Settings” tab.
5. In the “Transit Time Gap” field, change it to 2 min, as shown in Figure 31.

Figure 31. Transit time gap filter set to 2 min.



6. Click on the “Apply Changes” button, (E) in Figure 22.

The pop-up box will close.

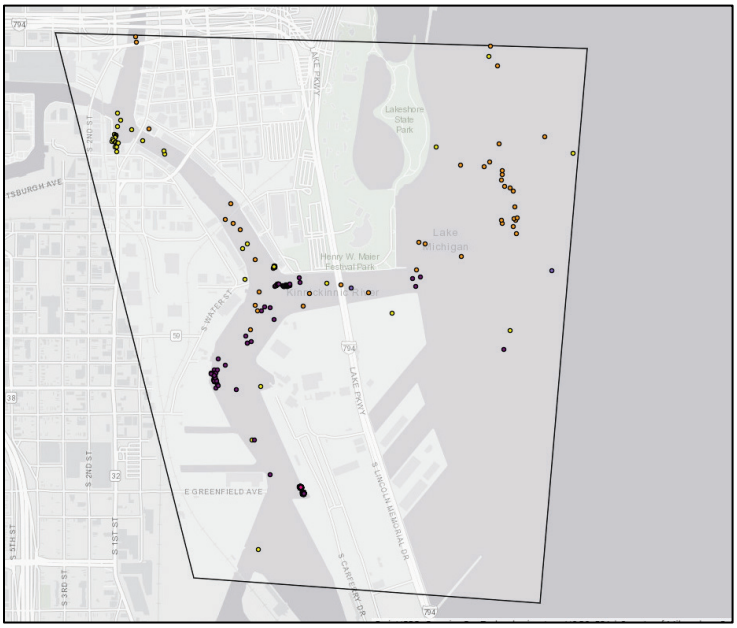
While AISAP is processing the data for an AOI, the AOI row in the “Analysis” tab will be highlighted in gray. Once it finishes processing, the AOI row will turn to white. This is independent from the AOI color as displayed on the map portion of the interface. An auto-generated email will also be sent from AISAP to notify the user that the processing is complete.

What are you really telling AISAP to do when you set the Transit Time Gap to 2 minutes, but the sampling rate of the data source is 5 minutes?

If there is a gap longer than 2 min between vessel position reports, AISAP will think they are separate transits and draw separate, unconnected, vessel track lines.

7. In the "August 10th" row, click on the transits button (A) in Figure 26, which looks like a flag and select "Map All Transits" from the drop-down menu, as shown in Figure 26 (B). The map should now look like Figure 32. Because the AIS query this project is set to Request 92899 which had a 5 min sampling rate, there are no AIS data points with time stamps that are less than 2 min apart. Therefore, none of the AIS data points are connected to form a trackline. Instead, the individual data points plotted on the map are presented separately.

Figure 32. Vessel track lines plotted with a 2 min transit time gap.



6.4 KML track lines

6.4.1 Export vessel track lines in KML format

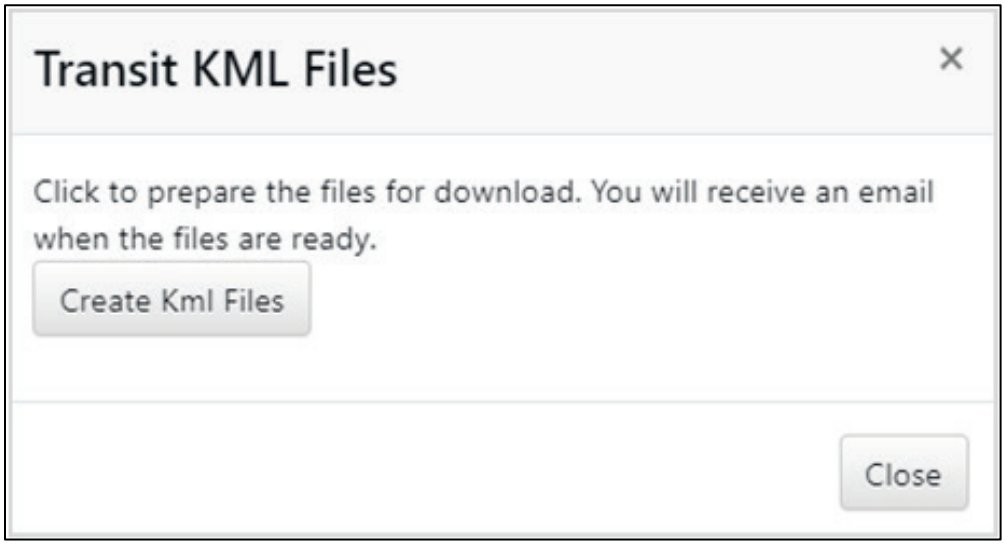
1. Access the "Example Project" project, located in the "Example Folder".
2. Under the "Areas of Interest" section, click on the "Analysis" tab, as shown in Figure 21 (A).

The AOI “August 10th” should be listed. Make sure it is white, which symbolizes AISAP has processed it.

3. Click on the transits button (A) in Figure 26, which looks like a flag, and select “Transit KML Files” from the drop-down menu.

A pop-up window will appear in the middle of your screen named “Transit KML Files” as shown in Figure 33.

Figure 33. Transit KML files pop-up window.



4. Click on the “Create KML Files” button.

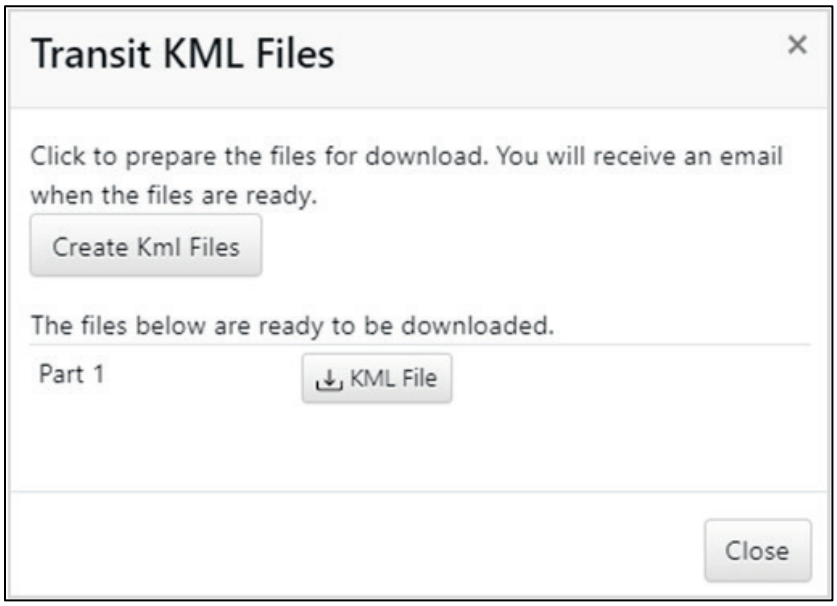
The pop-up window will disappear.

In a few minutes, you should receive an automated email informing you that your file is ready. The email may not appear immediately, so after a few minutes you can continue to the next step.

5. Click on the transits button (A) in Figure 26, which looks like a flag, and select “Transit KML Files” from the drop-down menu.

The “Transit KML Files” pop-up window will appear but will now have additional options in it. You should see a record listed in the “The files below are ready to be downloaded” section, named “Part 1”, and a “KML File” download button next to it, as shown in Figure 34.

Figure 34. Transit KML files pop-up window once KML files are ready for download.



6. Click on the “KML File” download button.

   Depending on your web browser settings, the file will either go to your Downloads folder or a Save As pop-up window will appear.

7. Select where you want to save the file and then click on “Save”.

If you get an error when trying to save, try shortening the file name when saving. Depending on the folder path name, the total filename might be too long if it exceeds 256 characters.

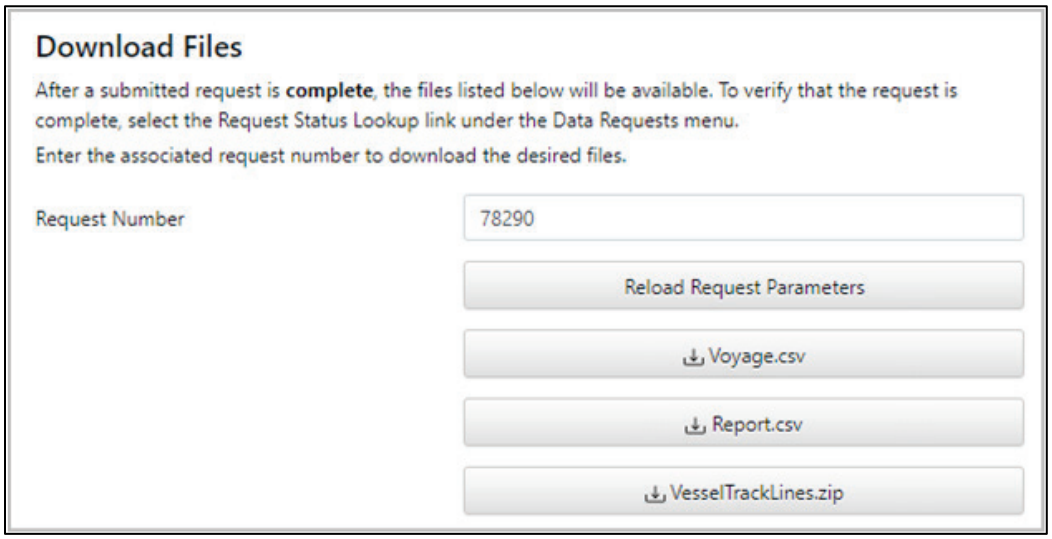
8. Click the “Close” button in the “Transit KML Files” window.

6.4.2 Export vessel track lines for an entire request query in KML format

This option works only if a user selected “Include KML Track Lines” when submitting the data request.

1. From the top, black menu bar of the AISAP homepage, click on “Data Requests” and choose “Query Tool” from the drop-down menu, as shown in Figure 3.
2. Scroll to the bottom section of the page called “Download Files”.
3. In the “Request Number” field, enter the ID number for the data request for which you want to get the KML files. As an example, use Request 78290 as shown in Figure 35.

Figure 35. "Download Files" section of the query tool page.



Note: Not all data requests have KML files associated with them; they have only KMLs if the KML box was checked with the initial request.

4. Click on the "VesselTrackLines.zip" button.

Depending on your browser settings, your download will either save automatically to the Downloads folder, or you will be prompted to select a location.

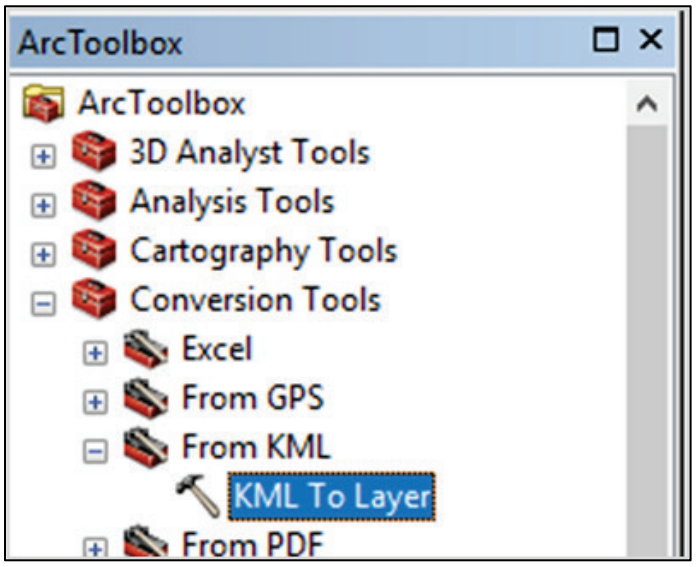
5. Find where the ZIP file was downloaded, then unzip the folder. (Right click and select "Extract here".)

6.4.3 Import KML format vessel track lines into ArcMap

For this exercise, the user needs to have completed Section 6.4.1. The user also needs to have ArcMap installed. Other geographic information system (GIS) software programs exist (e.g., open-source QGIS) which may be used to examine KML file outputs from AISAP. However, this section provides only instructions for ArcMap.

1. Open ArcMap desktop software program. If you are using ArcPro, the workflow will be different.
2. Open ArcToolbox.
3. Within ArcToolbox, expand the "Conversion Tools" menu, as shown in Figure 36.

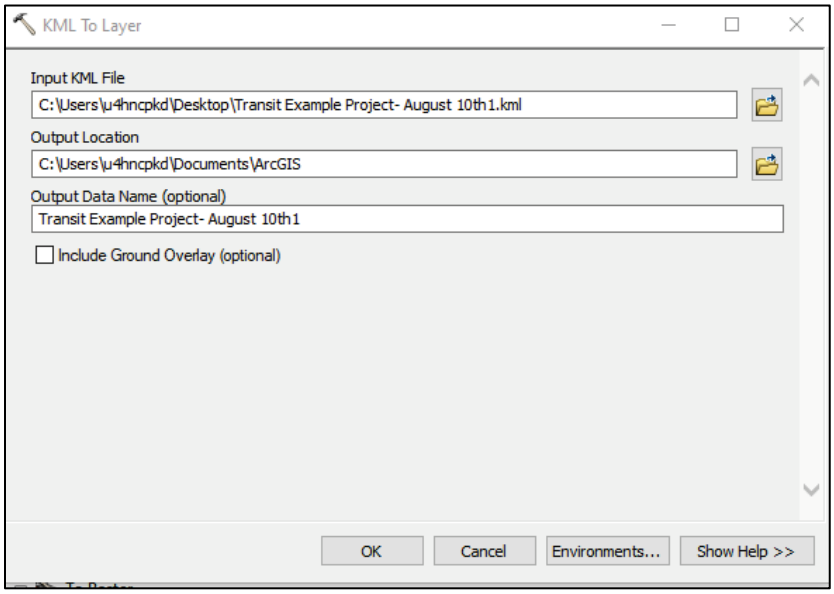
Figure 36. ArcToolbox with “Conversion Tools” expanded.



4. Under “Conversion Tools”, expand the menu for “From KML”.
5. Select the “KML To Layer” tool by double clicking on it.

The KML To Layer window will appear as a pop-up, as shown in Figure 37.

Figure 37. “KML to Layer” pop-up window.



6. On the “Input KML File” field, click on the folder icon at right to browse for the KML you had exported from AISAP.
7. Select the KML file.

Once you select the “Input KML”, the rest of the fields will auto-populate.

8. Click OK.
9. Once the conversion is finished, you should see the individual track lines and AOI polygon appear on your screen, as shown in Figure 38.

Figure 38. Example of track lines plotted in ArcGIS.

Note: The attribute table for your converted file will not include all the attribute data that were present in the original KMZ. However, the MMSI is retained in the “NAME” field for each record.

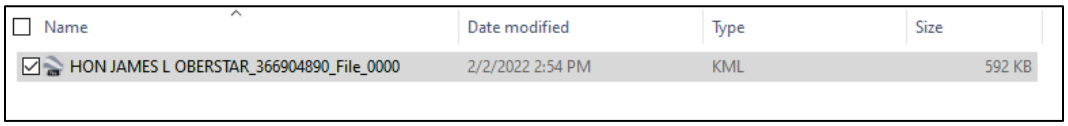
Note: The converted KMZ files will have the WGS_1984 Geographic Coordinate System. If you are using other layers, further conversion of the coordinate system might be required.

6.4.4 Import KML format vessel track lines into Google Earth

For this exercise the user needs to have completed the exercises in Section 6.4.2. The user also needs to have Google Earth installed.

1. Locate the VesselTrackLines unzipped folder.
2. Double-click on a KML folder to open it in Google Earth (it should automatically open in the correct program). You can open multiple KMLs at once, but it might be slower. This example uses the HON JAMES L OBERSTAR vessel KML, downloaded from request number 78290, as shown in Figure 39.

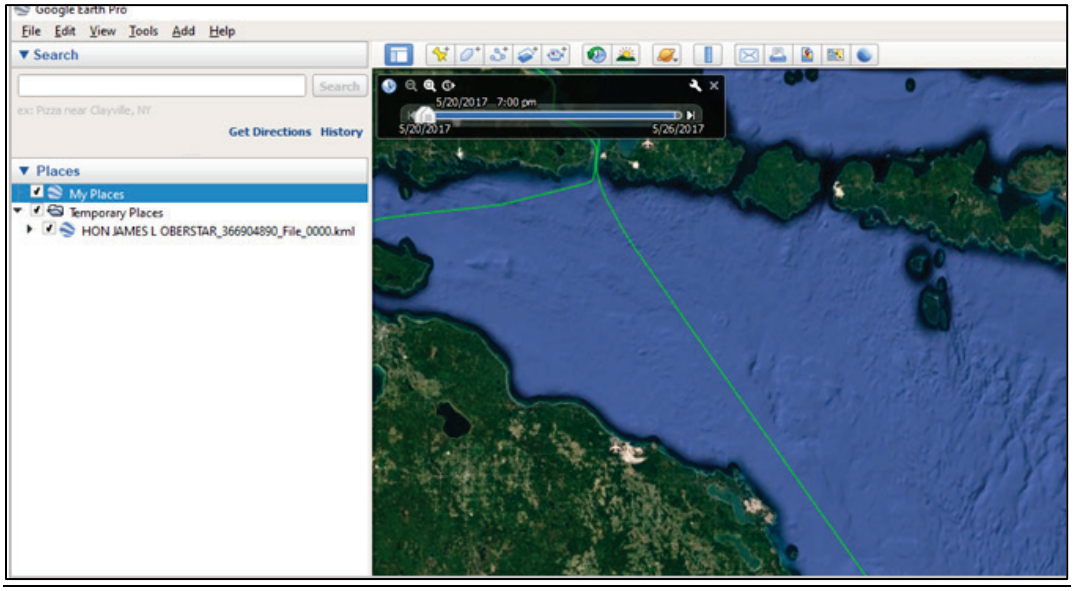
Figure 39. "VesselTrackLines" folder associated with request #78290.



Google Earth will automatically zoom to the location of the vessel track line. Zoom in and out to see the full extent of the track.

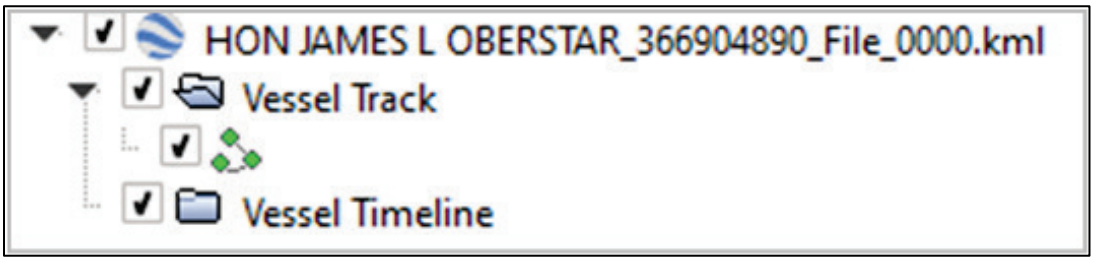
The randomly selected color for the track line *might be hard to see against the satellite imagery*, such as a blue line on the water. In Figure 40, it is bright green.

Figure 40. Track line of the *Hon James L Oberstar* vessel from request #78290 plotted in Google Earth.



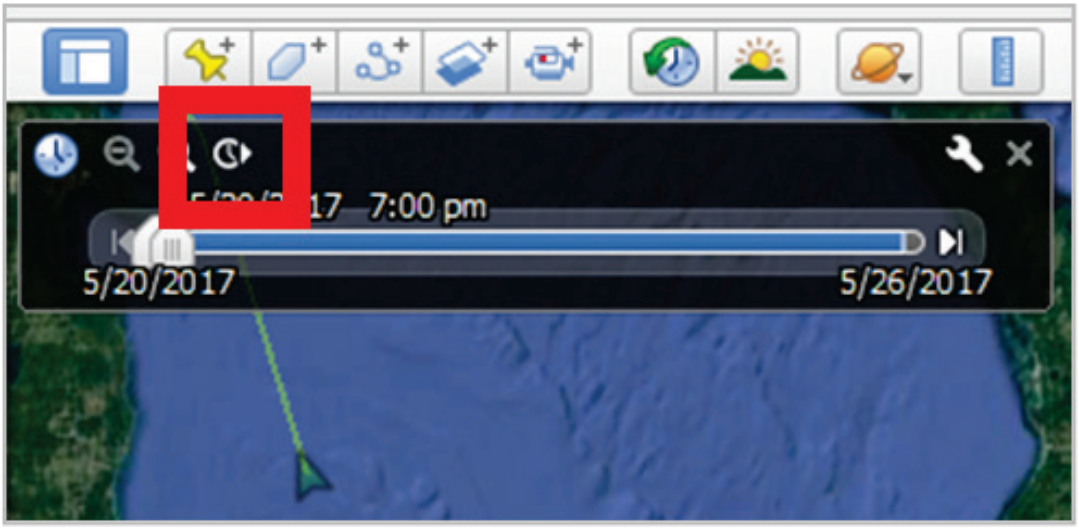
3. To change the vessel track line color, expand the selection by clicking the down-arrow beside "HON JAMES L OBERSTAR", as shown in Figure 41. Click the down-arrow again next to "Vessel Track". Right click the track line, which looks like three dots, and select "properties" from the drop-down menu.
4. Navigate to the "style, color" tab and change the color. Click "OK" to save your changes.

Figure 41. Drop-down menu to change the track line color in Google Earth.



5. To animate the KML, first zoom out so you can see the whole track.
6. Find the time slider menu in the upper left corner. Click on the play icon button to start the vessel track playback, as highlighted in red in Figure 42. You should see an icon (often a small triangle) move along the vessel track line.

Figure 42. KML animation play button.

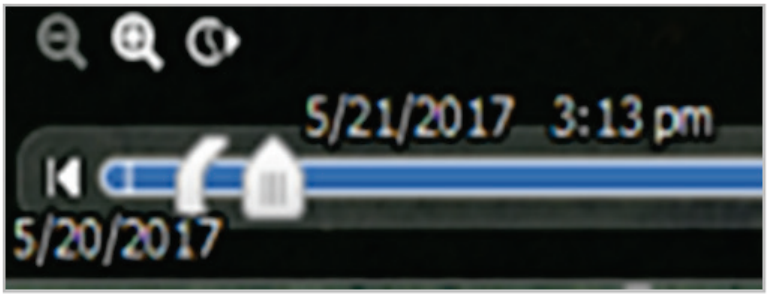


Note: If you cannot see the vessel playback time slider menu, it *might* be hidden underneath the historical imagery slider menu (a clock with an arrow curving over the top, as shown in Figure 43). Make sure the historical imagery is unchecked in the "View" tab.

Figure 43. Google Earth historical imagery slider menu.

7. To change the length of the *tail* or *shadow* that displays along the vessel track animation, on the time bar, you can adjust the distance between the pentagon-shaped slider and the C-shaped slider, shown in Figure 44. Adjust the distance between the two sliders until satisfied.

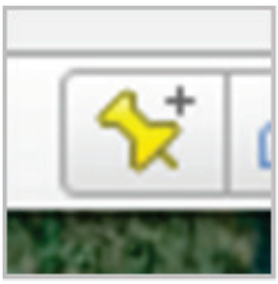
Figure 44. Time bar.



6.4.5 Make a movie of the animated KML format vessel track lines in Google Earth

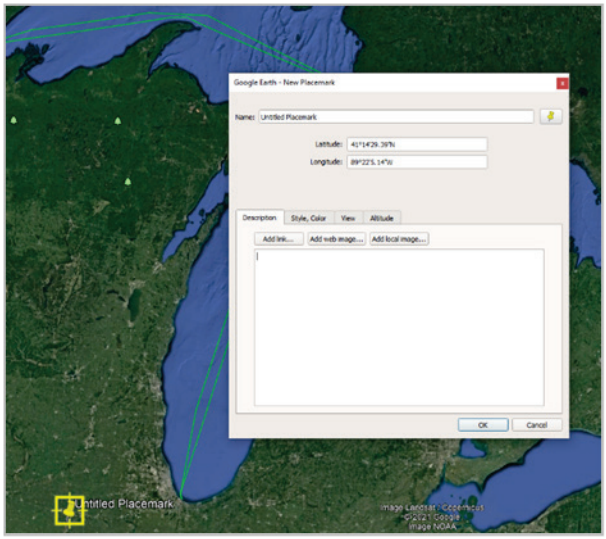
1. Zoom out so you can see the entire vessel track line.
2. To add an informational caption for the movie, you can drop a pin on the screen. Select the pin icon, as shown in Figure 45.

Figure 45. Pin icon to add an informational caption to the movie.



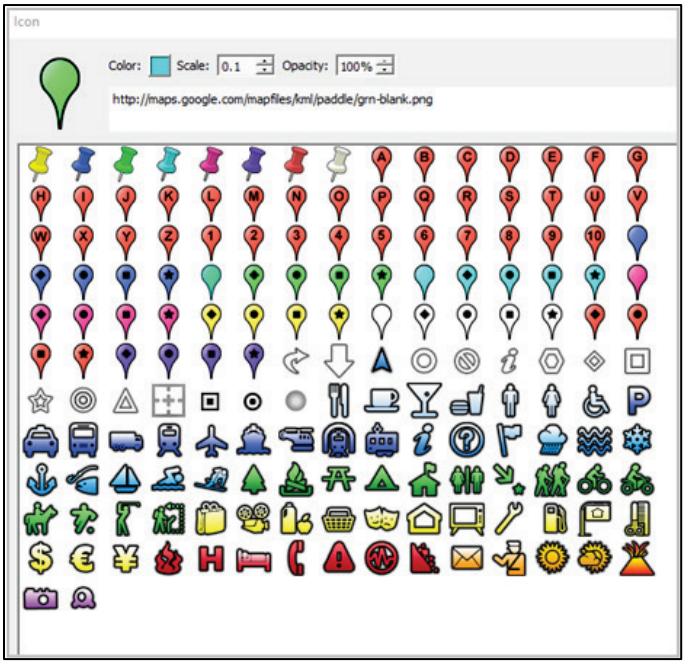
3. Move the pin to the bottom of the vessel track area by dragging and dropping it, as shown in Figure 46.

Figure 46. The pin has been moved to the bottom of the screen.



4. In the pin "Name" field, enter "HON James Oberstar".
5. You can change the size and style of the pin icon by right-clicking on the yellow pin icon to the right of the "Name" field. Setting the scale to 0.1, as shown in Figure 47, makes the pin invisible, but the text in the "Name" field will remain visible.

Figure 47. Window to adjust pin icon, including size.

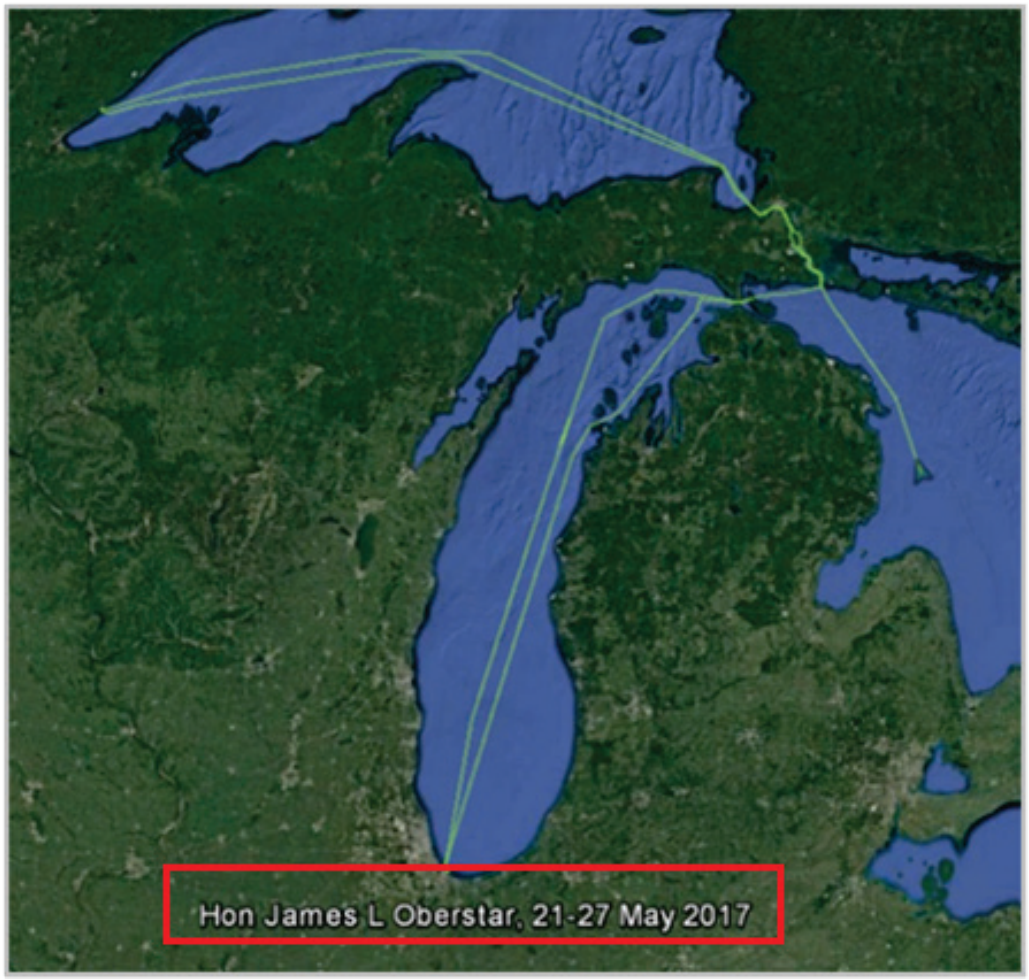


6. Once satisfied with the pin size, color, and text, click “OK” at the bottom of the “Google Earth – New Placemark” pop-up window.

Note: You might have to drop multiple pins to be able to have the text arranged to your liking.

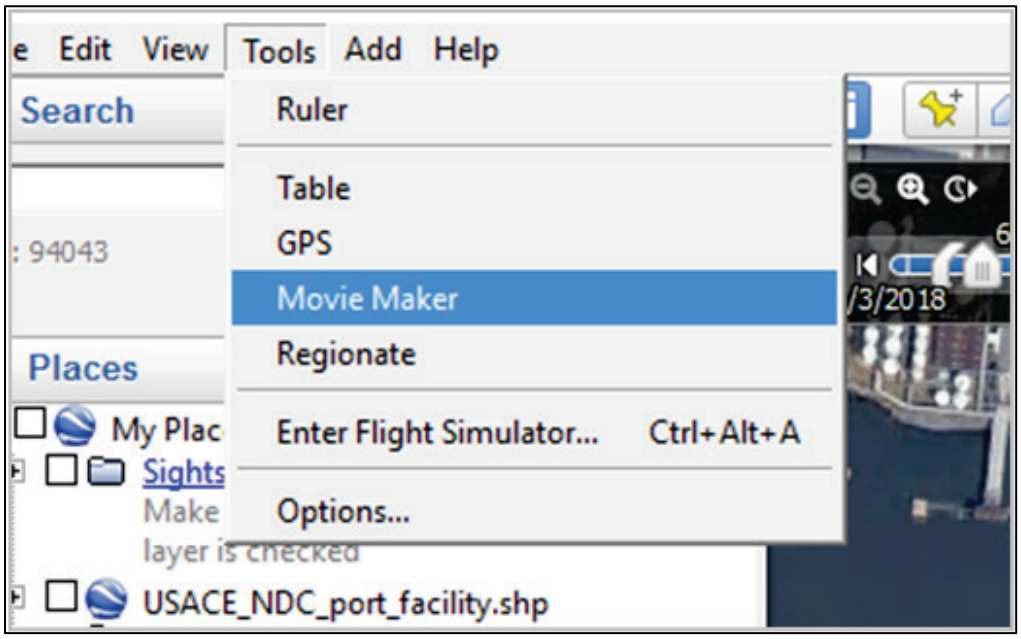
Figure 48 shows the pin and text when viewed in Google Earth. Note that the scale is 0.1, so the pin is not visible. Only the text is visible.

Figure 48. Example of label added.



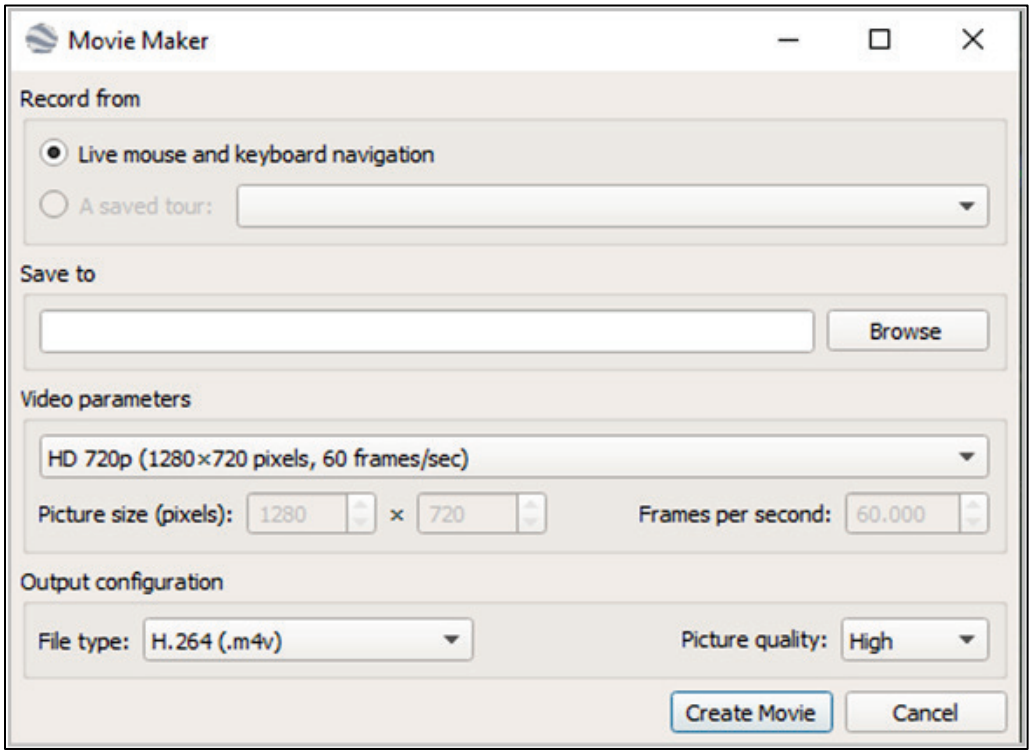
7. On the Google Earth “Tools” drop-down menu, select “Movie Maker”, as shown in Figure 49.

Figure 49. “Movie Maker” selection.



A Movie Maker Pop-up window will appear, as shown in Figure 50.

Figure 50. Movie Maker pop-up window.



8. Click “Browse” in the “Save to” section of the pop-up window and select where you want to save your movie.
9. Click “Save”.
10. Back up the time slider to the start of the time.
11. Press the “Play” icon on the time slide and then press “Create Movie” within the Movie Maker pop-up window.

Note: If you need to slow down the animation, click the wrench icon in the time slider to open “Date and Time Options”. Change the animation speed. You can also loop the animation if desired.

12. When the vessel has reached the end of its track, click “Stop Recording”.

Note: The time slider is not included in movie view.

7 Heat Maps and Cluster Maps

Relative density plots, or heat maps, are a way to visualize the density of AIS position reports in an area. Cluster maps provide the associated density numbers.

For these exercises, the user needs to have completed the exercises in Sections 4.1, 4.2, 4.5.2, 5.1, and 5.2.

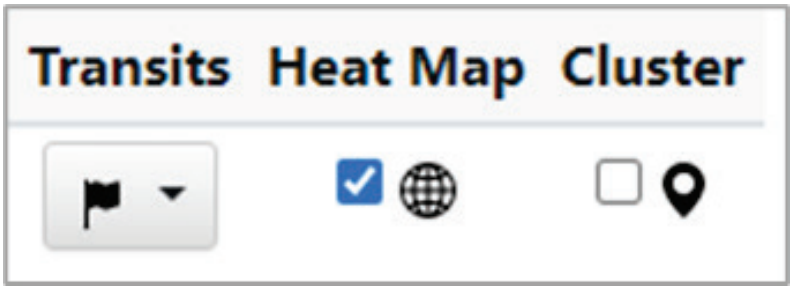
7.1 Create a heat map

1. Access the “Example Project” project, located in the “Example Folder”.
2. Under the “Areas of Interest” section, click on the “Analysis” tab, as shown in Figure 21 (A).

The AOI “August 10th” should be listed. Make sure it is white, which symbolizes AISAP has processed it.

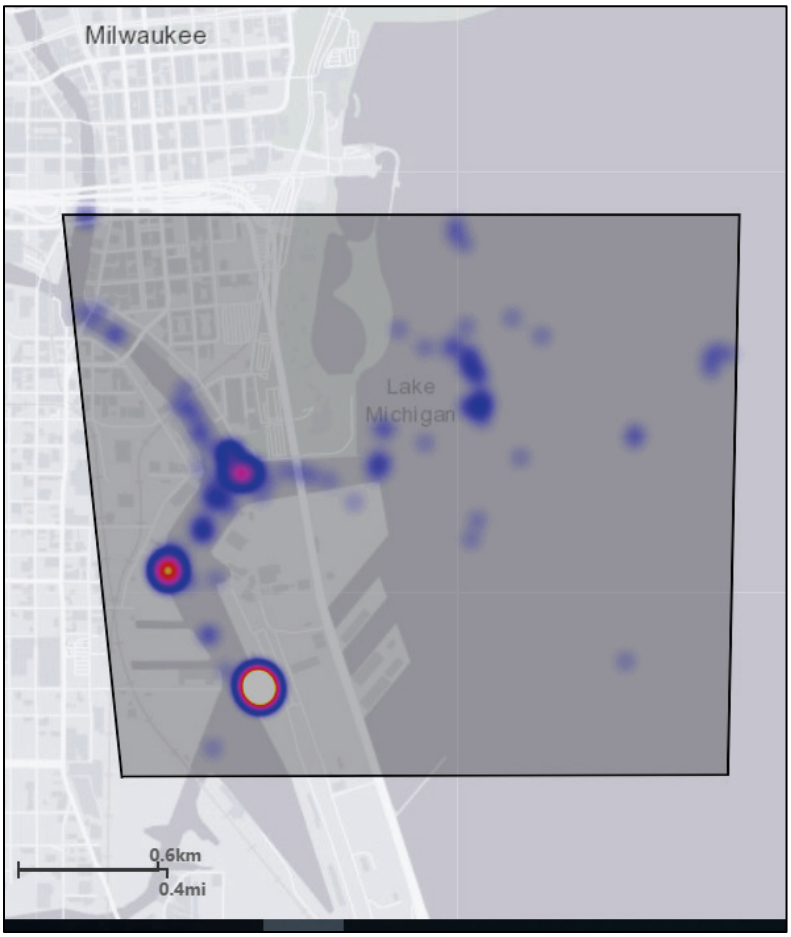
3. Check the box for the heat map as shown in Figure 51, which has an icon next to it that looks like a globe.

Figure 51. Heat map function.



The map will now automatically refresh and display a heat map that looks like the image in Figure 52.

Figure 52. Heat map example.



The bright white indicates the areas with the highest AIS report density while the light blue indicates the areas with lower AIS report density.

4. Zoom in and out on the map to see the heat map re-display.
5. To adjust the scale of the heat map, click on the “Map Tools” drop-down menu and select “Heat Map Control”.
6. Adjust the “Maximum” and “Minimum” value and then click “Update”.
7. Clear the heat map by unchecking the “Heat Map” box.

7.2 Create a cluster map

1. Access the “Example Project” project, located in the “Example Folder” that was created with exercises.
2. Under the “Areas of Interest” section, click on the “Analysis” tab, as shown in Figure 21 (A).

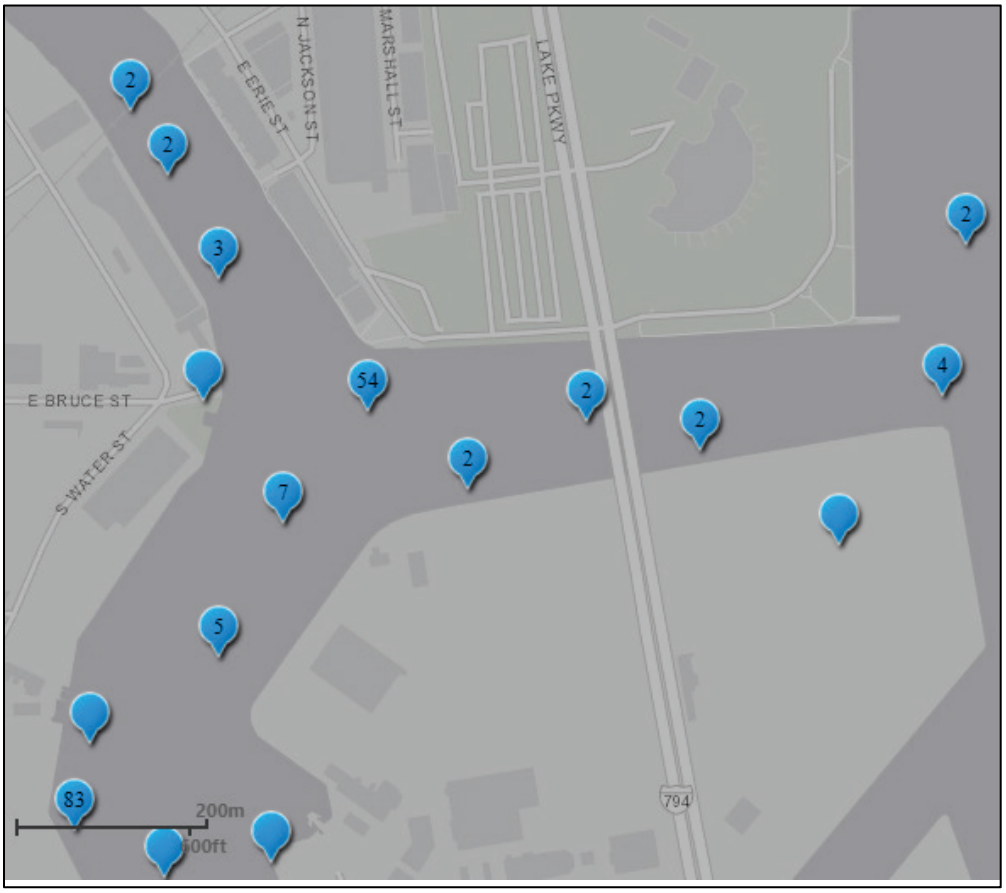
The AOI “August 10th” should be listed. Make sure it is white, which symbolizes AISAP has processed it.

3. Check the box for the “Cluster” as shown in Figure 53.

Figure 53. Cluster function.

The map will now automatically refresh and display a cluster map that looks like the image in Figure 54.

Figure 54. Cluster map example.



4. Zoom in and out on the map to see the cluster map re-display.
5. Clear the map by unchecking the “Cluster” box.

8 Statistical Analysis

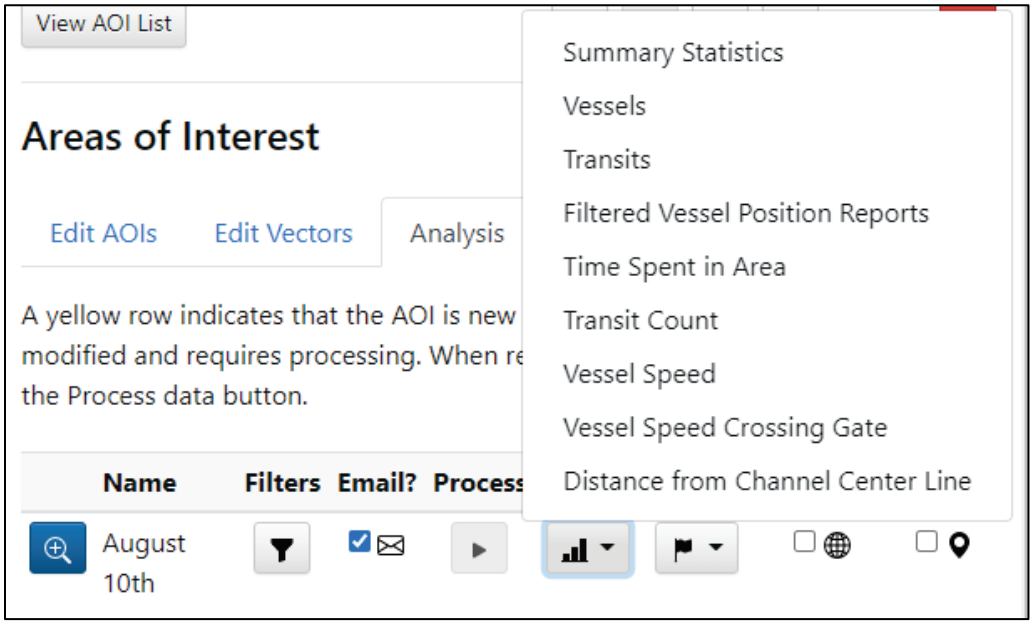
AISAP provides built-in statistical analysis tools; this section describes the available tools.

For this exercise, the user should complete the exercises in Sections 4.1, 4.2, 4.5.2, 5.1, and 5.2.

8.1 Summary statistics

1. Within your "Example Project", go to the "Analysis" tab listed in the "Areas of Interest" section of the page.
2. In the row for the AOI "August 10th", click on the results drop-down menu and click on "Summary Statistics". The results button looks like a bar chart, as shown in Figure 55.

Figure 55. "Results" menu.



A new tab will open titled "Example Project: August 10th", the name of your project and AOI.

3. Explore the provided summary statistics including changing from the "Charts" tab to the "Data" tab. These statistics provide summary information of the AIS data that are spatially inside the "August 10th" AOI and that meet its filtered criteria (e.g., that is for August 10, 2019).

Note: Within the “Charts” tab, the figures can be downloaded by clicking on the button on the top right of each figure. Within the “Data” tab, the data can be exported in .xlsx format by clicking on the Excel icon button on the top right of each table.

8.2 Vessels

1. Within your “Example Project", go to the “Analysis” tab listed in the “Areas of Interest” section of the page.
2. In the row for the AOI “August 10th” click on the results drop-down menu and click on “Vessels”.

   A new tab will open titled “Example Project: August 10th Vessels”.

3. Explore the provided vessel information. There is a record for each vessel with AIS data within the “August 10th” AOI and that meets its filtered criteria. Only vessels that were in the AOI on August 10, 2019, will be included in the results.

Note: Vessel type and dimension data are provided by the vessel operator and have not been validated. For example, a draft of “0” may indicate the operator has not entered a valid draft.

Data can be downloaded in .csv format by clicking on the “Vessels File” button or in .xlsx format by clicking on the Excel icon button.

8.3 Transits

1. Within your “Example Project", go to the “Analysis” tab listed in the “Areas of Interest” section of the page.
2. In the row for the AOI “August 10th” click on the results drop-down menu and click on “Transits”.

A new tab will open, titled “Example Project: August 10th Transits”.

3. Explore the provided vessel information. There is a record of each transit that occurred within the “August 10th” AOI and that meets its filtered criteria. A definition of a vessel’s transit is provided in Section 6.3. Note that a vessel can have more than one transit. The “Vessel Track Line Gap” filter, selected by the user, will affect the number of transit records and their start and end times.

Data can be downloaded in .csv format by clicking on the “Transits File” button or in .xlsx format by clicking on the Excel icon button.

8.4 Filtered vessel position reports

1. Within your “Example Project”, go to the “Analysis” tab listed in the “Areas of Interest” section of the page.
2. In the row for the AOI “August 10th” click on the Results drop-down menu and click on “Filtered Vessel Position Reports”.

A new tab will open titled “Example Project: August 10th Filtered Position Reports”.

3. Explore the provided information. There is a record of each AIS position report that has geographic coordinates within the “August 10th” AOI and that meet the filtered criteria.

Data can be downloaded in .csv format by clicking on the “Filtered Reports File” button.

8.5 Time spent in area

1. Within your “Example Project”, go to the “Analysis” tab listed in the “Areas of Interest” section of the page.
2. In the row for the AOI “August 10th” click on the Results drop-down menu and click on “Time Spent in Area”.

A new tab will open titled “Example Project: August 10th Time Spent in Area”. A record of each instance of a vessel dwelling within the AOI is provided. A dwelling instance occurs when a vessel enters and subsequently exits an AOI.

Table 1 lists what the different time stamp fields mean. Note: If a vessel enters and exits an AOI more than once, each instance will be its own record.

Table 1. Information included in the "Time Spent in Area" output.

Field	Definition
Previous Report	Timestamp of the vessel's last AIS report immediately prior to the vessel entering the AOI
Start Time	Timestamp of the vessel's first position report within the AOI (i.e., when it enters the AOI).
Stop Time	Timestamp of the vessel's last position report within the AOI (i.e., when it exits the AOI).
Next Report	Timestamp of the vessel's first report immediately proceeding its exit from the AOI.
Dwell Time Area Only	Stop Time minus Start Time
Dwell Time	Next Report minus Previous Report

Note: If a vessel has not yet departed from an AOI by the end of the time period associated with the AOI, in our example, August 11, 2019 00:00, then its record's "stop time" will equal the end of the time period (e.g., August 11, 2019 00:00). Similarly, if a vessel is already present in an AOI at the beginning of the time period associated with the AOI, in this example, August 10, 2019 00:00, then the record's "start time" will be that time (e.g., August 10, 2019 00:00).

Data can be downloaded in .csv format by clicking on the "Time Spent in Area" button or in .xlsx format by clicking on the Excel icon button.

8.6 Transit count

1. Within your "Example Project", go to the "Analysis" tab listed in the "Areas of Interest" section of the page.
2. In the row for the AOI "August 10th", click on the results drop-down menu and click on "Transit Count".

A new tab will open titled "Example Project: August 10th Transit Count". This tab contains the number of daily transits by all vessels, created with AIS data within the "August 10th" AOI and that met the filter criteria. The transit count by day is provided both in a graph and in a table. This example contains one day of data, so there is only one data point.

You can change the time period fidelity using the "Fidelity" drop-down menu, such as by selecting "Hour" and then clicking the "Update" button. Time fidelity options are hour, day, week, and month.

A moving average at user-defined period lengths can be displayed in the graph as well. (Note: To remove the moving average from the graph, select "Period Length" equal to zero.)

The graph can be downloaded by clicking on the button on the top right of the graph. The table can be exported in .xlsx format by clicking on the Excel icon button.

8.7 Average vessel speed

1. Within your "Example Project", go to the "Analysis" tab listed in the "Areas of Interest" section of the page.
2. In the row for the AOI "August 10th", click on the results drop-down menu and click on "Vessel Speed".

A new tab will open titled "Example Project: August 10th Vessel Speed".

The average vessel speed by day is provided both in a graph and in a table. This example contains 1 day of data, so there is one data point.

You can change the time period fidelity using the "Fidelity" drop-down menu, such as by selecting "Hour" and then clicking the "Update" button.

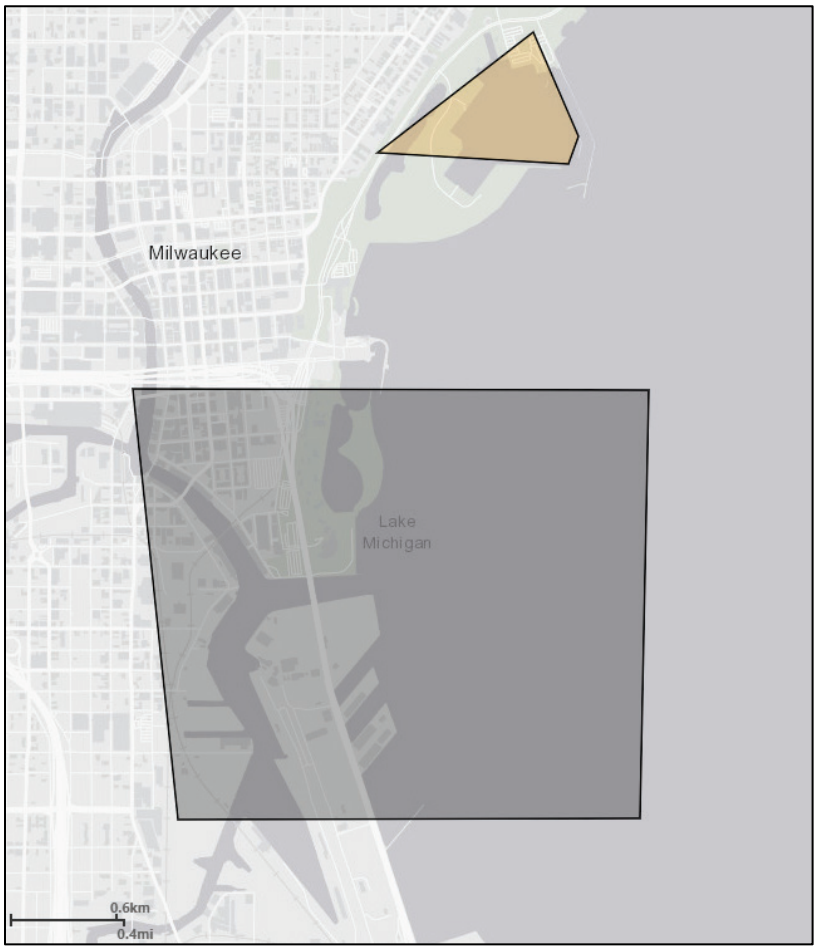
The graph can be downloaded by clicking on the button on the top right of the graph. The table can be exported in .xlsx format by clicking on the Excel icon button.

8.8 Transit times

The transit time feature provides vessels' transit times to travel from one AOI to another. To explore this function, at least two AOIs are needed in the project.

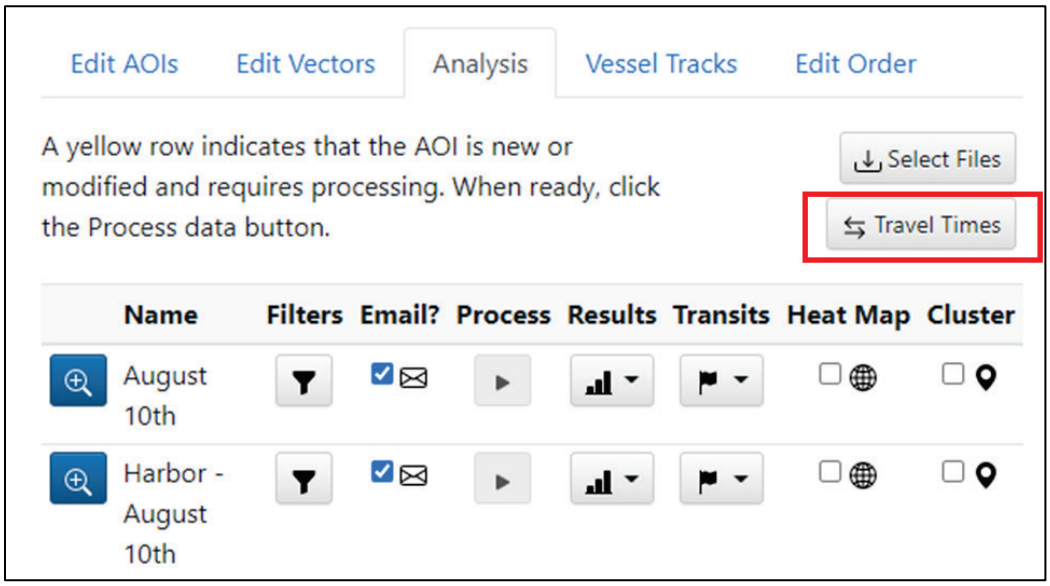
1. Within your "Example Project", go to the "Edit AOIs" tab.
2. Draw a new AOI over the nearby harbor at McKinley Park, as shown in orange in Figure 56. For directions on drawing an AOI, see Section 5.1.

Figure 56. New geofence added to the example project.



3. Name the new AOI "Harbor – August 10th" and click on the blue save icon to save the name change. For directions on naming an AOI, see Section 5.1.
4. Filter the AOI for the date range 08/10/2019 12:00:00 AM to 08/11/2019 12:00:00 AM. Follow the filtering directions provided in Section 5.2, if needed.
5. Process the AOI by clicking on the play button in the "Harbor – August 10th" AOI row.
6. Once the row for "Harbor – August 10th" has turned from gray to white, indicating it has been processed (Note: Yellow means it has not yet been processed), make sure you are in the "Analysis" tab.
7. Click on the "Travel Times" button, as shown in Figure 57.

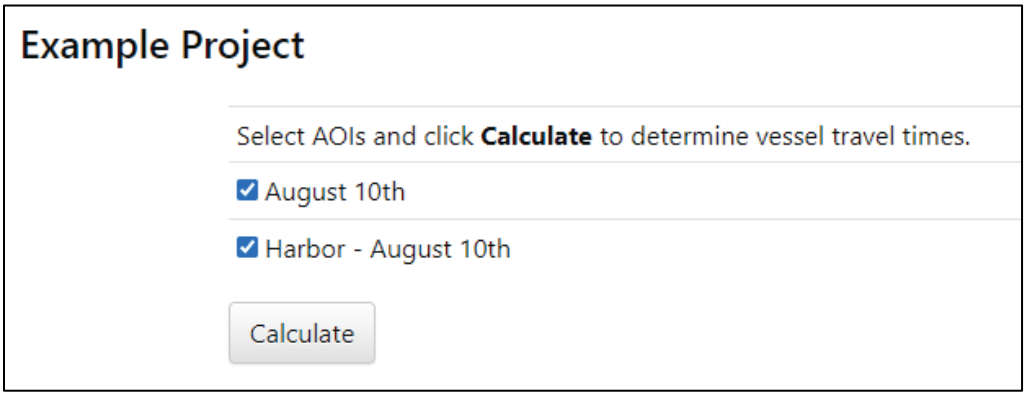
Figure 57. "Travel Times" button is indicated with a red box.



A new tab will open titled "Example Project".

8. From the list of AOIs, select "August 10th" and "Harbor – August 10th", as shown in Figure 58.

Figure 58. Selection of AOIs for transit times.



9. Click the "Calculate" button.

A record of each instance of a vessel transiting between the AOIs (as processed according to the user filter settings) is provided. Table 2 provides definitions for some of the fields. Note: If a vessel transits between the AOIs more than once, each instance will be its own record.

Table 2. Information included in the "Travel Times" output.

Field	Definition
Previous Area Name	Departure/From Area
Leaving	Timestamp of the vessel's last position report within the depature AOI (i.e., when the transit is considered to begin).
Area Name	Arrival/To Area
Arriving	Timestamp of the vessel's first position report within the arrival AOI (i.e., when the transit is considered to end).
Travel Time	Arriving minus Leaving

One can infer the direction of travel by considering which AOI is the "Leaving" one and which AOI is the "Arriving" one.

Data can be downloaded in .csv format by clicking on the "Travel Time File" button or in .xlsx format by clicking on the Excel icon button.

8.9 Download output for multiple AOIs quickly

1. Within your "Example Project", go to the "Analysis" tab.
2. Click on the "Select Files" button, which can be seen above the "Travel Times" button in Figure 57.

A new tab will open, titled with your project name. From this page, users can quickly download different statistical analysis results for the different AOIs in their projects.

9 Submitting a New AIS Data Request

The following steps describe how to request new data for the AISAP database. The requests are automated and are electronically sent to the USCG. The data are returned directly to the AISAP database. Data return speeds may range from a few hours to a few weeks depending on the request queue size and technical factors such as connectively between the AISAP server and the USCG server. If your request has not completed after 1 week, reach out to the AISAP team with the contacts provided under the "Help" option located on the top black menu bar in AISAP.

9.1 Submitting a new request

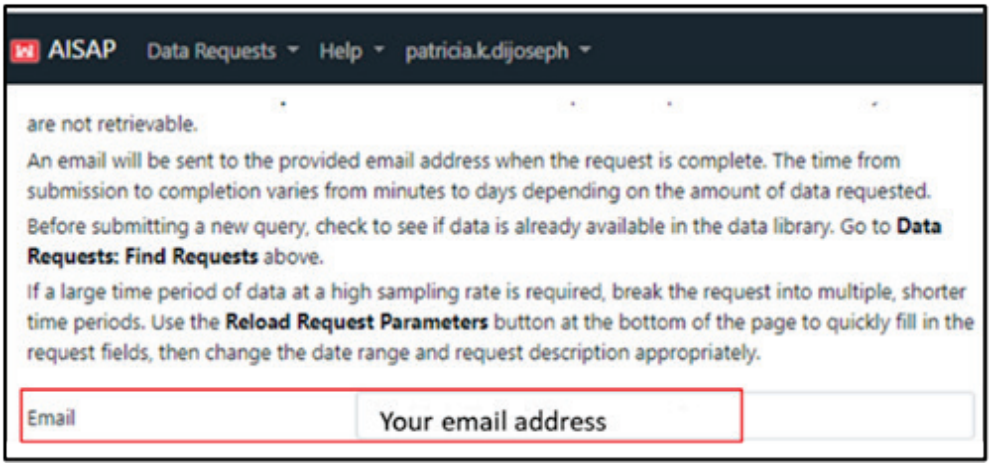
This example will be a request for AIS data for February 1, 2021, for Port Newark, NJ.

1. From the "Data Requests" drop-down menu located in the top black menu bar of the homepage, select "Query Tool".

This will take you to the query tool/data request page.

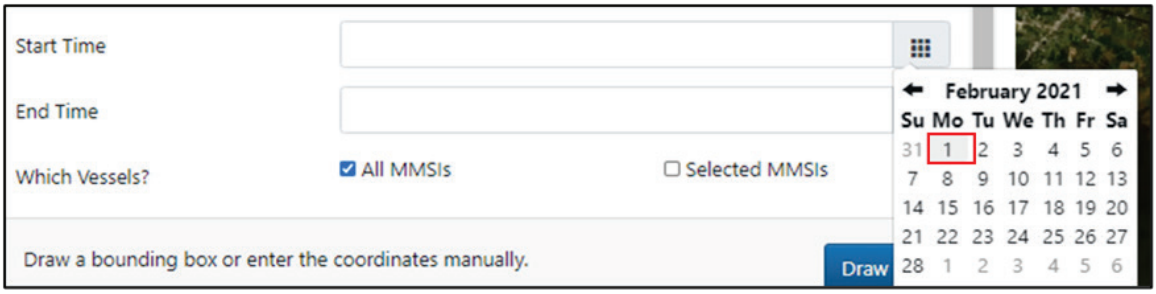
The email field should automatically populate with the address associated with your AISAP account, as shown in Figure 59.

Figure 59. Request email field.



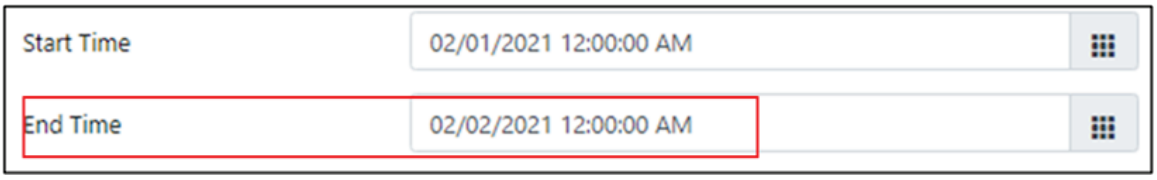
2. Enter the start time for the data as 02/01/2021 12:00:00 AM or use the calendar feature to select the time, as shown in Figure 60. *All AIS times are in UTC, not local time.*

Figure 60. Request date picker.



3. Enter the end time for the data as 02/02/2021 12:00:00 AM or use the calendar feature, as shown in Figure 61.

Figure 61. Request date fields filled in.



4. For "Which Vessels?" select "All MMSIs", as shown in Figure 62. "All MMSIs" means all vessels that broadcasted AIS data will be included.

Figure 62. Request vessels selection.

To select the spatial extent of the query, you can type in the corner coordinates of a rectangle, or you can use the built-in tool to select it on the map.

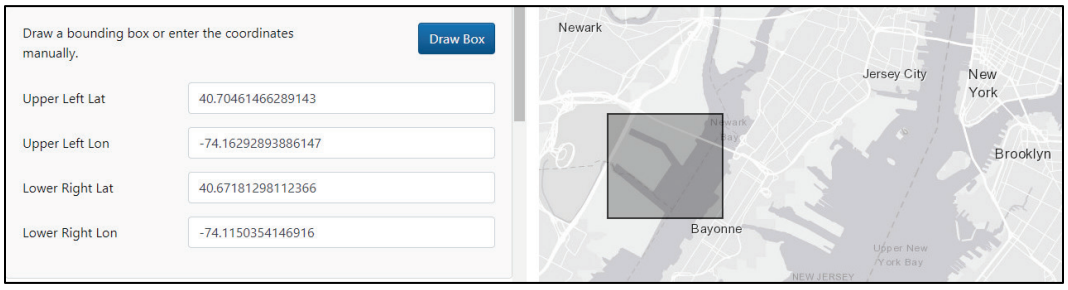
5. To select the spatial extent of the query, position the map over the area you want to query, such as a harbor or section of waterway. For this example, select Port Newark, NJ, as shown in Figure 63.

Figure 63. Port Newark, NJ.

6. Click on the “Draw Box” button.
7. Draw your query request box by placing your mouse in the location you want for the upper corner of your box; click and drag your mouse to where you want the diagonal corner to be and then release the mouse to finish drawing.

Note: The bounding box coordinates will automatically populate based on the box you draw, such as drawn in Figure 64.

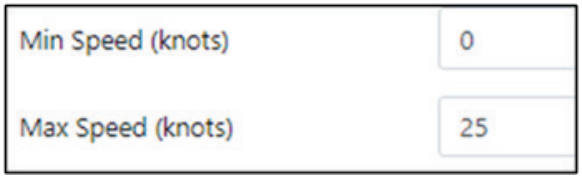
Figure 64. Bounding box coordinates.



Note, if you are not satisfied with the first box you drew, you can repeat steps 6 and 7.

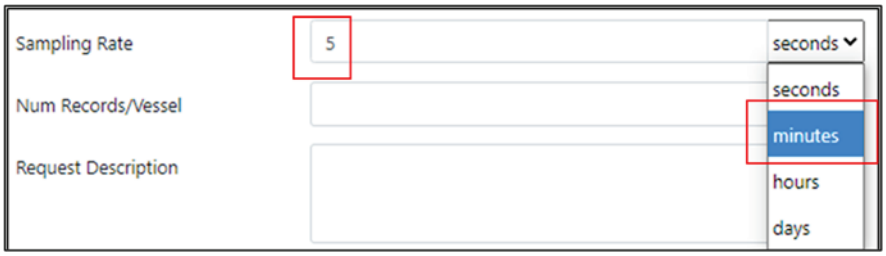
8. Leave the “Min Speed” and “Max Speed” at the default values of 0 knots and 25 knots, as shown in Figure 65.

Figure 65. Speed parameters field.



9. Enter a sampling rate (aka "ping rate") of 5 and select "minutes" from the time unit drop-down menu, as shown in Figure 66.

Figure 66. Sampling rate field.



The "Num Records/Vessel" field will automatically calculate and populate based on your time period and sampling rate, as shown in Figure 67.

Figure 67. "Num Records/Vessel" field.

10. Type in the "Request Description" box "example request; Port Newark; Feb 1, 2021; 5-min sampling".

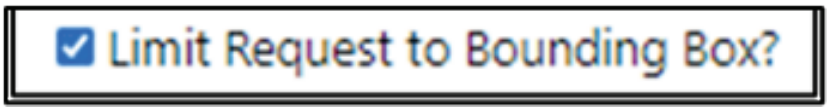
This request description will be viewable/searchable to all users. *You must have text in this box to submit a request.*

11. Uncheck the box that says "Include KML Track Lines?", as shown in Figure 68.

Figure 68. KML track lines selector.

12. Check the box that presents "Limit Request to Bounding Box?", as shown in Figure 69.

Figure 69. Data spatial return area selector.



This option will return vessel position reports **only** inside the bounding box. If you want a "tracer style" or "full duration query" to get position reports OUTSIDE of the bounding box, uncheck the box next to "Limit Request to Bounding Box".

13. Click the "Submit Request" button. If the "Submit Request" button is unclickable then check for errors or blank field boxes.
14. A pop-up window will confirm the query submission. You will also receive an auto-generated email confirming the submission that will also provide the request ID (number) associated with your request. You will get a second email when the data from your request are ready. When your request is ready, you can then create a new project and set it to your request ID, if you so choose.

9.2 Single vessel request

The user needs to have completed section 9.1 before moving on to this section.

This example will be a request for AIS data for January 2022 for the dredge *Wheeler*.

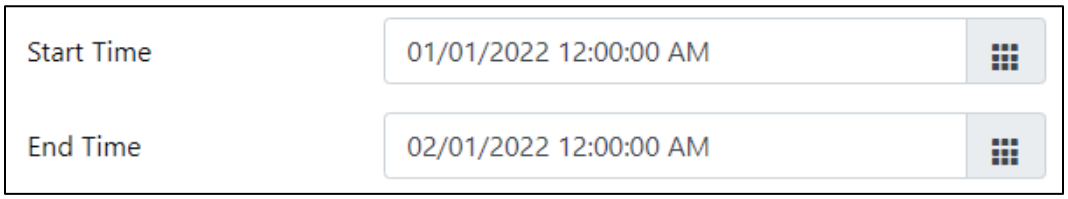
1. From the "Data Requests" drop-down menu located in the top black menu bar of the homepage, select "Query Tool".

This will take you to the query tool/data request page.

The email field should automatically populate with the address associated with your AISAP account, as shown in Figure 59.

2. Enter the start time for the data as 01/01/2021 12:00:00 AM or use the calendar feature, as shown in Figure 70. *All AIS times are in UTC, not local time*.
3. Enter the End Time for the data as 02/01/2021 12:00:00 AM or use the calendar feature, as shown in Figure 70.

Figure 70. Time period for single vessel request example.

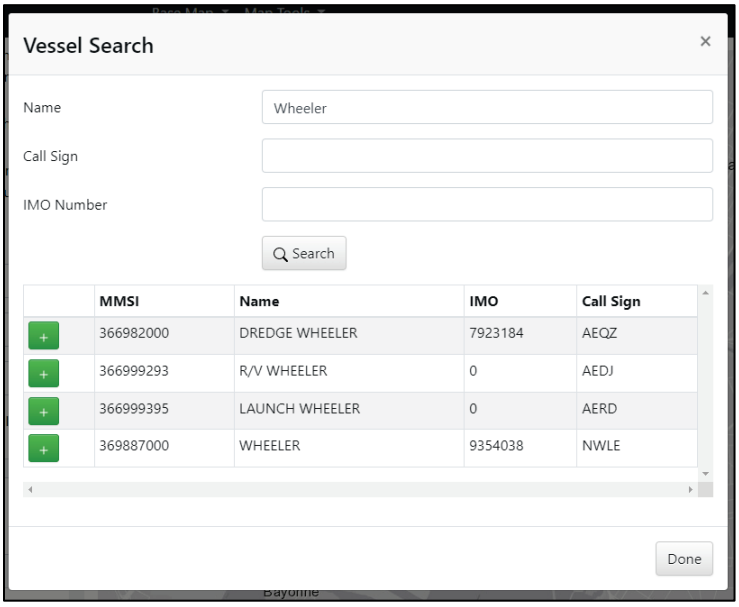


4. For “Which Vessels?” select “Selected MMSIs”.
5. If you know the vessel or vessels’ MMSIs, you can enter them in the MMSI List field, separated with commas between each vessel. The MMSI is a unique 9-digit identifier associated with the radio license aboard each vessel. For this example, the search will be for the MMSI for the dredge *Wheeler*.
6. Click the magnifying glass icon to the left of “MMSI List”.

A “Vessel Search” pop-up window opens.

7. Enter “Wheeler” in the name field and then click on the “Search” button as an example. You will see that all vessels with “Wheeler” in their name are listed. You should see four different vessels listed with this name as shown in Figure 71.

Figure 71. Vessel search box.



8. Click on the green plus sign for “DREDGE WHEELER”.
9. Click “Done”.

The MMSI for dredge *Wheeler* (366982000) now appears in the "MMSI" list.

10. Leave the "Min Speed" and "Max Speed" fields at the default values of 0 knots and 25 knots.
11. Enter a sampling rate (aka "ping rate") of 1 and select "hours" from the time unit drop-down menu, as shown in Figure 66.

The "Num Records/Vessel" field will automatically calculate and populate based on your time period and sampling rate. For this example, it should have "744" as the value.

12. Type in the Request Description box "example request; Dredge WHEELER; MMSI 366982000; Jan 2022; 1-hour sampling".

This request description will be viewable/searchable to all users. *You must have text in this box to submit a request.*

13. Uncheck the box that says "Include KML Track Lines?", as shown in Figure 68.

Note: You do not have the option to select a geographic region for the request. Instead, the request will include data for any location the selected vessel(s) have transited during the selected time period.

14. Click the "Submit Request" button. If the "Submit Request" button is unclickable, check for errors or blank field boxes.
15. A pop-up window will confirm the query submission. You will also receive an auto-generated email confirming the submission that will also provide the request ID (number) associated with your request. You will get a second email when the data from your request are ready. When your request is ready, you can then create a new project and set it to your request ID, if desired.

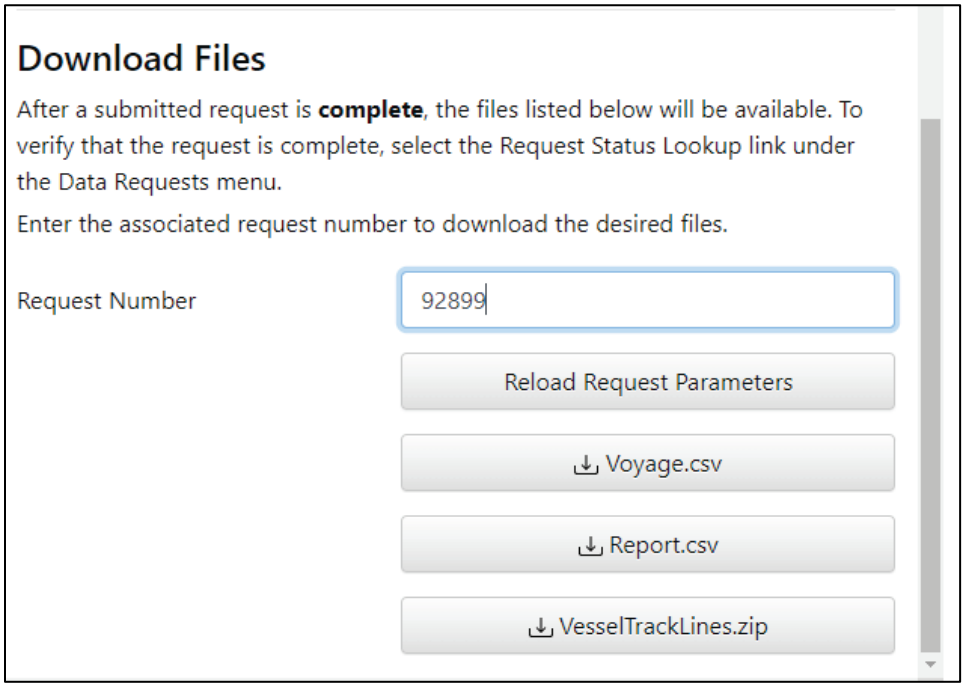
9.3 Reload previous request's parameters

1. From the "Data Requests" drop-down menu located in the top black menu bar of the homepage, select "Query Tool".

This will take you to the query tool/data request page.

2. Scroll down to the section titled “Download Files”, as shown in Figure 72.

Figure 72. “Download Files” section of the query tool page.



3. In the “Request Number” field, type in “92899” as an example, or the request number that you are interested in.
4. Click on the “Reload Request Parameters” button.

You will now see the query request parameters filled in for the query tool, such as the date range and bounding box coordinates. You can change any of the fields that you would like. Remember to update the “Request Description” field and to click on “Submit Request” when all the fields are filled to your liking.

9.4 Request status

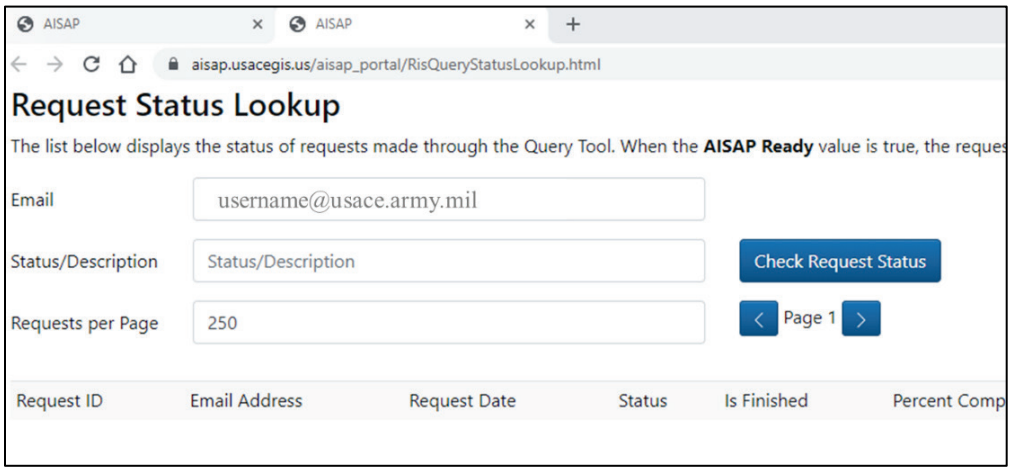
This section provides directions on how to check on the progress of your query and on how to see how many other queries are in the request queue.

1. From the “Data Requests” drop-down menu located in the top black menu bar of the homepage, select “Request Status Lookup”.

A new tab titled “Request Status Lookup” will open in your browser, such as displayed in Figure 73.

Your email address should auto-populate in the “Email” field.

Figure 73. Request Status Lookup page.



2. Click on the “Check Request Status” button.

AISAP will return a list of all queries you have submitted.

3. Check the request status of any other user by typing their name in the “Email” field.
4. Check the status of all requests, by all users, by leaving the “Email” field blank.

9.5 Stopping a request after it has been submitted

1. From the “Data Requests” drop-down menu located in the top black menu bar of the homepage, select “Request Status Lookup”.
2. Click on the “Check Request Status” button.
3. From the list of submitted requests, locate the one you want to stop processing.
4. Click on the “Stop” button associated with that request. The button is in the request’s row, second from the right.

The request will now no longer run.

9.6 Edit a request’s description after it has been submitted

1. From the “Data Requests” drop-down menu located in the top black menu bar of the homepage, select “Request Status Lookup”.
2. Click on the “Check Request Status” button.

3. From the list of submitted requests, locate the one you want to change the description for.
4. Click on the edit button associated with that request. The button is in the request's row and looks like a pencil.

An "Edit Request Details" pop-up window will open.

5. Edit the description and click the "Apply Changes" button.

The description will now be changed.

9.7 Download all data associated with an AIS data request

This section provides directions on how to download the vessels' characteristics and all the AIS position report data associated with a data request. The data are downloaded in a .csv file.

9.7.1 Download vessel characteristics

1. From the "Data Requests" drop-down menu located in the top black menu bar of the homepage, select "Query Tool".

This will take you to the query tool/data request page.

2. Scroll down to the section titled "Download Files", as shown in Figure 72.
3. In the "Request Number" field, type in "92899" as an example, or the request number that you are interested in.
4. Click on the "Voyage.csv" button.
5. Depending on your browser settings, the file will go to your Downloads folder or the Save As pop-up window will appear. If the latter, choose the folder location to save the file.
6. Locate the file and open it to explore the data provided within it. The file contains a table with records for each vessel type(s) included in the data request results. An example of the first 9 columns included in the Voyage file is shown in Figure 74.

Figure 74. Voyage.csv file display, partial view.

	A	B	C	D	E	F	G	H	I
1	MMSI	IMO_NUMBER	CALL_SIGN	NAME	SHIP_AND_CARGO_TYPE	DIM_BOW	DIM_STERN	DIM_PORT	DIM_STARBOAR
2	311000557	9767716	C6CS2	JAMNO	Cargo Ship - No additional	172	28	8	1
3	314444000	9298375	8PAN5	CAROLUS MAGNUS	Tanker - Carrying DG, HS or	131	34	17	
4	338021074	0	WA09082	USEPA LAKE GUARDIAN	Vessel - Engaged in dredging	3	50	3	
5	338038319			CAYENNE	Vessel - Sailing	9	1	2	
6	338090455	0	BERNIES	WEEKEND AT BERNIES	Vessel - Pleasure craft	10	3	0	
7	338092599			G3	Vessel - Pleasure craft	7	7	2	
8	338104573	0		AQUAMANIA	Vessel - Sailing	6	5	1	
9	338105486	0		EQUITY	Vessel - Pleasure craft	9	7	3	
10	338136144			NIGHTHAWK	Vessel - Pleasure craft	8	3	1	

9.7.2 Download AIS position reports

1. From the “Data Requests” drop-down menu located in the top black menu bar of the homepage, select “Query Tool”.

This will take you to the query tool/data request page.

2. Scroll down to the section titled “Download Files”, as shown in Figure 72.
3. In the “Request Number” field, type in “92899” as an example, or the request number that you are interested in.
4. Click on the “Report.csv” button.
5. Depending on your browser settings, your download will either save automatically to the Downloads folder, or you will be prompted to select a location. From the pop-up window, choose the folder location to save the file.
6. Locate the file and open it to explore the data provided within it. The file contains all the vessel position reports returned in the data request. The attributes of each position report are message type, MMSI, vessel name, receiver, time stamp, latitude, longitude, course over ground, navigation status, position accuracy, rate over ground, speed over ground, and heading.

10 Concluding Recommendations

The lessons in this report will help the user navigate through the main tools provided in AISAP. To maximize the return on time invested in learning AISAP, users are advised to do the following:

- Complete all the exercises using the example data or carefully substitute data from the location of your choice.
- When requesting new data from USCG NAIS archive, start with a small amount of data, such as 1 month of data for an entrance channel or waterway reach.
- Allow ample time for data requests from the USCG to complete and return data.
- For large data requests that might be required for multi-year navigation studies, please contact the authors of this document.
- For questions, please see the contact information listed under “Help” in the top, black menu bar of the AISAP homepage.
- For user-tailored training, either in-person or via a webinar, please see the contact information listed under “Help” in the menu bar of the AISAP homepage or contact the authors of this user guide.

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Unit Conversion Factors

Multiply	By	To Obtain
feet	0.3048	meters
inches	0.0254	meters
knots	0.5144444	meters per second
miles (nautical)	1,852	meters
miles (US statute)	1,609.347	meters
miles per hour	0.44704	meters per second

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14. ABSTRACT

The Automatic Identification System Analysis Package (AISAP) enables acquisition, statistical analysis, and visualization of Automatic Identification System (AIS) data from historic vessel position reports. The web-based AISAP software allows the users to choose which data they want to examine for a specific geographic area, time period, and vessel type(s). Built-in features provide vessel characteristics, arrival and departure information within a geofenced area, vessel travel time between two locations, vessel track line plots, and relative density plots of AIS data reports. AISAP accesses the Nationwide Automatic Identification System database hosted by the United States Coast Guard. This user manual provides training exercises for users to follow to familiarize themselves with AISAP procedures and workflows. These training exercises also provide examples of AISAP products.

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