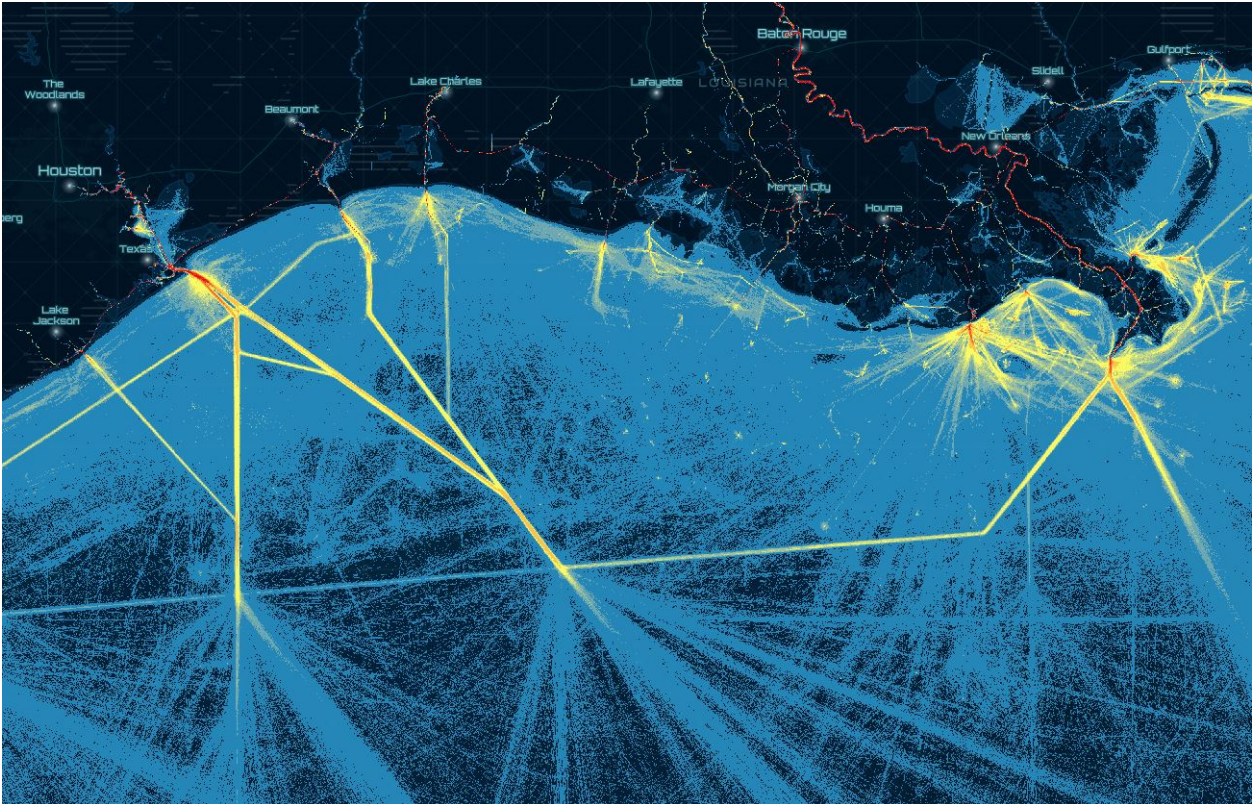


Frequently Asked Questions: AIS Data and Tools



Automatic Identification System (AIS) Point Data	1
AIS Trackline and Transit Count Data.....	6
AIS Tools.....	7
General.....	8

MarineCadastre.gov

October 2021

Automatic Identification System (AIS) Point Data

1. Q: Do you have plans to publish live or more recent data?

A: The most current AIS data we have access to is what is published on this website. We also do not have access to any live AIS data or feeds.

2. Q: Do you have AIS data before 2009?

A: No, 2009 is the earliest data we have.

3. Q: Do you have AIS for *[my location]*?

A: The AIS data published by MarineCadastre.gov originates from the Nationwide Automatic Identification System (NAIS) by the U.S. Coast Guard. The NAIS is composed of approximately 200 land-based receiving stations located near important navigation routes in the conterminous U.S., Alaska, Hawaii, Guam, and parts of the Caribbean. NAIS data are generally not available for the Arctic, waters beyond 40 to 50 miles of the coast, or foreign waters.

4. Q: Do you have AIS data collected by satellite?

A: No. All of our data originates from land-based receivers. Commercial providers collect, license, and sell satellite AIS data. Some federal agencies purchase satellite AIS data for specific needs, and they are restricted from distributing the data to the public by the terms of their license agreement.

5. Q: How do I interpret the Course Over Ground (COG) values?

A: The COG values are taken directly from the AIS and GPS feed originating on each vessel. Of course, there is always a risk that the raw National Marine Electronics Association (NMEA) data stream could be modified at unknown points in time by the core receiving organizations, such as the U.S. Coast Guard's Navigation Center (NAVCEN), as a result of maintenance at their receiving base stations. Sometimes COG values may appear off due to phase wrapping, or the vessel's use of a non-north setting in its GPS software. Reference the [NAVCEN documentation](#) for more information, which provides the specifications, domains, sentinel values, and other useful guidance on the raw data.

For data beginning in 2015, COG values that are less than 0 (negative) are known to be incorrect and can be corrected by adding 409.6. Values of 360.0 refer to the COG being unavailable and can be ignored.

There may be other methods for correcting COG values, for example, by recalculating from a pair of LAT, LON coordinate pairs, to get analysis-ready data. Unfortunately, we cannot provide hands-on support for providing "corrections" to fit your specific use.

6. Q: How do I interpret the Speed Over Ground (SOG) values?

A: The SOG values are taken directly from the AIS and GPS feed originating on each vessel. Of course, there is always a risk that the raw NMEA data stream could be modified at unknown points in time by the core receiving organizations, such as NAVCEN, as a result of maintenance at their receiving base stations. Sometimes SOG values may appear off due to the vessel's GPS software, transmitters being placed on airplanes or transport vehicles, or transmitters being associated with speed boats.

For data beginning in 2015, SOG values that are less than 0 (negative) are known to be incorrect and can be corrected by adding 102.4. Sentinel values such as 102.3 may indicate that no SOG value was transmitted, and can be translated as "not available." More information about these sentinel values and the SOG field can be referenced in the NMEA specs provided within the [NAVCEN documentation](#).

- 7. Q: Why are there so many type B Transceiver Class records, or why are some larger vessels classified as type B?**
A: For data beginning in 2018, an issue has been identified where AIS Message Types of 1 were incorrectly classified as Type B Transceiver Classes, that instead should be classified as Type A. Currently there is no simple method to correct this for end users. We are working on correcting this in the data downloads.
- 8. Q: Why are data missing in Alaska for some years?**
A: Data for Alaska have been available within our point data sets since 2009, but are not included in our derived data sets for tracks and transit counts. Although AIS point data may be present within Alaska, it may not cover the whole state, especially northern portions of the state and the Arctic Ocean. Better (northern) coverage can be found in years 2015, 2016, and 2017. Furthermore, the Alaska Marine Data Exchange (MXAK) owns a vast majority of the receiving stations across the state of Alaska. Beginning on 3/29/2021, AIS data within Alaska that were collected via MXAK stations have been filtered out of our data products, at the request of MXAK.
- 9. Q: What is the licensing or terms and conditions for use of these AIS historical data?**
A: Please refer to the terms of use provided by the [NAVCEN website](#), and the copyright notice listed below.
- “As required by 17 U.S.C. 403, third parties producing copyrighted works consisting predominantly of the material produced by U.S. government agencies must provide notice with such work(s) identifying the U.S. Government material incorporated and stating that such material is not subject to copyright protection within the United States. The information on government web pages is in the public domain and not subject to copyright protection within the United States unless specifically annotated otherwise (copyright may be held elsewhere). Foreign copyrights may apply.”
- 10. Q: Why are some files considerably smaller compared to the average size?**
A: At this time, the U.S. Coast Guard does not provide an explanation for the variability of data coverage and data volume for their NAIS network. The MarineCadastre.gov team does process all records that we receive from the U.S. Coast Guard. As noted in our metadata, we are aware of the reduced record count observed in late March and early April of 2018, for example.
- 11. Q: Is there any way to assess the AIS data coverage, since all data included in these datasets are from land-based receivers?**
A: This largely depends on how you define the assessment. NAIS data are generally not available for the Arctic, waters beyond 40 to 50 miles of the coast, or foreign waters. Vessel traffic within these areas could be under-represented by the land-based receivers. Complementary satellite data (which the Marine Cadastre does not possess) for the same year(s) of interest could help with assessing coverage in the areas we provide point data.
- 12. Q: Are your vessel type codes cross-referenced with the U.S. Coastguard’s AVIS database?**
A: We have used the Coast Guard's Authoritative Vessel Identification Service (AVIS) database to populate and improve many of the null values found in the native AIS data. [See our vessel type codes list](#).
- 13. Q: I am trying to locate historical data for a specific vessel. How do I do this?**
A: Download the point data for your time period(s) of interest, and then extract data for specific vessels using the Maritime Mobile Service Identity (MMSI) or International Maritime Organization (IMO) fields.

14. Q: What are the data formats for the AIS point data provided on MarineCadastre.gov, including spatial and temporal extent?

A: This table helps summarize the AIS point data provided on MarineCadastre.gov, as of October 2021.

Automatic Identification System Point Data Summary

Year	Period	Scope	File Type	Files	Size (GB)– Compressed	Size (GB)– Uncompressed (Estimated)	Comments
2009	monthly	UTM	FGDB	204	41.4	118	
2010	monthly	UTM	FGDB	204	49.3	141	
2011	monthly	UTM	FGDB	204	52.5	150	
2012	monthly	UTM	FGDB	216	64.7	185	
2013	monthly	UTM	FGDB	216	69.1	197	
2014	monthly	UTM	FGDB	216	54.0	154	Records for 4/23/2015 are missing, as stated within the metadata.
2015	monthly	UTM	CSV	216	69.6	199	
2016	monthly	UTM	CSV	216	81.0	231	
2017	monthly	UTM	CSV	216	83.3	238	
2018	daily	National	CSV	365	95.7	273	
2019	daily	National	CSV	365	99.3	284	
2020	daily	National	CSV	366	91.1	260	
2021	daily	National	CSV	87	20.0	61	January 1 - March 28

15. Q: Are accidents or other types of events removed from the AIS point data?

A: Collisions and accidents are not removed from the data explicitly. The MarineCadastre.gov AIS data represent 16 of the most important fields from the original AIS record. Our data are filtered to a one-minute rate and show all vessels that the land-based antennas received, with the exception of certain law enforcement, military, and other federal agency vessels that are excluded.

16. Q: Do you have tonnage, horsepower, fuel type, and other parameters for vessels?

A: No, these parameters are not part of our database. We have heard about other users finding these parameters in commercial databases, and having success in merging those parameters with the Marine Cadastre AIS records using the MMSI value as a JOIN key.

17. Q: Do you have a voyage identifier value?

A: Before 2015, we did calculate and insert a voyage ID and included the destination value. Our criteria for defining a voyage can be found in the AIS Data Handler documentation. Since 2015, we have not included a voyage ID or destination because defining the start and end of a voyage is a subjective and complex process dependent on mariner input. The Track Builder tools are now the best option to generate track lines that can be used to define a voyage.

18. Q: Do you have origination or destination values?

A: We collect the destination values; however, most of the entries are incomplete, inconsistent, or null. We will continue to monitor the destination and the origination input and will consider adding them to future products if the values are more complete.

19. Q: How do I interpret the vessel codes and cargo codes?

A: The vessel type codes are outlined in this [PDF document](#). The cargo codes are part of the vessel type parameter. Please see the detailed [documentation](#) available from the U.S. Coast Guard Navigation Center.

20. Q: How do the vessel draught field from 2009 to 2014 and the vessel draft field from 2015 to 2021 compare?

A: The 2009-2014 draught parameter is reported in 1/10's meters, and the value 255 equals 25.5 meters or greater. The 2015-2021 vessel draft parameter is reported in meters. Carriage requirements and instructions to mariners for entering vessel draft values have changed over time. Recent vessel draft values report the "maximum present static draught."

21. Q: If I want to group data by vessel type, can I combine vessel type codes? For example, should I combine vessel type 31 (towing) with vessel type 1025 (towing vessel)?

A: In this example, yes.

We have used the U.S. Coast Guard's Authoritative Vessel Identification Service (AVIS) to populate and improve many of the null values found in the native AIS data. Similar vessel types from both lists can be combined into groups. We usually categorize null values under the "other" group type. We have also found that many users have a need to define their own groups of vessel types. The vessel groups defined by MarineCadastre.gov are those frequently used among the ocean planning community.

- a. Codes 0 through 255 are original vessel type codes defined by AIS standards
- b. Codes 256 through 999 are an empty set added by MarineCadastre.gov
- c. Codes 1001 through 1025 are keys to the AVIS vessel type descriptions

22. Q: Who owns the copyright to these AIS data, and are they available for use and redistribution by commercial entities?

A: Our data are derived from the U.S. Coast Guard NAIS and are free for public use. The MarineCadastre.gov AIS data are intended for coastal and ocean planning. Please see the information at the bottom of the [NAIS webpage](#) for the terms and conditions of use. If you have additional questions about the terms and conditions, please use the contact email on the NAIS data request page.

23. Q: Are the AIS data provided by MarineCadastre.gov adequate for regulatory or enforcement purposes?

A: The AIS data provided by the Marine Cadastre are intended for marine planning purposes only.

24. Q: Why are there AIS points over land (e.g., like Kansas and Canada in data set 2017_01_Zone14)?

A: Location values are principally derived from on-vessel GPS devices. For a detailed discussion on errors in GPS signals, please search the web or contact a vendor of GPS units. Accurately reported GPS positions from vessels being transported over land can also be seen in the data, as well as vessels transiting very small canals and locks that may be difficult or impossible to see on a web-map.

25. Q: How do I account for apparent inconsistencies of the AIS timestamp and of an observed vessel's voyage?

A: The full timestamp is added to the record by the base station, using the time clock of the base station that is reporting in Coordinated Universal Time (UTC). Be sure to account for your time zone shift to UTC and other offsets such as Daylight Savings Time.

26. Q: Is there a schema diagram or data dictionary for the new AIS points data?

A: Below is the data dictionary starting in 2018. This expands the 2015, 2016, and 2017 data with the addition of the Transceiver Class designation.

Automatic Identification System Data Dictionary 2018

	Name	Description	Example	Units	Resolution	Type	Size
1	MMSI	Maritime Mobile Service Identity value	477220100	-	-	Text	8
2	BaseDateTime	Full UTC date and time	2017-02-01T20:05:07	-	YYYY-MM-DD:HH-MM-SS	DateTime	-
3	LAT	Latitude	42.35137	decimal degrees	XX.XXXXX	Double	8
4	LON	Longitude	-71.04182	decimal degrees	XXX.XXXXX	Double	8
5	SOG	Speed Over Ground	5.9	knots	XXX.X	Float	4
6	COG	Course Over Ground	47.5	degrees	XXX.X	Float	4
7	Heading	True heading angle	45.1	degrees	XXX.X	Float	4
8	VesselName	Name as shown on the station radio license	OOCL Malaysia	-	-	Text	32
9	IMO	International Maritime Organization Vessel number	IMO9627980	-	-	Text	16
10	CallSign	Call sign as assigned by FCC	VRME7	-	-	Text	8
11	VesselType	Vessel type as defined in NAIS specifications	70	-	-	Integer	short
12	Status	Navigation status as defined by the COLREGS	3	-	-	Integer	short
13	Length	Length of vessel (see NAIS specifications)	71.0	meters	XXX.X	Float	4
14	Width	Width of vessel (see NAIS specifications)	12.0	meters	XXX.X	Float	4
15	Draft	Draft depth of vessel (see NAIS specifications)	3.5	meters	XXX.X	Float	4
16	Cargo	Cargo type (see NAIS specification and codes)	70	-	-	Text	4
17	TransceiverClass	Class of AIS transceiver	A	-	-	Text	2

27. Q: What does a value of “511” in the Heading field represent?

A: The value 511 stands for “not available = default.”

28. Q: What is represented by Vessel Type code 59, and what is RR Resolution No. 18 referencing?

A: A good place to begin researching the meaning of type codes and resolutions is on the U.S. Coast Guard Navigation Center website (see [IMO Resolutions](#)).

29. Q: Do you include Class B data?

A: Beginning in 2018, we include class B data and the class designation for each record.

AIS Trackline and Transit Count Data

1. Q: What is the resolution (cell size) of the density grids?

A: The cell size for the kernel density grids (2011 and 2013) is 100 meters. The cell size for the transit count grids (2015-2020) is 100 meters.

2. Q: How can I calculate the estimated time of arrival (ETA) for vessel tracks?

A: While there are multiple ways one could calculate ETA values, here is just one suggestion:

- a. Filter the points to remove unwanted vessels or vessel types.
- b. Generate vessel tracks, probably using a 24-hour period to segment the tracks.
- c. Generate a polygon defining the arrival port.
- d. Examine track end-time date/times of the remaining tracks.

Note: Track start and end times are contained within the MarineCadastre.gov trackline data sets.

Note: Track start and end times are contained within trackline products generated by the Track Builder tools.

3. Q: Beginning in 2018, all vessels with VesselType 1001-1025 are combined into the single code 90 (or codes 90-99), whereas in previous years the distinction was made between these vessels. Is there any possibility of reverting this?

A: Prior to the processing of the 2018 and 2019 data by the MarineCadastre.gov team, the Coast Guard made two changes that resulted in the vessel type codes you see now. For one, the Coast Guard ceased support of the AVIS database. AVIS was the source for all the VesselType code enhancements above 999. Secondly, the U.S. Coast Guard issued a Special Notice, "AUTOMATIC IDENTIFICATION SYSTEMS - Revised AIS Encoding Guidance for U.S. waters."

The MarineCadastre team is aware of the importance of an accurate and useful vessel type code to the coastal and ocean planning community. We have found several additional sources of vessel type codes that help classify fishing vessels that we are evaluating. Many other third-party sources exist that could be used to refine and update vessel type codes. However, most if not all that we are aware of have commercial license restrictions that would prohibit our use.

4. Q: Why is there a small gap in coverage for the trackline data, running north and south in the Gulf of Mexico?

A: Our derived trackline data are processed per ocean basin and at 1-minute intervals, then merged into a national dataset. This results in a gap between the Gulf of Mexico and Atlantic data, which can be seen off the west coast of Florida. Users can build their own trackline data for larger ocean areas if this small gap in coverage is an issue for secondary analysis or processing needs.

5. Q: Why are there no trackline data for Alaska in some years?

A: Data for Alaska have been available within our point data sets since 2009, but are not included in our derived data sets for tracks and transit counts. Although AIS point data may be present within Alaska, it may not cover the whole state, especially northern portions of the state and the Arctic Ocean. Better (northern) coverage can be found in years 2015, 2016, and 2017. Furthermore, the Alaska Marine Data Exchange (MXAK) owns a vast majority of the receiving stations across the state of Alaska. Beginning on 3/29/2021, AIS data within Alaska that were collected via MXAK stations have been filtered out of our data products, at the request of MXAK.

AIS Tools

1. **Q: Do any of the AIS processing tools provided on the Marine Cadastre work with open source GIS software applications?**

A: Our AIS Track Builder and Transit Count tools require Esri software. More information is provided within the [tutorial for each tool](#) (see “Technical Guides”). Our Track Builder tool is an ArcGIS Pro (ArcPy) implementation that requires ArcGIS Pro. Esri now has its own version of our Track Builder woven into its code, called Reconstruct Tracks.

2. **Q: I am failing to create tracklines for points that are very close together (for example, less than 10 meters). How do I create tracklines in these cases?**

A: This is due to how the python script handles XY points that are very close together (~10 meters or less) AND are stored in a geographic coordinate system (GCS). If the points are first transformed into a projected coordinate system, the python script runs as intended and will connect the points even when they are in very close proximity to one another.

The TrackBuilder input file should be in a projected coordinate system if there is a need for points closer than ~10 meters to be connected. If very near points do not need to be connected, then either projected or geographic coordinate systems can be used for an input file.

3. **Q: Why do I encounter failures or errors when running the Track Builder tool (v3.1)?**

A: Error messages that say you have run out of memory while the tool is running could be due to using the 32-bit version of the tool or environment (such as IDLE). The best solution is to use the 64-bit command line version of the program. You will need to have the 64-bit Background Geoprocessing patch installed. The patch will install a 64-bit version of Python for ArcGIS Desktop. If you are running ArcGIS Pro, be sure to use our Track Builder Pro 1.0 tool.

4. **Q: When working AIS data prior to 2015 in the file geodatabase format, clipping the broadcast features to an area of interest causes the link between the features and the voyage attributes to be broken within the Track Builder. How do I retain these voyage attributes?**

A: The Track Builder tool looks for specific field names in the Vessel and Voyage tables that match the data model used in the MarineCadastre.gov products. Check during your CLIP process that file or field names are not being modified. Consider using a simple JOIN of the Vessel and Voyage tables using the MMSI as key after you run the Track Builder tool.

5. **Q: I am not an ArcGIS user. How can I access and use the 2009 to 2014 data that are in the file geodatabase format?**

A: Consider using the [GDAL Python library](#), which supports a wide range of file format translations and other operations that can be run from the command line. Numerous commercial applications by companies such as SAFE Software and MatLab have a capacity to read the native GDB format. Reference their documentation for which version is supported.

General

1. Q: How do I formally cite MarineCadastre.gov data?

A: When citing a specific data layer, please use the following format:

Bureau of Ocean Energy Management (BOEM) and National Oceanic and Atmospheric Administration (NOAA). MarineCadastre.gov. *{Enter Data Layer Name from Metadata}*. Retrieved *{Enter Month Day, Year}* from marinecadastre.gov/data.

2. Q: Can I provide derived AIS data products on other publicly available websites?

A: Yes, you can submit a derived product that uses AIS data from the Marine Cadastre. All that we ask is that you cite the data. And if possible, please let us know how you're using the data and what type of derived data set you developed. We always appreciate learning how users are applying our data and tools. When citing a specific data layer, please use the following format:

Bureau of Ocean Energy Management (BOEM) and National Oceanic and Atmospheric Administration (NOAA). MarineCadastre.gov. *{Enter Data Layer Name from Metadata}*. Retrieved *{Enter Month Day, Year}* from marinecadastre.gov/data.

Please also refer to the terms of use provided by the NAVCEN website, and the copyright notice listed below.

“As required by 17 U.S.C. 403, third parties producing copyrighted works consisting predominantly of the material produced by U.S. government agencies must provide notice with such work(s) identifying the U.S. Government material incorporated and stating that such material is not subject to copyright protection within the United States. The information on government web pages is in the public domain and not subject to copyright protection within the United States unless specifically annotated otherwise (copyright may be held elsewhere). Foreign copyrights may apply.”

3. Q: Who should I list as the Point of Contact, when citing Marine Cadastre AIS data?

A: MarineCadastre.gov Data Steward
NOAA Office for Coastal Management
(843) 740-1202
coastal.info@noaa.gov

4. Q: Does the Marine Cadastre maintain a list of coordinates for AIS receiver stations?

A: No. NOAA does not maintain or distribute the locations of AIS receivers, at the request of the U.S Coast Guard.

5. Q: How do I use the filter functionality in the “Download the Data” section?

A: The filter is based upon text within the download file names. For example, when typing “zone18,” the filter (correctly) limits the total downloads per year to 12 (i.e., one per month). Also note that our downloads changed from Universal Transverse Mercator (UTM) zones (2009-2017) to daily files (2018-present). Therefore, filtering by UTM zone would not be applicable for years after 2017. Furthermore, if you want to filter daily data by March 24 (for years after 2017), for example, type “03_24” within the search box.

6. Q: Have an AIS question not answered here?

A: Please reference the respective metadata for the data set(s) of interest, or email info@marinecadastre.gov with your question.