

**Technical Memo to:**  
Vancouver Energy Petroleum Terminal LLC

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**Date:** 2016-01-21  
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Vancouver Energy

# 2014 AIS Traffic Analysis



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**Task and objective:**

The traffic analysis shows the traffic transit numbers by ship type along cross-sections distributed within the study area. In addition, heat maps and speed profile maps respectively display the density of AIS vessel points and the speed ranges of the sailing ships. Both show the maps by ship type.

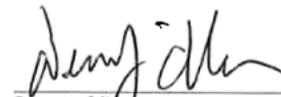
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- Unrestricted distribution (internal and external)
- Unrestricted distribution within DNV GL
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Reference to part of this report which may lead to misinterpretation is not permissible.

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1	2016-01-21	Deep Draft Vessels Discussion Added	MMATU	VDEM	DFOL
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# 1 INTRODUCTION AND OBJECTIVE

This memo provides the traffic analysis of the Columbia River from the bar to/from Vancouver Energy. Automatic Identification System (AIS) data was used to assess of the number of transits, traffic density and traffic speed in the study area. AIS data was obtained from Merchants Exchange in Portland, Oregon. The period of coverage for the AIS data is from '2014-01-1 00:00' to '2014-12-31 23:59' (Ref. /1/).

# 2 AIS TRACKS

This section presents the AIS tracks created from the AIS dataset. The entries in the AIS dataset were linked for each vessel to create the vessel tracks. Vessel tracks are presented for each vessel category.

Figure 2-1 presents the tracks for all vessel types in the study area.

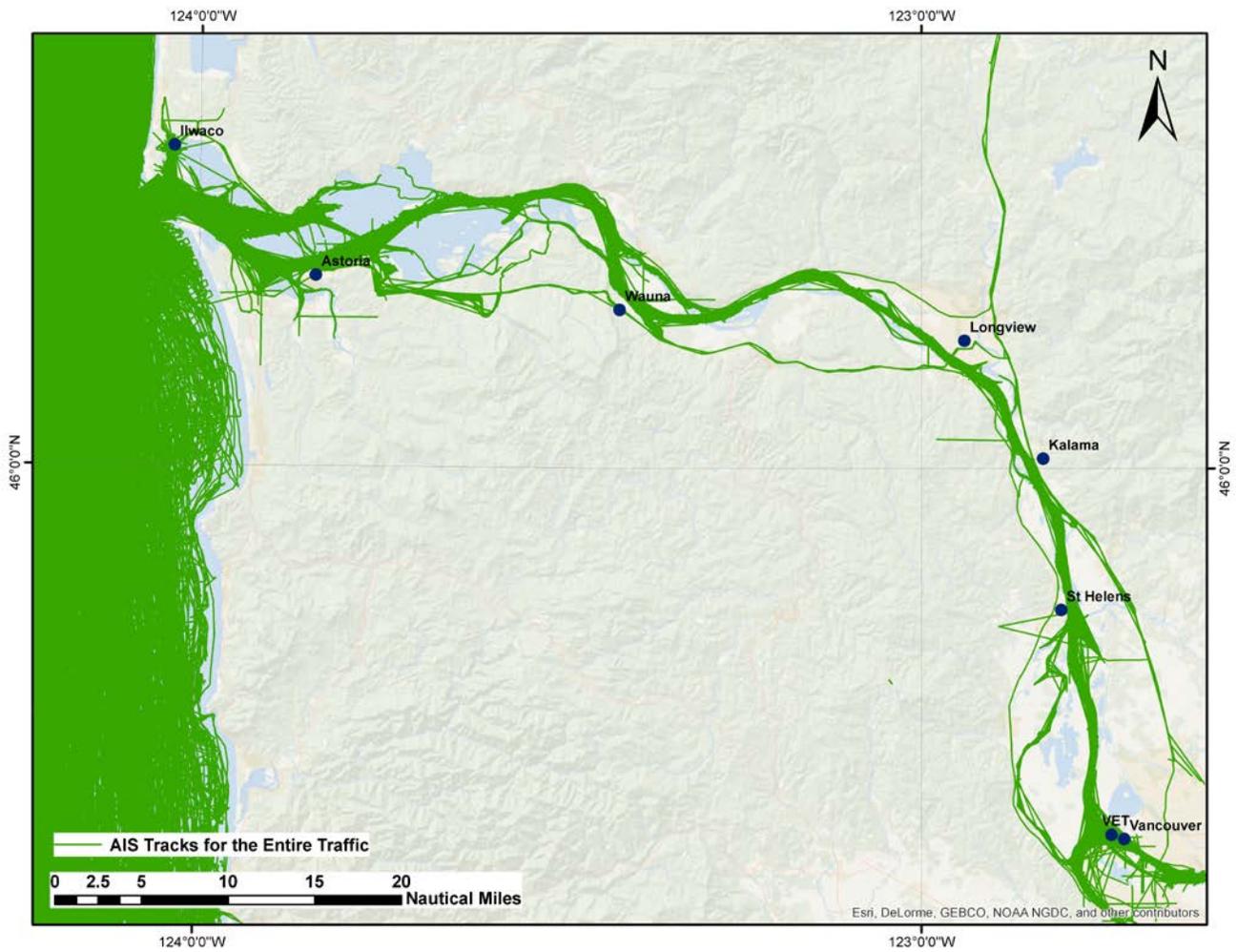


Figure 2-1 AIS Tracks for All Traffic

The AIS descriptors are grouped into ship categories. The vessel categories are as follows:

- Cargo/Carrier
- Passenger
- Service
- Tug
- Other
- Fishing
- Pleasure
- Tanker
- Undefined

The table below gives examples of the AIS description included in the nine ship categories.

**Table 2-1 Vessel Category Definition**

Vessel Category	Examples of Included AIS Vessel Types
Cargo/Carrier	Bulk carriers, container ships, general cargo ships, vehicles carrier, timber carriers
Passenger	Ro-Ro/Passenger ships, inland passenger ships, ferries
Service	Ice-breakers, military vessels
Tug	General tugs, towing vessels, barges, towing long and wide
Fishing	Trawlers, all fishing vessels
Pleasure	Pleasure crafts, yachts, sailing vessels
Tanker	LPG tankers, oil tankers, chemical tankers
Undefined	Vessels missing AIS data for vessel type
Other	Dredgers, pollution control vessels

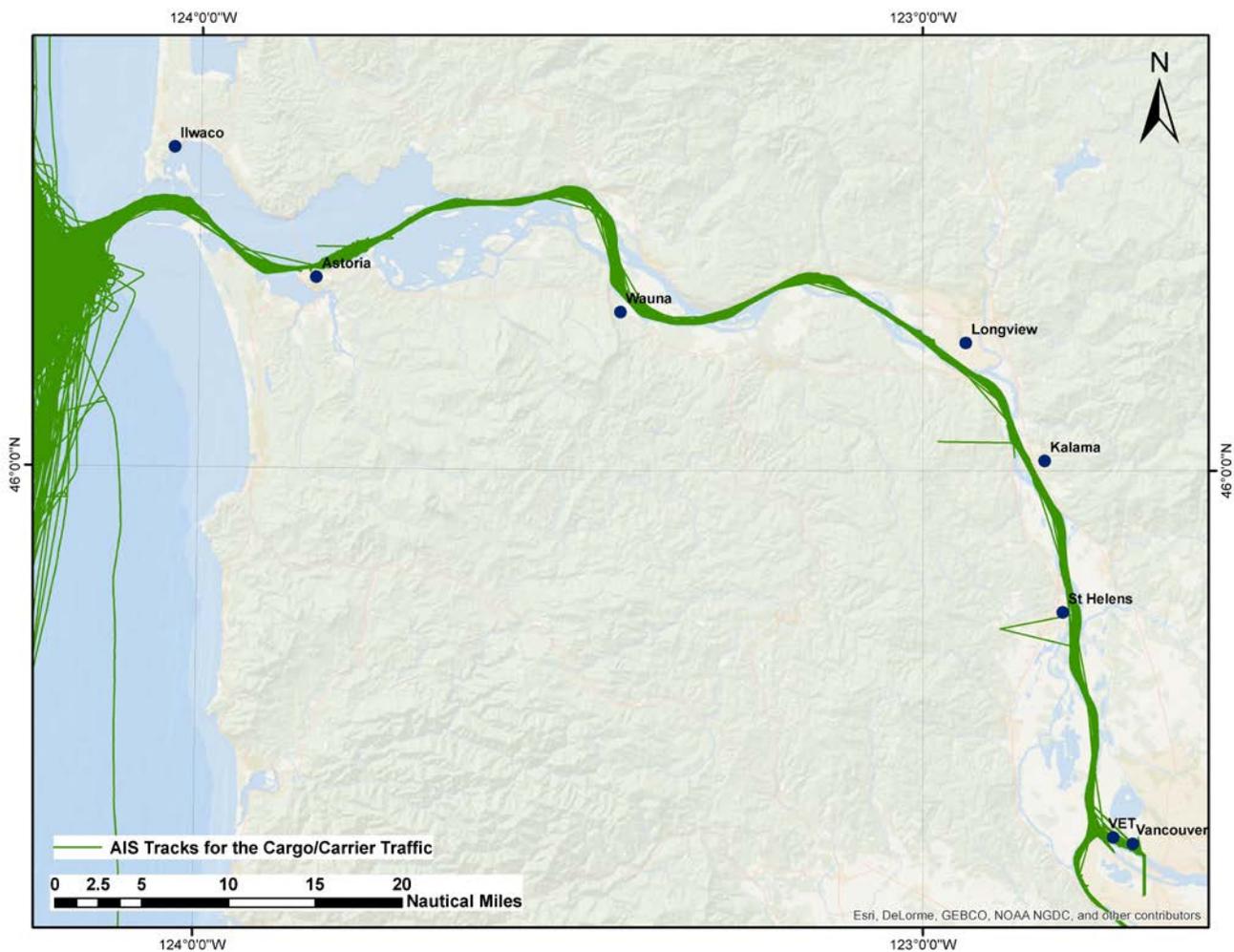
## 2.1 Deep Draft Vessels

All vessels in the "Cargo/Carrier" and "Tanker" categories are generally assumed to be deep draft vessels. In the 2014 AIS data for the study area, there are 976 unique vessels of the "Cargo/Carrier" and "Tanker" vessel types.

In some areas, the “Passenger”, “Other” and “Fishing” vessels are also deep draft vessels, but some research is needed to determine the proportion. Length overall (LOA) is the most readily available numerical information that gives an indication how deep a draft a vessel might have. In this case:

- 24 passenger vessels are in the data. Just a few are small, but the rest are 200 m – 300 m Length Overall (LOA)
- 156 fishing vessels are in the data. One is 112 m LOA; three are 60 m to 112 m LOA; and the rest are smaller than 50 m LOA or do not have LOA information.

Figure 2-2 presents the Cargo/Carrier tracks in the study area.



**Figure 2-2 AIS Tracks for Cargo/Carrier Traffic**

Figure 2-3 presents the tracks for fishing vessels in the study area.

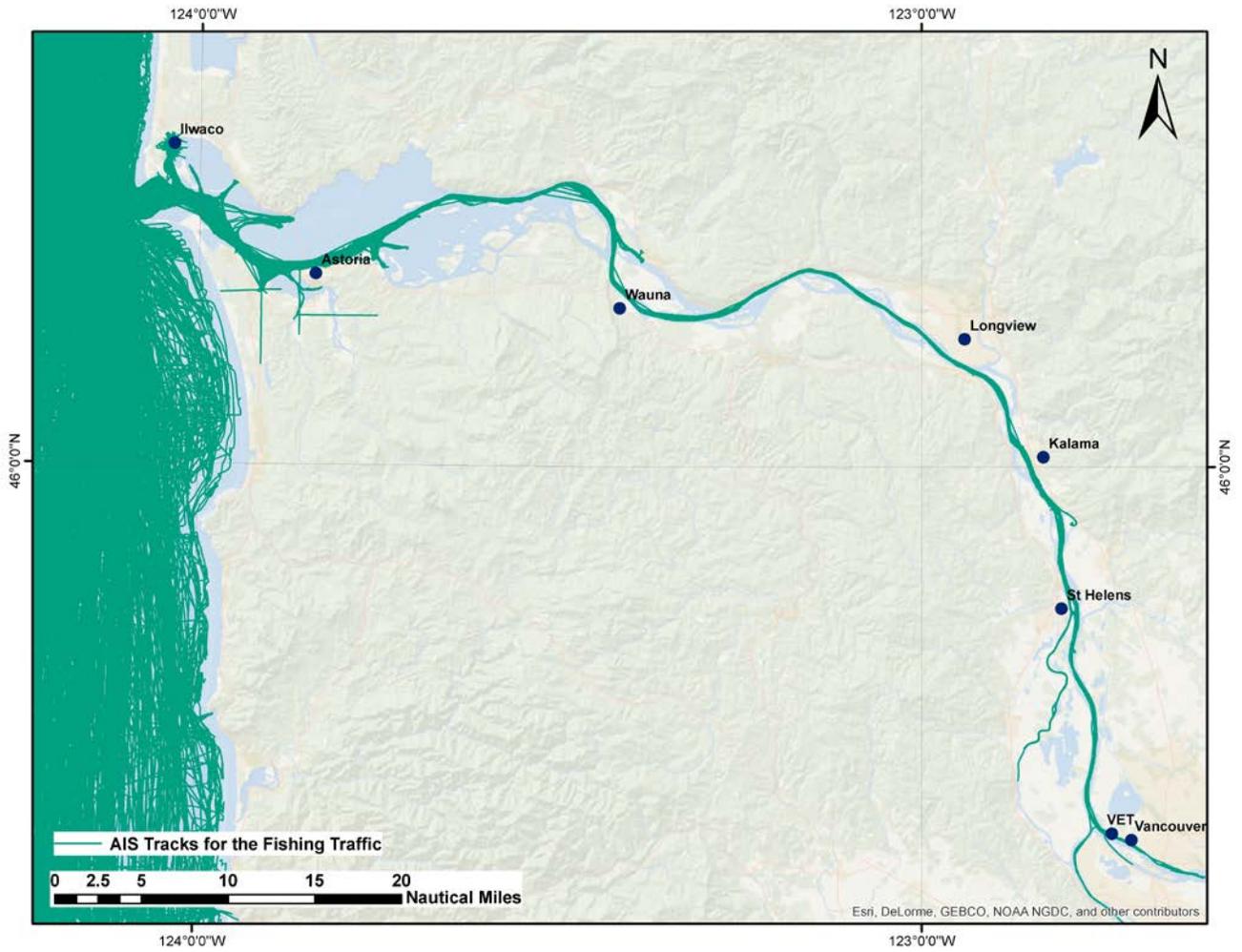


Figure 2-3 AIS Tracks for Fishing Traffic

Figure 2-4 presents the tracks for other traffic in the study area.

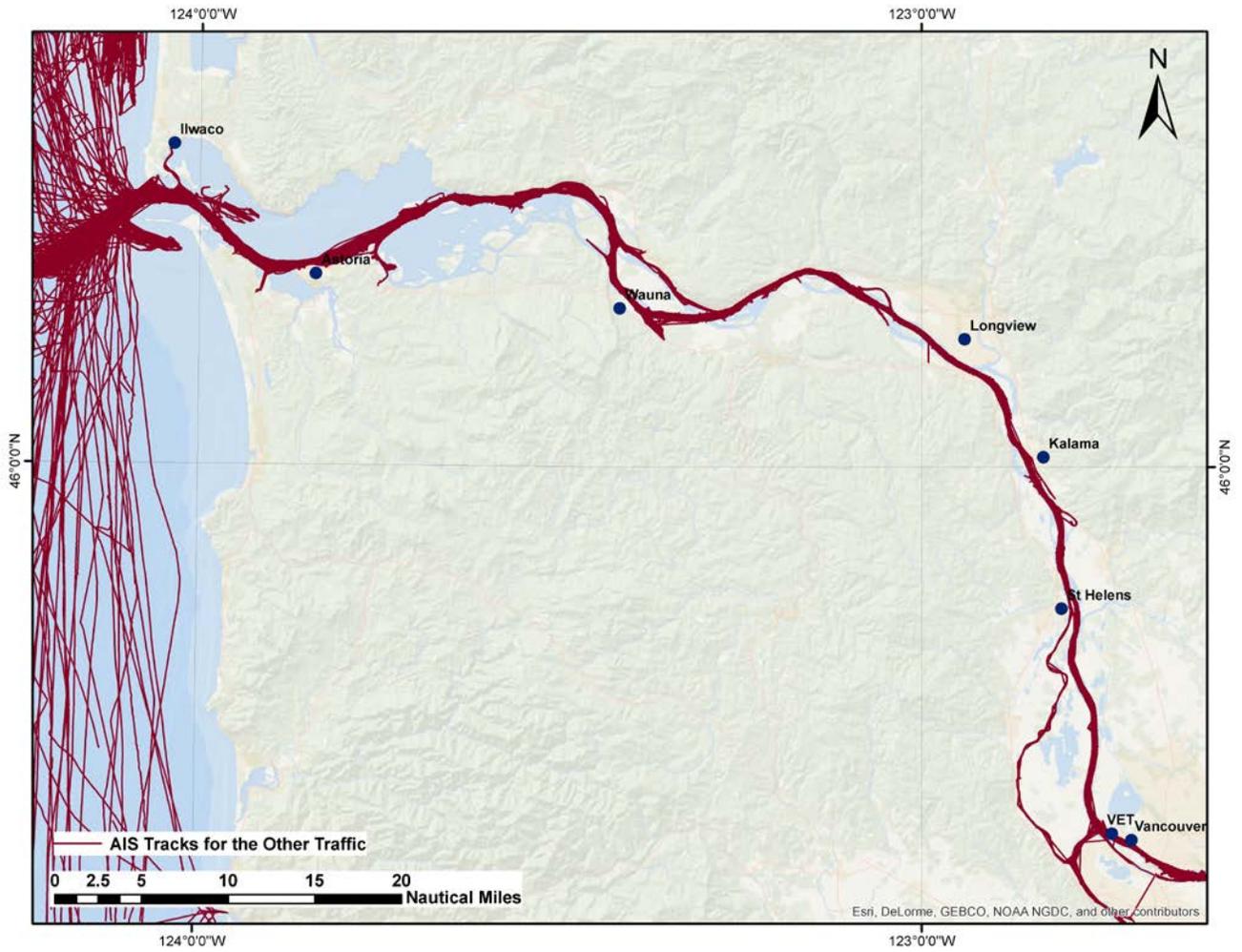


Figure 2-4 AIS Tracks for Other Traffic

Figure 2-5 presents the tracks for passenger vessels in the study area.

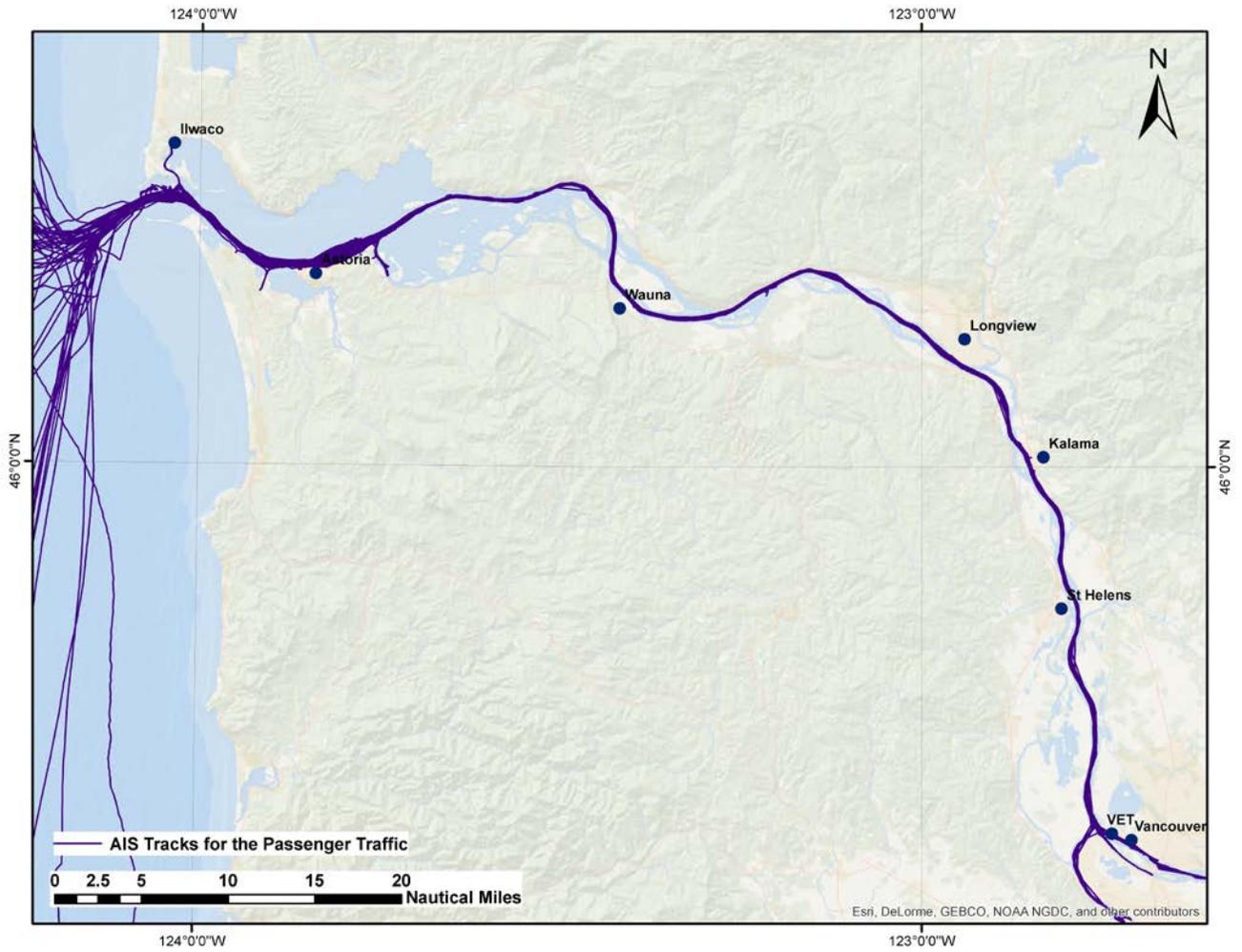


Figure 2-5 AIS Tracks for Passenger Traffic

Figure 2-6 presents the tracks for pleasure vessels in the study area.

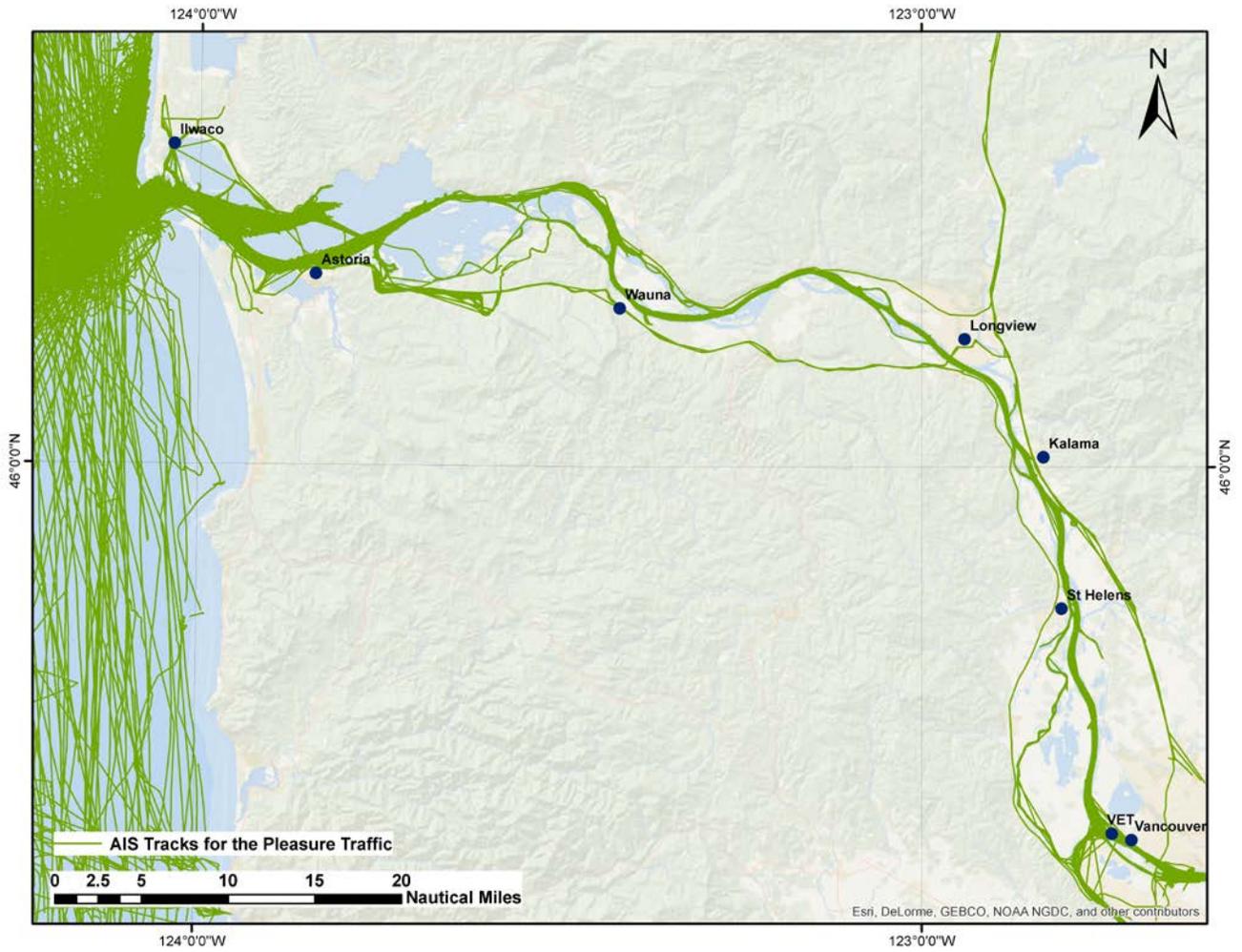


Figure 2-6 AIS Tracks for Pleasure Traffic

Figure 2-7 presents the tracks for service vessels in the study area.

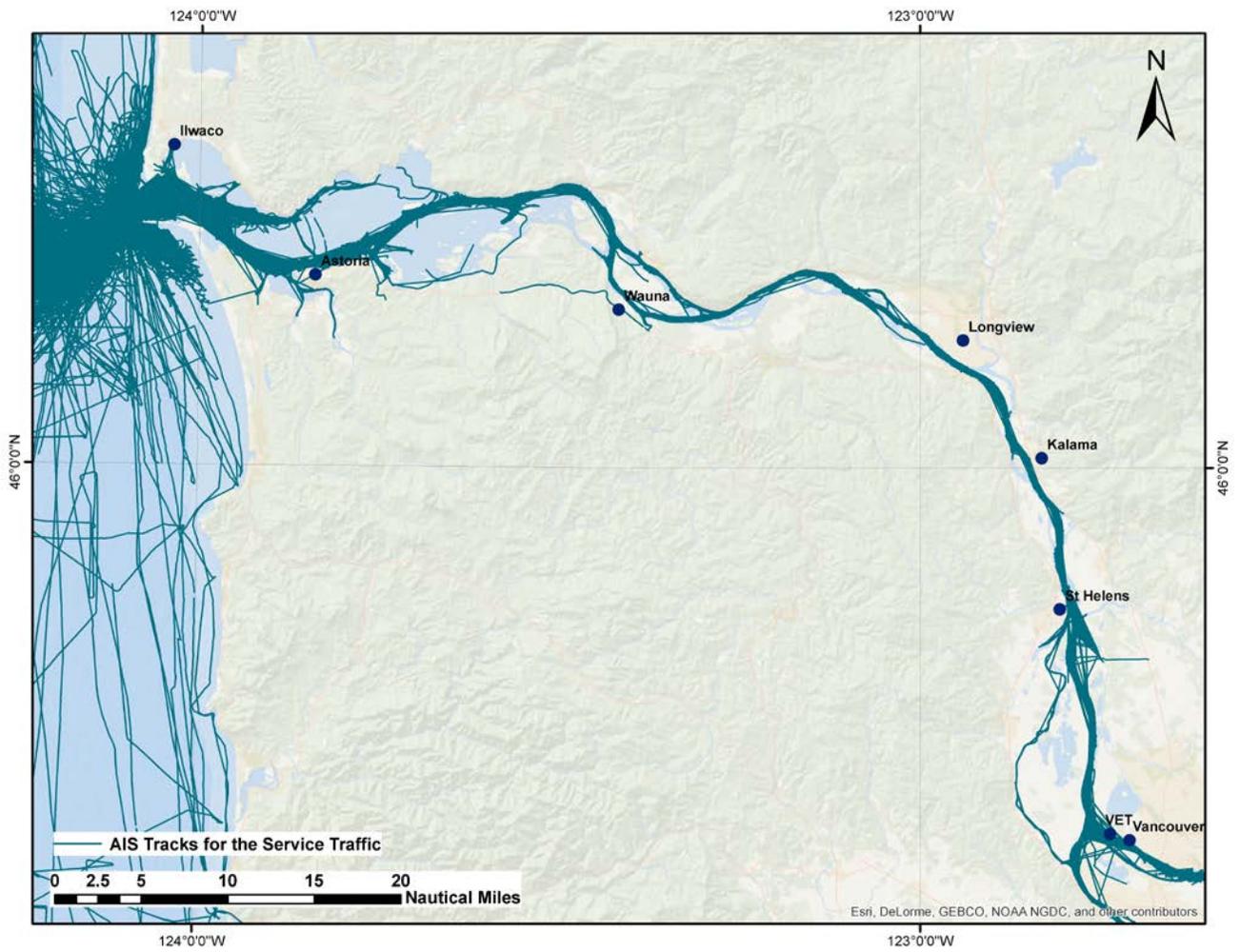


Figure 2-7 AIS Tracks for Service Traffic

Figure 2-8 presents the tracks for tankers in the study area.

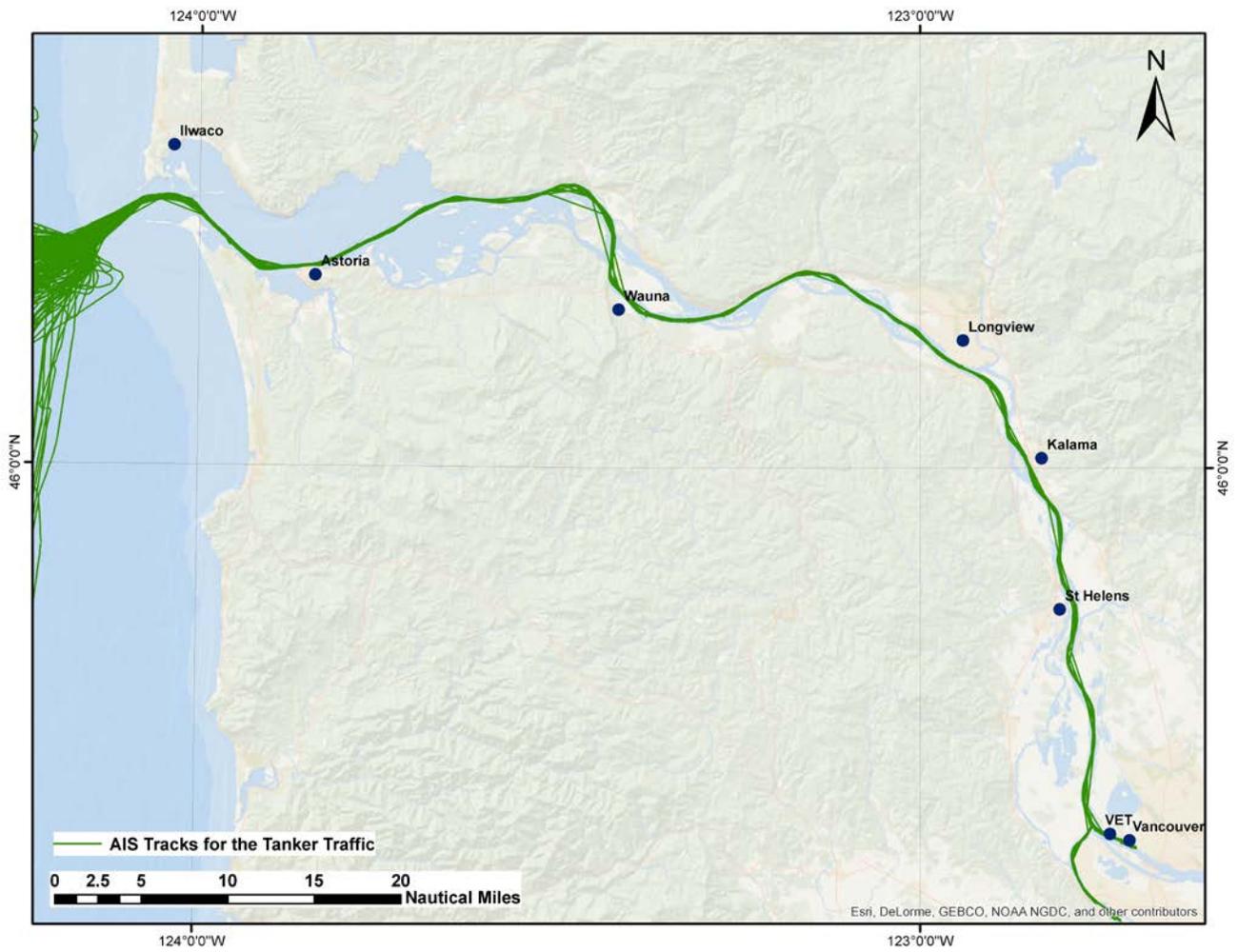


Figure 2-8 AIS Tracks for Tanker Traffic

Figure 2-9 presents the tracks for tugs in the study area.

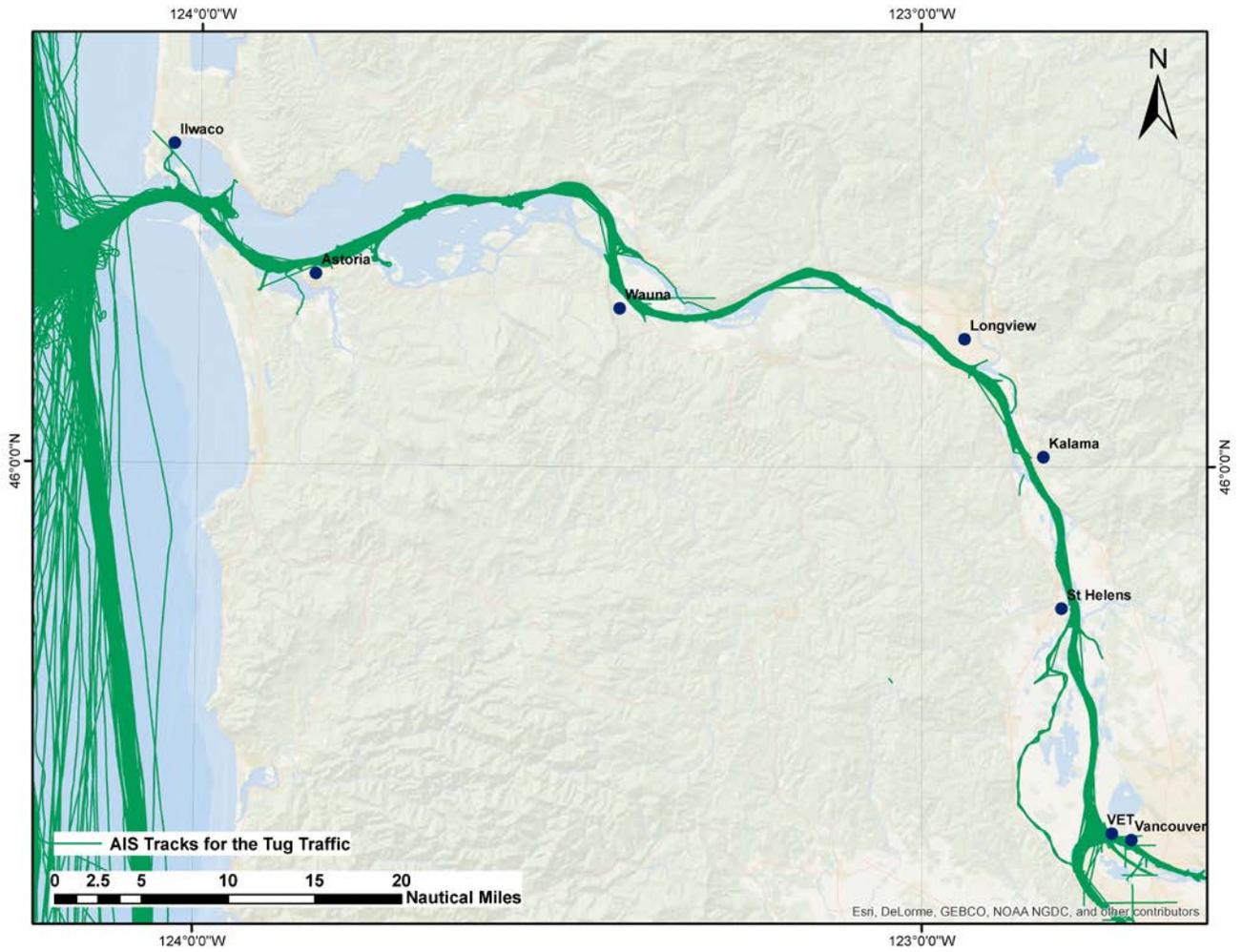


Figure 2-9 AIS Tracks for Tug Traffic

Figure 2-10 presents the tracks for undefined traffic in the study area.

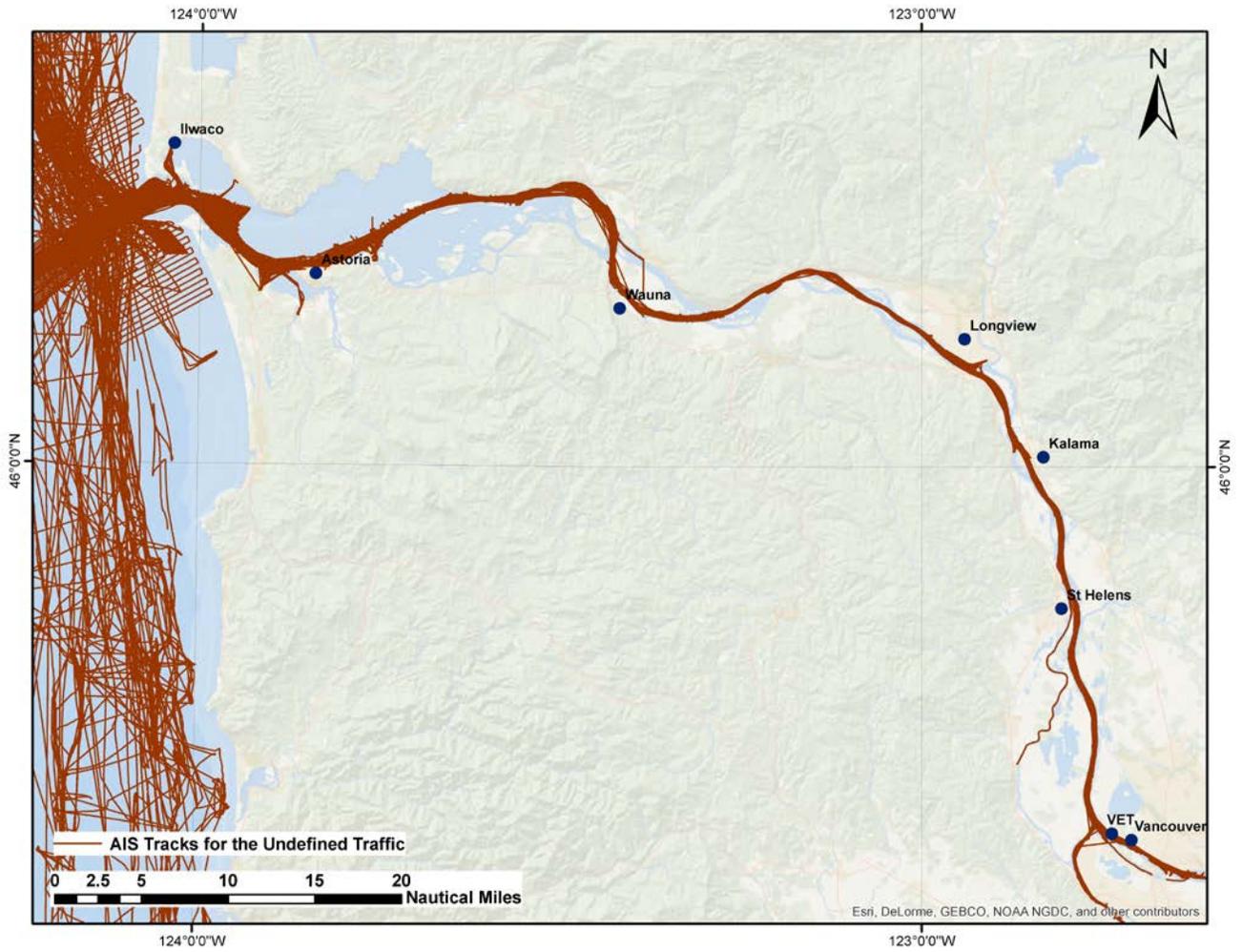


Figure 2-10 AIS Tracks for Undefined Traffic

### 3 TRAFFIC ANALYSIS

The numbers of transits are determined for each defined cross-section along the route to Vancouver Energy. For each cross-section, the AIS tracks are analyzed in terms of number of tracks and ship category. Figure 3-1 presents the locations of the cross-sections.

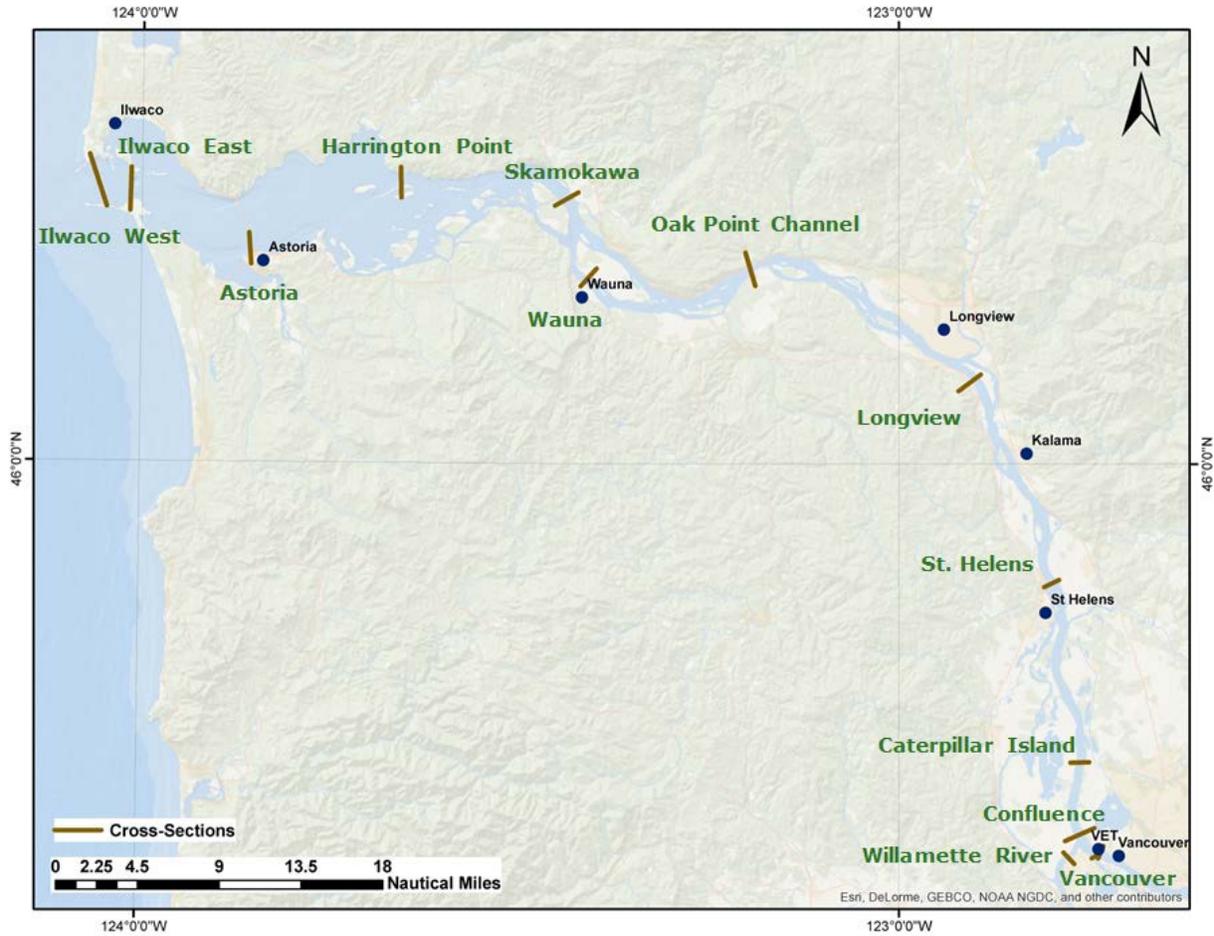


Figure 3-1 Cross-Sections within the Study Area

Table 3-1 shows the number of transits for each ship category at each defined cross-section.

**Table 3-1 Number of Transits at Each Cross-Section and by Ship Category**

Ship Category	Ilwaco West	Ilwaco East	Astoria	Harrington Point	Skamokawa	Wauna	Oak Point Channel	Longview	St Helens	Caterpillar Island	Confluence	Willamette River	Vancouver	Hayden Island
Cargo/Carrier	2,618	2,630	2,609	2,608	2,618	2,605	2,603	2,143	1,802	1,806	1,980	720	850	70
Fishing	2,192	1,895	1,418	60	48	33	30	28	31	8	8	3	7	1
Other	713	273	262	361	620	480	213	239	125	184	171	94	224	11
Passenger	61	62	911	186	188	188	188	187	183	189	207	62	166	4
Pleasure	545	332	334	119	124	117	117	107	152	226	353	150	336	44
Service	3,359	2,387	965	295	108	83	155	461	369	193	466	379	367	61
Tanker	151	152	153	152	154	151	151	154	142	141	148	75	75	-
Tug	926	1,017	1,449	1,498	1,502	4,017	2,166	3,757	3,512	3,659	12,096	9,257	10,438	410
Undefined	846	315	523	415	413	343	151	221	188	175	261	87	260	3
<b>Total</b>	<b>11,411</b>	<b>9,063</b>	<b>8,624</b>	<b>5,694</b>	<b>5,775</b>	<b>8,017</b>	<b>5,774</b>	<b>7,297</b>	<b>6,504</b>	<b>6,581</b>	<b>15,690</b>	<b>10,827</b>	<b>12,723</b>	<b>604</b>

Figure 3-2 presents a histogram of the number of transits for each cross-section.

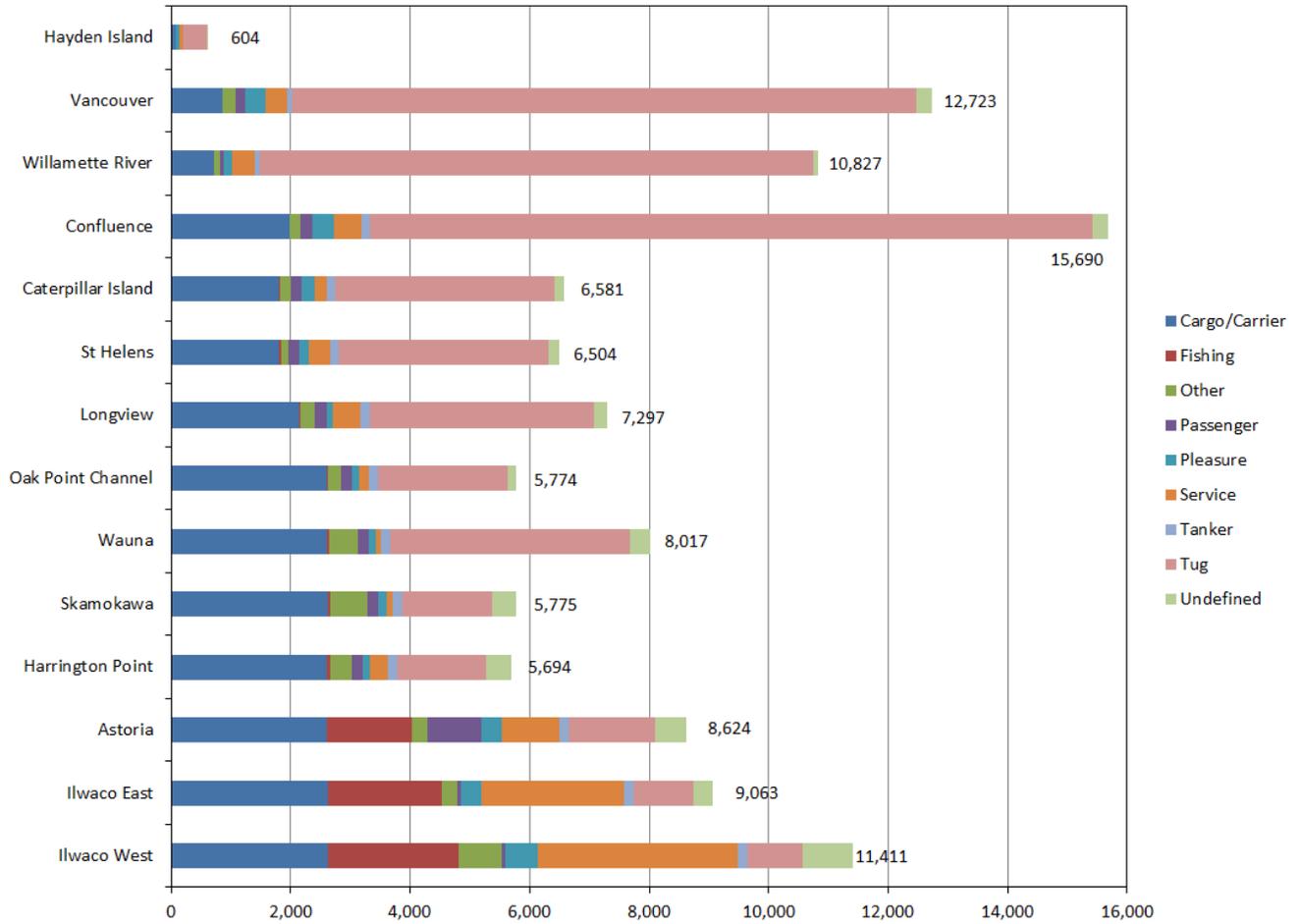
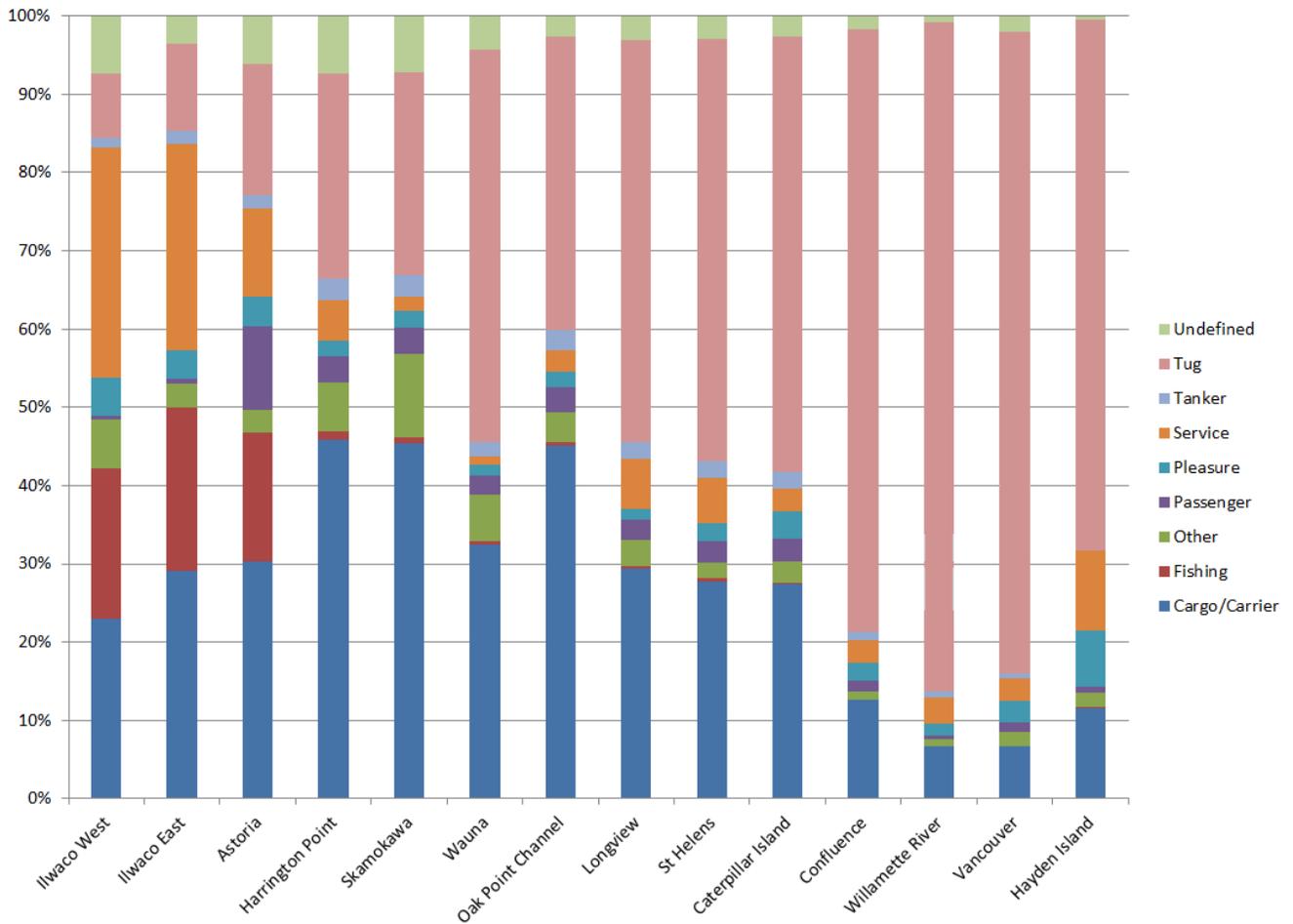


Figure 3-2 Number of Transits at Each Cross-Section and by Ship Category

Figure 3-3 gives the ship category distribution of the vessels crossing each cross-section.



**Figure 3-3 Distribution of the Transits by Ship Category at Each Cross-Section**

## 4 TRAFFIC DENSITY

AIS data is used to map the traffic density of the study area. The AIS dataset has been translated into the number of AIS points per grid cell (0.005 x 0.005 decimal degrees), which is interpreted as vessel density. A 'heat' map will be presented for each vessel category.

Figure 4-1 presents the traffic density heat map for all traffic in the study area.

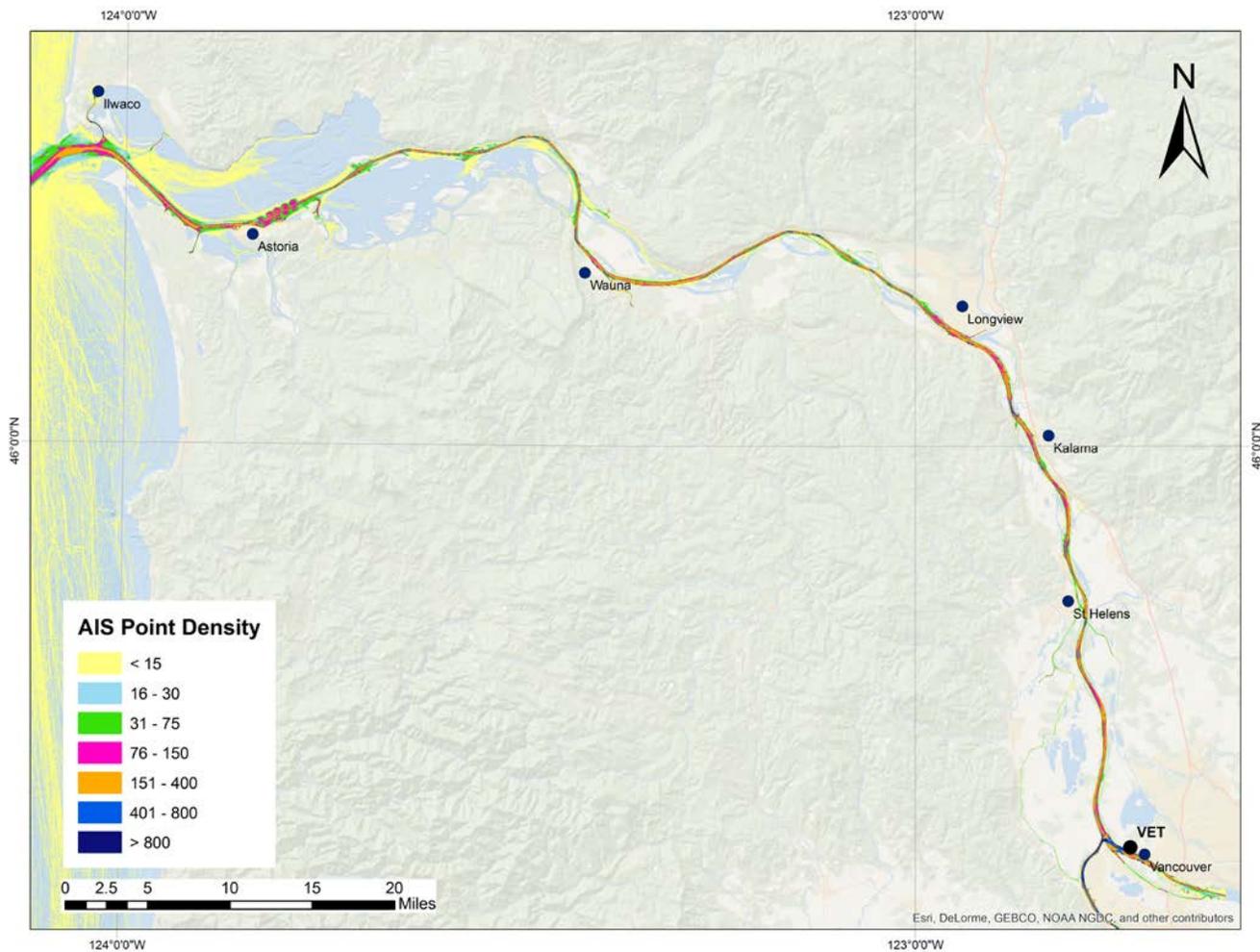


Figure 4-1 Traffic Density for All Traffic

Figure 4-2 presents the traffic density heat map for cargo/carrier vessels the study area.

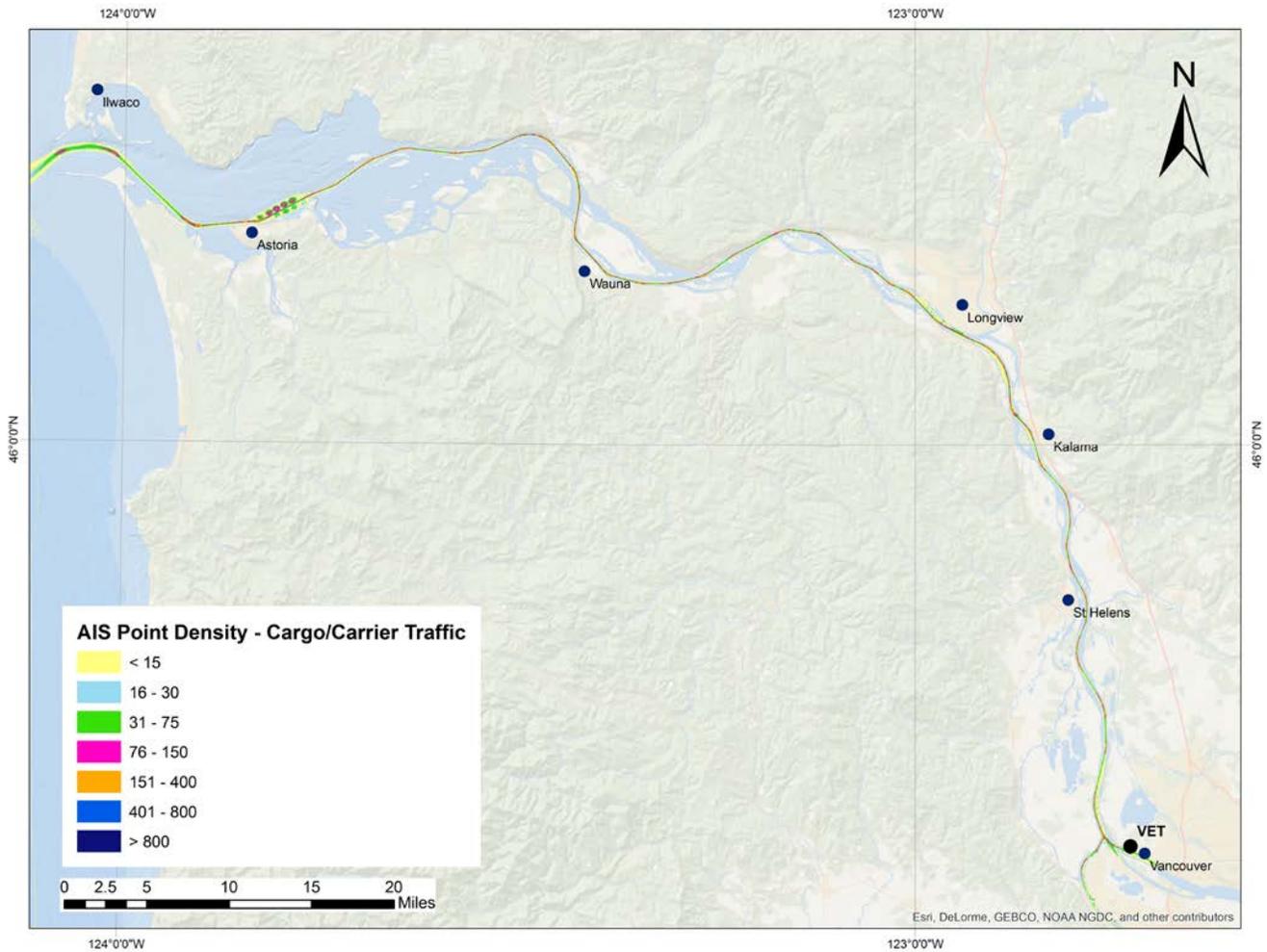


Figure 4-2 Traffic Density for Cargo/Carrier Traffic

Figure 4-3 presents the traffic density heat map for fishing vessels the study area.

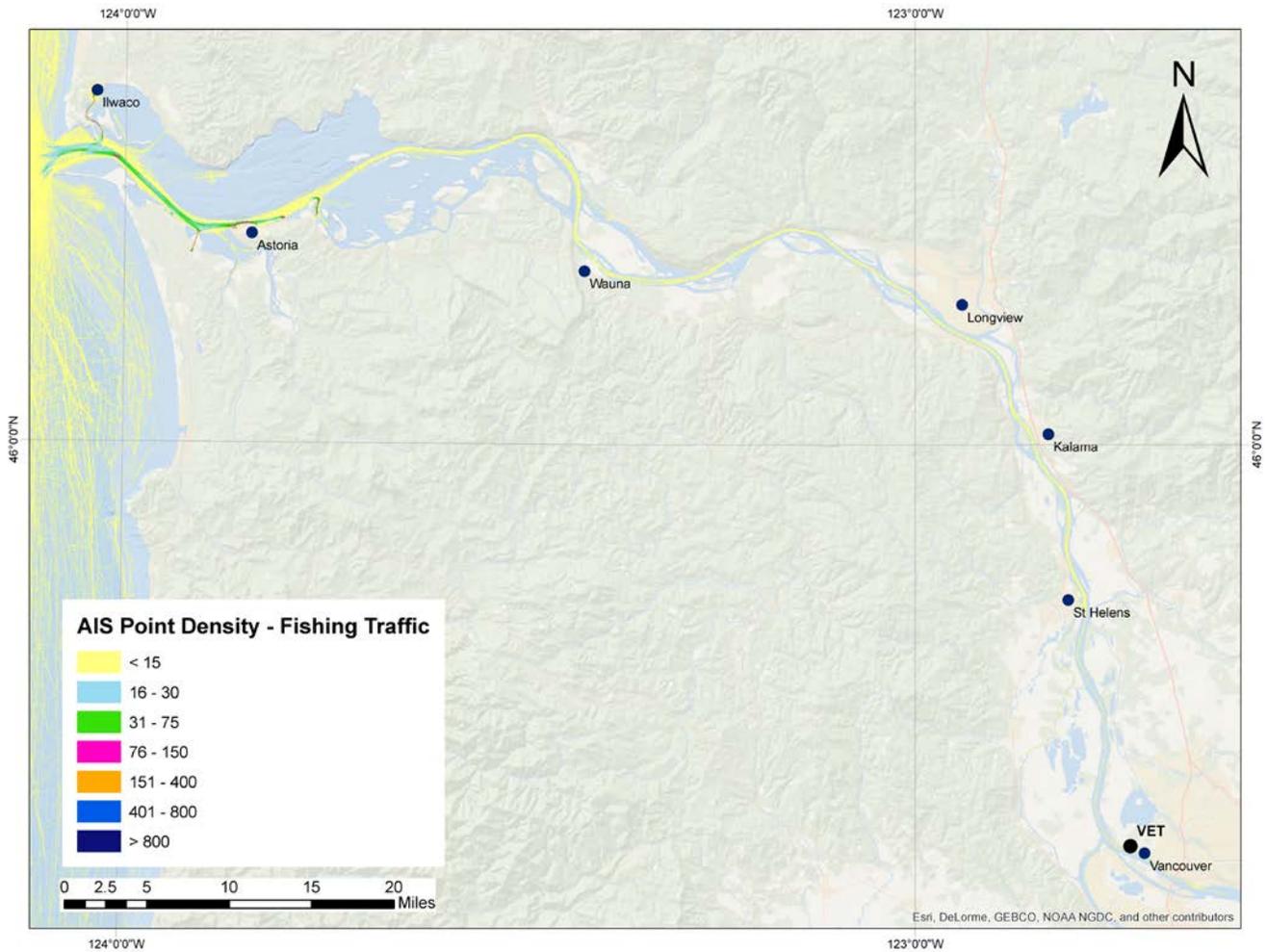


Figure 4-3 Traffic Density for Fishing Traffic

Figure 4-4 presents the traffic density heat map for other traffic the study area.

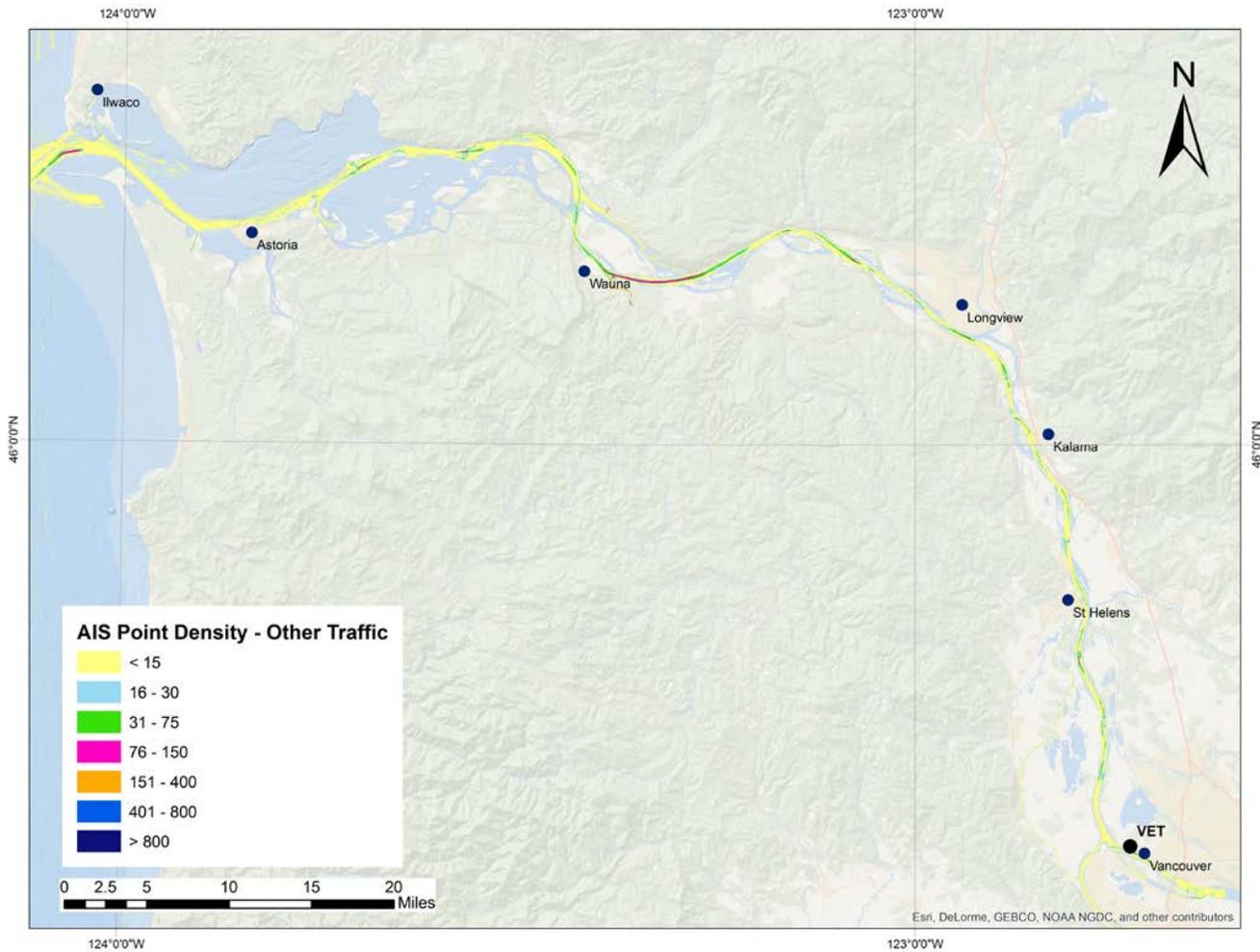


Figure 4-4 Traffic Density for Other Traffic

Figure 4-5 presents the traffic density heat map for passenger traffic the study area.

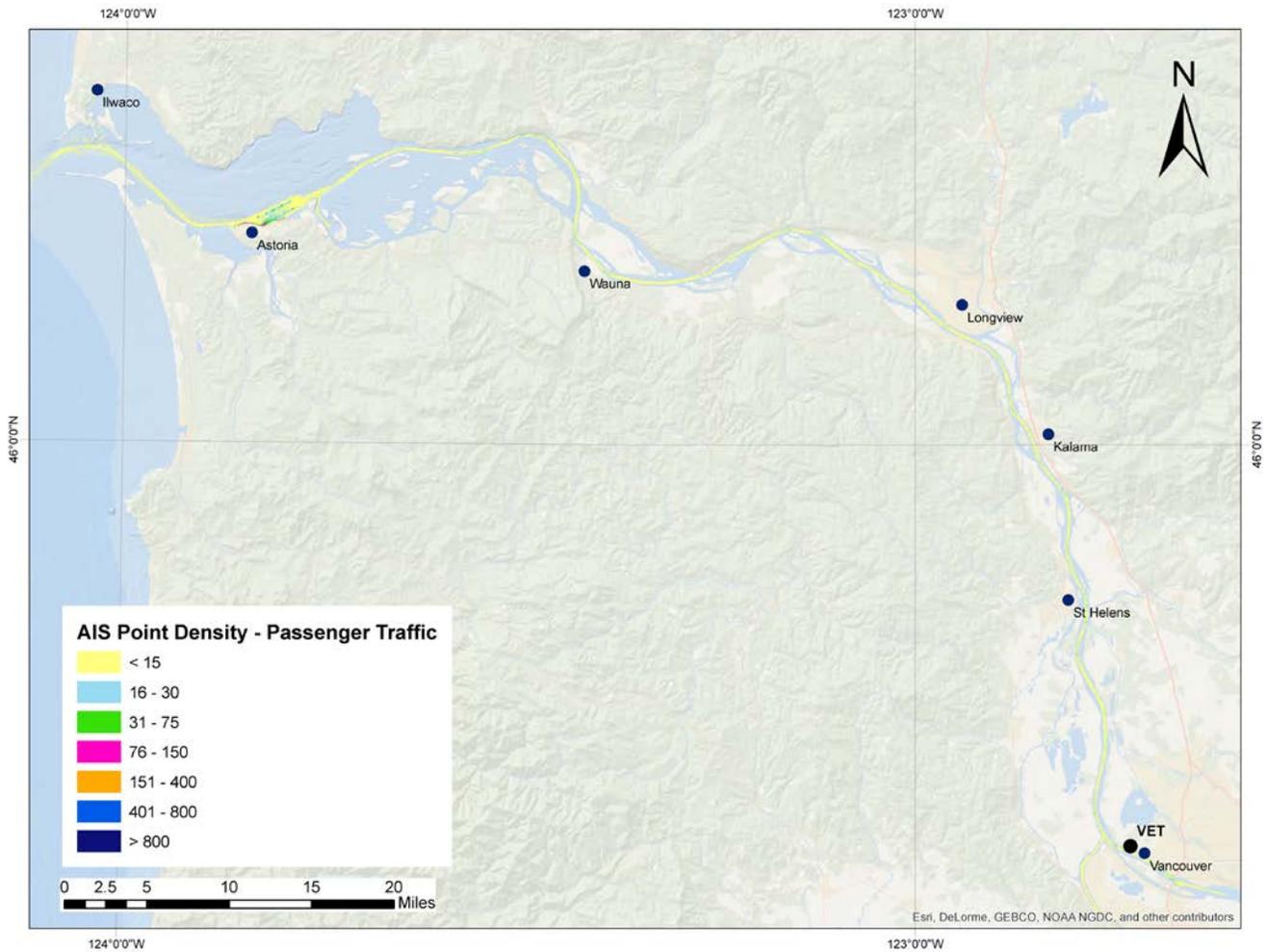


Figure 4-5 Traffic Density for Passenger Traffic

Figure 4-6 presents the traffic density heat map for pleasure traffic the study area.

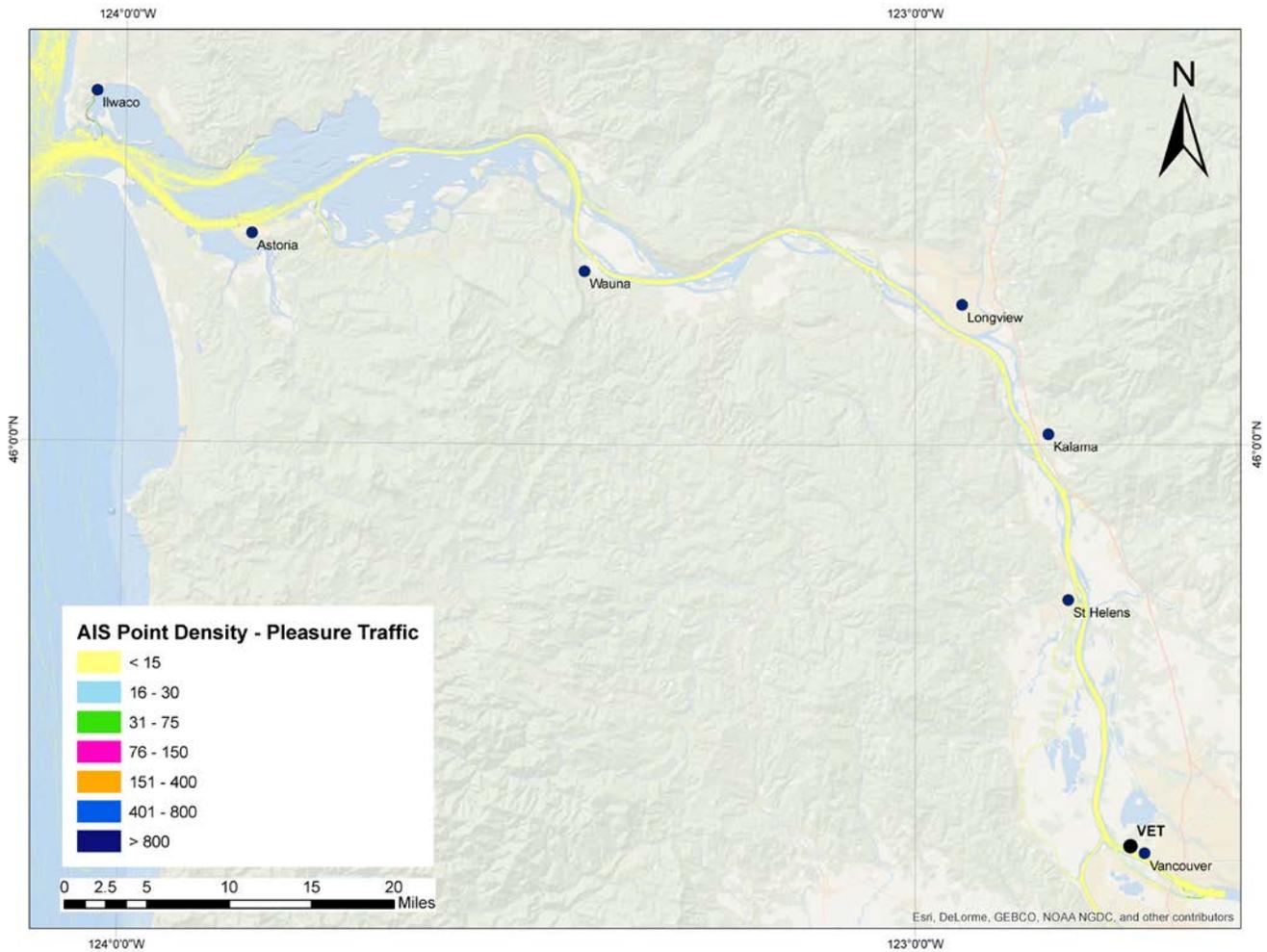


Figure 4-6 Traffic Density for Pleasure Traffic

Figure 4-7 presents the traffic density heat map for service vessels the study area.

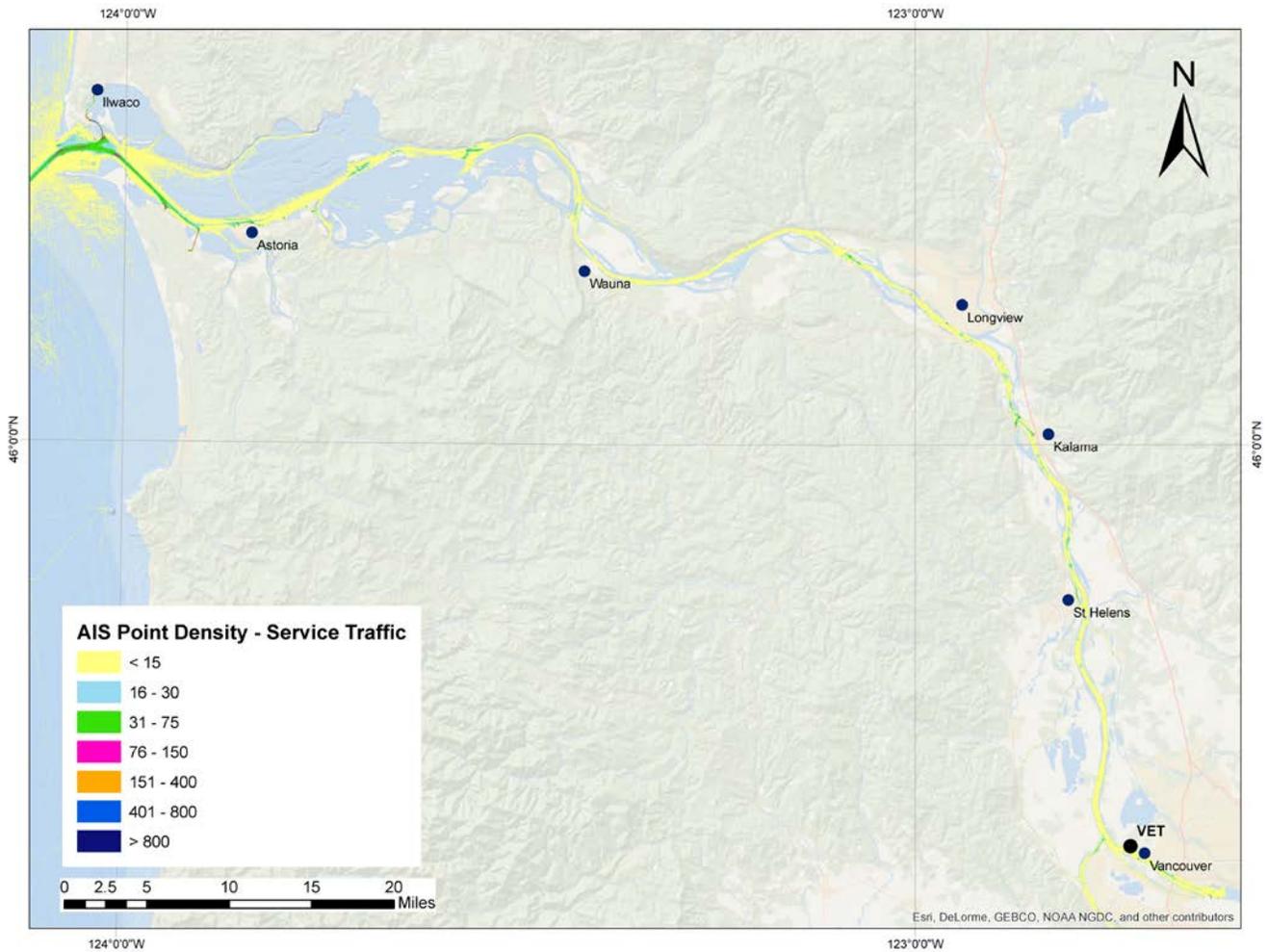


Figure 4-7 Traffic Density for Service Traffic

Figure 4-8 presents the traffic density heat map for tanker traffic the study area.

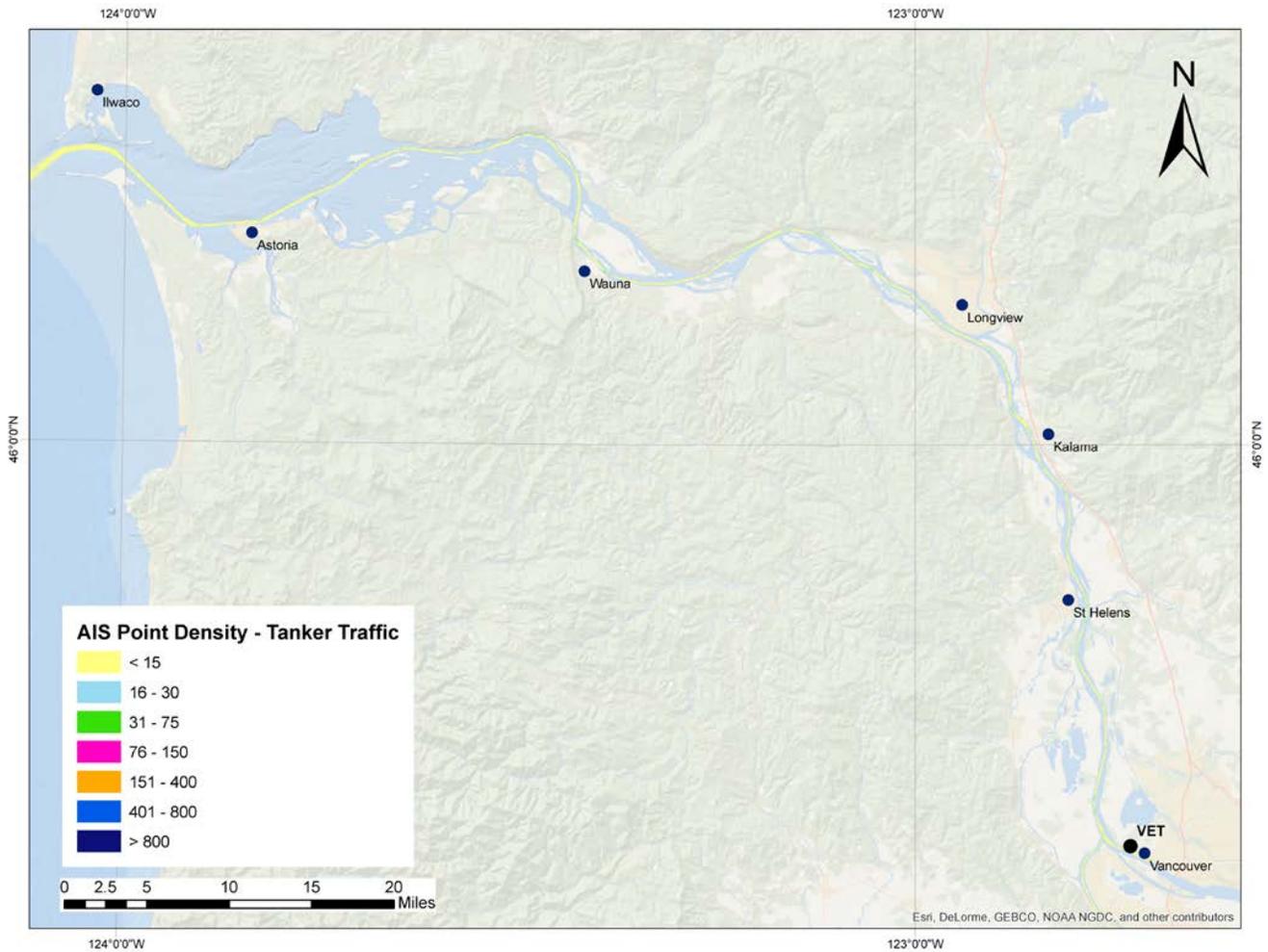


Figure 4-8 Traffic Density for Tanker Traffic

Figure 4-9 presents the traffic density heat map for tug traffic the study area.

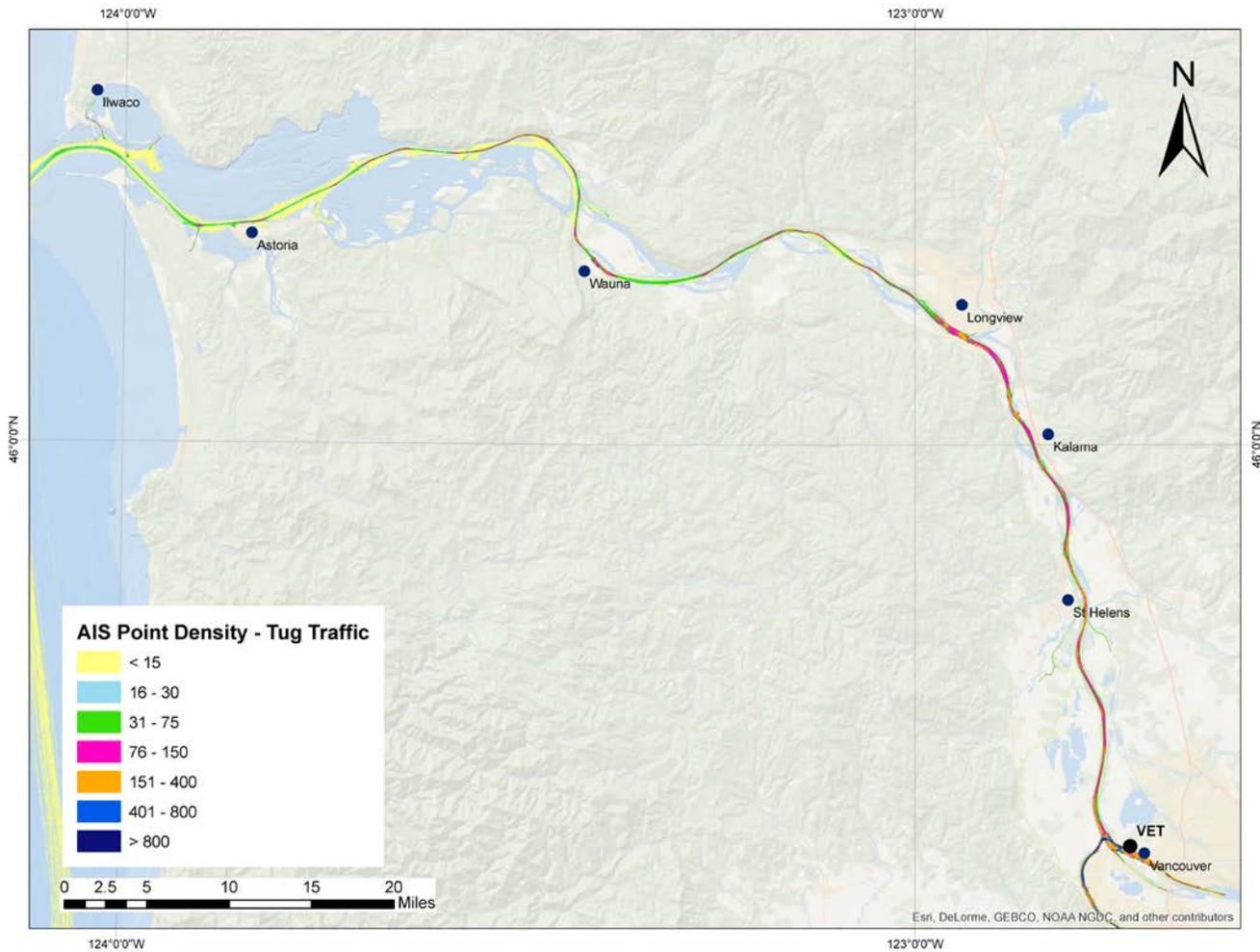


Figure 4-9 Traffic Density for Tug Traffic

Figure 4-10 presents the traffic density heat map for undefined traffic the study area.

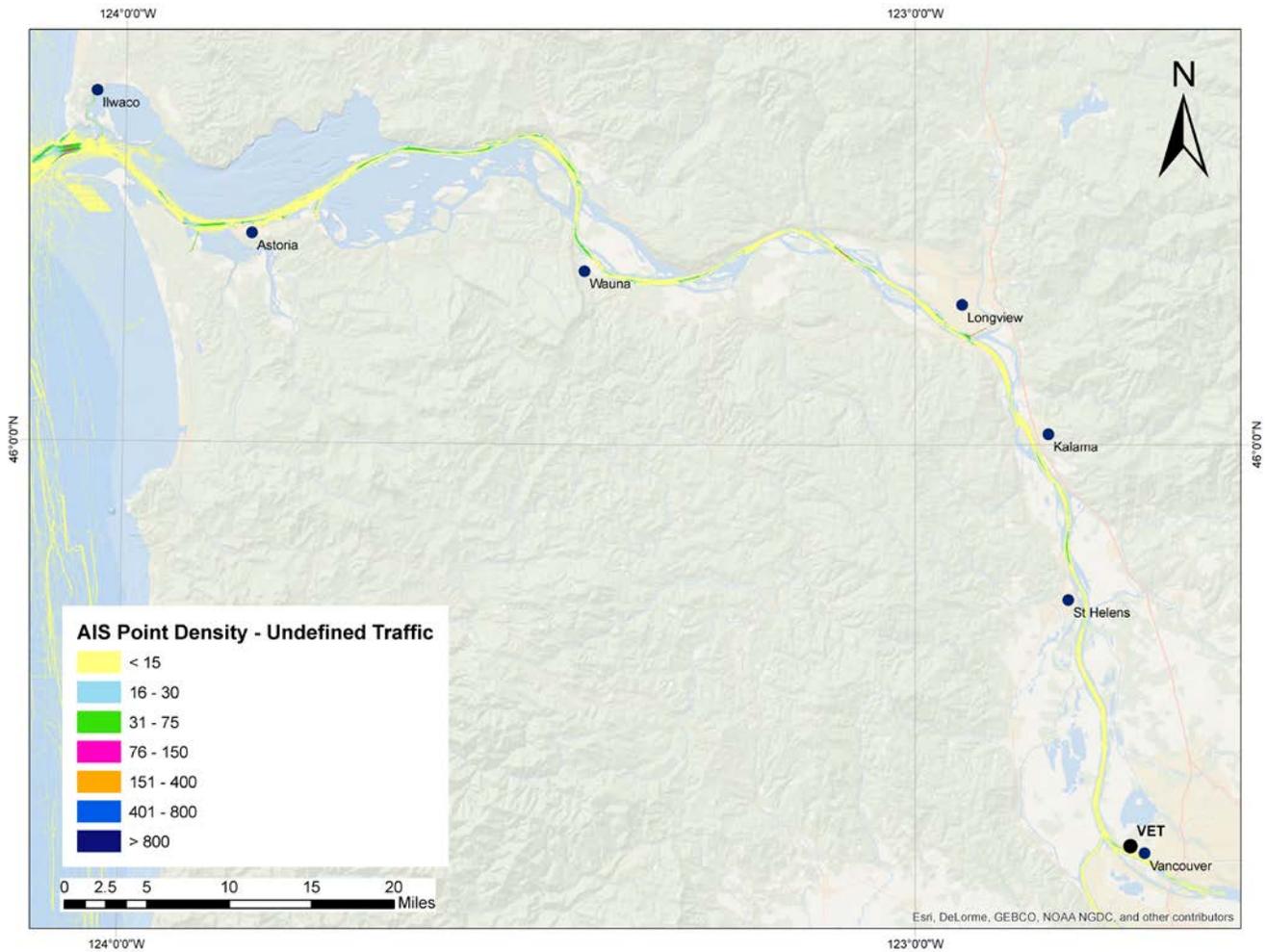


Figure 4-10 Traffic Density for Undefined Traffic

## 5 TRAFFIC SPEED PROFILES

The speed profile is created by assessing the average speed per grid cell in the study area. The speed is determined utilizing the time lapse between each data point. A speed map will be presented for each vessel category.

Figure 5-1 presents the speed profile for all traffic.

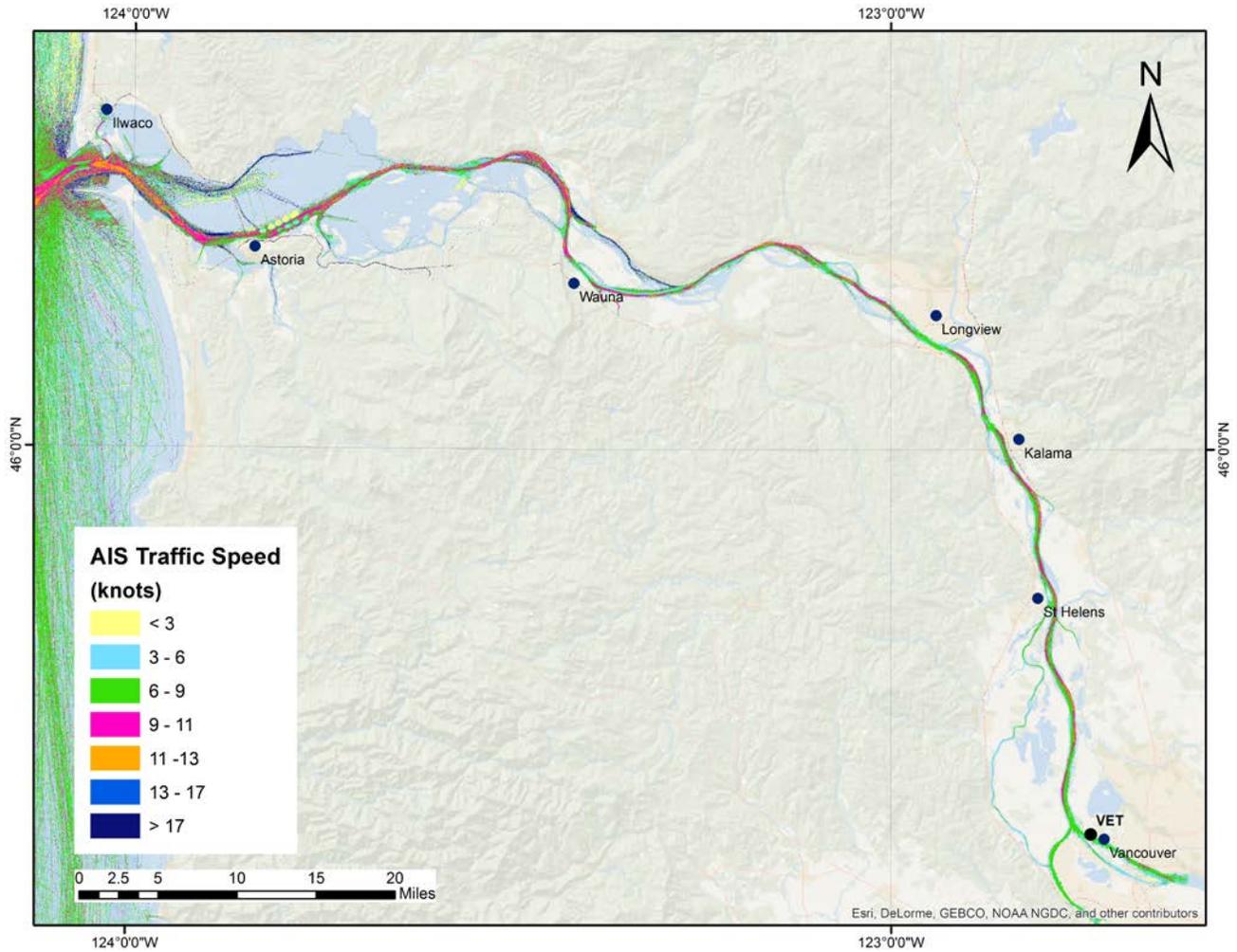


Figure 5-1 Speed Profile for All Traffic

Figure 5-2 presents the speed profile for cargo/carrier traffic.

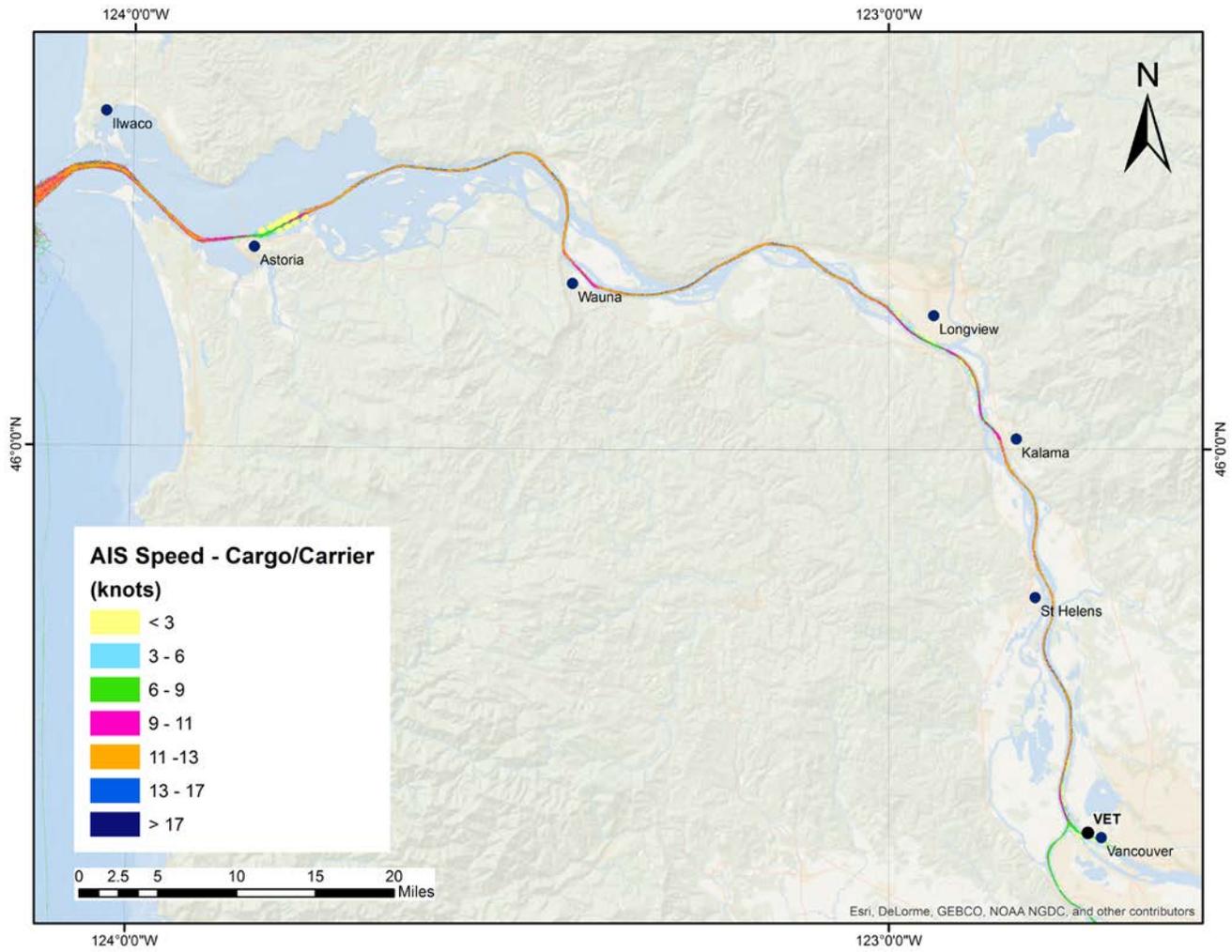
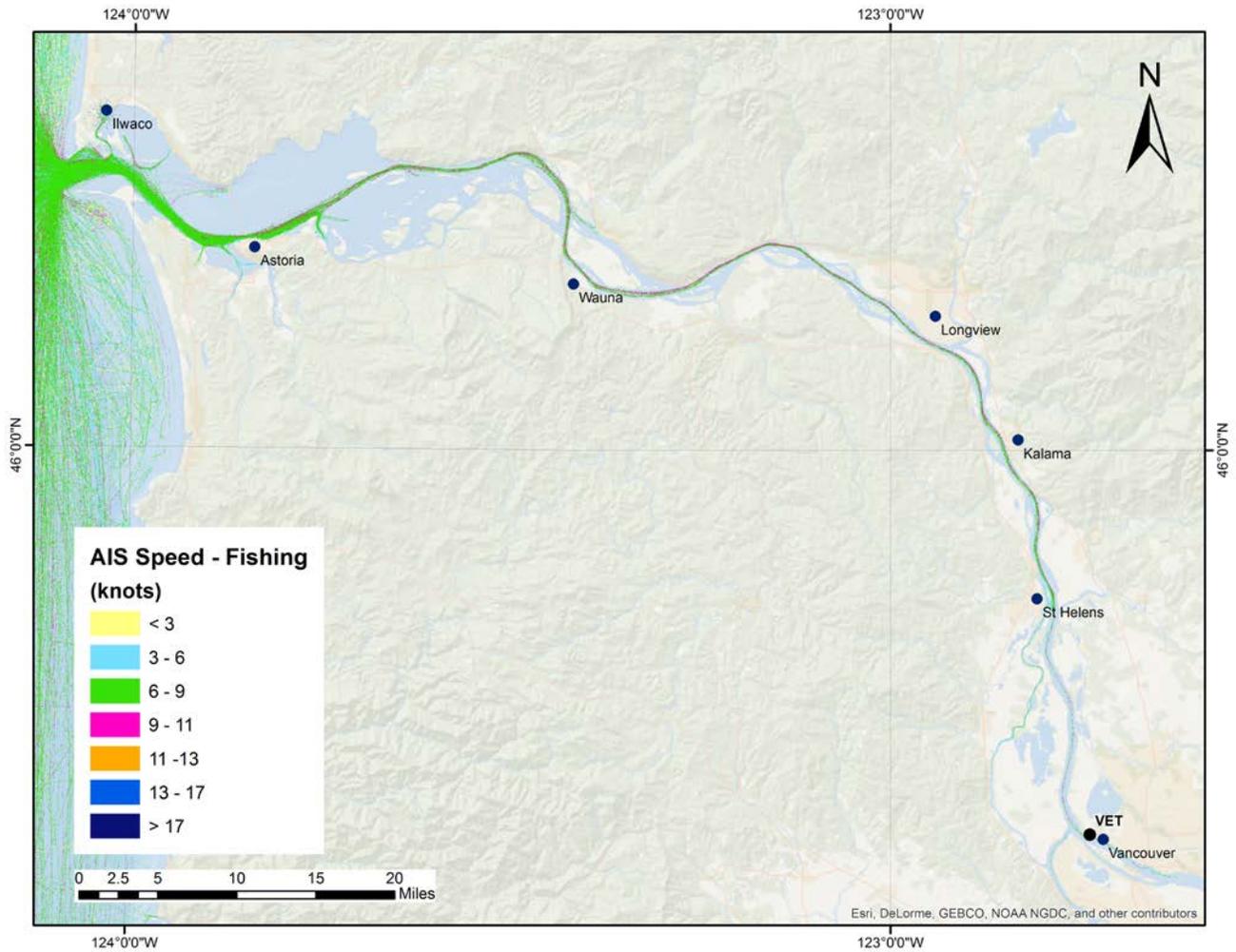


Figure 5-2 Speed Profile for Cargo/Carrier Traffic

Figure 5-3 presents the speed profile for fishing traffic.



**Figure 5-3 Speed Profile for Fishing Traffic**

Figure 5-4 presents the speed profile for other traffic.

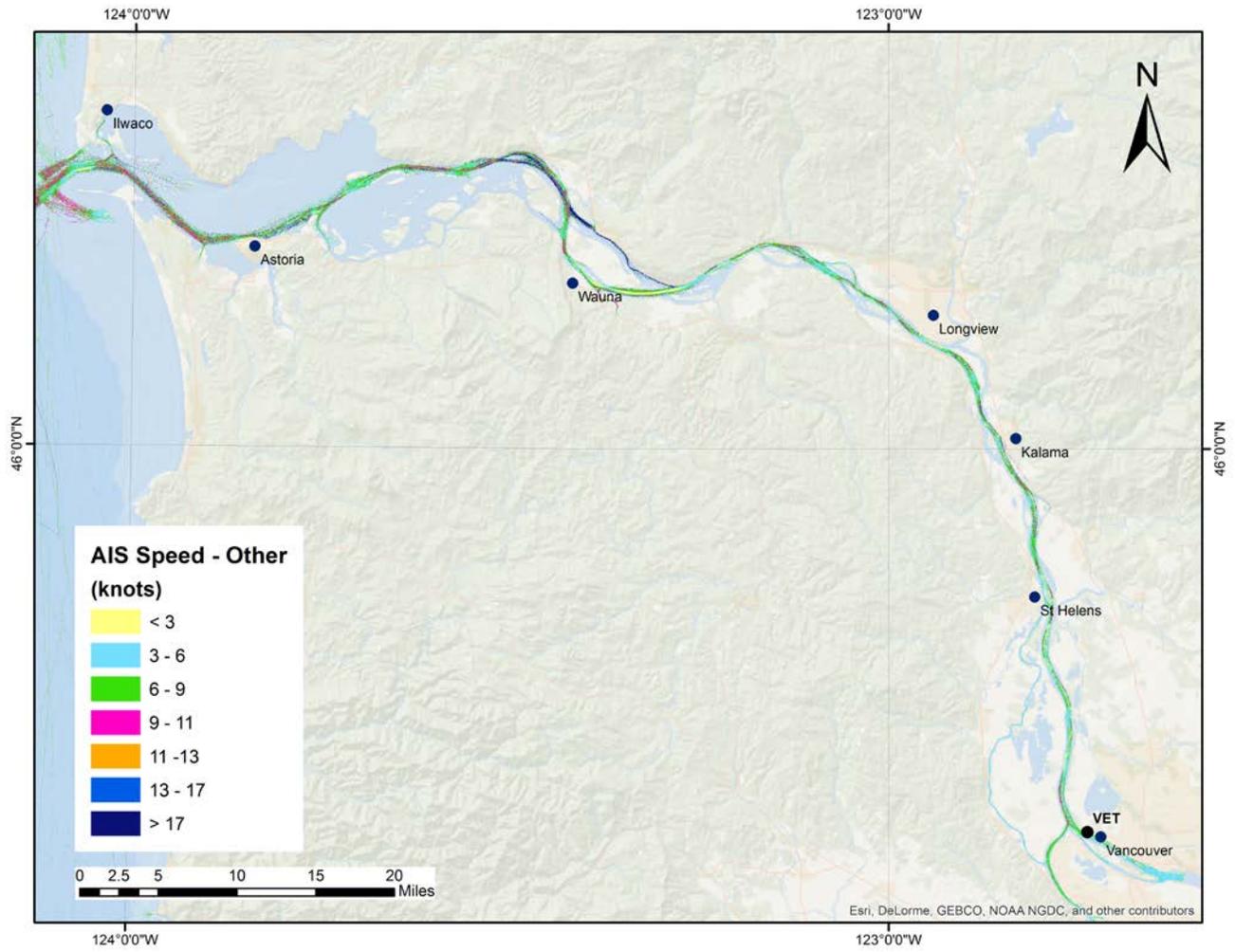


Figure 5-4 Speed Profile for Other Traffic

Figure 5-5 presents the speed profile for passenger traffic.

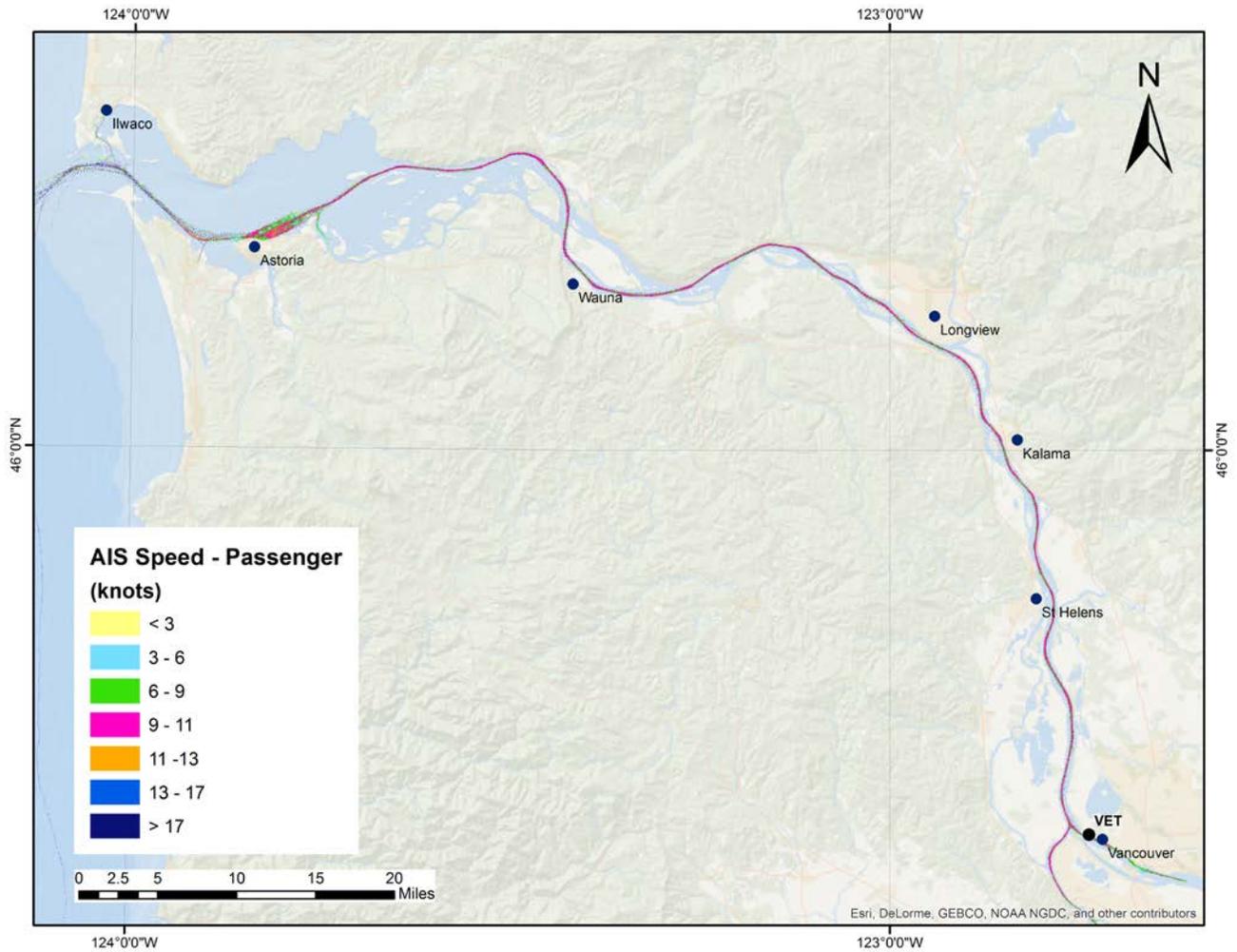


Figure 5-5 Speed Profile for Passenger Traffic

Figure 5-6 presents the speed profile for pleasure traffic.

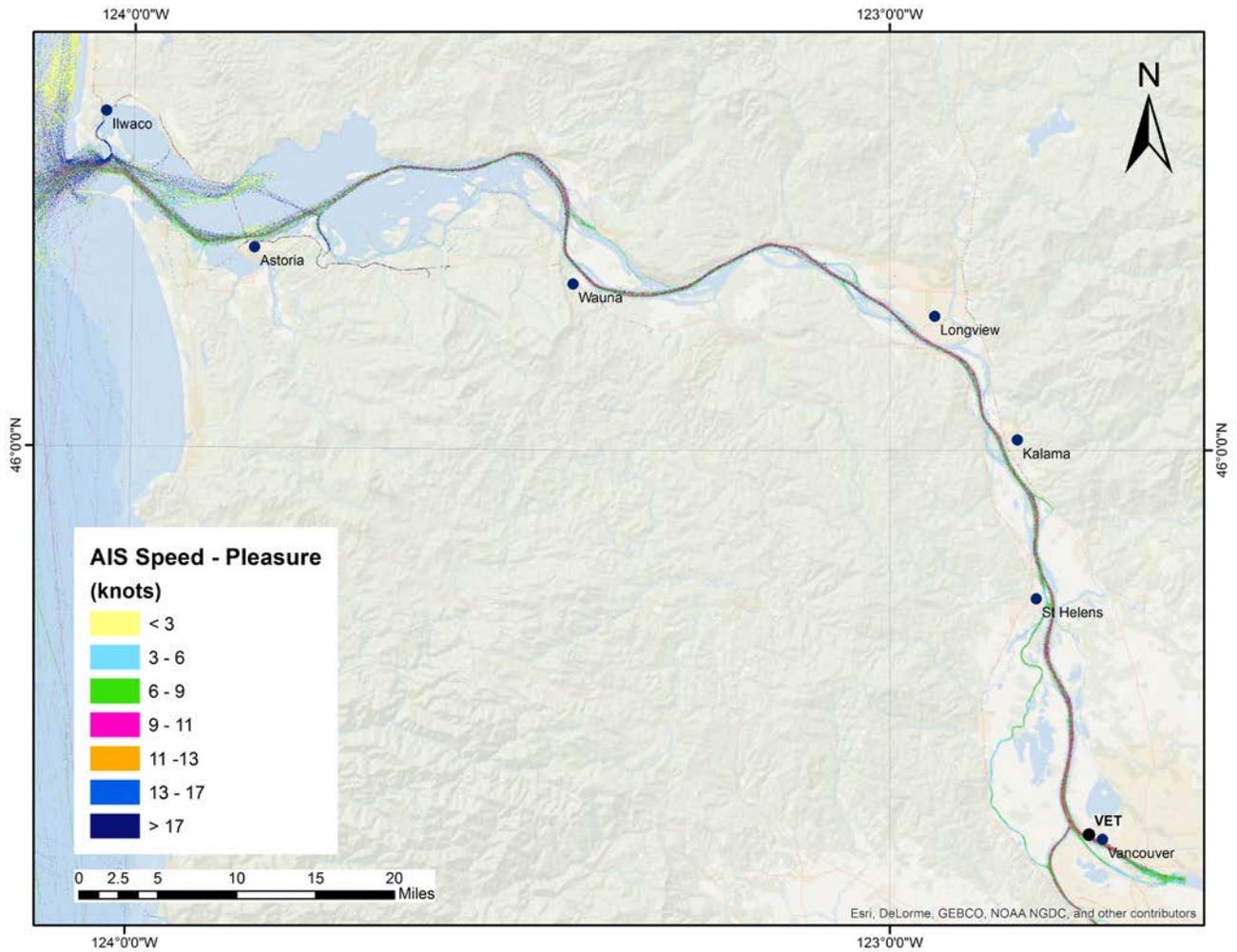


Figure 5-6 Speed Profile for Pleasure Traffic

Figure 5-7 presents the speed profile for service traffic.

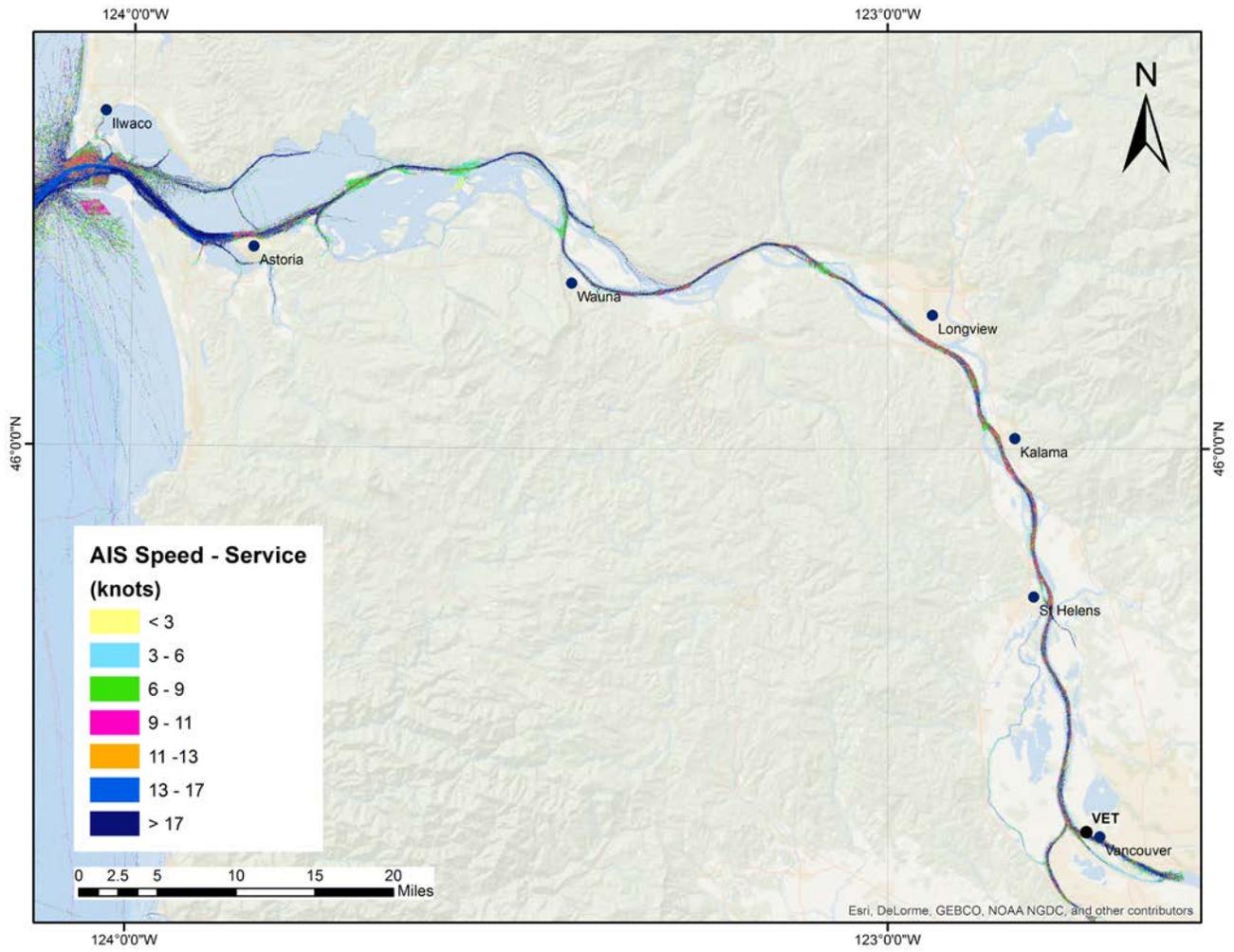


Figure 5-7 Speed Profile for Service Traffic

Figure 5-8 presents the speed profile for tanker traffic.

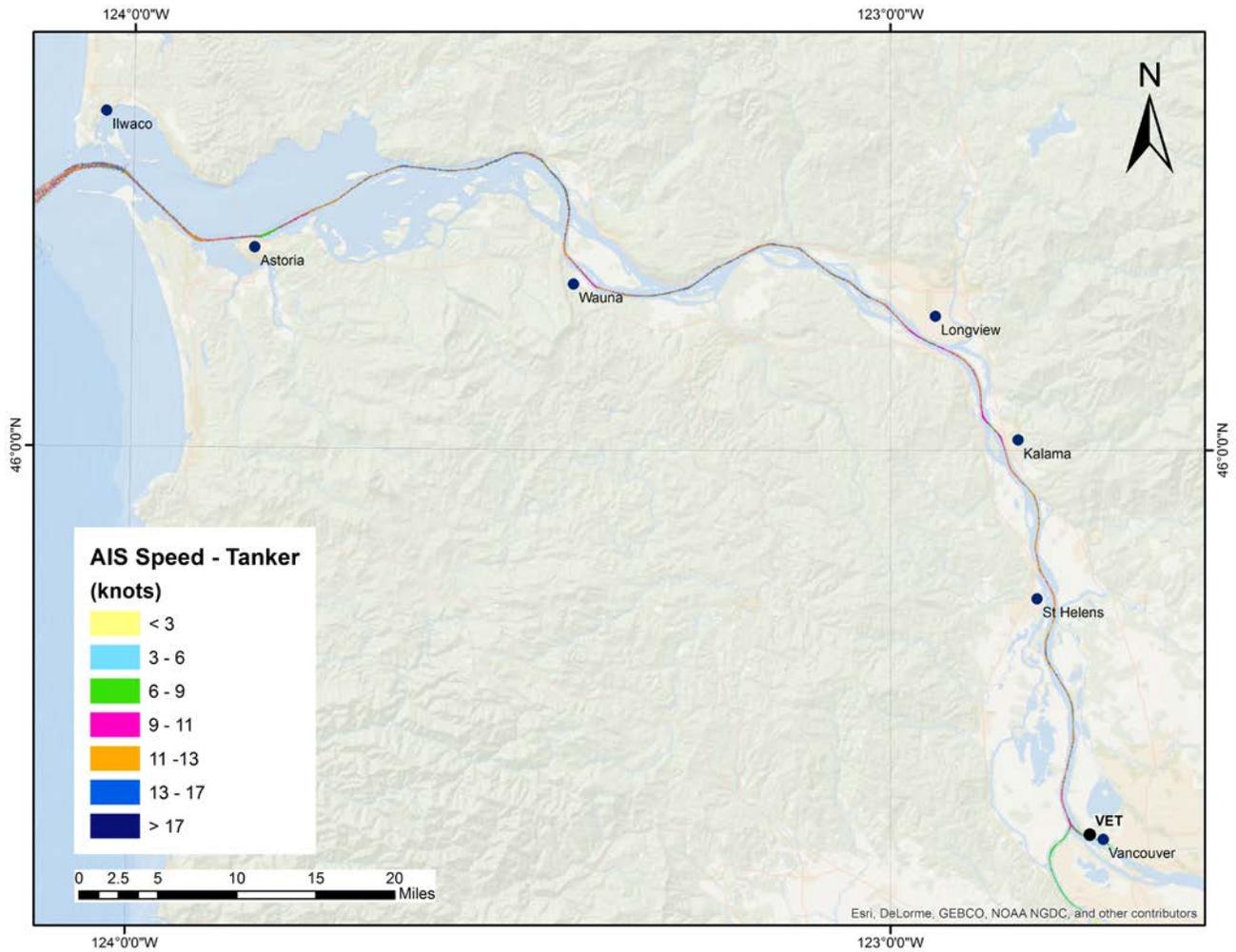


Figure 5-8 Speed Profile for Tanker Traffic

Figure 5-9 presents the speed profile for tug traffic.

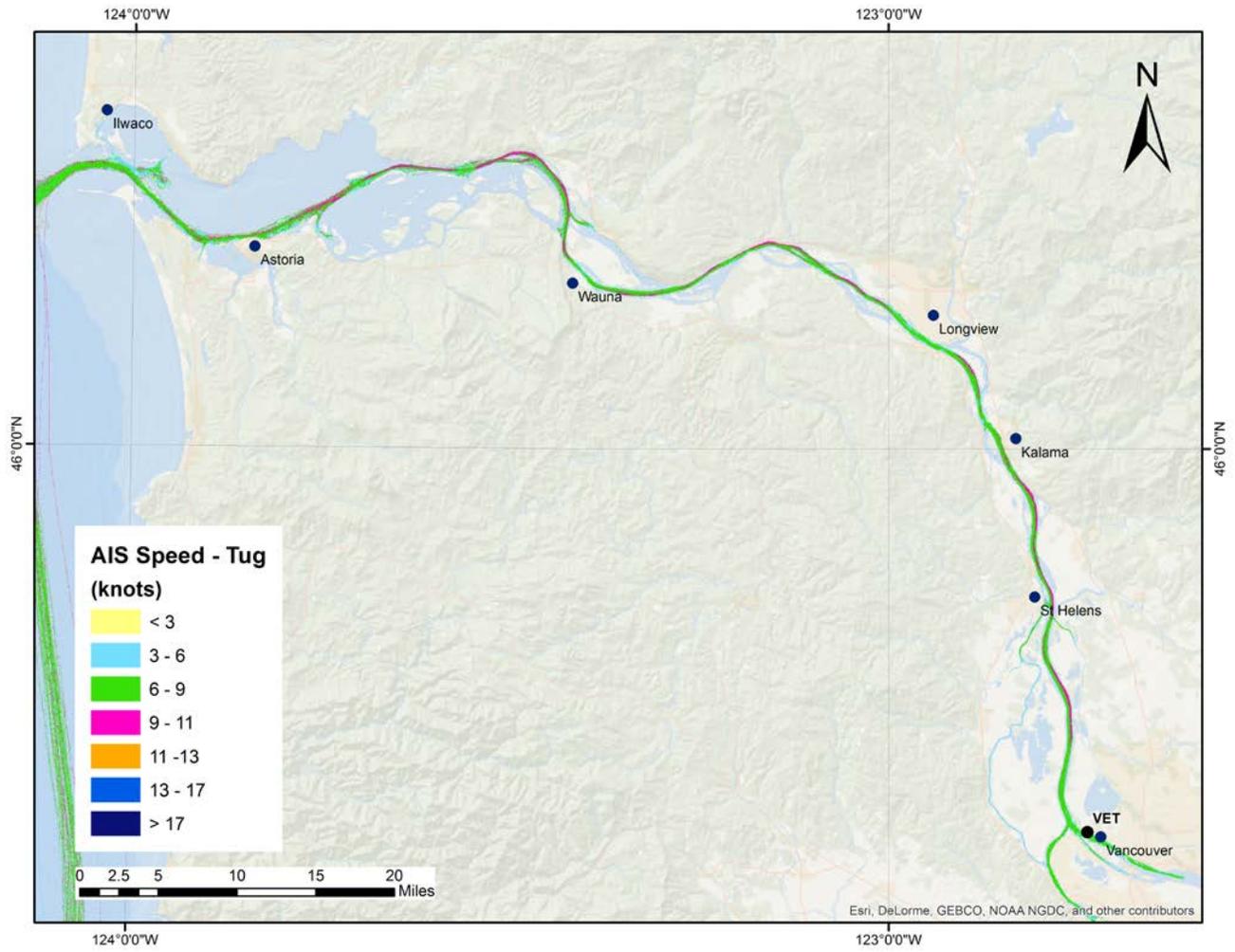


Figure 5-9 Speed Profile for Tug Traffic

Figure 5-10 presents the speed profile for undefined traffic.

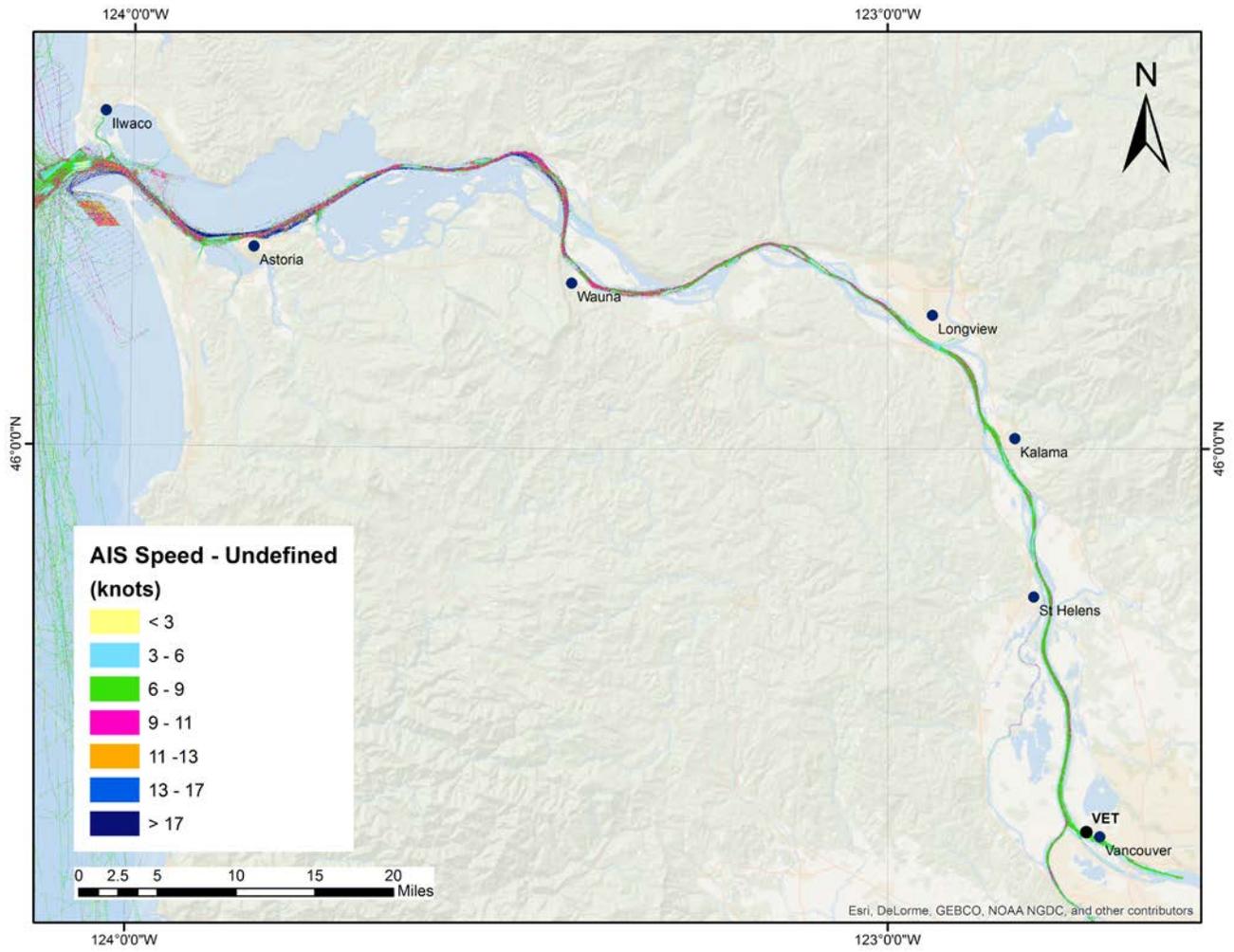


Figure 5-10 Speed Profile for Undefined Traffic



## 6 REFERENCES

/1/	Merchants Exchange in Portland, Oregon (2015)
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## ABOUT DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16,000 professionals are dedicated to helping our customers make the world safer, smarter and greener.