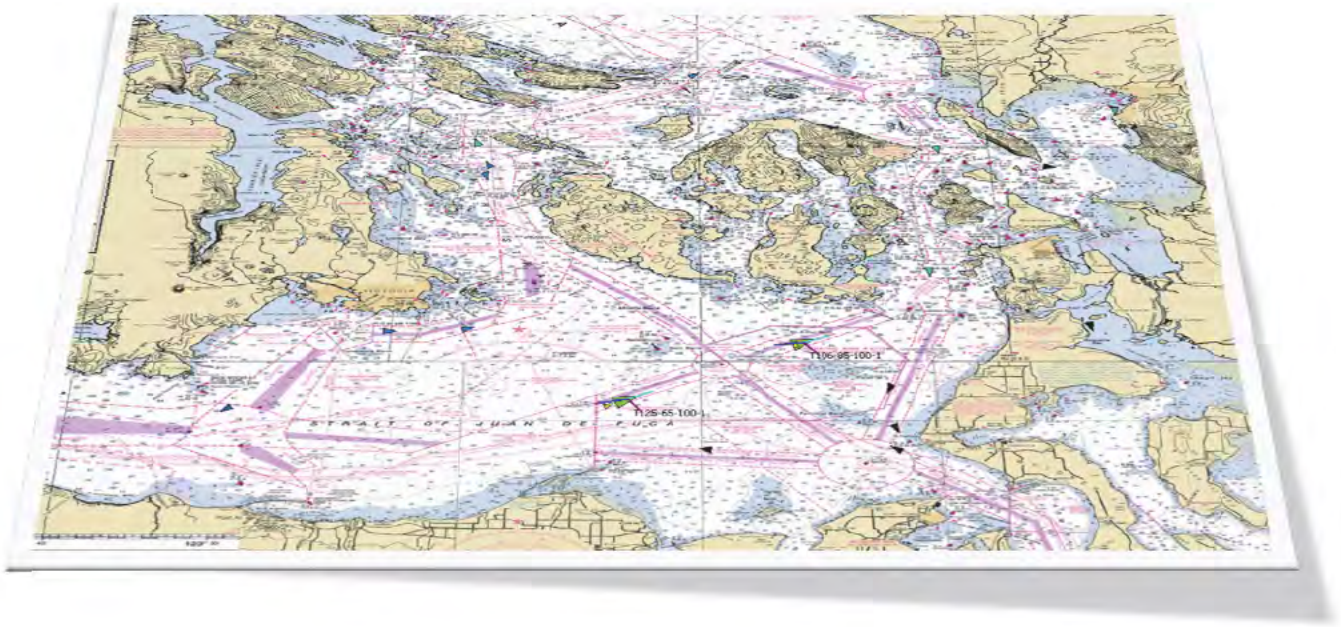
CHAPTER 4

VTRA 2010 FINAL REPORT

Preventing Oil Spills from Large Ships and Barges In Northern Puget Sound & Strait of Juan de Fuca



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4. VALIDATION OF 2010 VTOSS AND AIS 2010 CROSSING LINE DATA

AIS data is collected on a regular basis by the Marine Exchange Puget Sound (MXPS). Amongst other reports the Marine Exchange AIS system is able to produce crossing line count reports by cargo, tanker and passenger vessel at a line drawn on a nautical map. At our request, the MXPS produced these reports for three counting lines depicted in Figure 38 for the year 2010. Panel A, provides an overview look of the three counting lines, whereas Panels B, C and D provide a close-up view of these three counting lines separately. For the West Strait of Juan de Fuca line the crossing line count data separates eastbound and westbound traffic, whereas for the Georgia Strait and Puget Sound crossing lines count data is separated in north and southbound traffic as depicted in Panels B,C and D in Figure 38. Unfortunately, no AIS data is available for the year 2005 for the geographic area in Figure 38A.

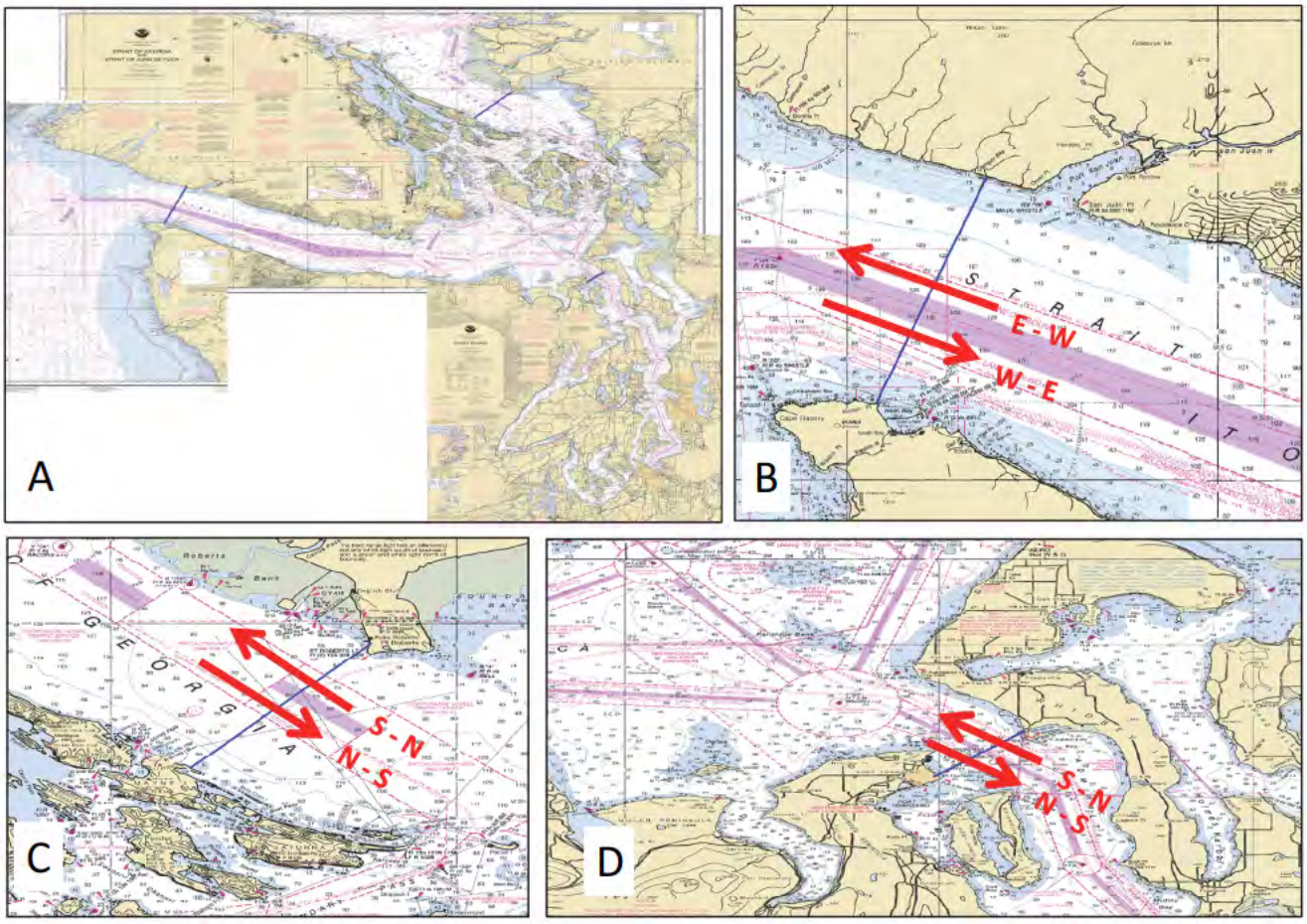

Figure 38. A: Overview of three AIS crossing definitions; B: Close-up view of crossing line at the West Strait of Juan de Fuca Entrance; C: Close-up view of crossing line at the George Strait entrance; D: Close-up view of the crossing line at the Puget Sound entrance.

Crossing line analysis of AIS 2010 data.

Table 8 provides the AIS 2010 crossing line counts for the three crossing lines depicted in Figure 38. From Table 4 one observe that per this data source it appears more traffic traveled north bound at the Georgia Strait Entrance (100%) than south bound (85%). For the West Strait of Juan de Fuca and Puget Sound crossing lines one observe a much more even distribution with about the same amount of traffic travelling in both directions. Moreover, a larger amount of traffic crosses the WSFJ crossing line (8217 – 150%), followed by the Puget Sound crossing line (5639 – 103%) and Georgia Strait crossing line (5471 – 100%). Hence, approximately 50% more traffic crosses the WSJF crossing line than the Georgia Strait crossing line, whereas only 3% more crosses the Puget Sound crossing line.

Table 8. AIS 2010 Crossing line counts by vessel types: cargo, tanker and passenger vessel. A: West Strait of Juan de Fuca crossing Line counts; B: Georgia Strait crossing Line counts; C: Puget Sound crossing line counts.

A: WSJF CROSSING LINE

Ship Type	East Bound	West Bound	Grand Total
Cargo	3216	3157	6373
Tanker	694	685	1379
Passenger	244	221	465
Grand Total	4154 - 100%	4063 - 98%	8217

B: GEORGIA STRAITE CROSSING LINE

Ship Type	North Bound	South Bound	Grand Total
Cargo	2278	2133	4411
Tanker	267	266	533
Passenger	414	113	527
Grand Total	2959 - 100%	2512 - 85%	5471

C: PUGET SOUND CROSSING LINE

Ship Type	North Bound	South Bound	Grand Total
Cargo	1754	1766	3520
Tanker	95	95	190
Passenger	958	971	1929
Grand Total	2807 - 100%	2832 - 101%	5639

Matching VTOSS 2010 Vessel Types to AIS 2010 Vessel Types.

The AIS crossing line counting feature depicted in Figure 38 was programmed into the VTRA 2010 simulation model to mimic the same counting procedure for each of the 26 different vessel type classifications listed in Table 4. Table 9 provides the crossing counts by vessel type and Table 10 by vessel master type as defined in Table 4 using the VTOSS 2010 dataset.

Table 9. GW/VCU MTS Crossing line counts using VTOSS 2010 data by 26 different vessel type classifications.

VESSEL TYPE	Master Type	TOT WSJF W-E	TOT WSJF E-W	TOT G_STR N-S	TOT G_STR S-N	TOT PS N-S	TOT PS S-N
BULKCARRIER	Cargo	1446	1493	1034	1023	300	309
CHEMICALCARRIER	Tanker	152	155	142	127	18	18
CONTAINERSHIP	Cargo	1045	1047	440	547	1004	994
DECKSHIPCARGO	Cargo	2	26	2	17	10	35
FERRY	Passenger	0	0	0	0	572	572
FERRYNONLOCAL	Passenger	1	5	1	3	423	450
FISHINGFACTORY	Fishing	83	117	20	51	108	133
FISHINGVESSEL	Fishing	3368	3330	227	220	320	329
LIQGASCARRIER	Tanker	2	4	0	0	0	0
NAVYVESSEL	Cargo	49	101	215	239	136	153
OILTANKER	Tanker	406	415	33	86	83	76
OTHERSPECIALCARGO	Cargo	251	253	334	166	102	4
OTHERSPECIFICSERV	Service	7	26	1	9	7	18
PASSENGERSHIP	Passenger	241	62	56	40	164	43
REFRIGERATEDCARGO	Cargo	0	5	0	22	15	27
RESEARCHSHIP	Service	35	51	1	6	42	45
ROROCARGOSHIP	Cargo	5	72	0	10	9	79
ROROCARGOCONTSHIP	Cargo	147	47	0	14	118	46
SUPPLYOFFSHORE	Service	0	5	0	2	33	27
TUGTOWBARGE	Tugtow	333	319	1201	1052	1631	1696
UNKNOWN	Service	0	0	0	0	0	0
USCOASTGUARD	Service	35	49	48	41	72	43
VEHICLECARRIER	Cargo	197	97	5	119	103	130
YACHT	Passenger	29	37	45	21	71	82
ATB	Tanker	58	74	45	48	34	35
ITB	Tanker	0	0	0	0	0	0
	Total	7892	7790	3850	3863	5375	5344

Table 10. GW/VCU VTRA model crossing line counts using VTOSS 2010 data by vessel master type.

Master Type	TOT WSJF W-E	TOT WSJF E-W	TOT G_STR N-S	TOT G_STR S-N	TOT PS N-S	TOT PS S-N
Cargo	3142	3141	2060	2158	1797	1777
Tanker	618	648	222	261	135	129
TugTow	333	319	1206	1053	1631	1696
Service	77	131	49	57	154	133
Passenger	271	104	97	60	1230	1147
Fishing	3451	3447	249	272	428	462
Total	7892 - 100%	7790 - 99%	3883 - 100%	3861 - 99%	5375 - 100%	5344 - 99%

Observe from the last row in Table 10 that contrary to Table 8 the same flow is observed going north bound and south bound at the Georgia Strait crossing line. In contrast for the AIS data in Table 8 85% is travelling southbound. Similarly, one observes that at the WSJF and Puget Sound crossing lines about the same amount of traffic flows in both directions.

Comparing VTOSS 2010 crossing line counts to AIS 2010 crossing line counts.

Observe from Table 9 and Table 4 that the master type category "tanker" includes: chemical carrier, oil tanker, atb and itb. This is consistent with the "tanker" category definition used in the generation of the AIS crossing count data in Table 8. The VTOSS classification "Navy vessel" was given a master type "cargo" classification also for consistency between the VTOSS 2010 master crossing line and AIS 2010 crossing line counts. For the remainder of the 26 vessel types in Table 9, its vessel master type was assigned based on the vessel type classification in Table 9 and Table 4.

In Figure 39, Figure 40 and Figure 41 a comparison is provided between the VTOSS 2010 informed VTRA 2010 model MTS crossing line counts and AIS 2010 crossing line counts in Table 8 and Table 10 for cargo, tanker and passenger vessels. The "tug-tow" master type crossing line counts in Table 10 are not included in the AIS 2010 crossing line counts. The "fishing" VTOSS 2010 master type counts in Table 10 includes the "Fishing vessel" counts from Table 9 that result from fishing vessel tribal and commercial fishing openers that are modeled in the VTRA 2010 MTS simulation model, but are not recorded in the VTOSS 2010 data, nor the AIS 2010 data. Finally, no service vessel classification is provided in the AIS 2010 crossing line counts. Hence, only the comparison provided for the three crossing lines in Figure 38 for the vessel types: cargo, tanker and passenger.

From Figure 39 one observes that the crossing line counts for these three vessel types agree between the two datasets AIS 2010 and VTOSS 2010 both in the east and west bound directions. Overall, one observes a general agreement for the cargo and tanker vessel types in Figure 40 and Figure 41, except for the cargo category travelling northbound in the Georgia Strait where a higher number of crossing counts are reported for the AIS 2010 data. Certainly, some discrepancies are observed for the passenger vessel classification for both the Georgia Strait and Puget Sound crossing lines. We attribute those discrepancies to vessel type misclassification in the VTOSS 2010 dataset. For example, at times the same oil tanker is both classified as a cargo vessel and as a tanker across the three different VTS systems recorded in the VTOSS 2010 dataset. Similar misclassifications are observed for the passenger vessel category. Overall, however, especially when concentrating on the cargo and tanker classifications, there is more agreement between the AIS 2010 and VTOSS 2010 crossing line counts in Figure 39, Figure 40 and Figure 41 than there is disagreement, leading to the conclusion that these two dataset reconcile well. Hence, the

validation of VTOSS 2010 crossing line counts in the GW/VCU MTS simulation model by AIS 2010 crossing line counts.

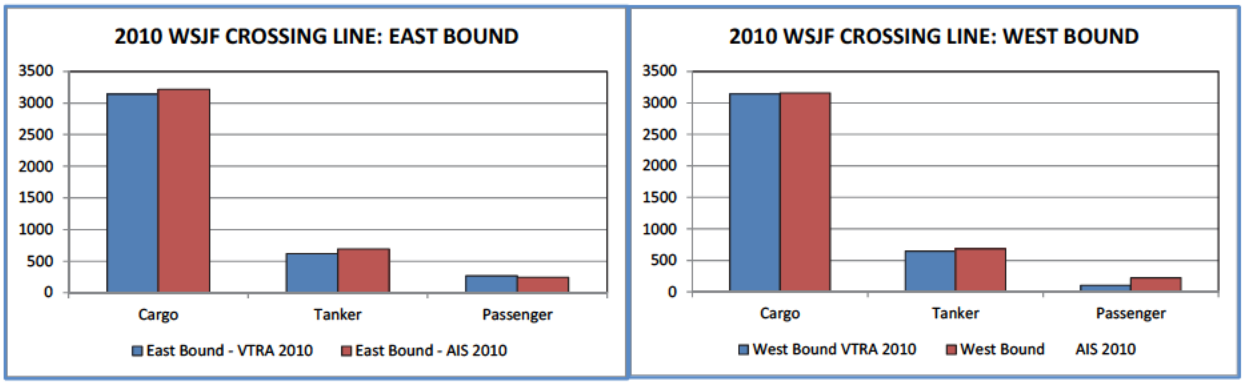

Figure 39. Comparison of AIS 2010 and VTOSS 2010 crossing line counts for cargo, tanker and passenger vessels for the West Strait of Juan de Fuca crossing line depicted in Figure 38B.

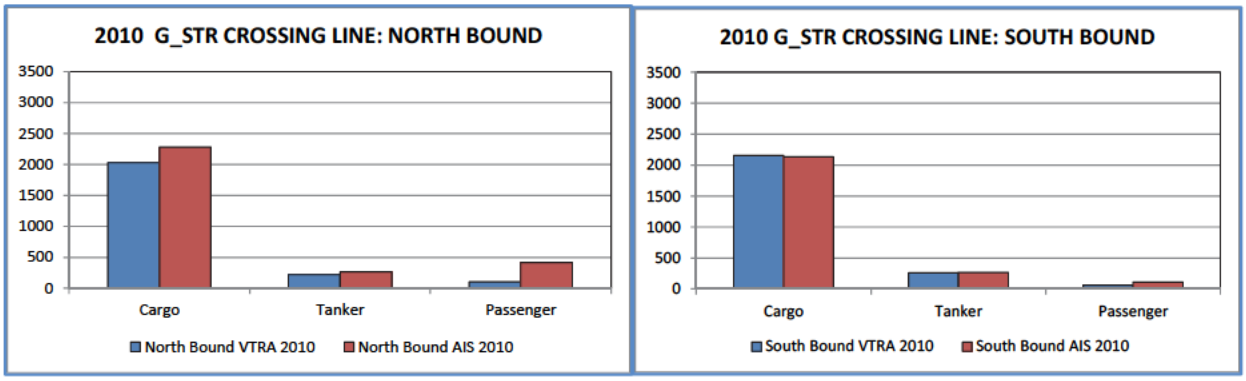

Figure 40. Comparison of AIS 2010 and VTOSS 2010 crossing line counts for cargo, tanker and passenger vessels for the Georgia Strait crossing line depicted in Figure 38C.

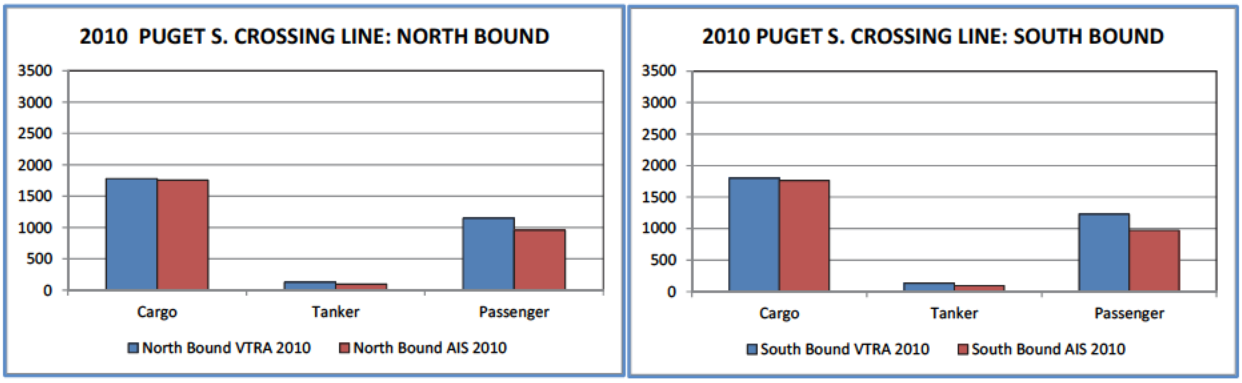

Figure 41. Comparison of AIS 2010 and VTOSS 2010 crossing line counts for cargo, tanker and passenger vessels for the Puget Sound crossing line depicted in Figure 38D.