CHAPTER 6

VTRA 2010 FINAL REPORT

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

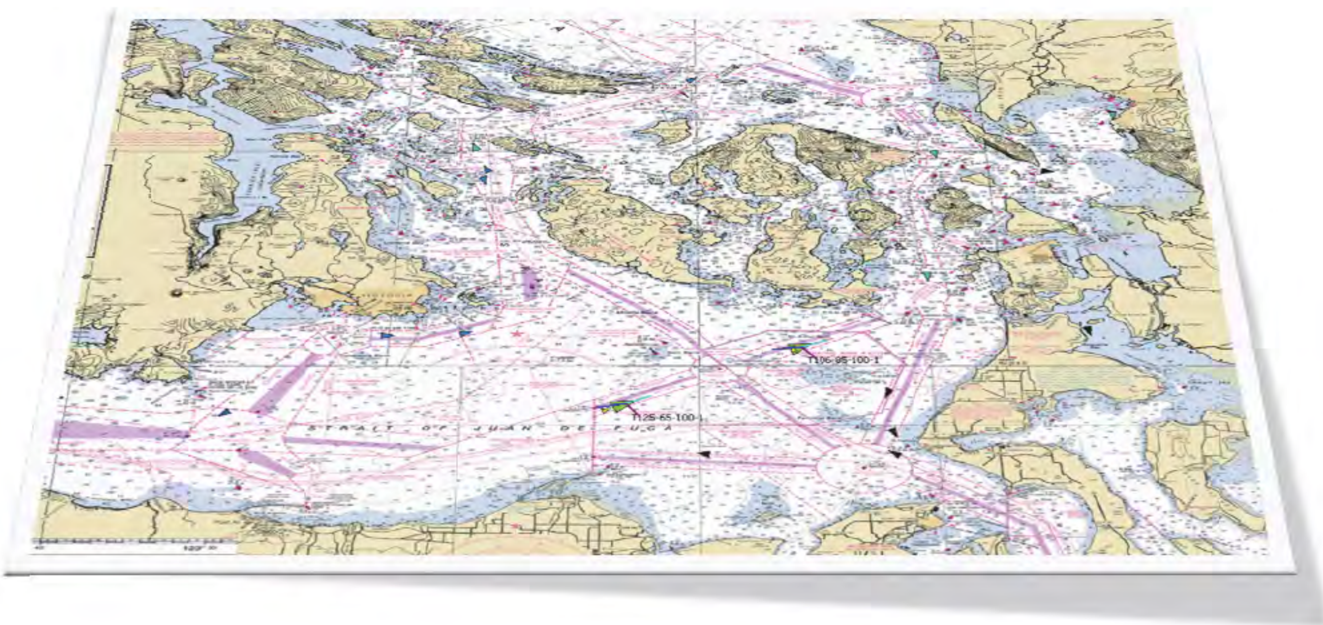

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Table Contents

6. ACCIDENT FREQUENCY AND OIL OUTFLOW RESULTS FOR VTRA 2010 BASE CASE

Figure 3 shows the accident causal chain, with the situations in which an accident can occur, the incident that causes the accident, the accident itself, and the consequences of the accident. We call the situations in which an accident could occur an accident exposure. For each accident exposure, the incident and accident probability models are used to calculate the POTENTIAL accident frequency. This is not a prediction of an accident, but shows a relative propensity that an accident could occur in one accident exposure versus another or the relative propensity for one type of accident versus another. The accident exposure and the POTENTIAL accident frequency are then combined with the oil outflow model to calculate the POTENTIAL oil outflow.

Overall Accident and Oil Outflow Results

Figure 55 shows the accident exposure (A), the POTENTIAL accident frequency (B), the POTENTIAL accident cargo oil loss (C), and the POTENTIAL accident fuel oil loss (D) for each accident type. Figure 55A shows that more power grounding accident exposures are counted in the 2010 simulation than other accident types, with drift grounding accident exposures next as the vessel drifts ashore after losing power, and collision accident exposures next as two vessels must interact to be counted. Allisions have the lowest exposure as they only occur as the vessel is near to its intended dock.

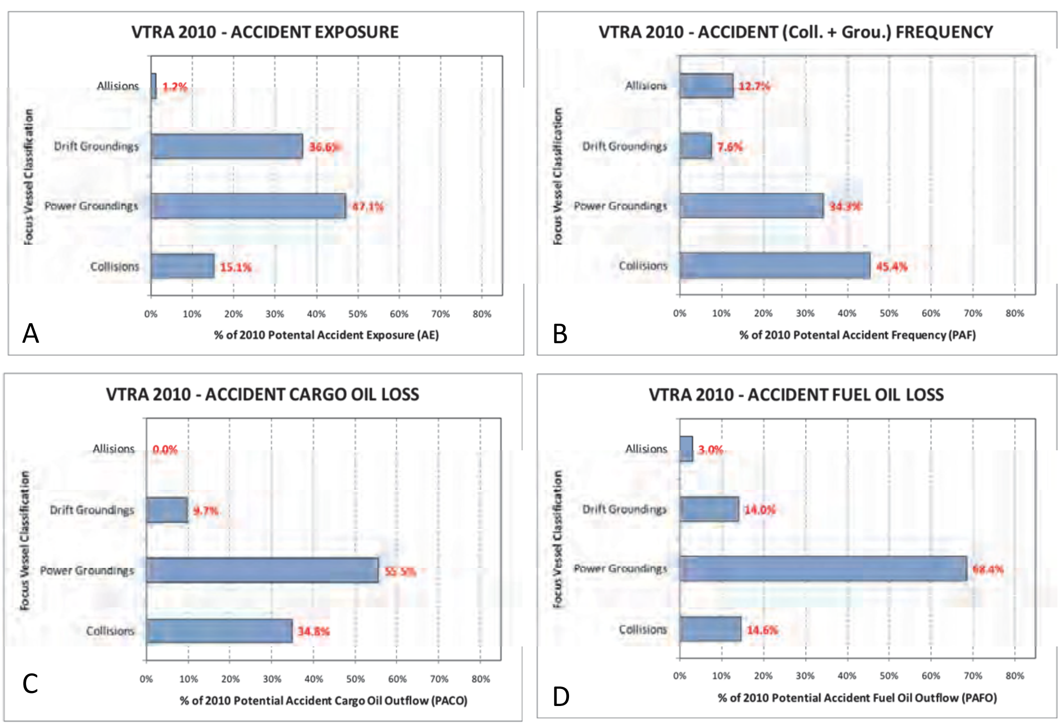

Figure 55. Accident exposure (A), accident frequency (B), cargo oil loss (C), and fuel oil loss (D).

All exposures do not have the same potential for an accident, however. Figure 55B shows that collisions have a higher POTENTIAL accident frequency than either grounding types even though the collision accident exposure is lower. The accident probability varies from accident exposure to accident exposure based on the specifics of the situation in which it occurs, but on average the collision exposures have a higher potential to result in an accident than the grounding exposures. Powered groundings have the next highest potential. In fact, collisions and powered groundings together comprise 79.7% of the POTENTIAL accident frequency.

Similarly, not all accidents have the same POTENTIAL for oil outflow. While collisions have higher POTENTIAL accident frequency, powered groundings have the highest POTENTIAL accident cargo oil loss (Figure 55C) and the highest POTENTIAL accident fuel oil loss (Figure 55D).

Accident and Oil Outflow Results by Focus Vessel Type

Figure 56 breaks down the POTENTIAL accident frequencies by the type of focus vessels that has the initiating incident. This is the first figure to have a POTENTIAL accidents-per-year scale. However, this is again not a prediction of a number of accidents each year, but a relative propensity for each accident type involving each focus vessel type. The highest potential is for collisions involving oil barges, with as much collision POTENTIAL as tankers, chemical carriers, and cargo vessels combined. Powered grounding POTENTIAL is more spread across oil barges and cargo vessels.

Figure 57 breaks down the POTENTIAL oil loss by the type of focus vessels that has the initiating incident. This figure has a POTENTIAL average cubic-meters-per-year scale. Again this is not a prediction of an amount of oil outflow each year, but a relative propensity for oil outflow for each accident type involving each focus vessel type. Clearly, tankers have the highest POTENTIAL as they carry the highest volume of cargo. However, container vessel powered groundings have the next most contribution as they carry larger amounts of fuel oil and tend to travel relatively at higher speeds. Oil barges do not have the same contribution to POTENTIAL oil loss as they do to POTENTIAL accident frequency. We believe this to be a result of the combined effect of (1) oil barges traveling at relative low speeds, (2) oil barges having assigned double hull protection in the VTRA 2010 models and finally, (3) oil barges not carrying as much cargo or fuel oil.

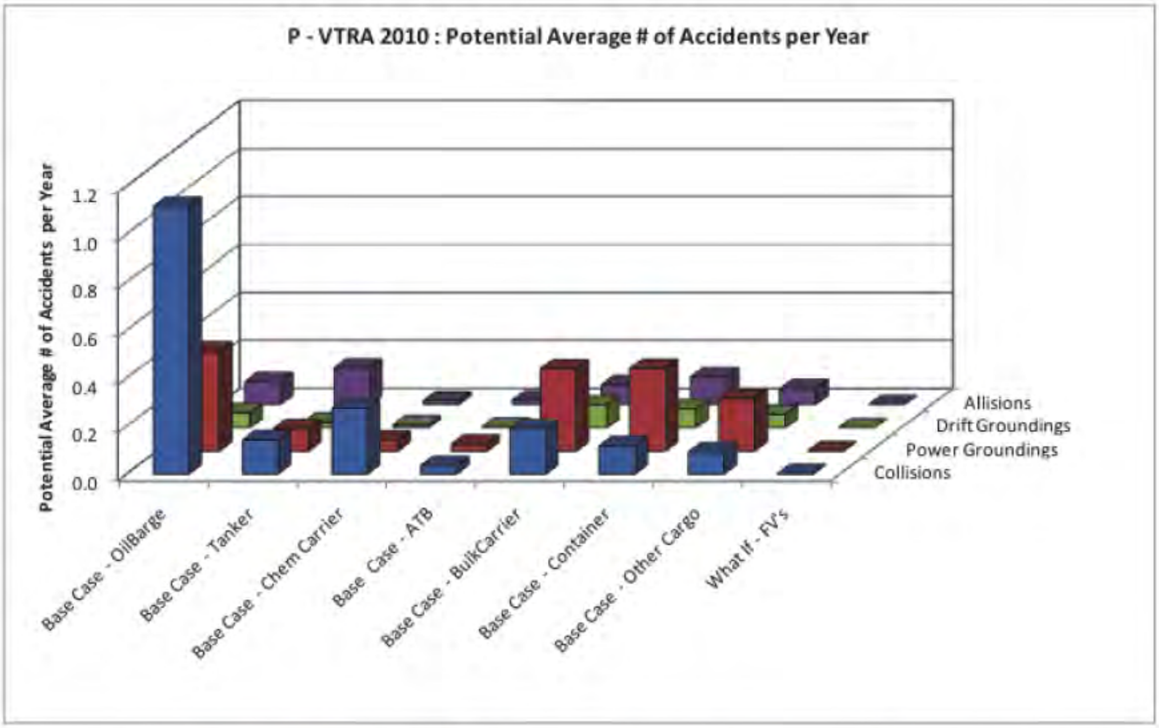

Figure 56. The POTENTIAL accident frequency by accident type and focus vessel type.

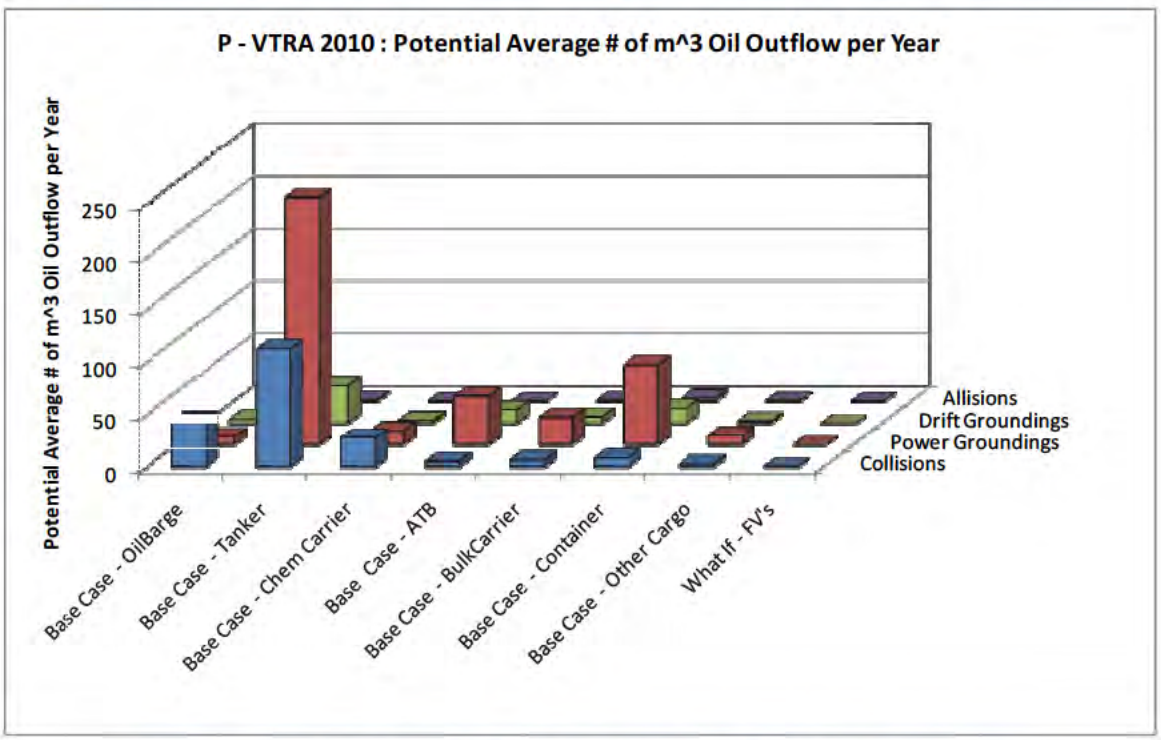

Figure 57. The POTENTIAL oil loss by accident type and focus vessel type.

Geographic Profiles of Accident and Oil Outflow Results

Figure 58 through Figure 63 show the same progression of accident exposure, POTENTIAL accident frequency, and POTENTIAL oil loss, but as geographic profiles. Figure 58, Figure 59 and Figure 60 show the geographic profiles of collision exposure, POTENTIAL collision frequency, and POTENTIAL collision oil loss respectively. Figure 61, Figure 62 and Figure 63 show the geographic profiles of grounding exposure, POTENTIAL grounding frequency, and POTENTIAL grounding oil loss respectively.

These figures demonstrate the importance of thinking about all phases of the accident event chain depicted in Figure 3. Figure 58 shows that there is exposure to collisions in the Straits of Juan de Fuca, while Figure 59 shows that exposure does not lead to as much POTENTIAL collision frequency as other areas with exposure. In fact, the POTENTIAL collision frequency appears more prevalent in Haro Strait/Boundary Pass, Rosario Strait, and the Puget Sound. Comparing these figures to Figure 60, we can see that while the area around the Pilot Station does not have a relatively high POTENTIAL collision frequency it does have a concentration of POTENTIAL collision oil loss due to the size and type of the vessels involved. Rosario Strait, Guemes Channel, and Haro Strait all have concentrations of POTENTIAL collision oil loss. In fact, the inner red box contains 67% of the POTENTIAL collision frequency and 53% of the POTENTIAL collision oil loss. Similarly, the outer red box contains 83% of the POTENTIAL collision frequency and 70% of the POTENTIAL collision oil loss. In Rosario Strait and Guemes Channel, the vessels involved are oil tankers (with larger oil cargos) and ferries and other vessels that are large enough to potentially penetrate the hull, but are not restricted by the one-way zone.

A similar effect is seen in Figure 61 through Figure 63. Again there is exposure to grounding along the shore of the Straits of Juan de Fuca, but there is not much POTENTIAL grounding frequency as the time to shore is relatively long in this area. The relatively more significant POTENTIAL grounding frequency and POTENTIAL grounding oil loss are in the red boxes. The inner red box contains 41% of the POTENTIAL grounding frequency and 61% of the POTENTIAL grounding oil loss. Similarly, the outer red box contains 58% of the POTENTIAL grounding frequency and 79% of the POTENTIAL grounding oil loss.

Combining POTENTIAL collision frequency profiles (Figure 59) and POTENTIAL grounding frequency profiles (Figure 62) results in the geographic POTENTIAL accident frequency profiles depicted in Figure 64. Combining POTENTIAL collision oil loss profiles (Figure 59) and POTENTIAL grounding los profiles (Figure 62) results in the geographic POTENTIAL accident loss profiles depicted in Figure 64.

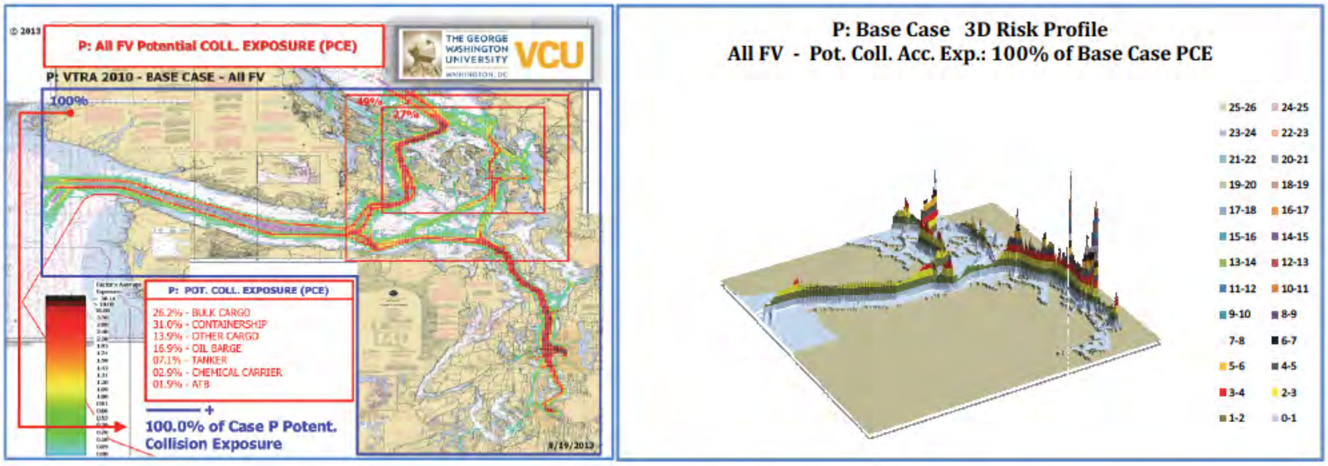

Figure 58.The geographic profile of the collision exposure.

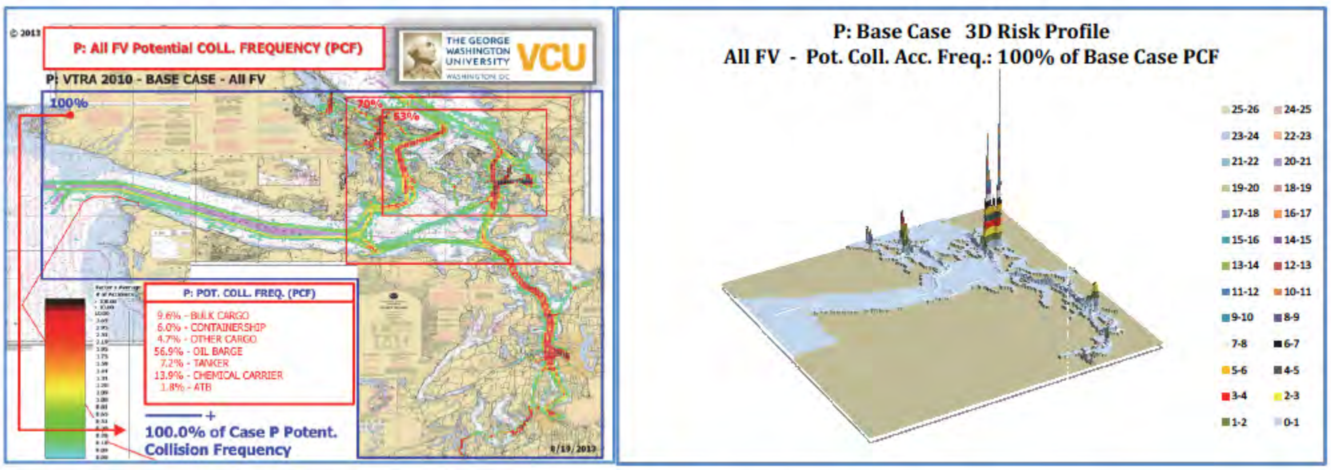

Figure 59.The geographic profile of the POTENTIAL collision frequency.

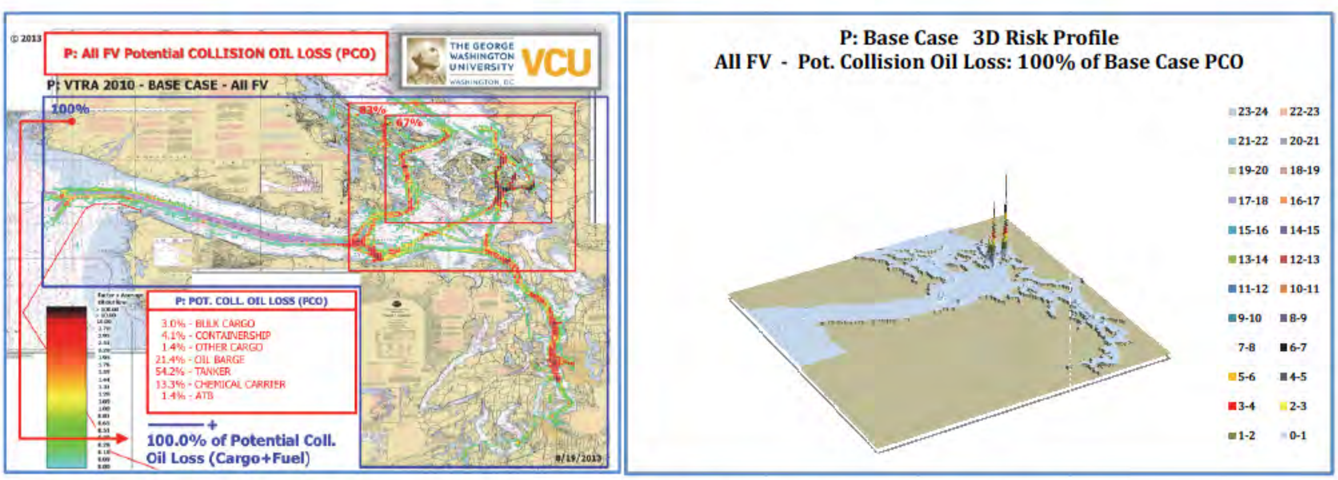

Figure 60.The geographic profile of the POTENTIAL collision oil outflow.

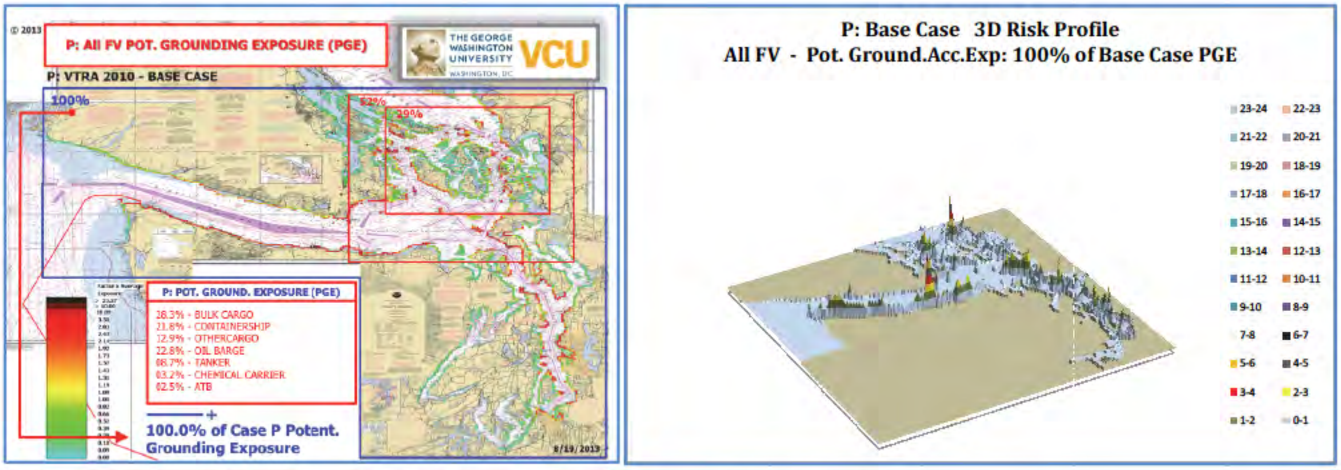

Figure 61.The geographic profile of the grounding exposure.

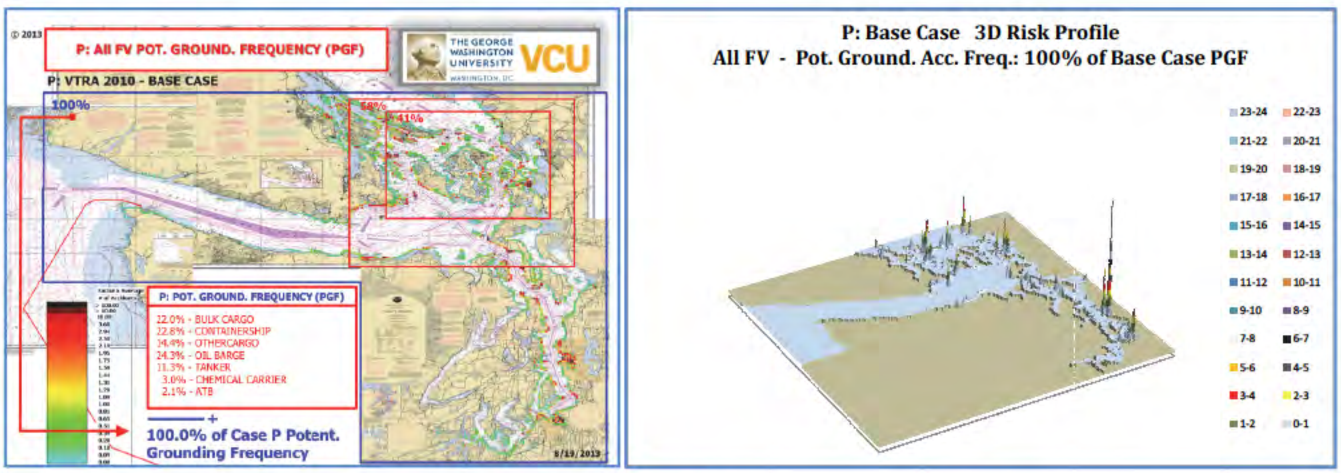

Figure 62.The geographic profile of the POTENTIAL grounding frequency.

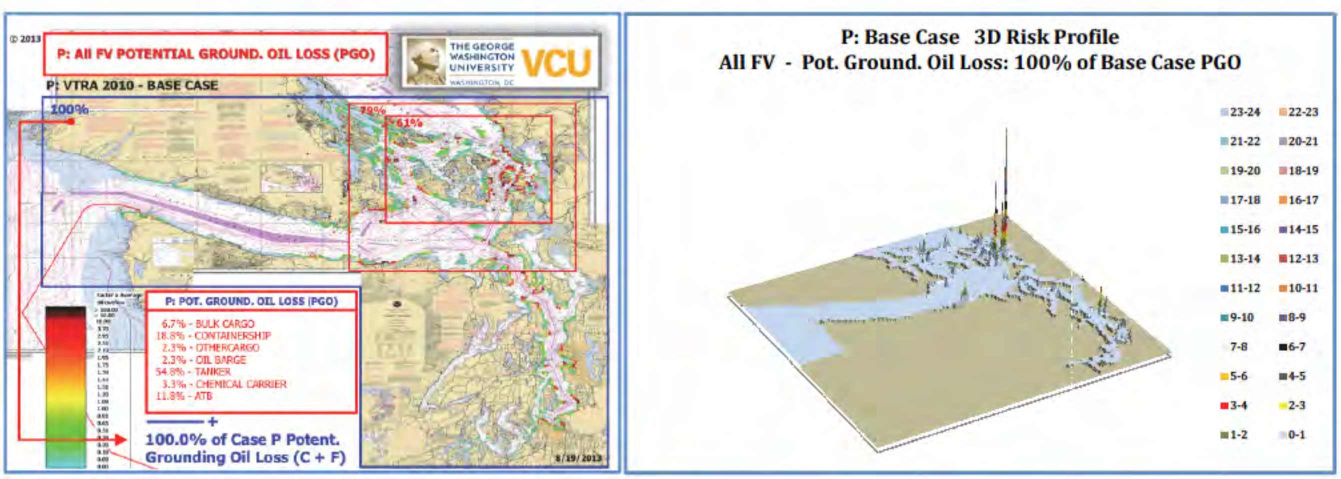

Figure 63.The geographic profile of the POTENTIAL grounding oil outflow.

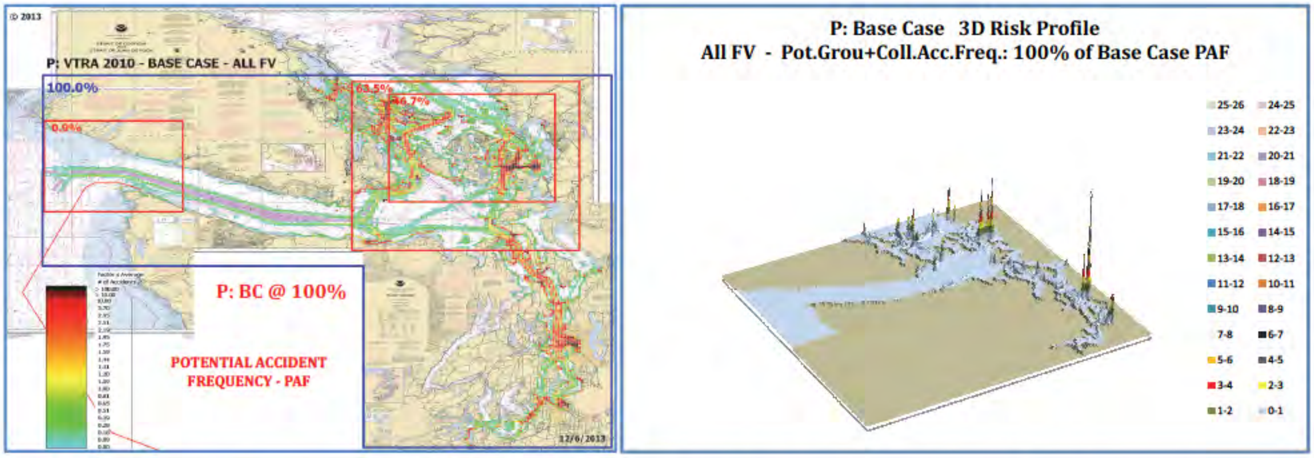

Figure 64.The geographic profile of POTENTIAL accident (collision + grounding) frequency.

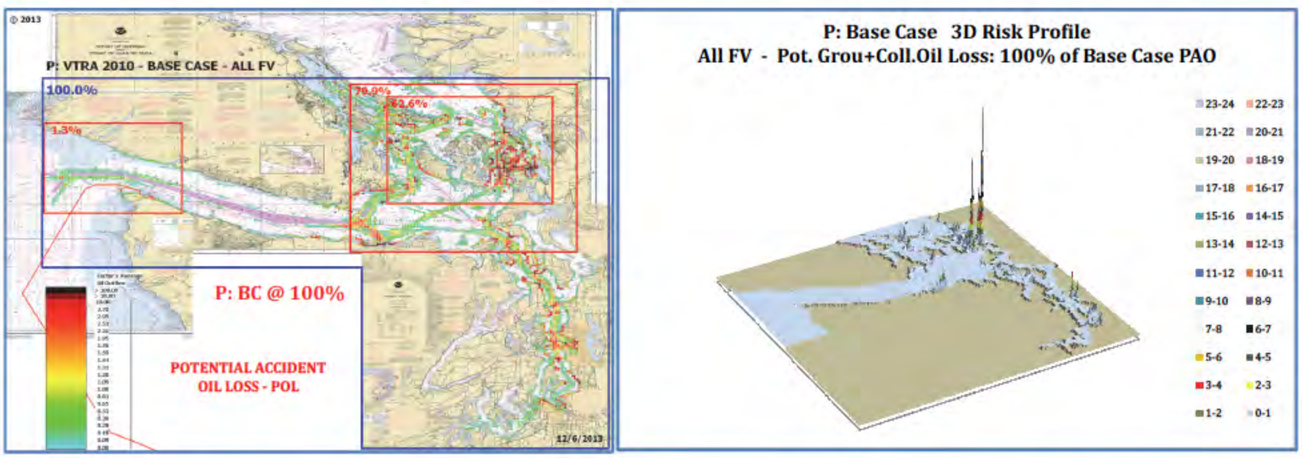

Figure 65.The geographic profile of POTENTIAL accident (collision + grounding) oil outflow.

In sections to come we shall provide geographic profile analysis results for combined POTENTIAL accident frequencies and POTENTIAL oil loss results as presented for the 2010 base case year in Figure 64 and Figure 65 for the various What-If and RMM Scenarios. When presenting these geographic profiles the panels in Figure 64 and Figure 65 shall be repeated for visual contrast purposes. Detailed and broken-down analysis results by collisions and groundings are available in the format of result presentations at:

http://www.seas.gwu.edu/~dorpjr/tab4/publications_VTRA_Update.html