

**EXHIBIT B - Scope of Work
Grant 2013-28
Vessel Traffic Risk Assessment**

Project Overview

The overall project to complete a Vessel Traffic Risk Assessment (VTRA) and develop a Risk Management Strategy (RMS) is expected to proceed in five PHASES. The first PHASE involves a stakeholder process led by the Puget Sound Partnership and the Washington State Department of Ecology; supported by the US Coast Guard (the AGENCIES) and Puget Sound Harbor Safety Committee in which GW/VCU shall participate. This first PHASE will be completed in coordination with a project funded by the MAKAH TRIBAL COUNCIL to update GW/VCU's VTRA analysis tool by GW/VCU. It is expected that the second and third PHASE will be led by the AGENCIES with strong technical support from GW/VCU using this updated VTRA analysis tool. During the fourth PHASE GW/VCU will provide technical support to a regional expert panel for the formulation of an RMS. The fifth implementation PHASE will be largely independent of the university consortium's work. This GW/VCU grant is to provide funding for GW/VCU cost and expenses for phases I-III.

- I. PHASE I (Estimated dates of initiation – upon signature of contract; and estimated completion 12/31/2012): GW/VCU will participate in a kick-off meeting led by the AGENCIES and follow-on meeting in December 2012. The kick-off meeting will start the stakeholder process that will help the AGENCIES define the future traffic scenarios to be analyzed by GW/VCU utilizing an updated version of GW/VCU VTRA analysis tool in PHASE II. GW/VCU shall be available for consultation by the AGENCIES over the course of the PHASE I stakeholder process outside of the scheduled stakeholder meetings.

The updating of this tool to 2010 Vessel Traffic Operational Support System (VTOSS) data is currently underway by GW/VCU under a separate grant funded by the MAKAH TRIBAL COUNCIL. These future traffic scenarios to be developed by PSP and Ecology with input from interested parties and technical support from GW/VCU shall seek to define:

- a. The maritime traffic and patterns anticipated within the next 10 years likely to arise from existing trends in vessel traffic without construction of large new marine terminals (the base risk scenario).
- b. The maritime traffic and patterns anticipated to result from each of the proposed commercial projects that are projected to be completed within the next 10 years.
- c. An extended class of Focus Vessels (FV's) to be studied.

The GW/VCU VTRA analysis tool considers Vessels of Interest (FV's) and Interacting Vessels (IV's) that may give rise to incidents that could lead to a spill. Potential oil losses from FV's are evaluated for drift and powered groundings as well as collisions. For collisions potential oil losses from IV's that collide with FV's are evaluated as well. During GW/VCU's prior work, the types of FV's were limited to Tankers, Articulated Tug Barges (ATB's) and Integrated Tug Barges (ITB's) that dock at BP Cherry Point. The expanded list of FV's for the VTRA under this grant shall be defined during PHASE I. The AGENCIES recognize that accident probability models and oil outflow models developed during GW/VCU's prior work will be used during PHASE II to conduct the VTRA for an extended class of FV's to include at a minimum, in addition to Tankers, ATB's and ITB's, tugs towing oil barges, container vessels, and bulk carriers. Computational complexity limits the extended class of FV's that GW/VCU's VTRA analysis tool can handle.

- II. PHASE II (Estimated date of initiation – January 14, 2013; and estimated date of completion May 17, 2013): Under a separate MAKAH contract GW/VCU will establish a new baseline level of risk for the year 2010 using as FV's: tankers, ATB's and ITB's. GW/VCU will at the start of PHASE II:
 - a. Computational complexity permitting, conduct a VTRA using the extended class of FV's defined during the stakeholder process under PHASE I modifying GW/VCU's existing accident probability and oil outflow models. This analysis will establish the 2010 VTRA baseline scenario for the purpose of this grant.
 - b. Conduct a VTRA for a limited set of future scenarios defined under PHASE I and compare them to the base case VTRA scenario. For example, one future scenario could involve no future project expansions but just a change in maritime traffic due to existing vessel trends

over the next 10 years. Other future scenarios may overlay on top of this future trend scenario maritime traffic increases as a result of future planned terminal expansions. Latter future scenarios can involve traffic increases due to a single future planned project or a combination thereof.

- c. The AGENCIES will lead a stakeholder process in developing a preliminary list of candidate risk mitigation strategies to be considered for implementation under PHASE III. GW/VCU shall be available during two planned stakeholder meetings to facilitate discussions with regional stakeholders for final set of risk mitigation scenario measures to be modeled and analyzed during PHASE III.
- III. PHASE III (Estimated dates of initiation – May 20, 2013; and estimated date of completion – August, 31, 2013): GW/VCU will apply the VTRA analysis tool containing vessel traffic, current and applicable meteorological data that has been updated to 2010, to:
- a. Incorporate the expanded list of FV's as defined during PHASE I, computational complexity permitting.
 - b. Evaluate the potential maritime safety interventions and estimate the relative location and scenario-specific potential risk reduction benefits from those measures.
 - c. Evaluate the selected measures for potential unintended negative consequences on the "system."
 - d. Evaluate the individual measures and the set of measures deemed likely to be successful as a set of complementary risk reduction actions
 - e. Deliver a draft Project Report by July 31, 2013 for review by the AGENCIES summarizing the results of PHASEs I through III. Finalize and submit the Final Project Report incorporating AGENCY comments by August 31, 2013.
- IV. PHASE IV (Estimated dates – Sept 1, 2013 through December 31, 2013): If requested, funded and available, GW/VCU will provide technical support to a regional expert panel convened by the AGENCIES to assist for the purpose of developing a Risk Management Strategy (RMS). PSP and Ecology recognize that current funding levels only cover GWU/VCU expenses up to August 31, 2013:
- a. The AGENCIES will convene a panel of regional experts to evaluate the set measures deemed most likely to be successful as a set of complementary risk reduction actions.
 - b. The AGENCIES will ask the panel of experts to recommend a complementary set of risk reduction actions for implementation.
 - c. The AGENCIES will evaluate the panel's recommendations and adopt a Risk Management Strategy (RMS).
- V. PHASE V (Expected to be on-going after adoption of the final VTRA report and Risk Management Strategy beginning December 31, 2013): While this activity is the ultimate goal of the project, it will not be conducted under this grant agreement. This phase of the project is solely within the AGENCIES' purview and will consist of actions to implement the standards and other actions proposed in the RMS, and/or encourage voluntary adoption of the RMS elements by the region's maritime community leaders through the Puget Sound Harbor Safety Committee and industry trade associations. If requested, funded and available, GW/VCU will provide presentations supporting the technical VTRA related foundations for the Risk Management Strategy.

Contact Information

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- George Washington University (GW) – Dr. Johan Rene Van Dorp, Professor Engineering Management and Systems Engineering, (202) 994-6638, dorpir@gwu.edu.
- Virginia Commonwealth University (VCU) – Dr. Jason Merrick, Director Statistical Sciences and Operations Research, (804) 828 5865, jrmerric@vcu.edu
- The Department of Ecology (*supporting agency*) –
 - Jon Neel, (360) 480-5696, jnee461@ecy.wa.gov
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Abbreviations

- Study Area – The Washington waters of Puget Sound east of Cape Flattery, north of Admiralty Inlet and west of Deception Pass, and their approaches.
- GWU – George Washington University is the prime subgrant awardee.
- VCU – Virginia Commonwealth University is a sub-awardee to GWU.
- GW/VCU – The technical team composed of GWU and VCU.
- PSP – The Puget Sound Partnership is the Washington state agency responsible for developing a Puget Sound Action Agenda, convening a Cross Partnership Oil Spill Work Group and for coordinating work to restore and protect Puget Sound.
- PSHSC – The Puget Sound Harbor Safety Committee.
- PSP Work Group – The Puget Sound Partnership’s Cross Partnership Oil Spill Work Group stakeholder advisory body.
- Ecology – The Washington Department of Ecology’s Spill Prevention, Preparedness and Response Program which is the primary state organization with authority and accountability for managing oil and hazardous material spill risk state-wide. Ecology is assisting PSP in conducting the VTRA with its expertise and experience.
- NGO – Non-Governmental Organization.
- VTRA – Vessel Traffic Risk Assessment.
- The AGENCIES – PSP, Ecology and potentially the US Coast Guard who will guide and facilitate the VTRA technical and public processes.

Background

Washington State shares the Salish Sea with the province of British Columbia. A large number of ships and barges operate in these shared waters placing the area at risk for major and catastrophic oil spills. While citizens in the Study Area enjoy a relatively safe marine transportation system compared to most other port states in the world, the potential for catastrophic spills continues to be a huge concern for the region’s environment, economy and quality of life, and the impact such a spill would likely have on the long-term restoration and protection of Puget Sound.

- Kinder-Morgan Pipeline - Within this context, the amount of vessel traffic and volume of oil being shipped is projected to increase significantly within the next decade. Kinder-Morgan is proposing to nearly triple their oil transmission pipeline capacity to transport diluted bitumen (dilbit), synthetic crude oil (syncrude) and conventional crude oil from Alberta oil wells and tar sands to Vancouver, British Columbia. If completed this project would likewise triple British Columbia crude oil exports by tankers to Pacific Rim ports. It is currently anticipated that this traffic would consist of approximately 250 “entering” tanker transits per year of vessels up to 180,000 Dead Weight Tons (DWT).

A significant portion of the increased Kinder-Morgan crude oil “through put” is also expected to be shipped through the Northern Tier Pipeline to Washington State’s northern refineries. A large portion of this oil may be “API group 5” heavy crude oil produced from oil sands that is diluted with natural gas well condensate to facilitate pumping and moving the highly viscous bituminous oil through the pipelines.

- SSA Marine Gateway Pacific Terminal – SSA Marine is proposing to build a bulk cargo export facility at Cherry Point, Washington called the Gateway Pacific Terminal (GPT). If completed, this project will become a major transshipment point for coal, grain and possibly other bulk commodities and substantially increase Puget Sound traffic (approximately 450 “entering” ship transits per year) at project completion.
- TESORO Refinery – The TESORO Refinery at March Point, near Anacortes (and other refineries) plans to increase frequency of unit train (approximately 100 tank cars) delivering conventionally produced crude oil from the western United States. The introduction of these crude oil deliveries by train there may result in an associated reduction in the number of laden crude oil tankers arriving at Tesoro’s marine terminal and possibly other refineries. Presumably this off-setting risk trend would continue as train deliveries

increase, however a large quantity of the refined products are likely to continue to be exported in “chemical” tankers. Note that the volume of eleven unit trains is roughly equivalent to one fully laden oil tanker.

- The Port of Vancouver – Canadian interests are proposing to expand port facilities for shipping containerized and bulk cargo out of Roberts Bank facilities, British Columbia just south of Vancouver.
- BP Cherry Point Refinery – Vessel traffic changes resulting from the refinery dock expansion.
- Washington State Refineries – The volume of refined petroleum products being shipped by tank barge to British Columbia may increase, potentially subject to provisions of the Magnuson limit on Puget Sound refining capacity. These refined products include ship, aircraft and other fuels.

As a result of these projects, the amount of oil being transported and the commensurate increased numbers of ships transiting through Puget Sound and the broader Salish Sea may present an unaddressed and increasing risk of major and catastrophic oil spills, unless additional risk management measures are identified and implemented that address any changes in risk. The purpose of this VTRA is to quantify the relative current and future risks, and establish a well-accepted technical basis for making decisions on what risk management measures would be beneficial in maintaining/managing the risk of potential spills currently and in the future.

Project Scope

This effort will utilize and leverage the extensive technical work already completed by GW/VCU, British Petroleum and the US Army Corps of Engineers to assemble the GW/VCU VTRA analysis tool as applied to the BP Cherry Point study. This previous study was developed using 2005 data from the federal Vessel Traffic Operational Support System (VTOSS) data, amongst other data sources. Figure 1 details the coverage area of the VTOSS data.

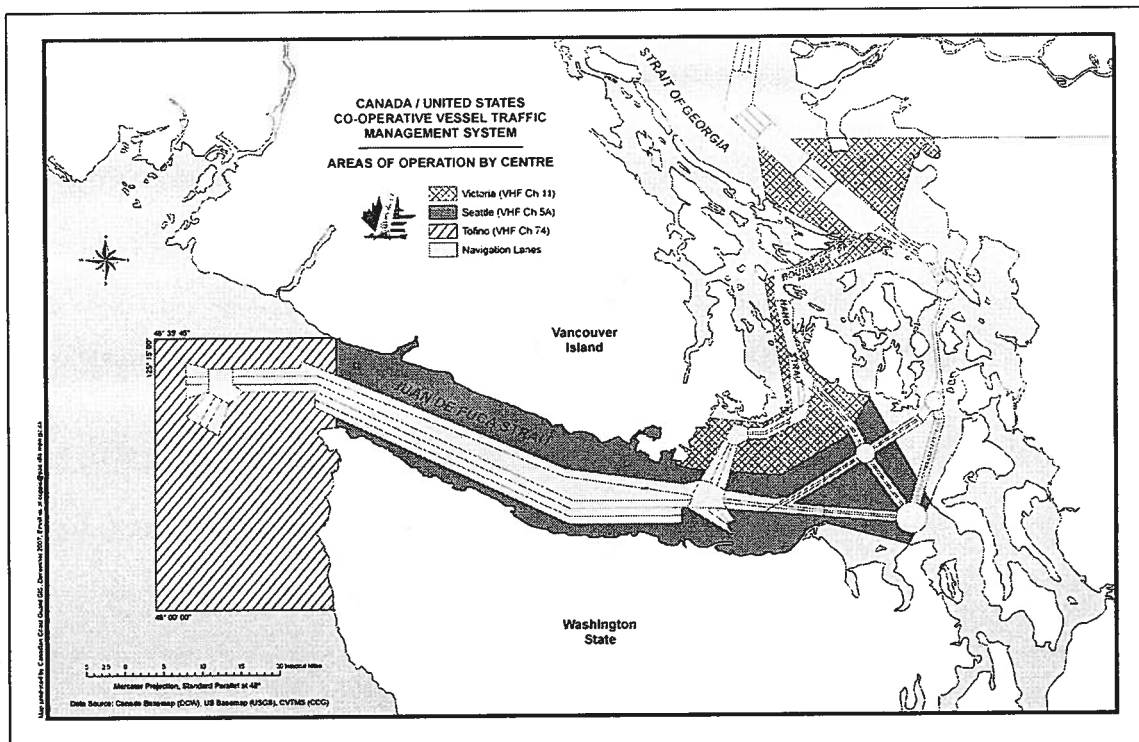


Figure 1. Geographic Coverage of VTOSS data.

The study area of GW/VCU's VTRA analysis tool is indicated by the blue border in Figure 2. A separately funded effort by the MAKAH TRIBAL COUNCIL to update the VTRA analysis tool from 2005 VTOSS data to using 2010 VTOSS data is currently underway by GW/VCU.

The approximate study area for the VTRA effort under this grant is indicated using the red dashed line in Figure 2. For this study area a VTRA is to be completed that includes updated 2010 and future projected VTOSS deep draft shipping and barge transit data. Focus areas of the study area include the following portions of Puget Sound and the greater Salish Sea:

- The area of the Strait of Juan de Fuca east of Cape Flattery.
- The eastern Strait of Juan de Fuca beginning at the westerly approaches to the pilot embarkation/debarkation area at Port Angeles, Washington.
- The Boundary Pass-Haro Strait waterway and its approaches (including vessel traffic transiting on both sides of the international boundary.)
- Rosario Strait and its approaches.
- Guemes Channel and the Saddleback Island passages.
- Designated anchorages in the study area including Vendovi Island.
- Southern Georgia Strait and its approaches to Washington waters.

To update GW/VCU's VTRA analysis tool GW/VCU will use the 2010 VTOSS deep draft shipping and barge data and projected traffic projections and patterns established under PHASE I from the proposed commercial projects expected within the next 10 years.

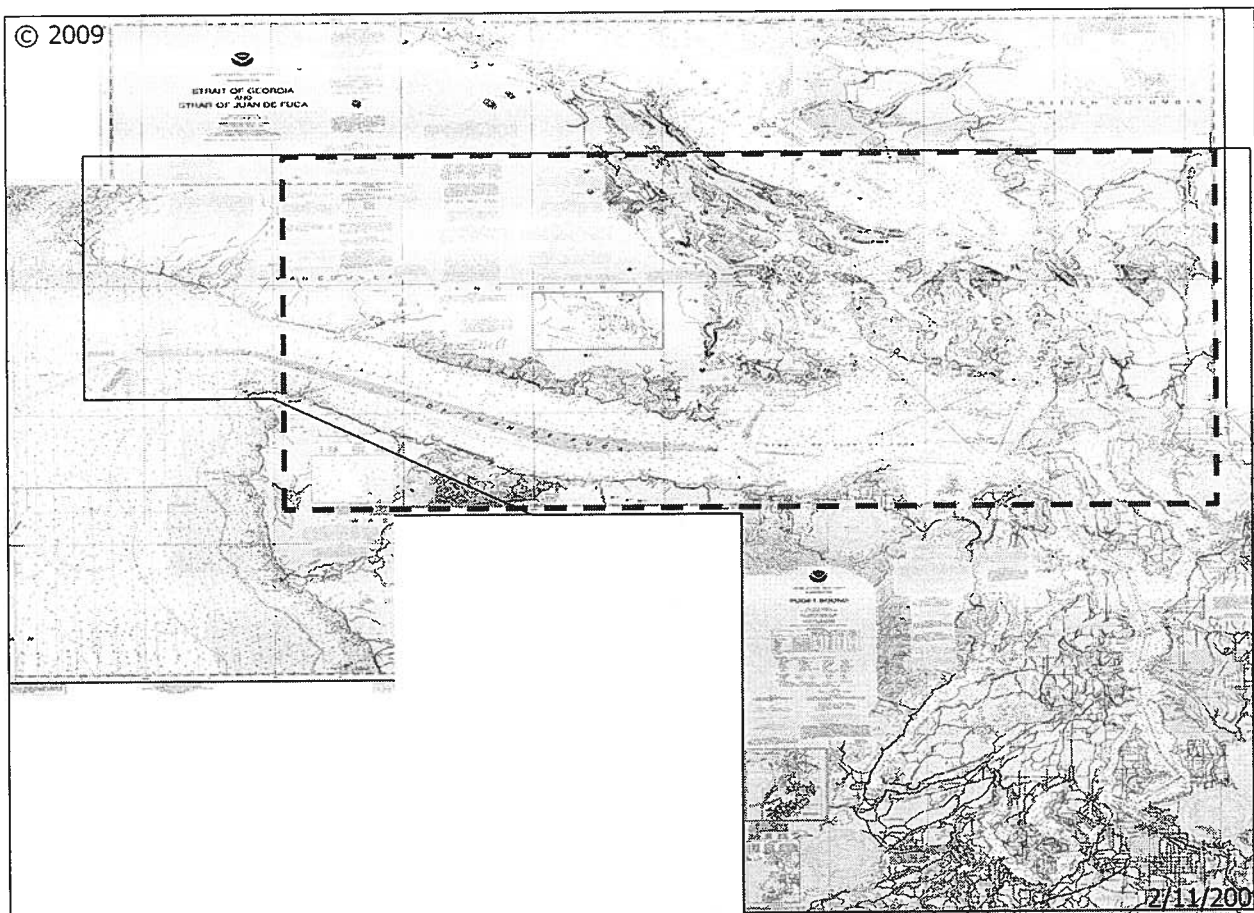


Fig. 2. Study area of the existing VTRA model is indicated via the blue border area. The approximate border for the VTRA study area for PSP and Ecology is indicated by the red dashed line.

PHASE I Project Technical Project Scope:

GW/VCU will participate in stakeholder meetings led by the AGENCIES or MAKAH in October 2012 and December 2012. GW/VCU will be available for consultation during the Fall 2012 to facilitate the definition of

future scenarios to be analyzed by GW/VCU during PHASE II. The AGENCIES will lead the effort to define the future scenarios.

Definition of future scenarios will need to address the routes that vessels will take. For example, modeled traffic routes used by Gateway vessels in GW/VCU's prior work for BP only traversed through Rosario Straits. Questions include:

- Could/should such vessels also use Haro Strait as a potentially available route?
- If so, what percentage of vessels would travel through Haro Strait?
- What should be the modeled arrival pattern for Gateway vessels?
- Others.

To allow for their implementation in GW/VCU's VTRA analysis tool, similar questions also need to be answered during PHASE I for future traffic scenarios involving vessels visiting other terminals in the area that are expected to increase vessel traffic.

Finally, PHASE I efforts will define the FV's for VTRA under PHASE II in consultation with GW/VCU. A key consideration here is the computational complexity when involving too many FV's. Computational complexity permitting, at a minimum FV's will include Tankers, ATB's, ITB's, Tugs with Oil Barges, Container Vessels, and Bulk Carriers.

PHASE II of the Technical Project Scope:

GW/VCU will develop a 2010 baseline risk analysis scenario using the FV classes defined under PHASE 1. GW/VCU implement the future traffic scenarios in their VTRA Analysis tool as defined under PHASE I and compare risk to the 2010 baseline risk scenario through the development of geographic risk profiles. An example of such a geographic profile is presented in Figure 3.

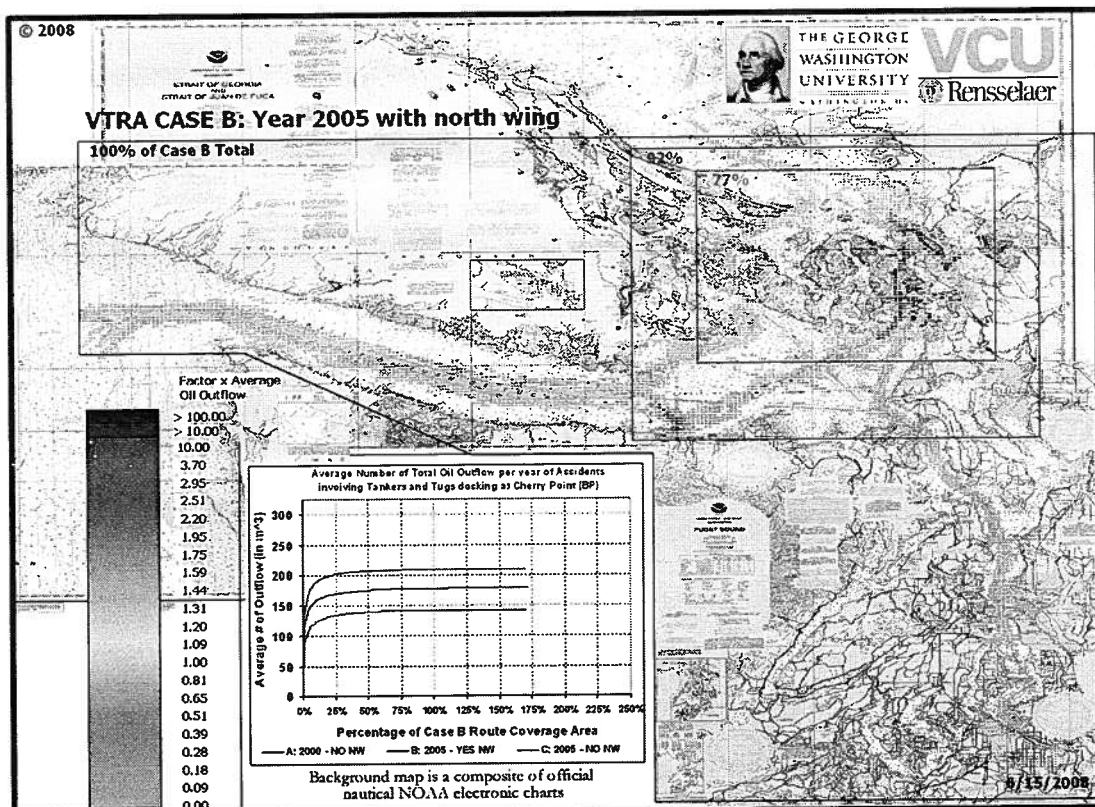


Fig. 3. Example geographic profile of oil spill risk (from BP Cherry Point VTRA).

Geographic profiles will be generated in terms of accident frequency and combined oil outflow volume. Separate oil outflow profiles in terms persistent oil (PO) and non-persistent (NPO) by originating vessel, i.e. FV or IV can be generated. GW/VCU will participate in two stakeholder meetings one in February 2013 and

one in May 2013. During these meetings GW/VCU shall prepare progress presentations. During the February 2013 meeting GW/VCU shall present the baseline VTRA scenario. During the May 2013 meeting future VTRA scenario shall be presented.

The AGENCIES recognize that the one-way zones in Rosario Strait and at Turn-Point in Haro Strait instituted by CVTS indirectly limit the number of vessels that can traverse these waterways throughout the year and for those vessel types subject to these one-way restrictions. *There is no a priori guarantee* that future projected traffic levels will not exceed this capacity. GW/VCU will report as soon as they experience traffic levels in their VTRA Analysis tool resulting in a blocking of traffic at the entrances of these waterways. Options for addressing this limitation that may be evaluated during this project include:

- Queuing vessels outside of these confined waters and scheduling their transits through the two one-way zones.
- Changing the operational conditions for the two one-way zones.

PHASE III of the Technical Project Scope:

GW/VCU evaluate a selection of risk mitigation scenarios in their VTRA Analysis tool as defined under PHASE I and PHASE II and compare risk to the 2010 baseline VTRA scenario through the development of geographic risk profiles. An example of such a geographic profile is presented in Figure 3. Geographic profiles will be generated in terms of accident frequency and combined oil outflow volume. Separate oil outflow profiles in terms persistent oil (PO) and non-persistent (NPO) by originating vessel, i.e. FV or IV are expected to be generated. During the summer 2013 stakeholder meeting(s) risk levels of risk mitigation VTRA scenarios shall be presented. A draft Final Report shall be submitted by July 31, 2013 to for review and comment by the AGENCIES detailing the technical VTRA analysis results conducted by GW/VCU over PHASE II and PHASE III. A final VTRA project report shall be submitted within a month after final comments are received.

PHASE IV of the Technical Project Scope:

Pending available funding GW/VCU will provide technical support to the AGENCIES when they convene a regional expert panel in developing a Risk Management Strategy (RMS) being informed by the PHASE III final report. This phase seeks to support and inform the existing regional model of continuous improvement in maritime safety—especially as articulated in the PSHSC's Harbor Safety Plan—endorsed by the US Coast Guard Captain of the Port.

Project Work Products and Schedule:

The primary written work product to be developed is a final report that details:

- (1) A historical vessel trend analysis;
- (2) A description of the development and assumptions of future projection scenarios GW/VCU were asked to conduct under PHASE II; and
- (3) A description of the development and assumptions of risk mitigation scenarios GW/VCU were asked to evaluate under PHASE III; and
- (4) A detailed description of 2010 FV traffic baseline risk for an extended FV class; and
- (5) A comparison of PHASE II future traffic scenario risk levels to the 2010 baseline risk; and
- (6) The effect of PHASE III risk mitigation scenarios on PHASE II future traffic scenarios.

The AGENCIES and Stakeholders shall be informed as analysis progresses during five stakeholder meetings. GW/VCU's presentations for the scheduled five trips approximately (December 2012, February 2013, May 2013 and August 2013, and another TBD shall serve as interim written progress reports. Submission date for the draft final report is estimated at July 31, 2013. A separate baseline risk presentation shall be developed by GWU and VCU for the February 2013 meeting. A separate future scenario risk presentation shall be developed for the May 2013 meeting. A separate risk mitigation scenario presentation shall be developed for the August 2013 meeting. All presentations shall utilize the generated geographic risk profiles to facilitate stakeholder understanding and will synthesize/summarize analytical results. Presentations, the draft final report and final report shall be posted on Professor van Dorp's faculty page.

The schedule of written interim progress reports (IPRs below) outlines the primary opportunities for the RECIPIENT to bill PSP. Every analytical step in PHASES I-III of this SOW will build upon the previous step in order to ultimately (and cumulatively) generate the content of the final report. Thus, to ensure concurrence between the RECIPIENT and PSP concerning the content, quality and direction of analyses over the duration of the grant—both PSP and RECIPIENT agree that following each Stakeholder meeting, and “go to meeting” calls with AGENCIES— PSP shall succinctly describe/summarize the decision(s) for the subsequent analytical step (SAS) for GWU in writing within five business days. GWU will accept and/or augment that summary with additional technical details within ten business days, and following PSP review/acceptance via an email acknowledgment within 5 business days, GWU will post the SAS on Professor van Dorp’s faculty webpage. Each SAS therefore—provides an alternative opportunity for RECIPIENT to bill PSP.

The anticipated schedule of written Interim Progress Reports (IPRs) and written summaries for each Subsequent Analytical Step (SAS) for PSP review/concurrence, is expected to coincide with the sequence of Stakeholder meetings as described below:

- I. December 2012 (IPR)
- II. January (SAS)
- III. February 2013 (IPR)
- IV. March (SAS)
- V. May 2013 (IPR)
- VI. June (SAS)
- VII. One date to be determined in Spring or possibly Fall 2013 (IPR and SAS)
- VIII. August 2013 (Final Report),

The estimated cost for PHASE I, II and III amounts to approximately \$173,272. The AGENCIES recognize this is an estimate only since much of the analysis GW/VCU will be asked to conduct will only be defined under PHASE I and PHASE II of the project.

The AGENCIES recognize the shared responsibility of defining future risk scenarios and risk mitigation scenarios for the purposes of this grant award and consider the GW/VCU analysis consortium to be partners and independent analysts providing the AGENCIES with analytical support using the GW/VCU VTRA analysis tool to help them develop a RMS for the study area.

Throughout the grant period, GW/VCU is not bound to maintain the confidentiality of work-in-progress. However, the project described in this agreement will be carried out under the general direction of the AGENCIES. Furthermore, GW/VCU and the AGENCIES understand the potential stakeholder sensitivity of the project and agree to consult with each other prior to publicly announcing any major decisions regarding the project. All final study work products (with the exception of the GW/VCU analytical tool) shall be in the public domain and will not be considered proprietary in nature.