2015 Vessel Traffic Risk Assessment

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November 7, 2017

Ecology Spills Program

- Mission:
  - Protect Washington's environment, public health and safety through a comprehensive spill prevention, preparedness, and response program
- Vision:
  - Prevent, prepare for, and respond aggressively to oil spills
  - Be our best for the state of Washington
  - Our spills goal is "zero spills."

Ecology Spills Program

- Four major activities
  - Prevent oil spills from vessels and oil handling facilities
  - Prepare for aggressive response to oil and hazardous material incidents
  - Rapidly respond to and clean up oil and hazardous material spills
  - Restore public natural resources damaged by oil spills

Ecology Spills Prevention

- Vessel screening and inspections
- Voluntary programs for tank vessels
- Oil transfer inspections
- Oil transportation risk assessments
- Facility inspections, plan review
- Technical assistance to the regulated community
- Incident Investigation

2015 VTRA Background

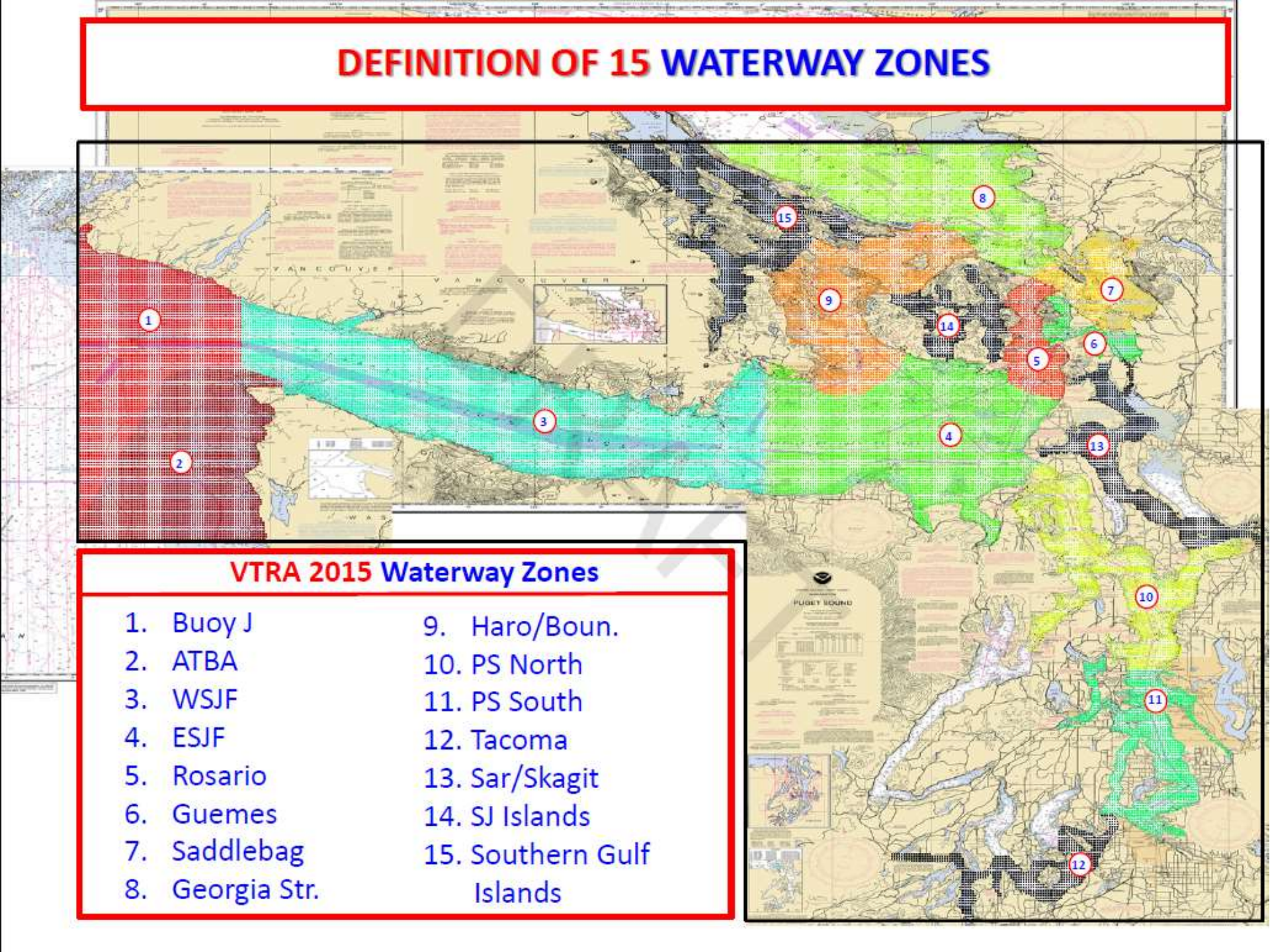
Sponsor: Ecology

Principle Investigators: George Washington University, Virginia Commonwealth University

Purpose: Provide updated information about the risks of oil spills from commercial vessel traffic in the Salish Sea

VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2015

DEFINITION OF 15 WATERWAY ZONES



VTRA 2015 Waterway Zones

1. Buoy J
2. ATBA
3. WSJF
4. ESJF
5. Rosario
6. Guemes
7. Saddlebag
8. Georgia Str.
9. Haro/Boun.
10. PS North
11. PS South
12. Tacoma
13. Sar/Skagit
14. SJ Islands
15. Southern Gulf Islands

VTRA Workgroup Membership

Chair: Captain Stephan Moreno, Puget Sound Pilots
(November, 2015 – August, 2016)

Federal advisors:

- US Coast Guard District 13; Sector Puget Sound

State and tribal leads:

- Makah Tribal Council
- Washington State Department of Ecology

Core workgroup members:

- American Waterways Operators
- BP
- Marine Exchange of Puget Sound
- Mulno Cove Consulting/Friends of the San Juans
- Pacific Merchant Shipping Association
- Puget Sound Partnership
- Puget Sound Pilots
- Puget Soundkeeper
- Tesoro
- Washington Association of Counties
- Washington Public Ports Association
- Wave/Friends of the Earth
- Western States Petroleum Association

VTRA Process

- **Update the model** with 2015 vessel traffic data
- **Define and model "what-if" cases** to reflect marine terminal projects that could become operational by 2025
- **Define and model risk reduction measures** to provide information about their potential to reduce accidents and oil spill risks

Key Risk Reduction Measures Modeled

- **Improvements to international and federal standards** that are in the process of being implemented
- **Rescue tug(s)** for Haro Strait and Boundary Pass
- **Tug escort** for articulated tug barges (ATBs) and towed oil barges in Puget Sound
- **Removal of the current size restriction** (125,000 deadweight tons) on oil tankers in Puget Sound
- **Escort of outbound tankers** from Kinder Morgan's Westridge Marine Terminal to the Pacific Ocean

Key Points to Consider

- Model results should be **considered in context** of the assumptions used in the model
- The VTRA process **focused on prevention** of accidents and oil spills, not oil spill trajectory, fate, or impact
- The **results provide a tool** to compare potential differences between the base case, what-if cases, and risk mitigation measures
- These **results are not predictions** of how many or what size oil spills will occur

Model Results

Oil spills from commercial vessels are "low probability/high consequence events"

- **98% of accidents did not result in oil loss** for both the base case and the 1,600 vessel what-if case
- **All the potential oil loss** evaluated in the model was the **result of less than 2% of potential accidents**

Model Results

Risk Varies by Region

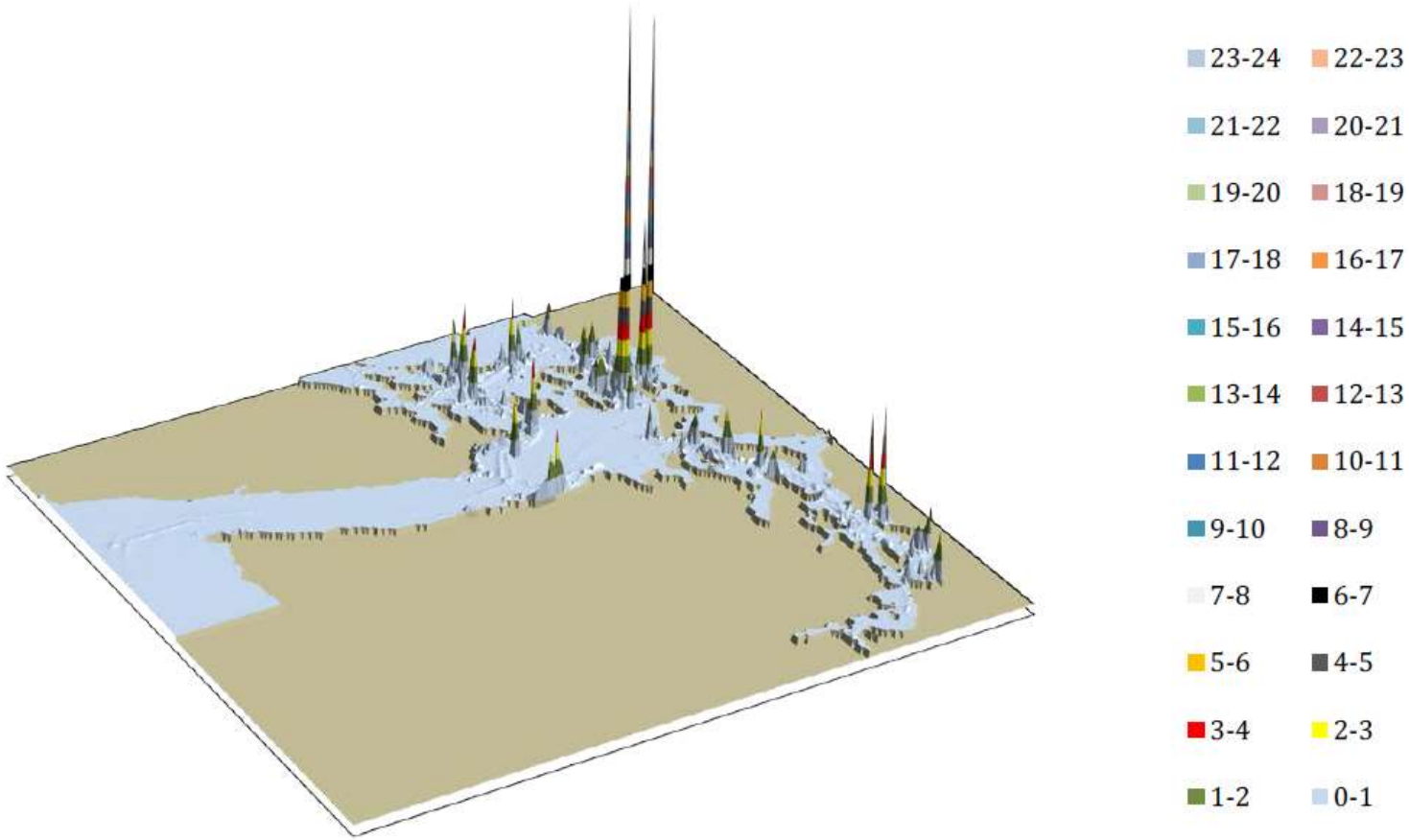
- For the 1,600 vessel what-if case, the largest increases in potential oil loss and potential accident frequency were at the entrance to the Strait of Juan de Fuca and in the Haro Strait/Boundary Pass waterway zone
  - Largest increase in potential oil loss by volume was in the Haro Strait/Boundary Pass waterway zone

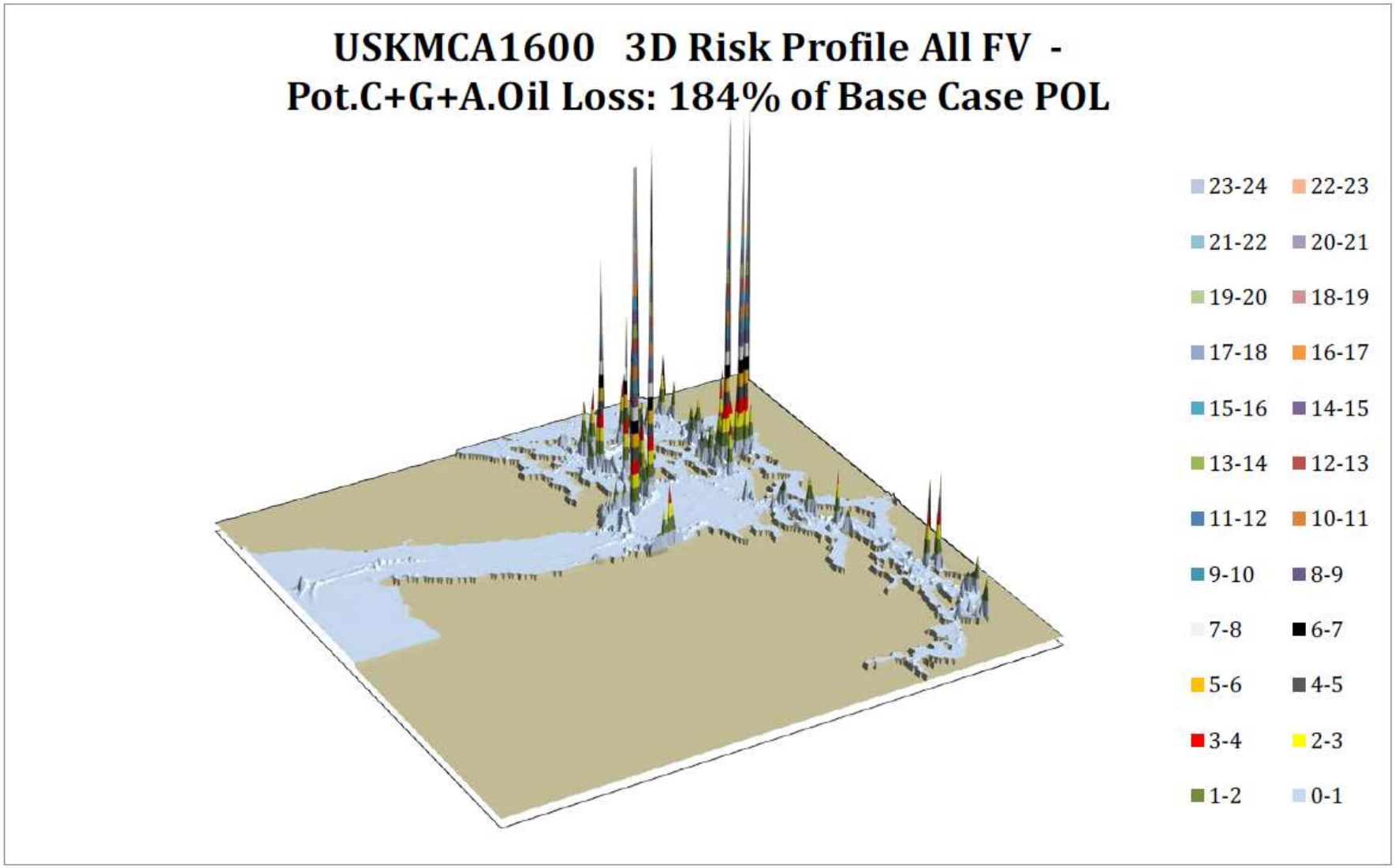
Model Results

Risk in a complex system is best managed systemically

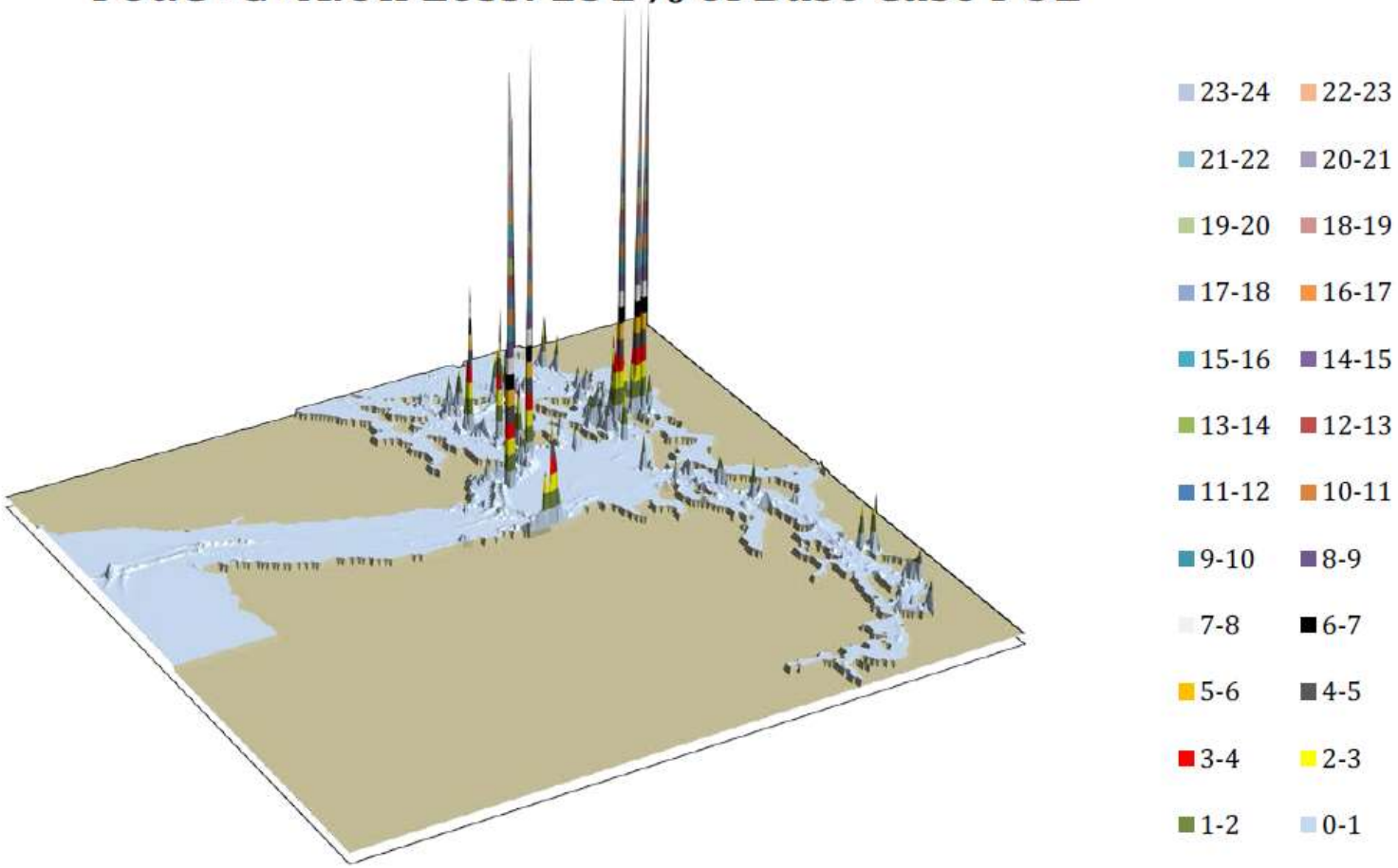
- The **greatest overall reductions** in potential oil loss **came from a portfolio** of five mitigation measures, rather than any single action.
- Within the five mitigation measure portfolio, the measure approximating pending improvements to vessel traffic management and safety had the greatest effect.
  - However, the model makes “maximum benefit assumptions” about the potential effect of these pending changes
- Removing the 125,000 deadweight ton restriction on oil tankers increased potential oil loss
- Tug escorts for articulated tug barges and towed oil barges reduced potential accidents by 15% and potential oil loss by 3%, compared to the 1,600 vessel what-if case

VTRA '15: Base Case 3D Risk Profile All FV - Pot.C+G+A.Oil Loss: 100% of Base Case POL



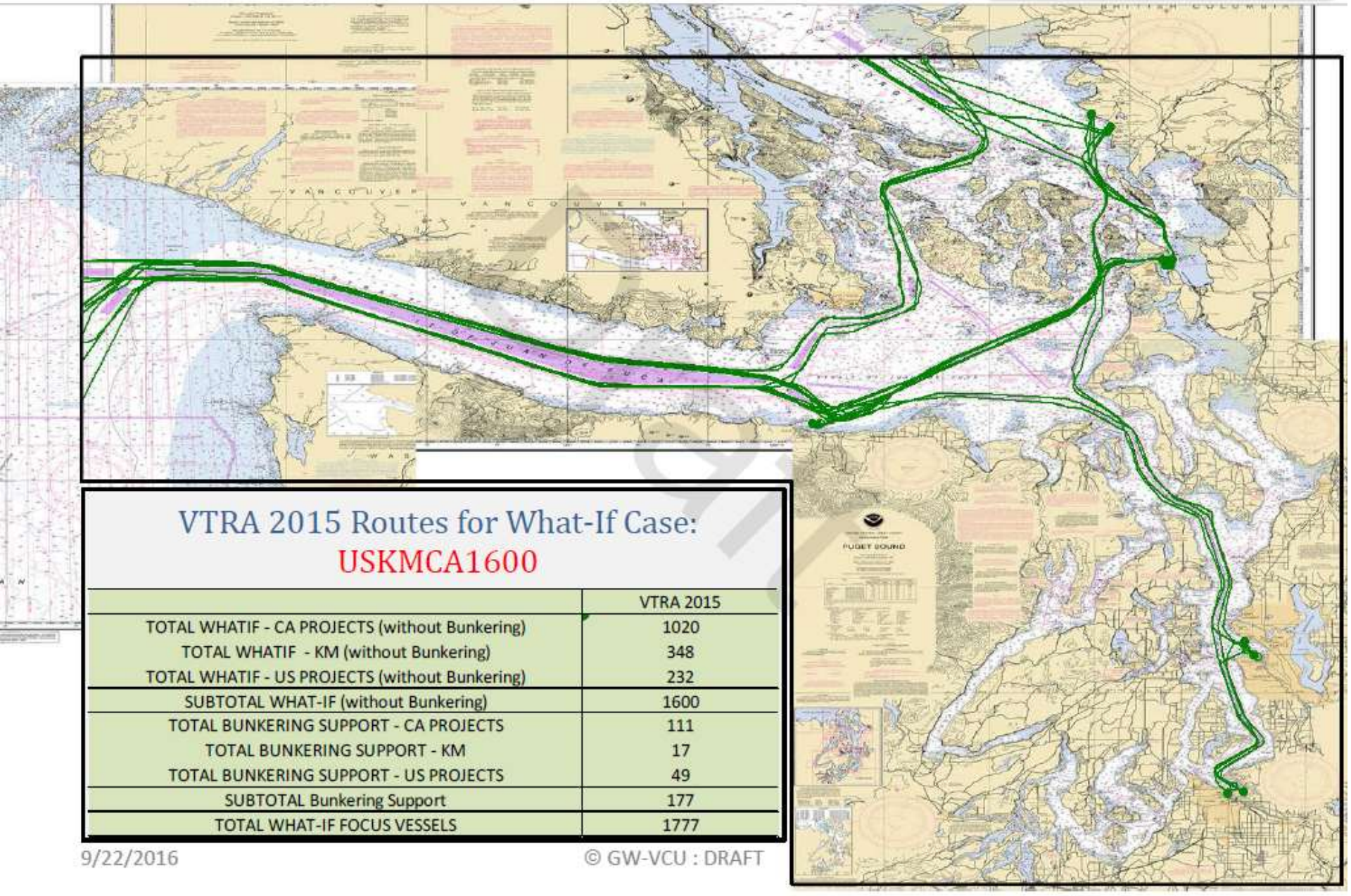

USKMCA1600 3D Risk Profile All FV -
Pot.C+G+A.Oil Loss: 184% of Base Case POL
23-24
22-23
21-22
20-21
19-20
18-19
17-18
16-17
15-16
14-15
13-14
12-13
11-12
10-11
9-10
8-9
7-8
6-7
5-6
4-5
3-4
2-3
1-2
0-1

USCAKM1600-5RMM 3D Risk Profile All FV - Pot.C+G+A.Oil Loss: 131% of Base Case POL



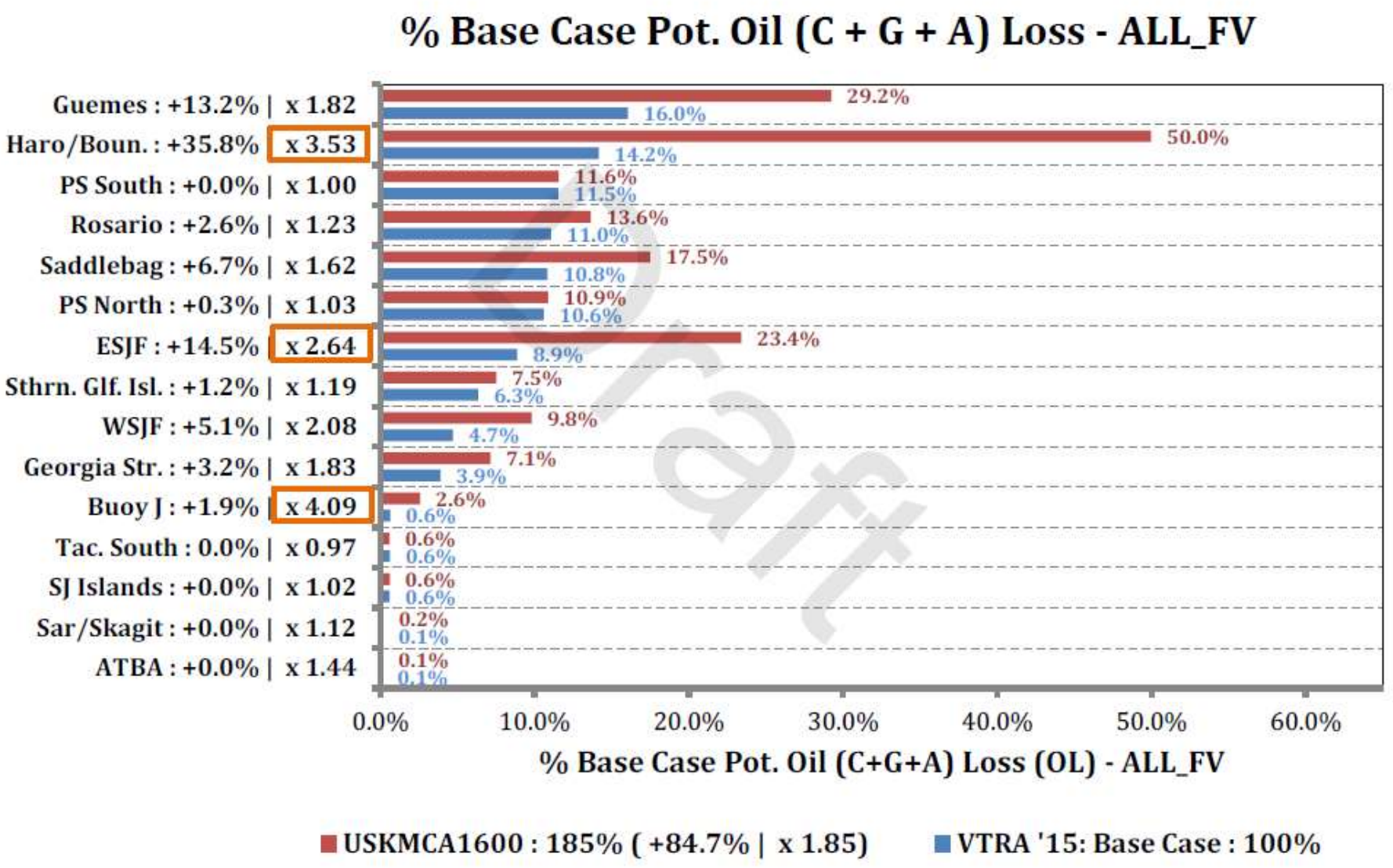
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2015

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC
VCU



VTRA 2015 Routes for What-If Case: USKMCA1600

	VTRA 2015
TOTAL WHATIF - CA PROJECTS (without Bunkering)	1020
TOTAL WHATIF - KM (without Bunkering)	348
TOTAL WHATIF - US PROJECTS (without Bunkering)	232
SUBTOTAL WHAT-IF (without Bunkering)	1600
TOTAL BUNKERING SUPPORT - CA PROJECTS	111
TOTAL BUNKERING SUPPORT - KM	17
TOTAL BUNKERING SUPPORT - US PROJECTS	49
SUBTOTAL Bunkering Support	177
TOTAL WHAT-IF FOCUS VESSELS	1777


% Base Case Pot. Oil (C + G + A) Loss - ALL_FV
Guemes : +13.2% | x 1.82
Haro/Boun. : +35.8% | x 3.53
PS South : +0.0% | x 1.00
Rosario : +2.6% | x 1.23
Saddlebag : +6.7% | x 1.62
PS North : +0.3% | x 1.03
ESJF : +14.5% | x 2.64
Sthrn. Glf. Isl. : +1.2% | x 1.19
WSJF : +5.1% | x 2.08
Georgia Str. : +3.2% | x 1.83
Buoy J : +1.9% | x 4.09
Tac. South : 0.0% | x 0.97
SJ Islands : +0.0% | x 1.02
Sar/Skagit : +0.0% | x 1.12
ATBA : +0.0% | x 1.44
29.2%
16.0%
50.0%
14.2%
11.6%
11.5%
13.6%
11.0%
17.5%
10.8%
10.9%
10.6%
23.4%
8.9%
7.5%
6.3%
9.8%
4.7%
7.1%
3.9%
2.6%
0.6%
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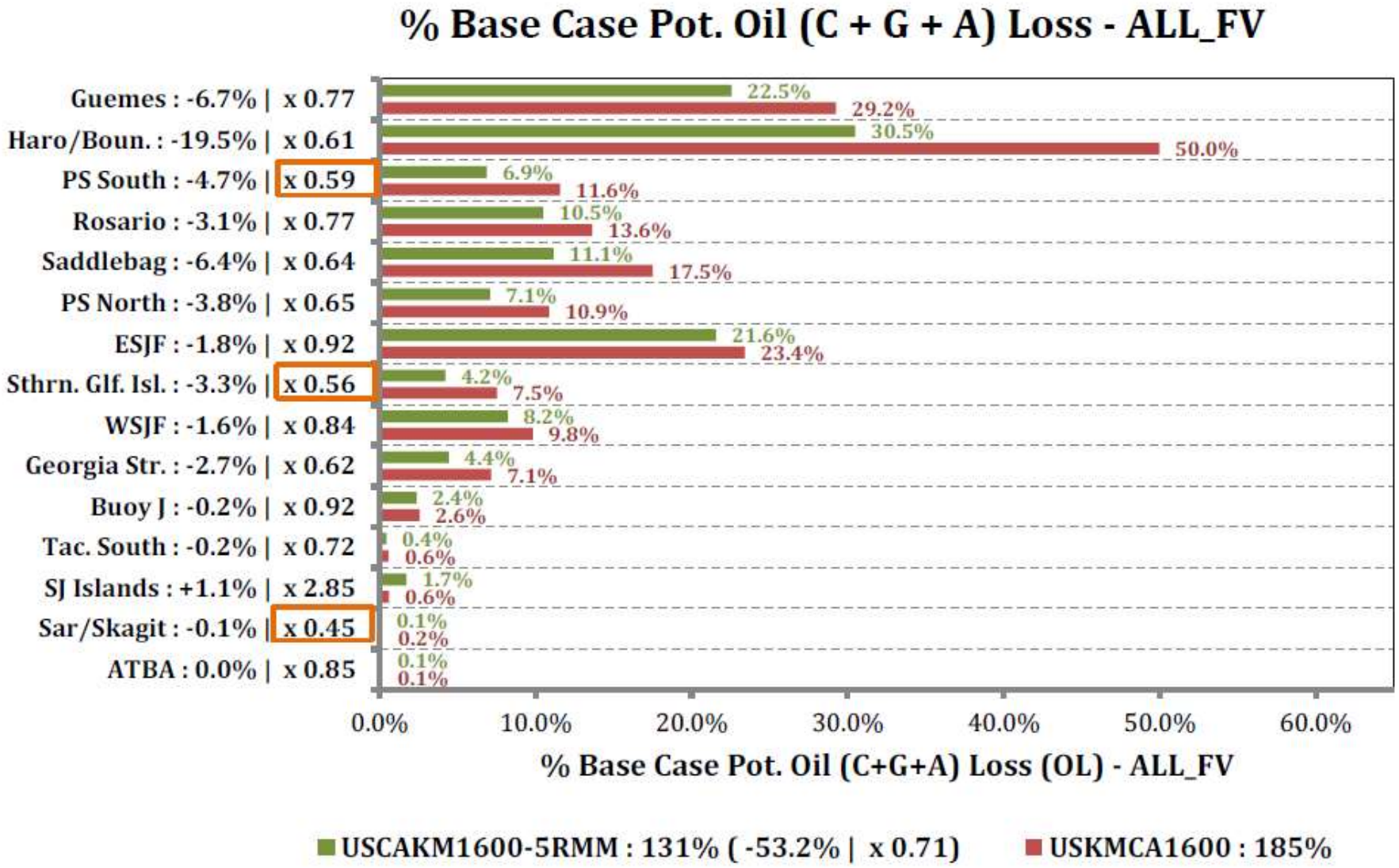
0.6%
0.6%
0.2%
0.1%
0.1%
0.1%
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
% Base Case Pot. Oil (C+G+A) Loss (OL) - ALL_FV
USKMCA1600 : 185% (+84.7% | x 1.85)
VTRA '15: Base Case : 100%


% Base Case Pot. Oil (C + G + A) Loss - ALL_FV
Guemes : -6.7% | x 0.77
Haro/Boun. : -19.5% | x 0.61
PS South : -4.7% | x 0.59
Rosario : -3.1% | x 0.77
Saddlebag : -6.4% | x 0.64
PS North : -3.8% | x 0.65
ESJF : -1.8% | x 0.92
Sthrn. Glf. Isl. : -3.3% | x 0.56
WSJF : -1.6% | x 0.84
Georgia Str. : -2.7% | x 0.62
Buoy J : -0.2% | x 0.92
Tac. South : -0.2% | x 0.72
SJ Islands : +1.1% | x 2.85
Sar/Skagit : -0.1% | x 0.45
ATBA : 0.0% | x 0.85
22.5%
29.2%
30.5%
50.0%
6.9%
11.6%
10.5%
13.6%
11.1%
17.5%
7.1%
10.9%
21.6%
23.4%
4.2%
7.5%
8.2%
9.8%
4.4%
7.1%
2.4%
2.6%
0.4%
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1.7%
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0.1%
0.2%
0.1%
0.1%
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
% Base Case Pot. Oil (C+G+A) Loss (OL) - ALL_FV
USCAKM1600-5RMM : 131% (-53.2% | x 0.71)
USKMCA1600 : 185%

Conclusion

- 2015 VTRA final report provides:
  - **An information source** to help government, tribes, and stakeholders answer complex and location-specific risk management questions.
  - Valuable **insight into relative changes in risk, and potential benefits** that could be realized by a portfolio approach to risk reduction.
- 2015 VTRA Final Report and Ecology Focus Sheet are available here:

http://www.ecy.wa.gov/programs/spills/prevention/RiskAssessment.html

2016 Salish Sea Oil Spill Risk Mitigation Workshop Background:

When: October 18 -19, 2016

Where: Bellingham, WA

Who: ~ 75 representatives from US and Canadian agencies, Tribes, First Nations, Environmental Groups, Industry Groups, & Nonprofit Organizations

Workshop Goal

Develop **actionable recommendations** to reduce the risk of oil spills from vessel traffic in the Strait of Juan de Fuca and the Salish Sea

Workshop Results

Rank	Risk Reduction Measure Description
1	**Escort tank vessels including oil barges and Articulated Tug Barges in Puget Sound**
2	**Create a Canada/US Transboundary Marine Safety Forum**
3	**Pre-position a multi-mission emergency response towing vessel (ERTV) for Haro Strait/Boundary Pass**
4	**Conduct a Ports and Waterways Safety Assessment (PAWSA) for Port Angeles Precautionary Area and Rosario Strait**
5	Share transboundary marine incident data
6	Support implementation of pending risk reduction measures
7	Broaden the oil spill prevention community: “Keep it in the tank”
8	a. Require a minimum 2-person bridge watch on tugs towing laden barges carrying pollutants in the Vessel Traffic System zone
	b. Require a minimum 2-person bridge watch on commercial vessels in reduced visibility.
9	Optimize anchorage number/ location

Grays Harbor

- Ecology funded in 2017-2019 to conduct a vessel traffic risk assessment for Grays Harbor
- Builds on previous legislature-directed work
  - Completed an update to Puget Sound VTRA in January 2017
  - Draft report on the Columbia River Vessel Traffic Evaluation and Safety Assessment due to the legislature December 15, 2017
- Opportunity to document current baseline of oil spill prevention and preparedness; identify potential ideas for continuous improvement

Grays Harbor VTRA - Goals

- Assess baseline and changing oil spill risks
  - Identify measures that could help reduce the risks of oil spills
- Assess oil spill response preparedness
  - Identify baseline response capability

GH VTRA study approach

- Use a recognized, industry-standard framework – IMO Formal Safety Assessment - to conduct risk assessment
- Conduct a deliberative process
  - Focus on any known areas where improvements could be made

IMO Formal Safety Assessment

- References: IMO; MSC 1023/MEPC 392
- 5-step process