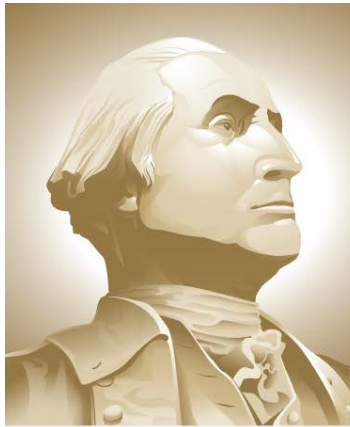


# **VTRA 2010**

## **TRAFFIC DENSITIES BY**

### **NON – FV, CARGO – FV and OIL - FV**

Presentation by: J. Rene van Dorp



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**V  
C  
U**

**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**MAY 3, 2013**

## Table. Focus Vessel (FV) Classification for the 26 VTOSS vessel type classification used in the GW/VCU MTS simulation model.

**NON – FV** : Those vessels that are only considered as Interacting Vessels (IV) with Focus Vessels (FV) in this study

**CARGO – FV** : Bulk Carriers and Container Vessels

**OIL – FV** : Oil Tankers, ATB and Tugs towing/pushing Oil Barges

**Note:** Focus Vessels (FV's) are also considered as Interacting Vessels (IV's) when interacting with another Focus Vessel.

#	VESSEL TYPE	FOCUS VESSEL?	#	VESSEL TYPE	FOCUS VESSEL?
1	BULKCARRIER	<b>CARGO - FV</b>	14	PASSENGERSHIP	NO
2	CHEMICALCARRIER	NO	15	REFRIGERATEDCARGO	NO
3	CONTAINERSHIP	<b>CARGO - FV</b>	16	RESEARCHSHIP	NO
4	DECKSHIPCARGO	NO	17	ROROCARGOSHIP	NO
5	FERRY	NO	18	ROROCARGOCONTSHIP	NO
6	FERRYNONLOCAL	NO	19	SUPPLYOFFSHORE	NO
7	FISHINGFACTORY	NO	20	TUGTOWBARGE	NO
8	FISHINGVESSEL	NO	21	UNKNOWN	NO
9	LIQGASCARRIER	NO	22	USCOASTGUARD	NO
10	NAVYVESSEL	NO	23	VEHICLECARRIER	NO
11	OILTANKER	<b>OIL - FV</b>	24	YACHT	NO
12	OTHERSPECIALCARGO	NO	25	ATB	<b>OIL - FV</b>
13	OTHERSPECIFICSERV	NO	26	OIL BARGE	<b>OIL - FV</b>



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STRAIT OF JUAN DE FUCA

# P: VTRA 2010 - Total Density

100%

53%

35%



## TOTAL 2010 TRAFFIC DENSITY

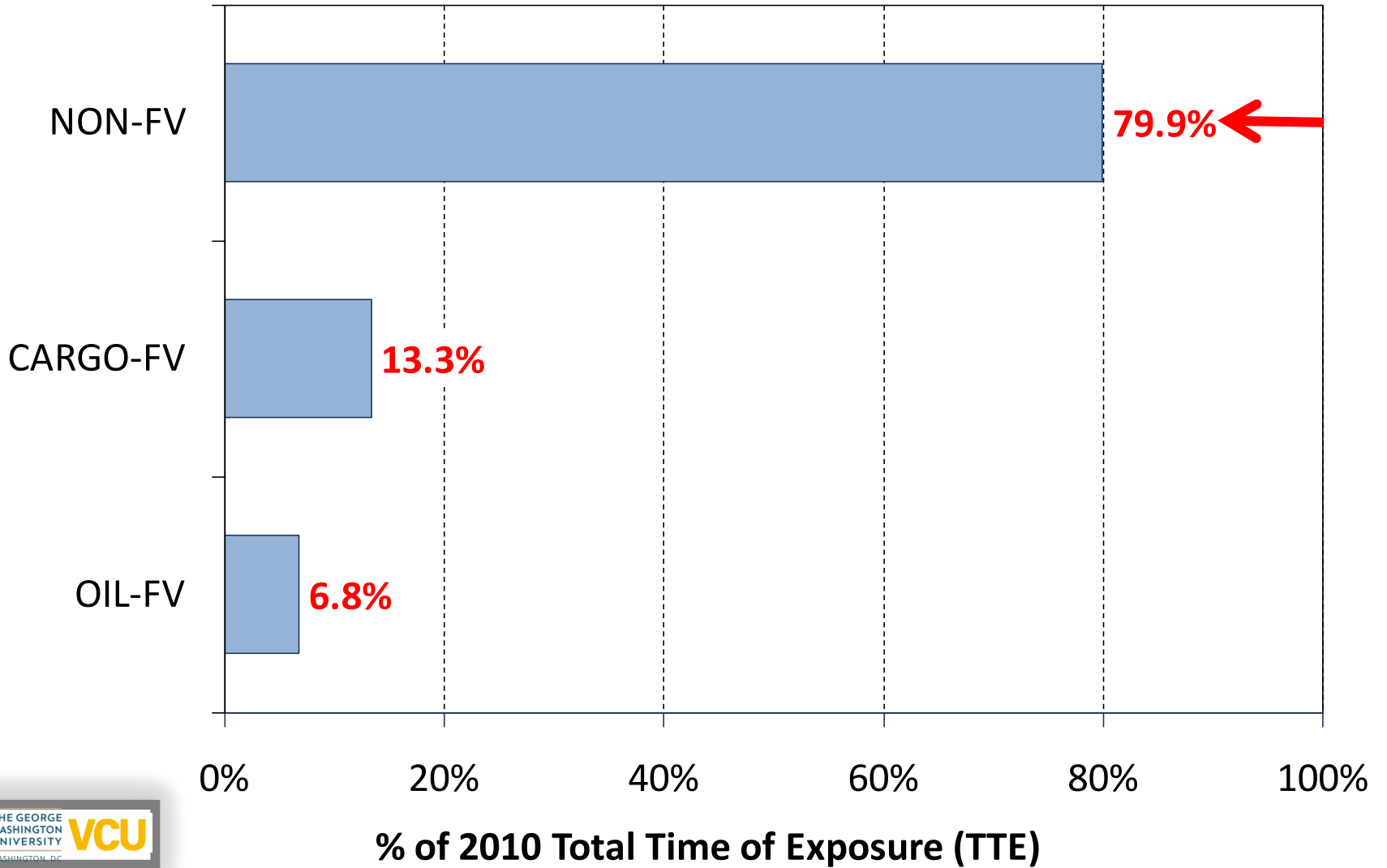
- 79.9% - NON-FV
- 13.3% - CARGO-FV
- 06.8% - OIL-FV

+  
100.0% of Case P Total



# VTRA MODEL - VTOSS 2010

**FOCUS VESSEL CLASSIFICATION**

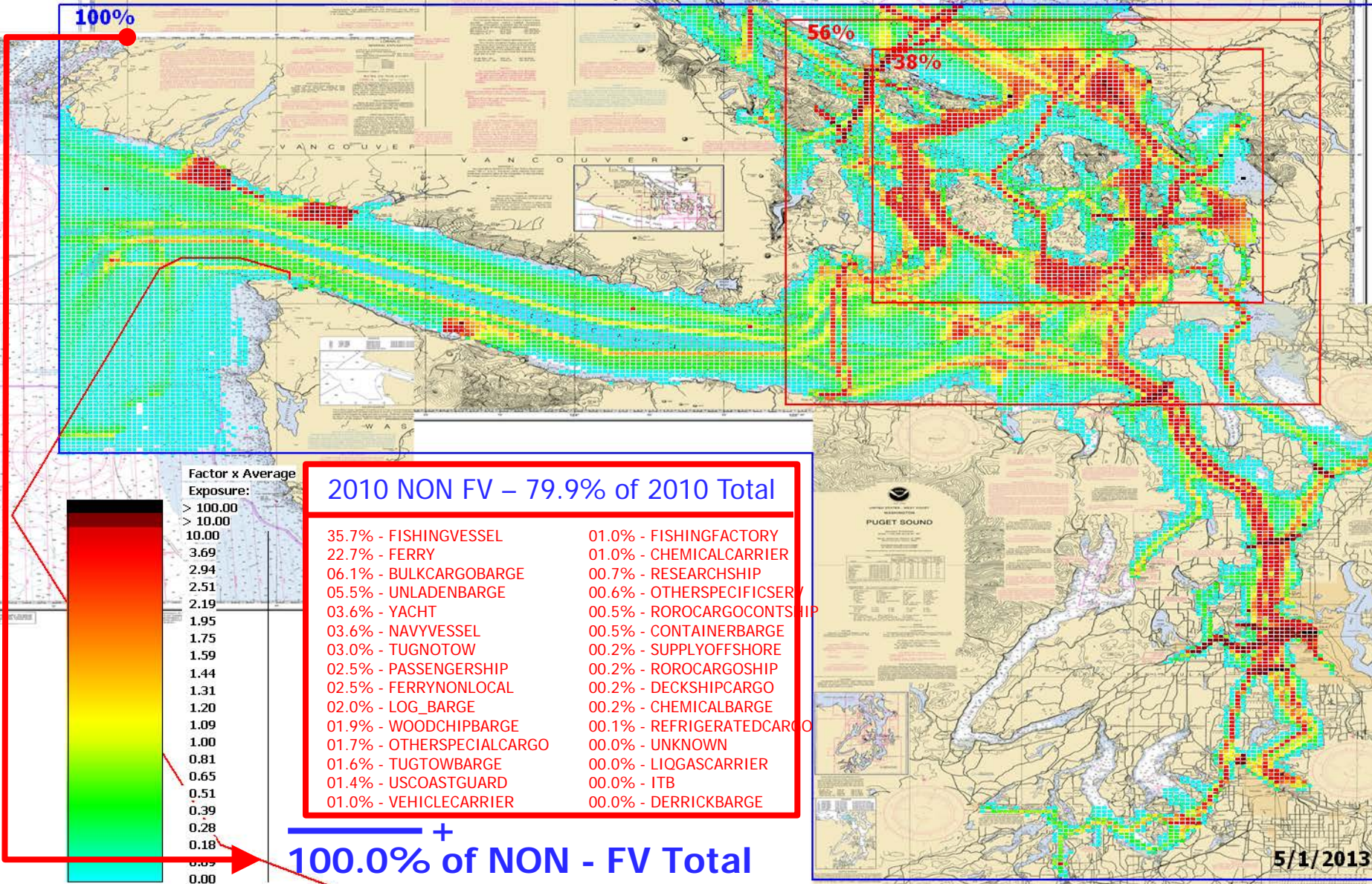






# 79.9% of Total Traffic Density

## P: VTRA 2010 - Non Focus Vessels Density



100%

56%

38%

Factor x Average Exposure:

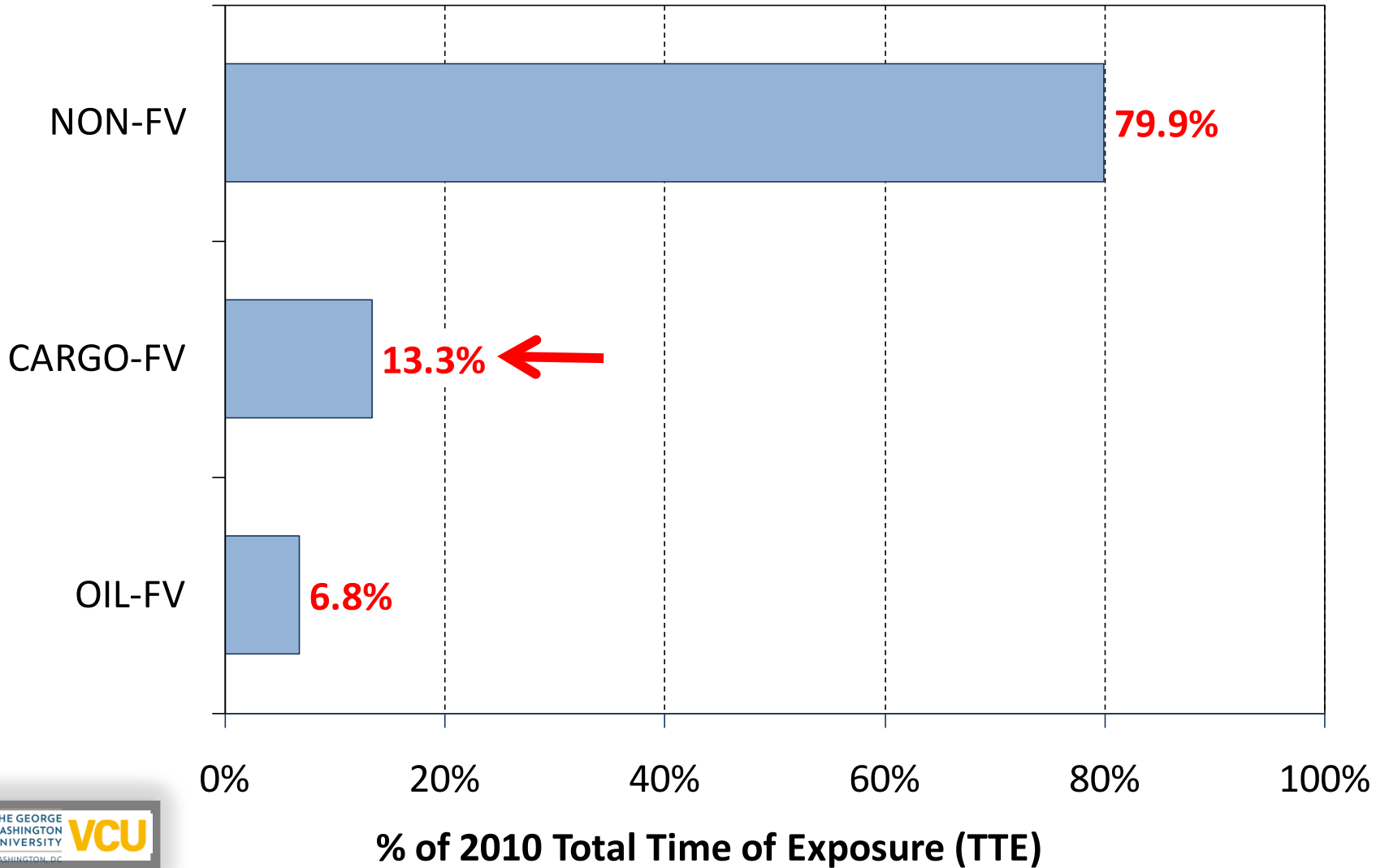
- > 100.00
- > 10.00
- 10.00
- 3.69
- 2.94
- 2.51
- 2.19
- 1.95
- 1.75
- 1.59
- 1.44
- 1.31
- 1.20
- 1.09
- 1.00
- 0.81
- 0.65
- 0.51
- 0.39
- 0.28
- 0.18
- 0.09
- 0.00

2010 NON FV – 79.9% of 2010 Total	
35.7% - FISHINGVESSEL	01.0% - FISHINGFACTORY
22.7% - FERRY	01.0% - CHEMICALCARRIER
06.1% - BULKCARGOBARGE	00.7% - RESEARCHSHIP
05.5% - UNLADENBARGE	00.6% - OTHERSPECIFICSERV
03.6% - YACHT	00.5% - ROROCARGOCONTSHIP
03.6% - NAVYVESSEL	00.5% - CONTAINERBARGE
03.0% - TUGNOTOW	00.2% - SUPPLYOFFSHORE
02.5% - PASSENGERSHIP	00.2% - ROROCARGOSHIP
02.5% - FERRYNONLOCAL	00.2% - DECKSHIPCARGO
02.0% - LOG_BARGE	00.2% - CHEMICALBARGE
01.9% - WOODCHIPBARGE	00.1% - REFRIGERATEDCARGO
01.7% - OTHERSPECIALCARGO	00.0% - UNKNOWN
01.6% - TUGTOWBARGE	00.0% - LIQGASCARRIER
01.4% - USCOASTGUARD	00.0% - ITB
01.0% - VEHICLECARRIER	00.0% - DERRICKBARGE

100.0% + of NON - FV Total

# VTRA MODEL - VTOSS 2010

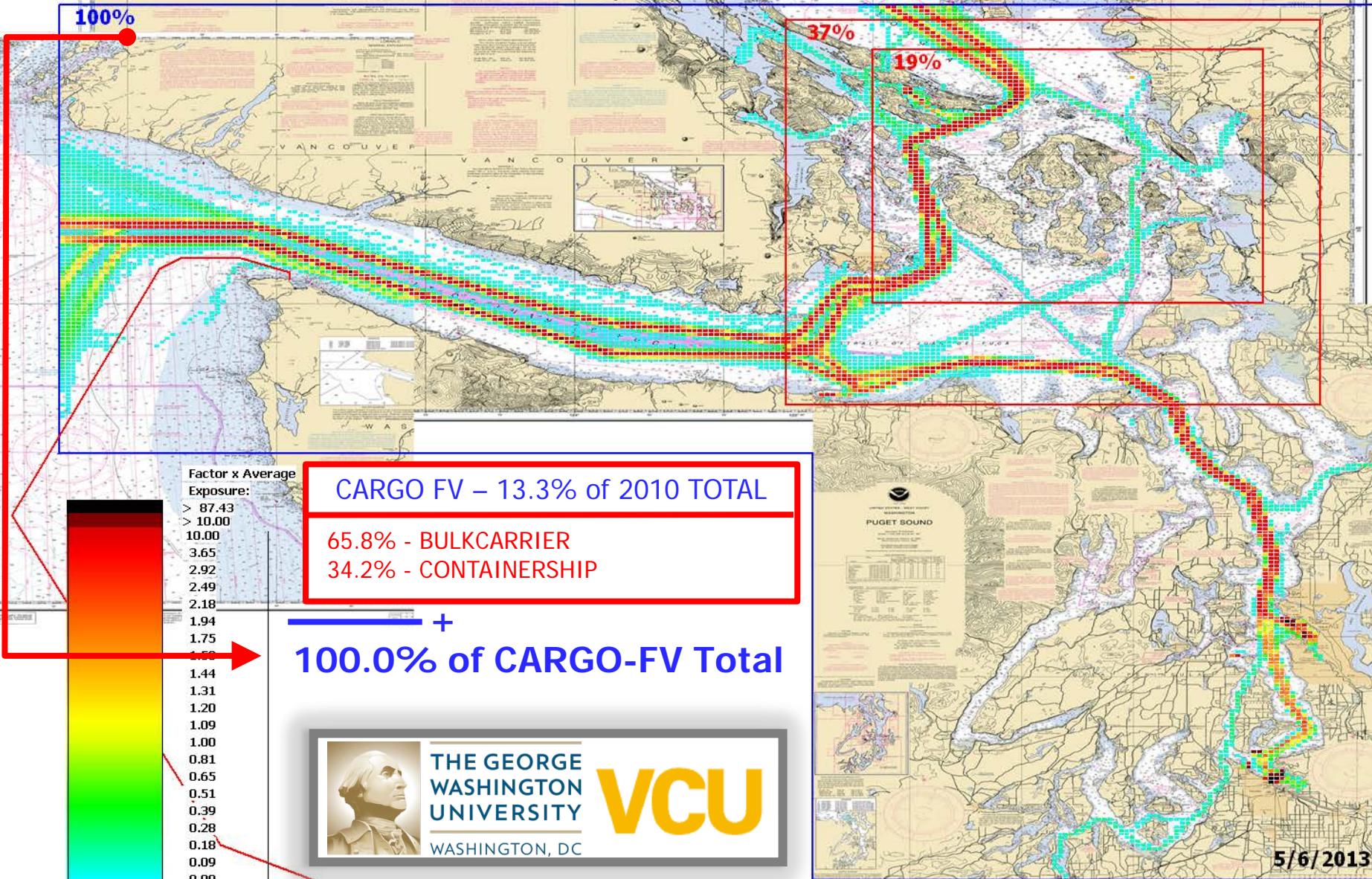
FOCUS VESSEL CLASSIFICATION





# 13.3% of Total Traffic Density

## P: VTRA 2010 - Cargo Focus Vessel Density



Factor x Average Exposure:

- > 87.43
- > 10.00
- 10.00
- 3.65
- 2.92
- 2.49
- 2.18
- 1.94
- 1.75
- 1.55
- 1.44
- 1.31
- 1.20
- 1.09
- 1.00
- 0.81
- 0.65
- 0.51
- 0.39
- 0.28
- 0.18
- 0.09
- 0.00

**CARGO FV – 13.3% of 2010 TOTAL**

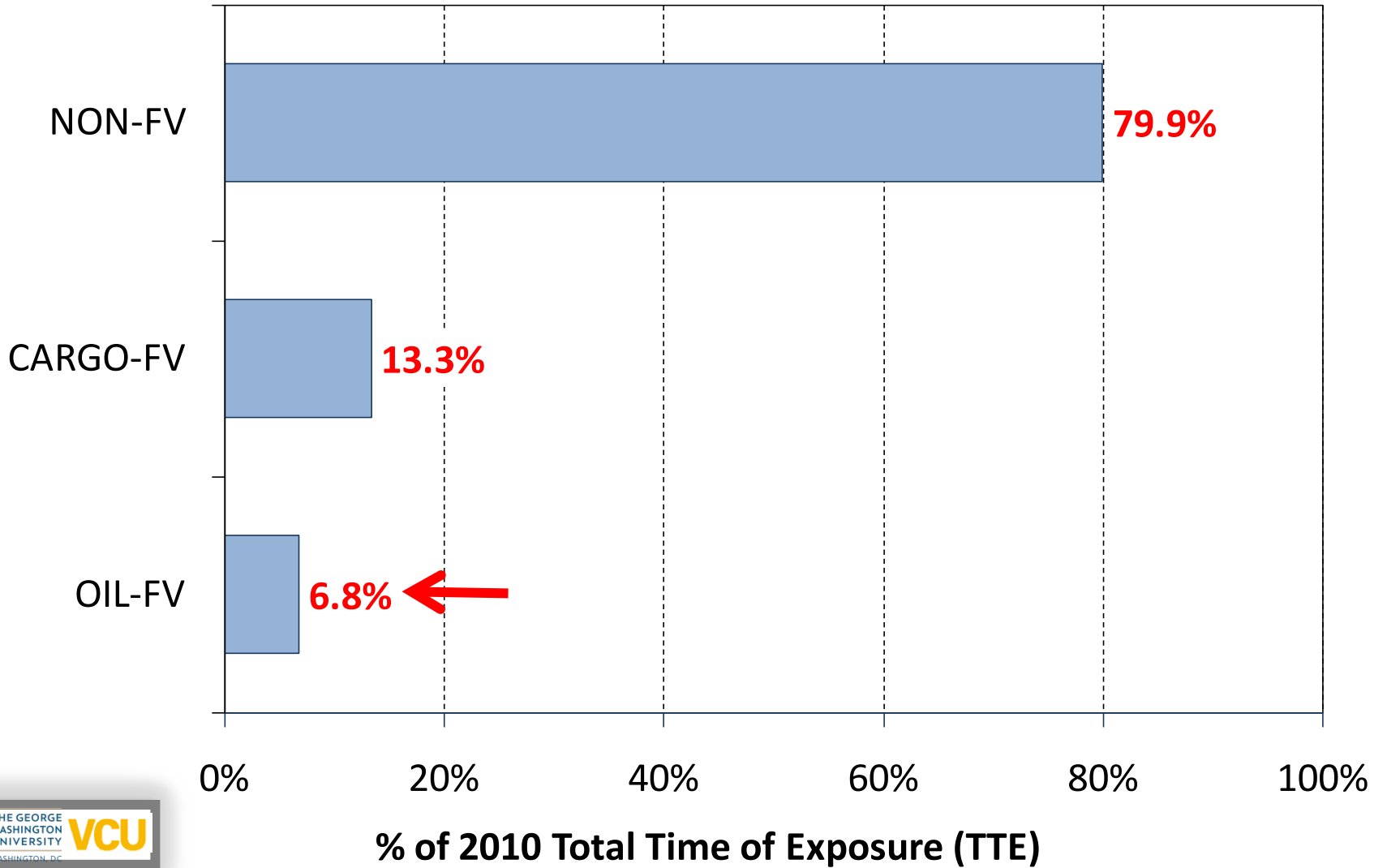
65.8% - BULKCARRIER  
34.2% - CONTAINERSHIP

**100.0% of CARGO-FV Total**



# VTRA MODEL - VTOSS 2010

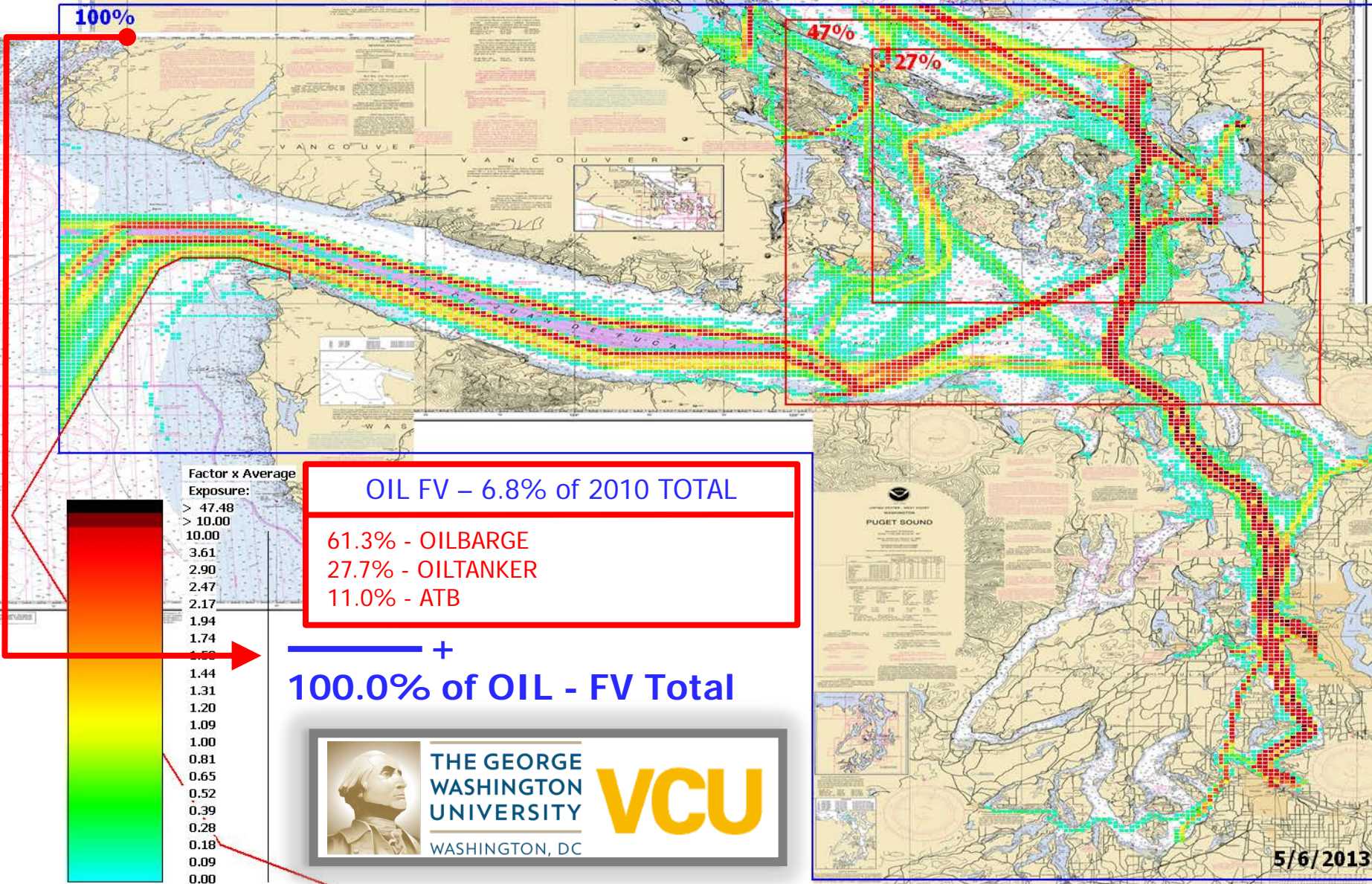
FOCUS VESSEL CLASSIFICATION





# 6.8% of Total Traffic Density

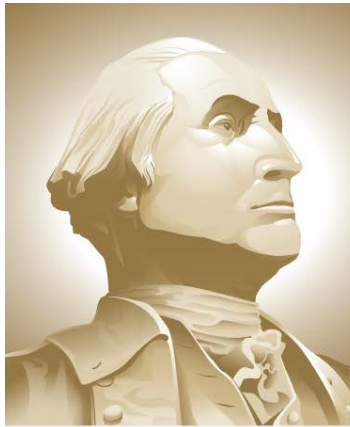
## P: VTRA 2010 - Oil Focus Vessel Density





# VTRA 2010 TRAFFIC DENSITY ANALYSIS BY LOCATION - ALL TRAFIC

Presentation by: J. Rene van Dorp



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**VCU**

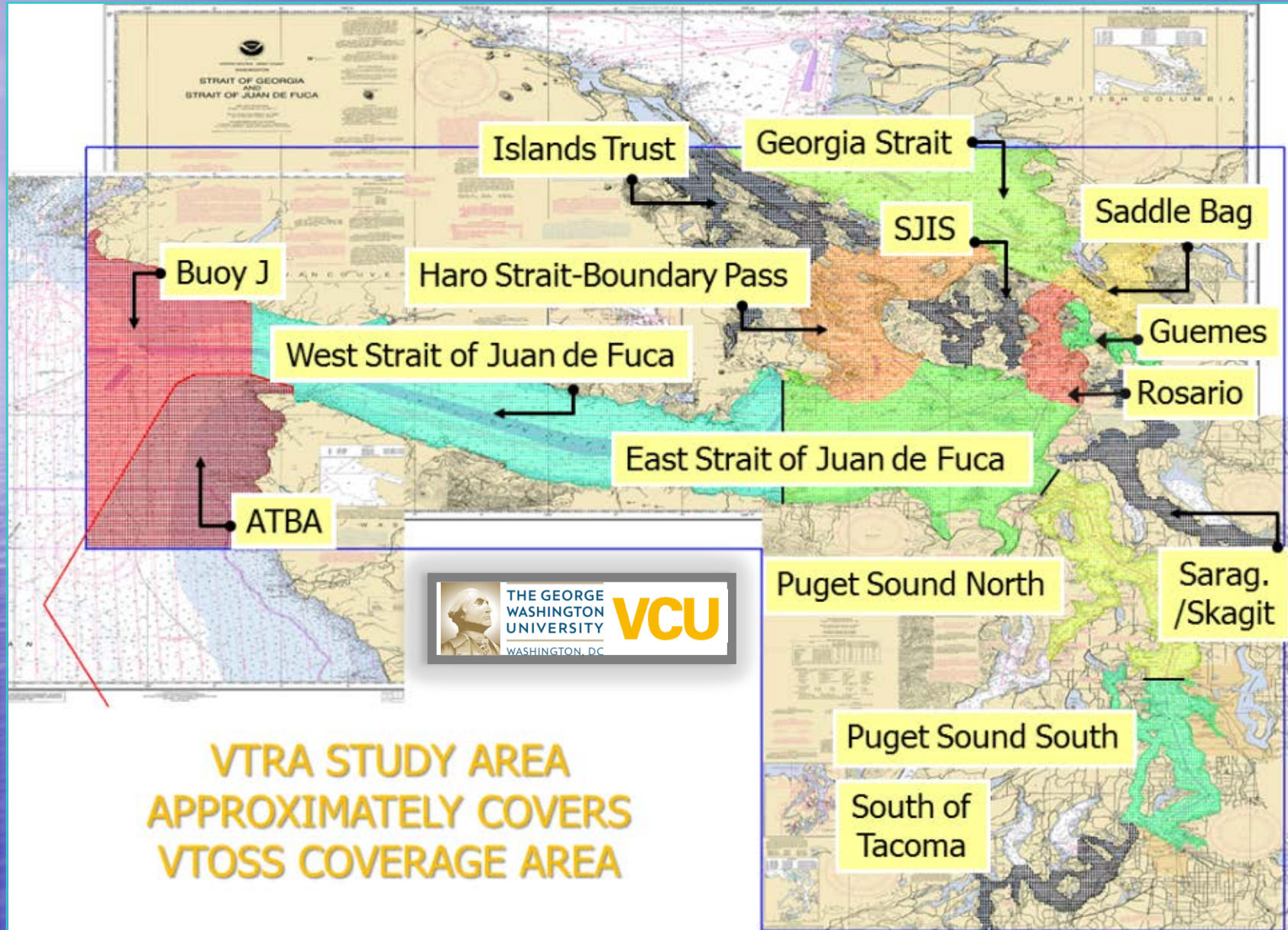
**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**MAY 3, 2013**



# Location definitions used in the GW/VCU MTS simulation model.





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AND  
STRAIT OF JUAN DE FUCA

# P: VTRA 2010 - Total Density

100%

53%

35%



**TOTAL 2010 TRAFFIC DENSITY**

- 79.9% - NON-FV
- 13.3% - CARGO-FV
- 06.8% - OIL-FV

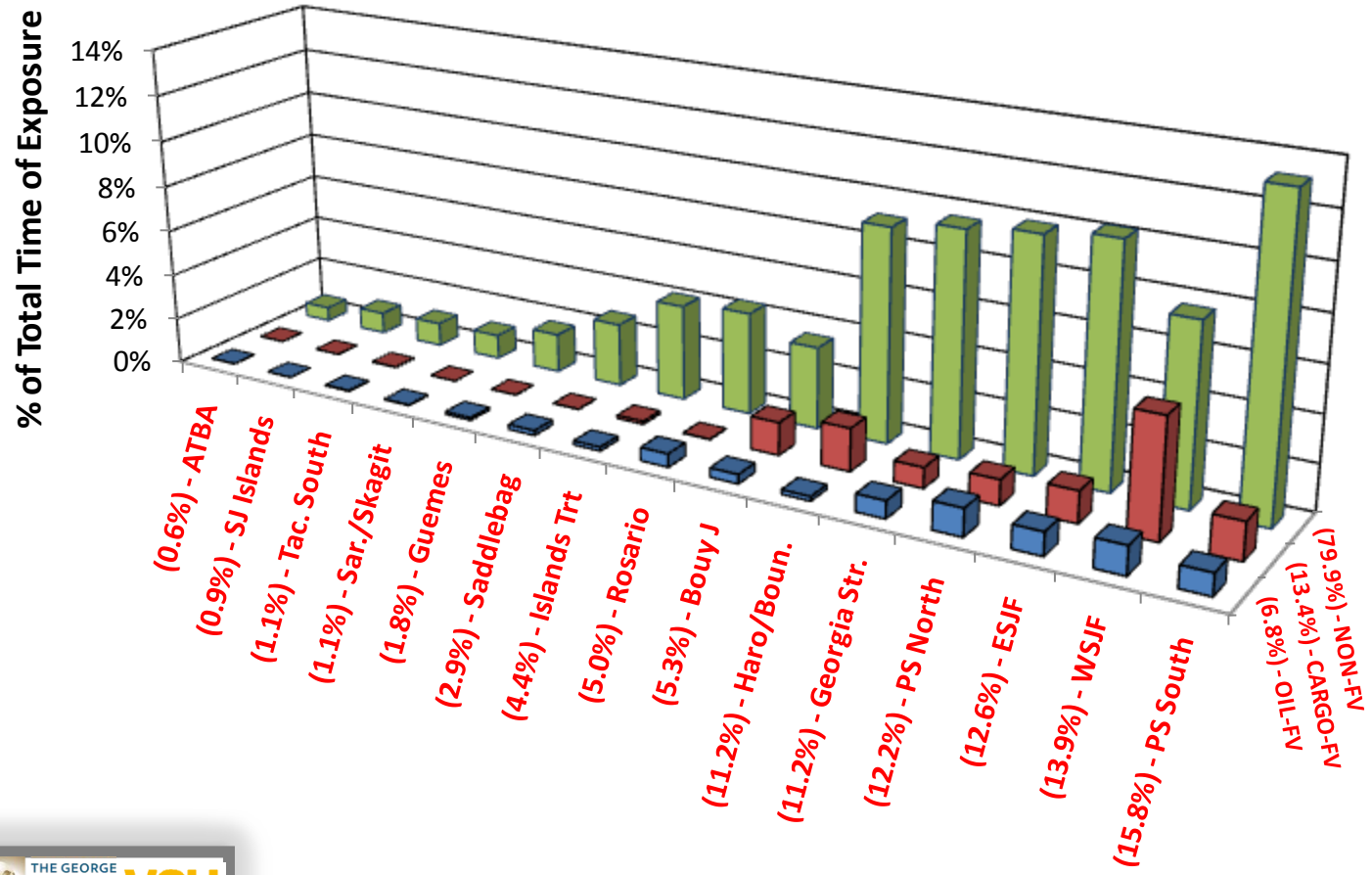
+  
**100.0% of Case P Total**

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**VCU**  
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# Traffic Density by Location – All Traffic

## VTRA MODEL - VTOSS 2010 - 100% of TRAFFIC



# 2010 Traffic Density Analysis by Location – All Traffic

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>	<i>Column 7</i>
<b>LOCATION</b>	<b># Grid Cells</b>	<b>% Area</b>	<b># Days Vessel is Moving per year</b>	<b>Average # of Vessels in Location</b>	<b>% of Total Time of Exposure</b>	<b>Density Factor (DF)</b>
WSJF	2857	19.6%	3749	10.3	13.9%	0.71
PS South	619	4.3%	4243	11.6	15.8%	3.70
Guemes	127	0.9%	482	1.3	1.8%	2.05
ESJF	2049	14.1%	3392	9.3	12.6%	0.89
Georgia Str.	1424	9.8%	3023	8.3	11.2%	1.15
PS North	983	6.8%	3280	9.0	12.2%	1.80
Saddlebag	375	2.6%	793	2.2	2.9%	1.14
Haro/Boun.	1066	7.3%	3012	8.3	11.2%	1.53
Rosario	307	2.1%	1341	3.7	5.0%	2.36
Buoy J	1478	10.2%	1431	3.9	5.3%	0.52
ATBA	1520	10.5%	169	0.5	0.6%	0.06
Tac. South	326	2.2%	287	0.8	1.1%	0.47
SJ Islands	259	1.8%	248	0.7	0.9%	0.52
Sar./Skagit	459	3.2%	288	0.8	1.1%	0.34
Islands Trt	696	4.8%	1192	3.3	4.4%	0.93
<b>Total</b>	<b>14545</b>	<b>100.0%</b>	<b>26929</b>	<b>73.8</b>	<b>100.0%</b>	<b>1.0</b>



↑  
Column 4  
 365

↑  
Column 4  
 Tot. Col. 4

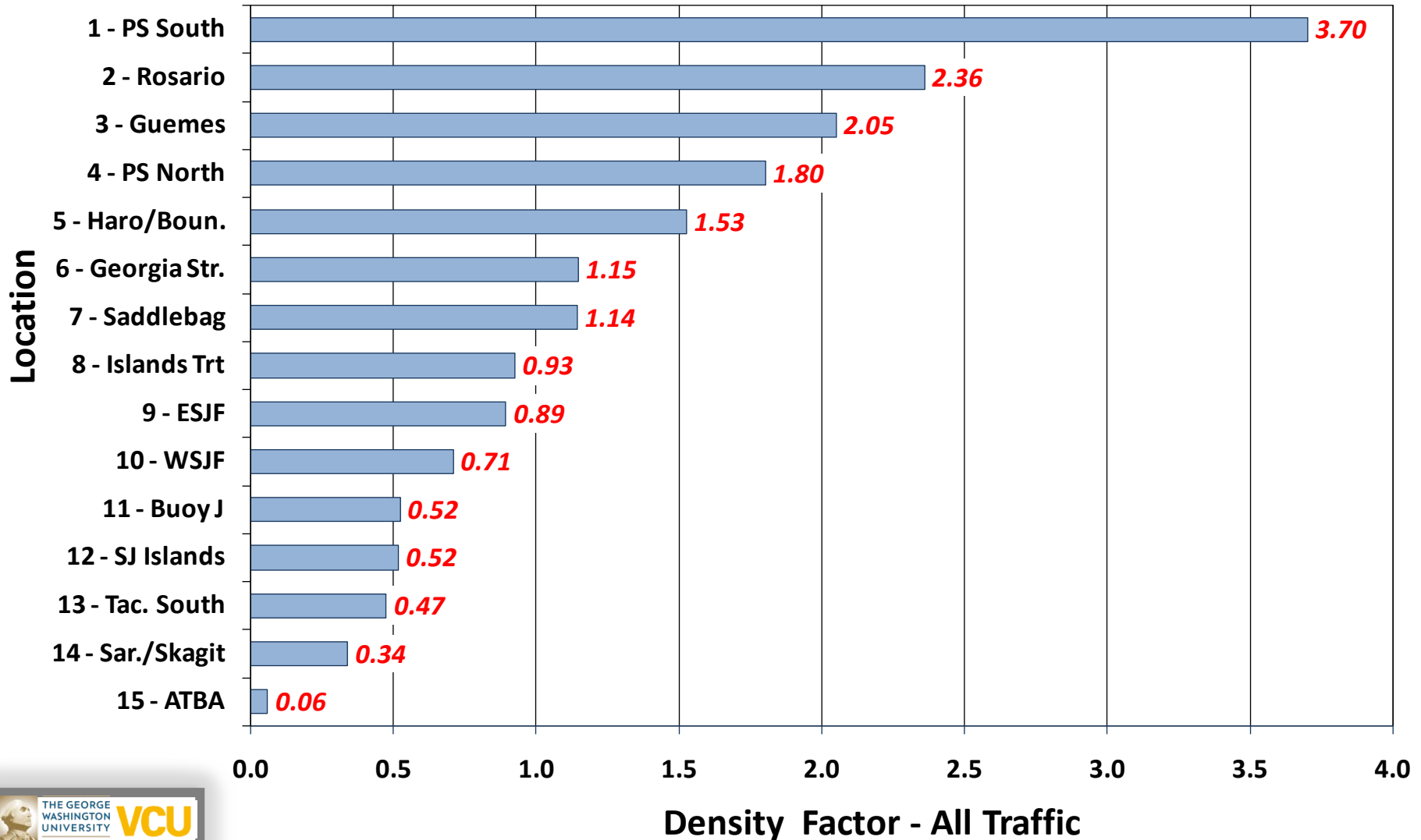
↑  
Column 4  
 Column 3



# Locations ranked by Density Factor – All Traffic

**VTRA  
2010**

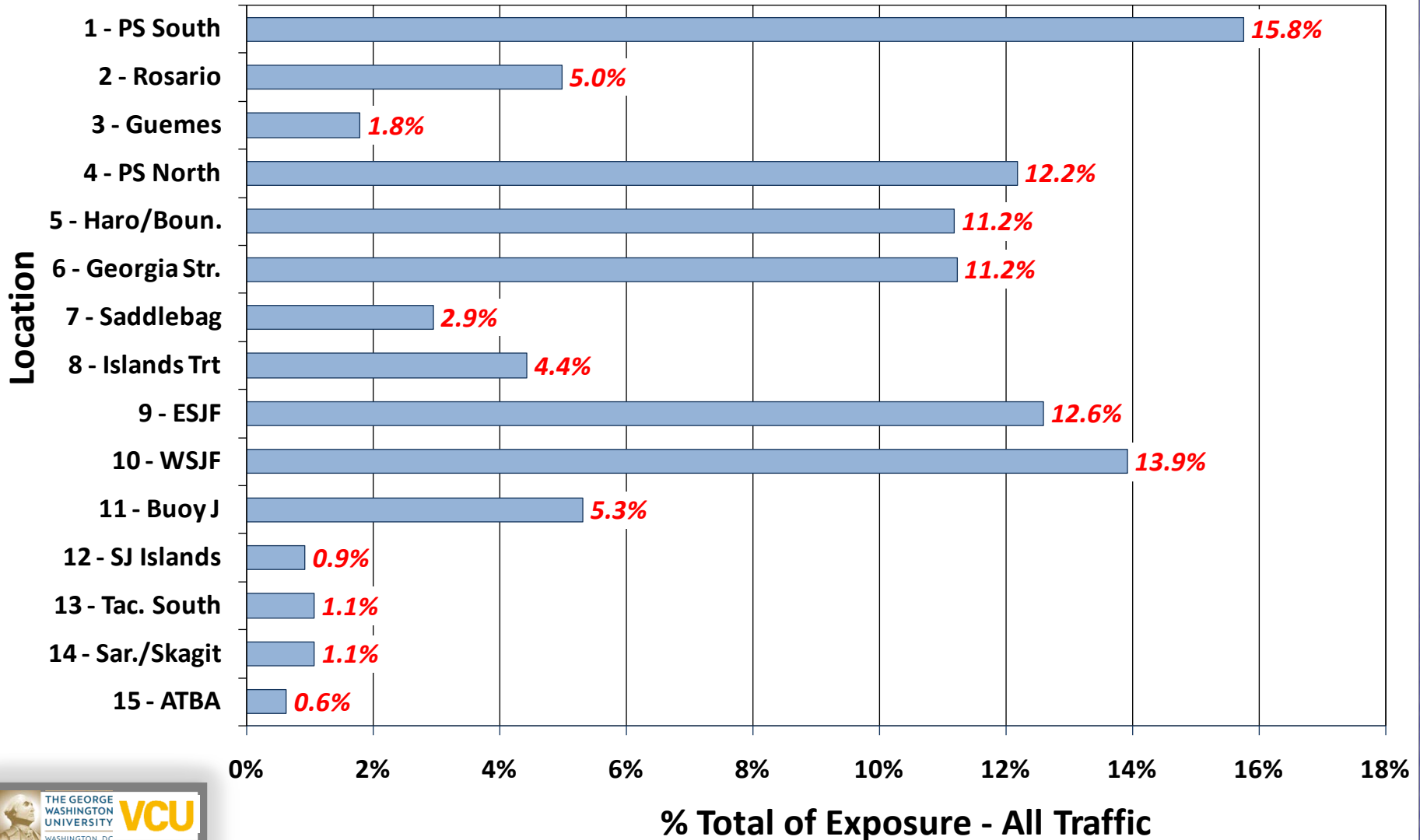
**Density Factor (DF) by Location - All Vessels =  
100% of total traffic i.e. 100% of Non-FV and FV-Traffic**



# Locations ranked by Density Factor – All Traffic

**VTRA  
2010**

**Total Time Exposure (TTE) by Location - All Vessels =  
100% of total traffic i.e. 100% of Non-FV and FV-Traffic**



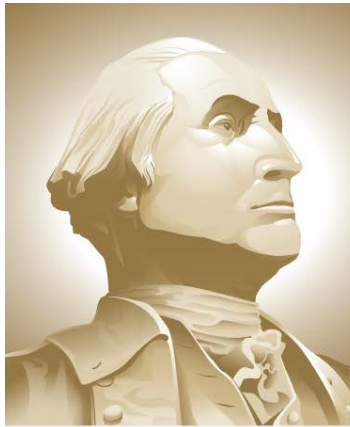


# **VTRA 2010**

## **TRAFFIC DENSITY ANALYSIS**

### **BY LOCATION NON – FOCUS VESSELS**

Presentation by: J. Rene van Dorp



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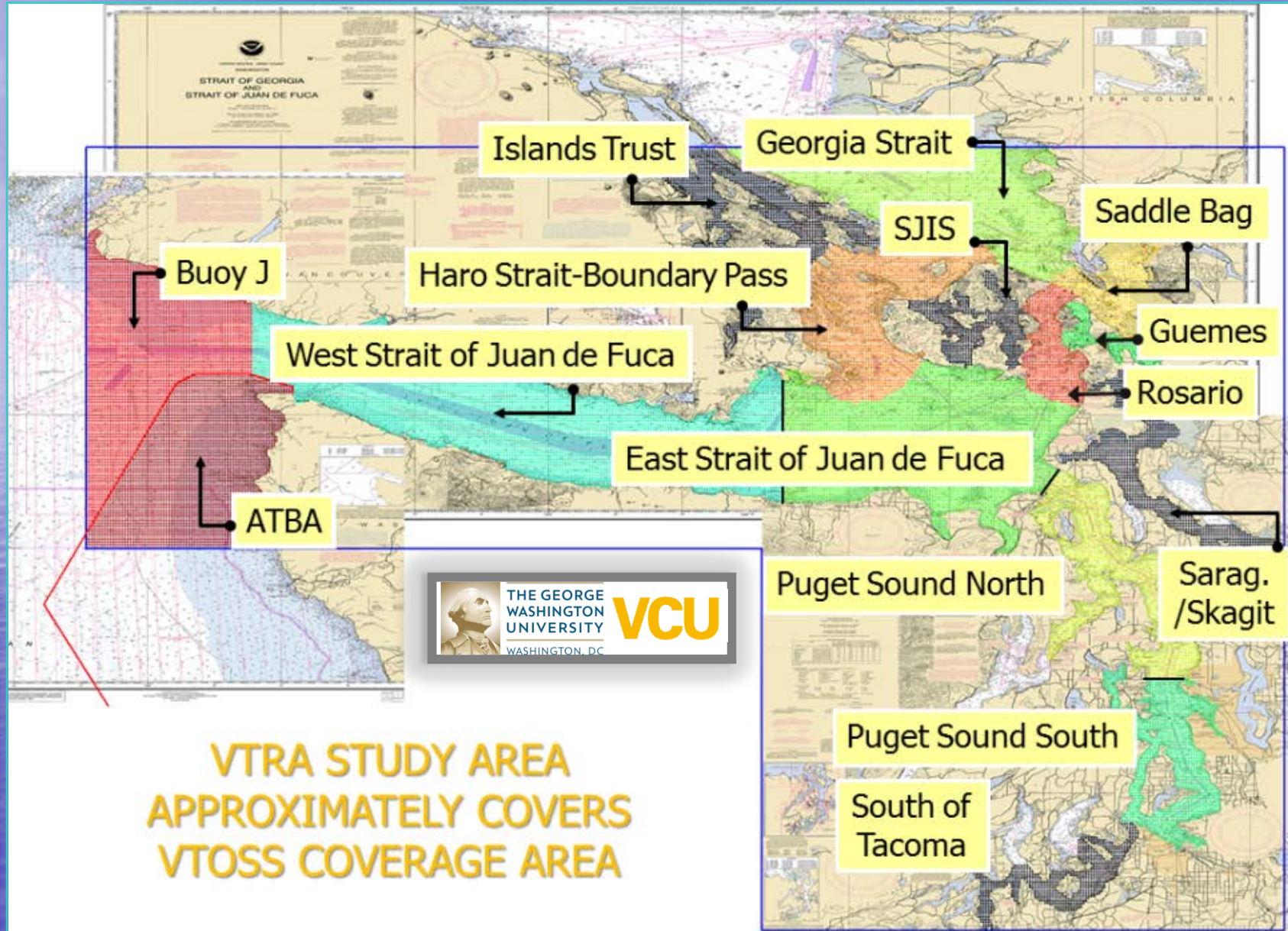
**VCU**

**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**MAY 3, 2013**

# Location definitions used in the GW/VCU MTS simulation model.

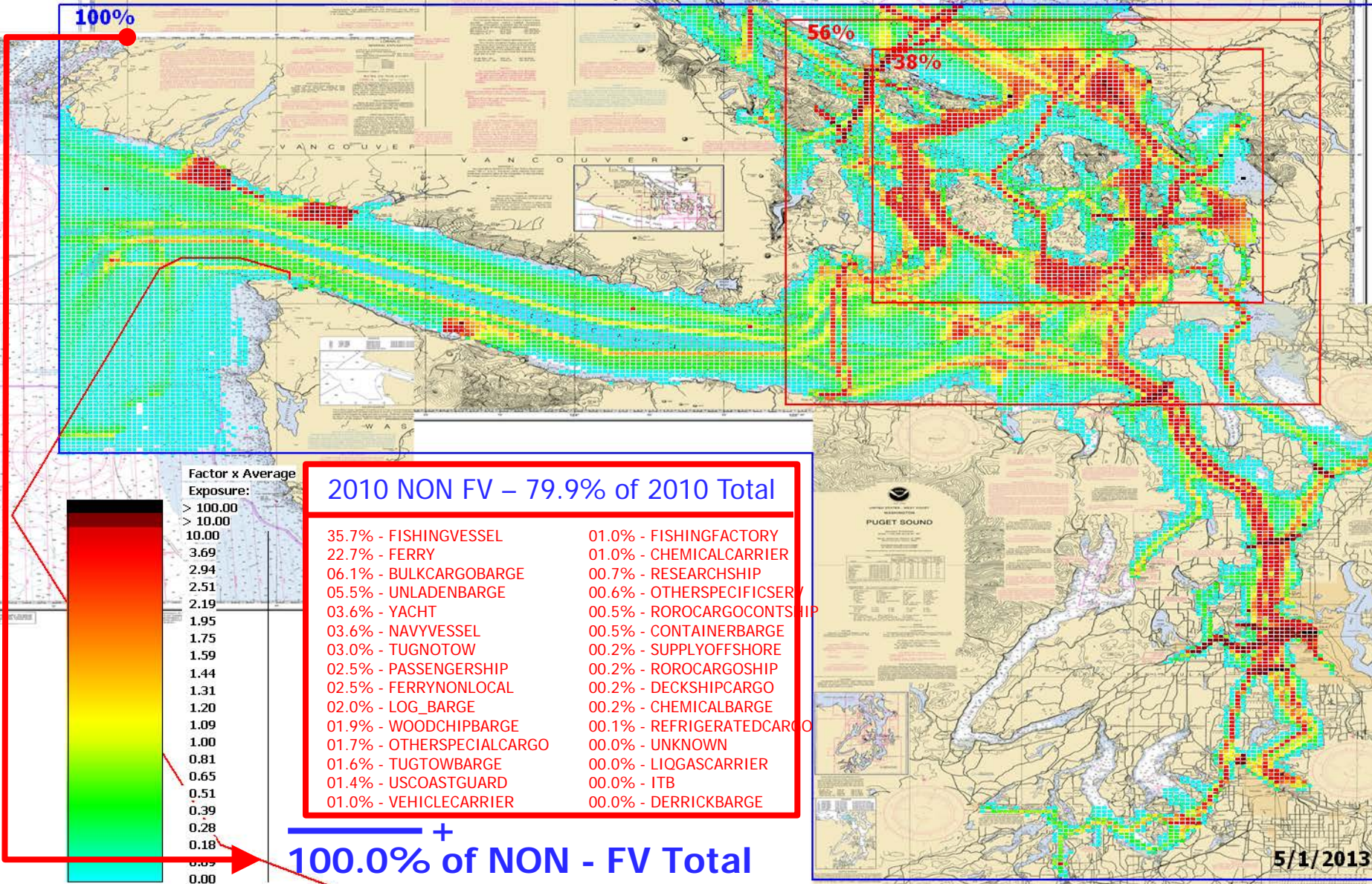






# 79.9% of Total Traffic Density

## P: VTRA 2010 - Non Focus Vessels Density



Factor x Average Exposure:

- > 10.00
- > 10.00
- 10.00
- 3.69
- 2.94
- 2.51
- 2.19
- 1.95
- 1.75
- 1.59
- 1.44
- 1.31
- 1.20
- 1.09
- 1.00
- 0.81
- 0.65
- 0.51
- 0.39
- 0.28
- 0.18
- 0.09
- 0.00

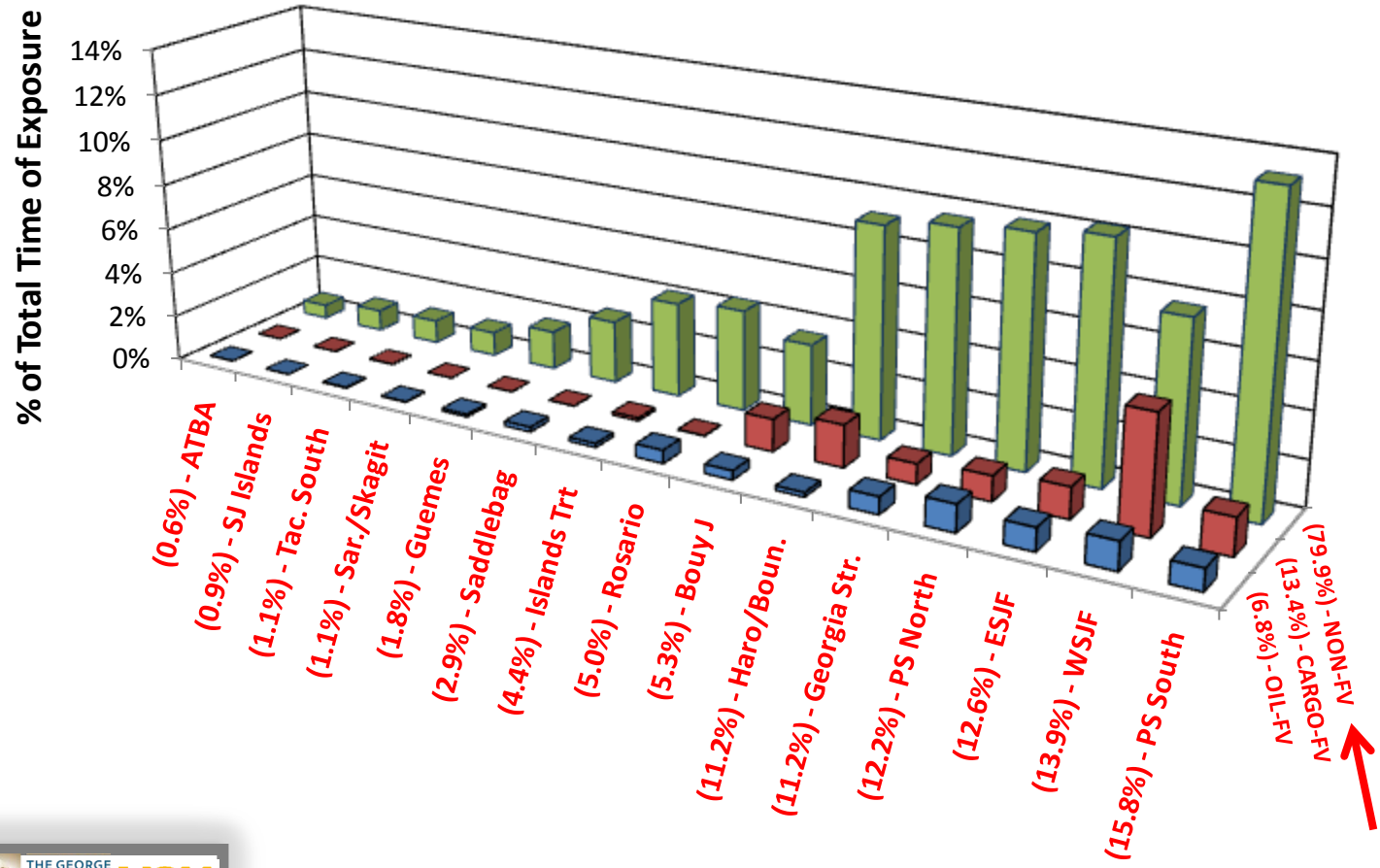
2010 NON FV – 79.9% of 2010 Total	
35.7% - FISHINGVESSEL	01.0% - FISHINGFACTORY
22.7% - FERRY	01.0% - CHEMICALCARRIER
06.1% - BULKCARGOBARGE	00.7% - RESEARCHSHIP
05.5% - UNLADENBARGE	00.6% - OTHERSPECIFICSERV
03.6% - YACHT	00.5% - ROROCARGOCONTSHIP
03.6% - NAVYVESSEL	00.5% - CONTAINERBARGE
03.0% - TUGNOTOW	00.2% - SUPPLYOFFSHORE
02.5% - PASSENGERSHIP	00.2% - ROROCARGOSHIP
02.5% - FERRYNONLOCAL	00.2% - DECKSHIPCARGO
02.0% - LOG_BARGE	00.2% - CHEMICALBARGE
01.9% - WOODCHIPBARGE	00.1% - REFRIGERATEDCARGO
01.7% - OTHERSPECIALCARGO	00.0% - UNKNOWN
01.6% - TUGTOWBARGE	00.0% - LIQGASCARRIER
01.4% - USCOASTGUARD	00.0% - ITB
01.0% - VEHICLECARRIER	00.0% - DERRICKBARGE

**100.0% +**  
**100.0% of NON - FV Total**



# Traffic Density by Location – All Traffic

## VTRA MODEL - VTOSS 2010 - 100% of TRAFFIC





# 2010 Traffic Density Analysis by Location limited to Non - Focus Vessels

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
LOCATION	# Grid Cells	% Area	# Days Vessel is Moving per year	Average # of Vessels in Location	% of Total Time of Exposure	Density Factor (DF)
WSJF	2857	19.6%	2066	5.7	9.6%	0.49
PS South	619	4.3%	3565	9.8	16.6%	3.89
Guemes	127	0.9%	452	1.2	2.1%	2.41
ESJF	2049	14.1%	2765	7.6	12.9%	0.91
Georgia Str.	1424	9.8%	2585	7.1	12.0%	1.23
PS North	983	6.8%	2671	7.3	12.4%	1.84
Saddlebag	375	2.6%	735	2.0	3.4%	1.32
Haro/Boun.	1066	7.3%	2467	6.8	11.5%	1.56
Rosario	307	2.1%	1184	3.2	5.5%	2.61
Bouy J	1478	10.2%	946	2.6	4.4%	0.43
ATBA	1520	10.5%	164	0.4	0.8%	0.07
Tac. South	326	2.2%	272	0.7	1.3%	0.56
SJ Islands	259	1.8%	247	0.7	1.2%	0.65
Sar./Skagit	459	3.2%	281	0.8	1.3%	0.41
Islands Trt	696	4.8%	1112	3.0	5.2%	1.08
<b>Total</b>	<b>14545</b>	<b>100.0%</b>	<b>21513</b>	<b>58.9</b>	<b>100.0%</b>	<b>1.0</b>



↑  
**Column 4**  


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 365

↑  
**Column 4**  


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 Tot. Col. 4

↑  
**Column 4**  

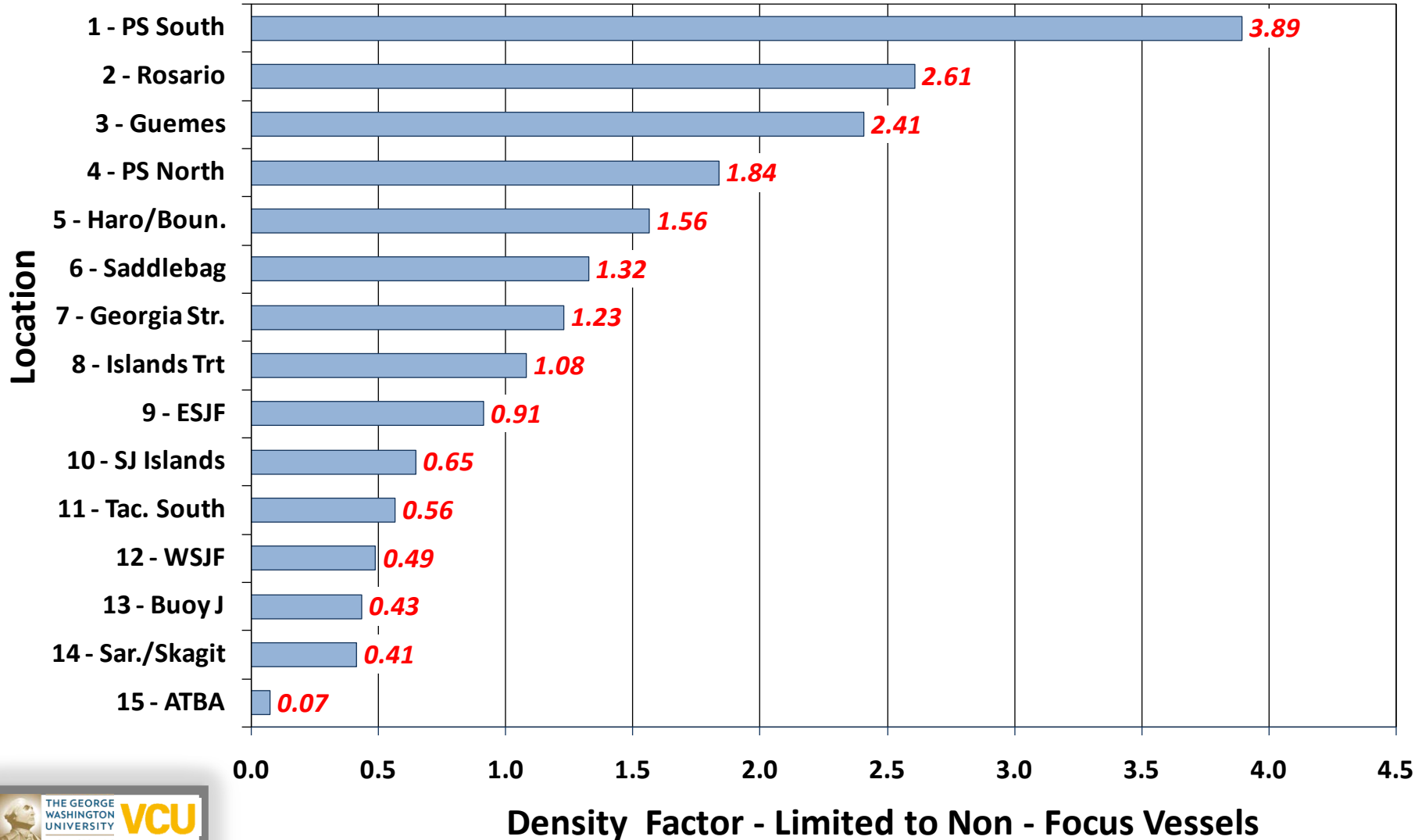

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 Column 3

# Locations ranked by Density Factor limited to Non-Focus Vessels

**VTRA  
2010**

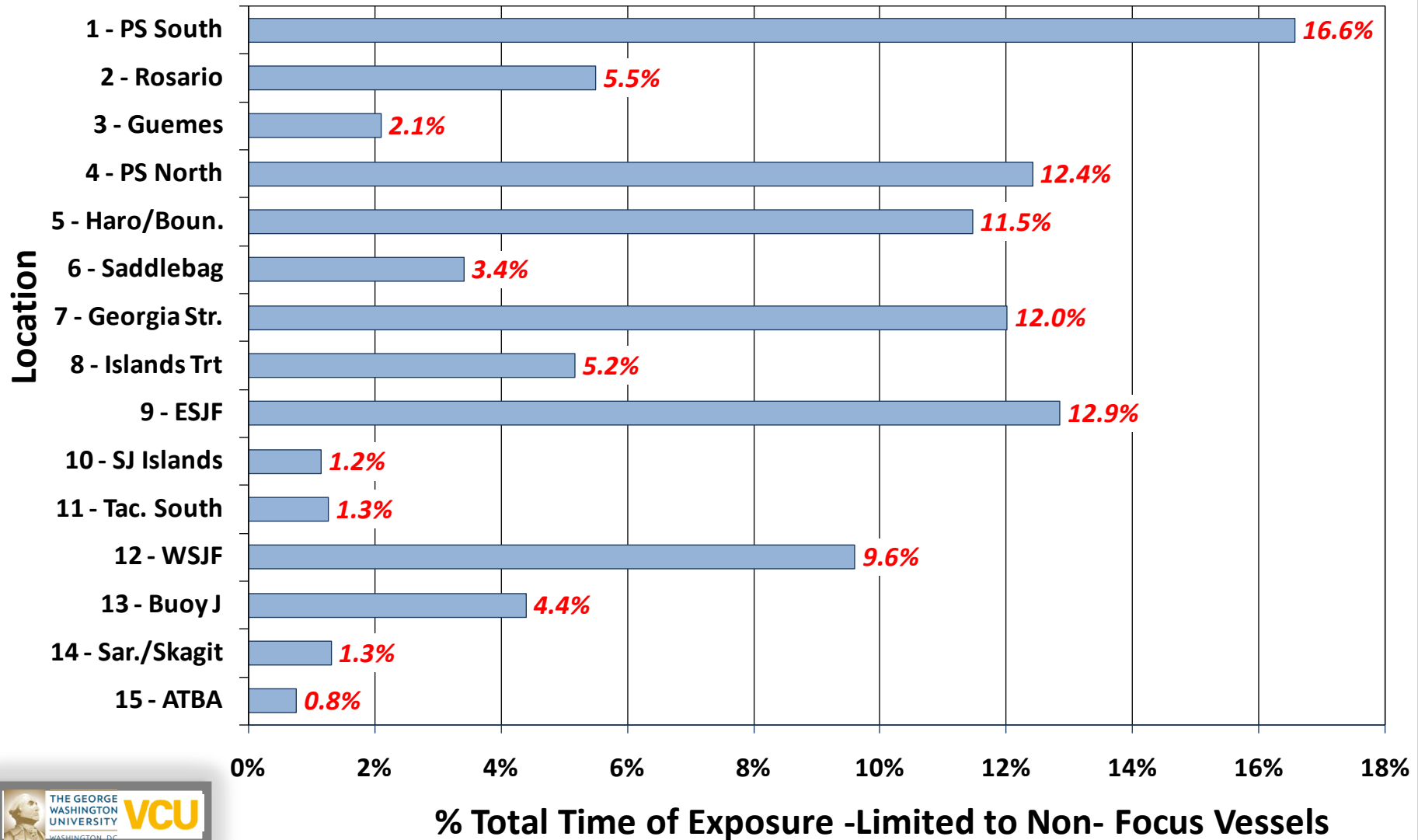
**Density Factor (DF) by Location - Non-Focus Vessel only =  
79.9% of total traffic - 100% of Non-FV Traffic**





# Locations ranked by Density Factor limited to Non-Focus Vessels

**VTRA** Total Time Exposure (TTE) by Location - Non-Focus Vessel only  
**2010**  
= 79.9% of total traffic - 100% of Non-FV Traffic

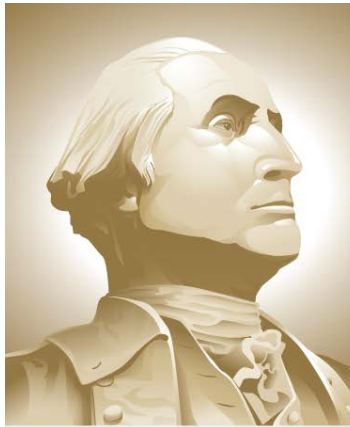


# **VTRA 2010**

## **TRAFFIC DENSITY ANALYSIS**

### **BY LOCATION CARGO – FOCUS VESSELS**

Presentation by: J. Rene van Dorp



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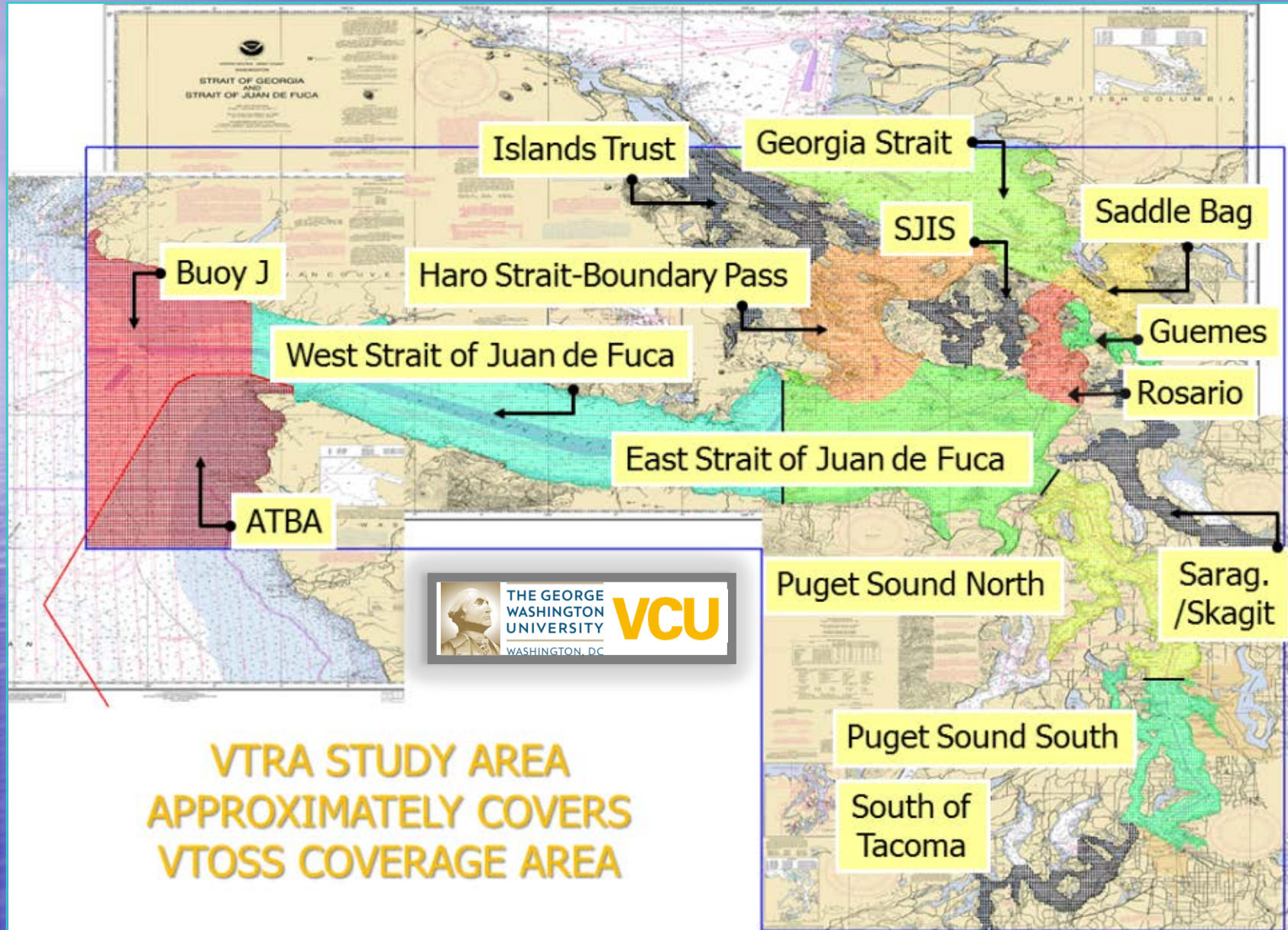
**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**MAY 3, 2013**



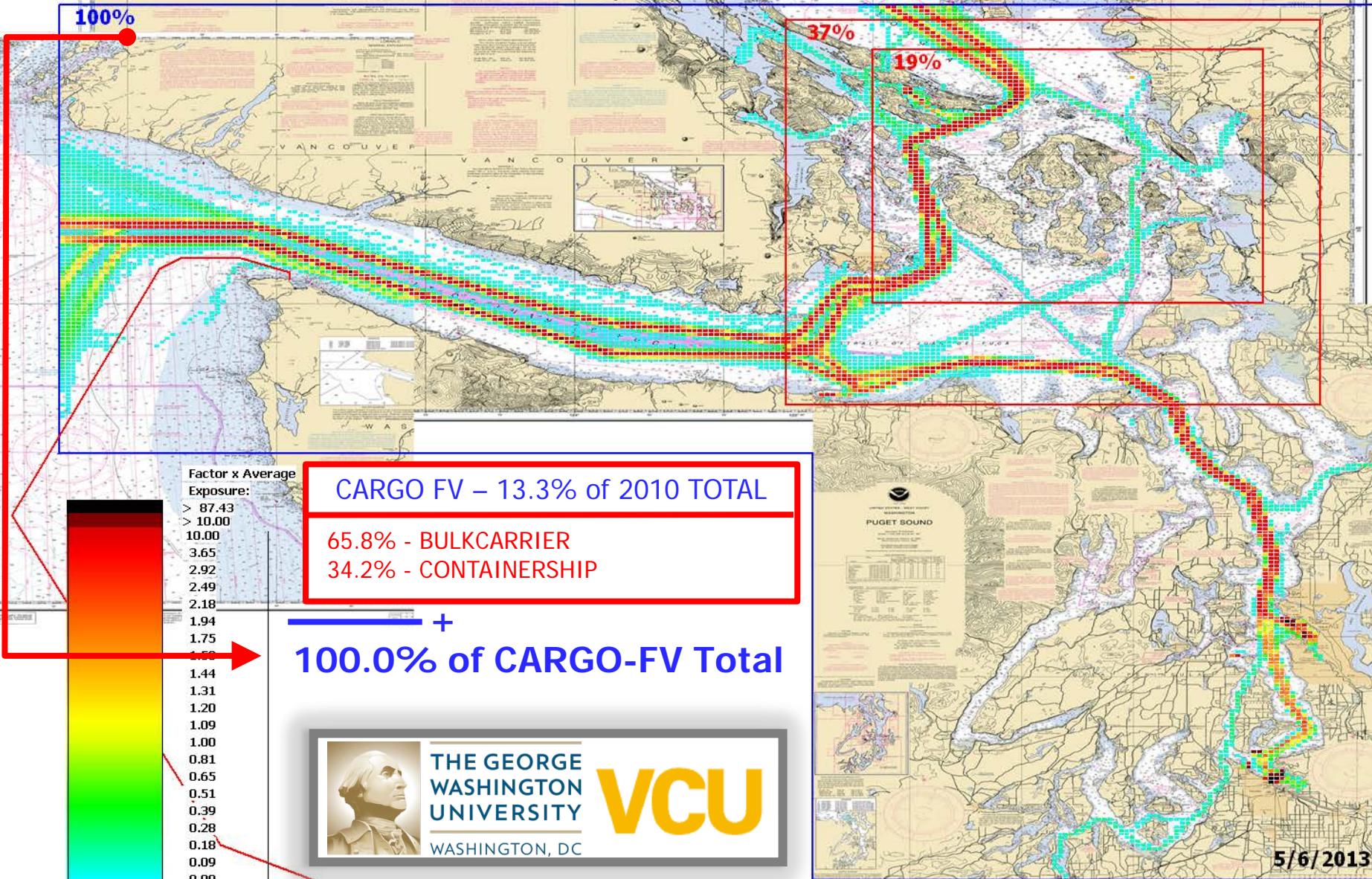
# Location definitions used in the GW/VCU MTS simulation model.





# 13.3% of Total Traffic Density

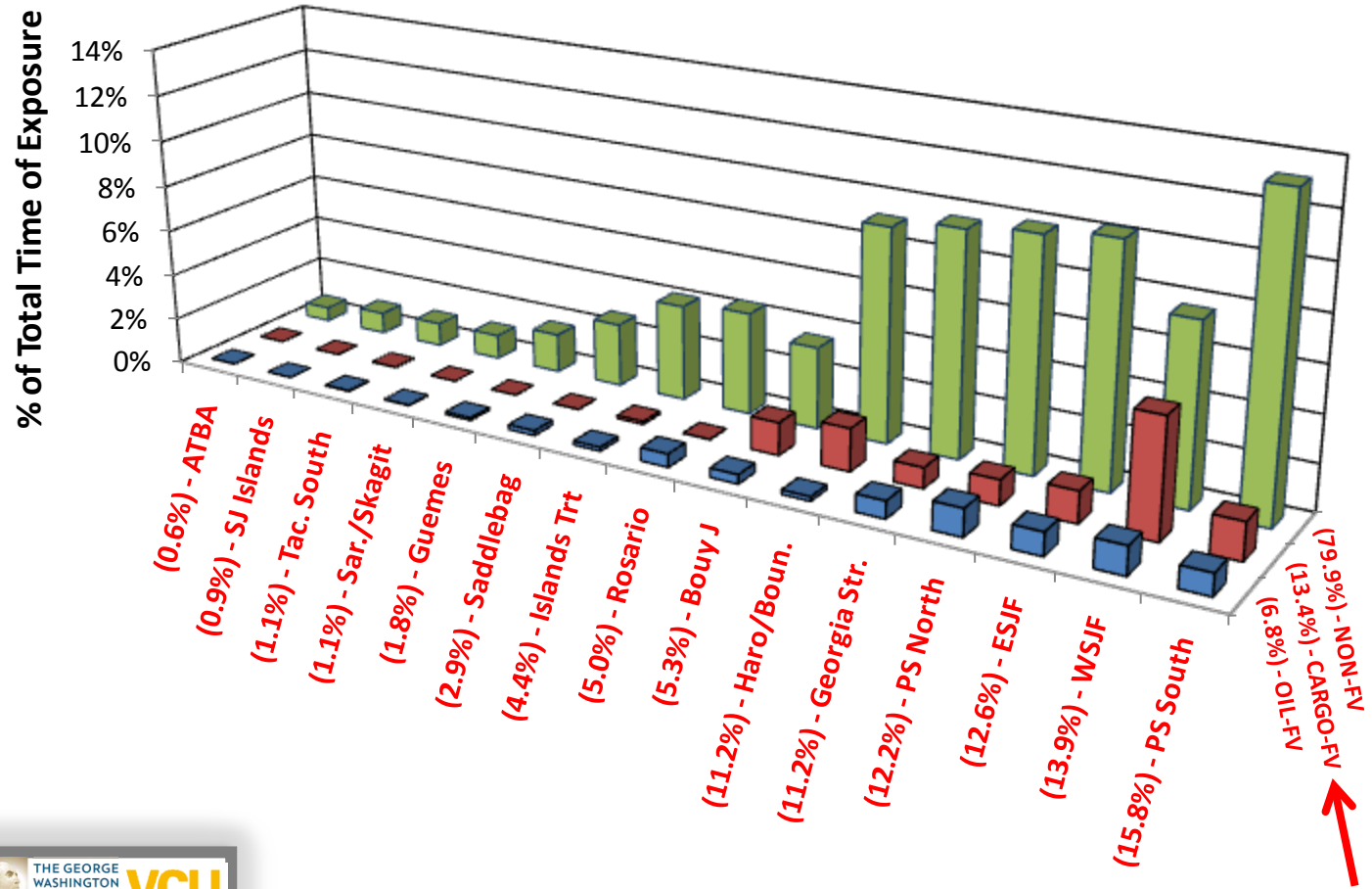
## P: VTRA 2010 - Cargo Focus Vessel Density





# Traffic Density by Location – All Traffic

## VTRA MODEL - VTOSS 2010 - 100% of TRAFFIC



# 2010 Traffic Density Analysis by Location limited to Cargo-Focus Vessels

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>	<i>Column 7</i>
<b>LOCATION</b>	<b># Grid Cells</b>	<b>% Area</b>	<b># Days Vessel is Moving per year</b>	<b>Average # of Vessels in Location</b>	<b>% of Total Time of Exposure</b>	<b>Density Factor (DF)</b>
WSJF	2857	19.6%	1357	3.7	37.7%	1.92
PS South	619	4.3%	429	1.2	11.9%	2.80
Guemes	127	0.9%	0	0.0	0.0%	0.01
ESJF	2049	14.1%	362	1.0	10.1%	0.71
Georgia Str.	1424	9.8%	236	0.6	6.6%	0.67
PS North	983	6.8%	292	0.8	8.1%	1.20
Saddlebag	375	2.6%	2	0.0	0.1%	0.03
Haro/Boun.	1066	7.3%	494	1.4	13.7%	1.87
Rosario	307	2.1%	4	0.0	0.1%	0.06
Bouy J	1478	10.2%	379	1.0	10.5%	1.04
ATBA	1520	10.5%	1	0.0	0.0%	0.00
Tac. South	326	2.2%	5	0.0	0.1%	0.06
SJ Islands	259	1.8%	0	0.0	0.0%	0.00
Sar./Skagit	459	3.2%	0	0.0	0.0%	0.00
Islands Trt	696	4.8%	35	0.1	1.0%	0.20
<b>Total</b>	<b>14545</b>	<b>100.0%</b>	<b>3597</b>	<b>9.9</b>	<b>100.0%</b>	<b>1.0</b>



↑  
**Column 4**  


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 365

↑  
**Column 4**  


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 Tot. Col. 4

↑  
**Column 4**  


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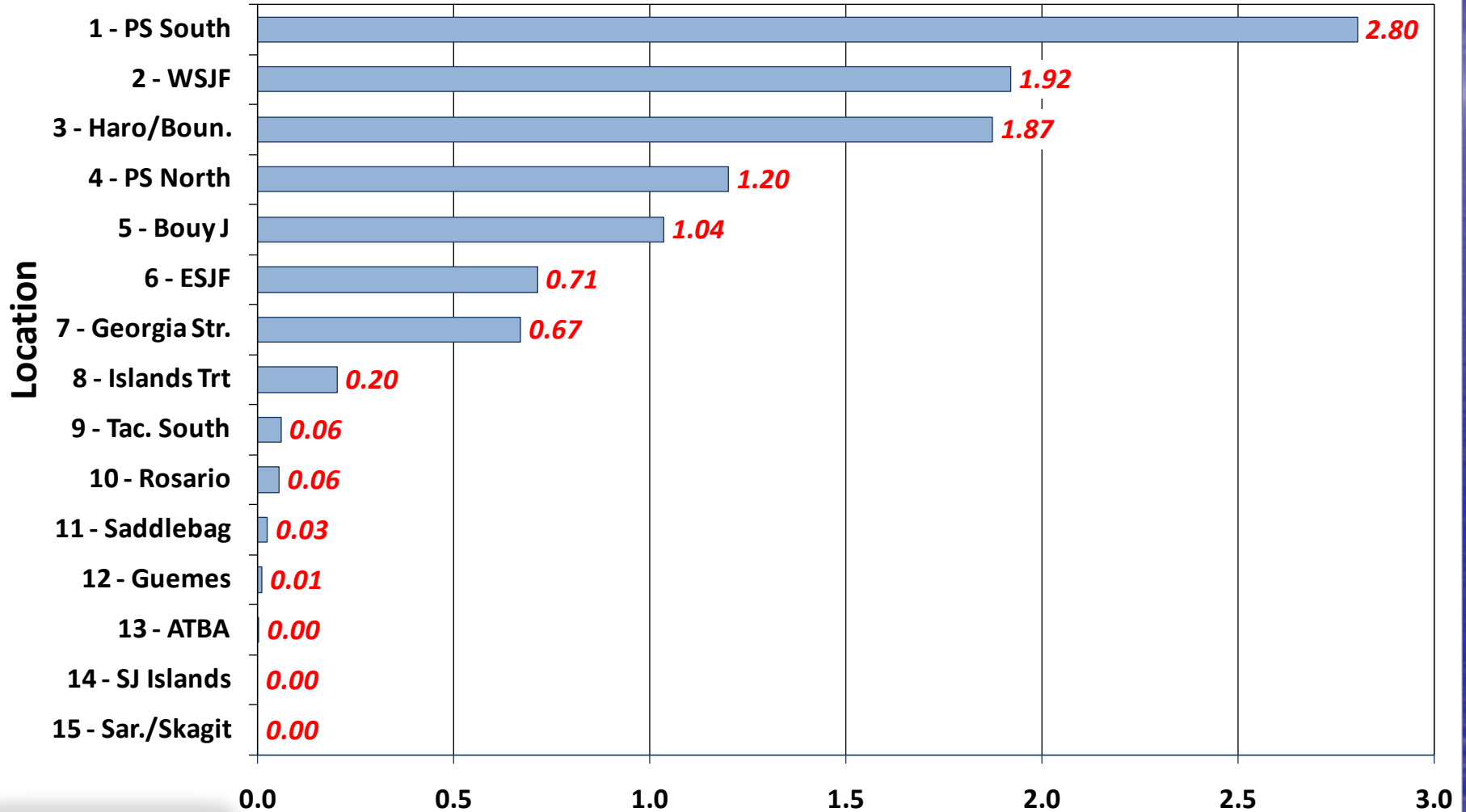
 Column 3



# Locations ranked by Density Factor limited to Cargo Focus Vessels

**VTRA  
2010**

**Density Factor (DF) by Location - Cargo Focus Vessel only =  
13.3% of total traffic - 66.2% of FV Traffic**



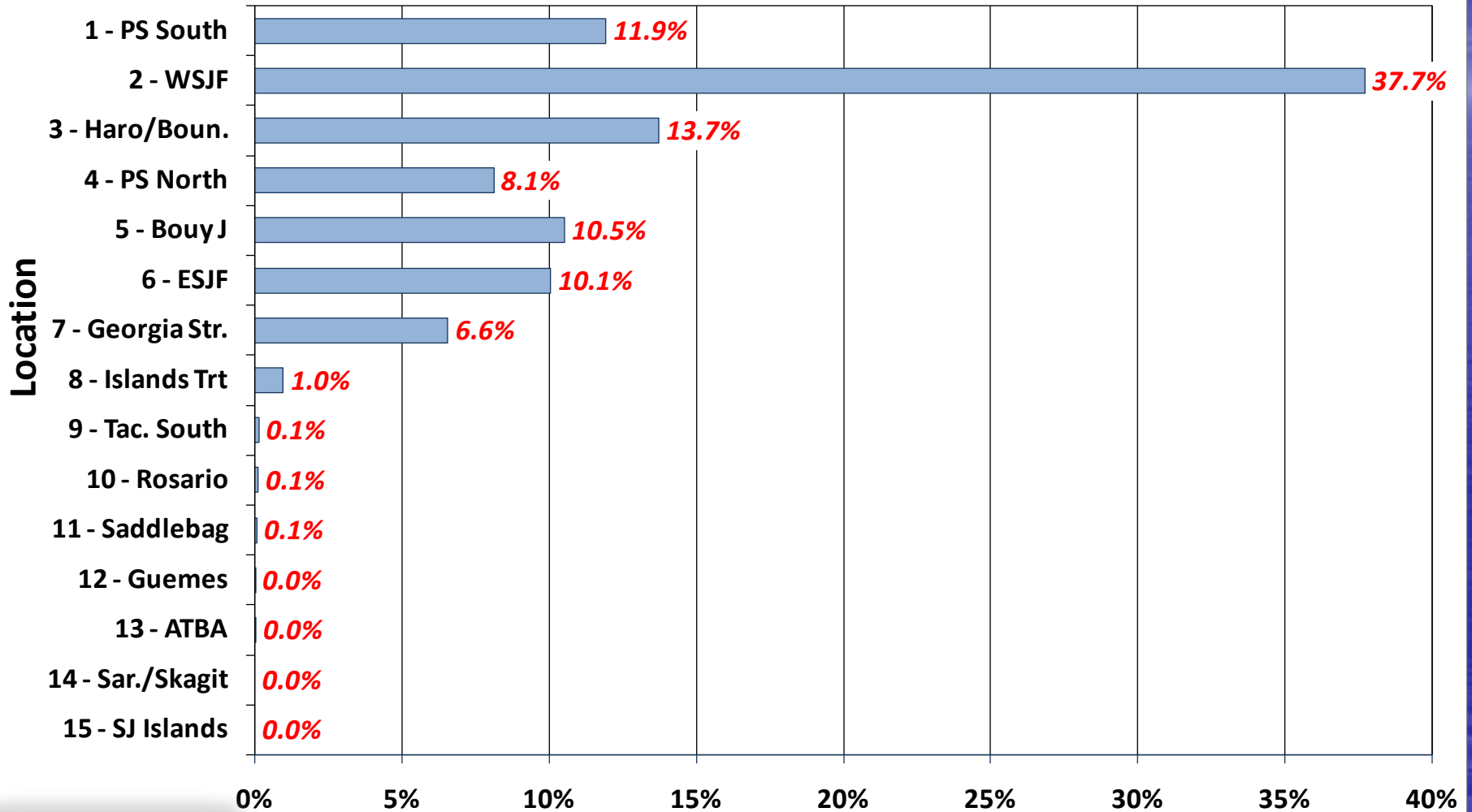
**Density Factor - Limited to Bulk Carrier, Containership**



# Locations ranked by Density Factor limited to Cargo Focus Vessels

**VTRA  
2010**

**Total Time Exposure (TTE) by Location - Cargo Focus Vessel  
only = 13.3% of total traffic - 66.2% of FV Traffic**



**% Total Time of Exposure - Limited to Bulk Carrier, Containership**

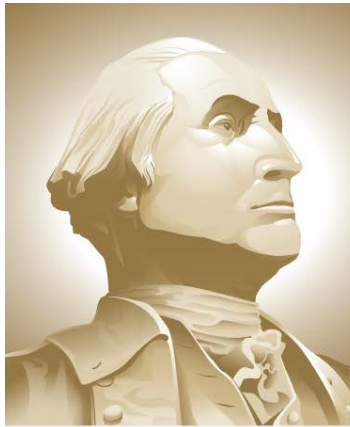


# **VTRA 2010**

## **TRAFFIC DENSITY ANALYSIS**

### **BY LOCATION OIL – FOCUS VESSELS**

Presentation by: J. Rene van Dorp



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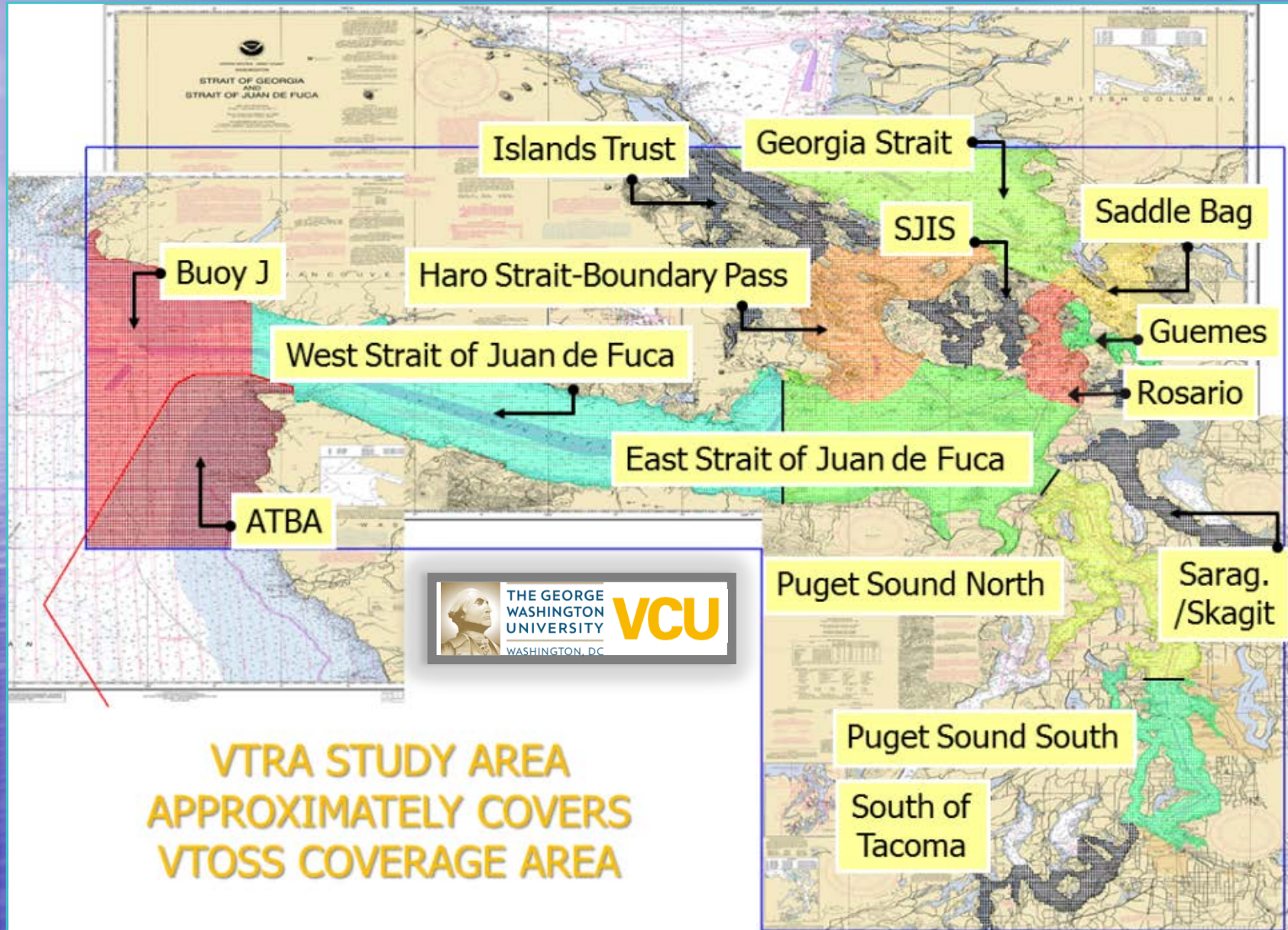
**VCU**

**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**MAY 3, 2013**

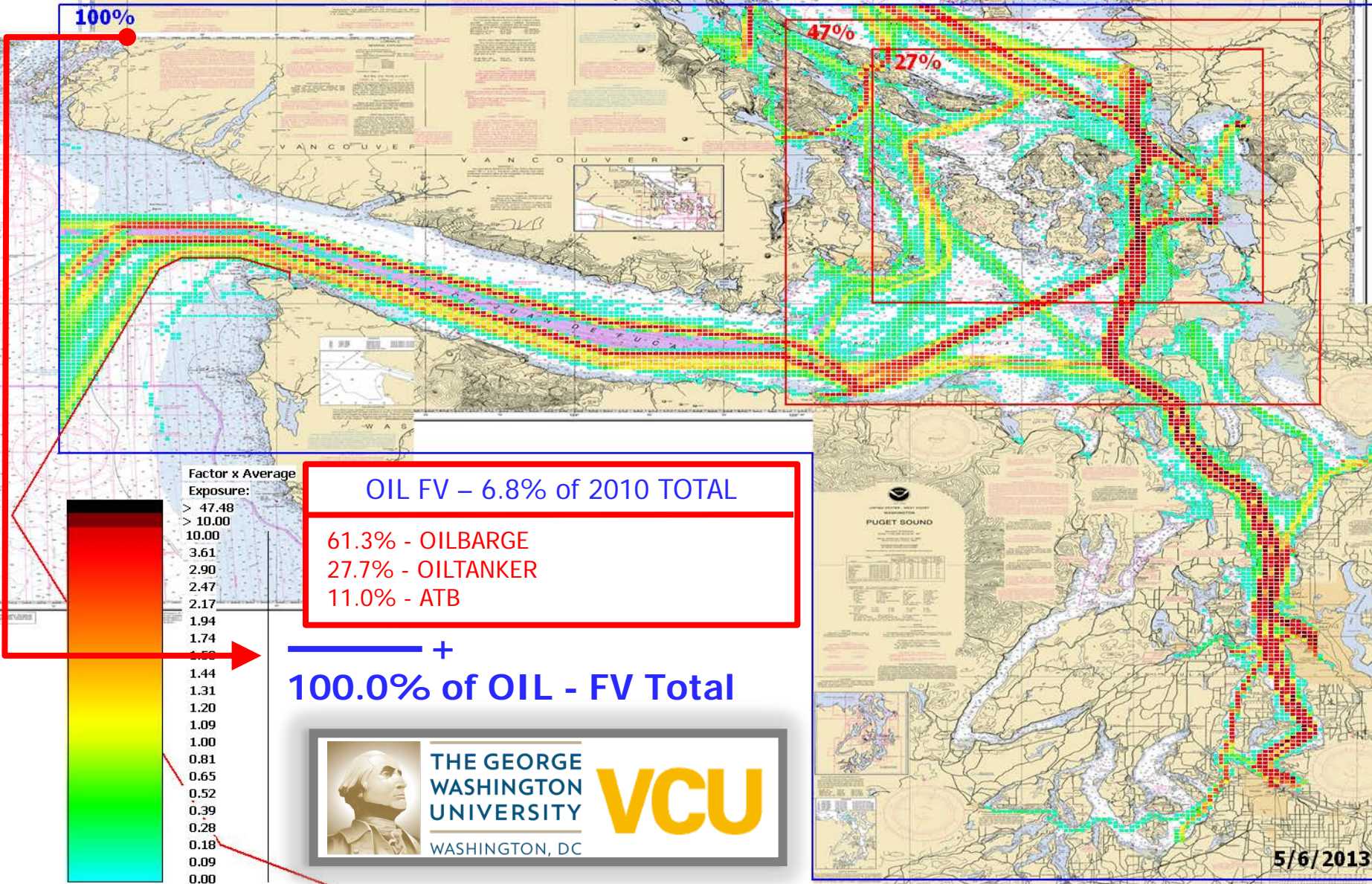
# Location definitions used in the GW/VCU MTS simulation model.





# 6.8% of Total Traffic Density

## P: VTRA 2010 - Oil Focus Vessel Density



Factor x Average Exposure:

- > 47.48
- > 10.00
- 10.00
- 3.61
- 2.90
- 2.47
- 2.17
- 1.94
- 1.74
- 1.55
- 1.44
- 1.31
- 1.20
- 1.09
- 1.00
- 0.81
- 0.65
- 0.52
- 0.39
- 0.28
- 0.18
- 0.09
- 0.00

**OIL FV – 6.8% of 2010 TOTAL**

- 61.3% - OILBARGE
- 27.7% - OILTANKER
- 11.0% - ATB

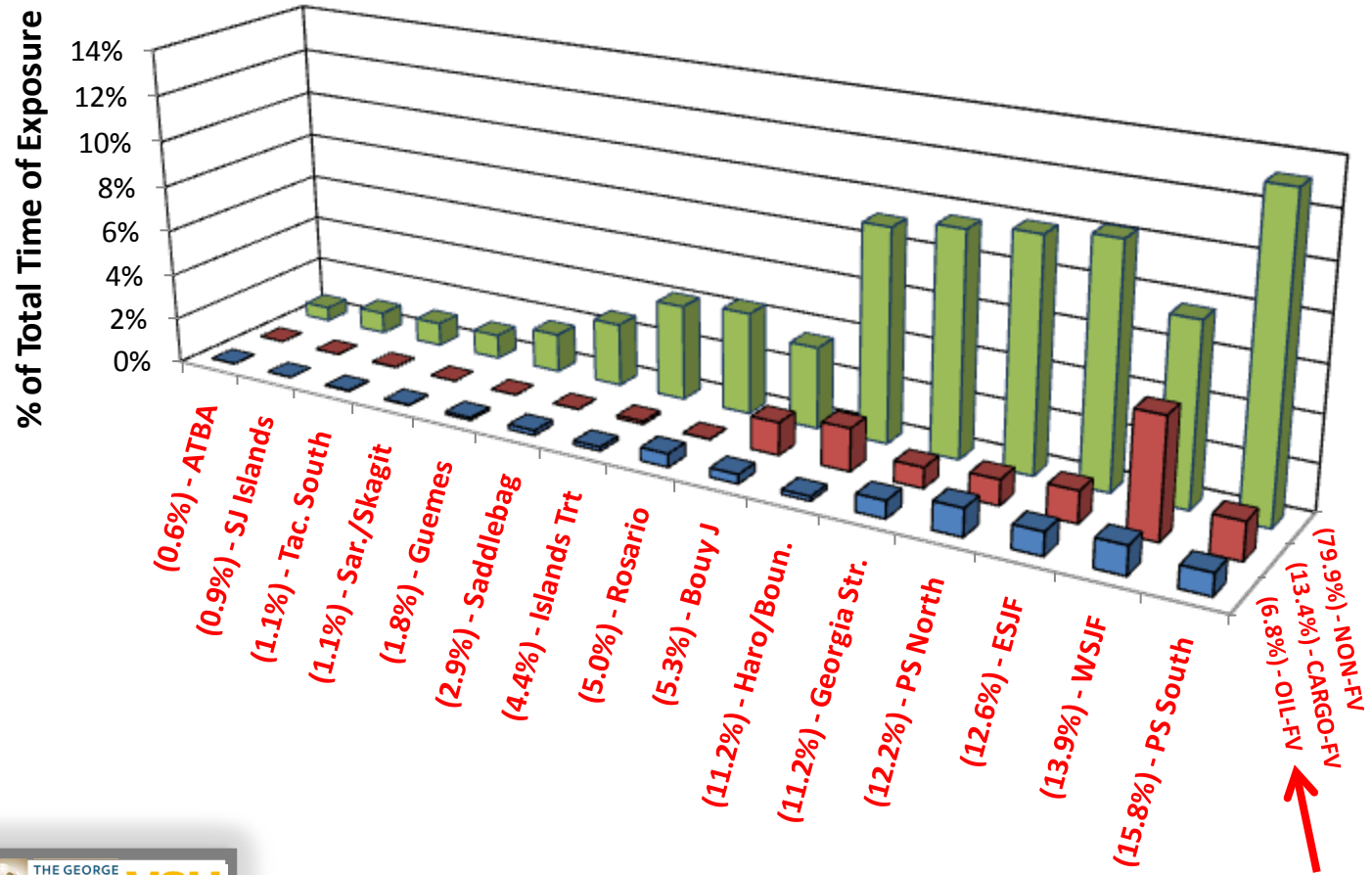
**100.0% of OIL - FV Total**





# Traffic Density by Location – All Traffic

## VTRA MODEL - VTOSS 2010 - 100% of TRAFFIC





# 2010 Traffic Density Analysis by Location limited to Oil-Focus Vessels

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>	<i>Column 7</i>
<b>LOCATION</b>	<b># Grid Cells</b>	<b>% Area</b>	<b># Days Vessel is Moving per year</b>	<b>Average # of Vessels in Location</b>	<b>% of Total Time of Exposure</b>	<b>Density Factor (DF)</b>
WSJF	2857	19.6%	326	0.9	17.9%	0.91
PS South	619	4.3%	249	0.7	13.7%	3.21
Guemes	127	0.9%	30	0.1	1.6%	1.86
ESJF	2049	14.1%	265	0.7	14.5%	1.03
Georgia Str.	1424	9.8%	201	0.6	11.1%	1.13
PS North	983	6.8%	317	0.9	17.4%	2.58
Saddlebag	375	2.6%	56	0.2	3.1%	1.20
Haro/Boun.	1066	7.3%	51	0.1	2.8%	0.38
Rosario	307	2.1%	153	0.4	8.4%	3.99
Bouy J	1478	10.2%	107	0.3	5.9%	0.58
ATBA	1520	10.5%	4	0.0	0.2%	0.02
Tac. South	326	2.2%	9	0.0	0.5%	0.23
SJ Islands	259	1.8%	1	0.0	0.0%	0.02
Sar./Skagit	459	3.2%	7	0.0	0.4%	0.13
Islands Trt	696	4.8%	45	0.1	2.5%	0.52
<b>Total</b>	<b>14545</b>	<b>100.0%</b>	<b>1820</b>	<b>5.0</b>	<b>100.0%</b>	<b>1.0</b>



↑  
**Column 4**  


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 365

↑  
**Column 4**  


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 Tot. Col. 4

↑  
**Column 4**  

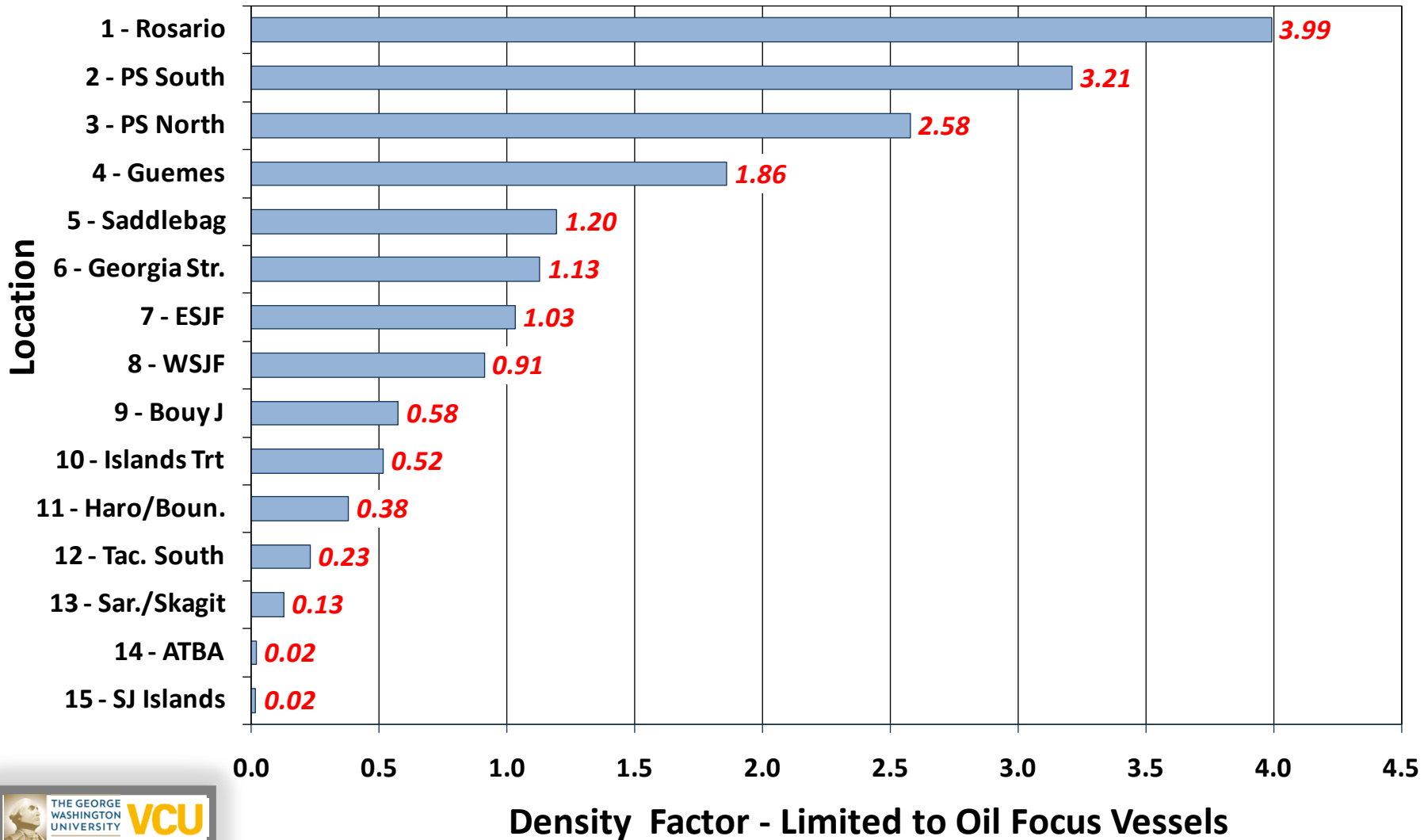

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 Column 3

# Locations ranked by Density Factor limited to Oil Focus-Vessels

**VTRA  
2010**

**Density Factor (DF) by Location - Oil Focus Vessel Only =  
6.8% of total traffic - 33.8% of FV Traffic**

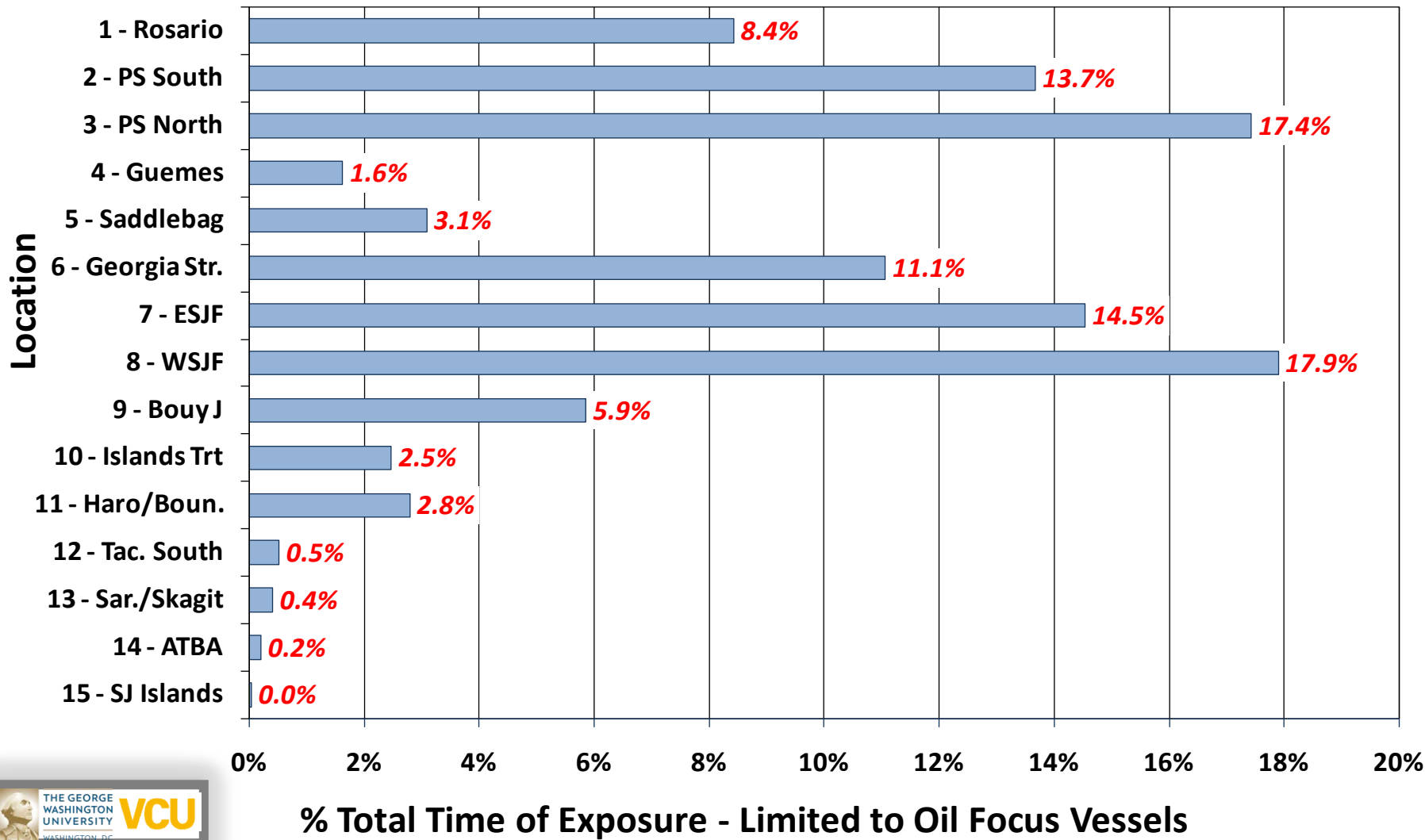


**Density Factor - Limited to Oil Focus Vessels**



# Locations ranked by Density Factor limited to Oil Focus-Vessels

**VTRA 2010** Total Time Exposure (TTE) by Location - Oil Focus Vessel Only =  
6.8% of total traffic - 33.8% of FV Traffic



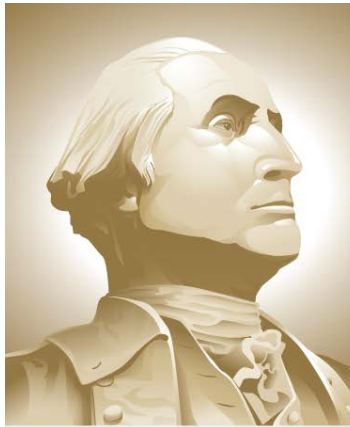
% Total Time of Exposure - Limited to Oil Focus Vessels

# **VTRA 2010**

## **TRAFFIC DENSITY ANALYSIS**

### **BY LOCATION ALL-FOCUS VESSELS**

Presentation by: J. Rene van Dorp



**THE GEORGE  
WASHINGTON  
UNIVERSITY**

WASHINGTON, DC

**VCU**

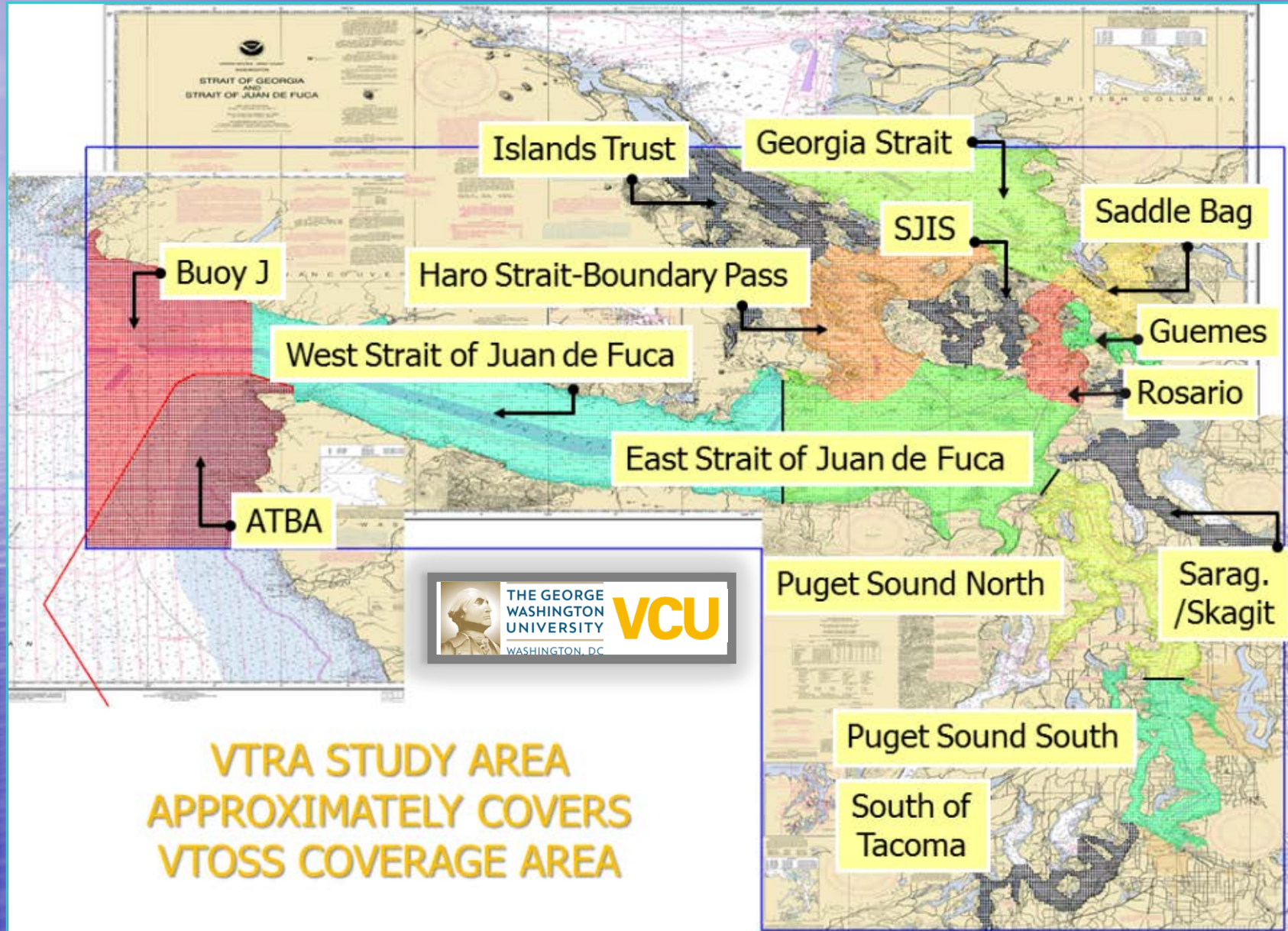
**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**MAY 3, 2013**



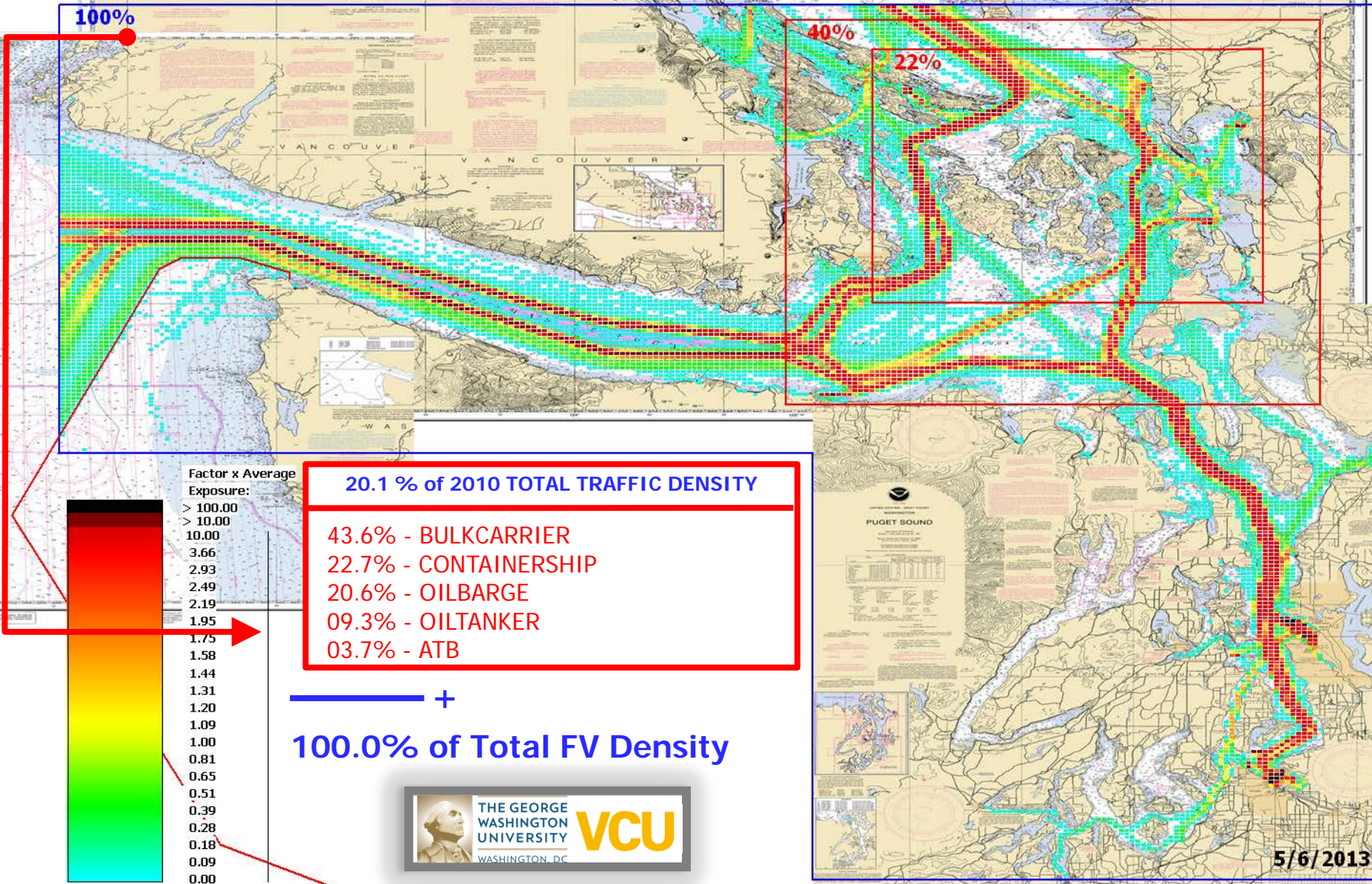
# Location definitions used in the GW/VCU MTS simulation model.





# 20.1% of Total Traffic Density

## P: VTRA 2010 - Focus Vessels Density



100%

40%

22%

- Factor x Average Exposure:
- > 100.00
  - > 10.00
  - 10.00
  - 3.66
  - 2.93
  - 2.49
  - 2.19
  - 1.95
  - 1.75
  - 1.58
  - 1.44
  - 1.31
  - 1.20
  - 1.09
  - 1.00
  - 0.81
  - 0.65
  - 0.51
  - 0.39
  - 0.28
  - 0.18
  - 0.09
  - 0.00

20.1 % of 2010 TOTAL TRAFFIC DENSITY

- 43.6% - BULKCARRIER
- 22.7% - CONTAINERSHIP
- 20.6% - OILBARGE
- 09.3% - OILTANKER
- 03.7% - ATB

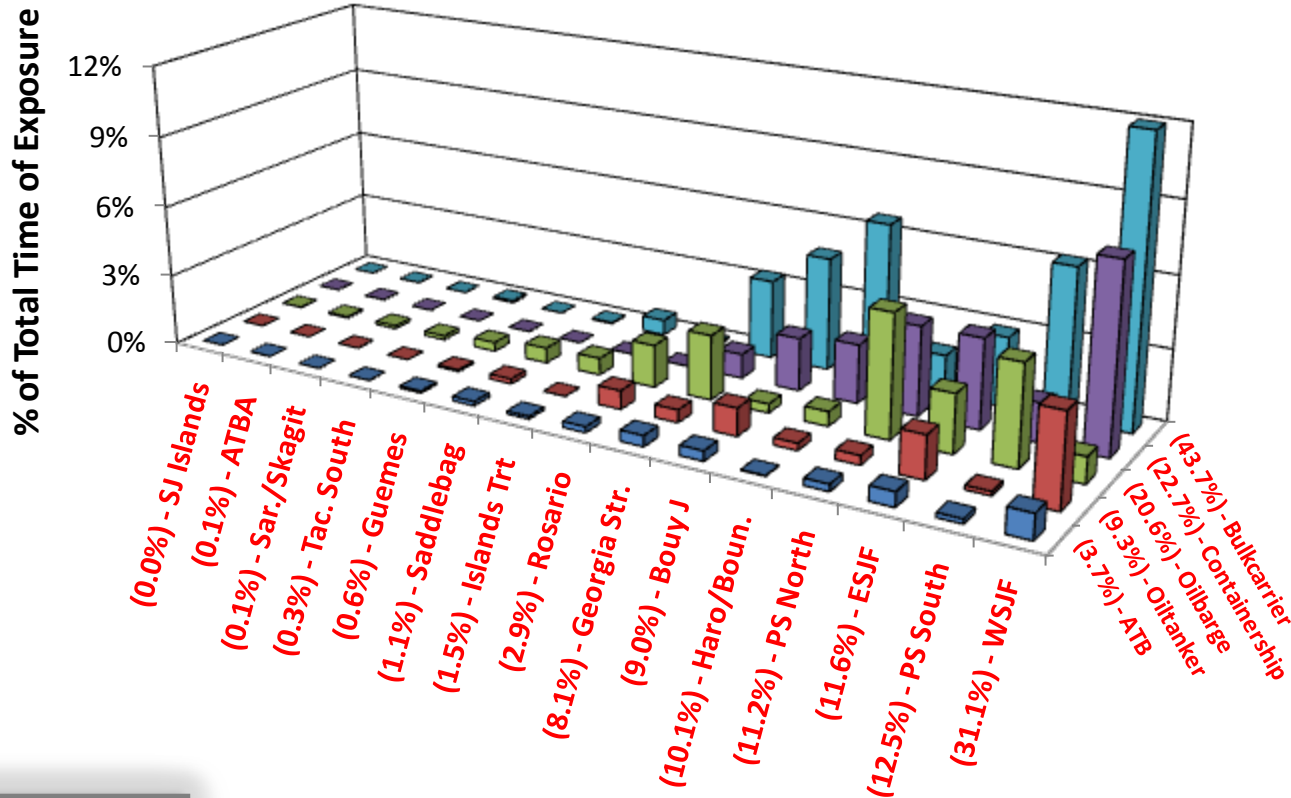
+  
100.0% of Total FV Density





# Traffic Density by Location and Focus Vessel

## VTRA MODEL - VTOSS 2010 - 20.1% of TRAFFIC



# 2010 Traffic Density Analysis by Location – Limited to Focus Vessels

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>	<i>Column 7</i>
<b>LOCATION</b>	<b># Grid Cells</b>	<b>% Area</b>	<b># Days Vessel is Moving per year</b>	<b>Average # of Vessels in Location</b>	<b>% of Total Time of Exposure</b>	<b>Density Factor (DF)</b>
WSJF	2857	19.6%	1683	4.6	31.1%	1.58
PS South	619	4.3%	678	1.9	12.5%	2.94
Guemes	127	0.9%	30	0.1	0.6%	0.63
ESJF	2049	14.1%	626	1.7	11.6%	0.82
Georgia Str.	1424	9.8%	438	1.2	8.1%	0.83
PS North	983	6.8%	609	1.7	11.2%	1.66
Saddlebag	375	2.6%	58	0.2	1.1%	0.42
Haro/Boun.	1066	7.3%	545	1.5	10.1%	1.37
Rosario	307	2.1%	158	0.4	2.9%	1.38
Buoy J	1478	10.2%	485	1.3	9.0%	0.88
ATBA	1520	10.5%	5	0.0	0.1%	0.01
Tac. South	326	2.2%	14	0.0	0.3%	0.12
SJ Islands	259	1.8%	1	0.0	0.0%	0.01
Sar./Skagit	459	3.2%	7	0.0	0.1%	0.04
Islands Trt	696	4.8%	80	0.2	1.5%	0.31
<b>Total</b>	<b>14545</b>	<b>100.0%</b>	<b>5417</b>	<b>14.8</b>	<b>100.0%</b>	<b>1.0</b>



↑  
**Column 4**  


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 365

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**Column 4**  


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 Tot. Col. 4

↑  
**Column 4**  


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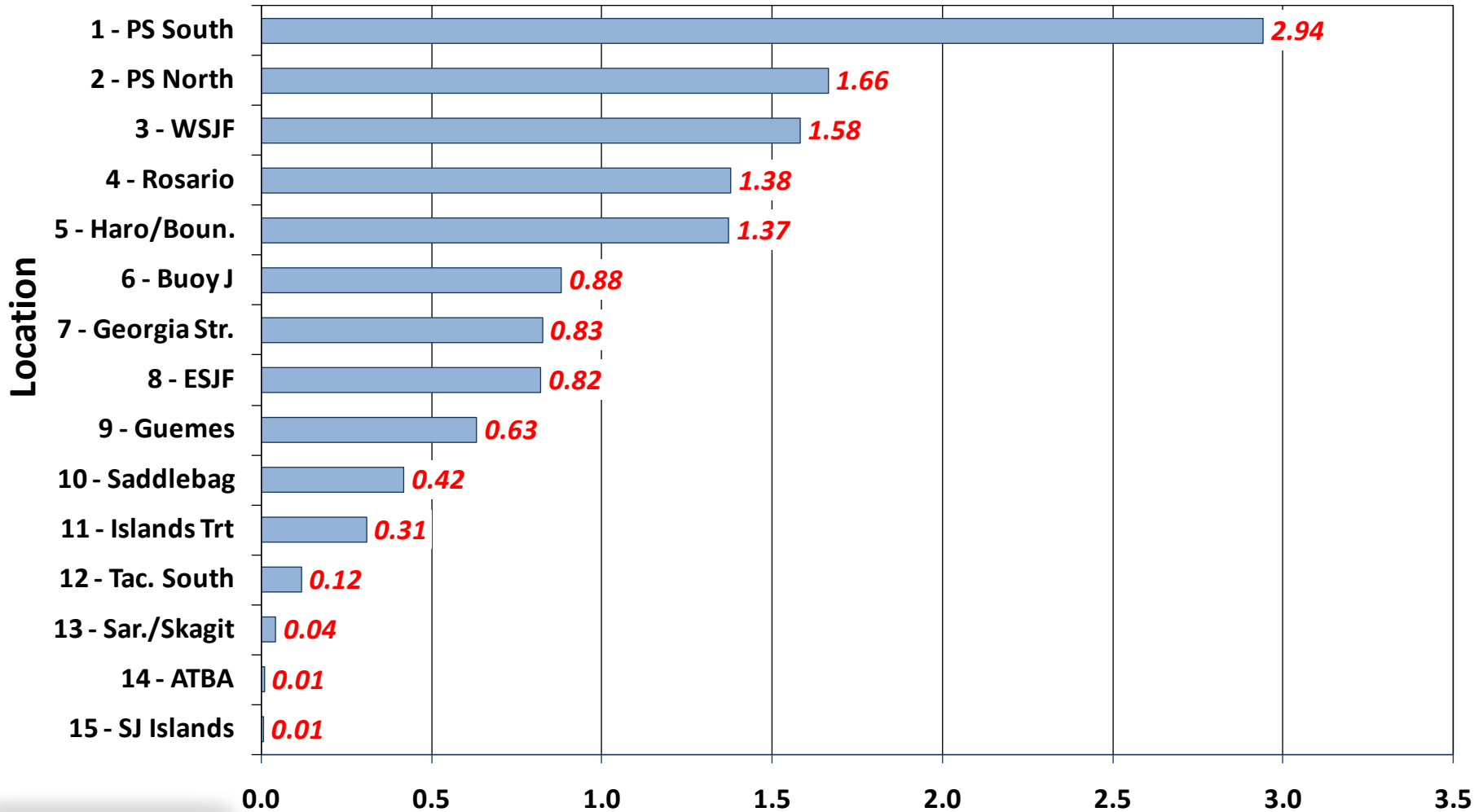
 Column 3



# Locations ranked by Density Factor – All Focus Vessels

**VTRA  
2010**

**Density Factor (DF) by Location - Focus Vessel Only =  
20.1% of total traffic - 100% of FV Traffic**

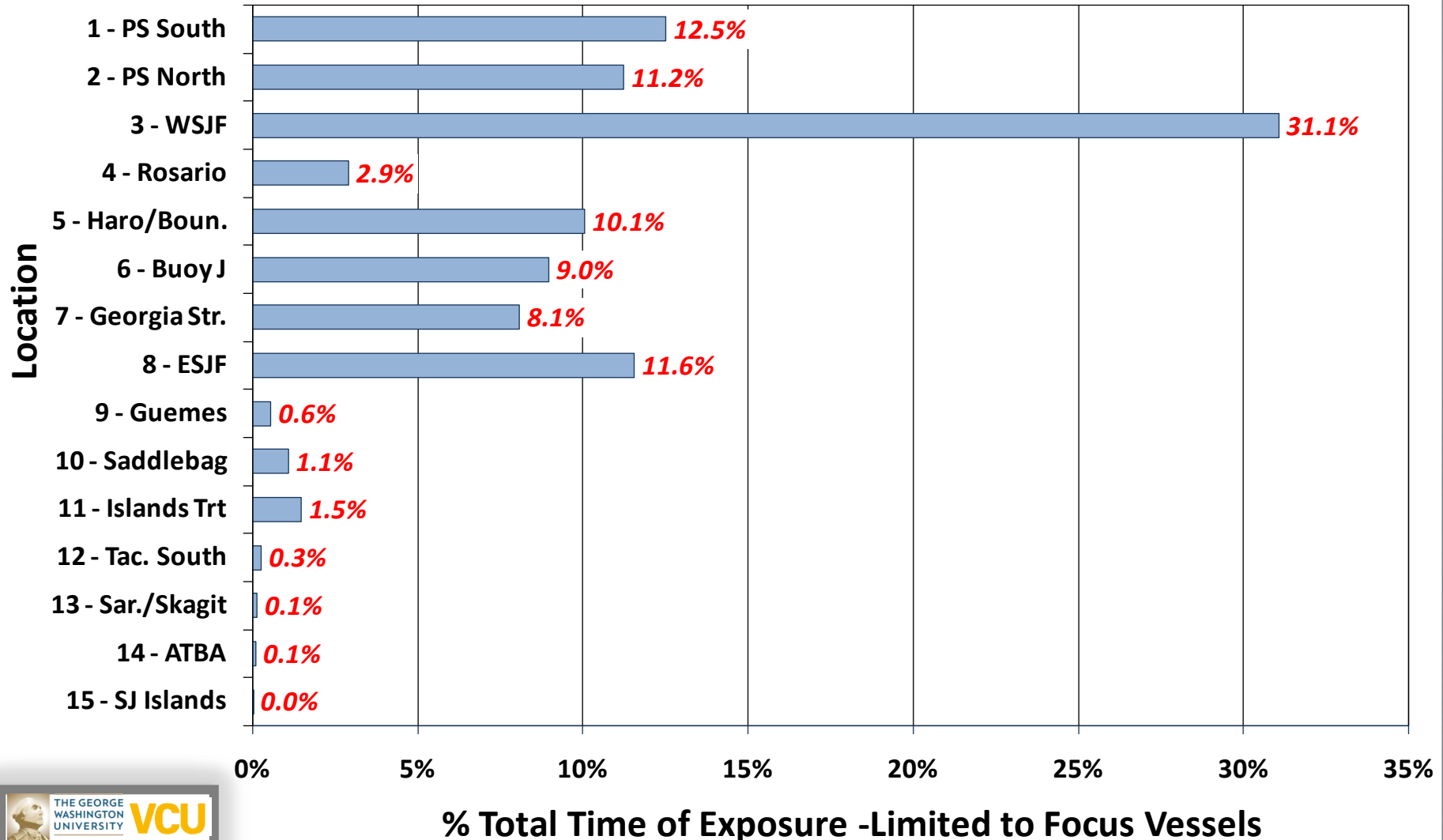


**Density Factor - Limited to Focus Vessels**

# Locations ranked by Density Factor – Limited to All Focus Vessels

**VTRA  
2010**

**Total Time Exposure (TTE) by Location - Focus Vessel Only =  
20.1% of total traffic - 100% of FV Traffic**

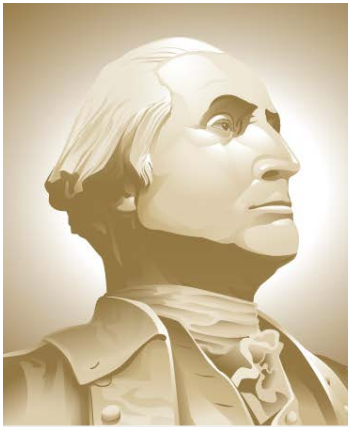




# VTRA 2010

## FOCUS VESSEL TRAFFIC DENSITIES

Presentation by: J. Rene van Dorp



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WASHINGTON  
UNIVERSITY

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WASHINGTON, DC

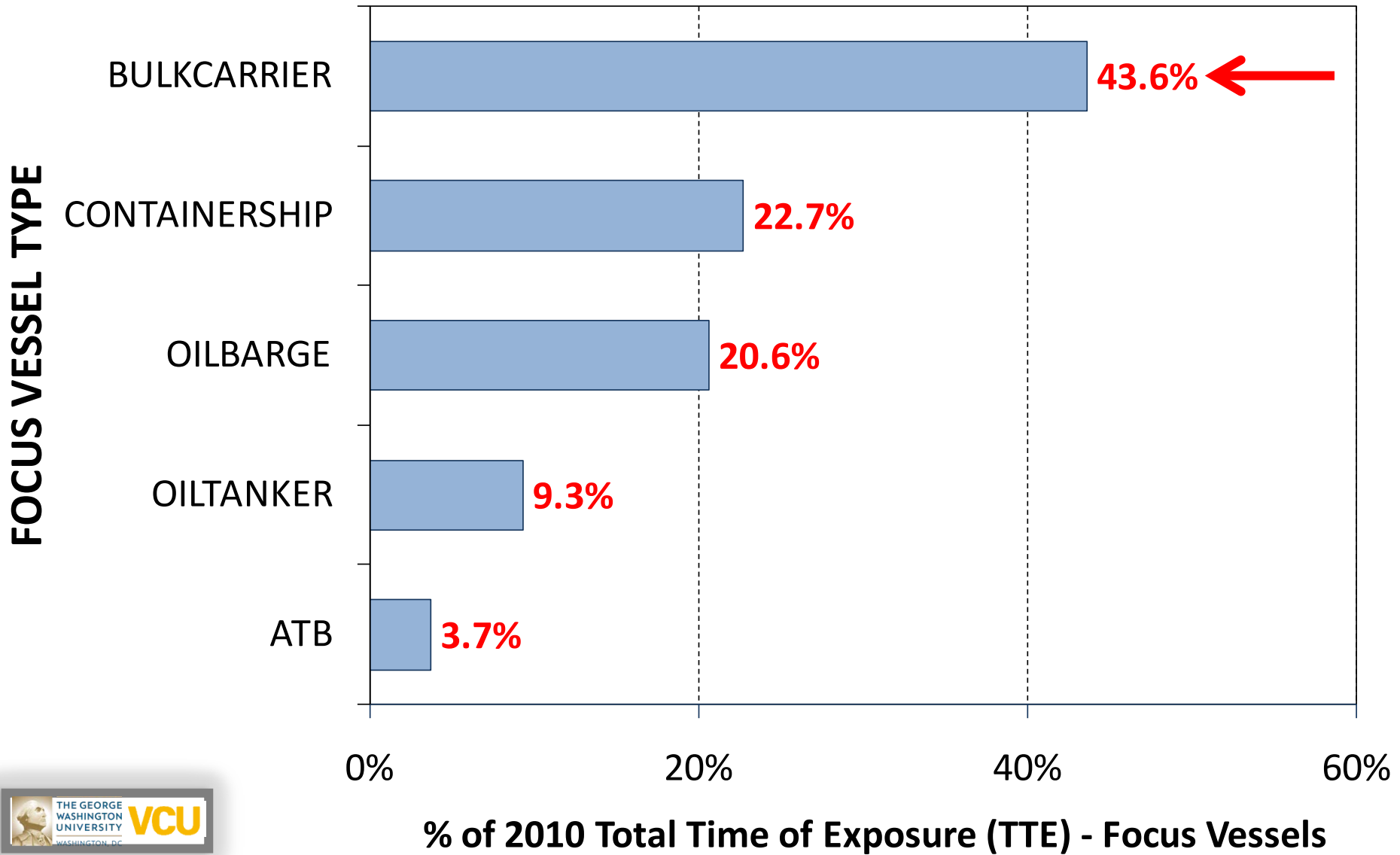
VCU

**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**MAY 3, 2013**

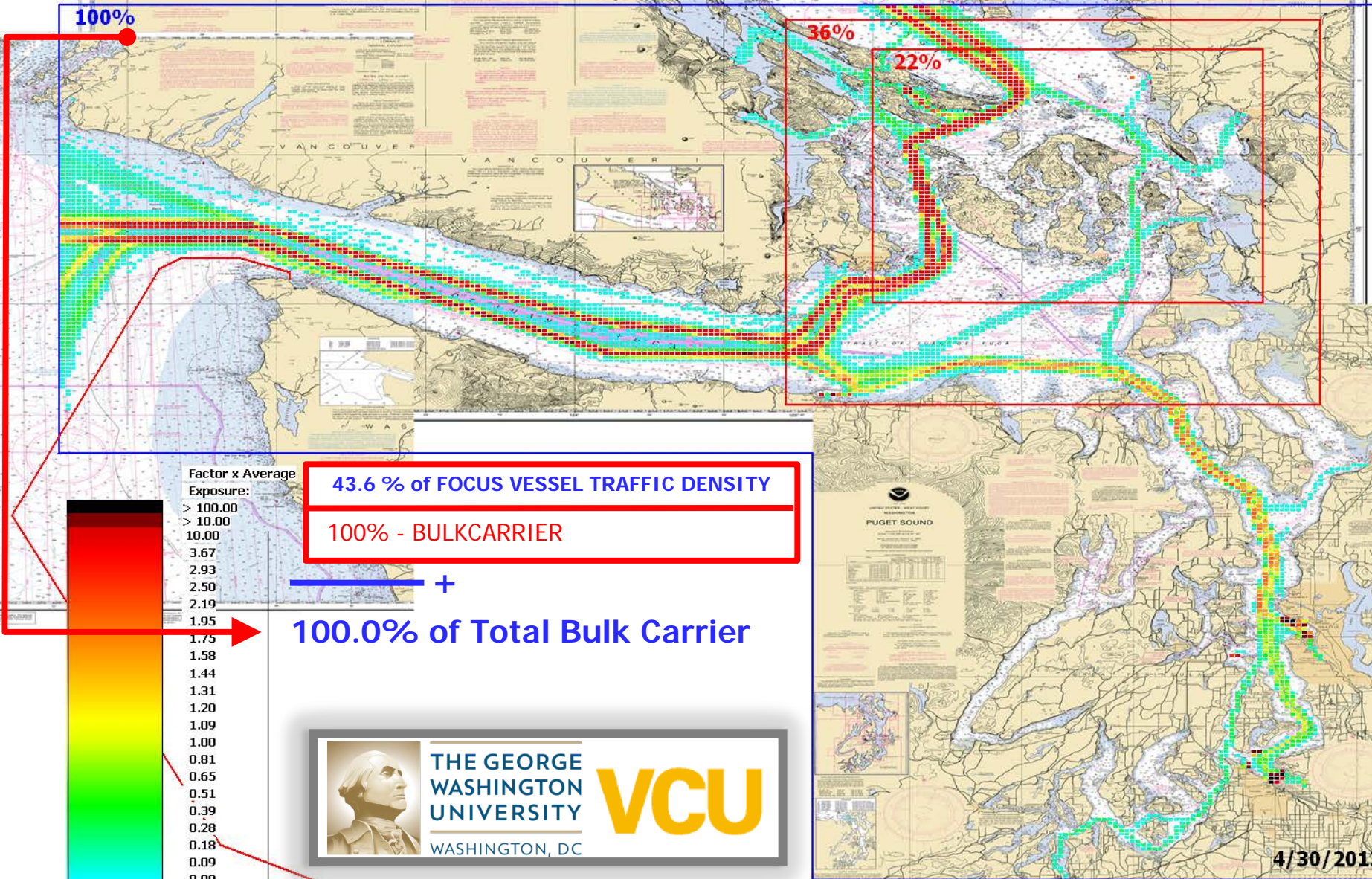
# VTRA MODEL - VTOSS 2010 - Limited to Focus Vessels





# 43.6% of Total Focus Vessel Traffic Density

## P: VTRA 2010 - BULK CARRIER Density



Factor x Average Exposure:

- > 100.00
- > 10.00
- 10.00
- 3.67
- 2.93
- 2.50
- 2.19
- 1.95
- 1.75
- 1.58
- 1.44
- 1.31
- 1.20
- 1.09
- 1.00
- 0.81
- 0.65
- 0.51
- 0.39
- 0.28
- 0.18
- 0.09
- 0.00

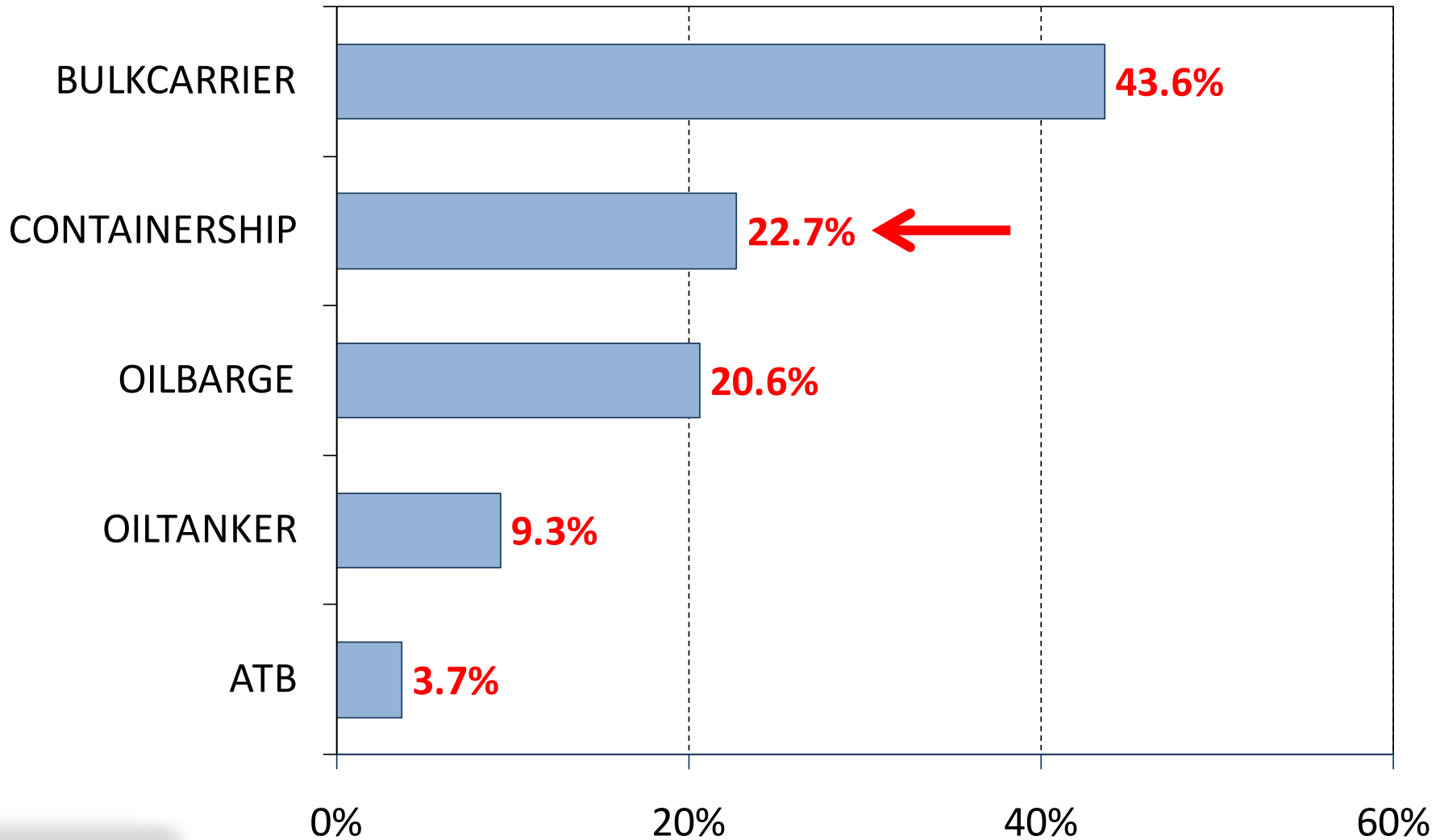
**43.6 % of FOCUS VESSEL TRAFFIC DENSITY**  
**100% - BULK CARRIER**

**100.0% of Total Bulk Carrier**



# VTRA MODEL - VTOSS 2010 - Limited to Focus Vessels

FOCUS VESSEL TYPE



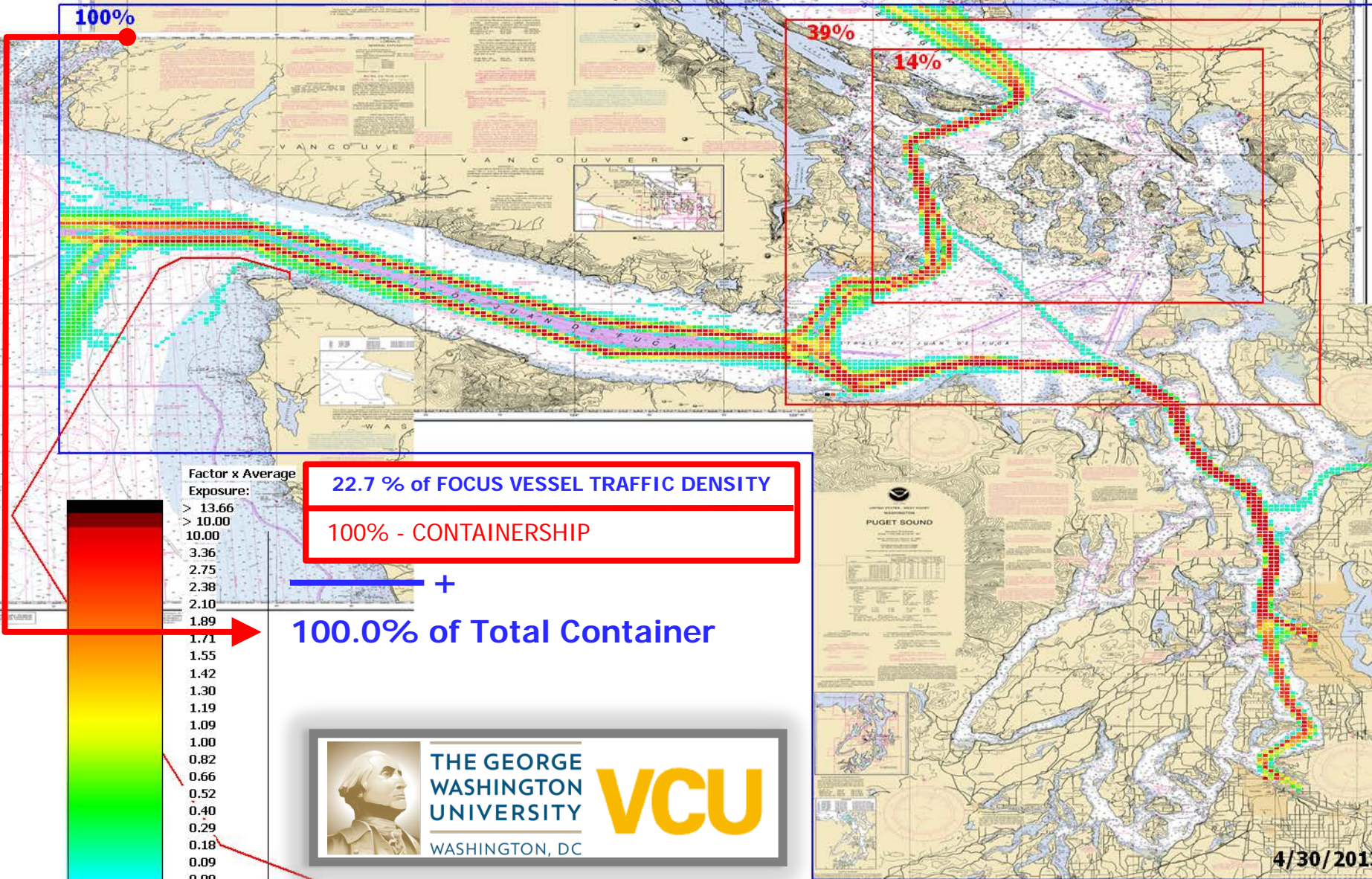
% of 2010 Total Time of Exposure (TTE) - Focus Vessels





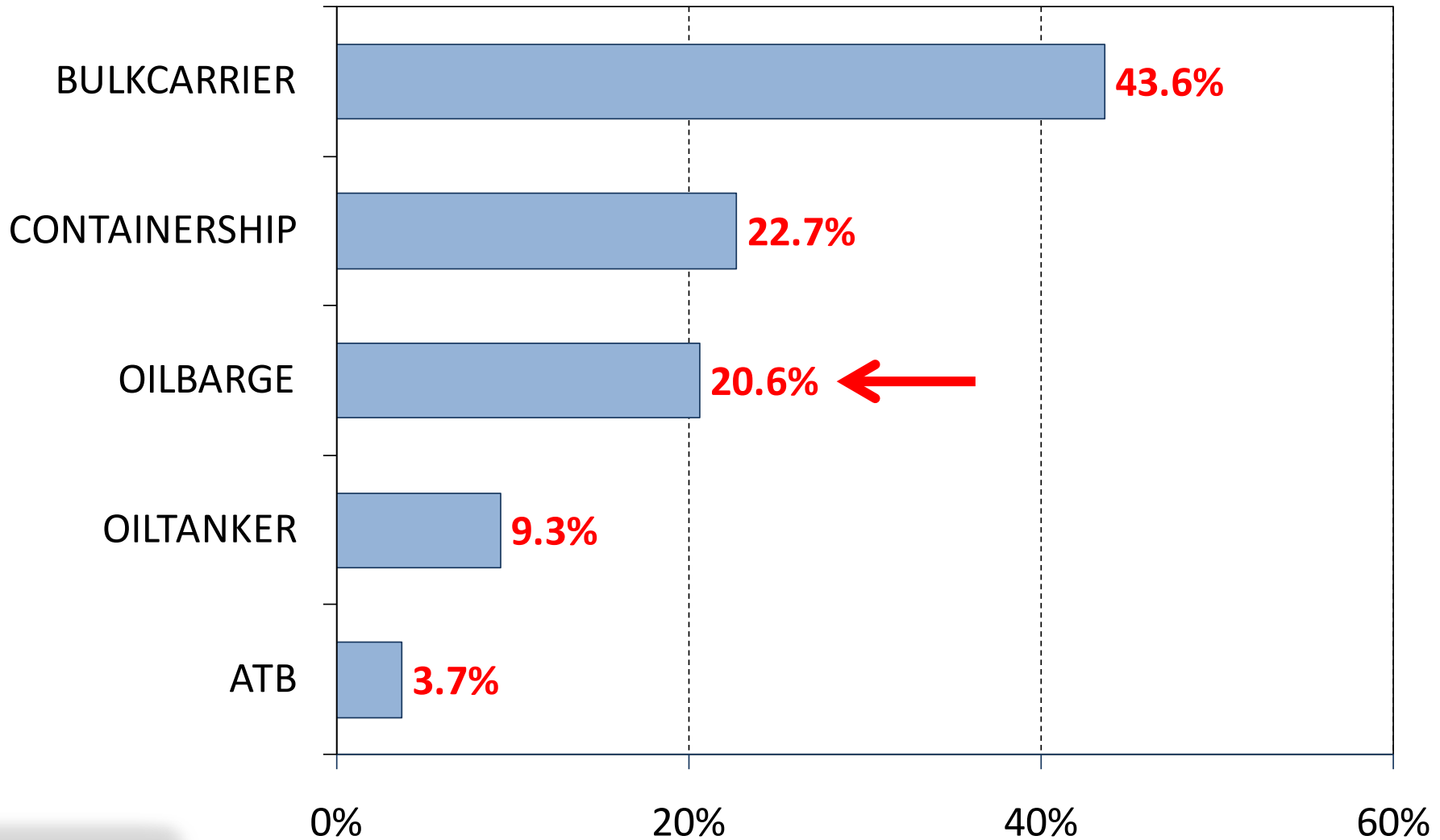
# 22.7% of Total Focus Vessel Traffic Density

## P: VTRA 2010 - CONTAINERSHIP Density



# VTRA MODEL - VTOSS 2010 - Limited to Focus Vessels

FOCUS VESSEL TYPE



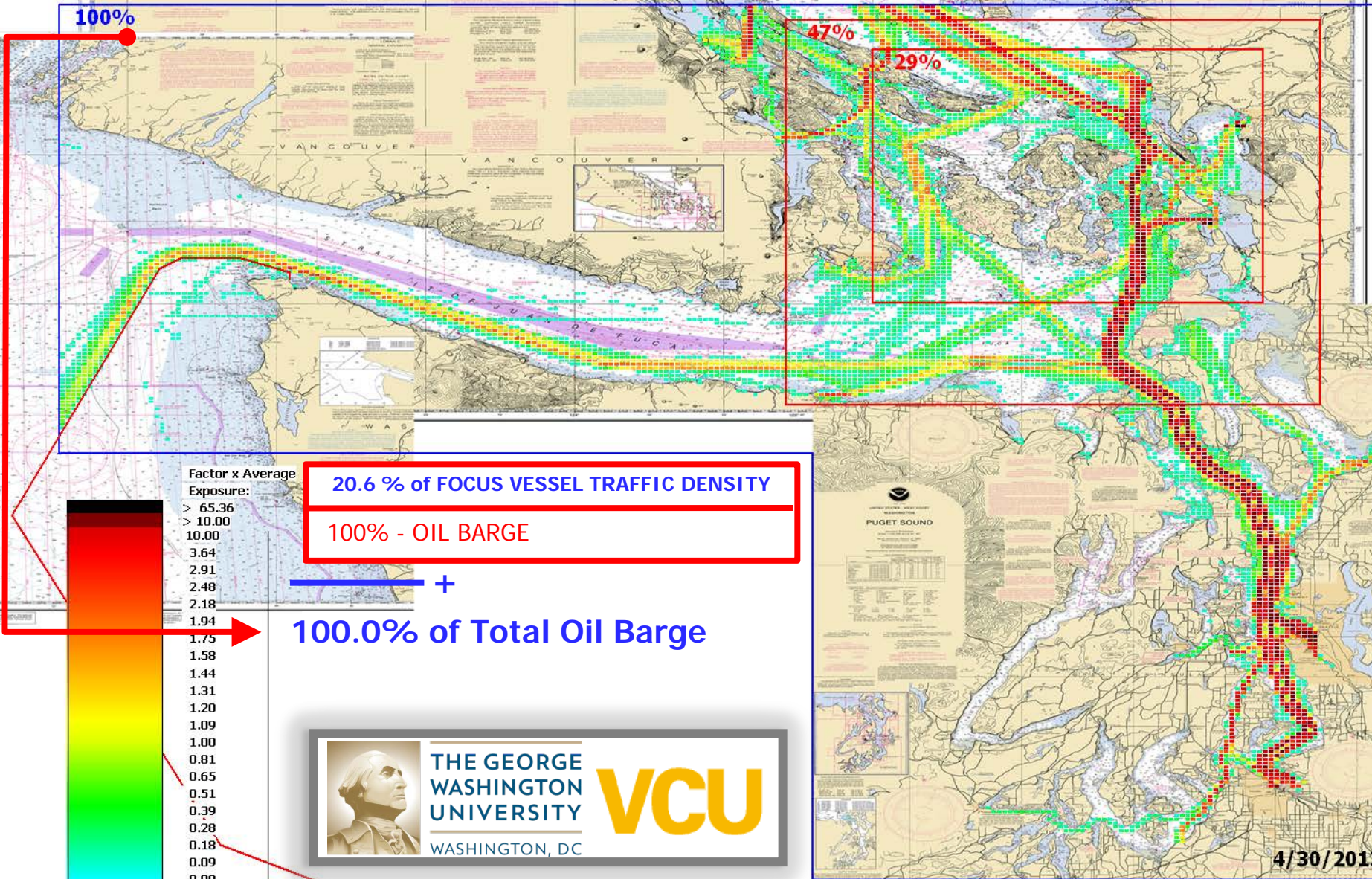
% of 2010 Total Time of Exposure (TTE) - Focus Vessels





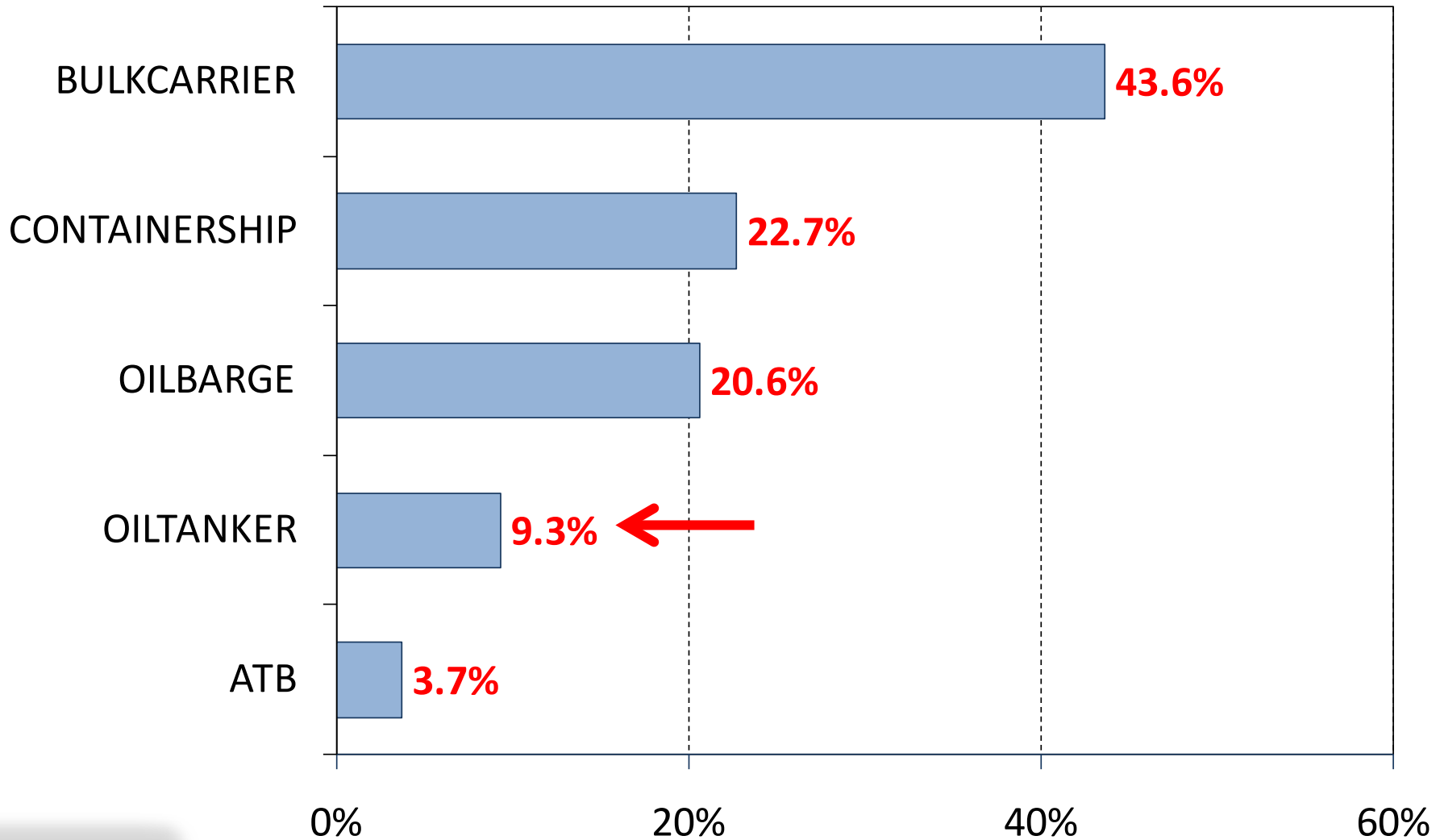
# 20.6% of Total Focus Vessel Traffic Density

## P: VTRA 2010 - OILBARGE Density



# VTRA MODEL - VTOSS 2010 - Limited to Focus Vessels

FOCUS VESSEL TYPE



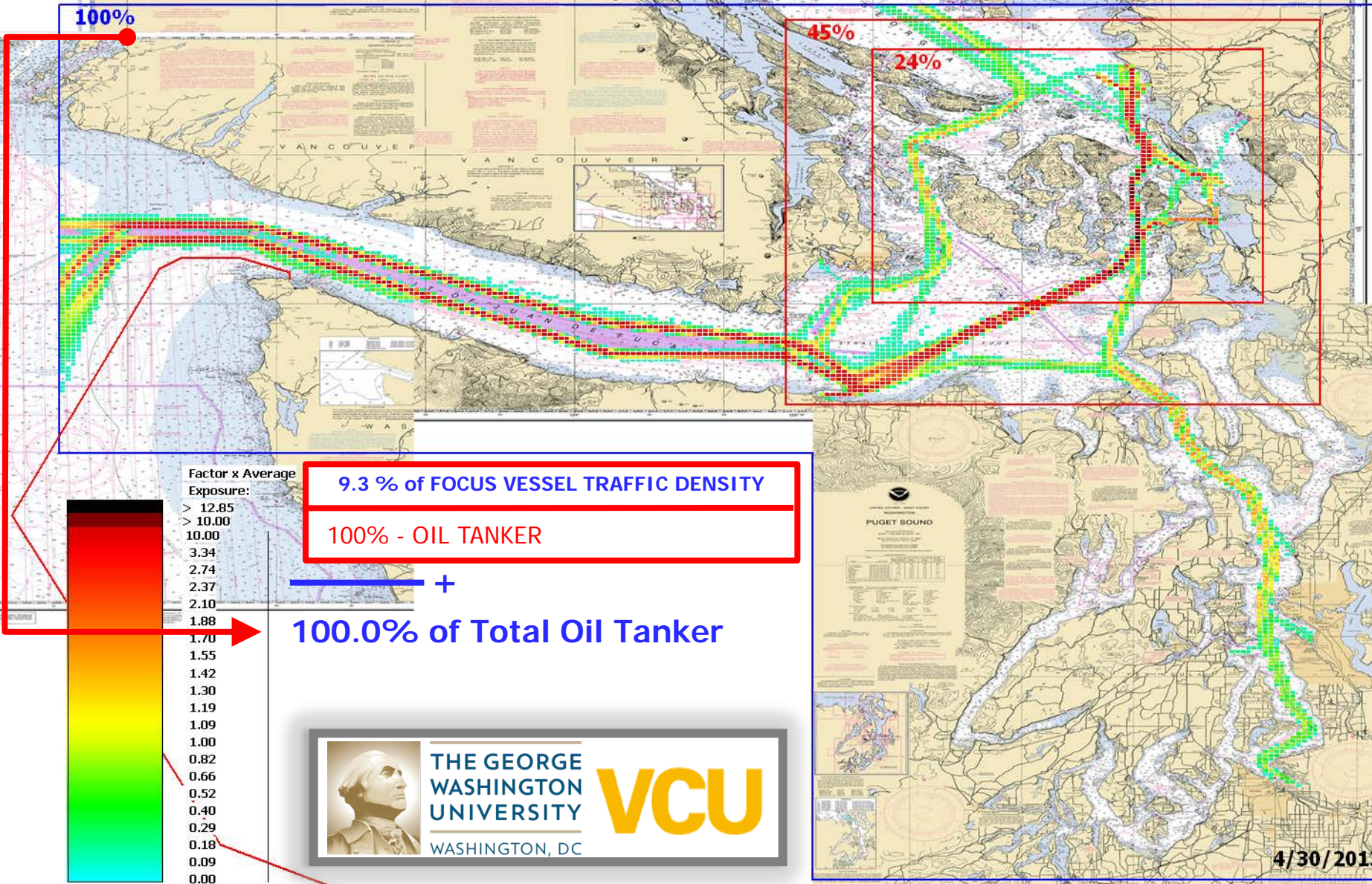
% of 2010 Total Time of Exposure (TTE) - Focus Vessels





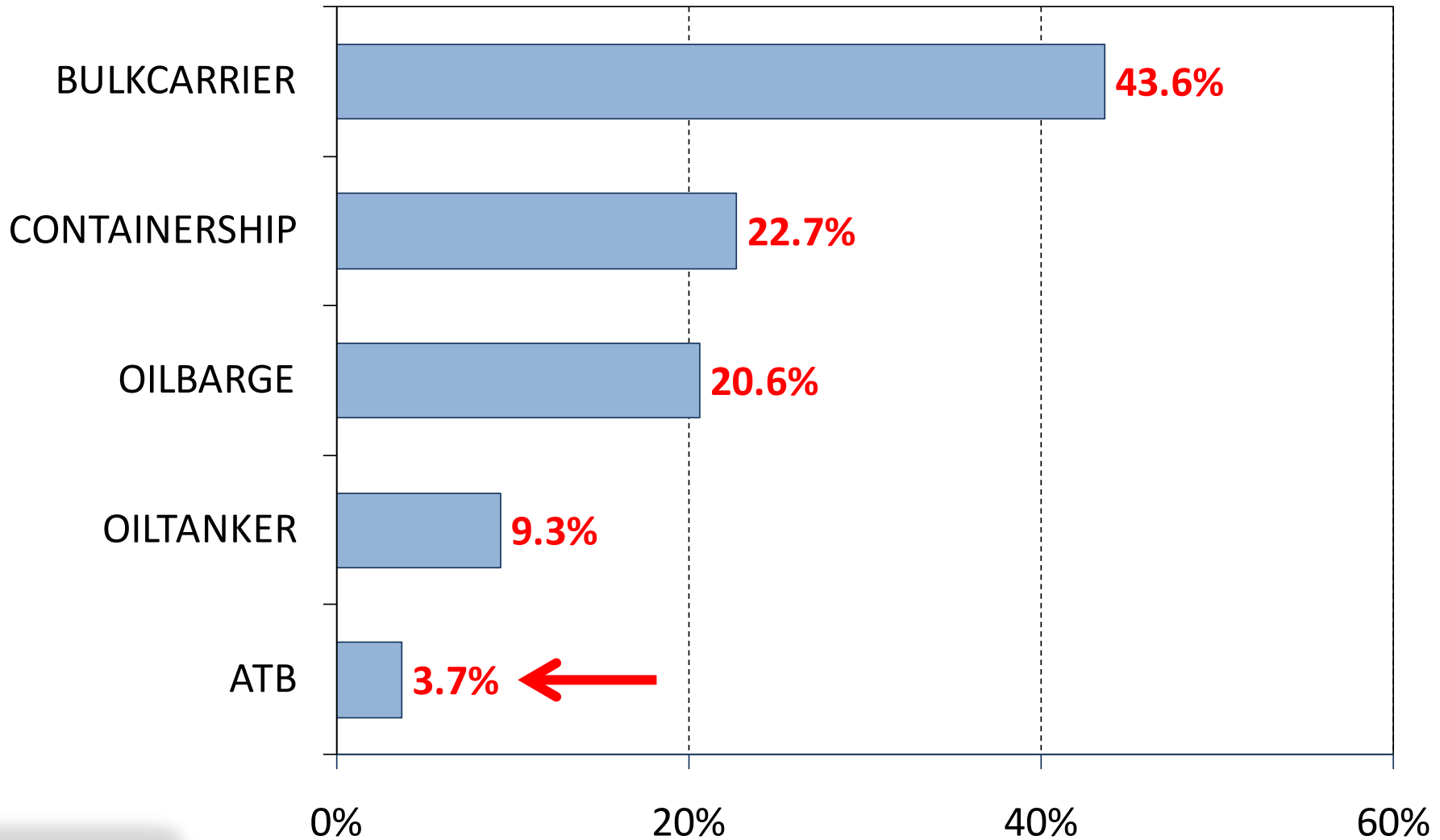
# 9.3% of Total Focus Vessel Traffic Density

## P: VTRA 2010 - OILTANKER Density



# VTRA MODEL - VTOSS 2010 - Limited to Focus Vessels

FOCUS VESSEL TYPE



% of 2010 Total Time of Exposure (TTE) - Focus Vessels





# 3.7% of Total Focus Vessel Traffic Density

## P: VTRA 2010 - ATB Density

