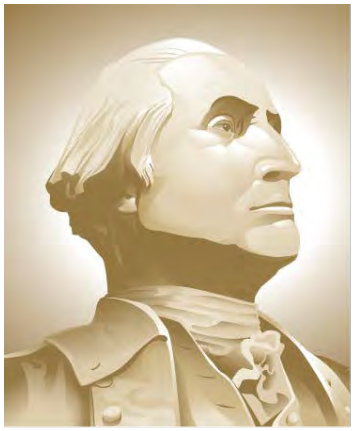
VTRA 2010 BASE CASE RESULTS BY ACCIDENT TYPE

Presentation by: J. Rene van Dorp



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VCU

2010 BASE CASE

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

AUGUST 19, 2013

PRELIMINARY

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, Container Vessels, Other Cargo Vessels

TANK – FV : Oil Barge, Oil Tankers, Chem-Carrier, ATB

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

IMPORTANT:

THE OPERATIVE WORD IN PRESENTING THESE ANALYSIS RESULTS IS THE USE OF THE WORD

POTENTIAL

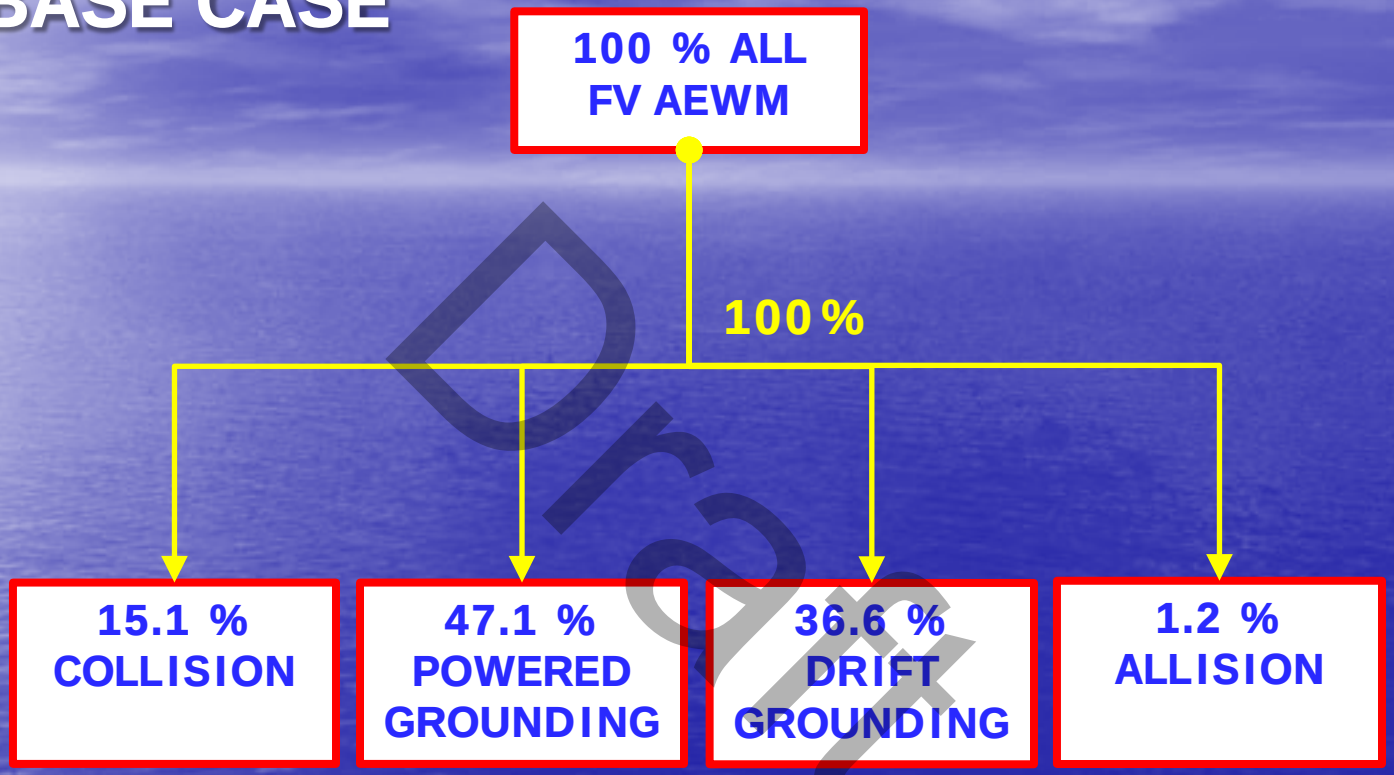
TO INDICATE THAT THESE ANALYSIS RESULTS DO NOT FOLLOW FROM AN HISTORICAL DATA ANALYSIS, BUT THROUGH THE USE OF AN ANALYSIS TOOL THAT EVALUATES SUCH **POTENTIAL**.

THE 2010 YEAR IS CONSIDERED **THE BASE CASE YEAR** AND A BASE CASE YEAR POTENTIAL IS EVALUATED.

NEXT, **WHAT-IF SCENARIOS** ARE DEVELOPED FROM THE BASE CASE BY ADDING ADDITIONAL HYPOTHETICAL TRAFFIC AND A WHAT-IF POTENTIAL IS EVALUATED AND COMPARED **RELATIVE TO THE BASE CASE** TO INFORM **RISK MANAGEMENT.**

A TAXONOMY OF 2010 FOCUS VESSEL ACCIDENT EXPOSURE WHILE MOVING (AEWM)

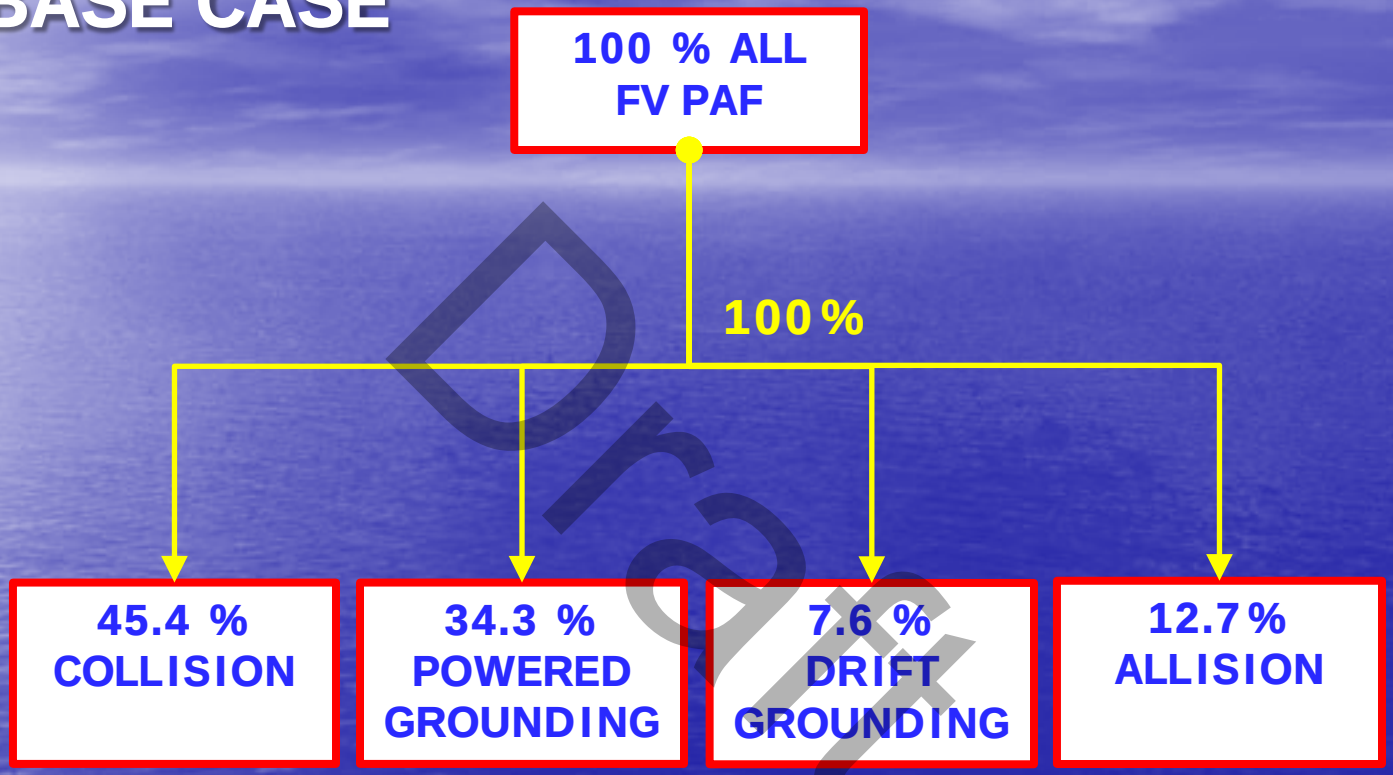
2010 BASE CASE



AEWM : ACCIDENT EXPOSURE WHILE MOVING - PER YEAR

A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ACCIDENT FREQUENCY (PAF) – PER YEAR

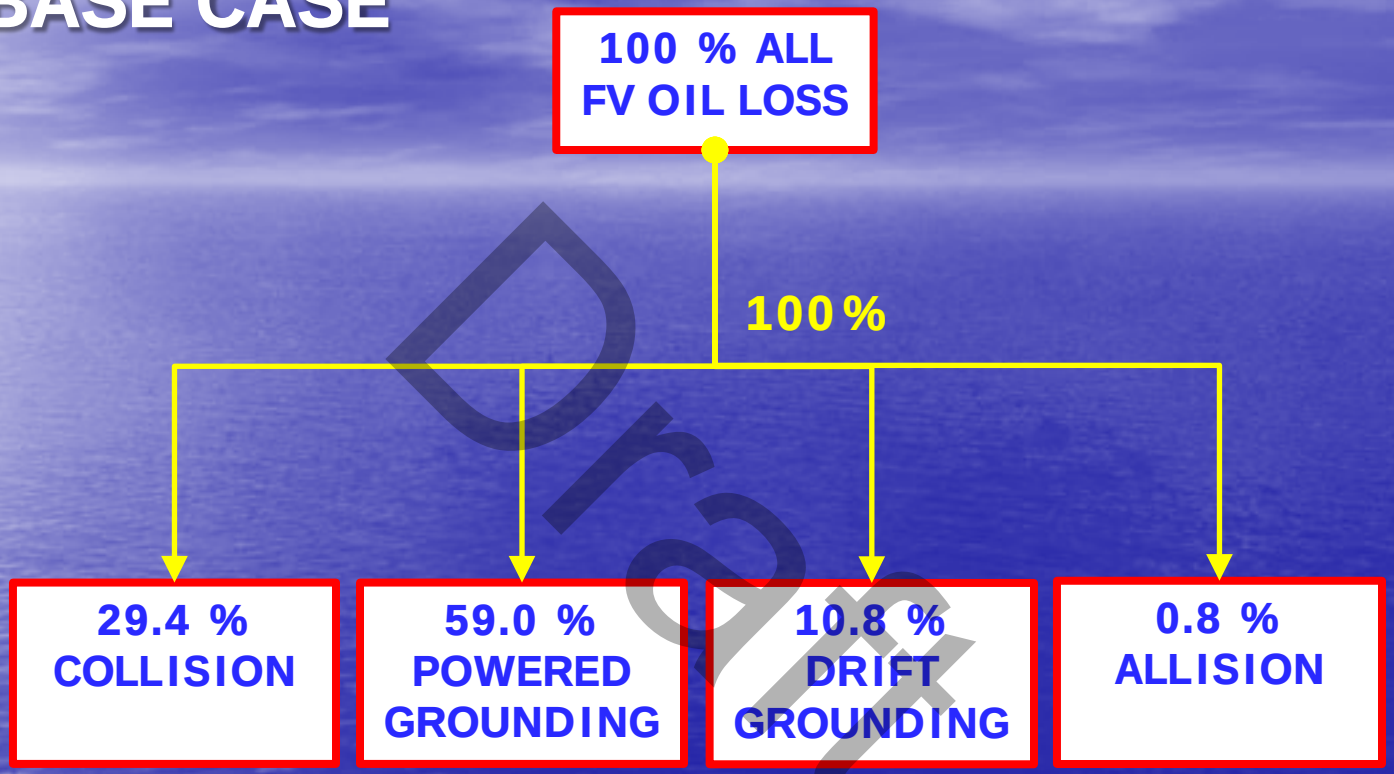
2010 BASE CASE



PAF : POTENTIAL ACCIDENT FREQUENCY - PER YEAR

A TAXONOMY OF 2010 FOCUS VESSEL POTENTAL ANNUAL OIL LOSS BY ACCIDENT TYPE

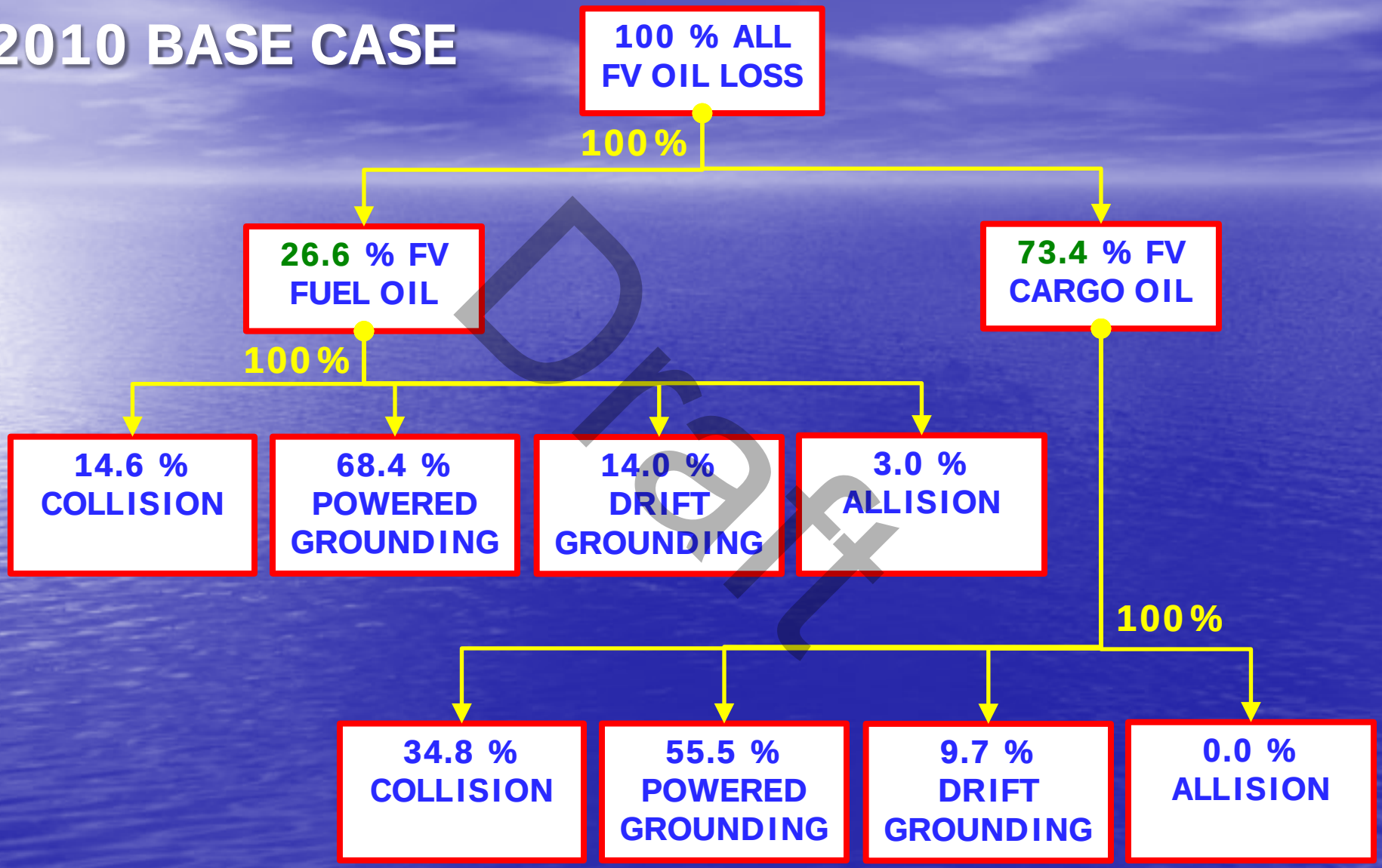
2010 BASE CASE



PAOL : POTENTIAL ACCIDENT OIL LOSS - PER YEAR

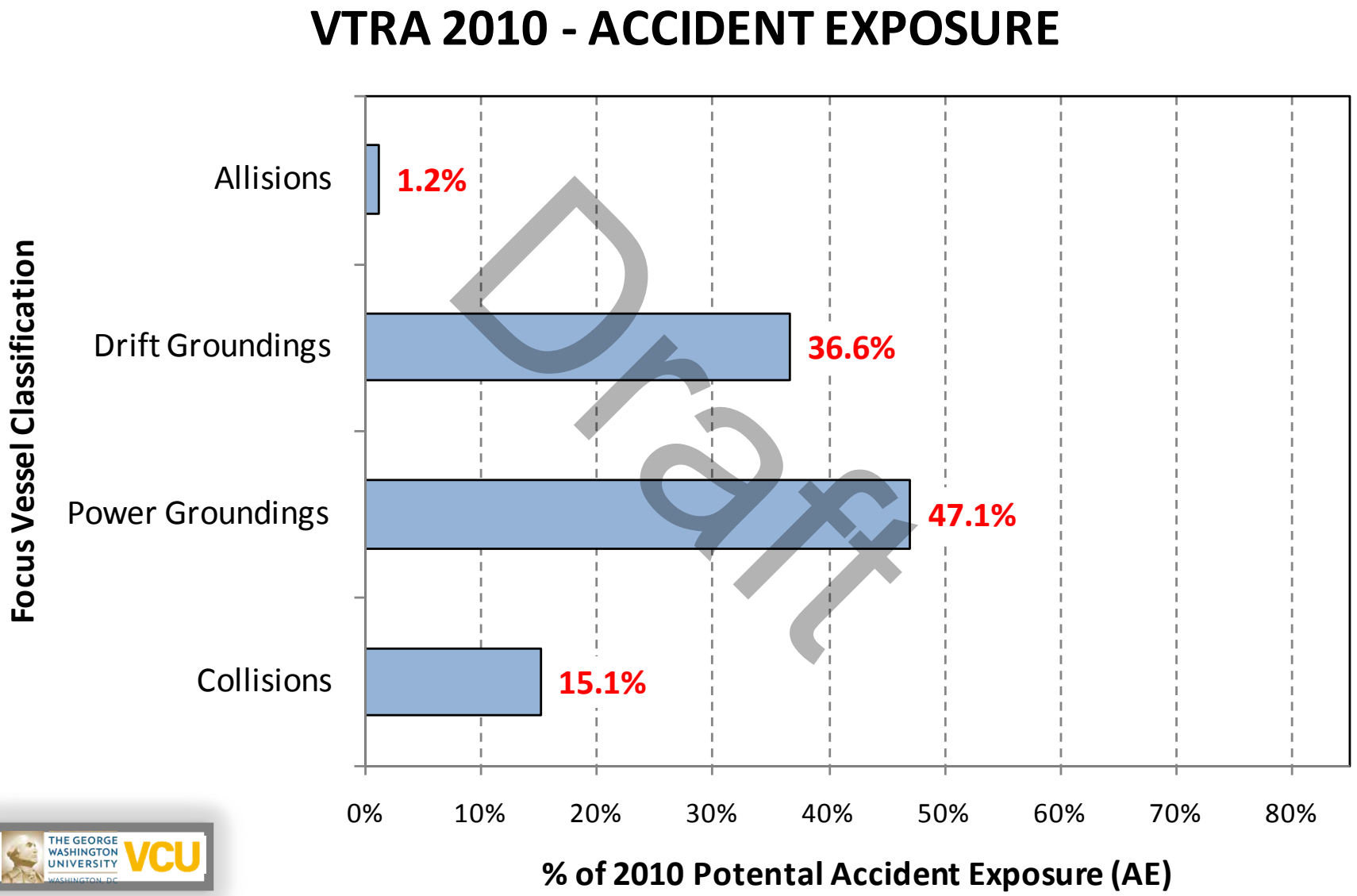
A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL OIL LOSS BY ACCIDENT TYPE (PAOL)

2010 BASE CASE

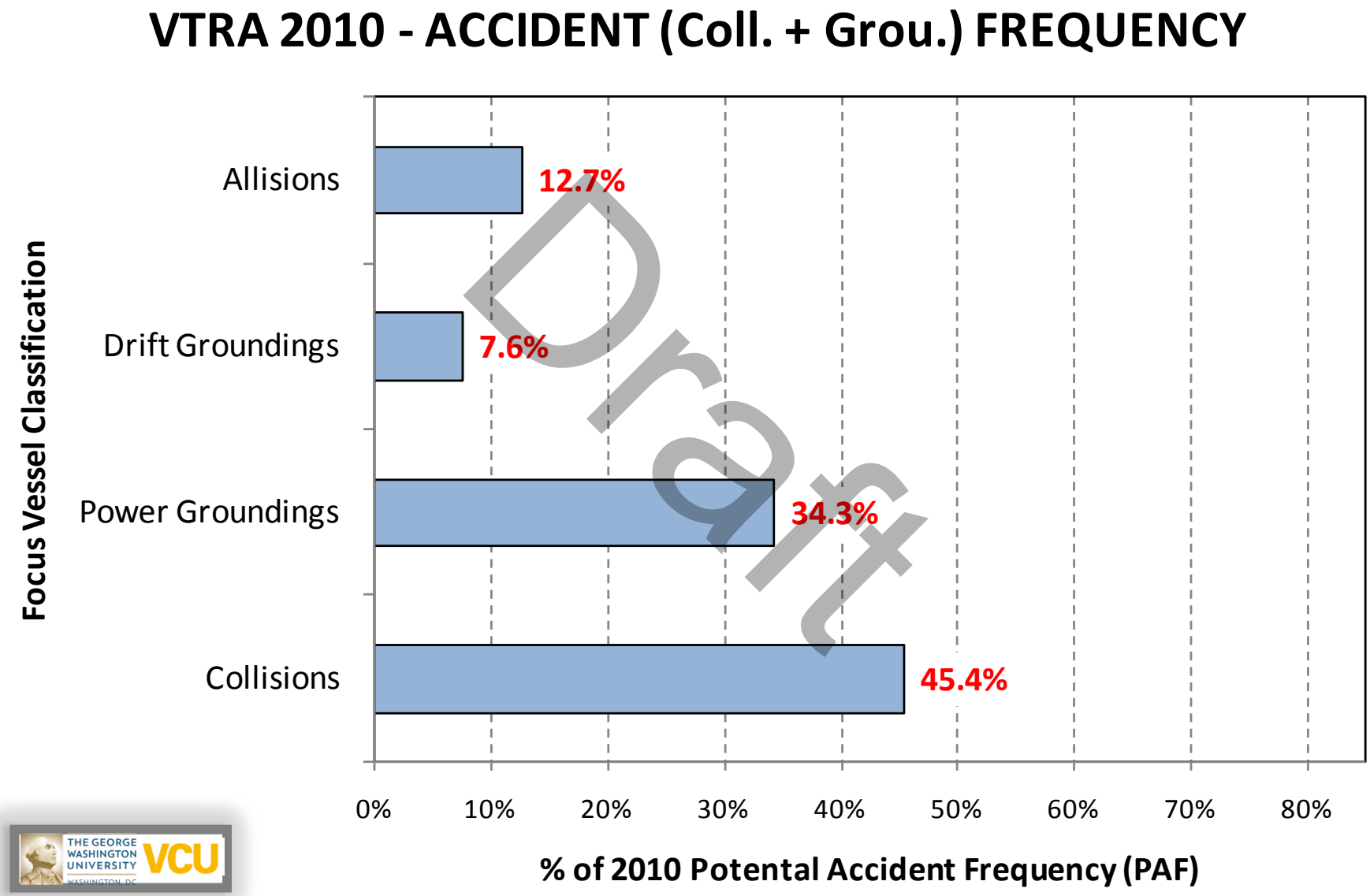


PAOL : POTENTIAL ACCIDENT OIL LOSS - PER YEAR

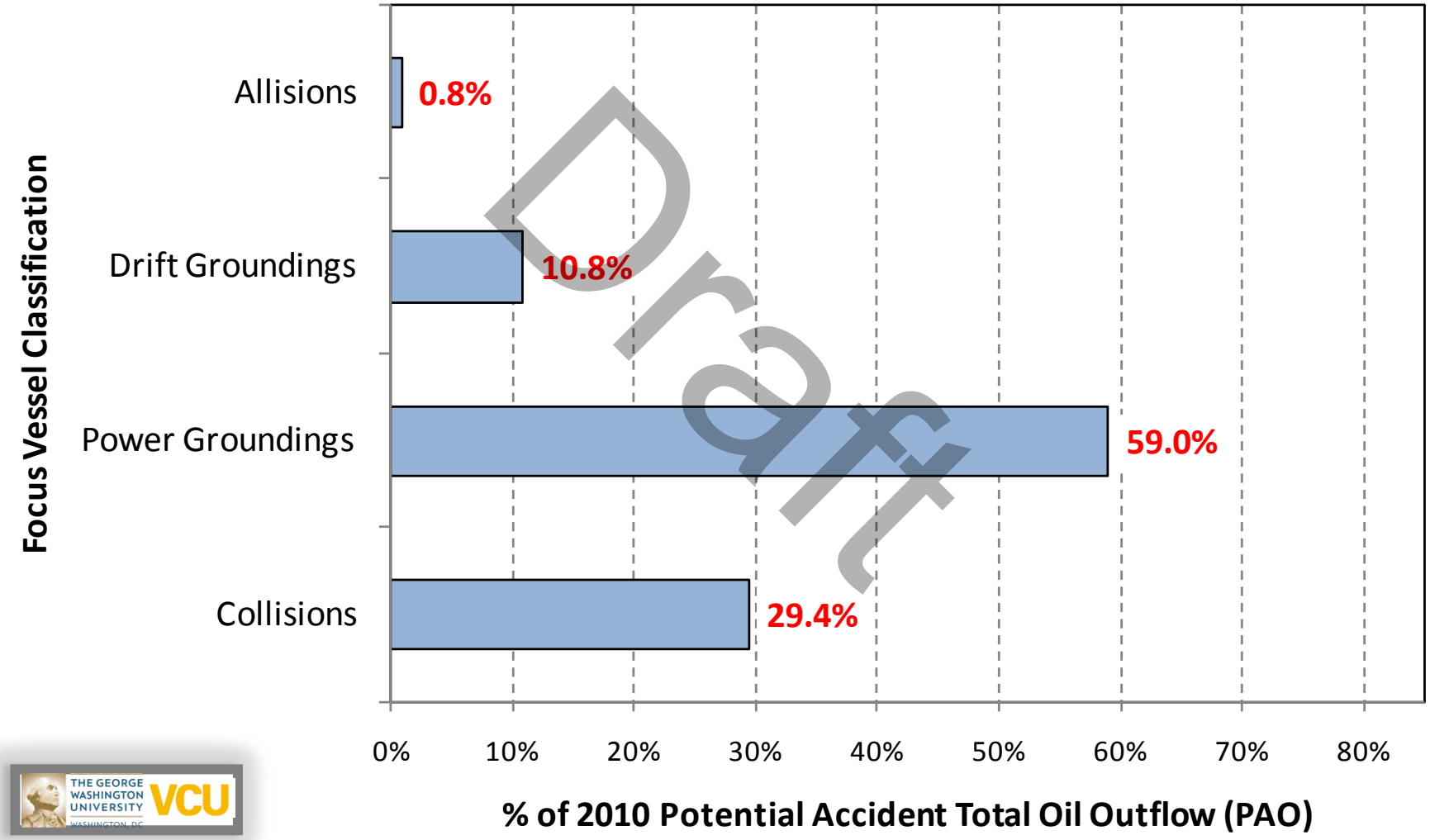
2010 BASE CASE



2010 BASE CASE



VTRA 2010 - ACCIDENT OIL LOSS (CARGO + FUEL)



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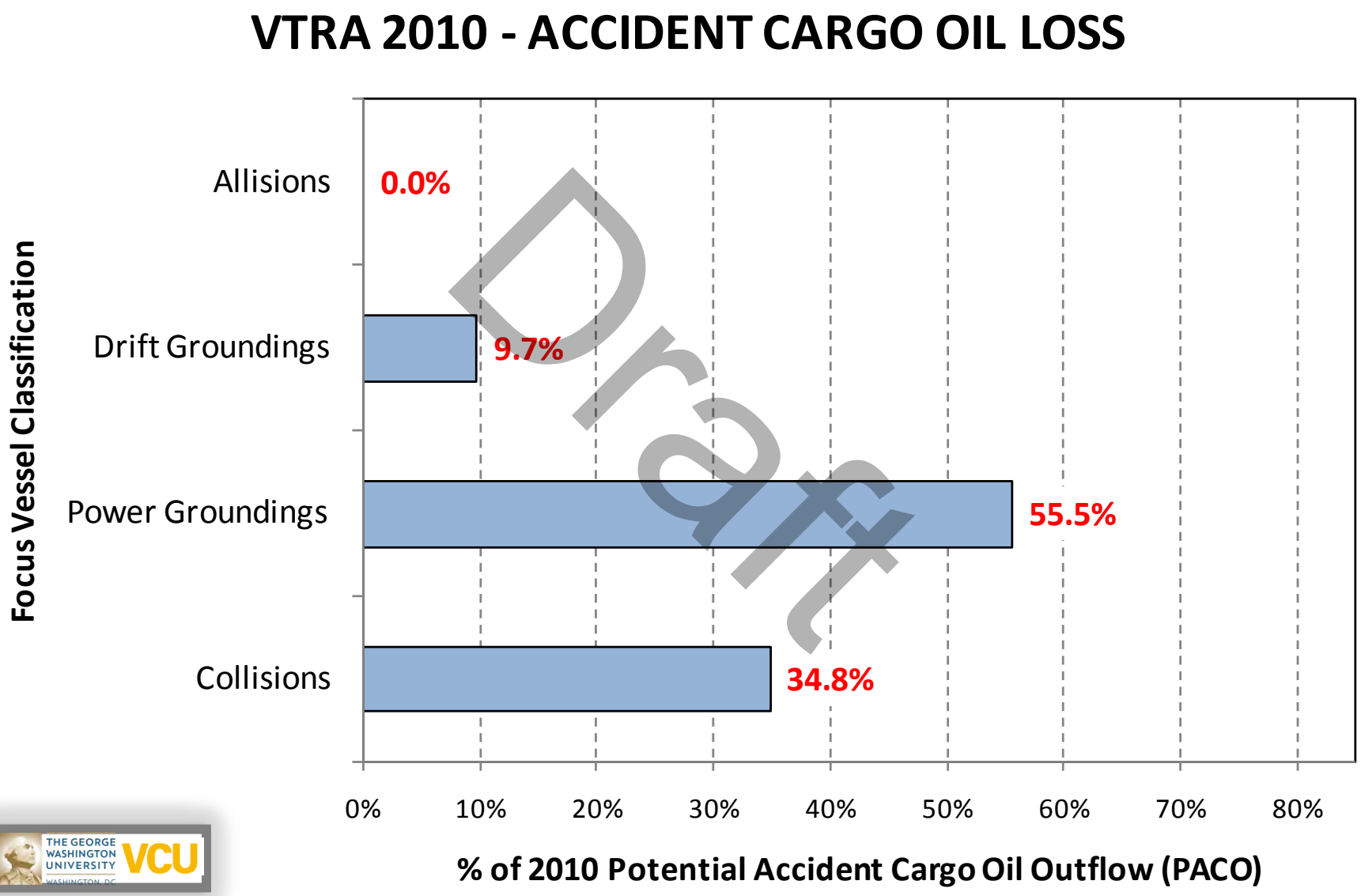
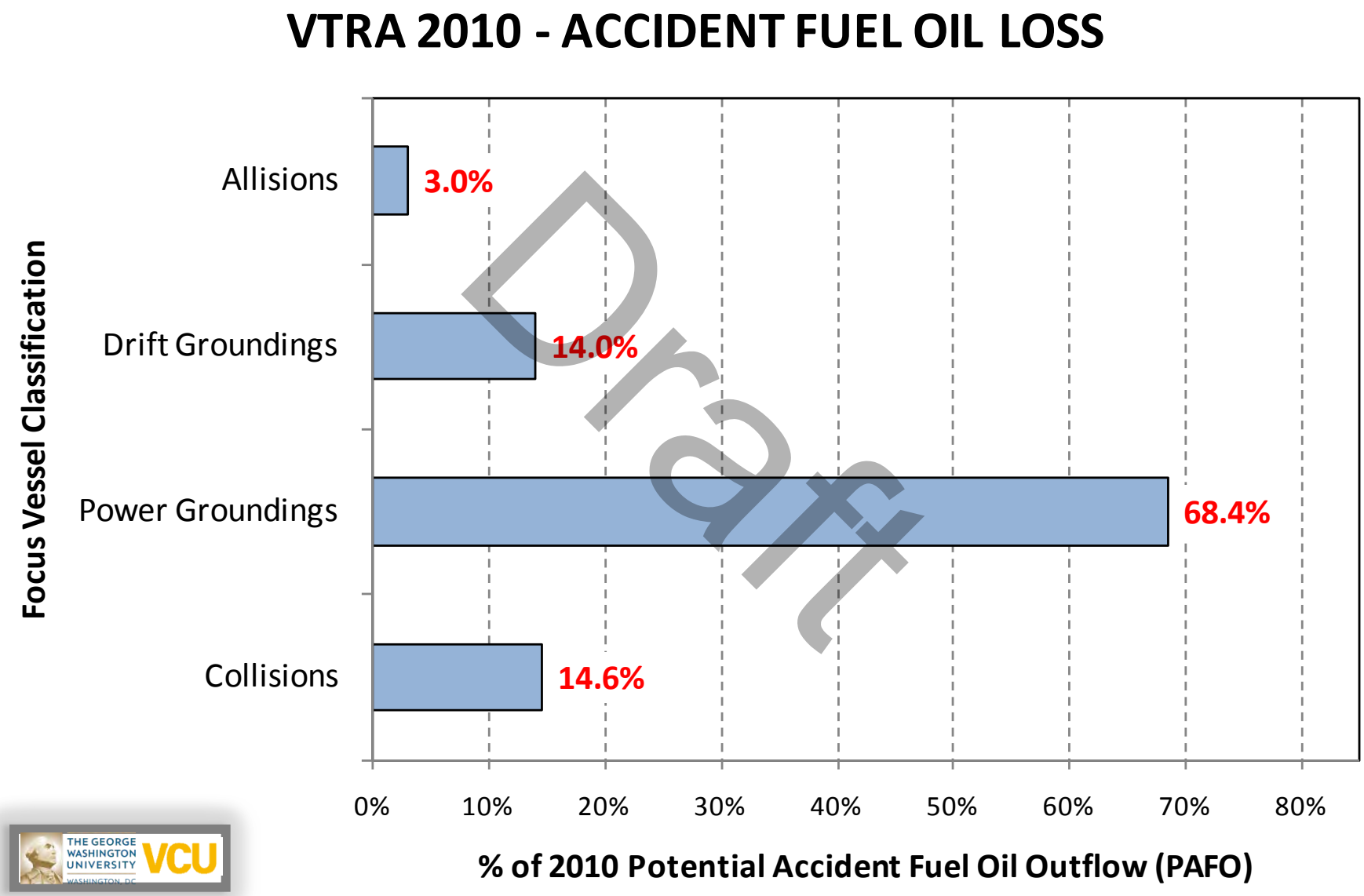
2010 BASE CASE

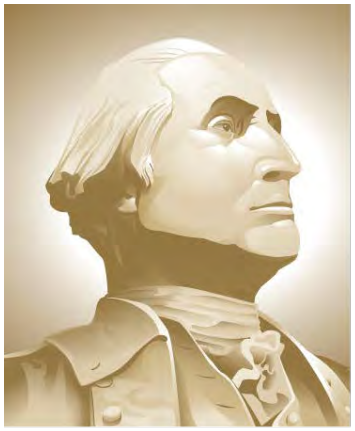


2010 BASE CASE



VTRA 2010 BASE CASE RESULTS – COLLISION GEOGRAPHIC PROFILES

Presentation by: J. Rene van Dorp



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GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

AUGUST 19, 2013

P: All FV - VESSEL TIME EXPOSURE (VTE)

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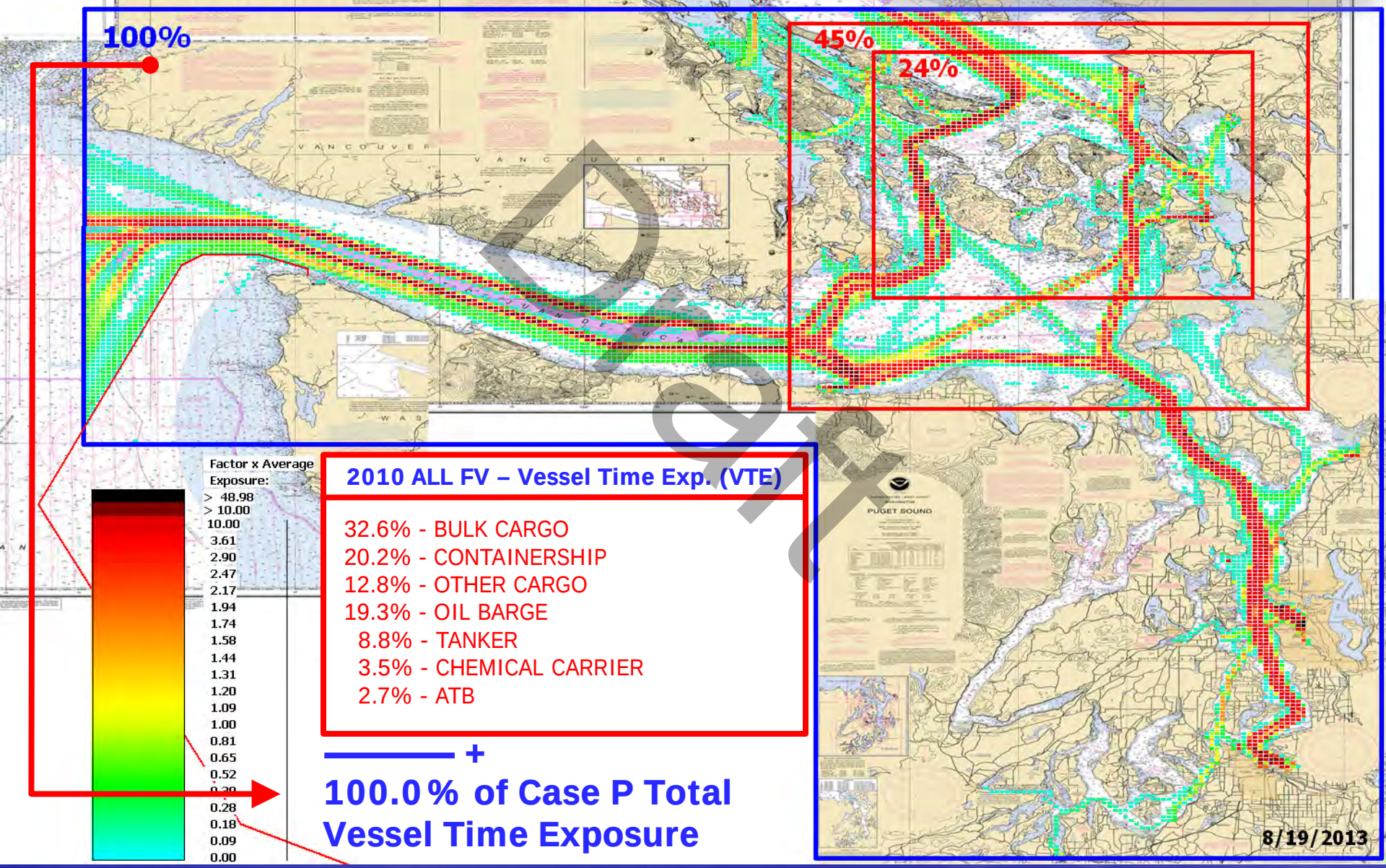
P: VTRA 2010 - BASE CASE - All FV



Factor x Average Exposure:

> 48.98
> 10.00
10.00
3.61
2.90
2.47
2.17
1.94
1.74
1.58
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.52
0.28
0.18
0.09
0.00

2010 ALL FV – Vessel Time Exp. (VTE)

32.6% - BULK CARGO
20.2% - CONTAINERSHIP
12.8% - OTHER CARGO
19.3% - OIL BARGE
8.8% - TANKER
3.5% - CHEMICAL CARRIER
2.7% - ATB

\+

100.0% of Case P Total Vessel Time Exposure

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P: All FV Potential COLL. EXPOSURE (PCE)

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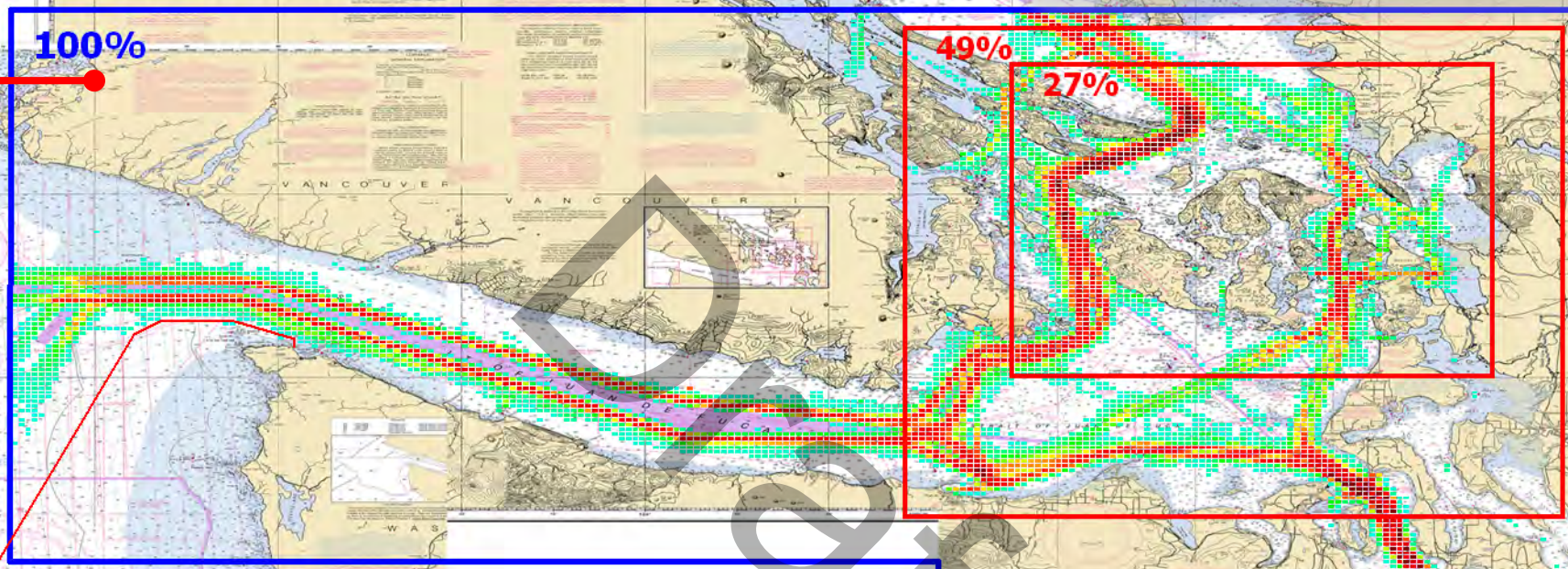
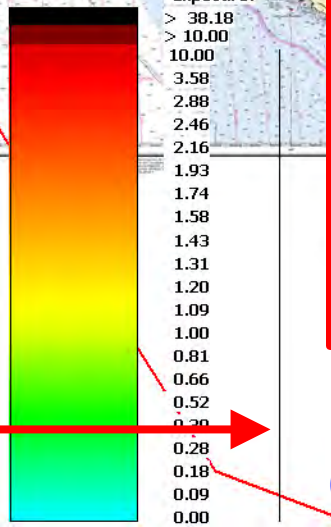
P: VTRA 2010 - BASE CASE - All FV



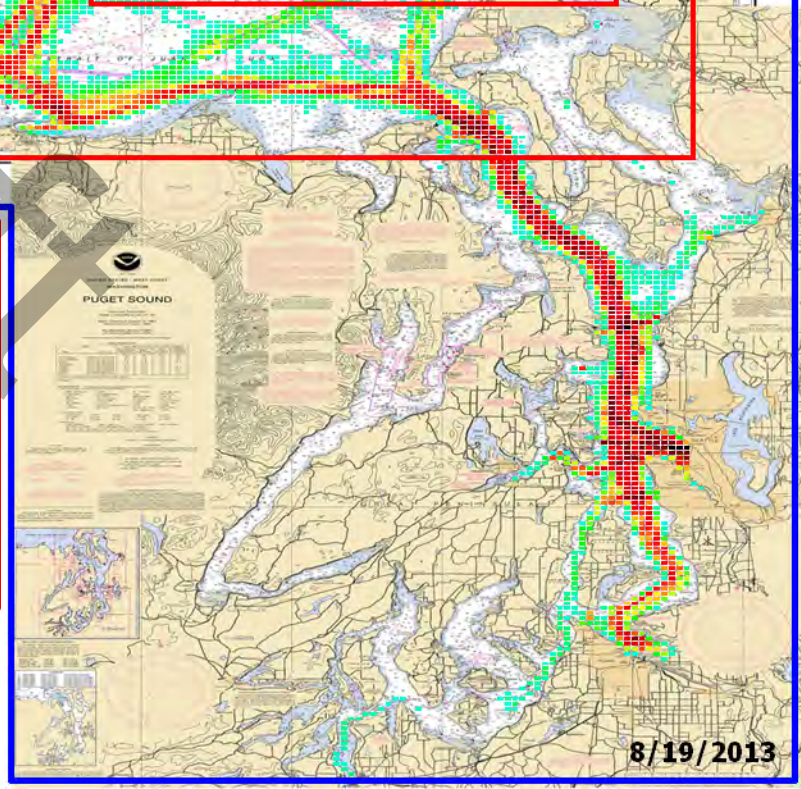


P: POT. COLL. EXPOSURE (PCE)

26.2% - BULK CARGO
31.0% - CONTAINERSHIP
13.9% - OTHER CARGO
16.9% - OIL BARGE
07.1% - TANKER
02.9% - CHEMICAL CARRIER
01.9% - ATB

\+

100.0% of Case P Potent. Collision Exposure



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P: All FV Potential COLL. FREQUENCY (PCF)

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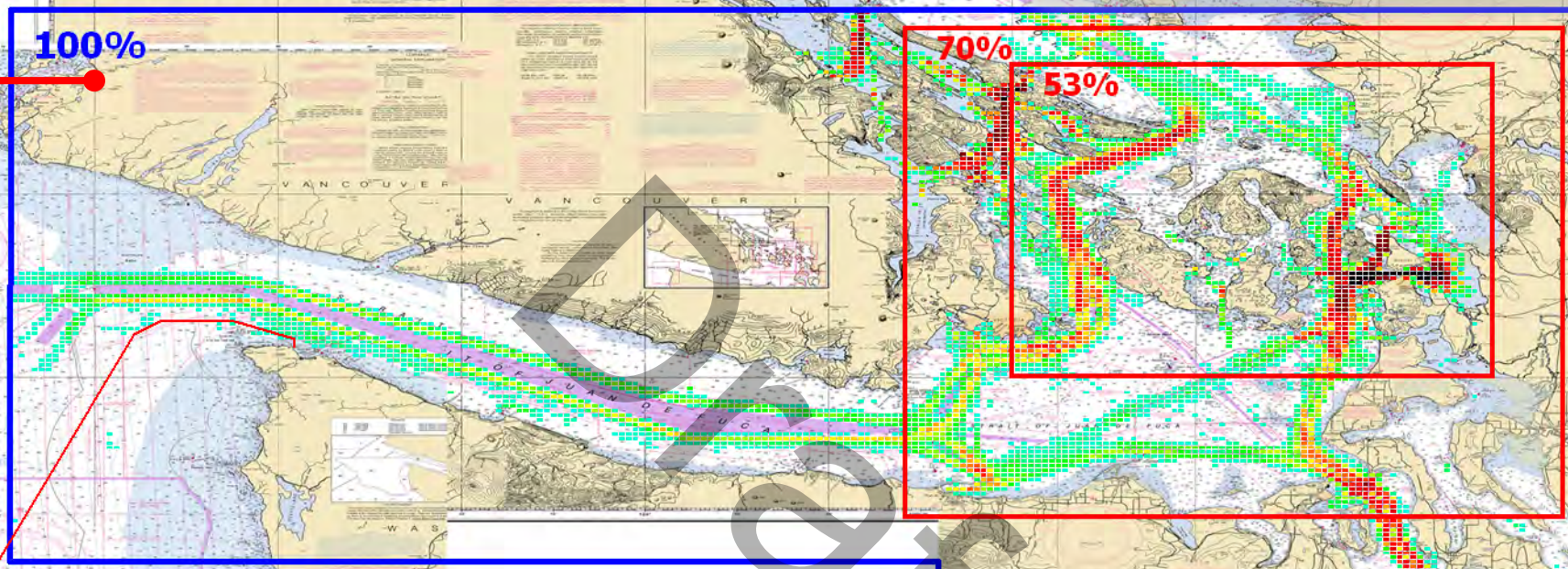
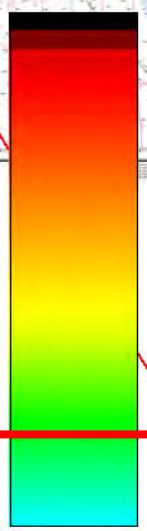
P: VTRA 2010 - BASE CASE - All FV





Factor x Average # of Accidents

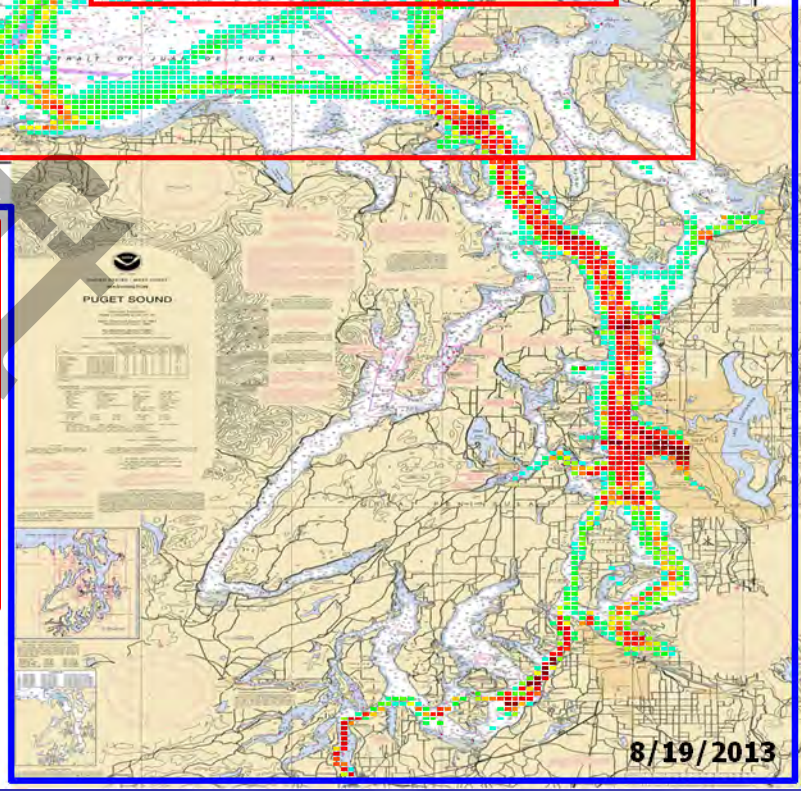
> 100.00
> 10.00
10.00
3.69
2.95
2.51
2.19
1.95
1.75
1.59
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.51
0.39
0.28
0.18
0.09
0.00

P: POT. COLL. FREQ. (PCF)

09.6% - BULK CARGO
06.0% - CONTAINERSHIP
04.7% - OTHER CARGO
56.9% - OIL BARGE
07.2% - TANKER
13.9% - CHEMICAL CARRIER
01.8% - ATB

\+

100.0% of Case P Potent. Collision Frequency



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P: All FV Potential COLLISION OIL LOSS (PCO)

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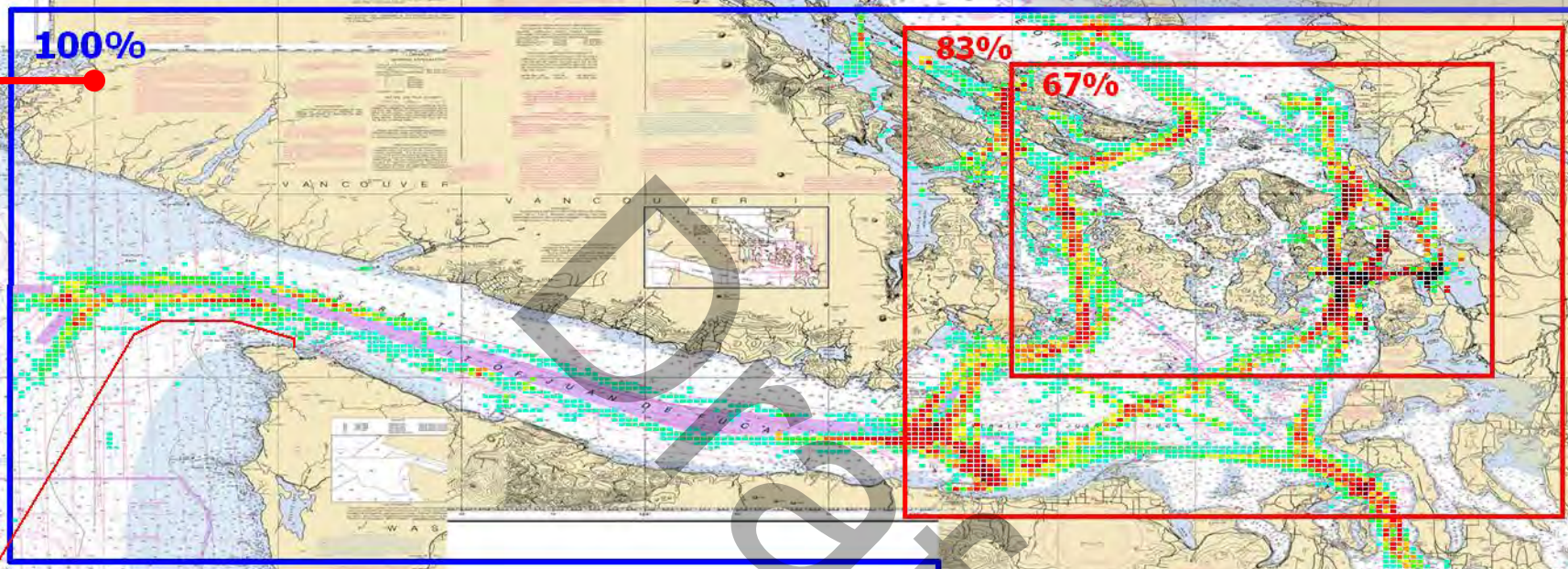
P: VTRA 2010 - BASE CASE - All FV



Factor x Average Oil Outflow

> 100.00
> 10.00
10.00
3.70
2.95
2.51
2.20
1.95
1.76
1.59
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.51
0.28
0.18
0.09
0.00

P: POT. COLL. OIL LOSS (PCO)

03.0% - BULK CARGO
04.1% - CONTAINERSHIP
01.4% - OTHER CARGO
21.4% - OIL BARGE
54.2% - TANKER
13.3% - CHEMICAL CARRIER
01.4% - ATB

\+

100.0% of Potential Coll. Oil Loss (Cargo+Fuel)

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P: All FV POT. COLL. FUEL OIL LOSS (PCFO)

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P: VTRA 2010 - BASE CASE

13%

9%

6%

Factor x Average Oil Outflow

> 100.00
> 10.00
10.00
3.70
2.95
2.51
2.20
1.95
1.76
1.59
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.51
0.39
0.18
0.09
0.00

P: POT. COLL. FUEL OIL (PCFO)

2.1% - BULK CARGO
2.6% - CONTAINERSHIP
1.0% - OTHER CARGO
5.0% - OIL BARGE
1.2% - TANKER
1.0% - CHEMICAL CARRIER
0.2% - ATB

\+

13.2% of Potential Coll. Oil Loss (Cargo+Fuel)

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P: All FV POT. COLL. CARGO OIL LOSS (PCCO)

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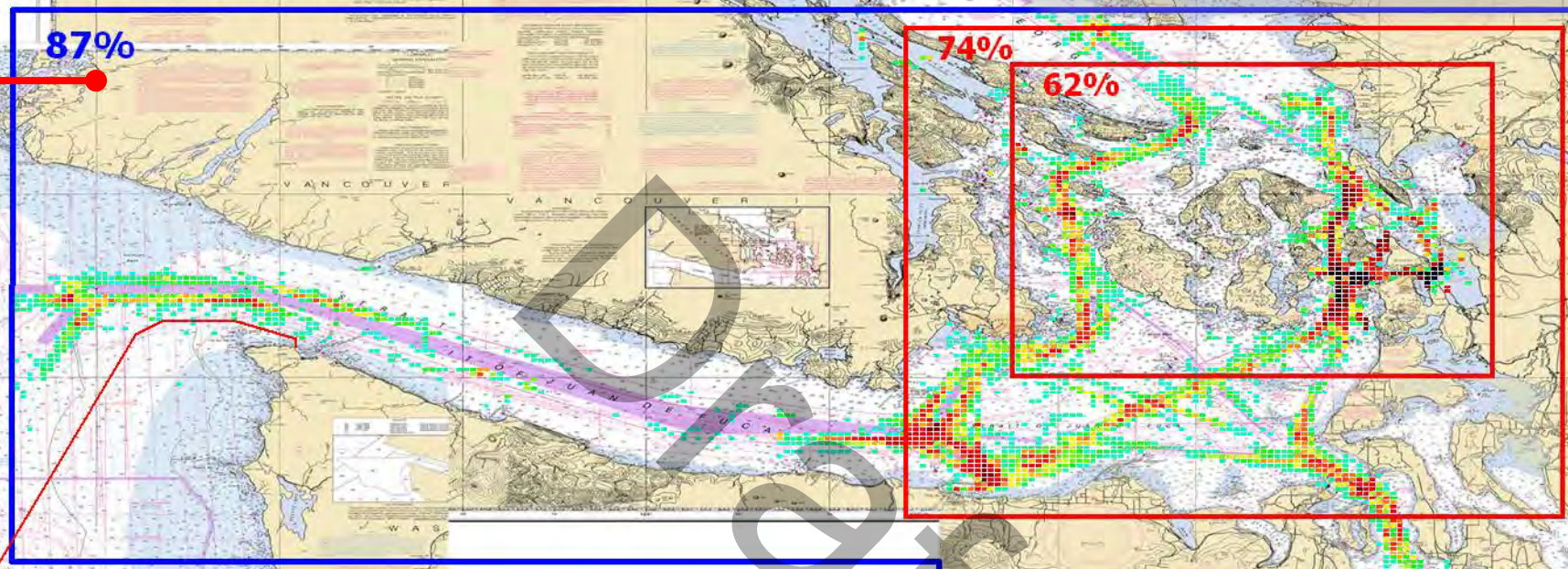
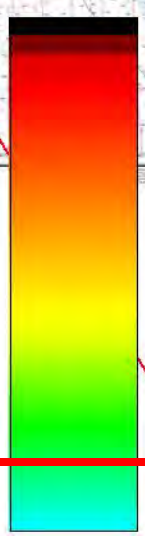
P: VTRA 2010 - BASE CASE





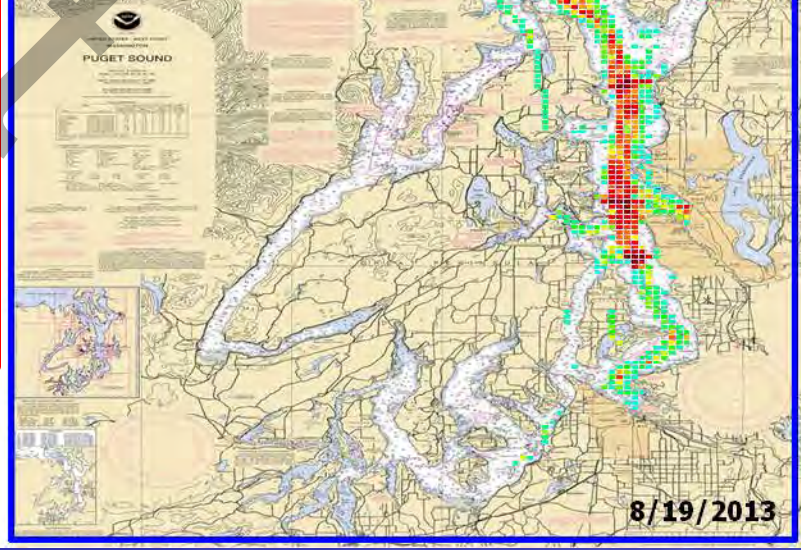
Factor x Average Oil Outflow
> 100.00
> 10.00
10.00
3.70
2.95
2.51
2.20
1.95
1.76
1.59
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.51
0.39
0.18
0.09
0.00

P: POT. COLL. CARGO OIL (PCCO)

00.9% - BULK CARGO
01.5% - CONTAINERSHIP
00.5% - OTHER CARGO
16.3% - OIL BARGE
52.9% - TANKER
12.4% - CHEMICAL CARRIER
02.3% - ATB

\+

86.8% of Potential Coll. Oil Loss (Cargo+Fuel)



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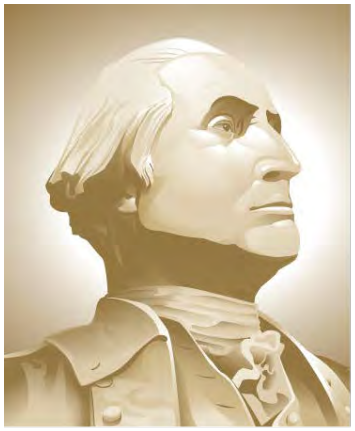
VTRA 2010 BASE CASE RESULTS – GROUNDING GEOGRAPHIC PROFILES

Presentation by: J. Rene van Dorp



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GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

AUGUST 19, 2013

P: All FV - VESSEL TIME EXPOSURE (VTE)

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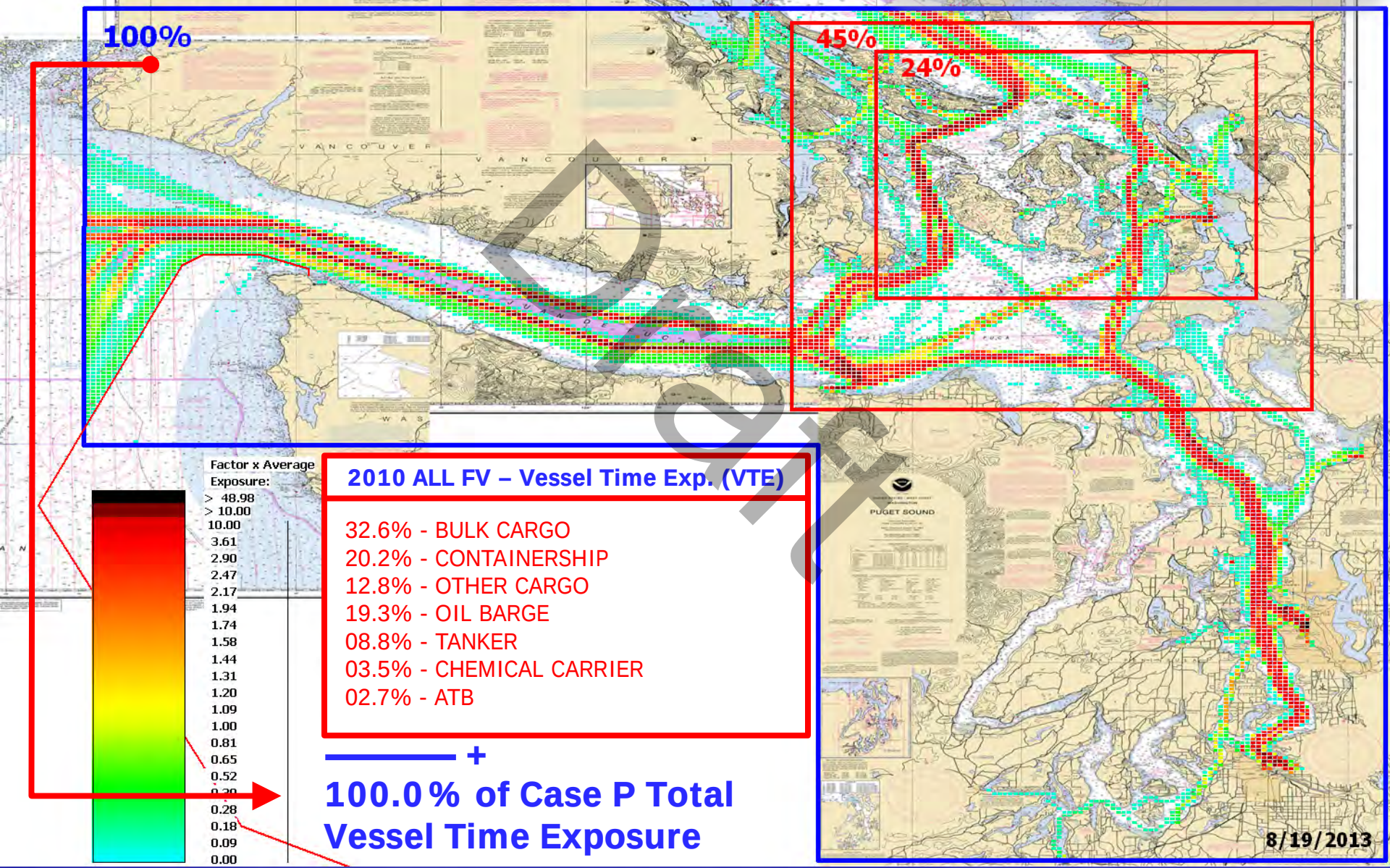
P: VTRA 2010 - BASE CASE - All FV



2010 ALL FV – Vessel Time Exp. (VTE)

32.6% - BULK CARGO
20.2% - CONTAINERSHIP
12.8% - OTHER CARGO
19.3% - OIL BARGE
08.8% - TANKER
03.5% - CHEMICAL CARRIER
02.7% - ATB

\+

100.0% of Case P Total Vessel Time Exposure

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P: All FV POT. GROUNDING EXPOSURE (PGE)

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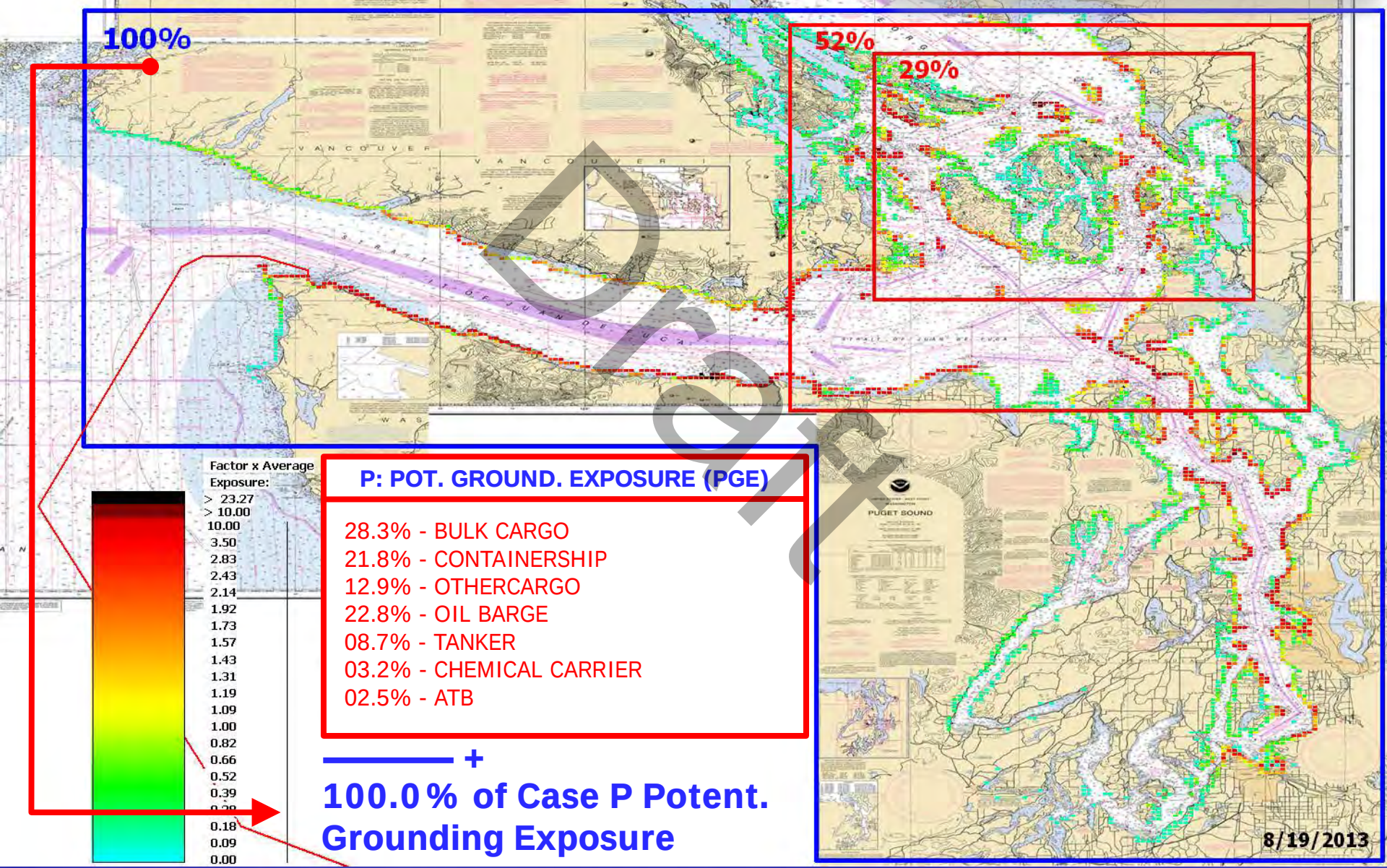
P: VTRA 2010 - BASE CASE



P: POT. GROUND. EXPOSURE (PGE)

28.3% - BULK CARGO
21.8% - CONTAINERSHIP
12.9% - OTHERCARGO
22.8% - OIL BARGE
08.7% - TANKER
03.2% - CHEMICAL CARRIER
02.5% - ATB

\+

100.0% of Case P Potent. Grounding Exposure

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P: All FV POT. GROUND. FREQUENCY (PGF)

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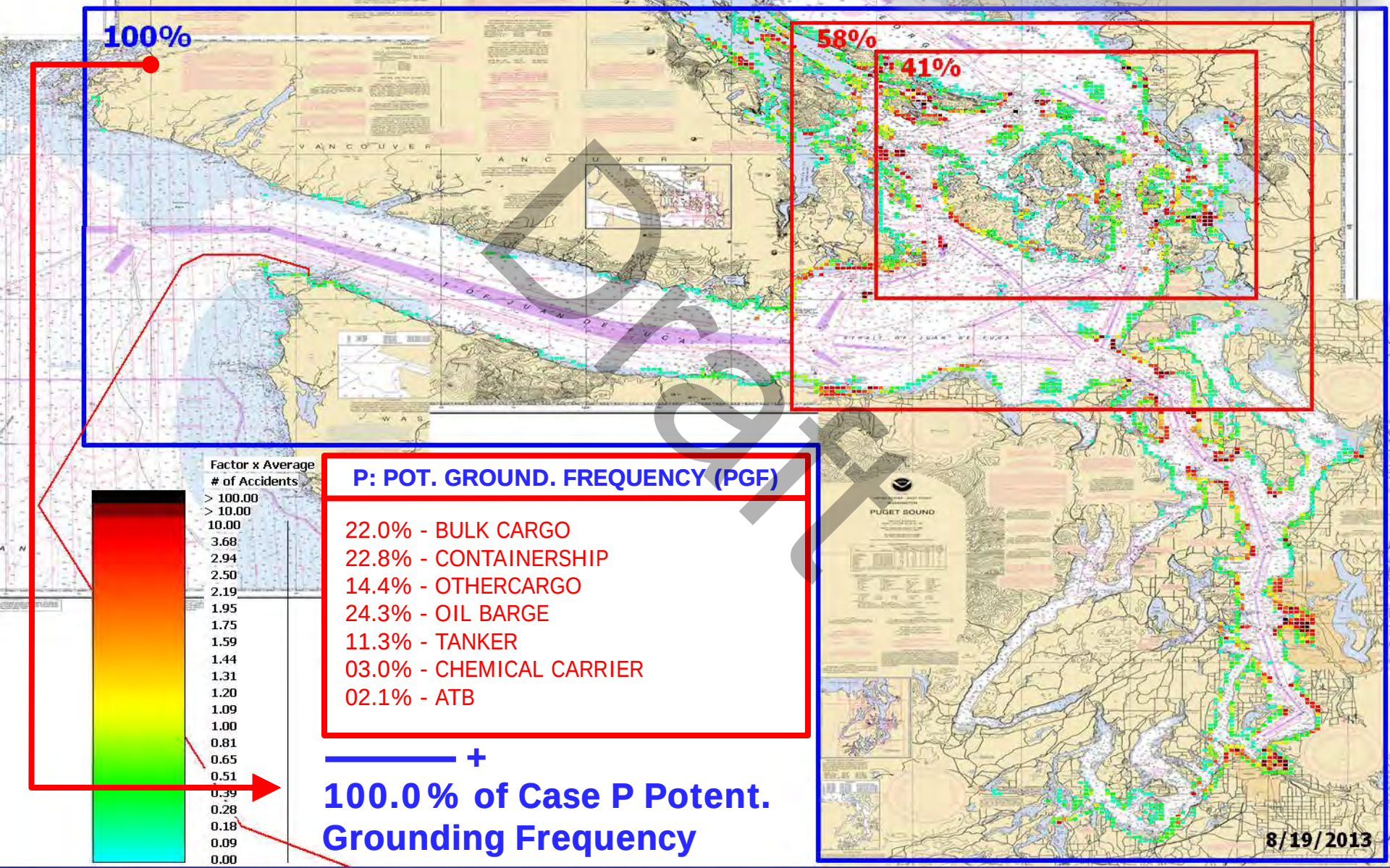
P: VTRA 2010 - BASE CASE



P: POT. GROUND. FREQUENCY (PGF)

22.0% - BULK CARGO
22.8% - CONTAINERSHIP
14.4% - OTHERCARGO
24.3% - OIL BARGE
11.3% - TANKER
03.0% - CHEMICAL CARRIER
02.1% - ATB

\+

100.0% of Case P Potent. Grounding Frequency

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P: All FV POTENTIAL GROUND. OIL LOSS (PGO)

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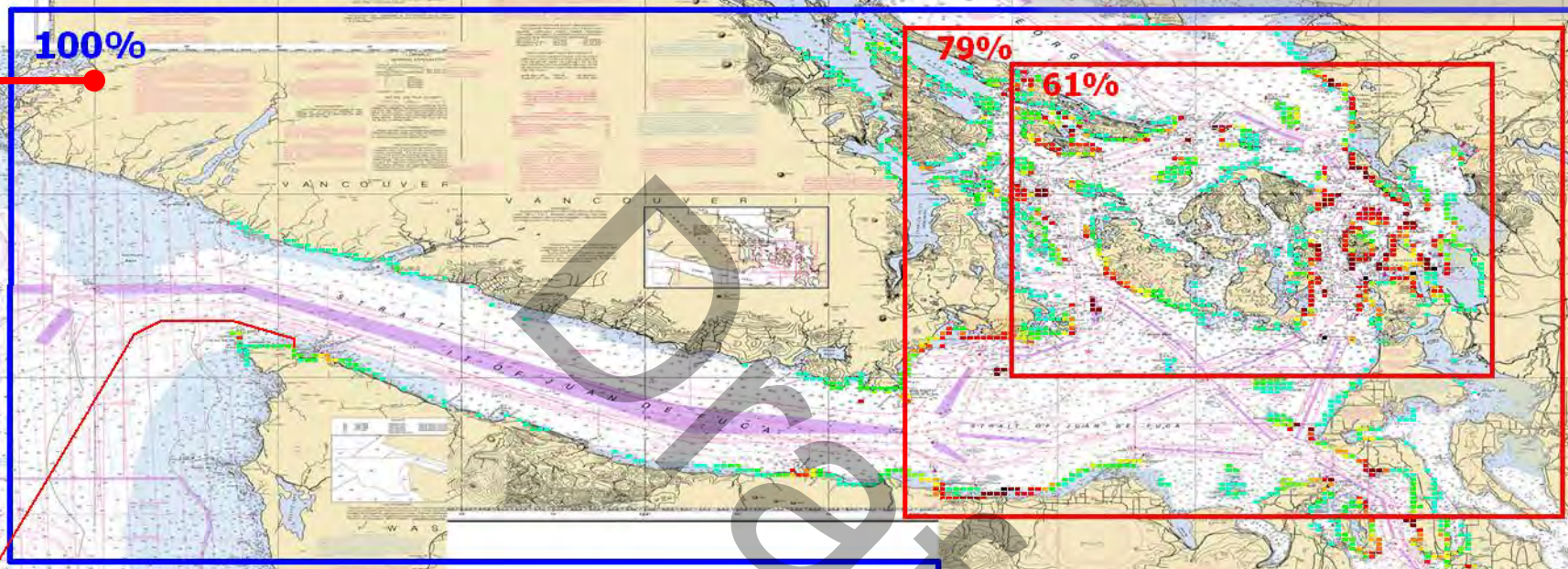
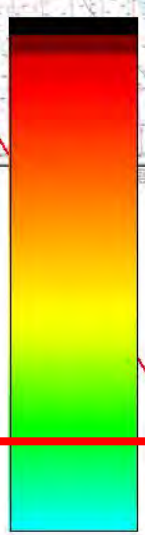
P: VTRA 2010 - BASE CASE



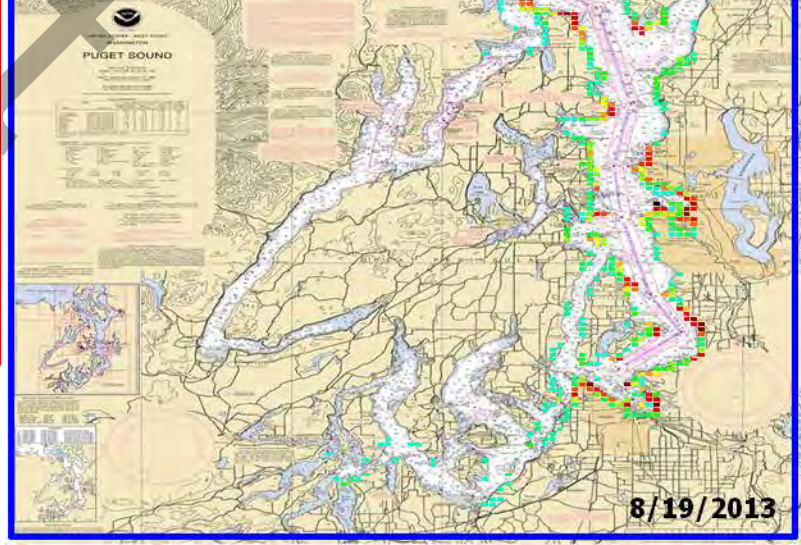


P: POT. GROUND. OIL LOSS (PGO)

06.7% - BULK CARGO
18.8% - CONTAINERSHIP
02.3% - OTHERCARGO
02.3% - OIL BARGE
54.8% - TANKER
03.3% - CHEMICAL CARRIER
11.8% - ATB

\+

100.0% of Case P Potent. Grounding Oil Loss (C + F)



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P: All FV POT. GROUND. FUEL OIL LOSS (PGFO)

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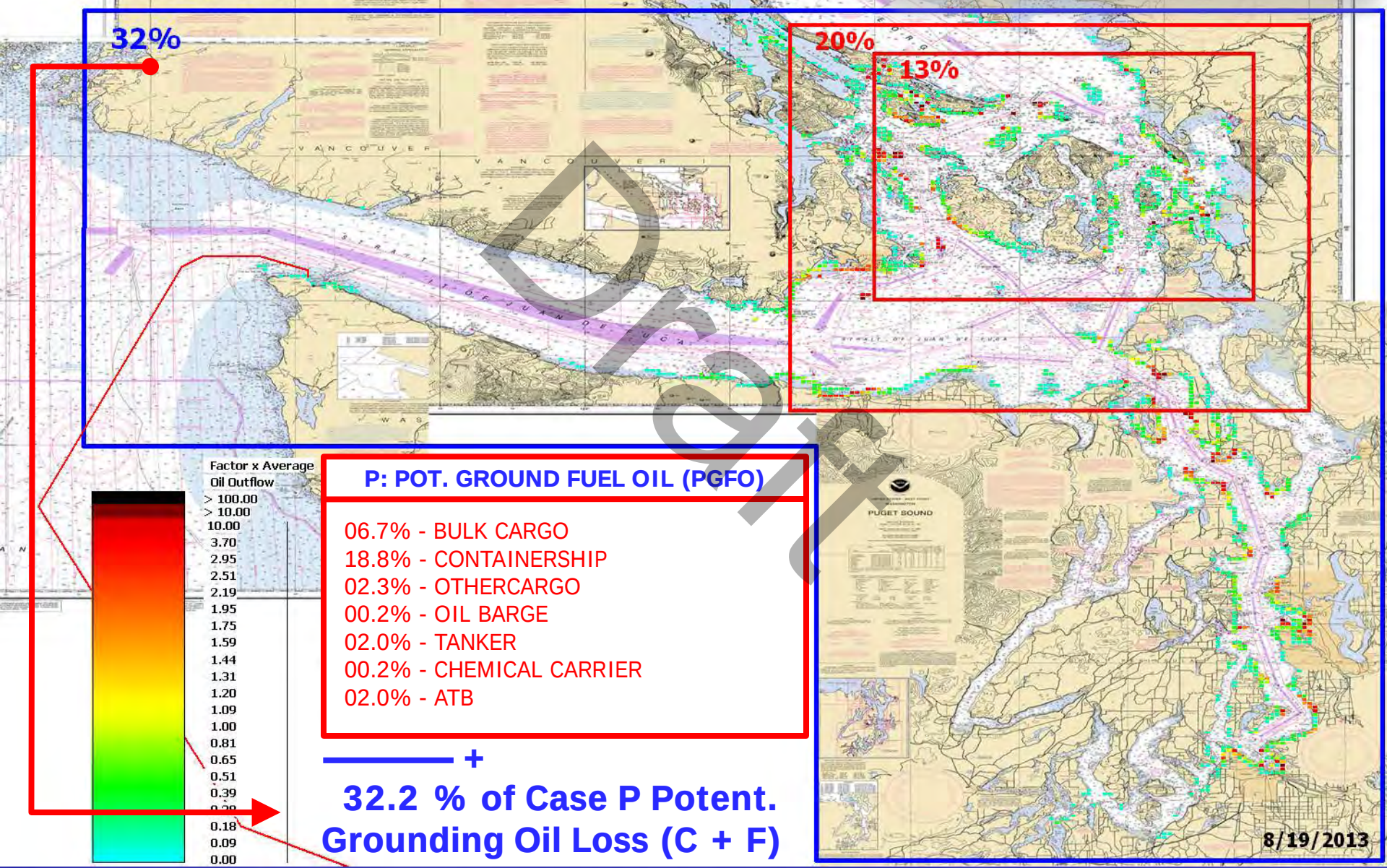
P: VTRA 2010 - BASE CASE



P: POT. GROUND FUEL OIL (PGFO)

06.7% - BULK CARGO
18.8% - CONTAINERSHIP
02.3% - OTHERCARGO
00.2% - OIL BARGE
02.0% - TANKER
00.2% - CHEMICAL CARRIER
02.0% - ATB

\+

32.2 % of Case P Potent. Grounding Oil Loss (C + F)

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All FV Potential GROUNDING CARGO OIL LOSS

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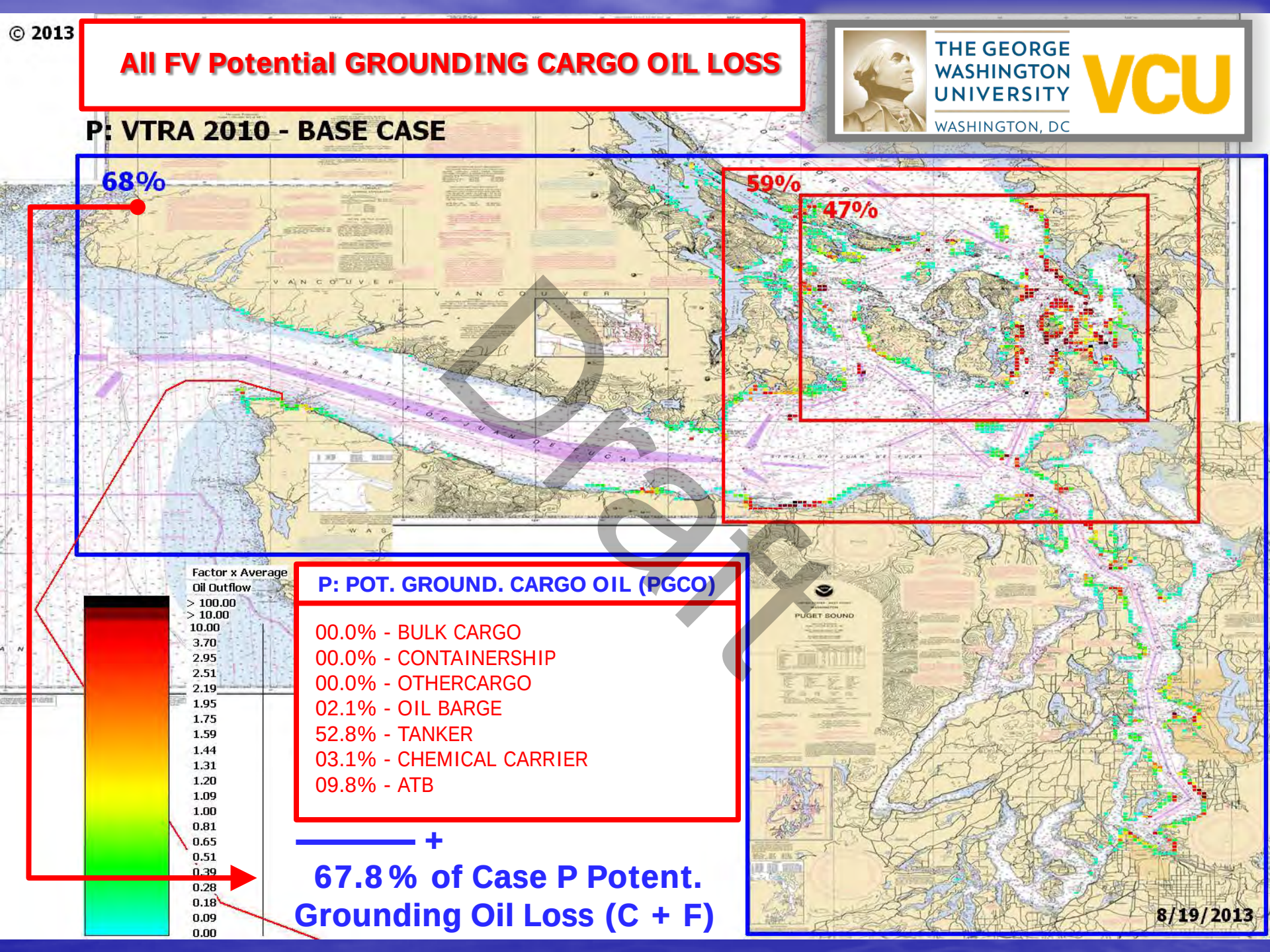
P: VTRA 2010 - BASE CASE



P: POT. GROUND. CARGO OIL (PGCO)

00.0% - BULK CARGO
00.0% - CONTAINERSHIP
00.0% - OTHERCARGO
02.1% - OIL BARGE
52.8% - TANKER
03.1% - CHEMICAL CARRIER
09.8% - ATB

\+

67.8% of Case P Potent. Grounding Oil Loss (C + F)

8/19/2013