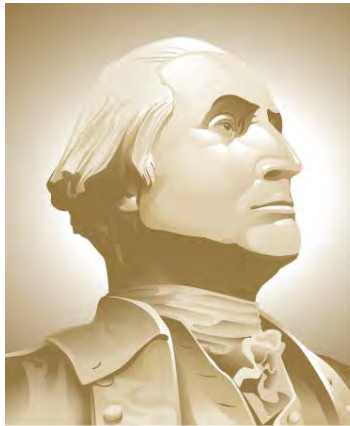


VTRA 2010 POTENTIAL GROUNDING OIL FUEL AND CARGO LOSSES BY ALL FV, CARGO – FV, TANK- FV and WHAT-IF FV

Presentation by: J. Rene van Dorp



**THE GEORGE
WASHINGTON
UNIVERSITY**

WASHINGTON, DC

VCU

CASE Q: Gateway + Bunkering Operations

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

AUGUST 28, 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 Interacting Vessels (IV) with Focus Vessels (FV)

BASE CASE CARGO – FV : Bulk Carriers, Container Vessels, Other Cargo Vessels that travel in VTRA 2010 Base Case

BASE CASE TANK – FV : Oil Barge, Oil Tankers, Chemical Carrier, ATB 's that travel in VTRA 2010 Base Case

WHAT IF – FV : CARGO AND TANK FV'S added to VTRA 2010 Base Case to model What-If Scenario

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**.

CASE Q: GW 487 + Bunkering Operations:

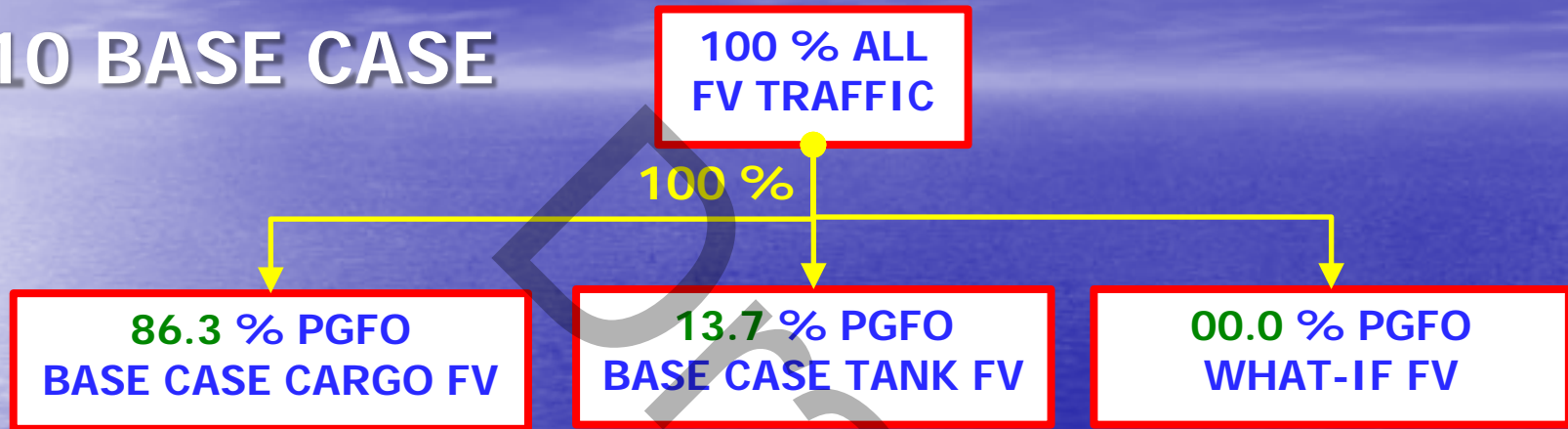
BASE CASE 2010 TRAFFIC WITH FOLLOWING WHAT-IF FOCUS VESSELS

487 Gateway Bulk Carriers + Bunkering Barges

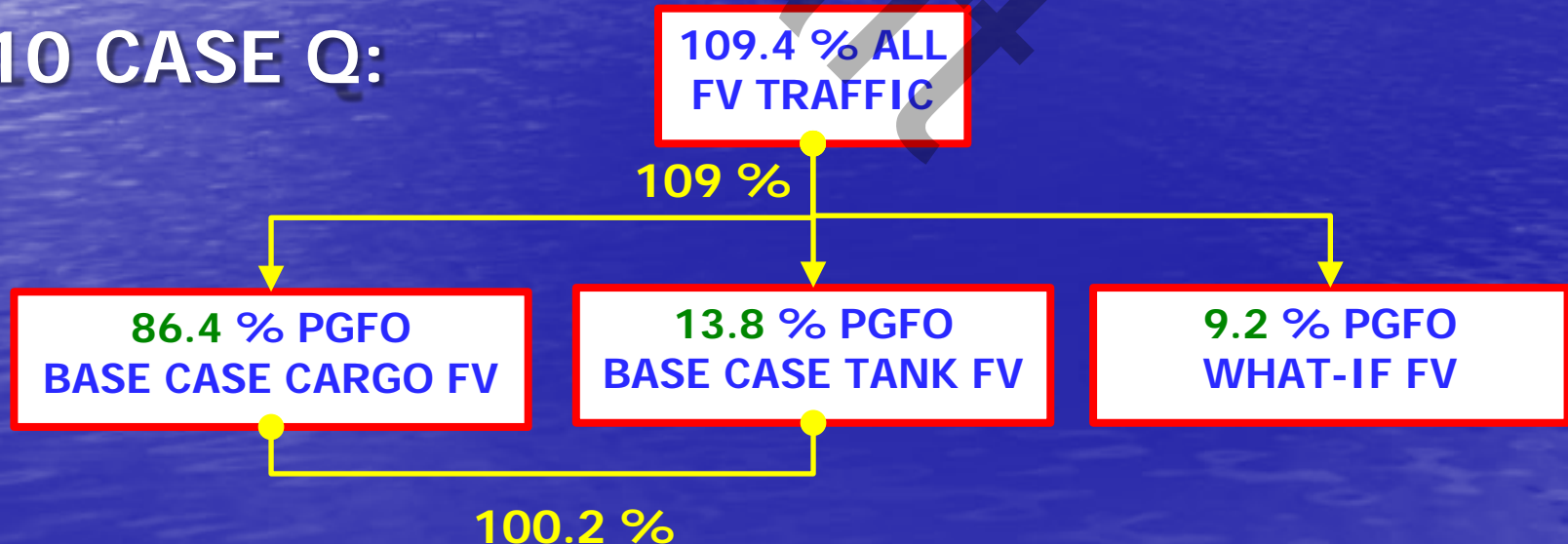
A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL GROUNDING FUEL OIL LOSS

PCFO : POTENTIAL GROUNDING FUEL OIL LOSS - PER YEAR

2010 BASE CASE

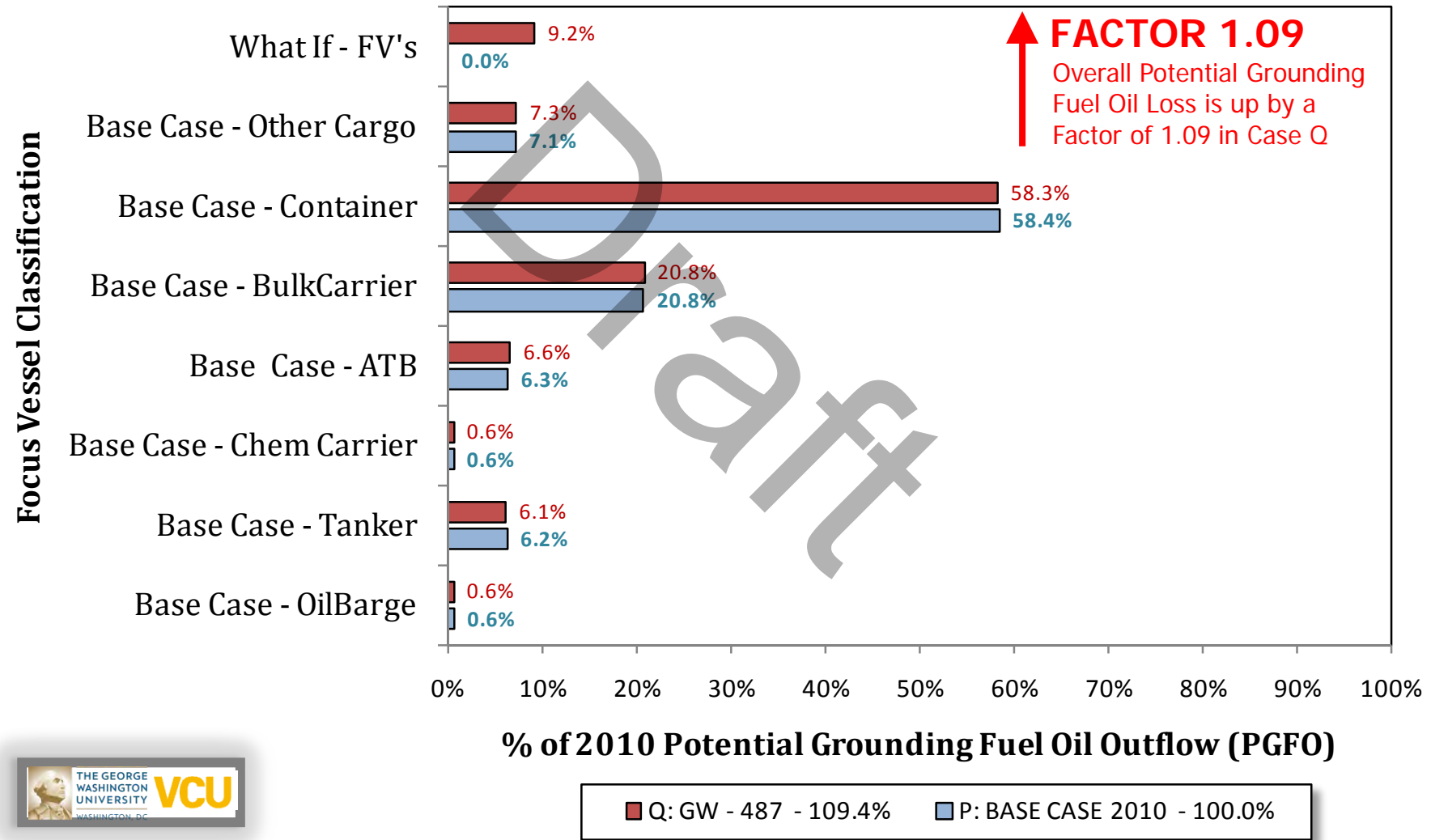


2010 CASE Q:



CASE Q: GW 487 + BUNKERING

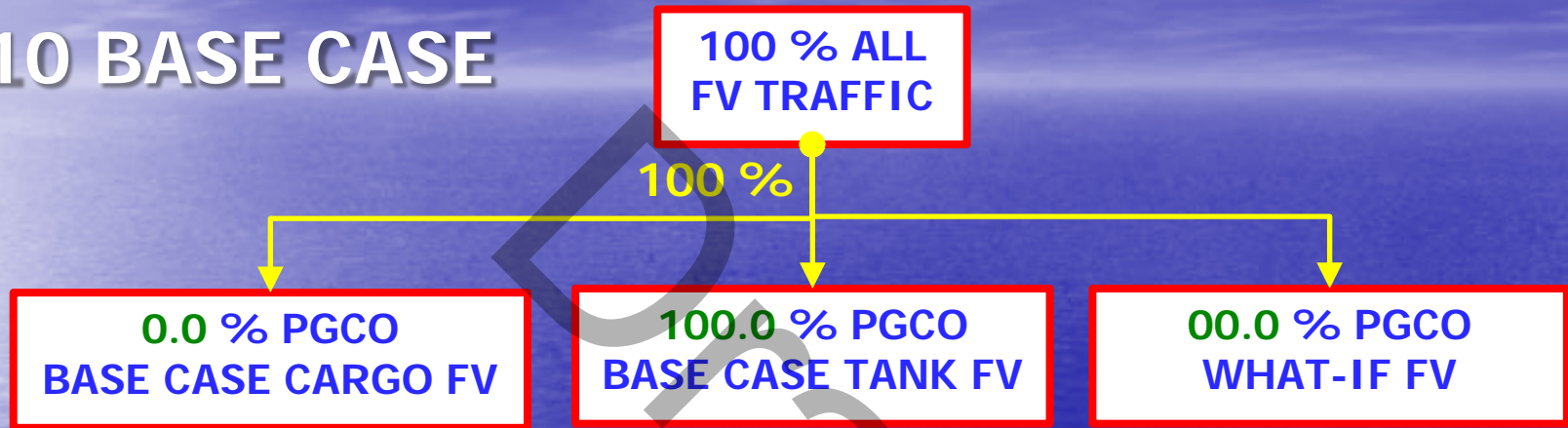
VTRA 2010 - GROUNDING FUEL OIL LOSS



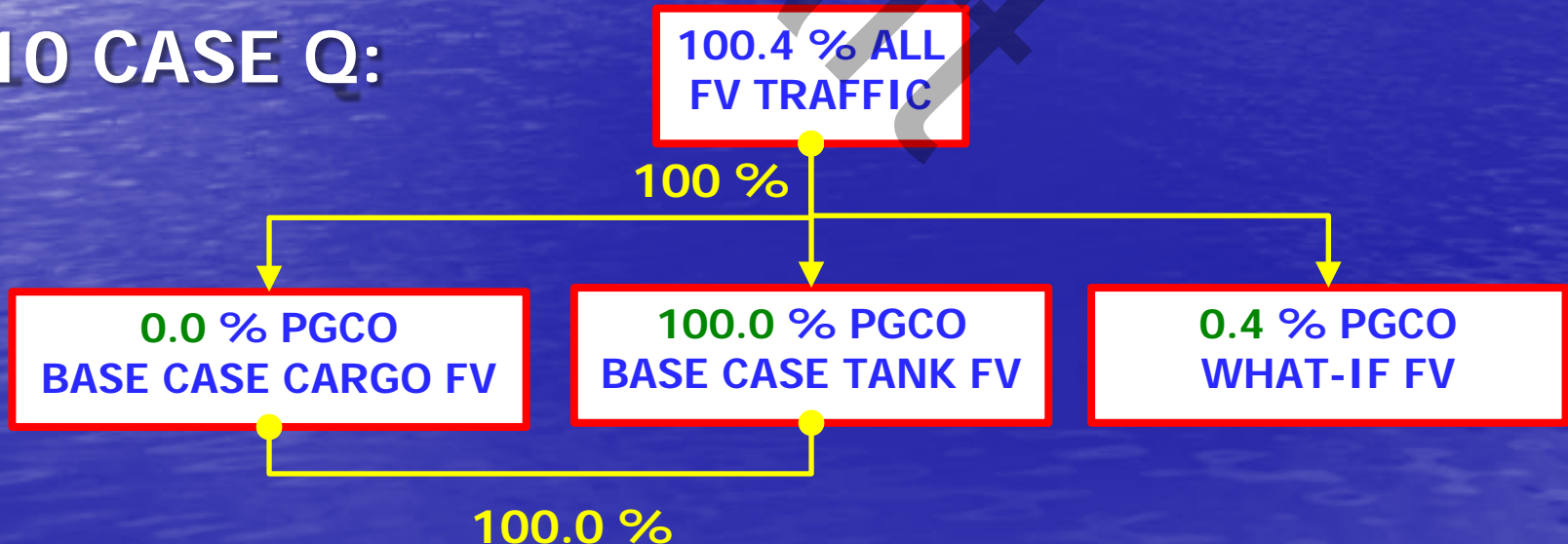
A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL GROUNDING CARGO OIL LOSS

PCCO : POTENTIAL GROUNDING CARGO OIL LOSS - PER YEAR

2010 BASE CASE

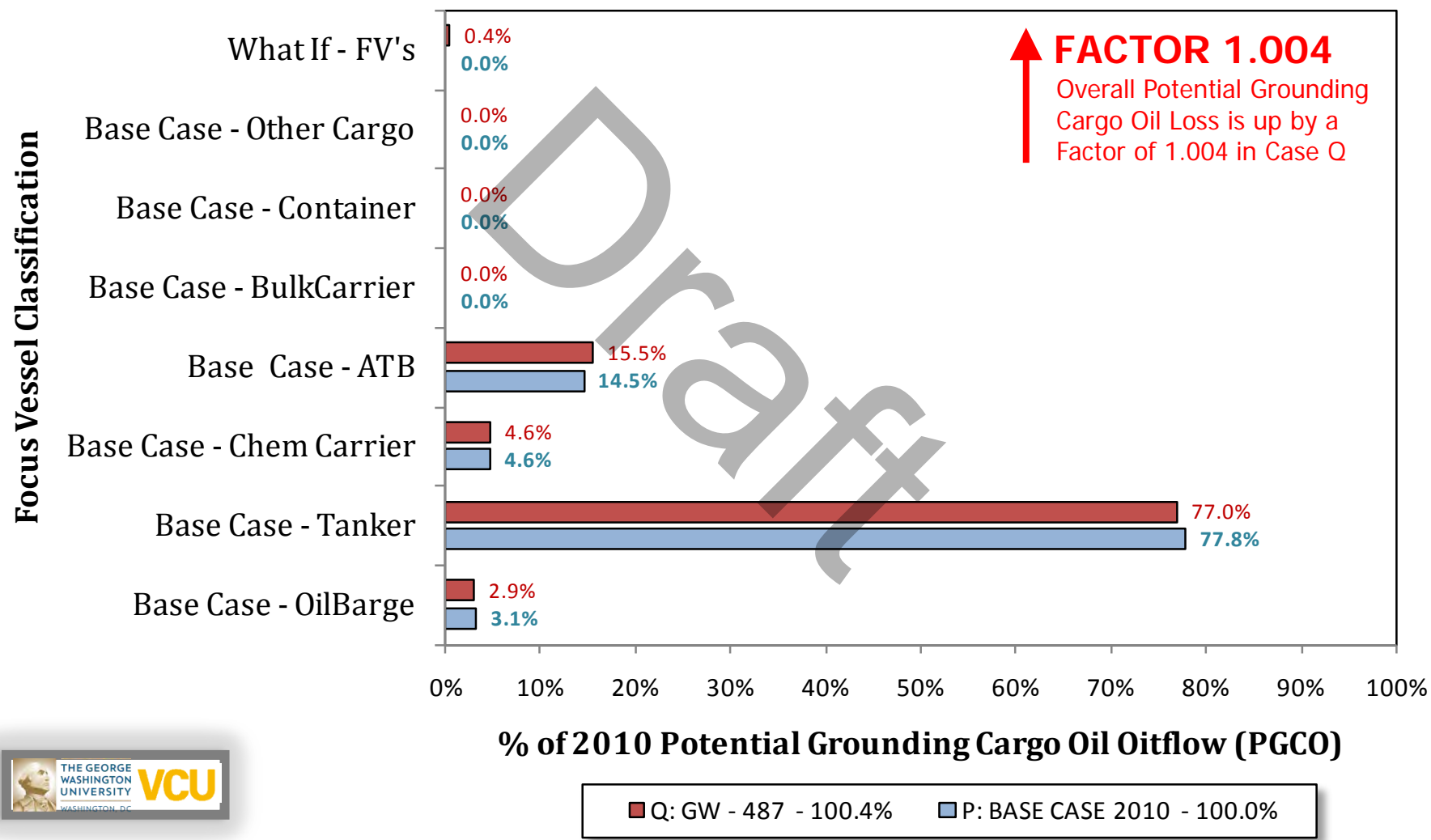


2010 CASE Q:



CASE Q: GW 487 + BUNKERING

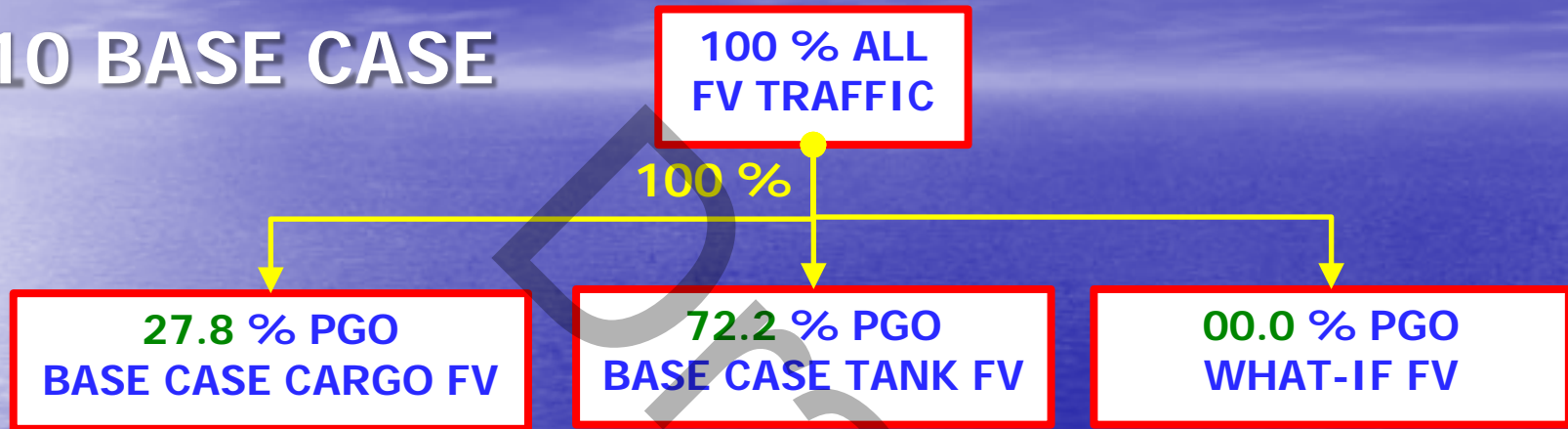
VTRA 2010 - GROUNDING CARGO OIL LOSS



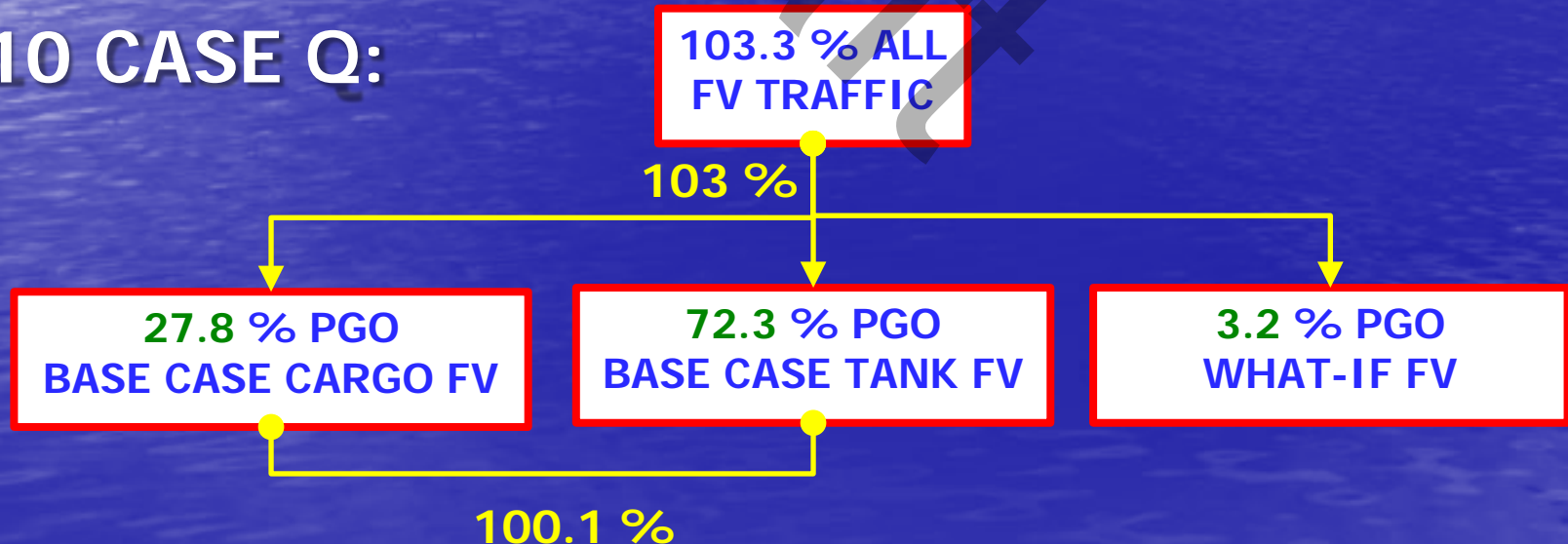
A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL GROUNDING OIL LOSS

PGO : POTENTIAL GROUNDING OIL LOSS - PER YEAR

2010 BASE CASE

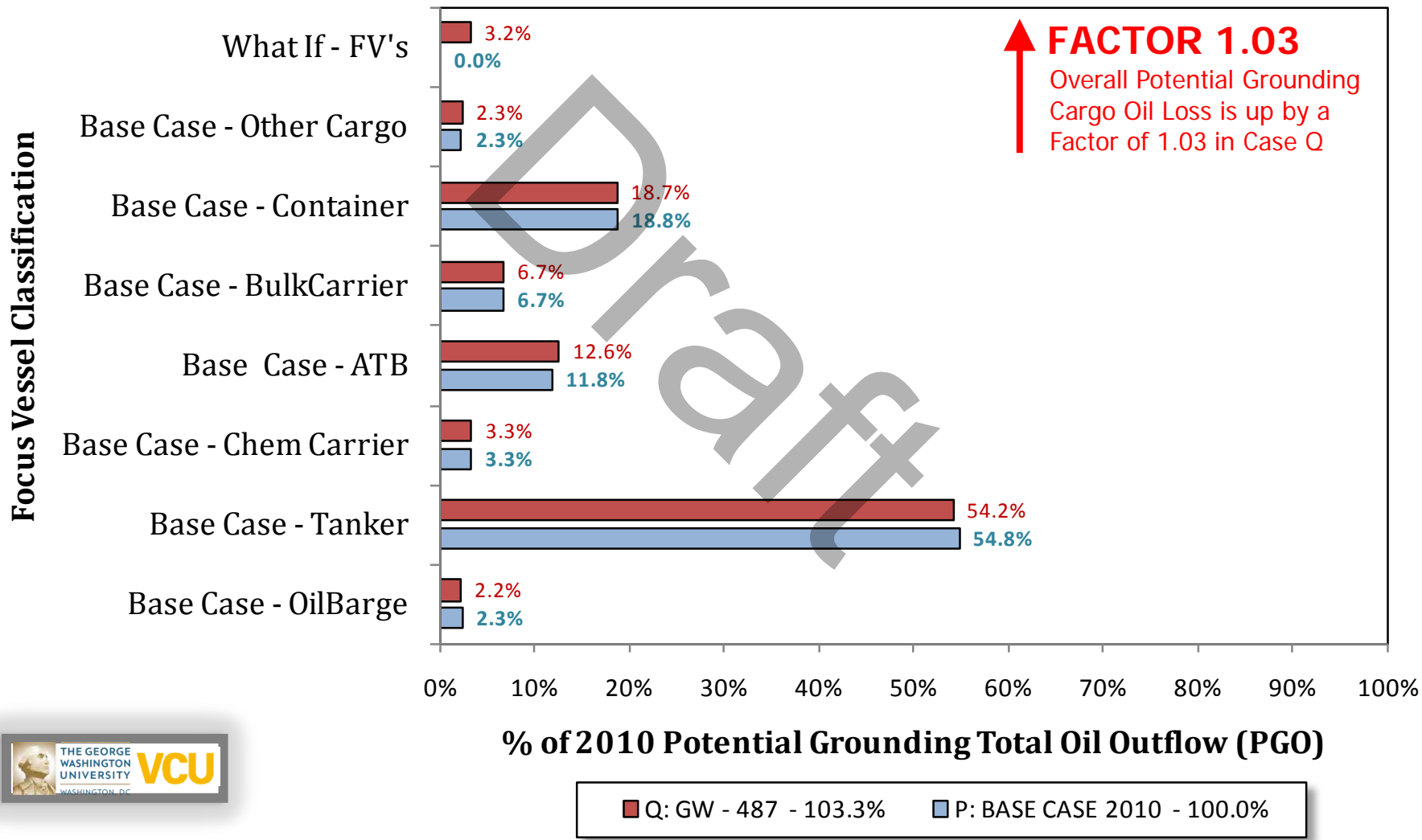


2010 CASE Q:



CASE Q: GW 487 + BUNKERING

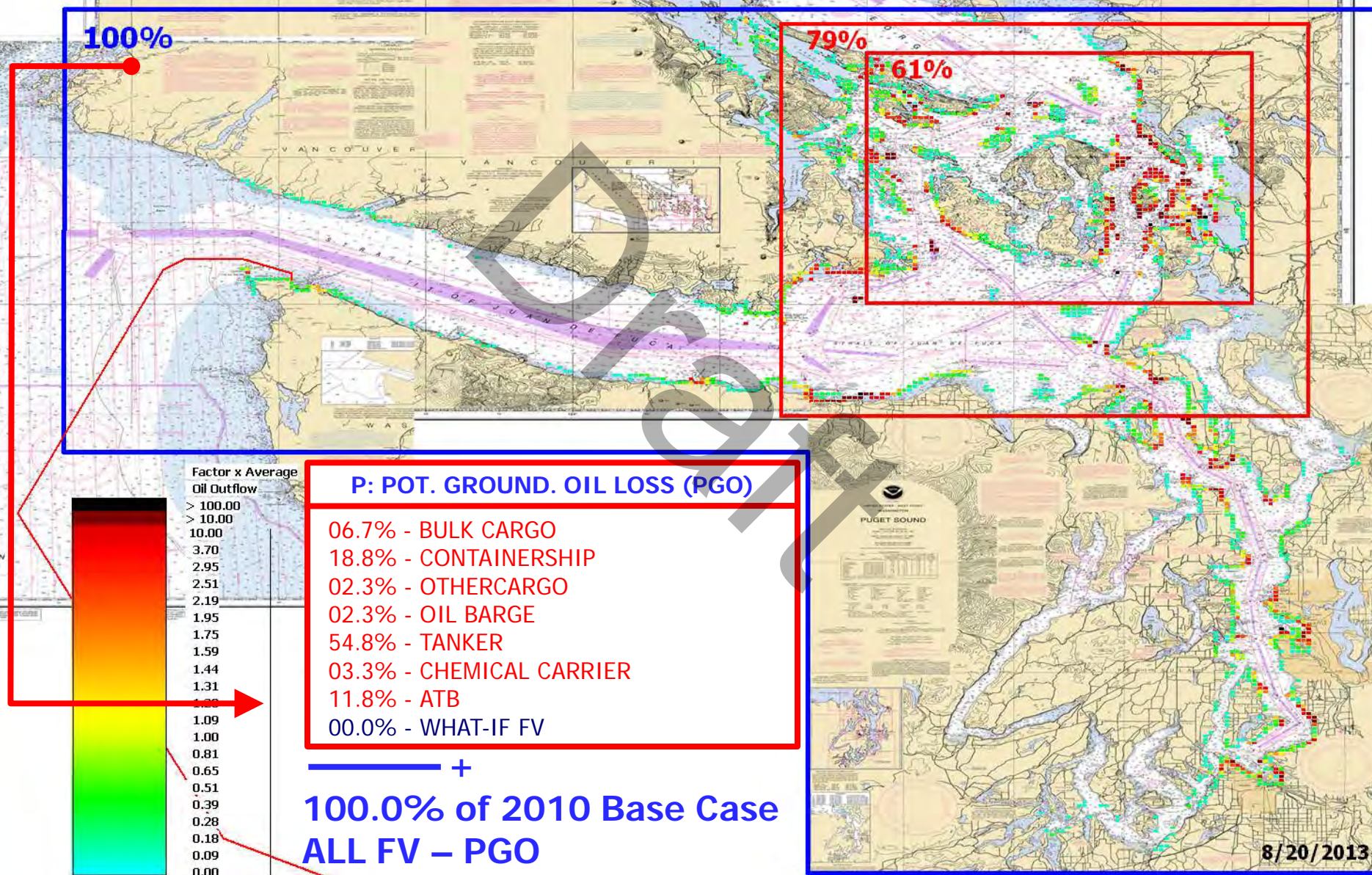
VTRA 2010 - GROUNDING OIL LOSS (CARGO + FUEL)





P: ALL FV POTENTIAL GROUNDING OIL (FUEL + CARGO) LOSS (PGO)

P: VTRA 2010 - BASE CASE





Q: ALL FV POTENTIAL GROUNDING OIL (FUEL + CARGO) LOSS (PGO)

Q: VTRA 2010 - GATEWAY 487

103%

82%

64%

Factor x Average
Oil Outflow

> 100.00
> 10.00
10.00
3.70
2.95
2.51
2.19
1.95
1.75
1.59
1.44
1.31
1.22
1.09
1.00
0.81
0.65
0.51
0.39
0.28
0.18
0.09
0.00

Q: POT. GROUND. OIL LOSS (PGO)

06.7% - BULK CARGO
18.7% - CONTAINERSHIP
02.3% - OTHERCARGO
02.2% - OIL BARGE
54.2% - TANKER
03.3% - CHEMICAL CARRIER
12.6% - ATB
03.2% - WHAT-IF FV

103.3% of 2010 Base Case
ALL FV – PGO

Q: WHAT-IF FV POTENTIAL GROUNDING OIL (FUEL + CARGO) LOSS (PGO)

Q: VTRA 2010 - GATEWAY 487

Factor x Average
Oil Outflow

> 100.00
> 10.00
10.00
3.70
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

Q: POT. GROUND. OIL LOSS (PGO)

02.9% - BULKCARRIER
00.0% - CONTAINERSHIP
00.0% - OIL TANKER
00.3% - OIL BARGE

— +
3.2% of 2010 Base Case
ALL FV – PGO

P: ALL FV POTENTIAL GROUNDING FUEL OIL LOSS (PGFO)



THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON, DC

VCU

P: VTRA 2010 - BASE CASE

32%

20%

13%

Factor x Average
Oil Outflow

> 100.00
> 10.00
10.00
3.70
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
0.20
0.18
0.09
0.00

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
00.0% - WHAT-IF FV

— +
32.0% of 2010 Base Case
ALL FV – PGO

Q: ALL FV POTENTIAL GROUNDING FUEL OIL LOSS (PGFO)



THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON, DC

VCU

Q: VTRA 2010 - GATEWAY 487

35%

23%

16%

Factor x Average
Oil Outflow

> 100.00
> 10.00
10.00
3.70
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
0.20
0.18
0.09
0.00

Q: POT. GROUND. FUEL OIL (PGFO)

06.7% - BULK CARGO
18.7% - CONTAINERSHIP
02.3% - OTHERCARGO
00.2% - OIL BARGE
02.0% - TANKER
00.2% - CHEMICAL CARRIER
02.1% - ATB
03.0% - WHAT-IF FV

+
35.2% of 2010 Base Case
ALL FV – PGO

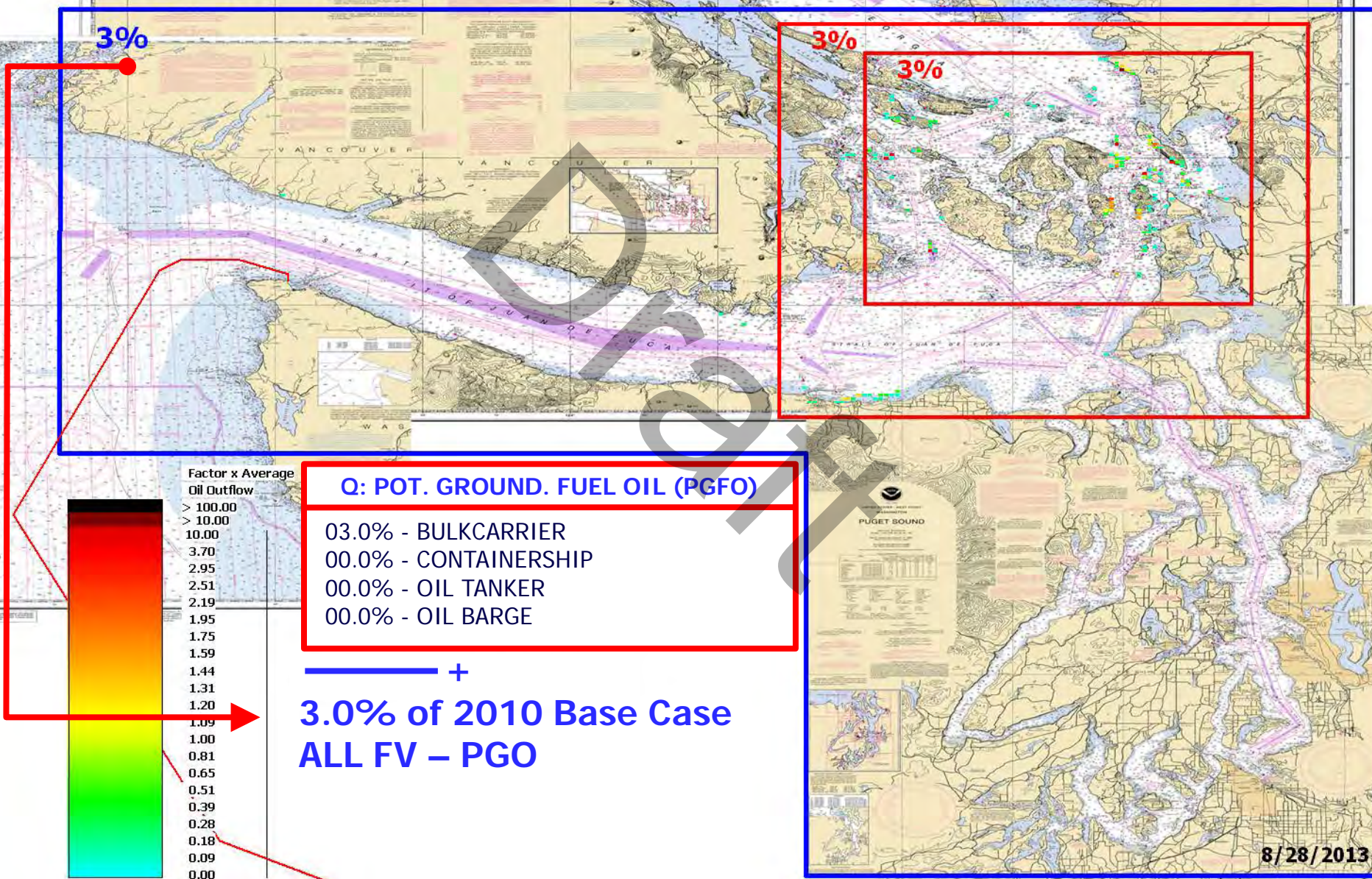
Q: WHAT-IF FV POTENTIAL GROUNDING FUEL OIL LOSS (PGFO)



THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON, DC

VCU

Q: VTRA 2010 - GATEWAY 487



P: ALL FV POTENTIAL GROUNDING CARGO OIL LOSS (PGCO)



THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON, DC

VCU

P: VTRA 2010 - BASE CASE

68%

59%

47%

Factor x Average
Oil Outflow

> 100.00
> 10.00
10.00
3.70
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
0.20
0.18
0.09
0.00

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
00.0% - WHAT-IF FV

+
67.8% of 2010 Base Case
ALL FV – PGO

Q: ALL FV POTENTIAL GROUNDING CARGO OIL LOSS (PGCO)



THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON, DC

VCU

Q: VTRA 2010 - GATEWAY 487

68%

59%

48%

Factor x Average
Oil Outflow

> 100.00
> 10.00
10.00
3.70
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
0.20
0.18
0.09
0.00

Q: POT. GROUND CARGO OIL (PGCO)

00.0% - BULK CARGO
00.0% - CONTAINERSHIP
00.0% - OTHERCARGO
02.1% - OIL BARGE
52.2% - TANKER
03.2% - CHEMICAL CARRIER
10.5% - ATB
00.3% - WHAT-IF FV

+
68.1% of 2010 Base Case
ALL FV – PGO

Q: WHAT-IF FV POTENTIAL GROUNDING CARGO OIL LOSS (PGCO)



THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON, DC

VCU

Q: VTRA 2010 - GATEWAY 487

Factor x Average
Oil Outflow

> 100.00
> 10.00
10.00
3.70
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

Q: POT. GROUND. CARGO OIL (PGCO)

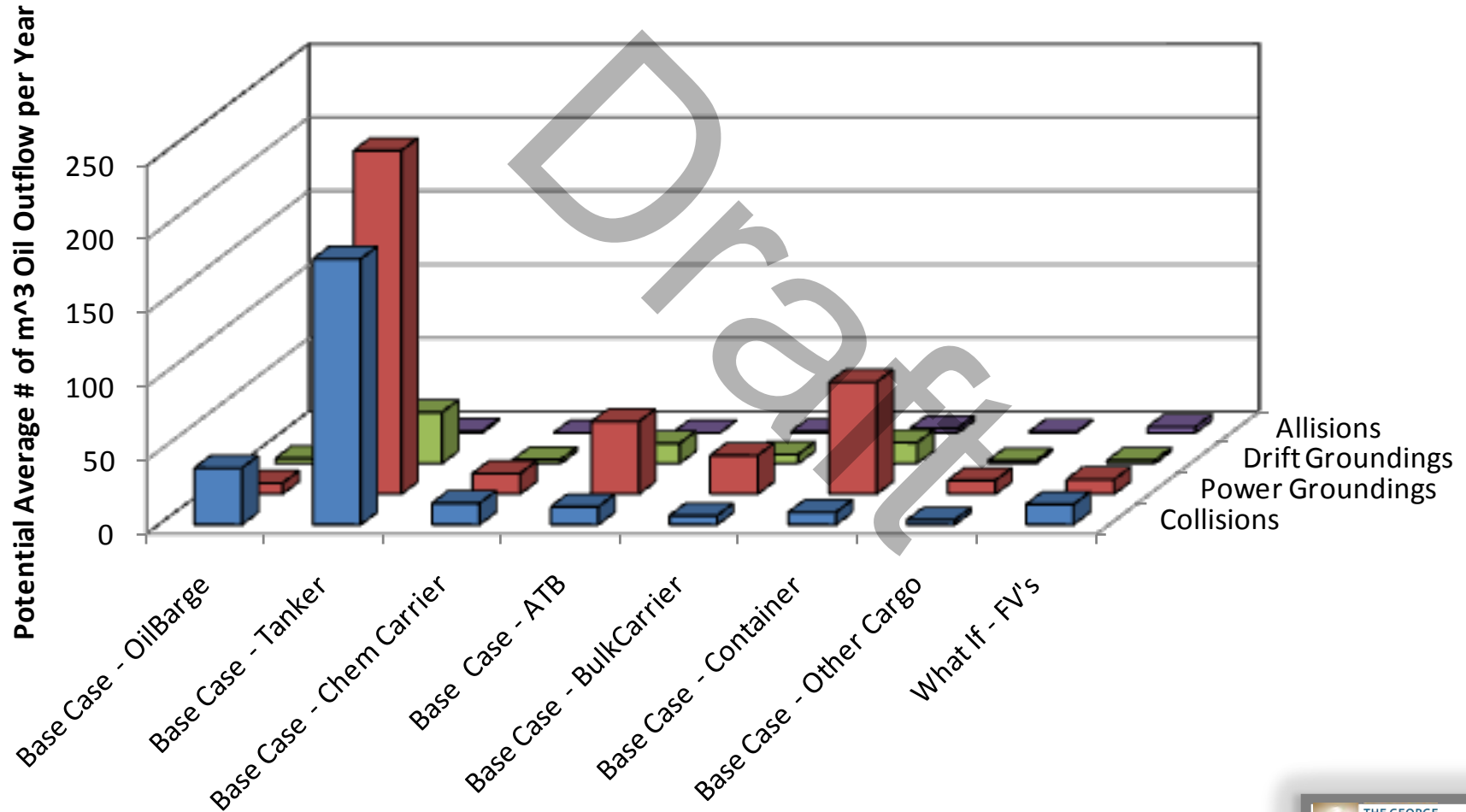
00.0% - BULKCARRIER
00.0% - CONTAINERSHIP
00.0% - OIL TANKER
00.3% - OIL BARGE

— +
00.3% of 2010 Base Case
ALL FV – PGO

A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ACCIDENT FREQUENCY AND ACCIDENT TYPE

CASE Q: GW 487 + BUNKERING

Q - VTRA 2010 : Potential Average # of m³ Oil Outflow per Year



CASE Q: GW 487 + Bunkering

Q - VTRA 2010 : Potential Average # of m^3 Oil Outflow per Year					
Focus Vessel	Collisions	Power Groundings	Drift Groundings	Allisions	Total
Base Case - OilBarge	18.6%	1.8%	4.6%	0.0%	7.0%
Base Case - Tanker	87.2%	56.2%	45.5%	21.3%	63.9%
Base Case - Chem Carrier	7.0%	3.4%	3.4%	0.0%	4.4%
Base Case - ATB	5.9%	11.9%	17.7%	0.0%	10.6%
Base Case - All Tank FV's	118.7%	73.2%	71.2%	21.3%	85.9%
Base Case - BulkCarrier	3.0%	6.3%	8.1%	15.9%	5.6%
Base Case - Container	4.0%	18.3%	18.5%	52.7%	14.4%
Base Case - Other Cargo	1.5%	2.2%	2.4%	10.6%	2.1%
Base Case - All Cargo FV's	8.5%	26.8%	29.0%	79.2%	22.1%
Base Case - All FV's	127.2%	100.1%	100.2%	100.5%	108.1%
What If - FV's	6.6%	2.4%	2.8%	71.2%	4.2%
Total - Base Case + What- IF	133.8%	102.4%	103.0%	171.7%	112.3%

Q - VTRA 2010 : Potential Average # of m^3 Oil Outflow per Year					
Focus Vessel	Collisions	Power Groundings	Drift Groundings	Allisions	Total
Base Case - OilBarge	38.5	7.4	3.5	0.0	49.3
Base Case - Tanker	180.6	233.5	34.8	1.2	450.1
Base Case - Chem Carrier	14.6	14.0	2.6	0.0	31.1
Base Case - ATB	12.2	49.2	13.5	0.0	74.9
Base Case - All Tank FV's	245.8	304.1	54.4	1.2	605.4
Base Case - BulkCarrier	6.1	26.2	6.2	0.9	39.4
Base Case - Container	8.4	76.1	14.1	3.0	101.6
Base Case - Other Cargo	3.2	9.2	1.8	0.6	14.8
Base Case - All Cargo FV's	17.6	111.4	22.2	4.5	155.7
Base Case - All FV's	263.4	415.5	76.5	5.7	761.2
What If - FV's	13.7	9.8	2.1	4.1	29.7
Total - Base Case + What- IF	277.2	425.3	78.7	9.8	790.9