

VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

3D Relative Risk Profile Comparison
Potential Grounding Accident Frequency

CASE T – GW – KM – DP & 6 RMM's

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VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010



RMM 1: Max. Speed of Container Vessels at 17 knots.

RMM 2: Reduce Human Error incident on Oil Barges by 50%

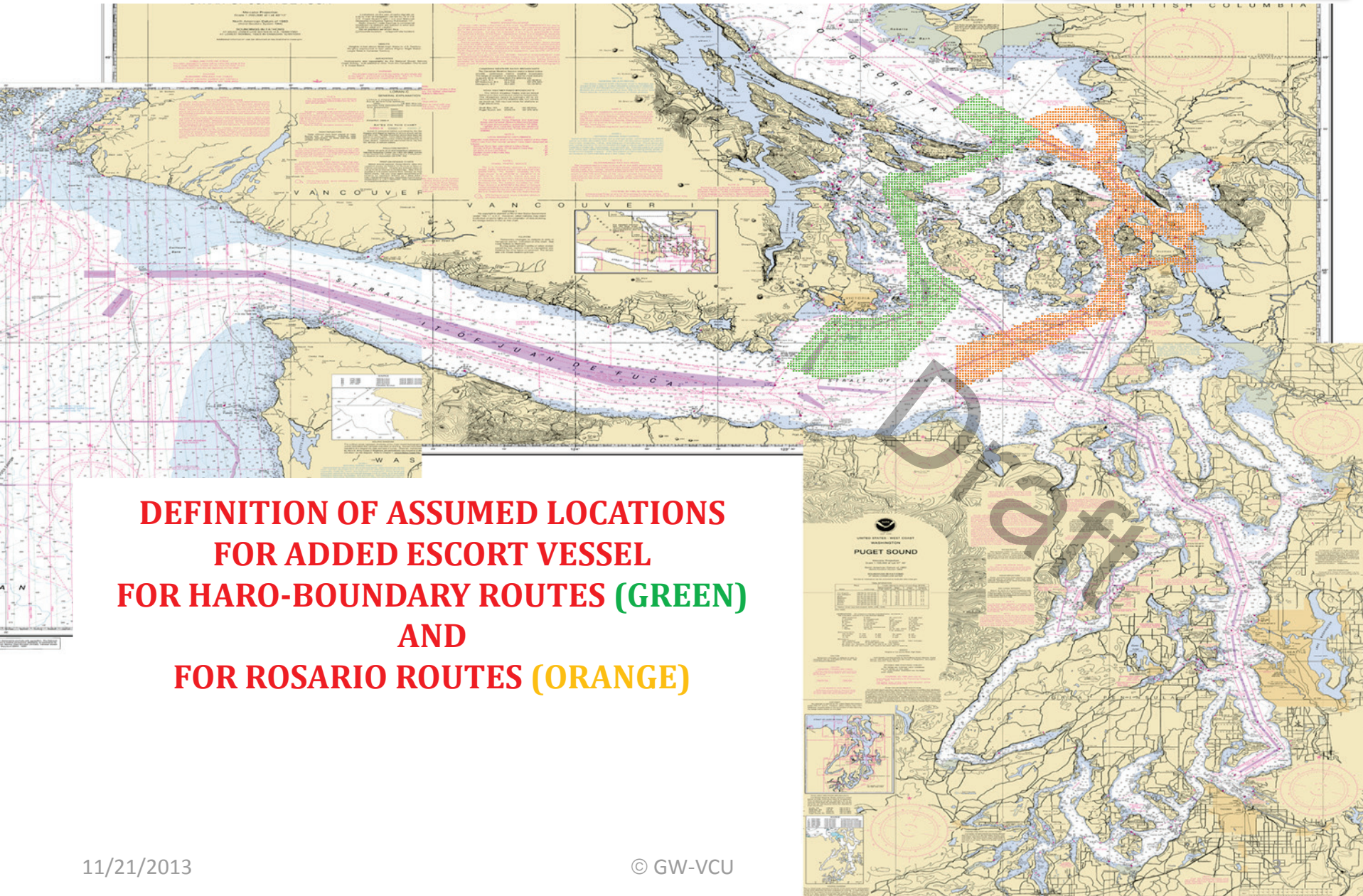
RMM 3: No Bunkering for Gateway Vessels

RMM 4: ATB Vessels obey Rosario one-way regime

RMM 5: + 1 Escort for Laden Tank Focus Vessels (except Oil Barges) and Cape size Bulk Carriers on Rosario Routes (see next page)

RMM 6: + 1 Escort for All Focus Vessels on Haro-Boundary Pass Routes (see next page)

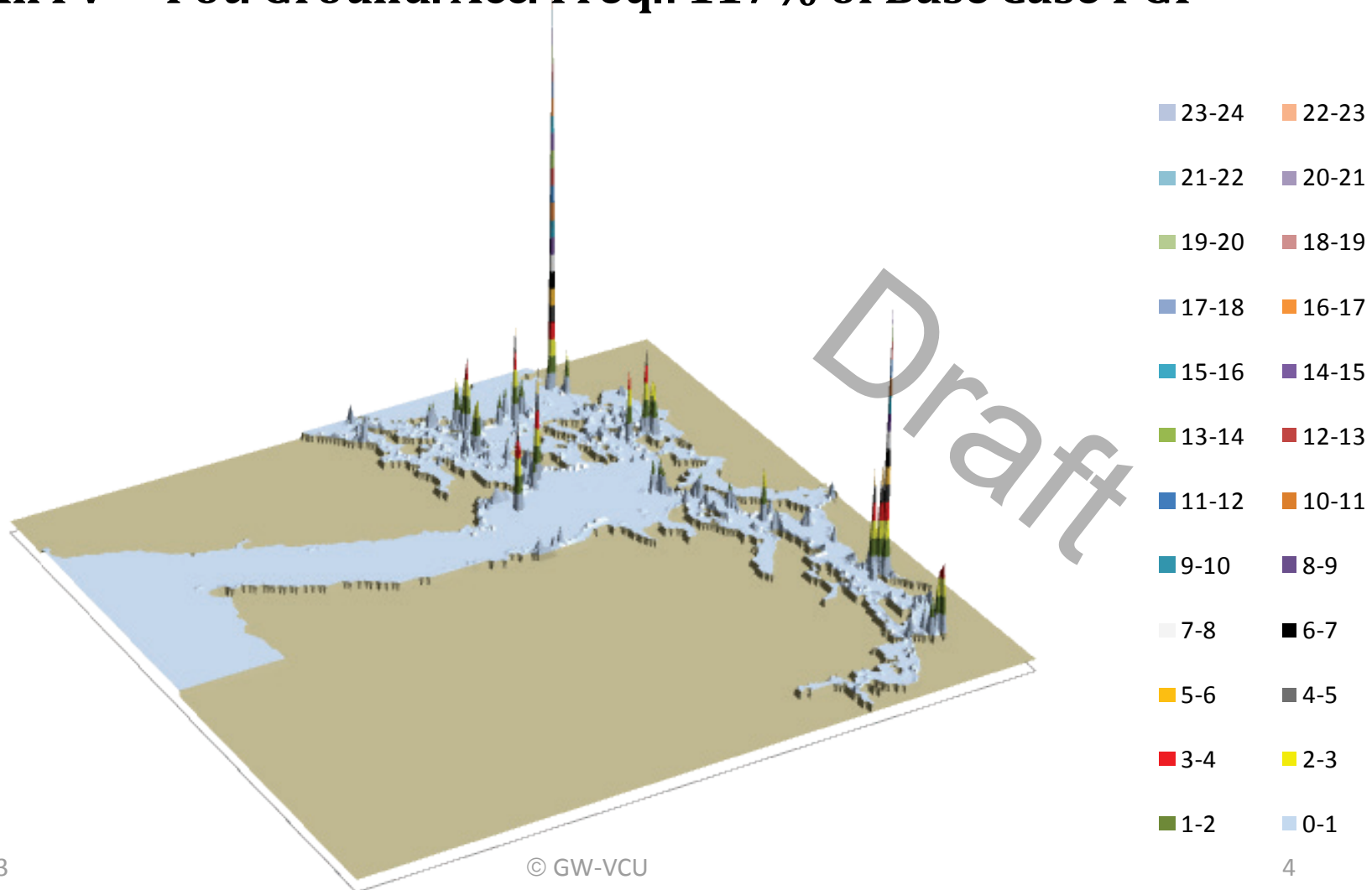
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010



**DEFINITION OF ASSUMED LOCATIONS
FOR ADDED ESCORT VESSEL
FOR HARO-BOUNDARY ROUTES (GREEN)
AND
FOR ROSARIO ROUTES (ORANGE)**

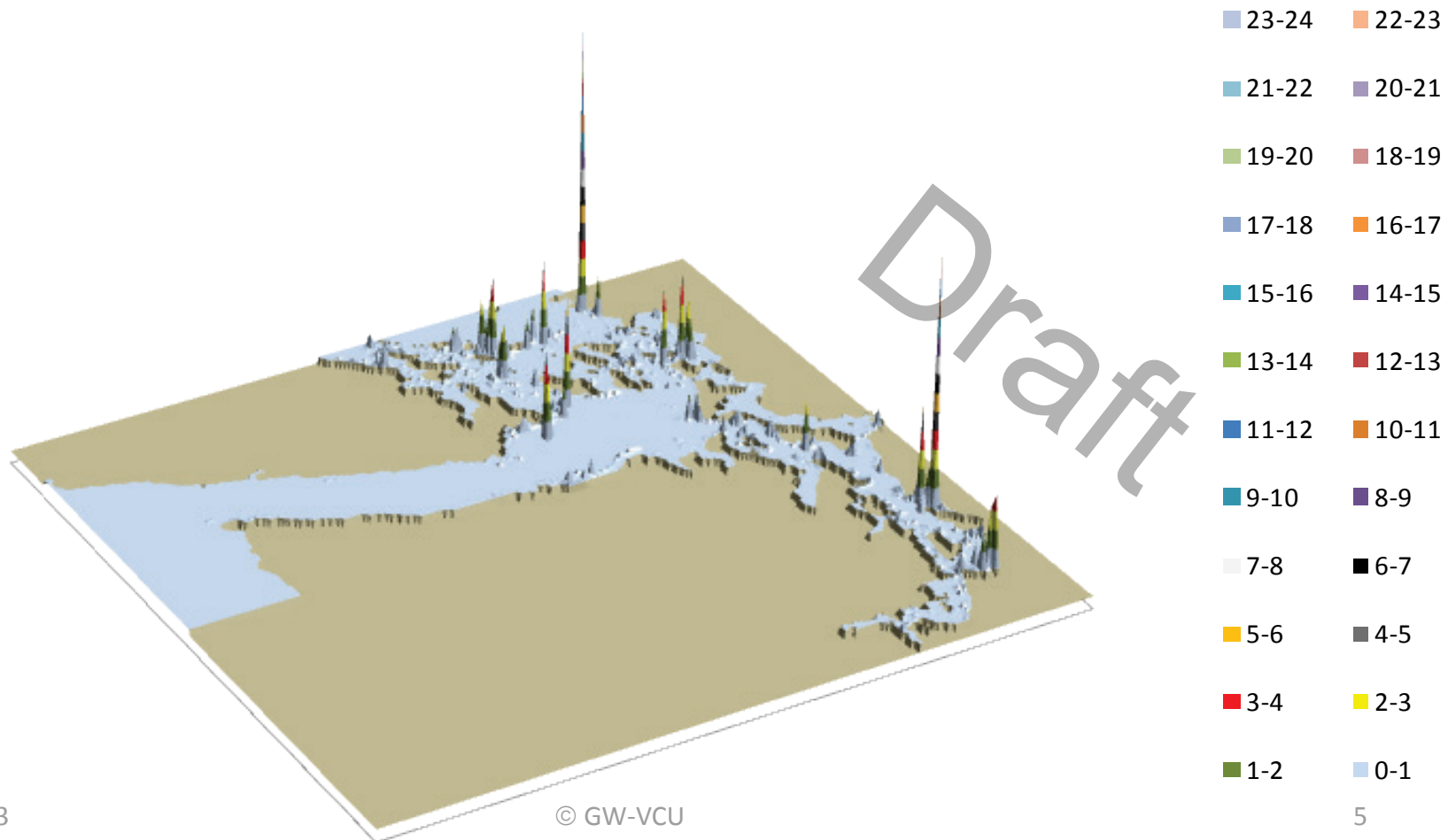
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP 3D Risk Profile All FV - Pot. Ground. Acc. Freq.: 117% of Base Case PGF



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & 6 RMM 3D Risk Profile
All FV - Pot. Ground. Acc. Freq.: 89% of Base Case PGF



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348 - ALL FV

116.7%

73.8%

54.0%

0.3%

Factor x Average
of Accidents

- > 100.00
- > 10.00
- 10.00
- 3.68
- 2.94
- 2.50
- 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

POTENTIAL GROUNDING
FREQUENCY - PGF

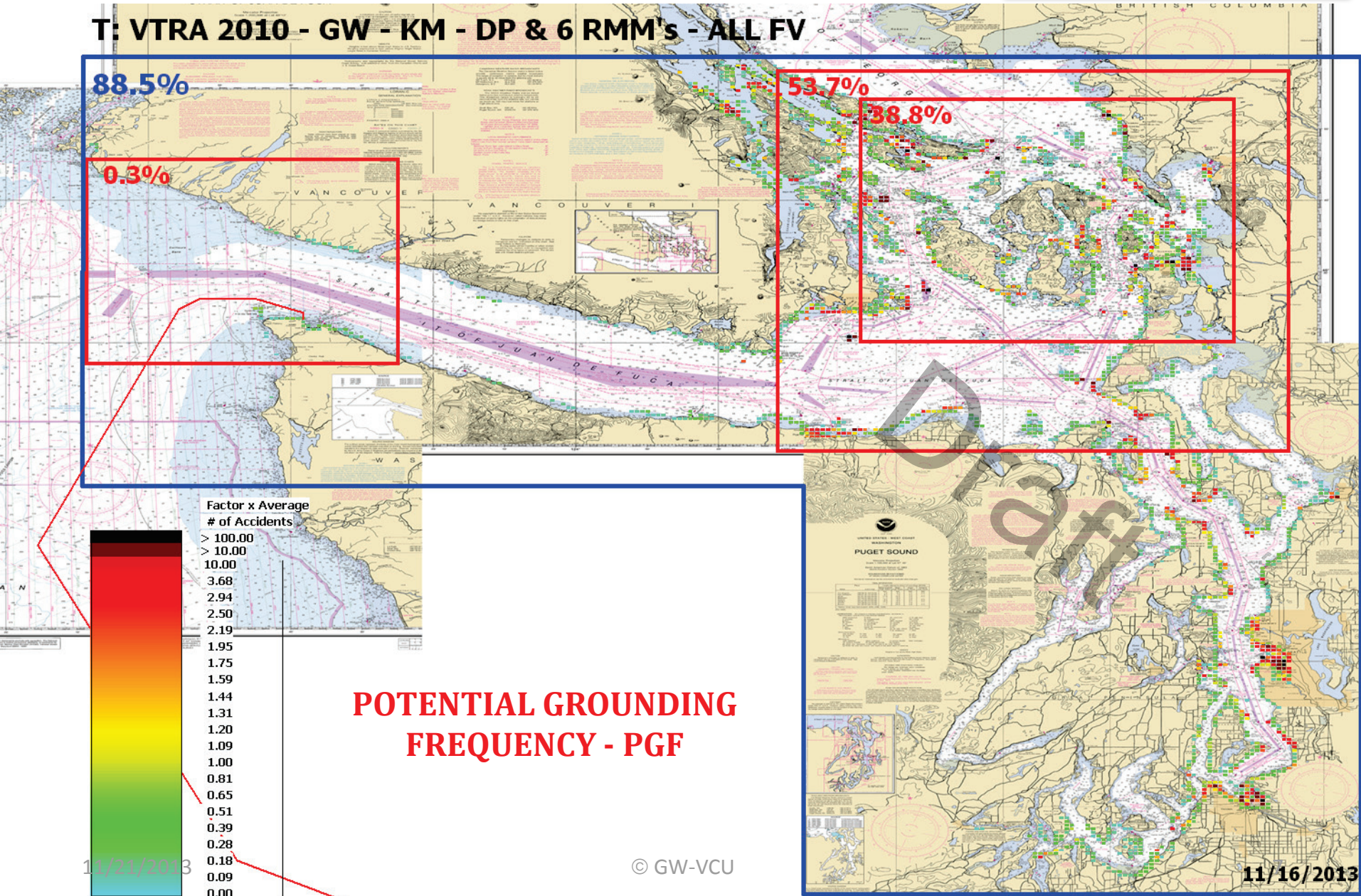
11/21/2013

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11/16/2013

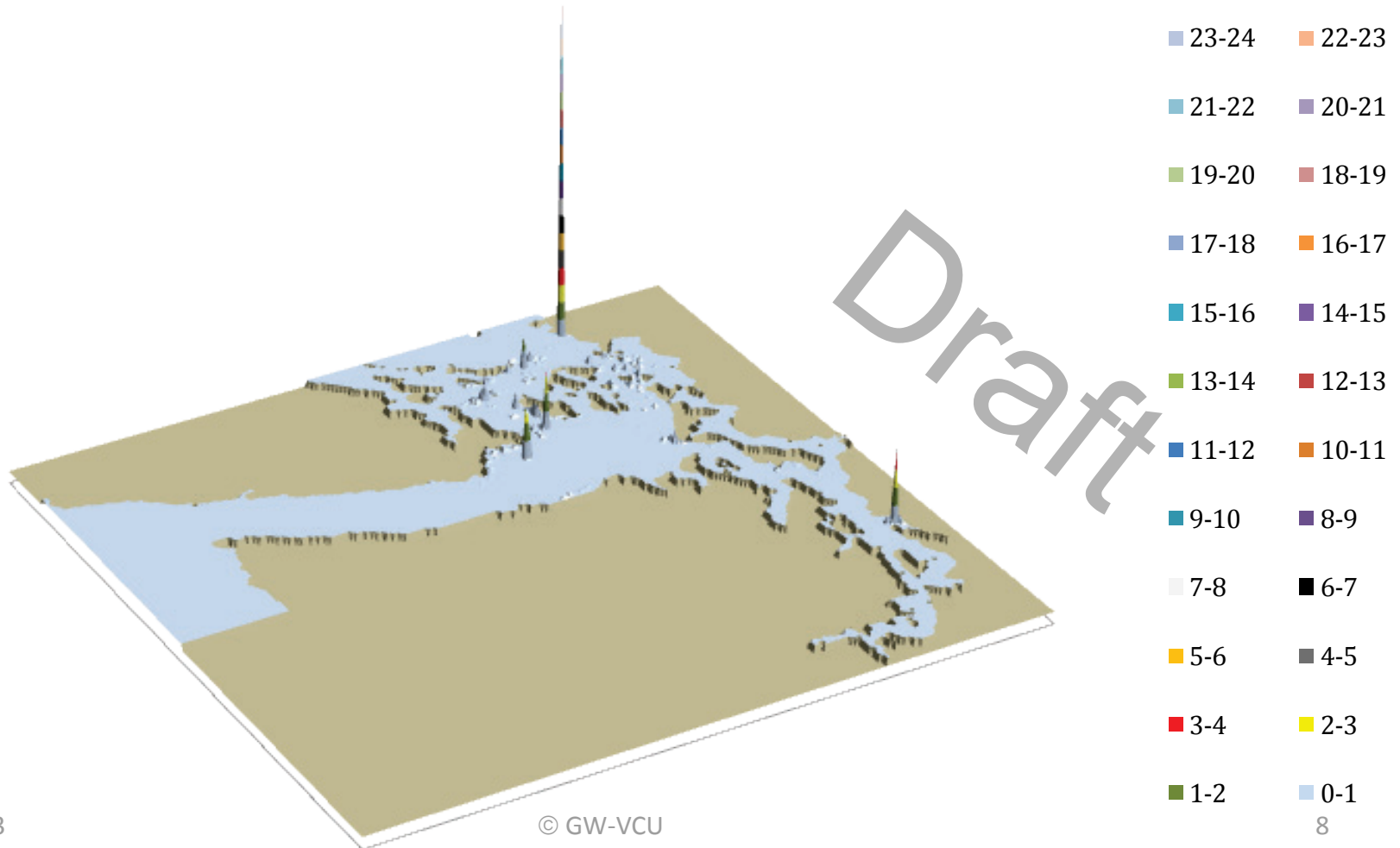
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & 6 RMM's - ALL FV



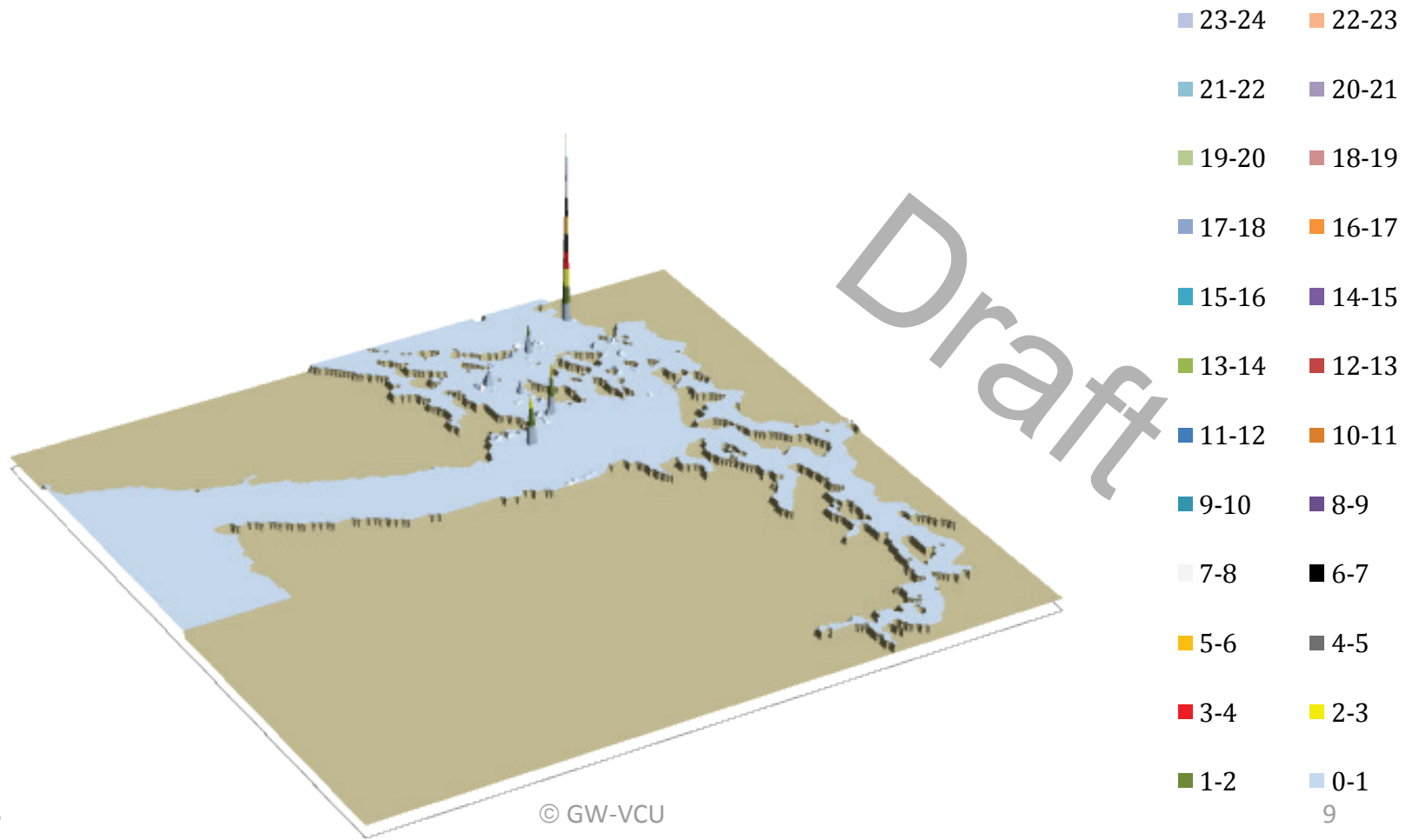
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP 3D Risk Profile What-If FV - Pot. Grou. Acc. Fr.: 19% of Base Case PGF



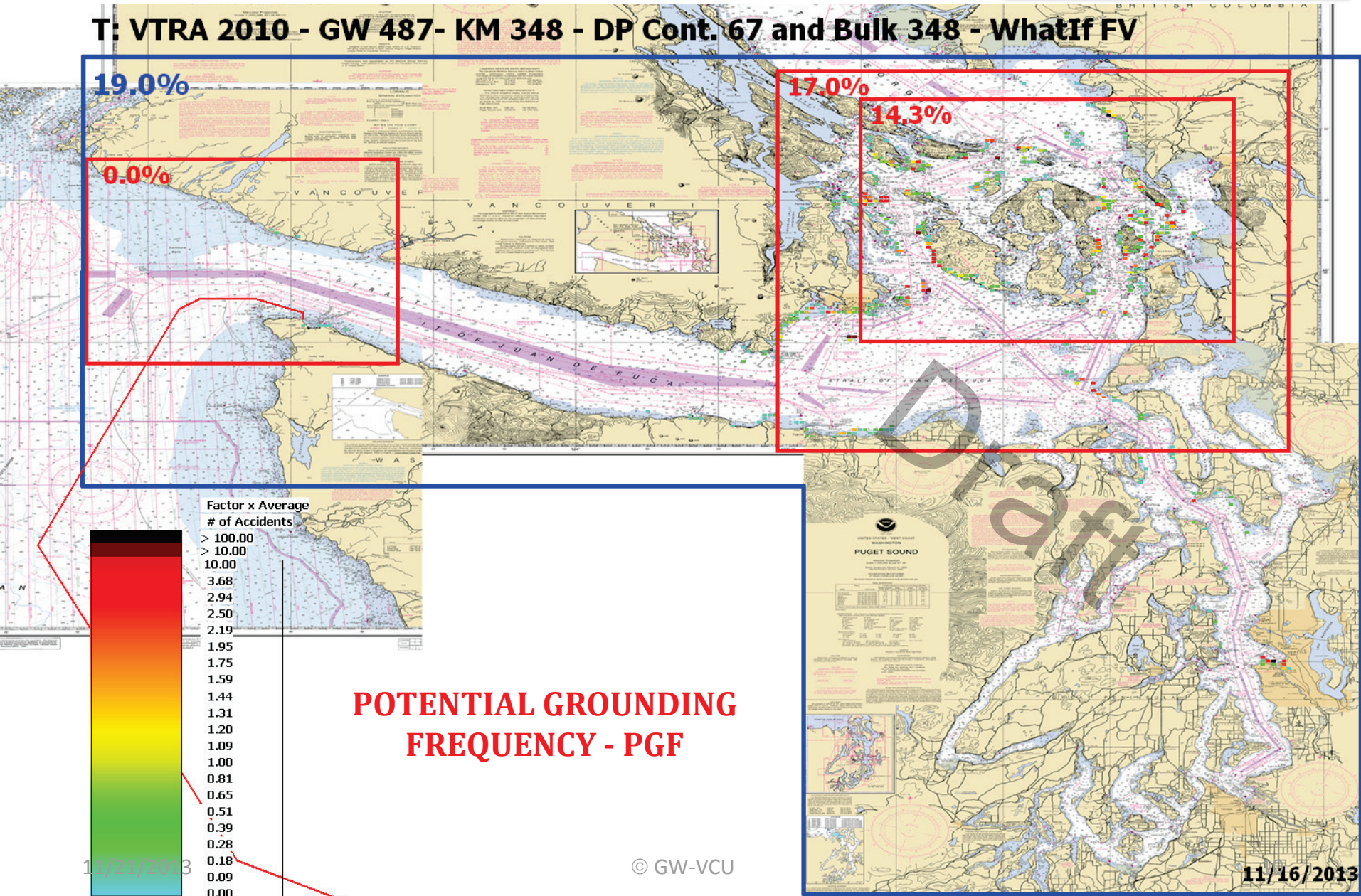
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & 6 RMM 3D Risk Profile What-If FV - Pot. Grou. Acc. Fr.: 9% of Base Case PGF



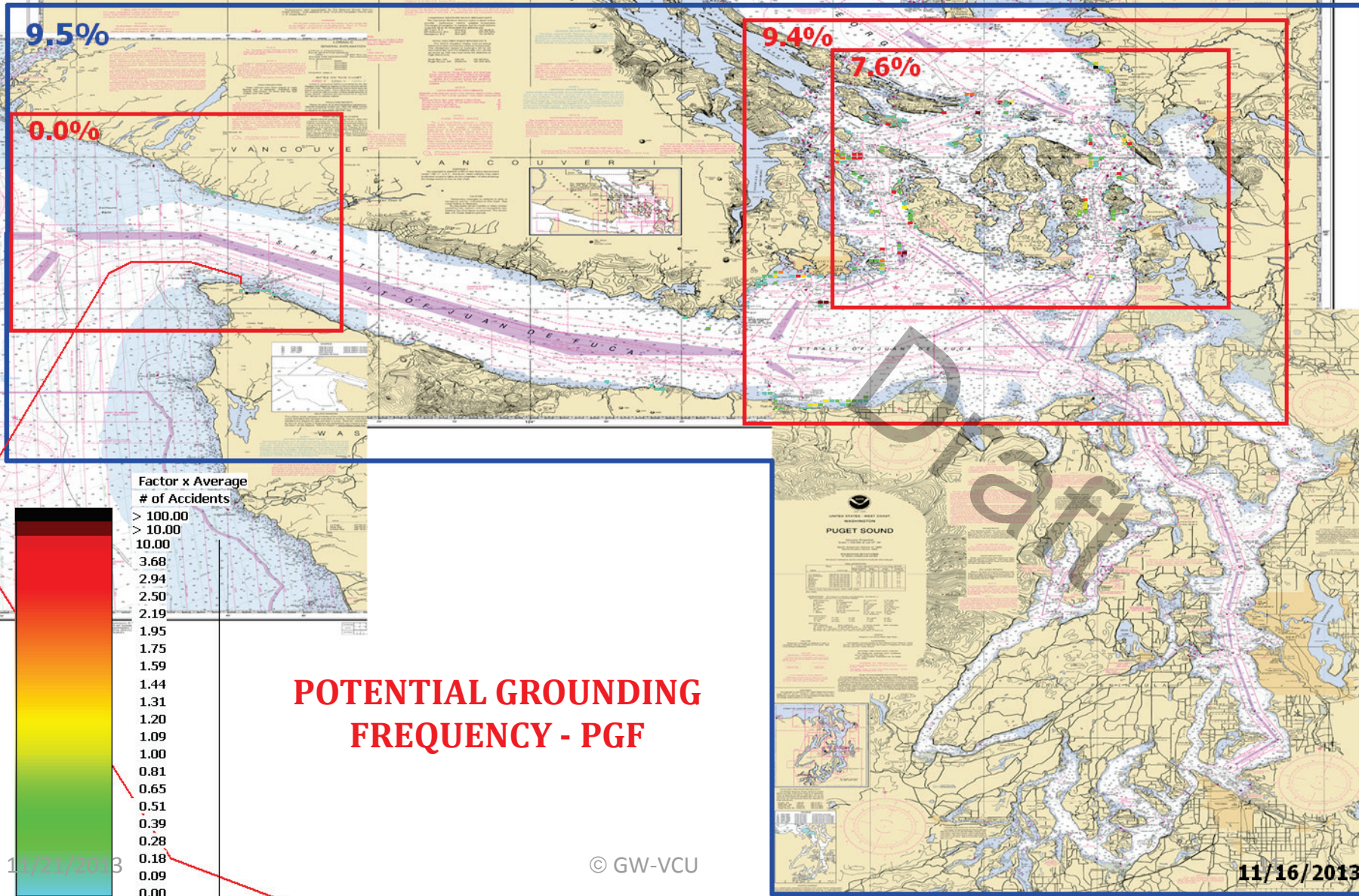
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348 - WhatIf FV



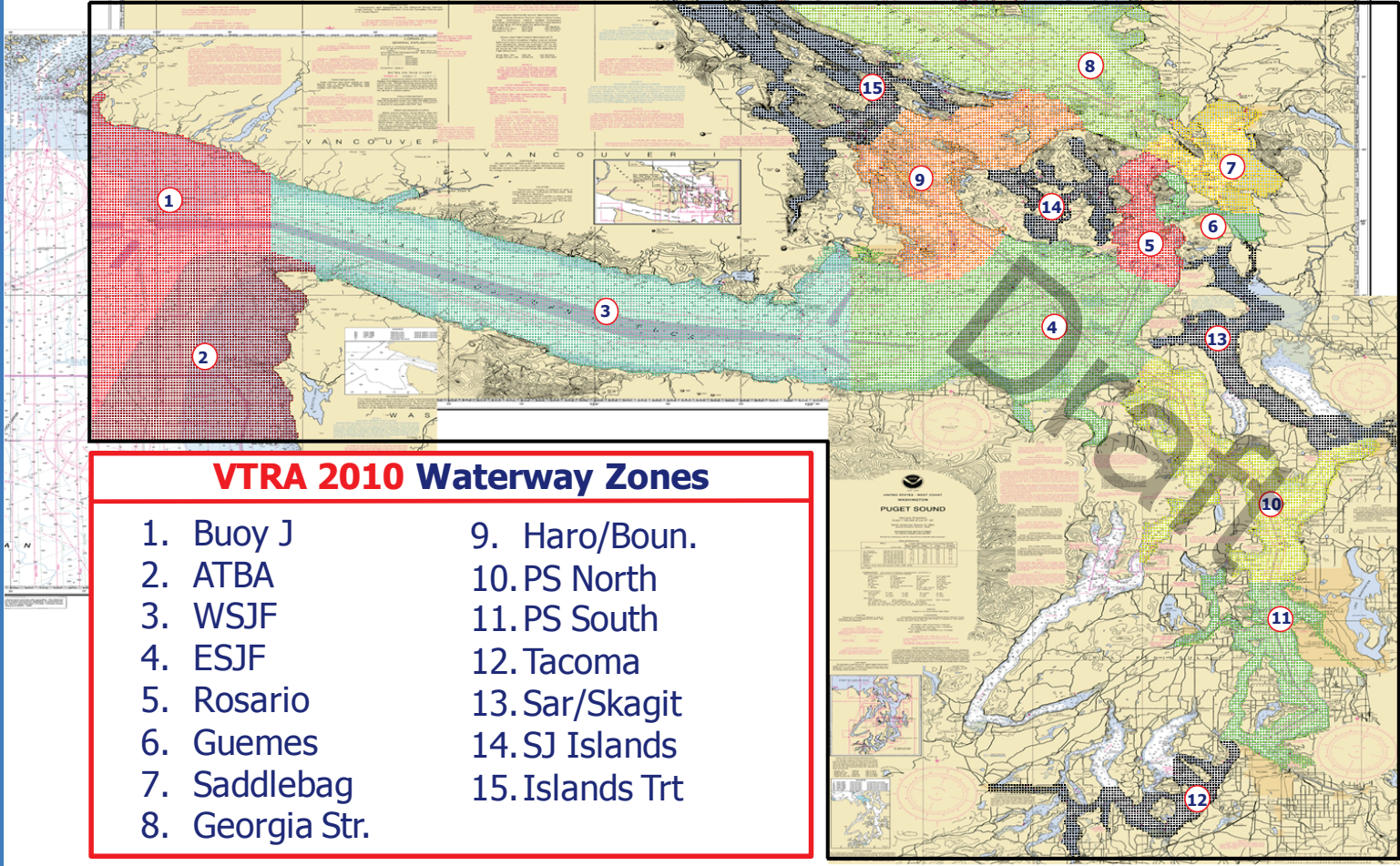
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & 6 RMM's - WhatIf FV



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

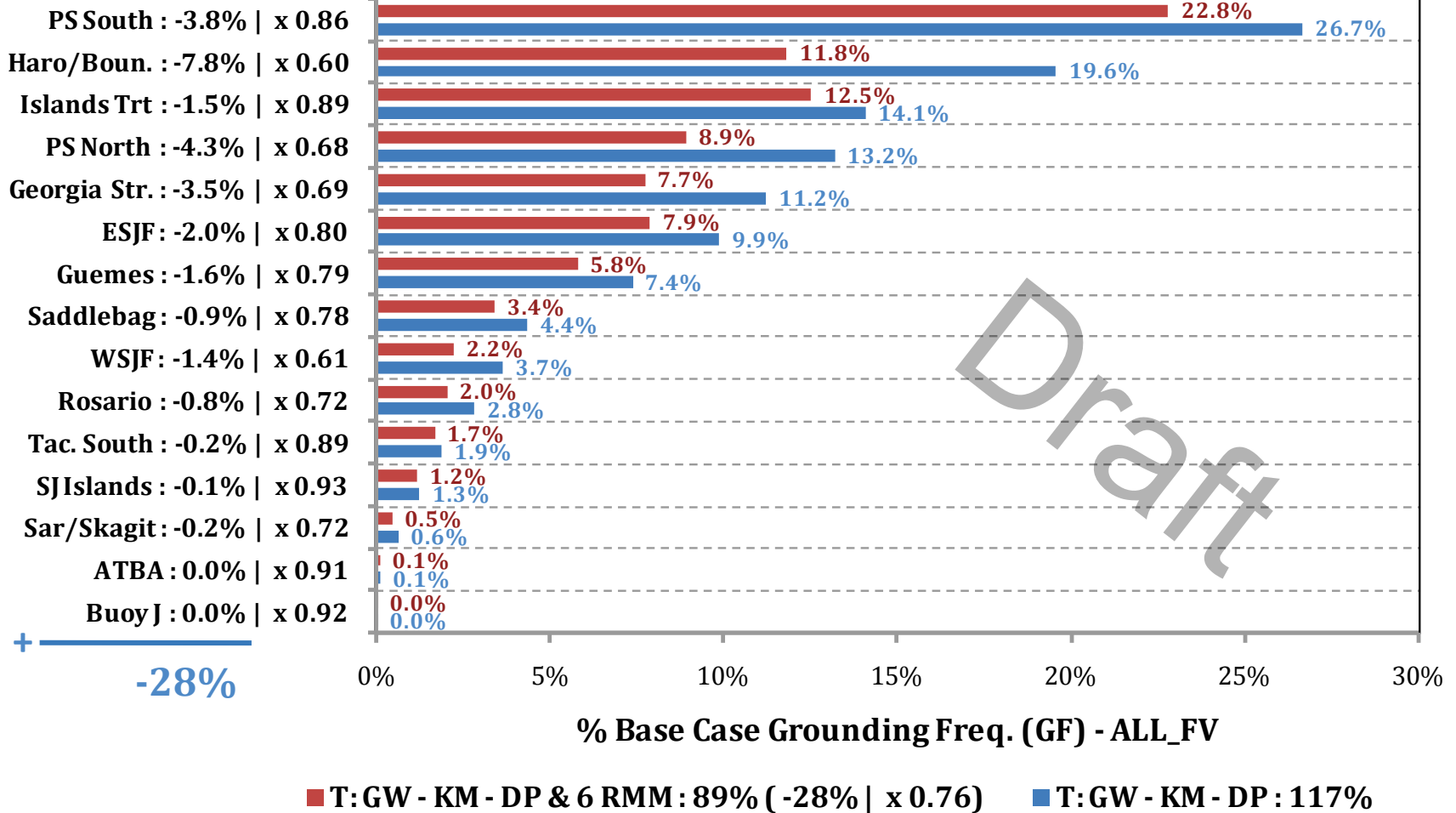
DEFINITION OF 15 WATERWAY ZONES



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

% Base Case Grounding Frequency - ALL_FV

Waterway Zone:

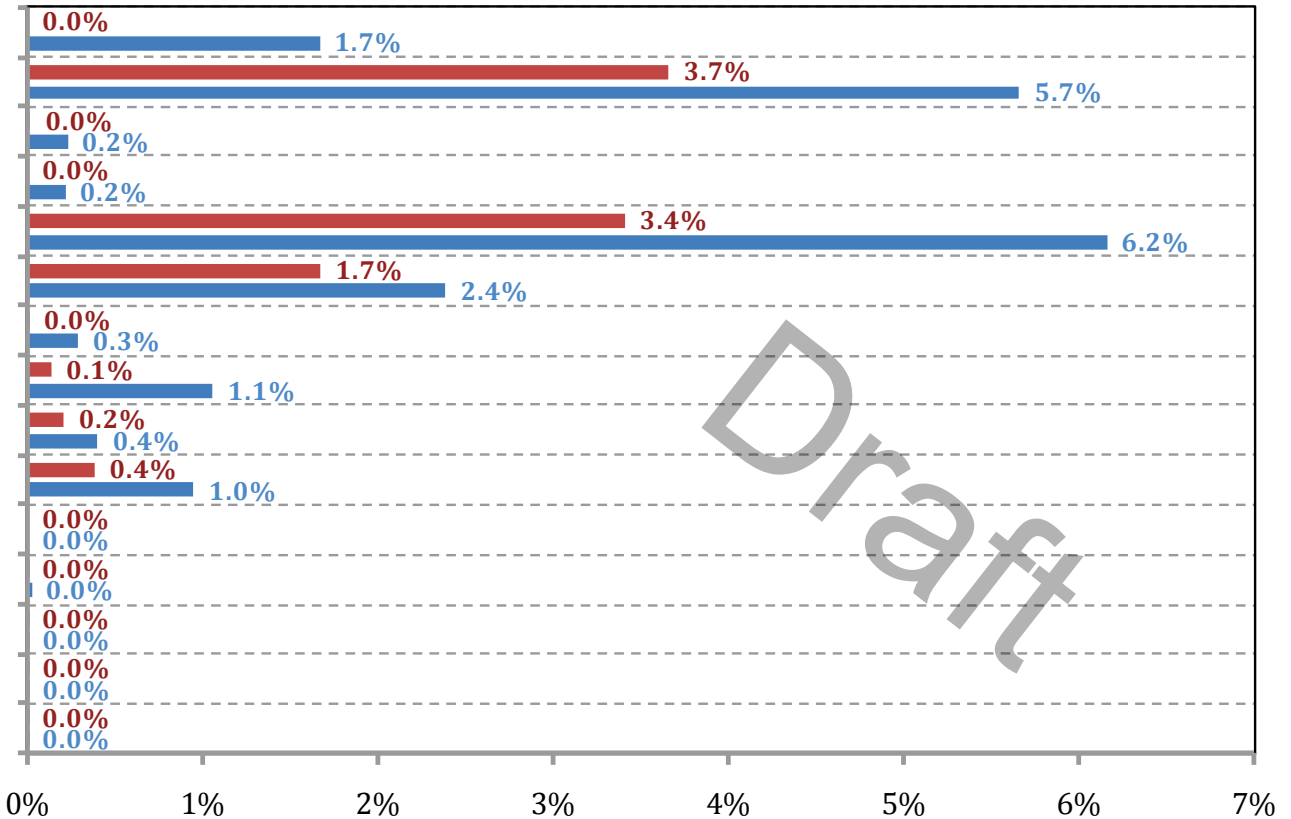


VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

% Base Case Grounding Frequency - WhatIf

Waterway Zone:

PS South : -1.7% | x 0.00
 Haro/Boun. : -2.0% | x 0.65
 Islands Trt : -0.2% | x 0.08
 PS North : -0.2% | x 0.00
 Georgia Str. : -2.7% | x 0.55
 ESJF : -0.7% | x 0.70
 Guemes : -0.3% | x 0.03
 Saddlebag : -0.9% | x 0.13
 WSJF : -0.2% | x 0.52
 Rosario : -0.6% | x 0.40
 Tac. South : 0.0% | x 0.00
 SJIslands : 0.0% | x 0.03
 Sar/Skagit : 0.0% | x 0.01
 ATBA : +0.0% | x 1.03
 Buoy J : 0.0% | x 0.91



+ **-10%**

% Base Case Grounding Freq. (GF) - WhatIf

■ T:GW - KM - DP & 6 RMM : 10% (-10% | x 0.50) ■ T:GW - KM - DP : 19%