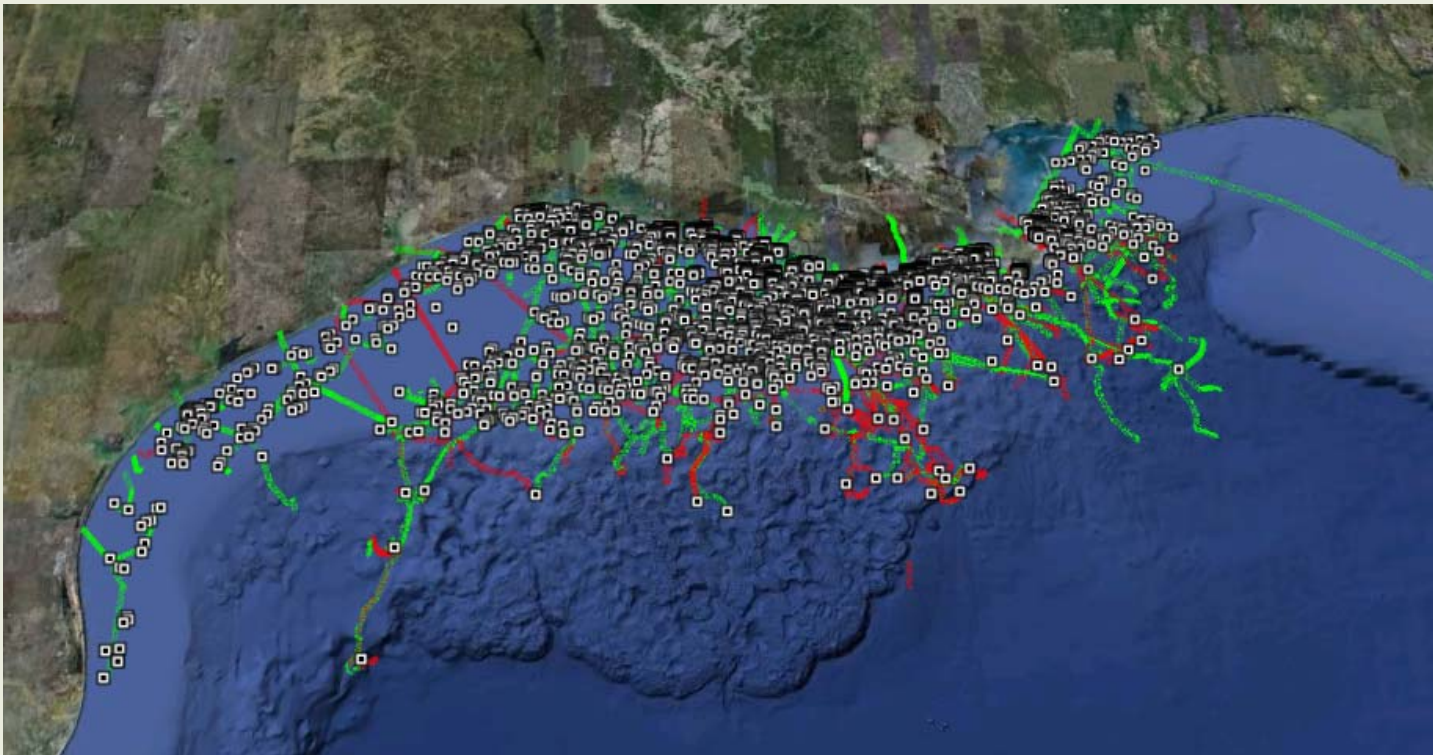


ConStat Risk Assessment



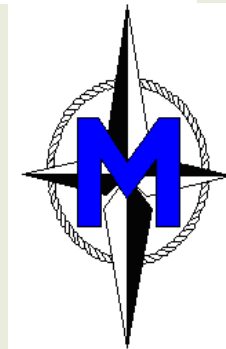


JIP Summary

- **Duration**
 - July 1st to December 31st 2007
- **Objective**
 - Develop a generally accepted rapid MODU mooring risk assessment method
- **Budget**
 - 5% Project Management
 - 14% Malcolm Sharples
 - 81% Delmar Staff
 - \$36,371 Over Budget
 - \$246,371 Total Spent

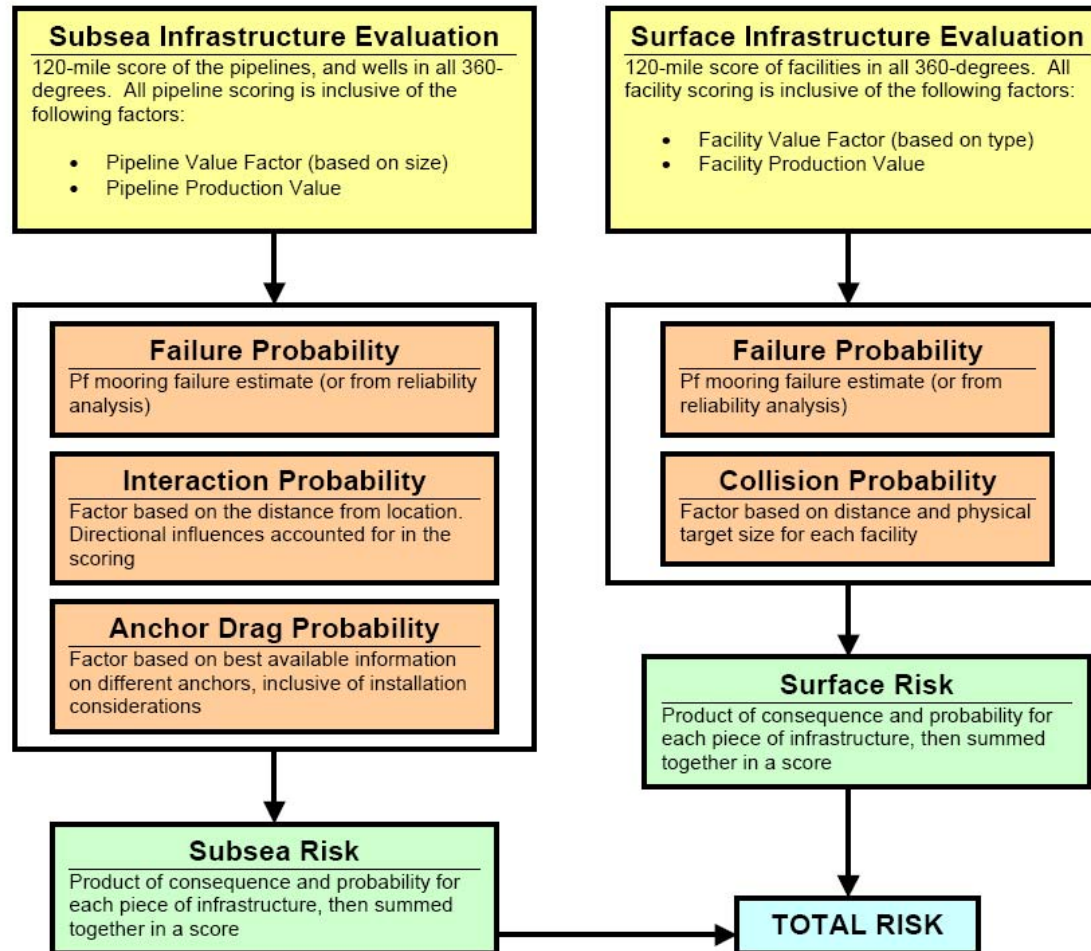


Participants





Methodology Flowchart (Rev 4)



- **Pipelines**
 - **Consequence**
 - 6-months deferred production
 - Repair cost
 - **Probability**
 - Probability of Mooring Failure
 - Pipeline Distance to Well
 - Mooring Component Factor
 - Anchor Type Factor
 - Pipeline Size / Damage Factor



Subsea Risk

- **Wells**
 - **Consequence**
 - **Well Repair Cost**
 - **Probability**
 - **Probability of Mooring Failure**
 - **Mooring Component Factor**
 - **Anchor Type Factor**
 - **Well Distance Factor**



Anchor Type Factor

Anchor Type	With Anchor Plan	Without Anchor Plan
HHC Drag	0.10	0.25
Drag VLA	0.05	0.33
Suction Pile	0.001	0.01
Plate Anchor	0.05	0.33
Omni-max	0.01	0.1

***Anchor Type Factor only affects subsea risk events**

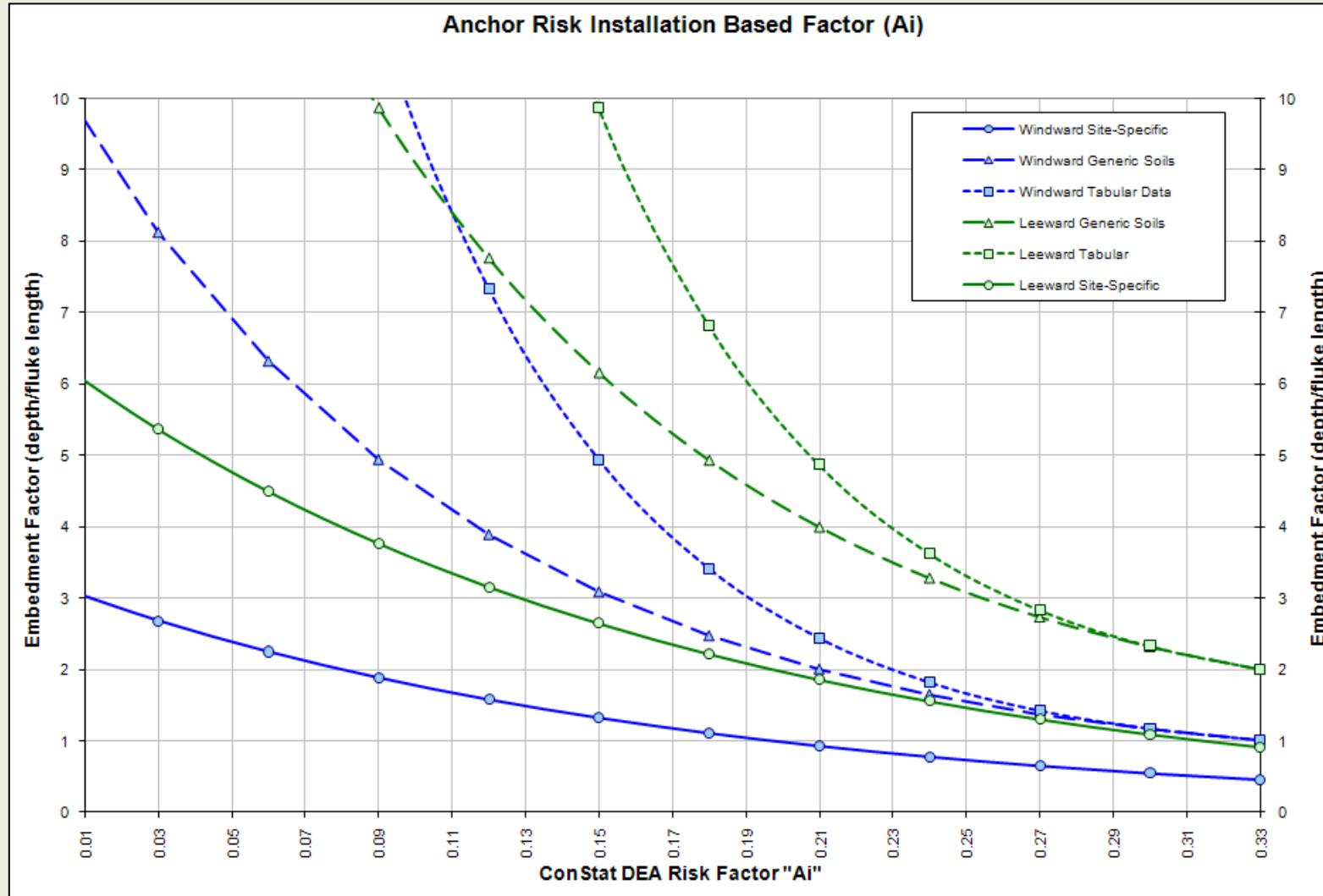


New ConStat DEA Factor

- **DEA Factor = $A_i \times A_r$**
- **A_i - Anchor Risk Installation Based Factor**
- **A_r - Anchor Risk Design Point Based Factor**

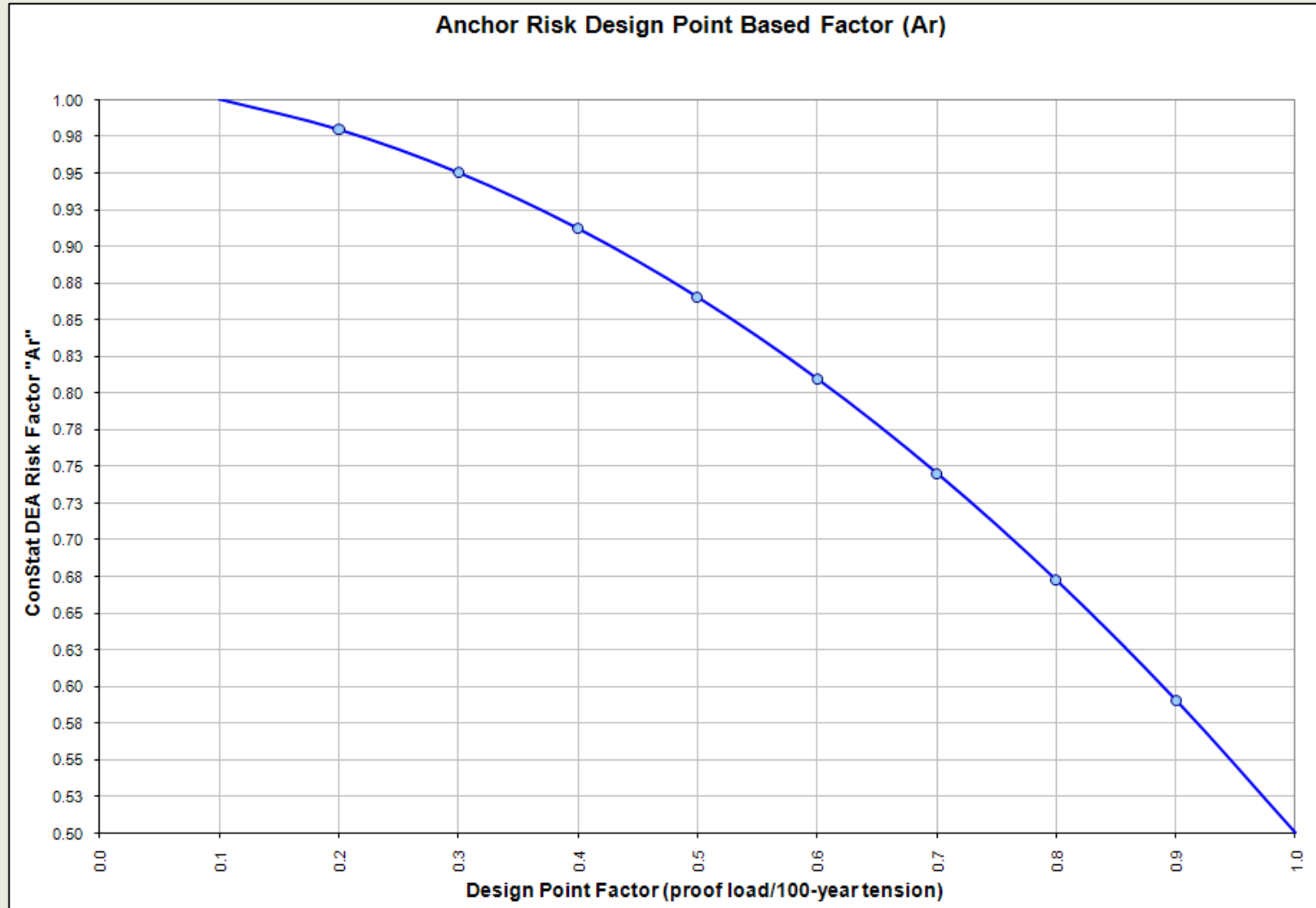


Anchor Risk Installation Based Factor (Ai)





Anchor Risk Design Point Based Factor (A_r)



- **Facility Interaction**
 - **Consequence**
 - 6-months deferred production
 - **Facility Interaction Repair Cost**
 - Flair Boom Damage
 - Mooring Damage
 - SCR Damage
 - **Probability**
 - Probability of Mooring Failure
 - Facility Distance to Well
 - **Facility Type (Interaction Radius)**
 - Mooring System Inclusive
 - SCR Inclusive

- **Facility Collision**
 - **Consequence**
 - 3-years deferred production
 - Facility Replacement Cost
 - **Probability**
 - Probability of Mooring Failure
 - Facility Distance to Well
 - Facility Type (Collision Radius)
 - Structural Surface Size



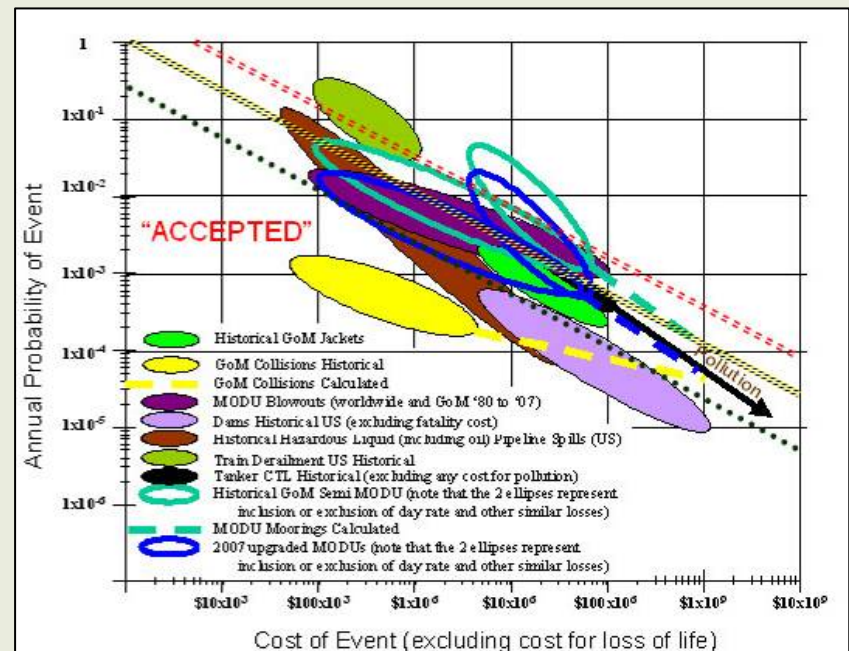
Facility Damage Cost

Type	Collision	Interaction
Caisson	\$5 million	\$5 million
Fixed Jacket	\$35 million	\$17.5 million
“Hub” or Major Jacket	\$120 million	\$60 million
Mini TLP	\$175 million	\$43.75 million
TLP	\$450 million	\$112.5 million
SPAR	\$500 million	\$125 million
Semi-submersible	\$500 million	\$125 million
FPSO	\$500 million	\$125 million

***Values were provided by operators**

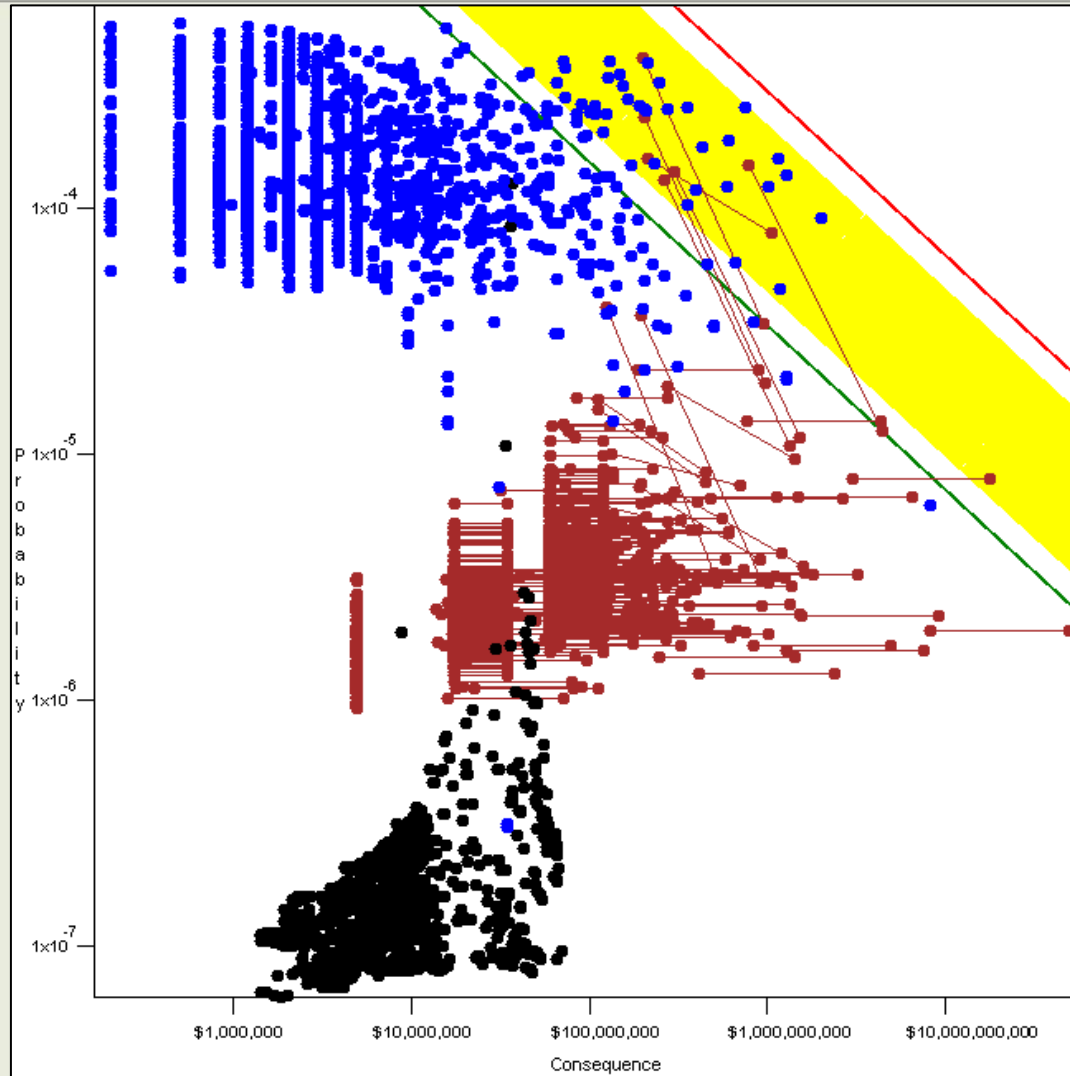


Risk Result Output

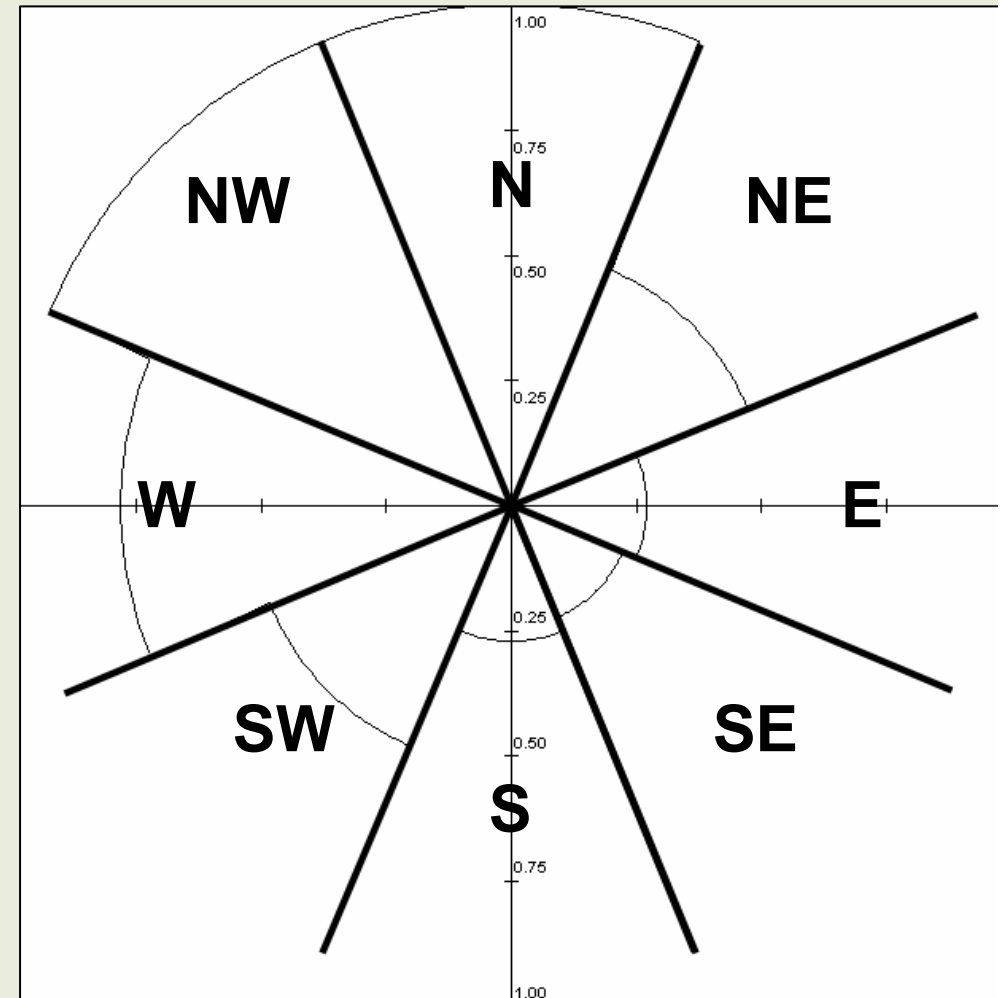




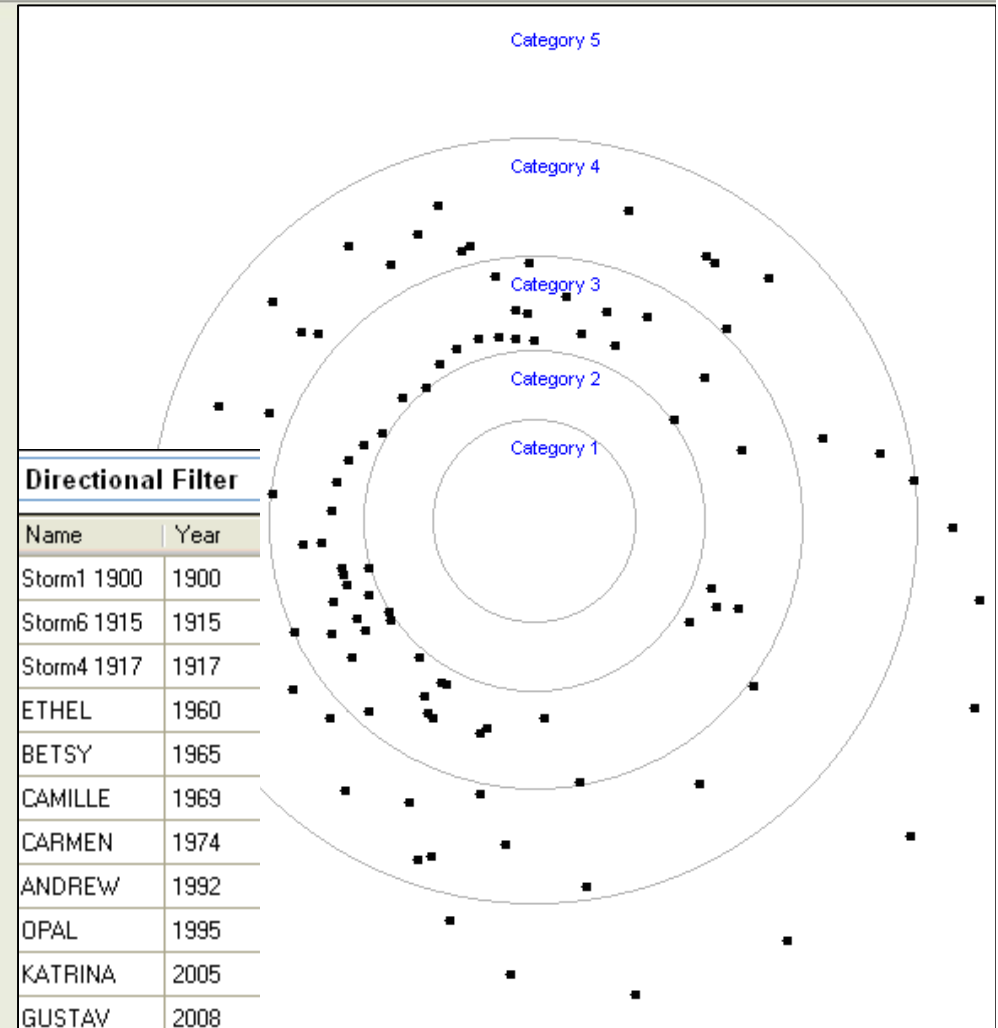
Risk Result Output



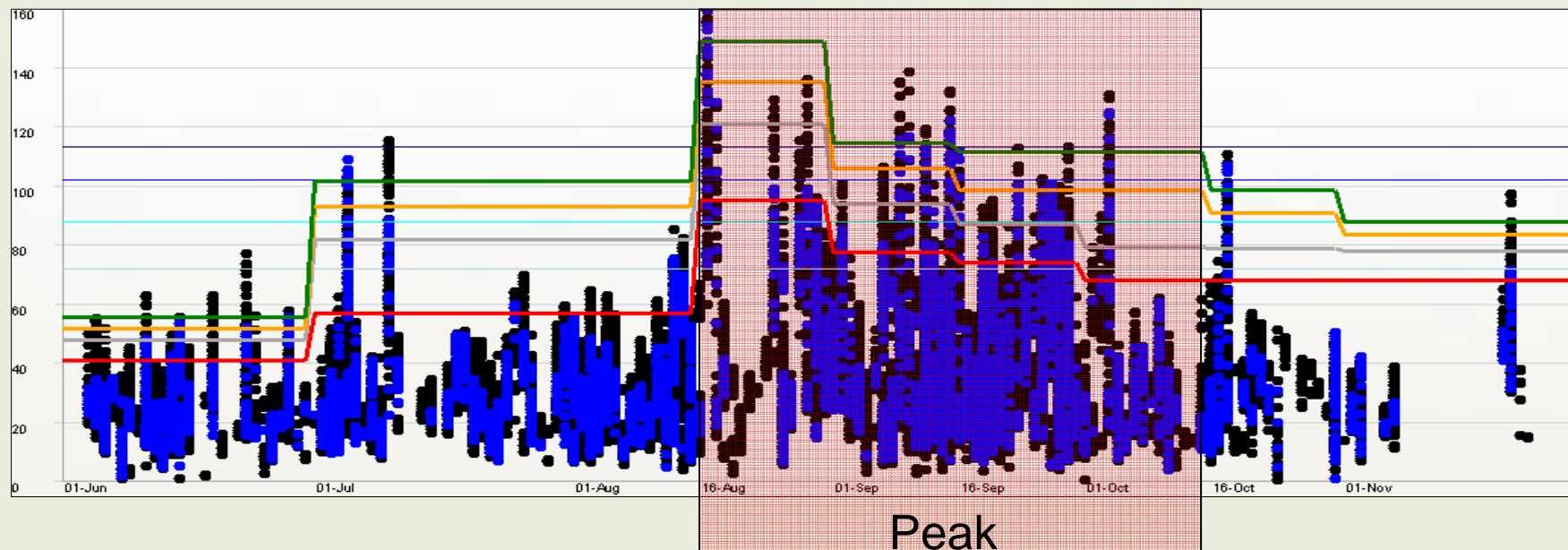
- **Historical Wind Directions**
 - 2MET Regions
 - Site-specific
- **Directionality applied to risk events**
- **8 sector approach**



- Hurricane Wind Direction Density
- Wind Direction Sector Probability
 - Total Number of Hurricanes
 - Number of Hurricanes per Sector
- Sector Probability Scaled
 - Factor of 1.00

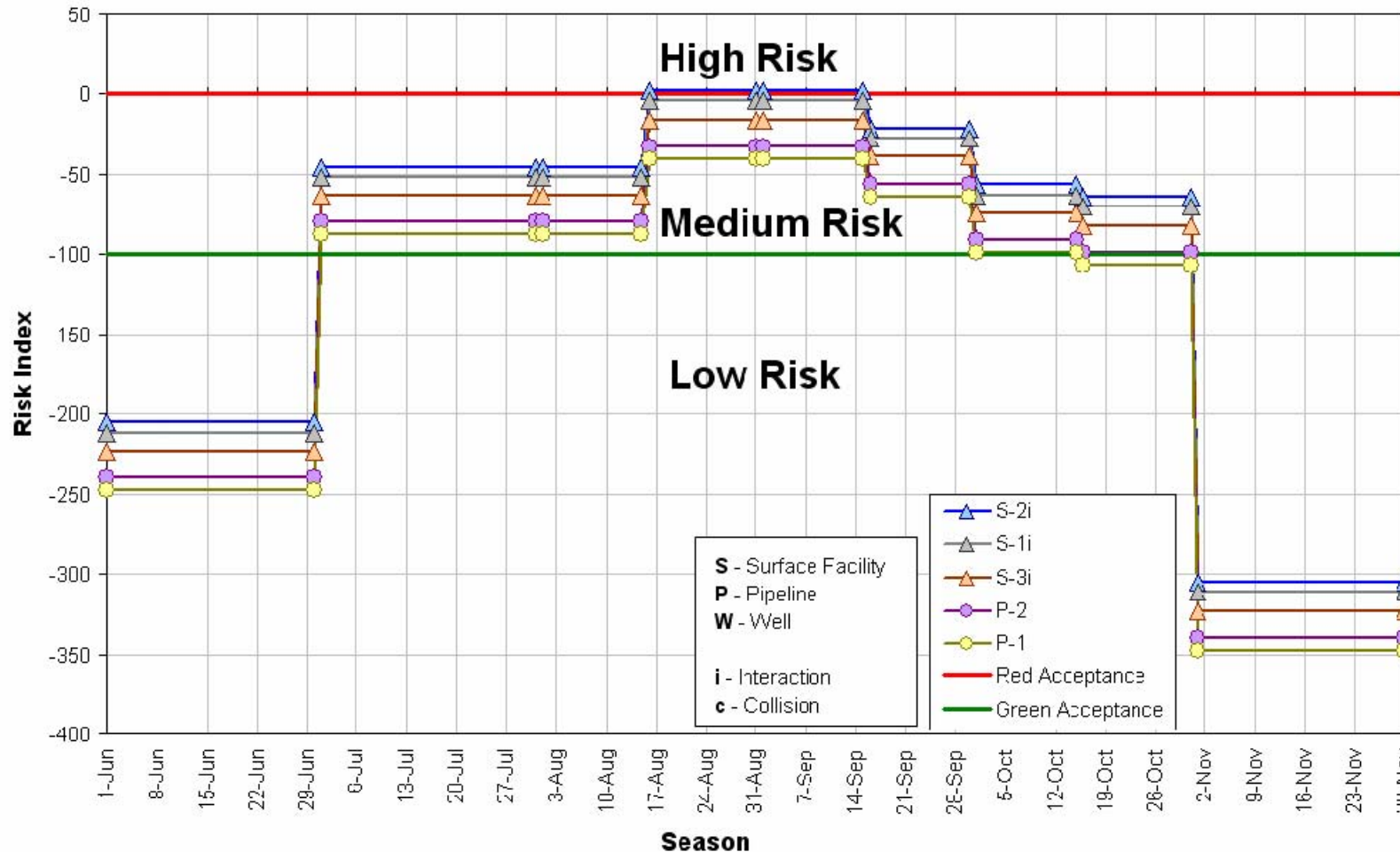


- **Peak Season (higher number & intensity)**
 - 2MET Region
 - Site-specific
- **Non-Peak Season (reduced number & intensity)**
 - Calculates probability reduction (based on wind speeds)
 - 2MET Region or Site-specific



Seasonal Risk Results

Deepwater Nautilus DC 486
Risk Summary Graph - Top Five Controlling Risk Events



Production Matrix

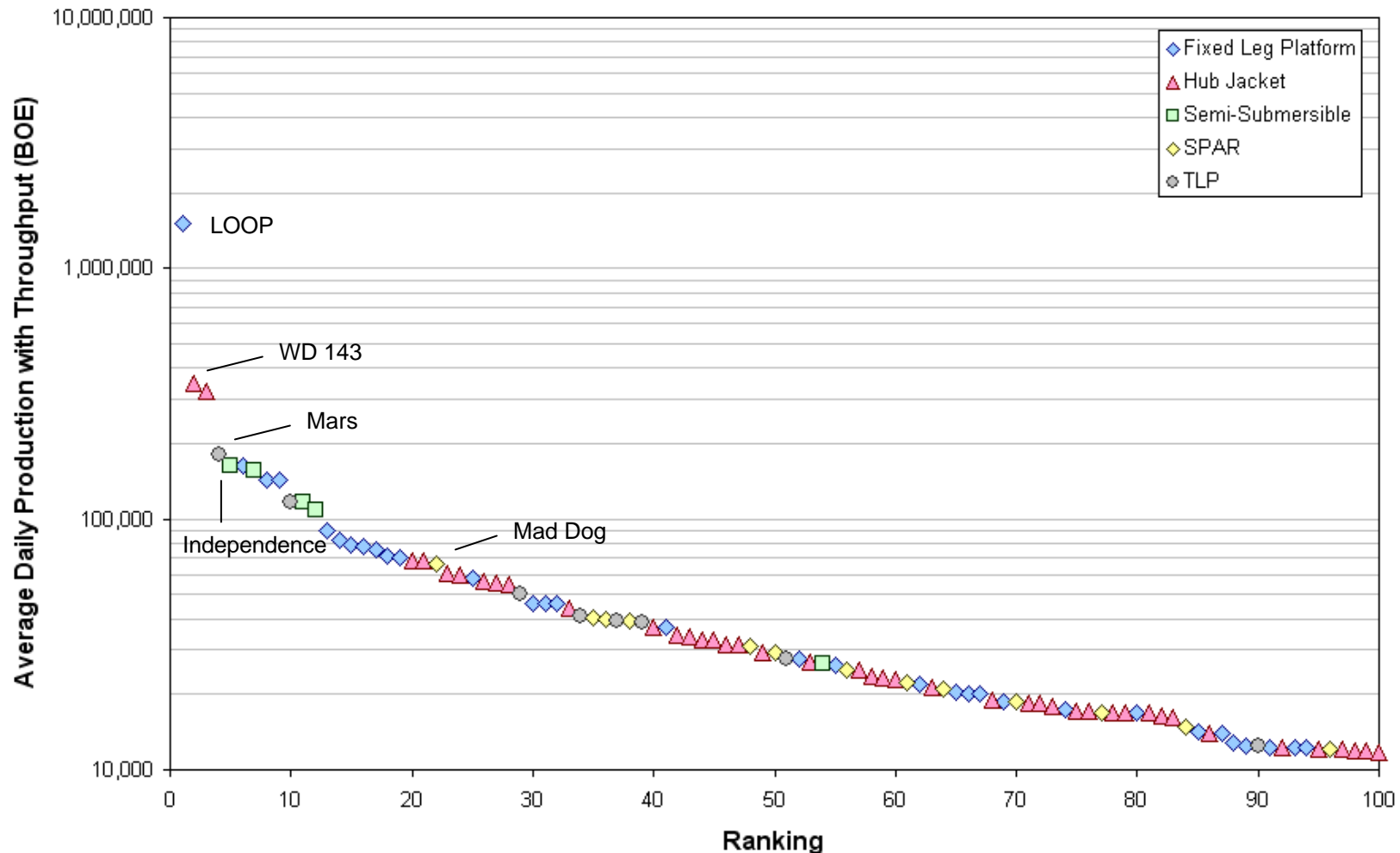
Production and Throughput for Infrastructure in the Gulf of Mexico

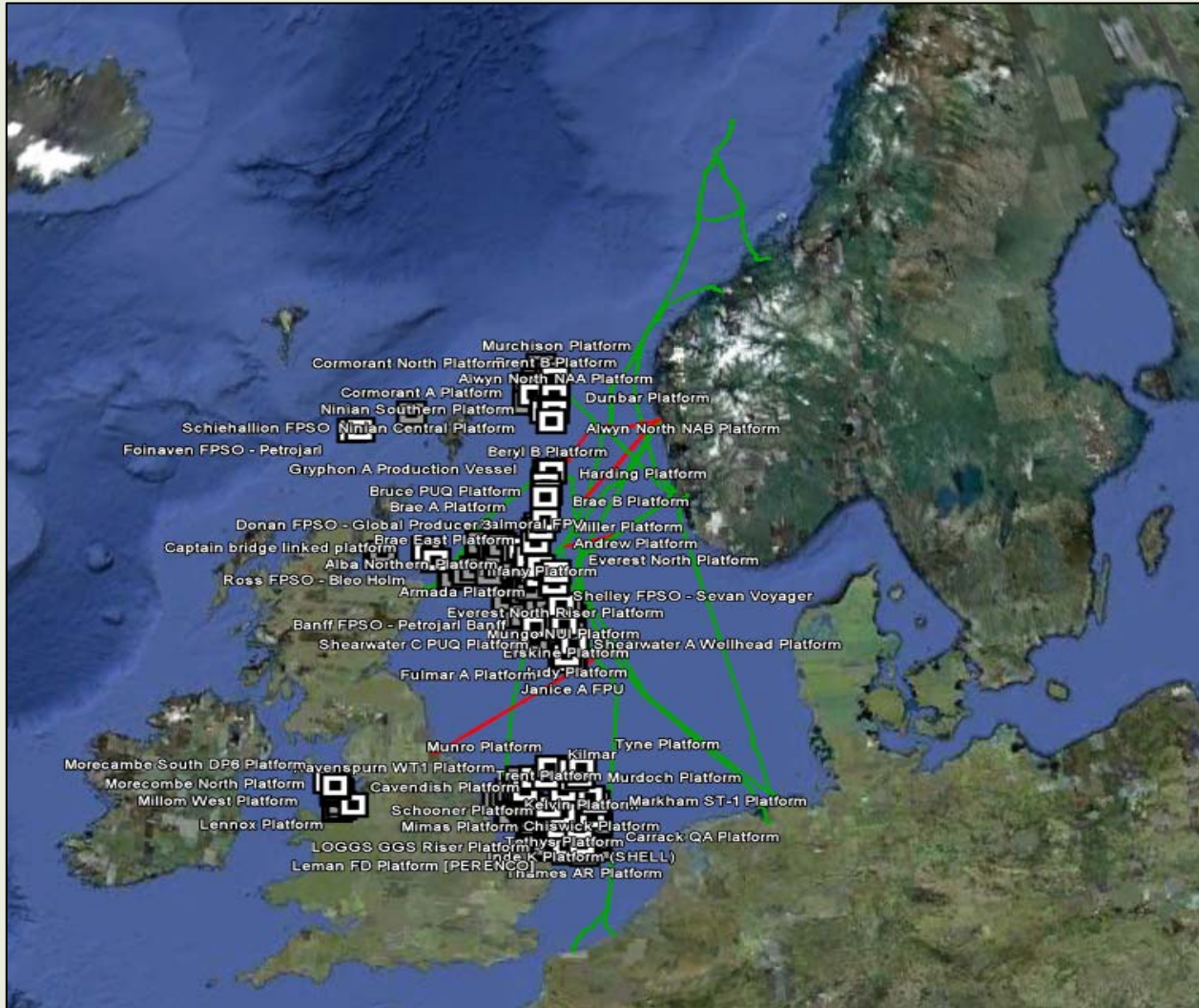


Production Matrix

- **Top 250 producing assets (~87% Total)**
- **Production traced**
 - Through pipelines
 - Through hub facilities
- **Deferred Production Value \$30.00 (Version K).**
 - 25% of BOE Value
- **Throughput is assigned to pipelines**
- **Throughput is applied to structures**
 - Added to top 250 producers
 - Applied to non/minor producers

Top 100 Producers with Throughput - ConStat Version F





- Infrastructure database extended to the North Sea – UK and Norway
- Fatigue based risk assessment for both MODU and long term moored production facilities
- Metocean / disconnection analysis for DP MODU units