Cook Inlet RISK ASSESSMENT

Cook Inlet Risk Assessment

Cook Inlet Regional Citizen's Advisory Council

Board Meeting

December 5th, 2014

The Cook Inlet RCAC, U.S. Coast Guard and State of Alaska are conducting a risk assessment of maritime transportation in Cook Inlet, Alaska.

What is a Risk Assessment?

- What can go wrong?
- How likely is it to occur?
- What are the consequences if it does?
- What can we do to reduce the likelihood or consequences?

Project Overview -- Scope

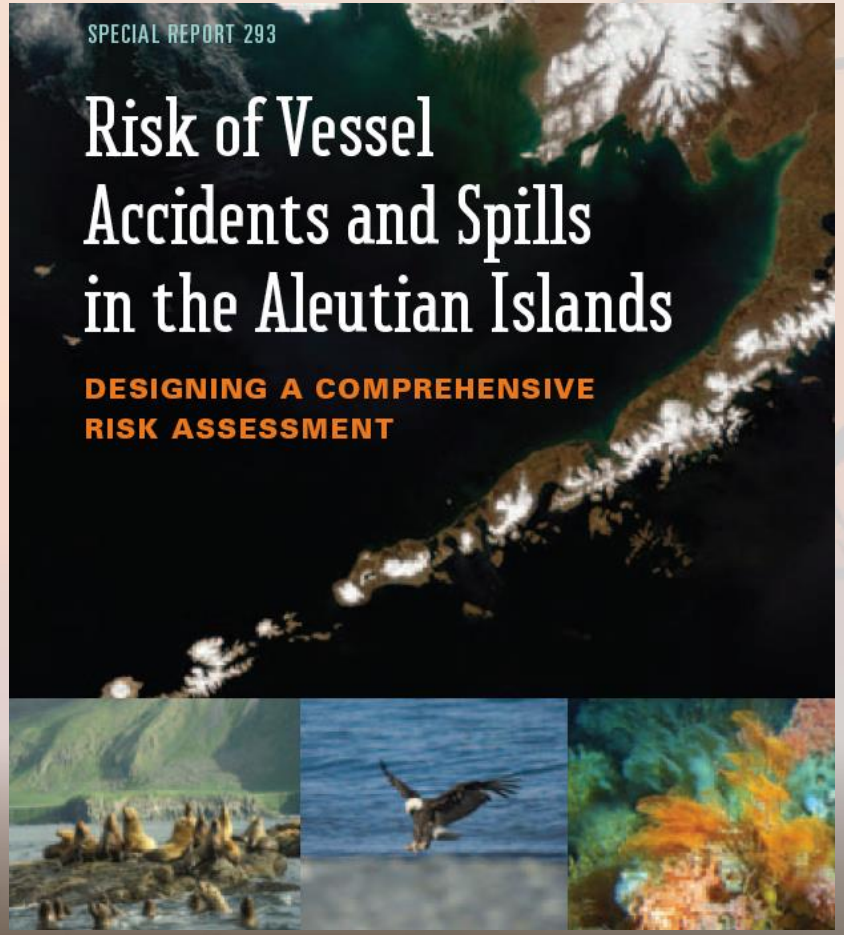
- Marine vessels > 300 GT or with at least 10,000 gallon fuel capacity
- Does NOT include: military or research vessels; other petroleum operations on land or water in area

Project Method

Stakeholder driven risk assessment, informed with semi-quantitative analysis.

Phase A – Look at current risks in system

Phase B – Develop risk reduction options, either recommend implementation or study



Project Status

- Solicited Public Comment on Draft Final Report and supporting documents
- Public Comment Period ended October 27
- Currently reviewing and drafting response to comments
- Final Report by end of year.

Phase A Overview

- Formation of Management Team, Advisory Panel
- Vessel Traffic Study (Cape International, 2012)
- Spill Baseline and Accident Causality Study (Glosten and ERC, 2012)
- Identification of representative scenarios
- Consequence Analysis Workshop & Report

ADVISORY PANEL

Fisheries

Jim Butler

Sarah E. Melton

Land/Resource Manager

Philip Johnson

Marie Steele

Marine Pilot

Jeffrey Pierce
Josh Weston

ADVISORY PANEL

Mariner – Freight Ship

George Lowery

A John (Jack) Rasmussen

Mariner - Tanker

Jack Jensen

Mariner – Tug & Barge

Greg Pavellas

Louis Audette

ADVISORY PANEL

Mariner – Other

Richard Wilson

Owen Boyle

Native Alaskan/ Subsistence

Michael Opheim

Tracie Merrill

NGO

Ron Long

Bob Pawlowski

ADVISORY PANEL

Oil Platform & Mobile Drilling Unit Operators

Gregory Duggin

Ports & Harbors

Bryan Hawkins

Stephen Ribuffo

Marc Van Dongen

Marine Salvor

David Devilbiss

Paul Hankins

ADVISORY PANEL

Technical Advisor on Risk Assessment

Dr. Jack Harold

Vessel Traffic Study

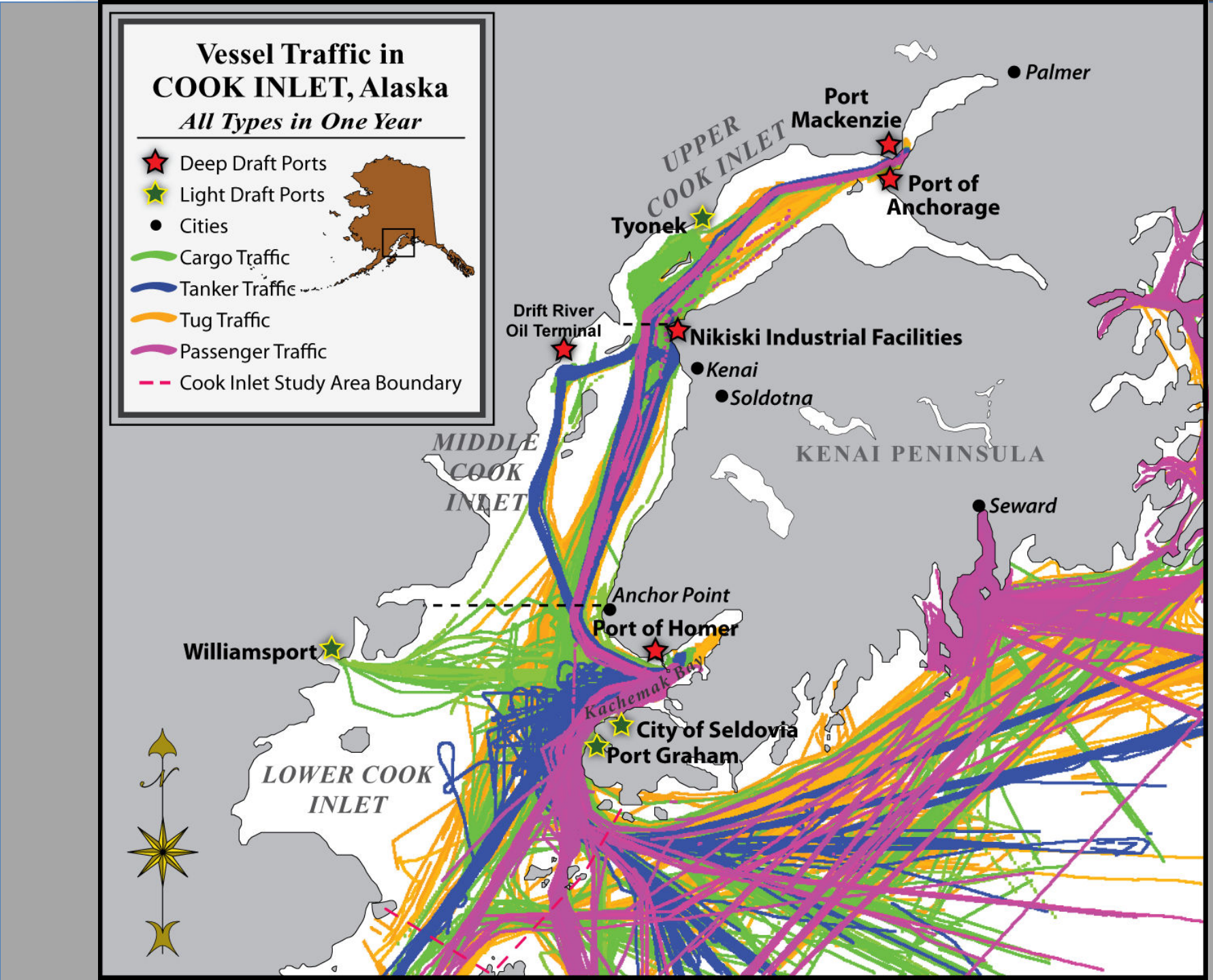
Objectives

1. Characterize Vessel Traffic Utilizing Cook Inlet in 2010 Base Year (≥ 300 Gross Tons),
2. Predict Vessel Traffic Until 2019

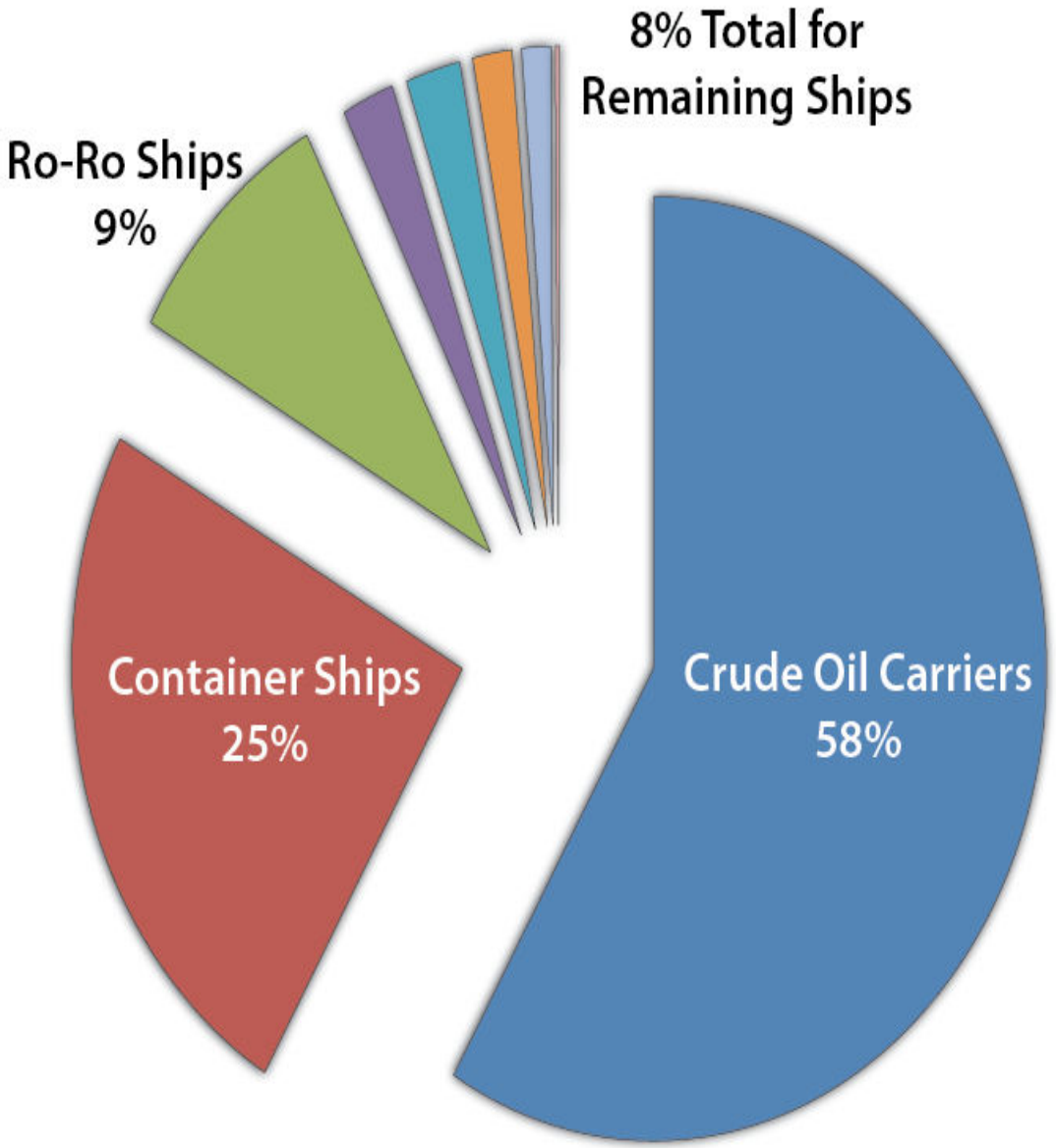
Vessel Traffic Study

- 480 ship port calls
- 80% of the 480 calls were made by 15 ships

- AMHS ferries 23%
- Container ships 22%
- Ro-Ro cargo ships 22%
- Crude tank ships 15.5%
- Refined tank ships 4%
- Bulk carriers 4%
- LNG carriers 2.5%
- Cruise ships 3%
- Fish industry 1%


Vessel Traffic in
COOK INLET, Alaska
All Types in One Year
Deep Draft Ports
Light Draft Ports
Cities
Cargo Traffic
Tanker Traffic
Tug Traffic
Passenger Traffic
Cook Inlet Study Area Boundary
Palmer
Port Mackenzie
UPPER COOK INLET
Port of Anchorage
Tyonek
Drift River Oil Terminal
Nikiski Industrial Facilities
Kenai
Soldotna
MIDDLE COOK INLET
KENAI PENINSULA
Seward
Anchor Point
Port of Homer
Williamsport
Kachemak Bay
City of Seldovia
Port Graham
LOWER COOK INLET
N

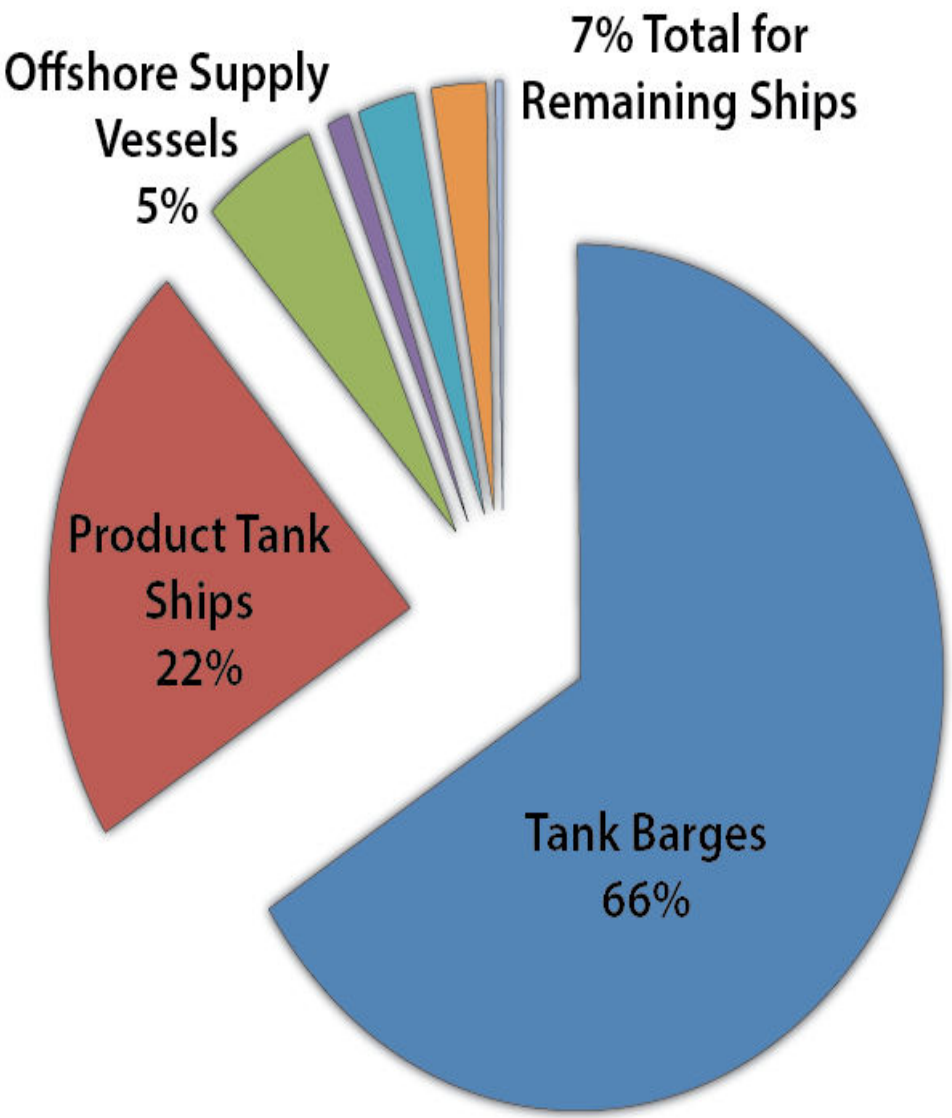
Persistent Oil Movement by Vessel Category



449 Million Gallons

- Crude Oil Tank Ships
- Container Ships
- Ro-Ro Cargo Ships
- Bulk Carriers
- Product Tank Ships
- Gas Carriers
- Cruise Ships
- General Cargo Ships

Non-persistent Oil Movement by Vessel Category



575 Million Gallons

- Tank Barges
- Product Tank Ships
- Offshore Supply Vessels
- Passenger Vessels
- Tugs, Transient
- Tugs, Resident
- Fish Processors

Spill Baseline & Causality Study

Number of Spills by Vessel Type

- Overall 3.4 spills/year historically, range:
  - 0.7 spills/year for tank ships
  - 1.3 spills/year for non-tank vessels (cruise ships, cargo vessels)
- Estimated overall 3.9 spills/year for 2015-2020

Spill Baseline & Causality Study

Potential Spill Sizes by Vessel & Incident Type

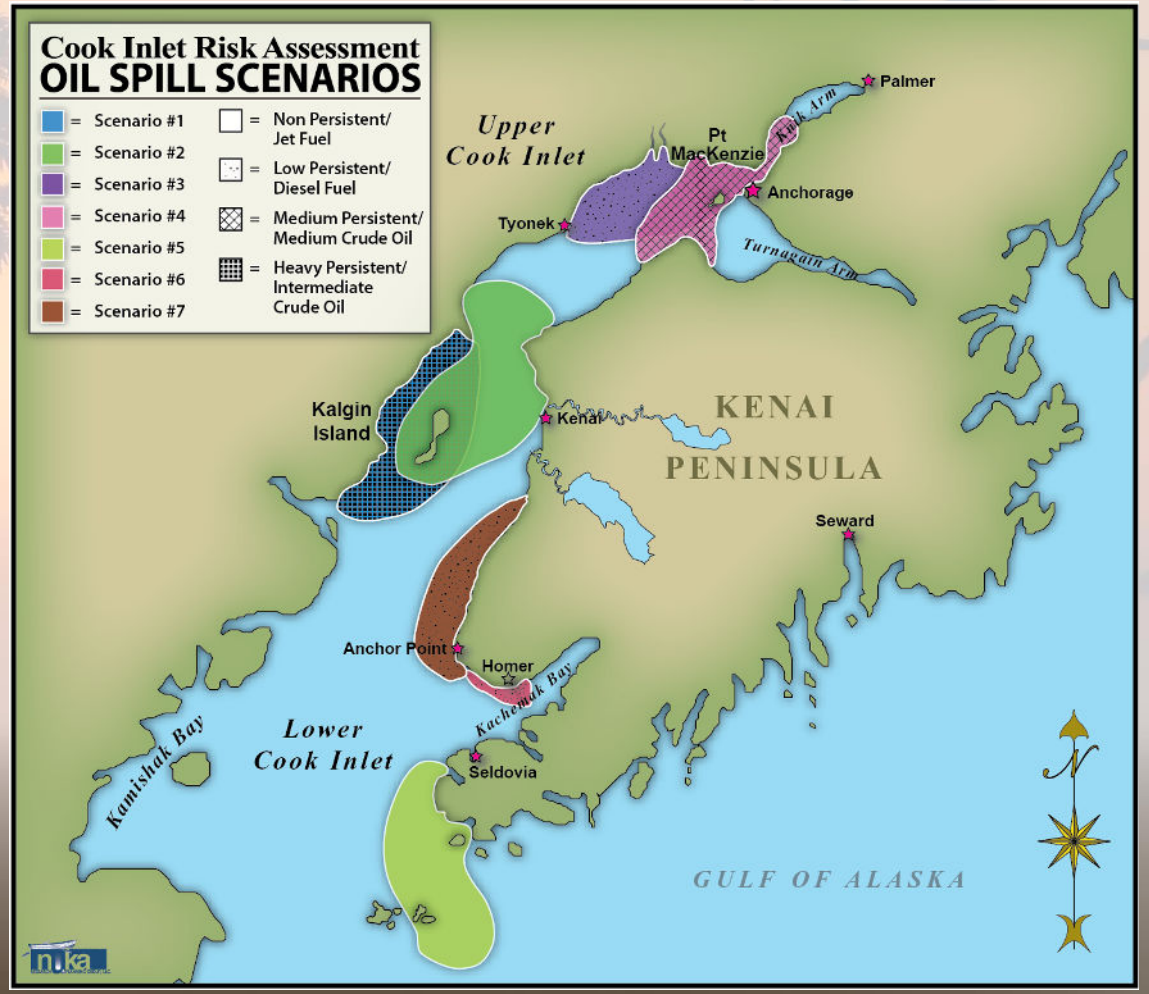
- Moderate (50th percentile) spill sizes:
  - 10 gallon (transfer errors, non-impact incidents from workboats)
  - 20,000 gallons (crude carrier impact incident)
- Large (95th percentile) spill sizes:
  - 2,000 gallons (transfer errors, non-impact incidents from workboats)
  - 15 million gallons (crude carrier impact incident)

Spill Rates and Scenarios

- Scenarios defined for 2,112 unique combinations of vessel types and spill factor subcategories.
- Majority of scenarios have “low” to “very low” relative risk level.
- Tank ships have lowest baseline spill rate, but have the greatest potential risk associated with an oil spill.

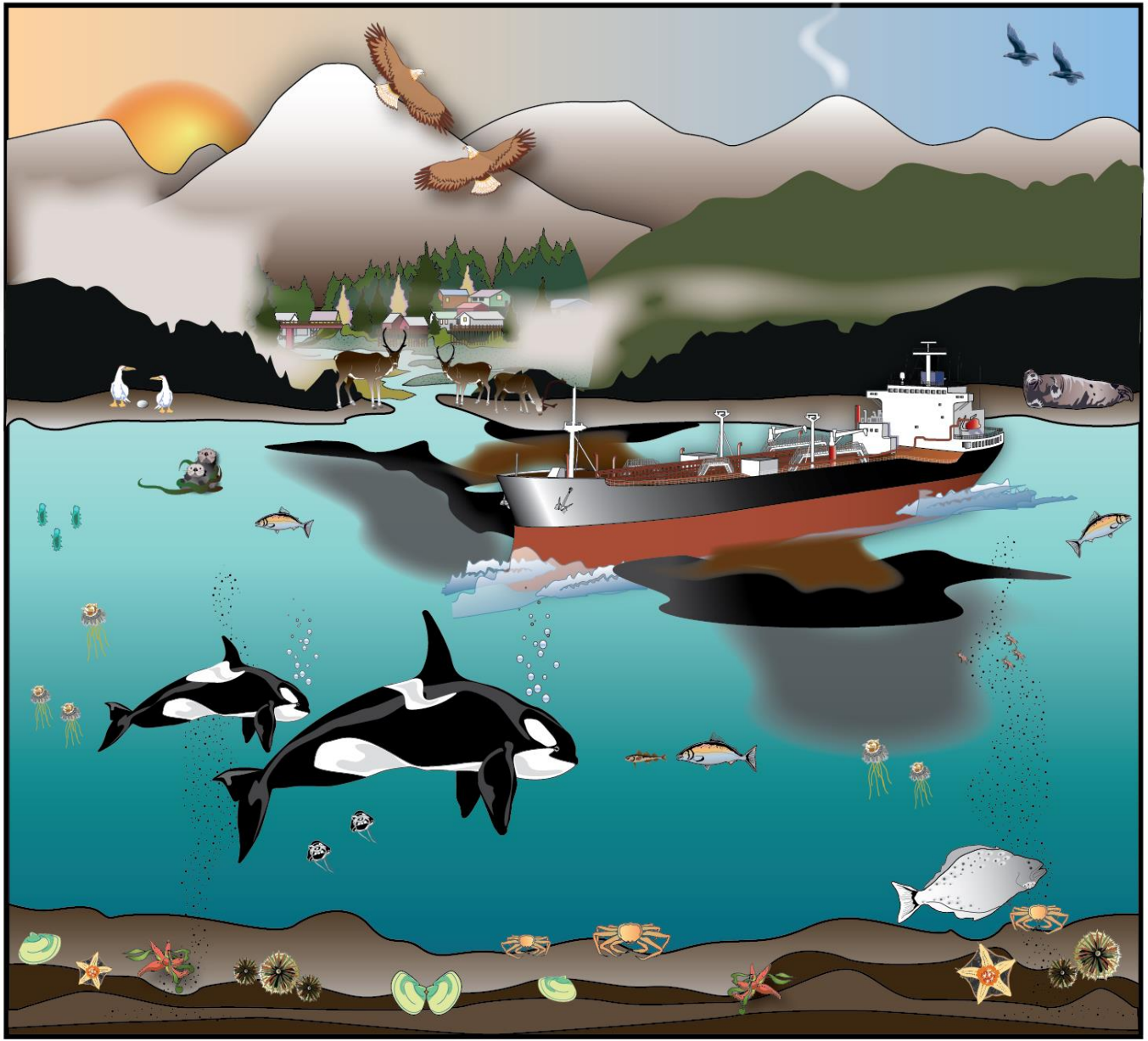
Consequence Analysis Workshop

- Based on Expert Judgment
- Considered 7 spill scenarios
- Characterized likely impacts



Considered Environmental Impacts

bald eagles
waterfowl
sea birds
terrestrial mammals
shorebirds
fin fish
sea otters
pinnipeds
whales & porpoises
shell fish



evaporating oil may be inhaled

oil on shore may smother shellfish and other resources in the littoral habitat, or contaminate food sources for terrestrial mammals

floating oil may coat seabirds or sea otters causing them to lose buoyancy and/or warmth

oil in the water column can be ingested by fish/shellfish and passed up the food chain

Considered Socioeconomic Impacts

tourism

humans

recreation

subsistence

commercial fishing

general commerce

oil industry operations

Recreational tourism may be stifled by fears of contamination

Vessels may be prohibited from entering certain areas, inhibiting general commerce or oil industry operations

Fisheries may be closed

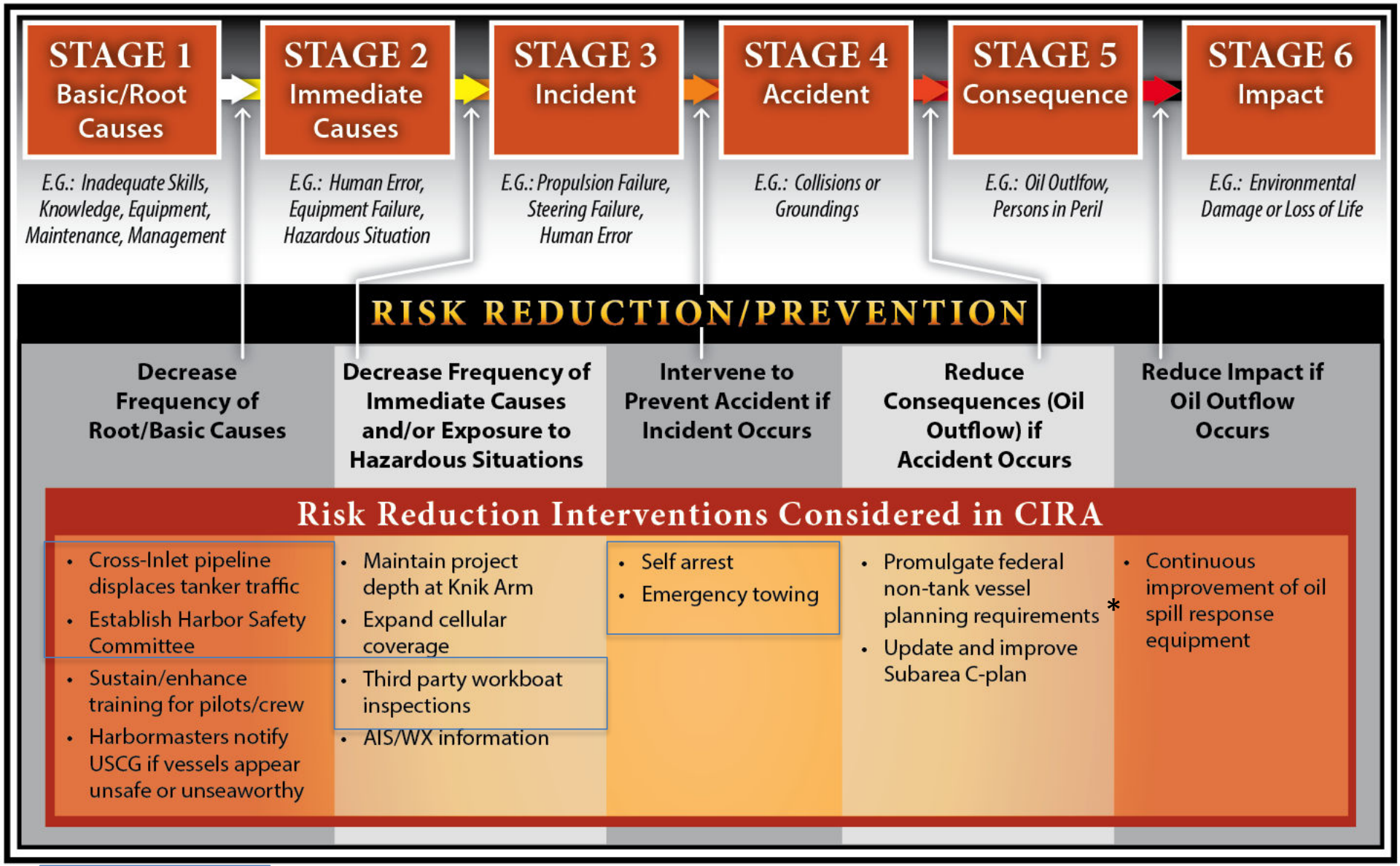
Consequence Analysis Workshop

- Both persistent and non-persistent oil spill scenarios were evaluated
- Range of seasons and weather conditions
- Considered potential spill trajectories
- Even moderate spills (~100 bbl) can have significant impacts

Phase B Overview

- Elicit RRO recommendations
  - Public, AP, federal legislation
- Advisory Panel reviews RROs *(Feb 2013)*
  - RROs for immediate/sustained implementation *(Summarized in 2013)*
  - RROs requiring further study
  - Focus on cross-Inlet pipeline, distressed vessel rescue/emergency towing-related issues

Risk Reduction Measures Organized by Causal Chain

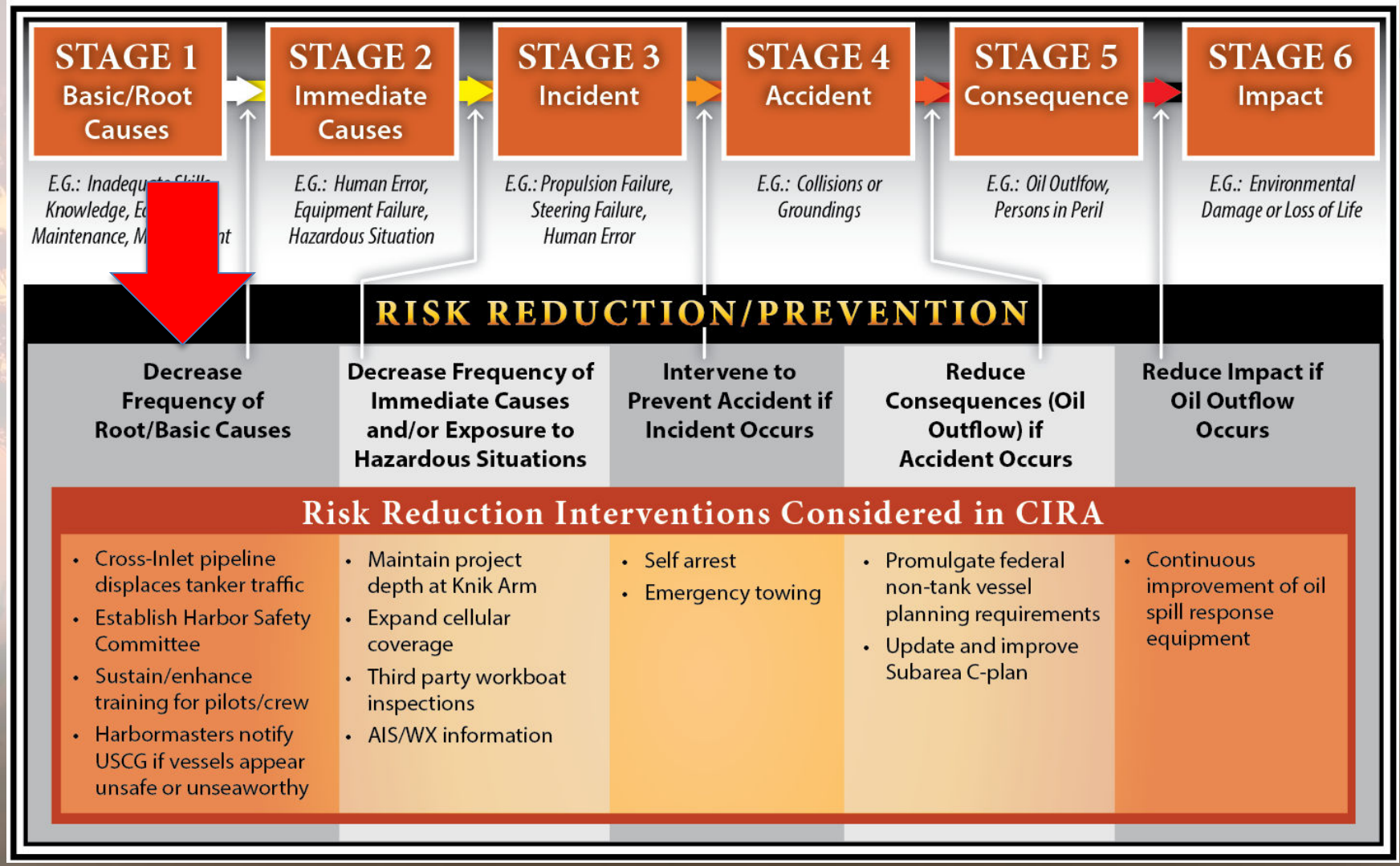


Primary focus of new info.

* Completed. No further discussion needed.

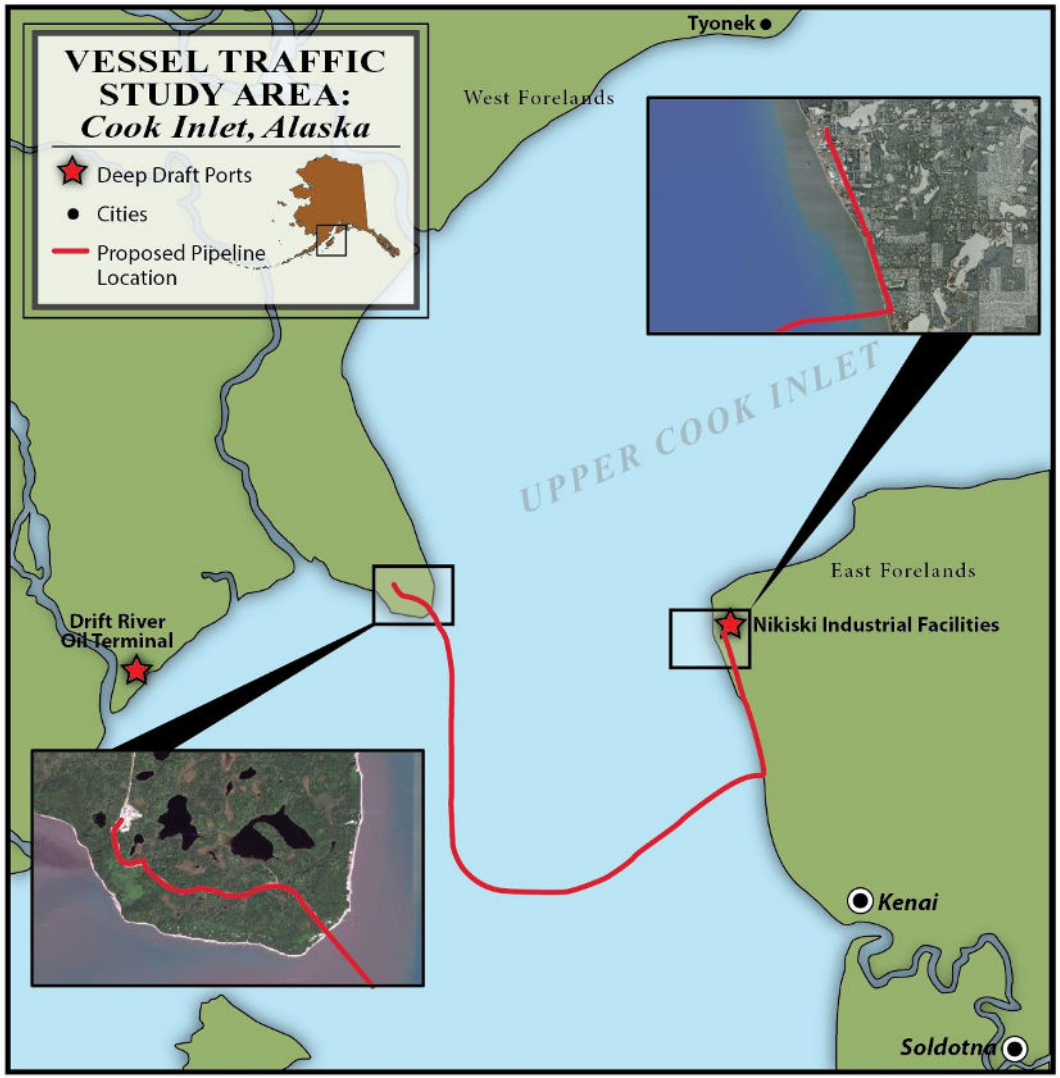
Based on graphic provided by Dr. Jack Harrald.

Remove Root Cause



Eliminating Root Cause

Would the risk of a tanker crude oil spill would be reduced by construction of a 22 mi 8” subsea pipeline, thus eliminate cross-inlet tanker traffic?



Cross-Inlet Pipeline

Risk = Frequency x Consequence

We examine both

- Frequency = spills per year
- Consequence = distribution of spill size

We consider

- Empirical data
- Literature review
- Practical knowledge

Cross-Inlet Pipeline

Frequency

- Glosten Associates (2013) estimates that removing the tanker transits removes .105 spills per year
- International Oil and Gas Producers (2010) estimates annual spill rate for subsea pipelines at .00181 spills per year, give this pipeline length
- Net reduction in spill frequency **98%**

Cross-Inlet Pipeline

Frequency

- The only sales grade sub-sea pipeline in the state is the NorthStar pipeline, which has been operation 13 years with zero leaks
- There have been 3 crude oil spills from tankers in Cook Inlet during the same time frame.

Cross-Inlet Pipeline

Spill Size Distribution

	Small[1] (25th percentile (gallons)	Moderate (50th percentile) (gallons)	Large (95th percentile) (gallons)	Worst Case Discharge (gallons)
Crude tanker impact	500	20,000	15,000,000	28,500,000
Subsea pipeline	<1	5	571	232,227
Reduction (%)	>99	>99	>99	99

Cross-Inlet Pipeline

Spill Size

- The largest tanker spill in Cook Inlet was the Glacier Bay spill in 1987 207,000 gallons.
- The largest sales quality pipeline crude oil spill was 10 gallons in 1996.

Cross-Inlet Pipeline

Benefits of Pipeline

- Elimination of tanker transportation across Cook Inlet
- Alternative to Drift River facility, knocked out of service in 2009
- Lower transportation costs

Cross-Inlet Pipeline

Benefit Cost Analysis

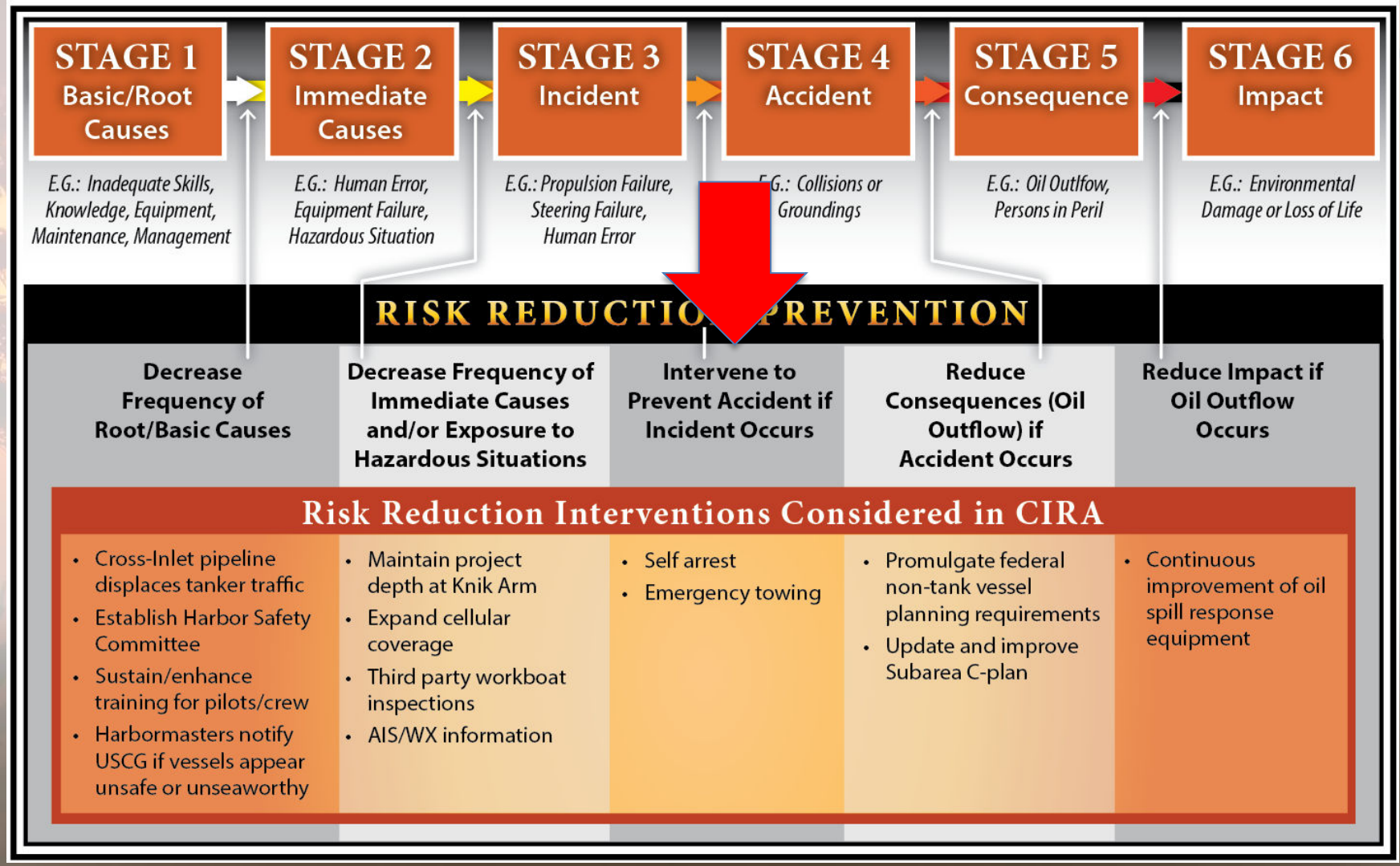
- Benefit/Cost Ratio 1 = breakeven
- Costs = Construction and operation of pipeline minus cost of tanker operations. Does not include Drift River.
- Benefits = value of spilled oil, cleanup costs, environmental damages, socioeconomic damages

Cross-Inlet Pipeline

Benefit Cost Ratio

Median Spills	One Large Spill	One Worst Case Spill
0.05	5.8	18.1

Prevent Incident From Becoming An Accident



Preventing Drift Groundings

Are tugs of opportunity sufficient to prevent a drift grounding in Cook Inlet?

Emergency Towing

- Estimate of minimum tug size
- Response times for existing tugs of opportunity
- Estimating the length of time a distress vessel might have before drifting aground

Emergency Towing

Scenarios

- Locations

Emergency Towing

Scenarios

- Vessels

Emergency Towing

Scenarios

- Weather

Environmental Condition (percentile)	Load Case					
	50th	50th	50th	90th	90th	90th
Region	Upper	Kachemak	Kennedy	Upper	Kachemak	Kennedy
Parameter						
Ice coverage (%)	0%	0%	0%	70%	0%	0%
Ice thickness (cm)	0	0	0	30	0	0
Current (kts)	3.8	0.6	1.8	5.2	0.8	2.5
Wave height Hs (m)	0.5	0.5	1.6	0.0	1.4	3.8
Wave period Tm (s)	4.6	4.6	5.6	0.0	4.8	7.7
Wind speed (kts)	7.4	7.2	12.2	14.9	17.1	25.8

Emergency Towing

Minimum Tug Size

- Task is to control disabled vessel, turn it and arrest its drift.
- Glosten estimates 30 MT bollard pull in non-ice
- More work is necessary to determine minimum tug in ice conditions

Emergency Towing

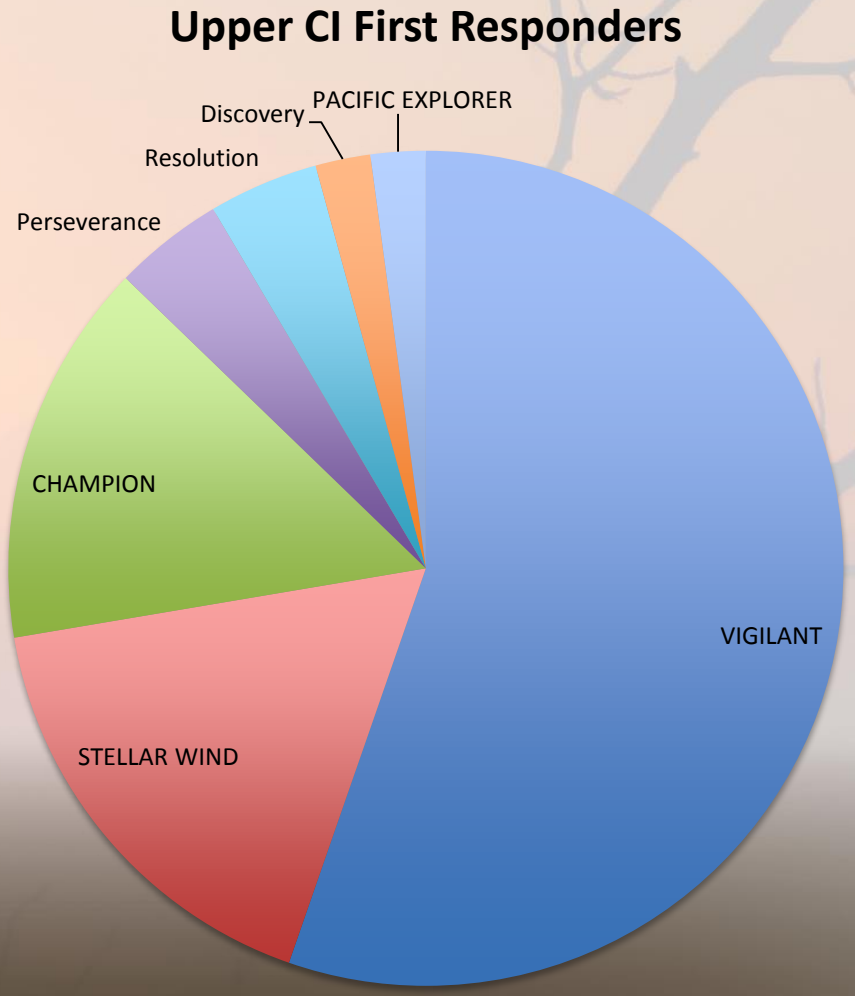
Tug of Opportunity

- Considering tow vessel locations once each week
- Vessels tow barge have to drop barge at port
- Calculate time to for a capable tow vessel to reach scenario locations

Emergency Towing

Upper Cook Inlet

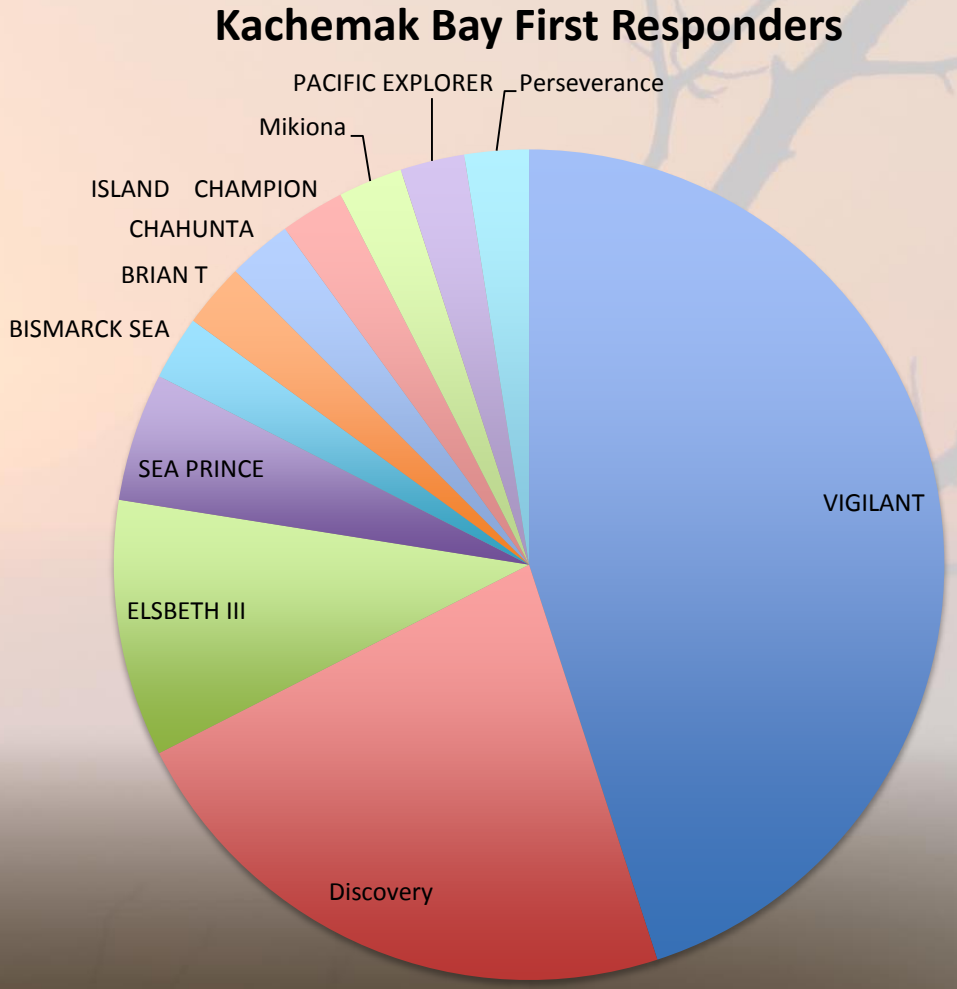
- Average = 3.6 hr
- Best = 2.2 hr
- Worst = 7.1 hr



Emergency Towing

Kachemak Bay

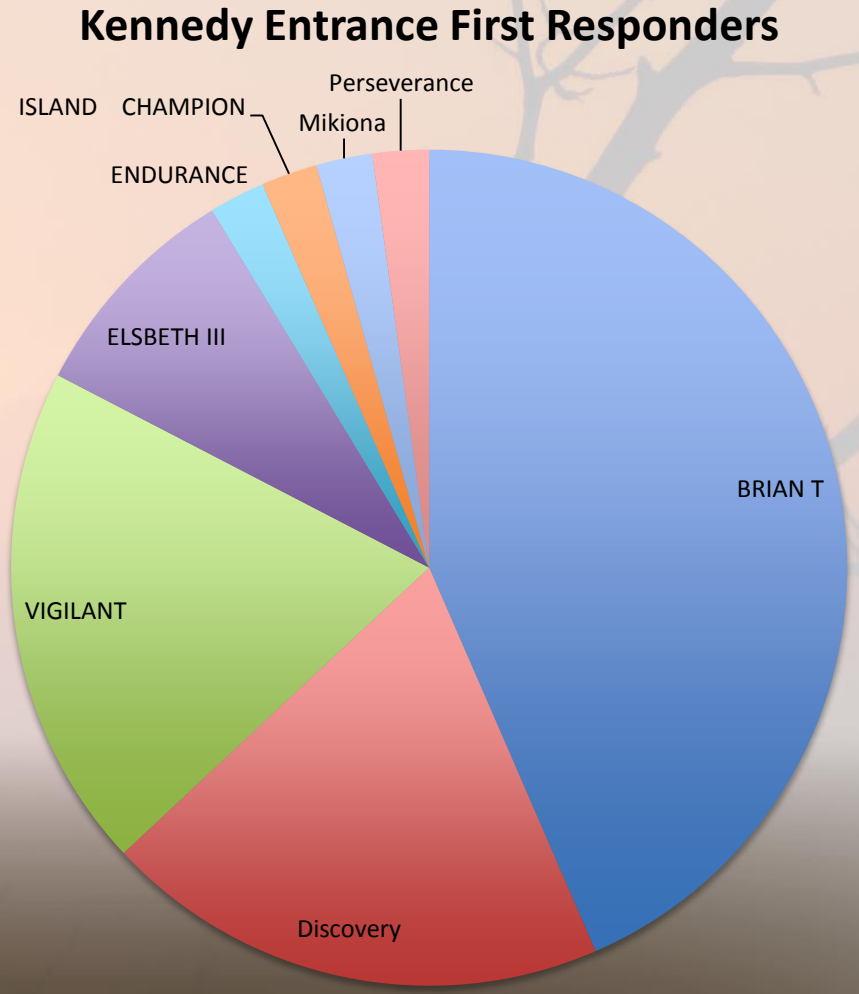
- Average = 5.4 hr
- Best = 2.6 hr
- Worst = 13.0 hr



Emergency Towing

Kennedy Entrance

- Average = 7.4 hr
- Best = 3.5 hr
- Worst = 10.2 hr



Emergency Towing

Tug of Opportunity

- One year snap shot
- Docking tugs, OSSV,and OSRV primary 1st responders
- Tugs in tow are not likely 1st responders
- 40% weeks no towing vessels south Anchor Pt
- 64% non-towing vessel without barge

Emergency Towing

Time to rescue

- Compile wind rose data; strength and direction
- Use 90th percentile wind
- Glosten estimate drift rate for containership for given winds
- Determine distance to hazard
- Calculate time to hazard

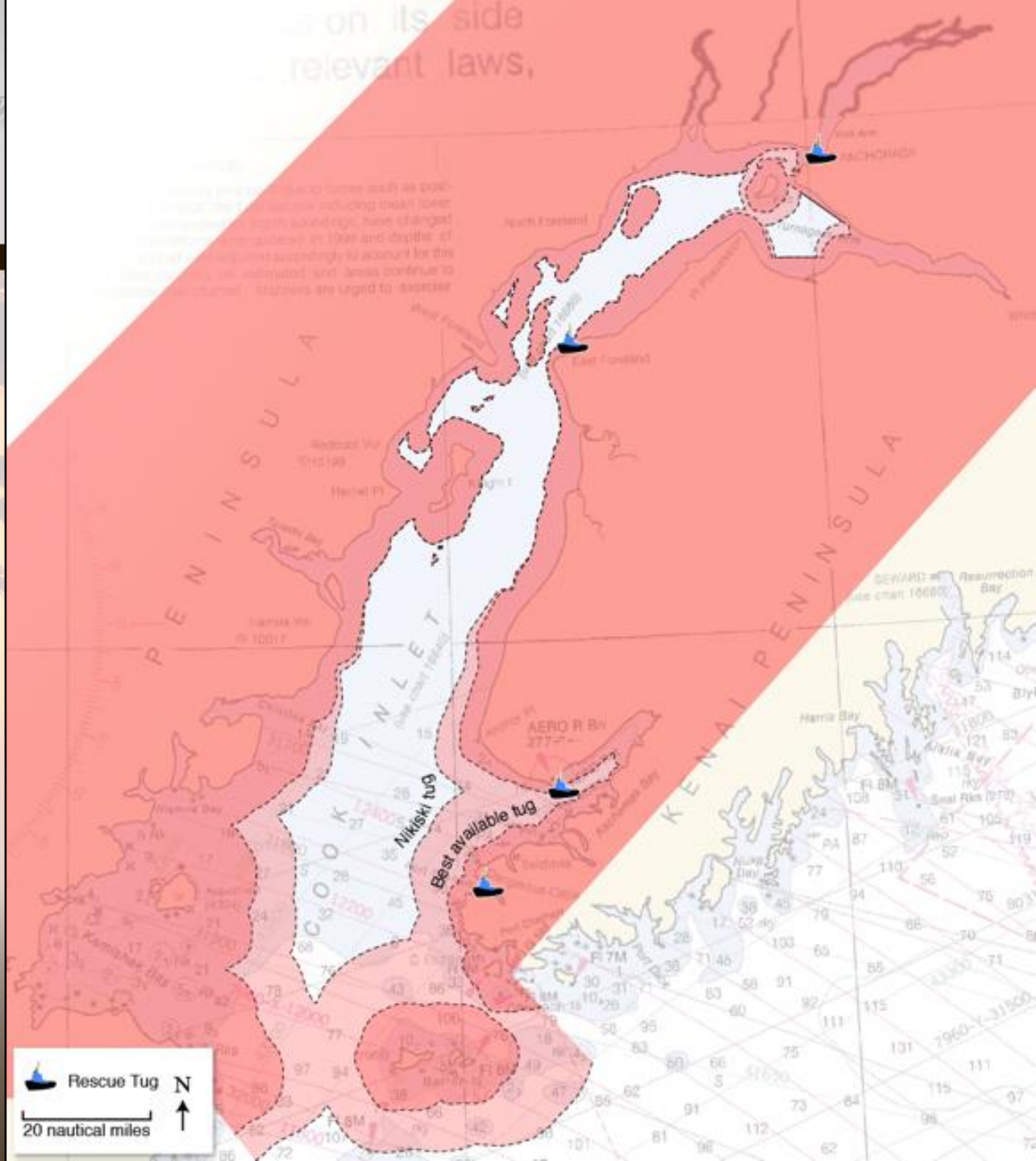
Emergency Towing

Time to rescue

Scenario Location *Hazard*	Wind speed (knots)	Distance to Hazard (NM)	Time to Grounding/ Impact (Hours)	Average Time for First Response Tug to Arrive (Hours)
Upper Cook Inlet				
Rocky shoal near Boulder Point	11	5.7	5.1	3.6
Granite Point Platform	7	5.7	6.3	3.6
Kachemak Bay				
Naskowhak Reef	14	2.3	1.3	5.4
Kennedy Entrance				
West Amatuli Island	16	7.2	3.3	7.4
Nord Island	17	8.5	3.6	7.4
Elizabeth Island	10	6.5	4.4	7.4

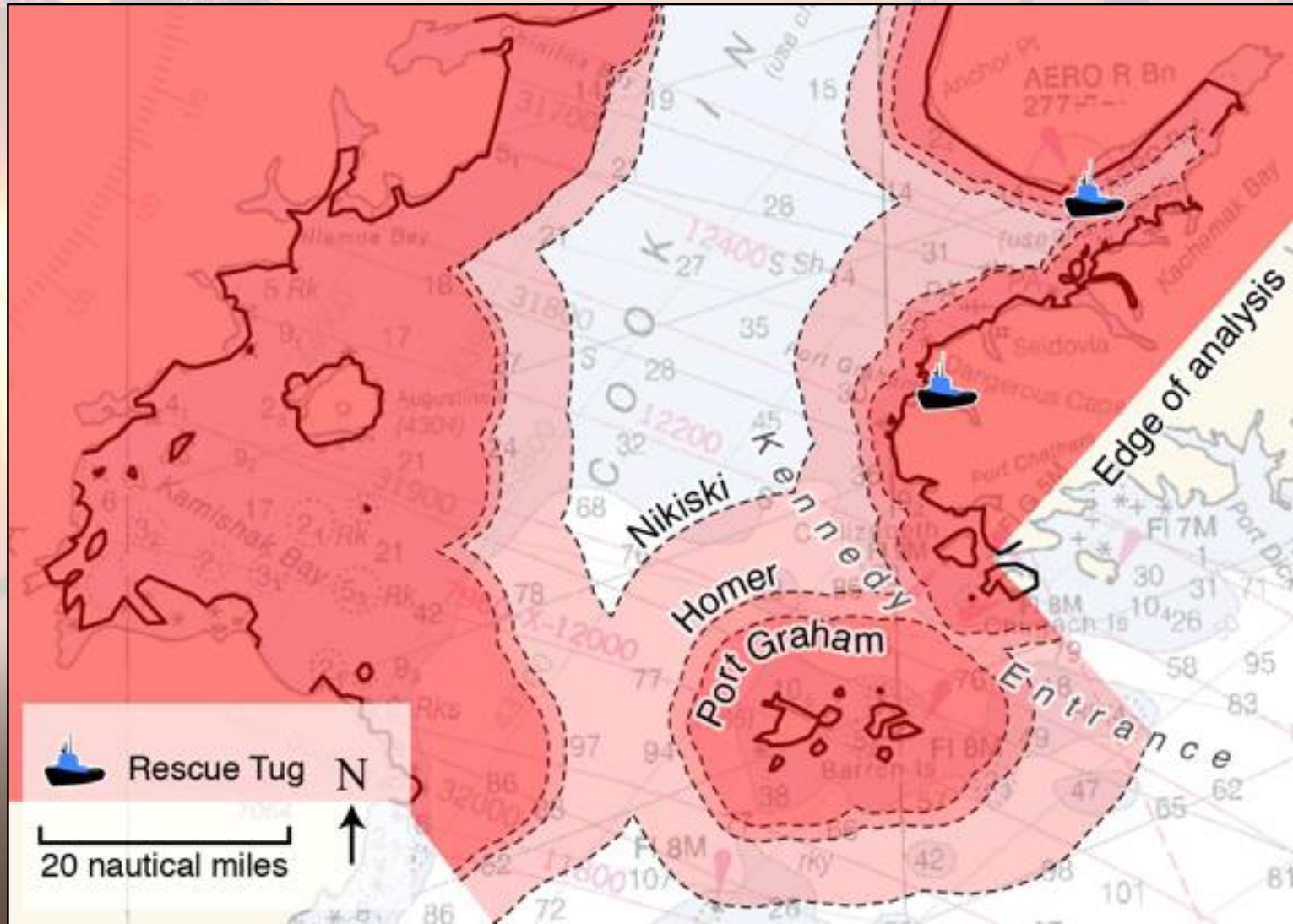
Cook Inlet RISK ASSESSMENT

Zone of No Save



Emergency Towing

Zone of No Save



Emergency Towing

Time to rescue

- Much of Cook Inlet is outside the ZONS
- Areas where the shipping lanes are inside the ZONS are:
  - Anchorage/Fire Island
  - Forelands
  - Kennedy Entrance
  - Kachemak Bay, if no tugs southern inlet

Towing

- ID likely first responder vessels and create TOO program
  - MOUs for emergency towing
  - AIS tracking and communication re: availability and location
  - Training and exercises
- Establish electronic monitoring program for deep draft vessels to facilitate prompt identification of distressed vessel

Towing

- Locate Emergency Towing System in Homer with regular exercises/drills
- ID highest standard of care and best practices for deep draft vessels in CI
- Encourage use of highest possible standard of care in areas where TOO rescue/self-arrest are less likely to be successful

Preventing Drift Groundings

Can ships self arrest using their anchor and prevent a drift grounding in Cook Inlet?

Self Arrest

- Glosten literature review
- Reviewer's disagree
- Dredging an anchor common docking maneuver

Self Arrest

- Continue quantitative study of the ability of large vessels to self-arrest in different parts of the Inlet (input from mariners, pilots, as well as experts in materials, simulations, and ship dynamics)

- Continue quantitative study of vessel rescue in ice (similar participation)

Training

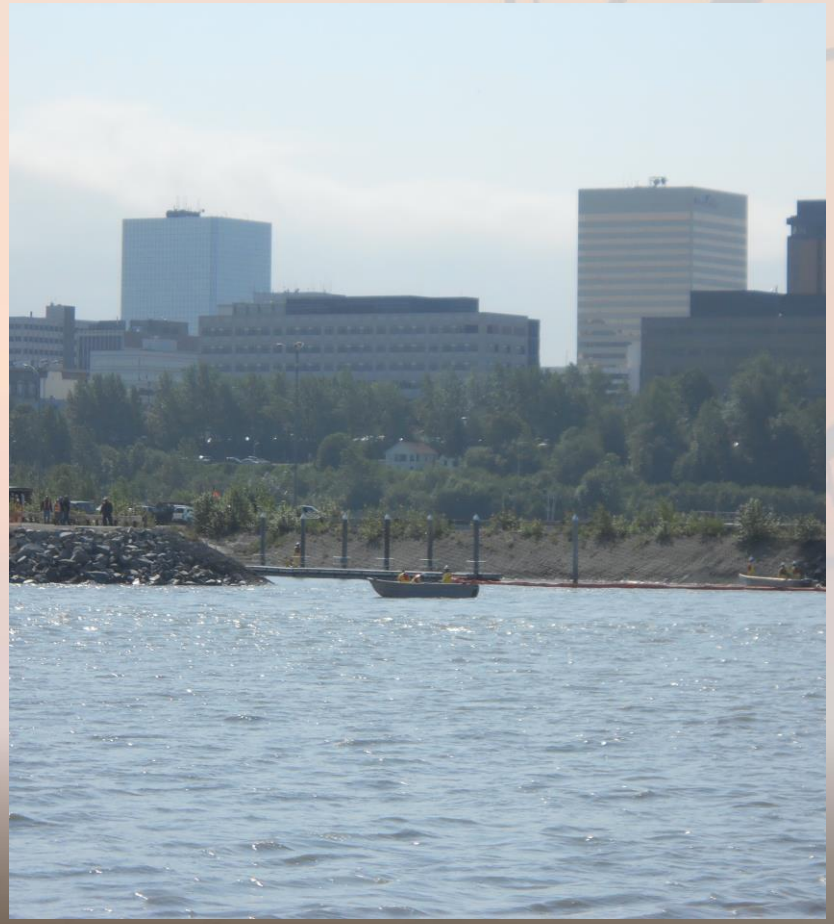
- Continued, sustained training for those operating vessels in Cook Inlet-specific conditions & locations (via simulators) is critical to safe operations
- The highest possible level of training should be achieved, including that offered by AVTEC
- Costs can be shared among companies

Notification Recommendation

- Harbormasters/port directors may turn away vessels they deem unsafe/unseaworthy
- Procedure should be identified in port/harbor SOPs & Alaska Clean Harbors program certification

Dredging Recommendation

- Upper Cook Inlet dredging should continue as needed to maintain project depth (mean low-low water of 43 ft.) through channel



Cellular/VHF Recommendation

- Cellular coverage should be expanded to enhance access to online information resources, though acknowledge the importance of ensuring that online access to email, etc. is not a distraction to pilots, others
- The USCG should expand VHF coverage so vessels of all sizes can communicate to shore in case of emergency

AIS/WX Recommendation

- AIS software companies should upgrade software to allow vessel operators to receive information transmitted via AIS on board
- The pilot broadcasts should be evaluated by vessel operators and this information used to inform long-term approach to this means of enhancing situational awareness
- AP agreed in 2013 that this should be tested, but tests were not feasible due to the inability of vessels to receive transmittals at this time

Workboat Recommendations

- Workboat operators in Cook Inlet should continue to use third party audits/inspections of their vessels and procedures to promote safe operations
- The workboat community should be represented in the HSC to facilitate identifying and addressing future issues if changes occur

Subarea C-plan Recommendation

- Subarea Committee should reconvene to expand and update plan as needed (USCG and ADEC co-chair)
- Planned to start Winter 2015

Spill Response Recommendation

- Response resources should be continually tested and assessed to validate and improve on effectiveness in Cook Inlet.
- The best available technology should be used for spill response.

Establish Harbor Safety Committee

- Precedent widely established around country
- Forum for waterway users to discuss safety and security issues
- Operates outside regulatory context
- Facilitate multi-stakeholder input
- Communication/coordination and/or policy recommendations
- Well-suited to ongoing issues and changing context

Proposed HSC Issues to Address

- Consider emergency towing and self arrest best practices
- Review and update winter ice guidelines *as needed*
- Consider enhanced ice monitoring
- Engage pilots, others in collaborative update to Coast Pilot

Proposed HSC Issues to Address

- Engage salvors, others in collaborative discussion of salvage and marine firefighting issues
- Update underwater obstruction database

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