



# 2<sup>nd</sup> Regional Table Top Exercise

Improved Disaster Risk Management for Caribbean Ports



**OAS** | More rights  
for more people



**CIP** | Inter-American  
Committee on Ports



**HudsonAnalytix**  
Complexity Made Simple™



### ENVIRONMENTAL

- ✓ Marine Emergency Planning
- ✓ Oil Spill Response Planning
- ✓ Regulatory Compliance and Planning
- ✓ Exercises, training, assessments



### SECURITY

- ✓ Terminals, Ports, Ships, Wind
- ✓ Command Control C2
- ✓ Regulatory Compliance and Planning, ISPS, MTSA
- ✓ Exercises, training, assessments
- ✓ Maritime Domain Awareness



### CYBER

- ✓ Enterprise-level strategy, investment and planning
- ✓ Capability assessments
- ✓ Regulatory Compliance
- ✓ Threat intelligence



### PORT & TERMINAL

- ✓ Port strategic investment and planning
- ✓ Port operations and process assessments
- ✓ Port governance advisory



## Consequence Management



Global



Innovative



Experienced



Integrated

# Introduction to Oil Spills

1. Background
  1. History of Oil Spills
  2. Roles, Responsibilities and Authorities and Funding
2. Planning
3. Preparedness
4. Management of Oil Spills
5. Scenario and Exercise Kick-off
6. Lessons Learned
7. Closing



# Background

PRESENT STATUS

CAPACITY BUILDING

WHAT IS POSSIBLE



## Goals and Objectives Exercise

- Train and exchange thoughts in a non-emergency environment
- What are our perceptions
- Collective input from experiences
- Continue to build your risk management arsenal!



# STARTING POINT

- IDENTIFICATION OF ROLES, AUTHORITIES AND RESPONSIBILITIES
- REGULATORY FRAMEWORK(S)/JURISDICTION(S)
- EXISTING INTERFACE WITH OTHER PLANS (I.E. DISASTER MANAGEMENT PLANS, ETC)
- SOURCES OF FUNDING
  - PRE-INCIDENT PLANNING AND PREPAREDNESS
  - INCIDENT RESPONSE.



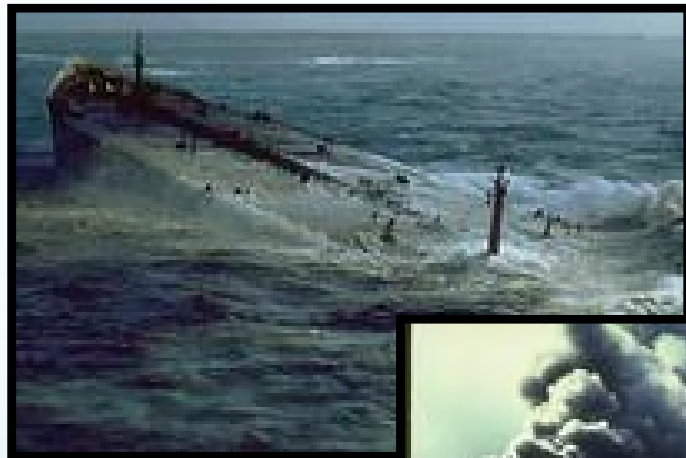
# Rate your Country Plan

Based on following indicators rate you country plan.

- a. Clear designation of responsibilities/authorities
- b. Environmental Sensitivity Mapping
- c. Resource Identification and Contracting
- d. Training



# History of Spills



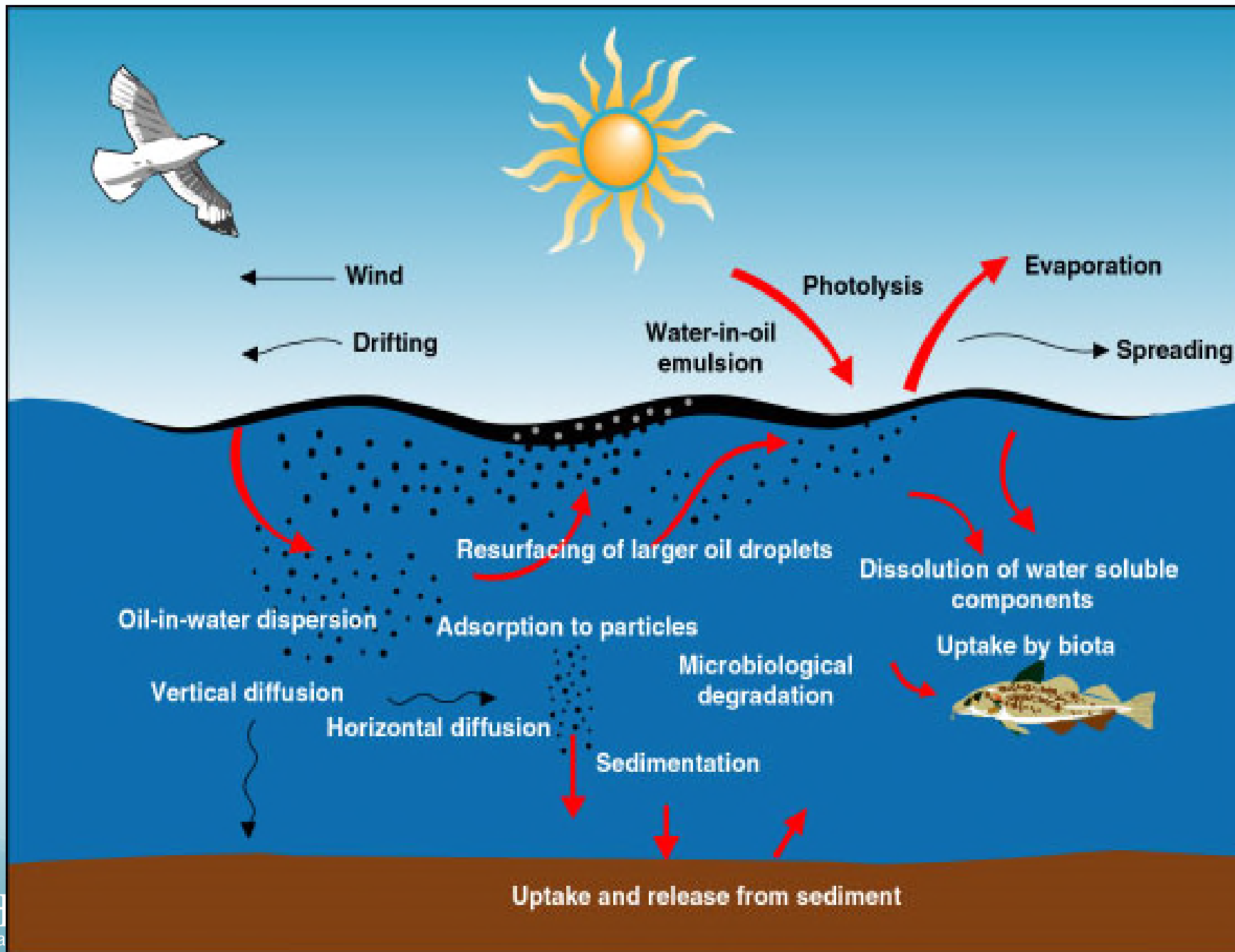


# FOUNDATIONS OF PLANNING

- ASSESSING YOUR RISK
  - LIKELIHOOD
  - CONSEQUENCES
  - FATE AND EFFECTS
- RESPONSE GOALS AND OBJECTIVES
- MAPPING OF SENSITIVE AREAS
- PRIORITIES FOR PROTECTION



# Fate & Effects of Spilled Oil



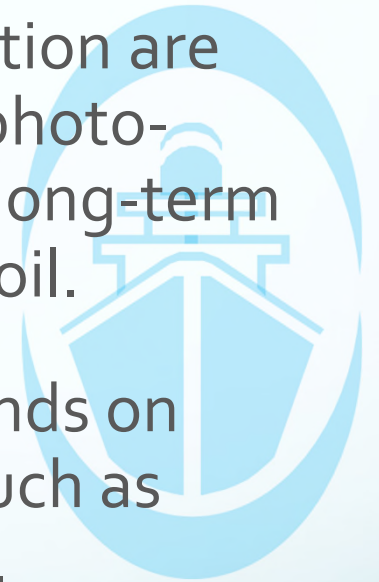
## Weathering of Oil on Water

- **Evaporation**- vaporization of certain fractions of the oil to the atmosphere
- **Solubility** – substance dissolved in water
- **Dissolution** – low molecular weight compounds are lost by the large volume of water.
- **Dispersion** – Spreading out into the water column
- **Emulsification** – Mixture of oil and water forming a stable mixture that is very difficult to break
- **Oxidation** – O<sub>2</sub> added to the compound forming an “oxide”
- **Sedimentation** – Sinking of petroleum products due to evaporation or adhesion to other mineral products’
- **Biodegradation** – The natural breakdown of hydrocarbons by bacteria and other micro organisms



## Fate & effect - Summary

- Once spilled, oil begins to weather and its physical and chemical characteristics change over time.
- Spreading, evaporation, dispersion and emulsification are important in the early stages of the spill whereas photo-oxidation, sedimentation and biodegradation are long-term processes that determine the ultimate fate of the oil.
- The speed with which these processes occur depends on weather conditions and characteristics of the oil such as specific gravity, volatility, viscosity and pour point.



# PRIORITIES FOR PROTECTION

- COMMERCE
- CRITICAL LOCAL OPERATIONS
- MILITARY
- TOURISM
- ECOSYSTEM



# PREPAREDNESS



# ELEMENTS OF PREPAREDNESS

- PLAN MAINTENANCE
- RESOURCE MANAGEMENT
  - OIL SPILL RESPONSE CONTRACTORS
  - SUBJECT MATTER EXPERTS
  - INCIDENT COMMUNICATIONS PLAN
  - STAKEHOLDER COMMUNICATIONS
  - THIRD PARTY IMPACTS
  - COOPERATIVE RESPONSE RESOURCES



# ELEMENTS OF PREPAREDNESS, cont.

- MAINTENANCE OF EQUIPMENT, INTERNAL AND EXTERNAL
- TRAINING, DRILLS AND EXERCISES
- DOCUMENTATION FRAMEWORK
- COST TRACKING AND FINANCE





# ELEMENTS OF PREPAREDNESS, cont.

- ARRANGEMENTS WITH GOVERNMENT OWNED REFINERIES AND FACILITIES
- VESSELS OF OPPORTUNITY POLICY
- VOLUNTEERS POLICY
- WILDLIFE RESCUE POLICY



# What can you do to best protect your interests?

- Before an incident
  - Systems and procedures are in order
  - Personnel are trained
  - Records onboard are in order
- When an incident occurs:
  - Get professional people on-scene immediately
  - Ensure (insist upon) full coordination between your Spill Manager and Emergency Management Team, legal and insurance representatives and your organization



## SCENARIO

### Incident brief:

At 0900LT a collision between a 100k ton bulk carrier and a 200k ton crude oil tanker occurred 16 miles south of nearest land. The tanker is dead in the water and drifting away from shore. The port #2 wing tank was punctured releasing an initial estimated 125 MT of crude oil to the sea. The bulker's bow was damaged but the vessel is not in danger nor leaking oil and is standing by to render assistance as necessary.

### Conditions:

- Clear skies, visibility 15 miles, Easterly wind 10 knots, sea state 2. Air Temp 30 C, Sea temp 27C
- Sunset 1729LT
- Sunrise 0555LT

## What can be done?

**Minimize and Mitigate through  
Management**



## RESPONSE ACTIONS WHEN THE SPILL OCCURS

- INCIDENT AND CRISIS TEAM ACTIONS
  - FACILITATE EMERGENCY TEAM
  
  - ASSESS RISK
  
  - DEVELOP MITIGATION STRATEGIES
  
  - IDENTIFY 'OPPORTUNITIES'
  
  - LOOK AHEAD



# Effective Incident Management

- Effective incident management means:
  - Initial Response on scene
  - Operational Management
  - Environmental Damage Mitigation
  - Financial Management
  - Claims Management
  - Team --Critical Interfaces



## Characteristics of a Successful Response

- Timeliness
- Reporting
- Goal Setting and Achievement Measurement
- Fiscal Management
- Identification and Control of Exposures



# Overall Management of Oil Spills

## Systematic Approach

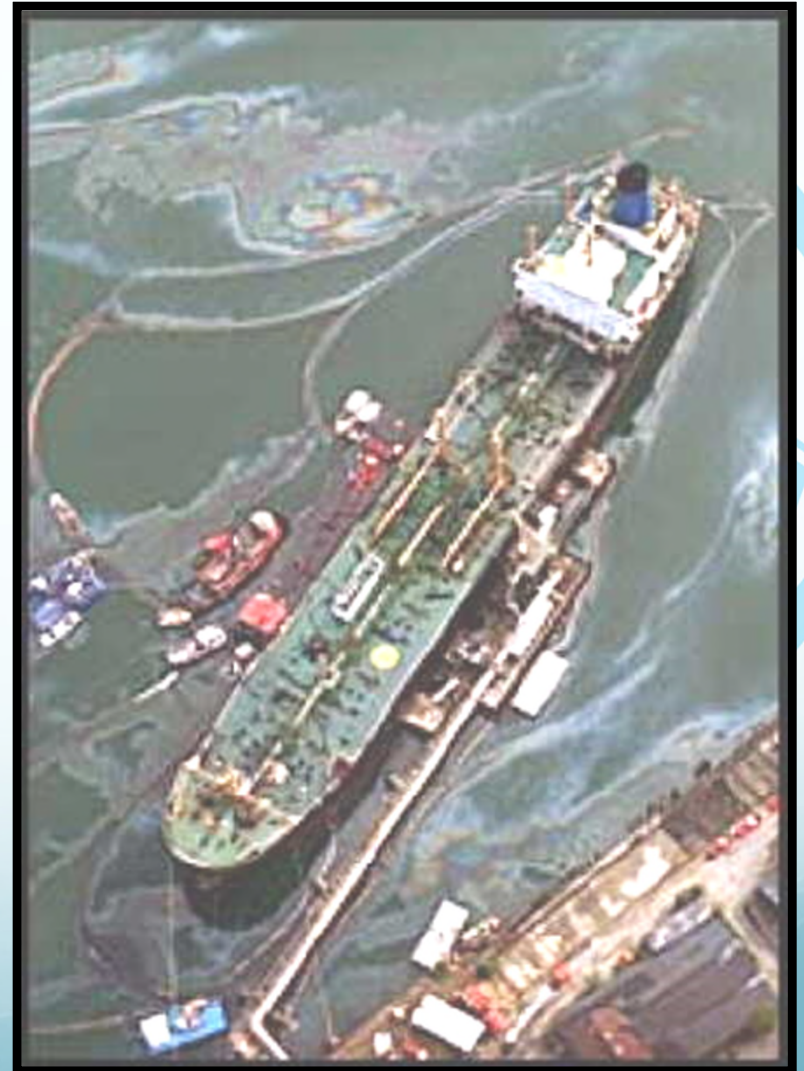
- Streamlined Decision Making
- Effective Team work
- Efficient use of Resources

*Managed Mutual Response  
Goals*





# What are your priorities?



# Strategies & Tactics

Objective

Desired Outcome

Strategy

How is the objective going to be achieved?

Tactics

What equipment, what amount, where and when is it needed, who will be performing the work

# Strategies & Tactics

## **Strategies**

Based on the objectives set by the command strategies for achieving those objectives are necessary.

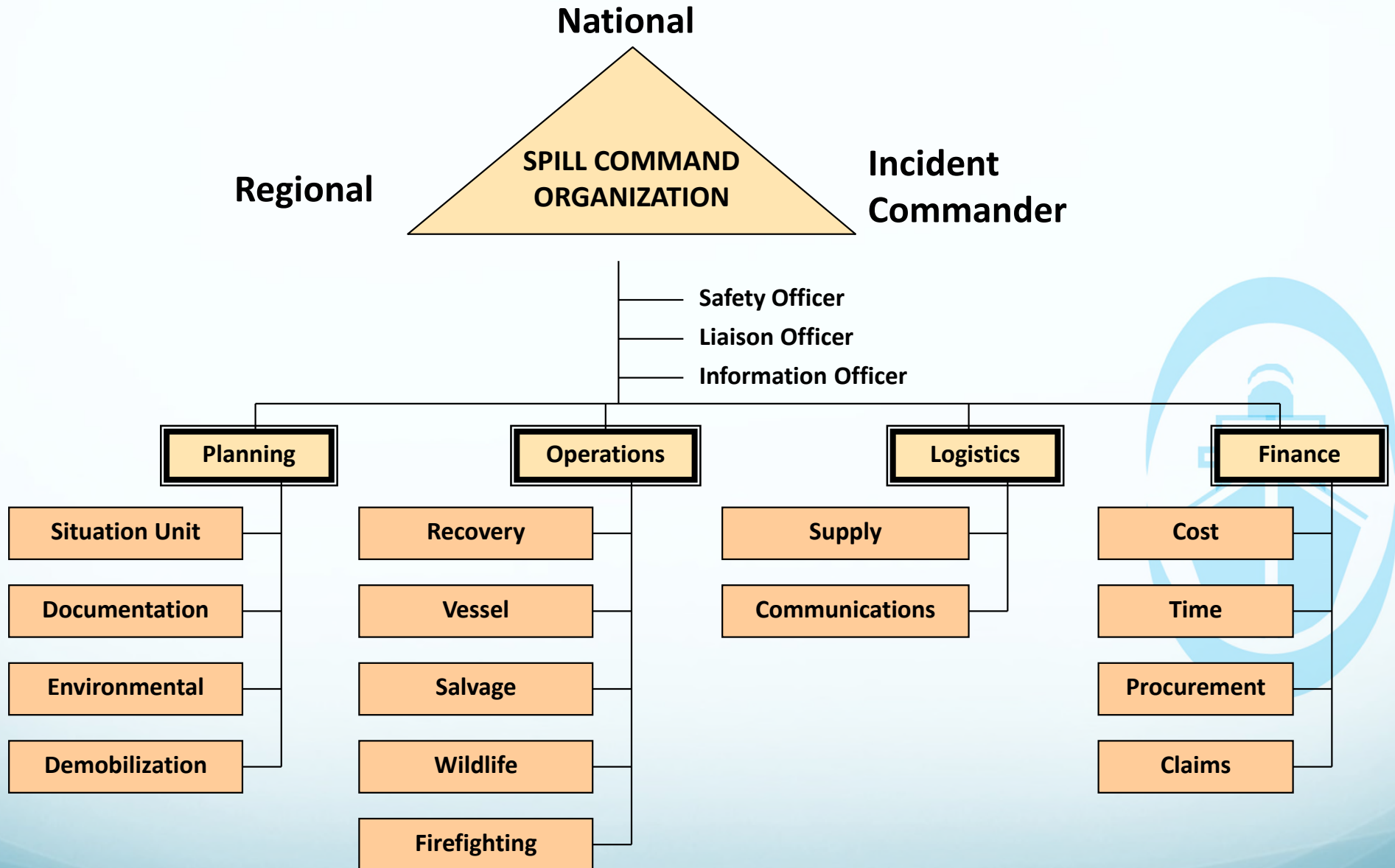
If the Objective is the desired outcome the strategy is the HOW of how are we to achieve that desired outcome.

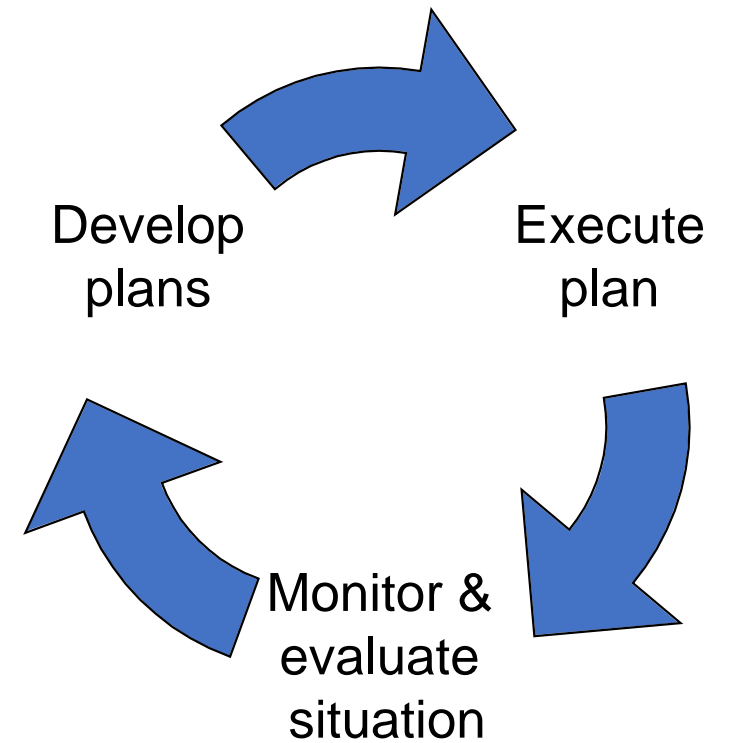
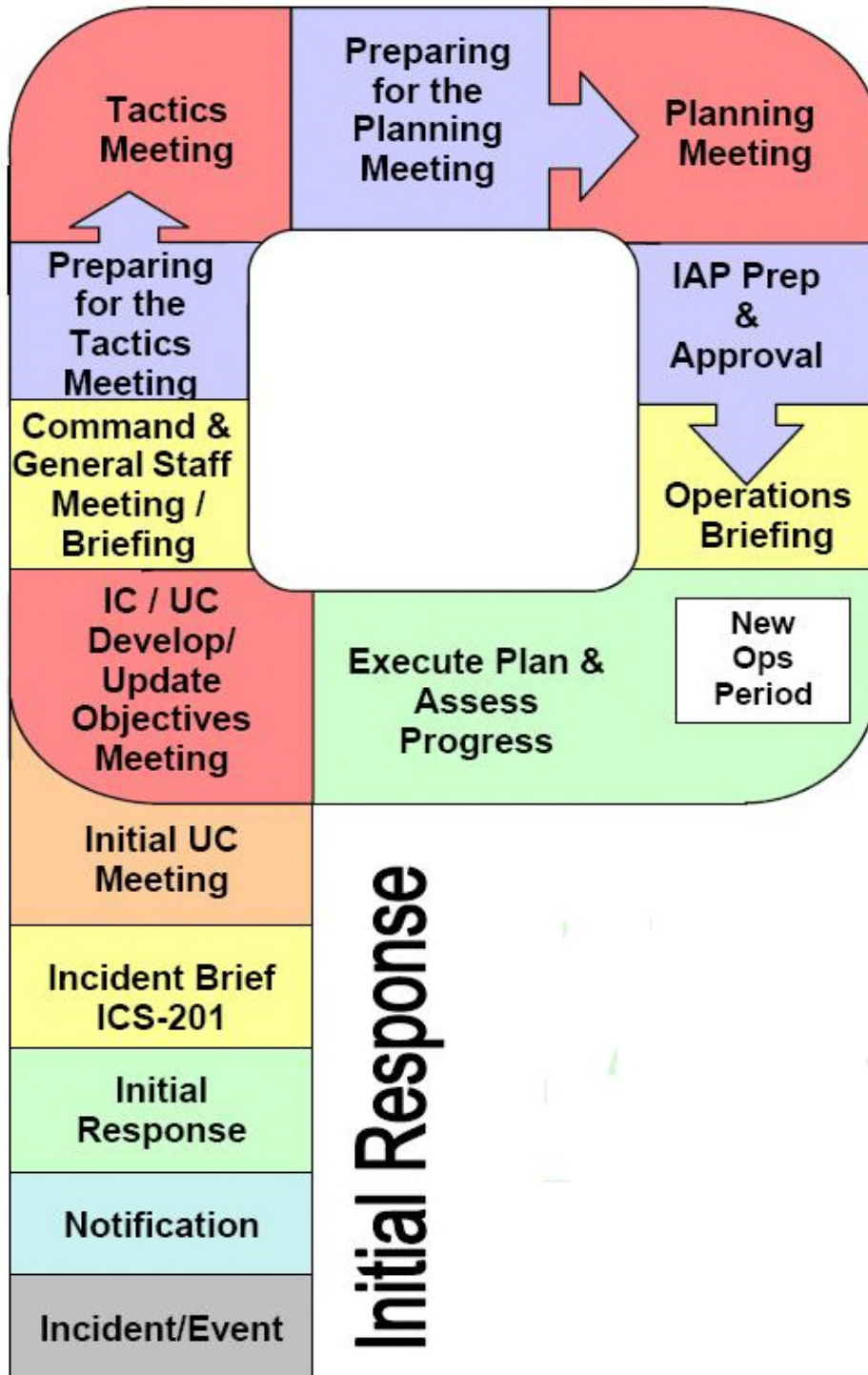
## **Tactics**

The tactics are the Who, What, Where, When of the HOW question. What equipment and what amount, where is the equipment needed, when does it need to be there and who will be working the specific task(s)

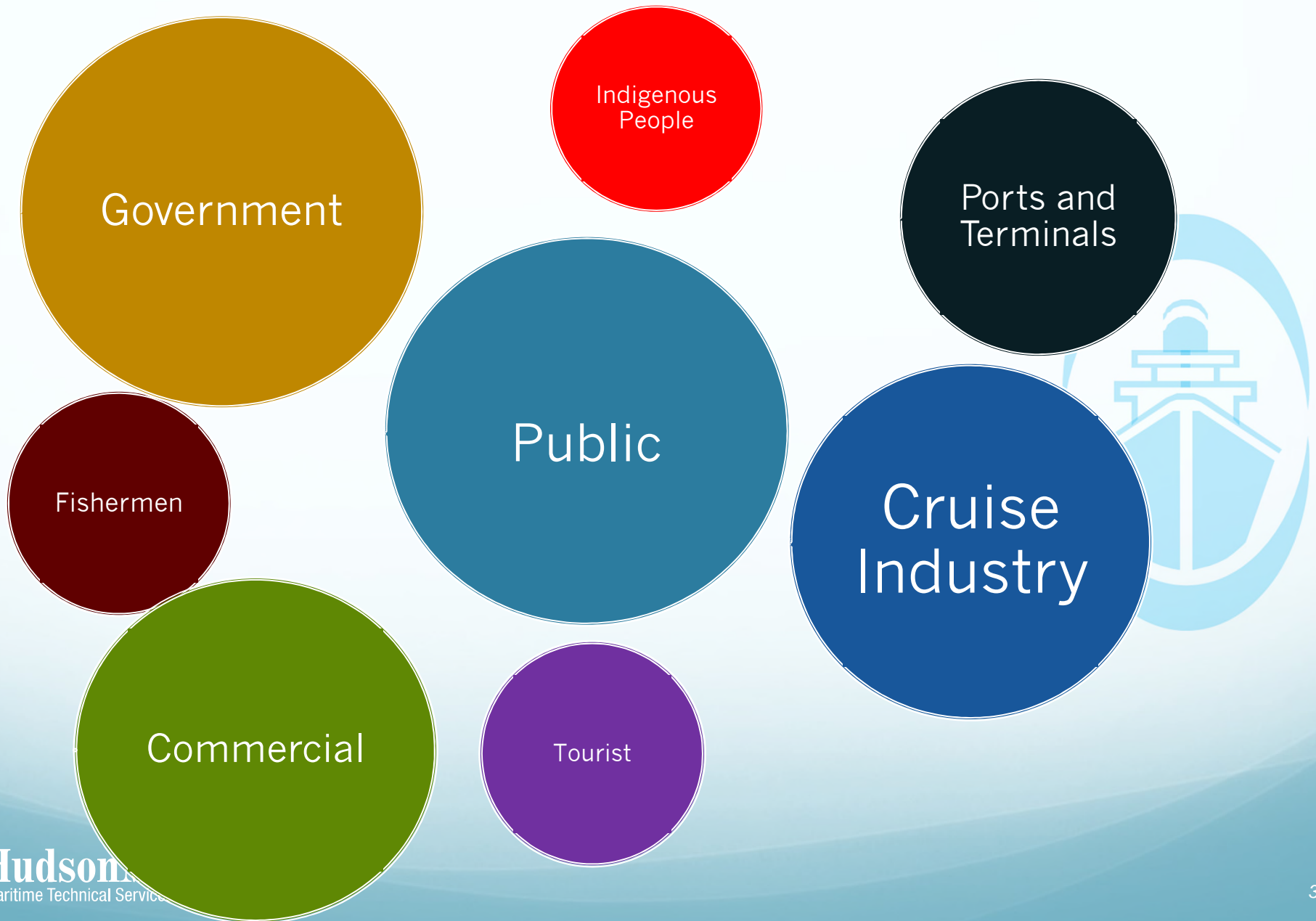


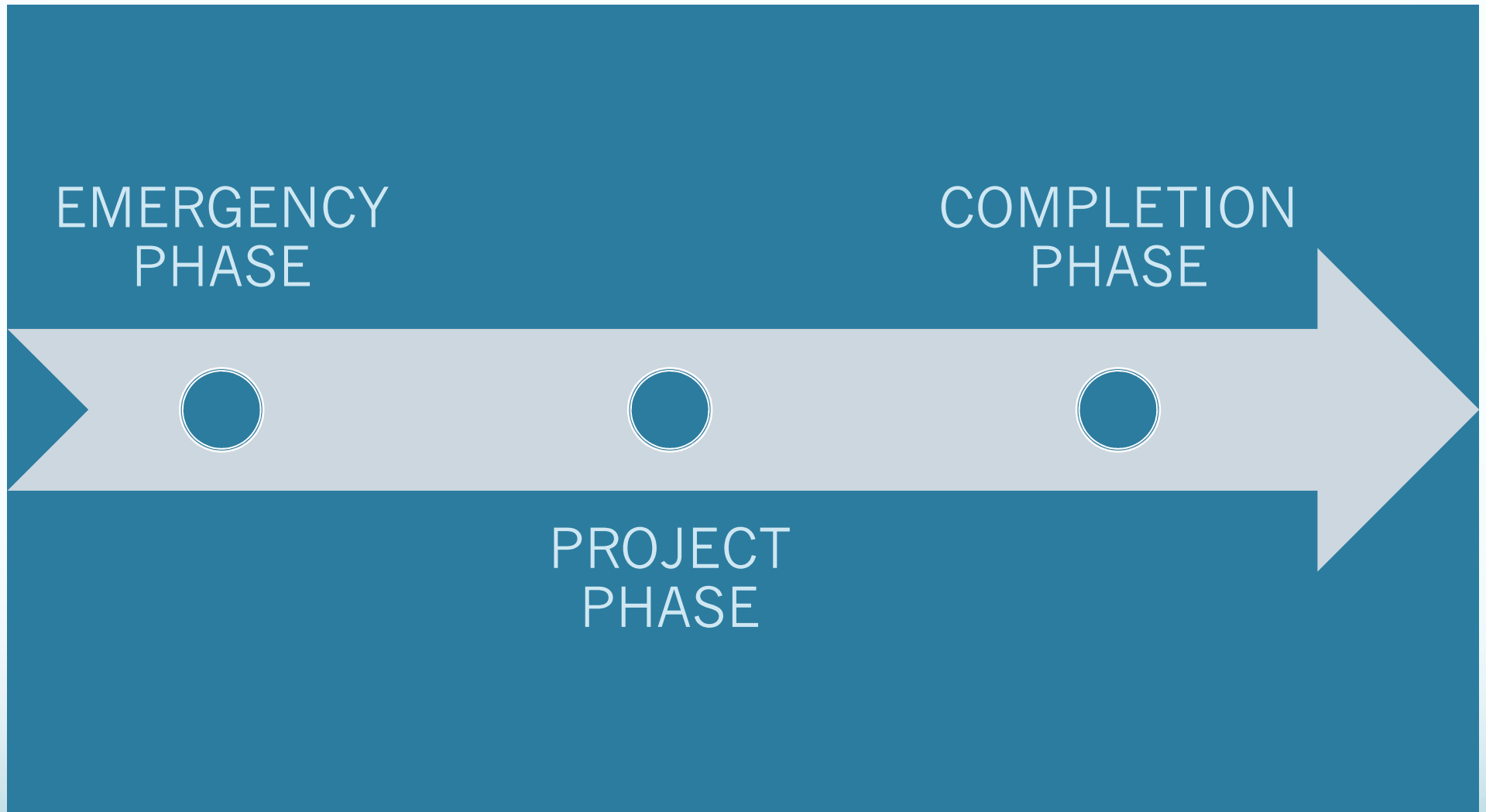
# SPILL COMMAND ORGANIZATION





# Stakeholders





## Results

- Cost savings
- Earlier Case Closure---Return to Normal Business
- Defined Case Parameters
- Reputation Management



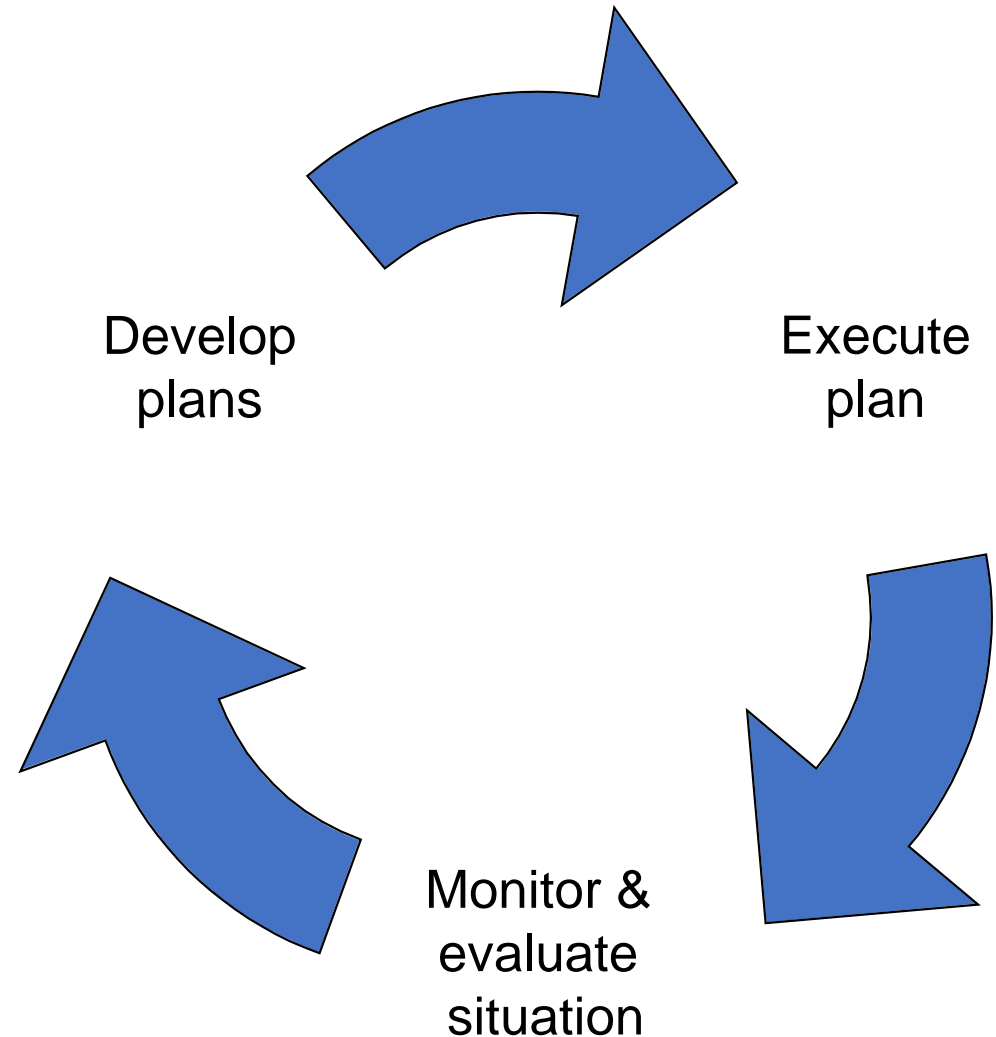
**A properly managed incident can be a success for all stakeholders**



# Response elements

## Planning cycle

- Operational period established
- Cycle occurs each operational period
- Decisions based on actual results and situational updates



# Response elements

- Monitoring
  - Provides status update of spill and recovery action progress
  - Timely validation of response strategies
  - Multiple monitoring activities should be utilized
    - Onsite
    - Aerial Observation
    - Remote sensing

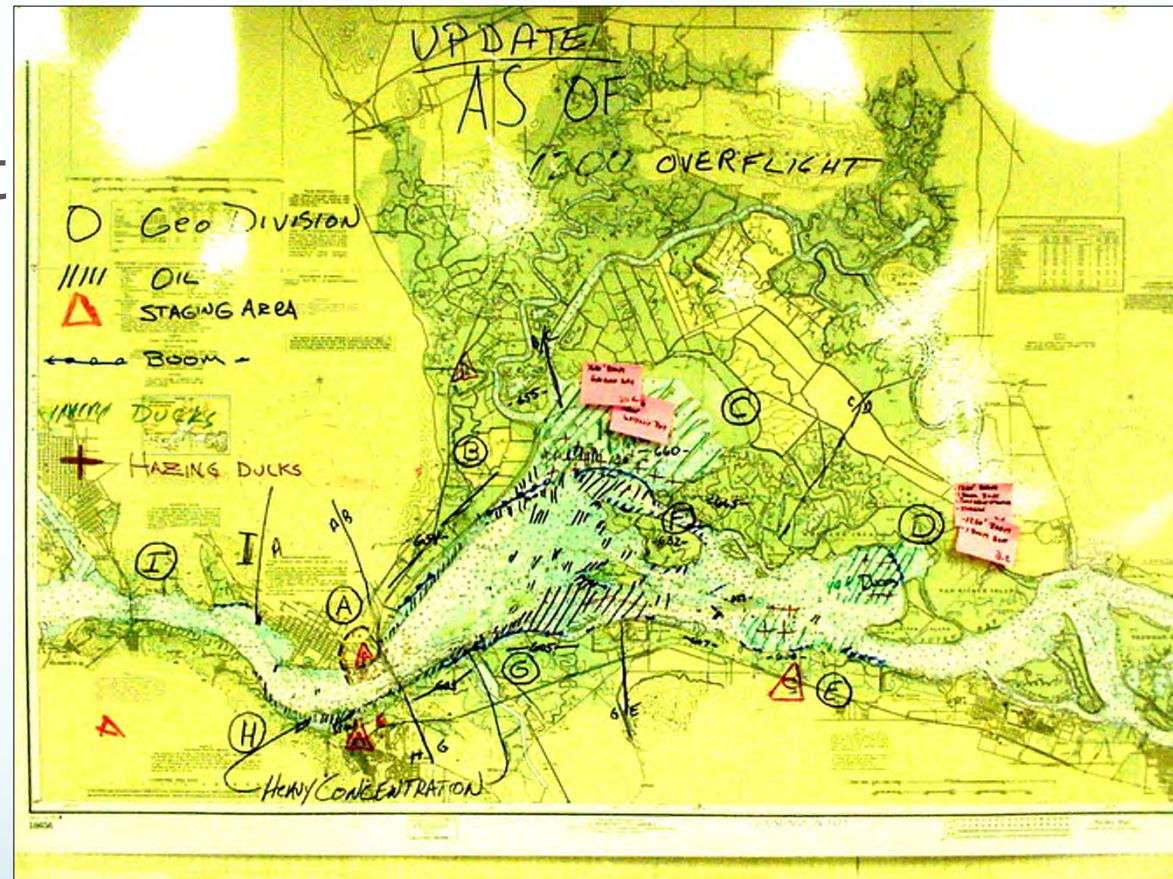
## Initial General Tasks

- Gather Information
  - Latest Status of Response
- Determine Resource Status
  - **Assigned**
  - **Available**
  - **Enroute/ On Order**
- Review Response Plan



## Sources of Information

- Situation Display
- Incident Briefing Report
- Previous plan
- Resource Tracking
- Ops-Plan Worksheet



## Spill Response Duties

### General Tasks

- Establish organization
- *Conduct Regular Section Briefings*
- *Establish Priorities and coordination within Section to Planning Process*
- Establish Comms with Field Div & Grp
- Coordinate with Documentation Unit for forms, reports, and records



## Initial Response Checklist

- Safety of Personnel (Is anyone Injured?)
- Establish Safety & Security Zone
- Stop the Flow
- Initial Assessment & Containment
- Notification
- Continue Assessment & Containment



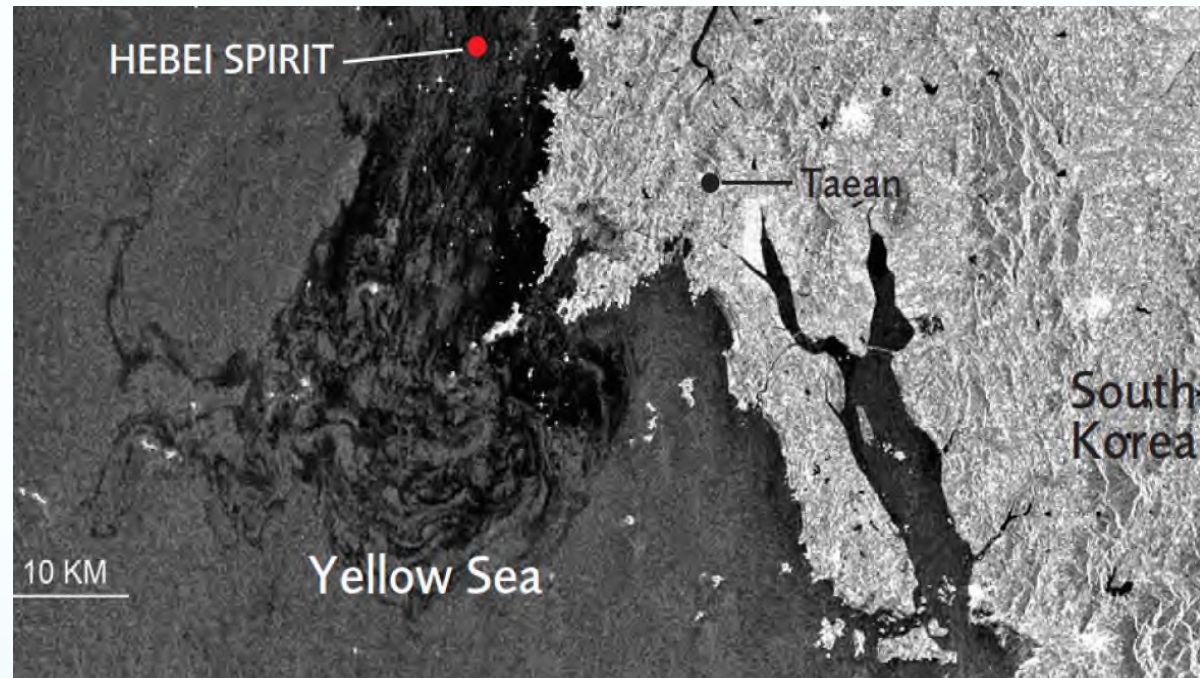
## Response elements

- Aerial Observation
  - Helicopter / Airplane
    - ◆ Cover large areas
    - ◆ Observe sea at oil
    - ◆ Can direct response resources
    - ◆ Radar tracking capability
  - Limitations
    - ◆ Viewing from a distance
    - ◆ Range and weather



## Response elements

- Remote sensing
  - Infrared
  - Regional coverage
- Satellite imagery
  - Overall context
  - No weather limitations
  - Delay in receipt possible



Courtesy of European Space Agency (ESA)



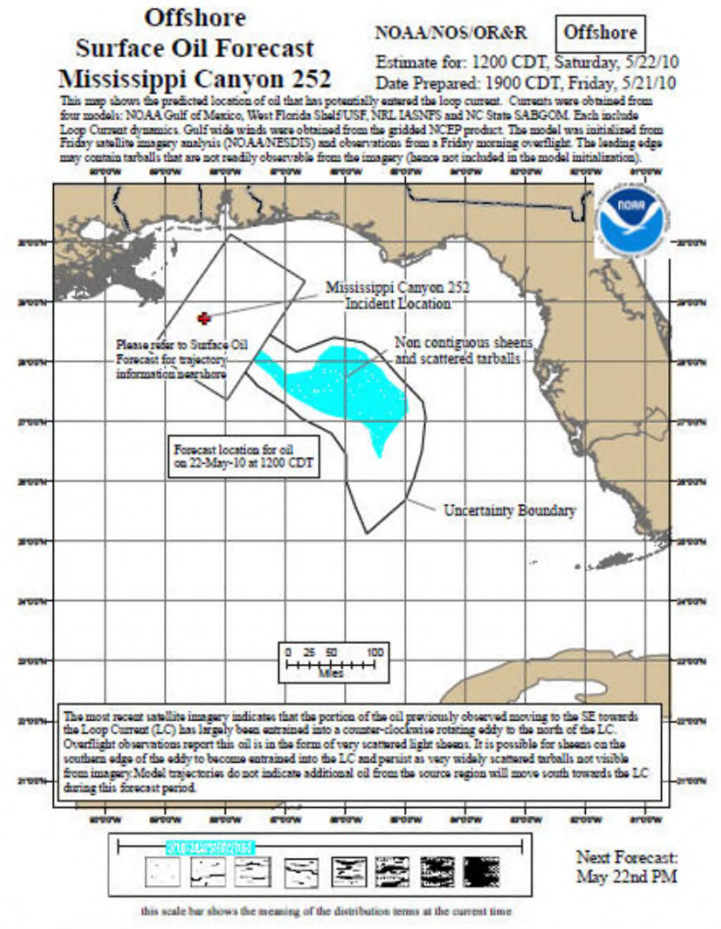
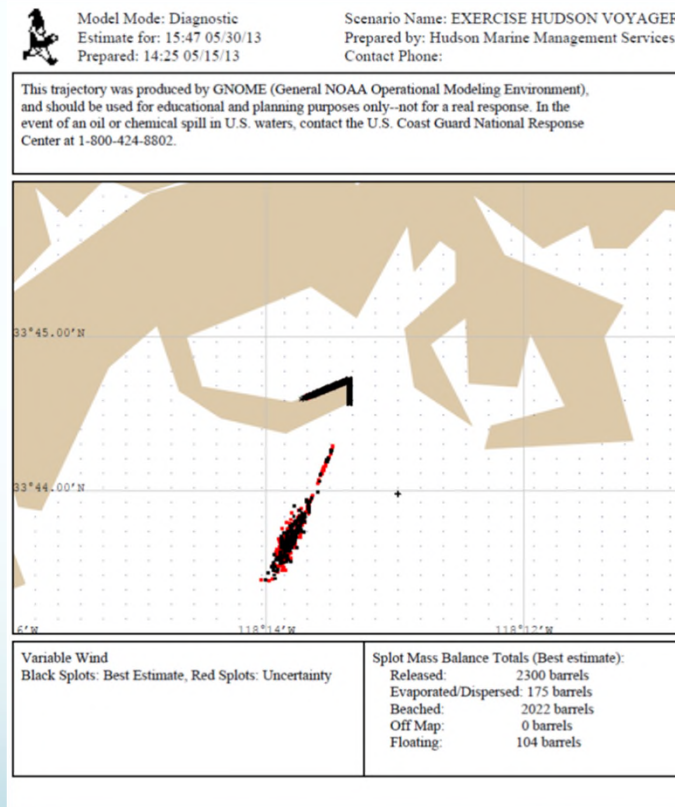
## Response elements

- Trajectories

- Shows where the oil is likely to move based on;
  - ◆ Oil type
  - ◆ Actual and forecasted weather/currents, tides
  - ◆ Mechanical and natural removal
- Used in the planning process for deployment and positioning of response equipment
- Used to protect environmentally, economic sensitive sites



## Trajectories



# SAFETY



# Safety Issues on an Oil Spill



# Safety Issues on an Oil Spill

What's the Appropriate Personnel Protective Equipment on the Job?



# Safety Issues on an Oil Spill

## Boating Safety

- PFD always required when in the boat. off shore life vests, buoyancy vests, float coats, mustang suits.
- PFD must be worn when working on boats or as a general rule, when near water.



# Safety Issues on an Oil Spill

## Site Safety Plan = Site Control

- Develop the Plan Immediately
- Isolate/control and Identify the Hazards!
- Get a person to create a Safety Plan
- The SSP Objectives are Simple:
  - **KEEP WORKERS SAFE**
  - **MINIMIZE CONTAMINATION OF WORKERS**
  - **PROTECT THE PUBLIC**
  - **PROTECT THE ENVIRONMENT**

*Reminder – The HAZWOPER standard requires the use of the Buddy System*



## Initial Site Safety Plan

Safety Plan used to Characterize & Control Response Safety:

- Who is in charge
- What the hazards are
- What to do if something goes wrong during the initial response effort
- Control of the site
- Monitoring & PPE Requirements
- Decontamination Procedures



As a responder what information is important to you?



# Safety Issues on an Oil Spill

## Primary Hazards of Spilled Oil Products

### ■ Vaporization

- Vapors are flammable
- Vapors displace Oxygen
- Some Vapors are Toxic

- Contact – absorption by the skin and eyes.
- Ingestion – Don't eat it
- Injection - Clean all cuts
- Inhalation – Breathing toxic vapors



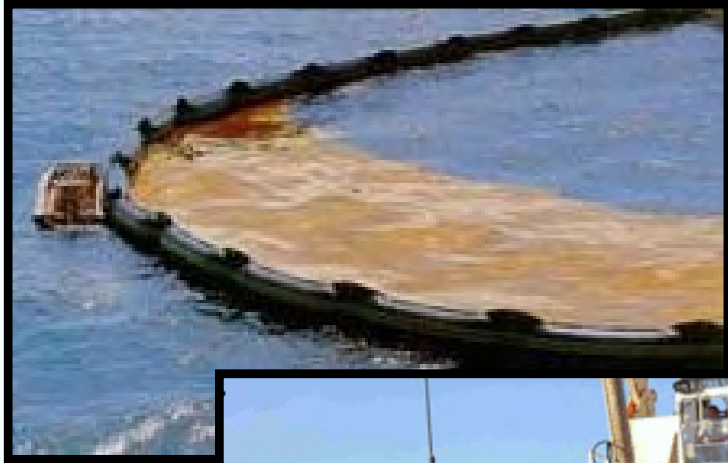
Physical hazards associated with slippery surfaces

# Safety Issues on an Oil Spill

- Safety of Personnel (Is anyone Injured?)
- Establish Safety & Security Zone
- Stop the Flow
- Initial Assessment & Containment
- Notification
- Continue Assessment & Containment



# Containment and Recovery



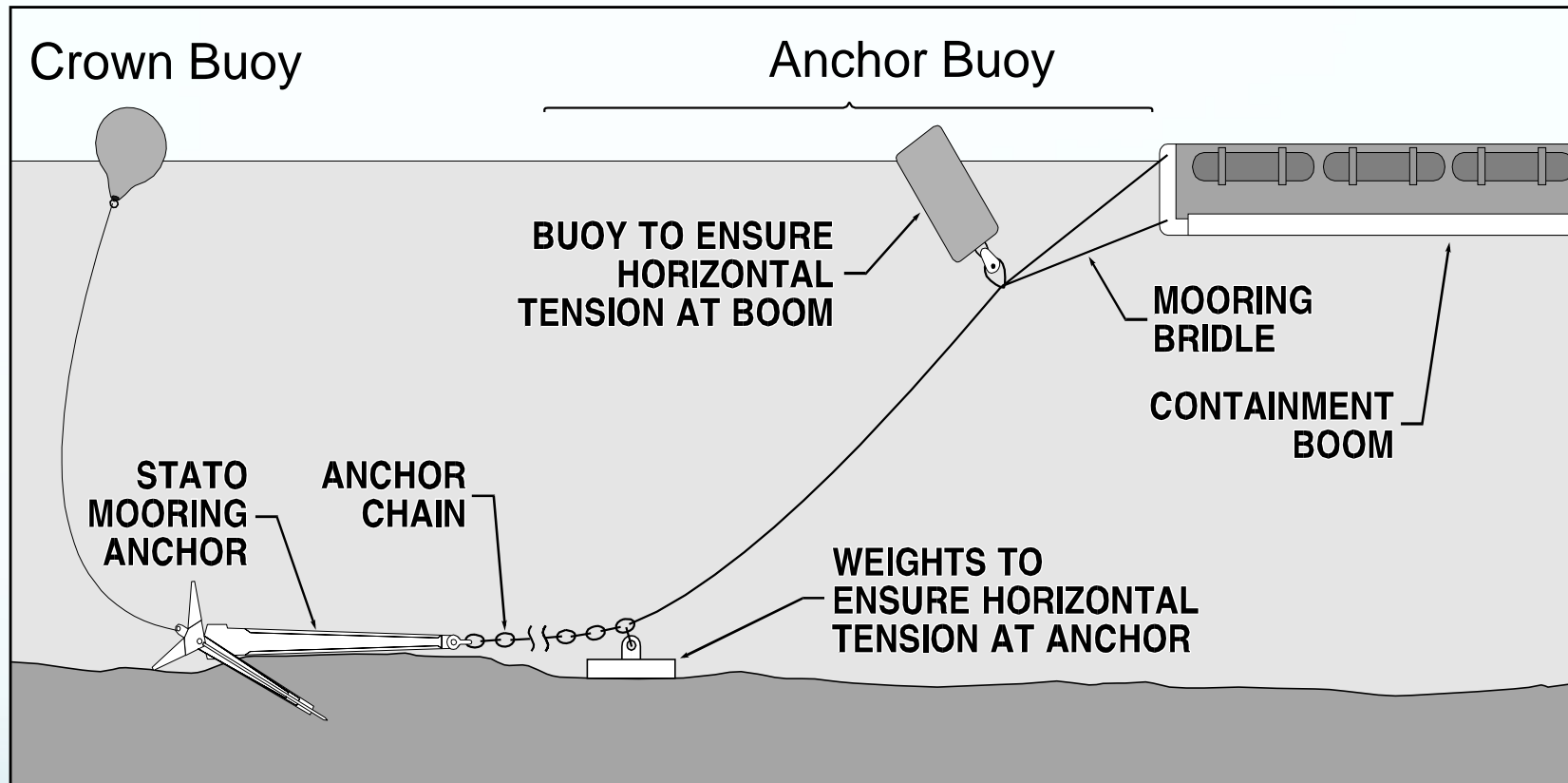
# Containment and Recovery

## Types of Boom

- Internal Foam Flotation
  - Self-Inflatable
- Pressure-Inflatable
- Fence
- Specialty Booms
  - Shore Sealing
  - Swift Water
  - Trawl



# Containment and Recovery



**Typical Mooring Arrangement.**

SOURCE: U.S. NAVY

# Containment and Recovery

## Fence Boom



## Inflatable Boom



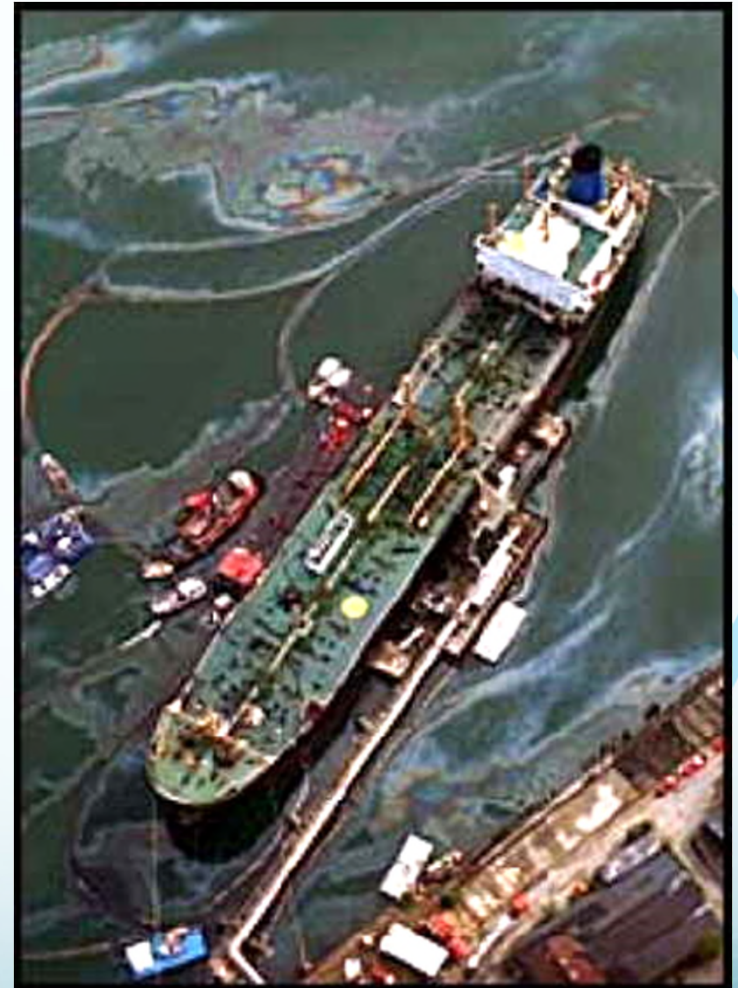
# Containment and Recovery

## Sorbent Booms



# Containment and Recovery

## Vessel Containment





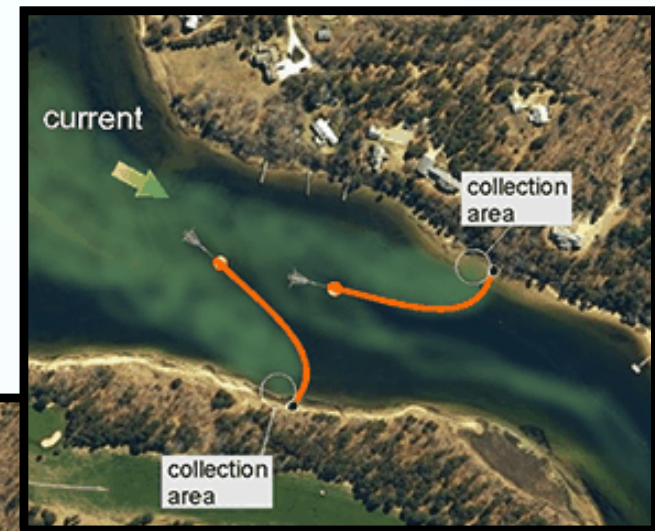
# Containment and Recovery

## Prevention Booming



# Containment and Recovery

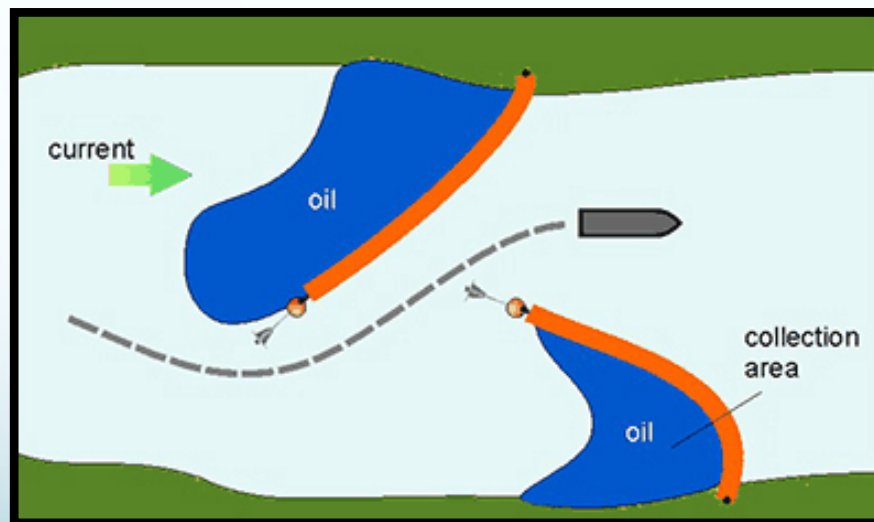
## Diversion Booming



# Containment and Recovery

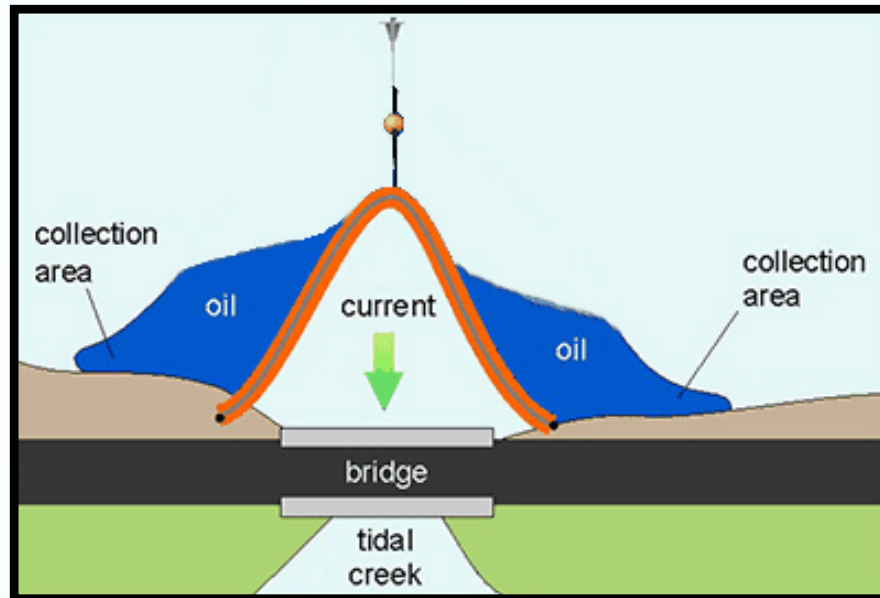
## Staggered Chevron Booming

A **staggered chevron boom** configuration can be used in areas with strong currents to remove, intercept, deflect, or move a slick towards a more desirable recovery site.



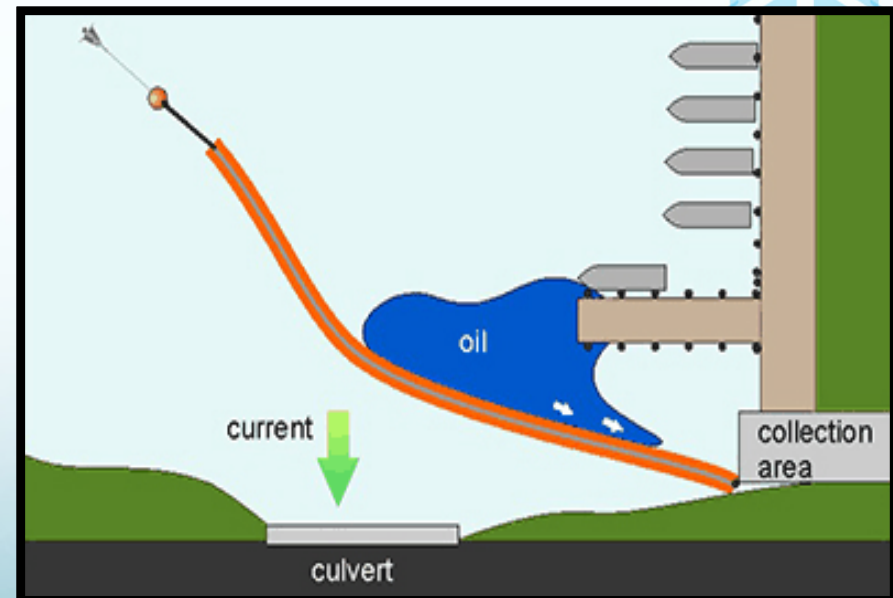
Deflection Staggered Chevron collection allows Boats to pass

# Containment and Recovery



Exclusion Booming at the entrance to a river or creek

Deflection Booming alongside a dock or pier



# Containment and Recovery

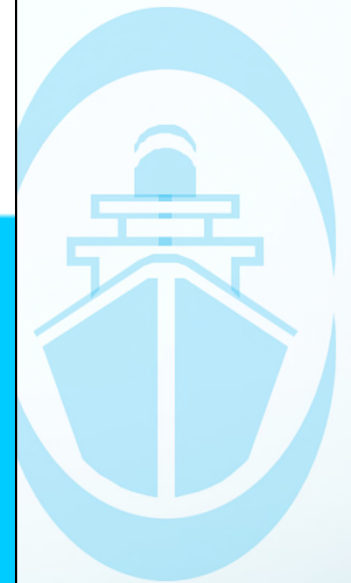
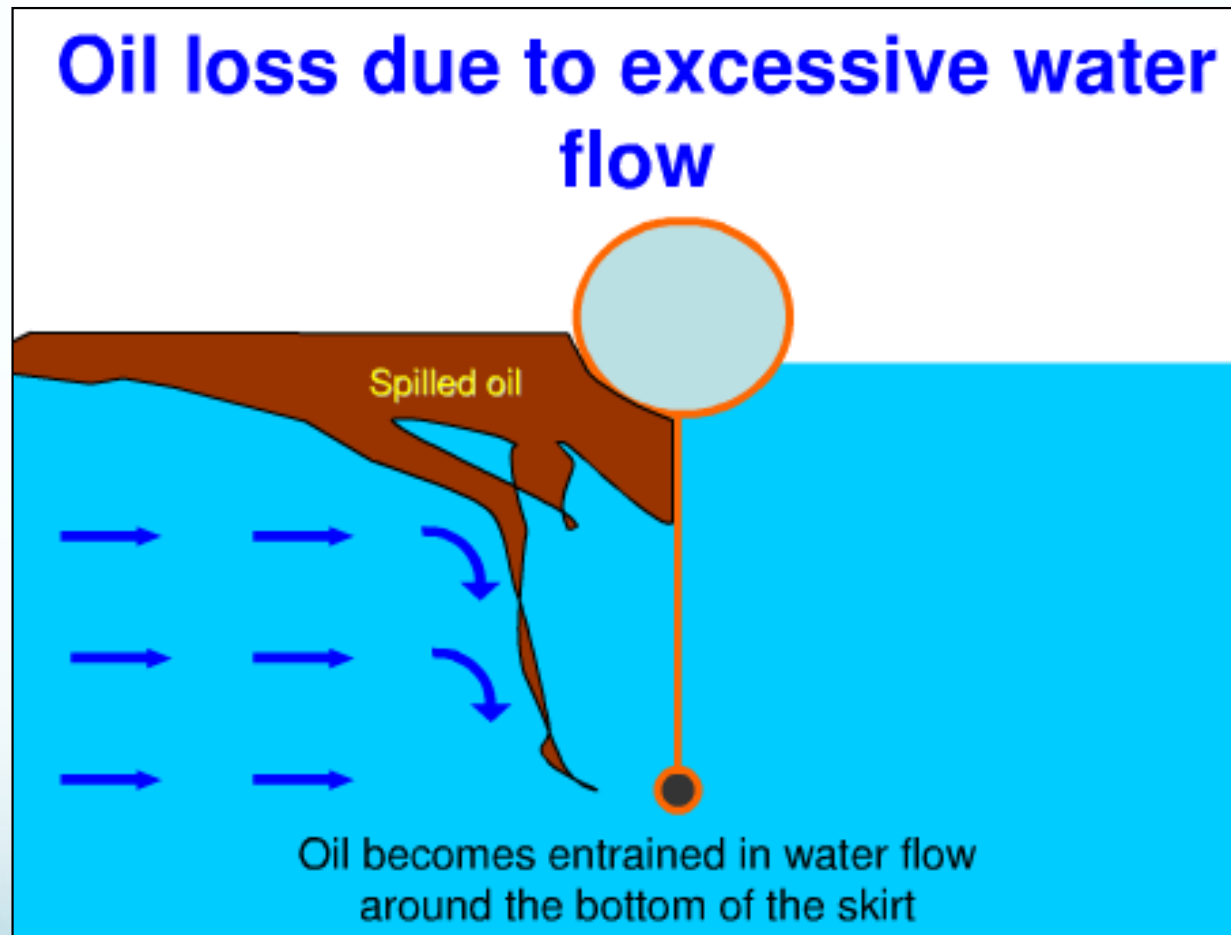
## Boom Performance

- **Entrainment** - current or tow exceeds .7 knots. Oil breaks off and goes under boom.
- **Drainage failure** - boom full and oil flows under the skirt.
- **Loading** - drag caused by current on anchored boom or from towing. More boom and greater draft increases drag. 1 hp for every 20 lbs of drag needed for towing.



# Containment and Recovery

**Entrainment** - current or tow exceeds 0.7 knots.



# Oil Recovery

Oil Must be Recovered After it has been Contained

Recovery can be Accomplished by Several Different Methods

- Skimmers
- Sorbents
- Other Countermeasures



# Containment and Recovery

## Skimmers

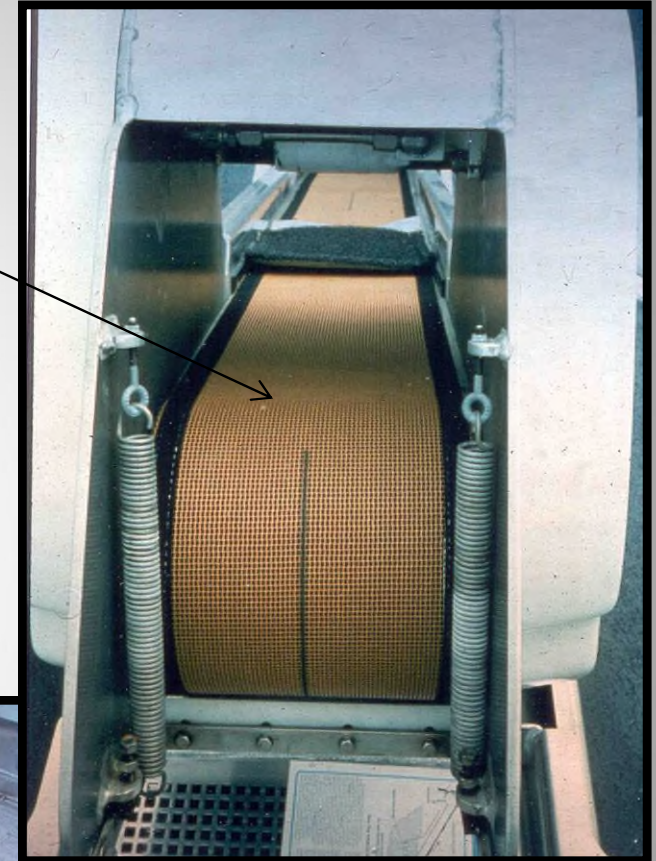
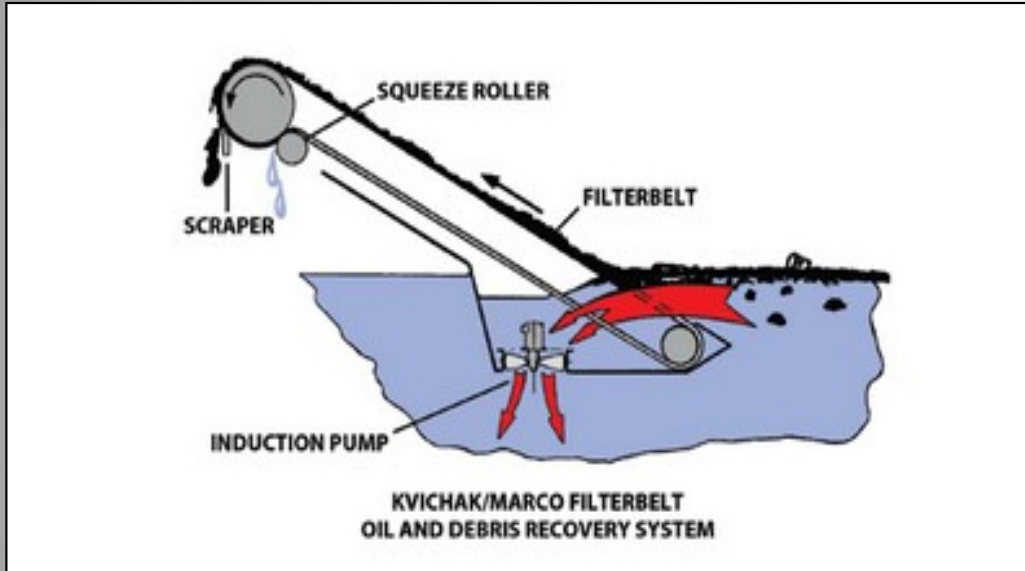




Containment and Recovery

# Filterbelt System

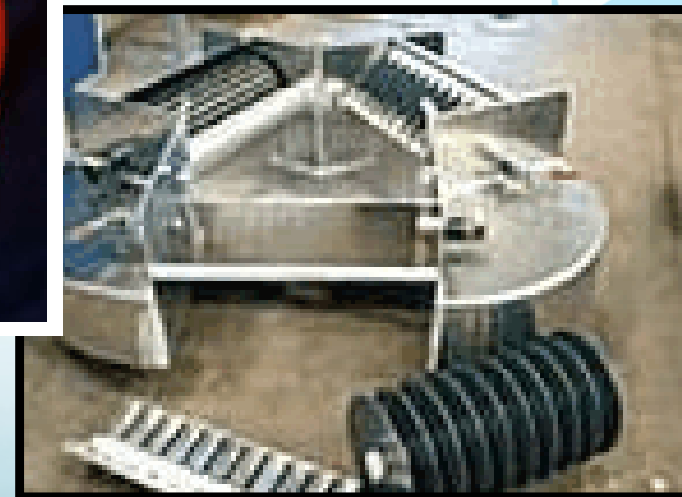
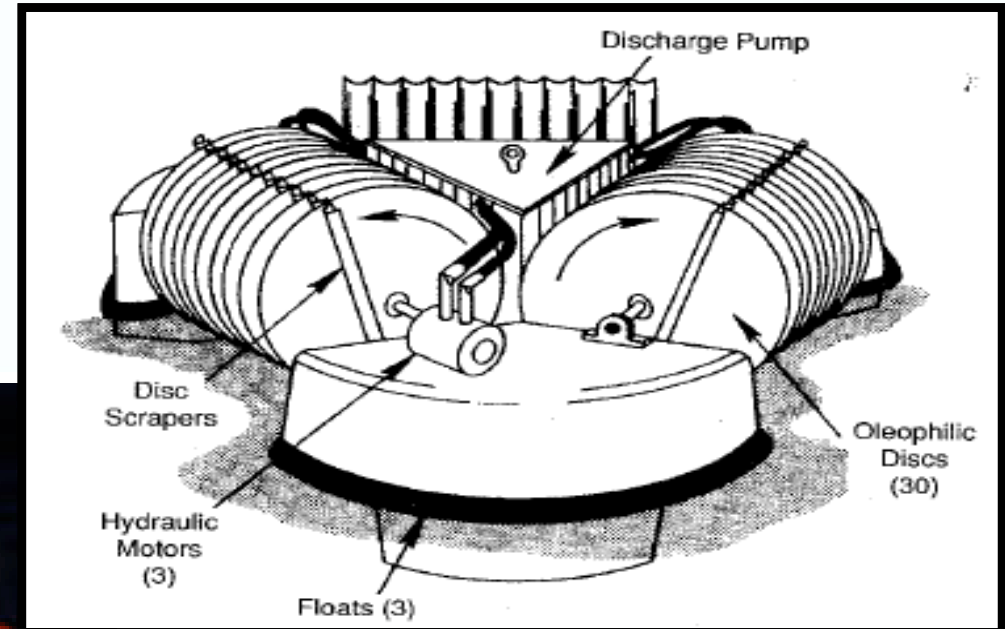
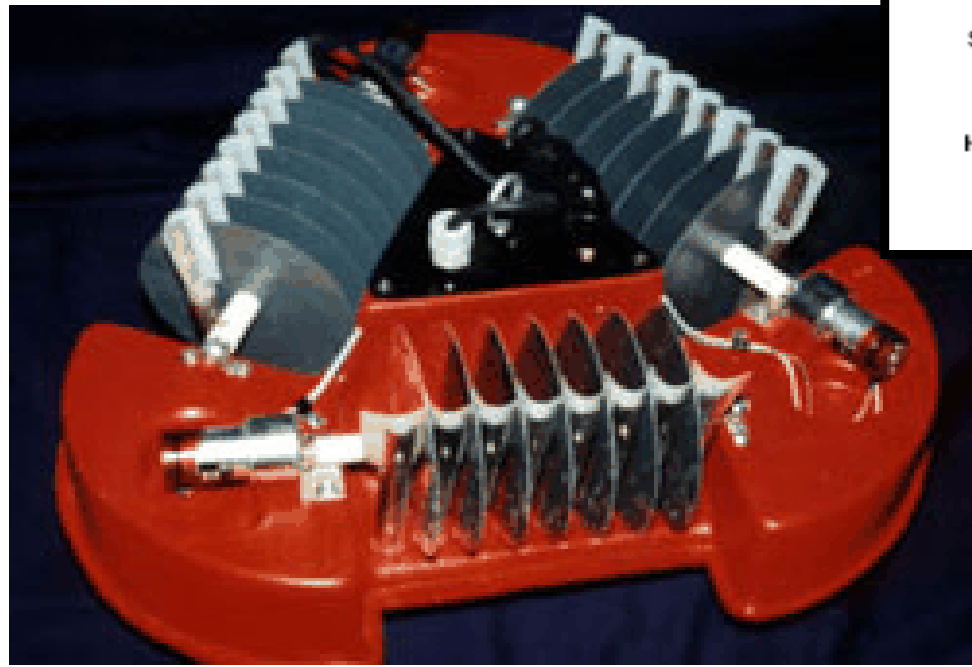
## Backing Belt



Filter Pads

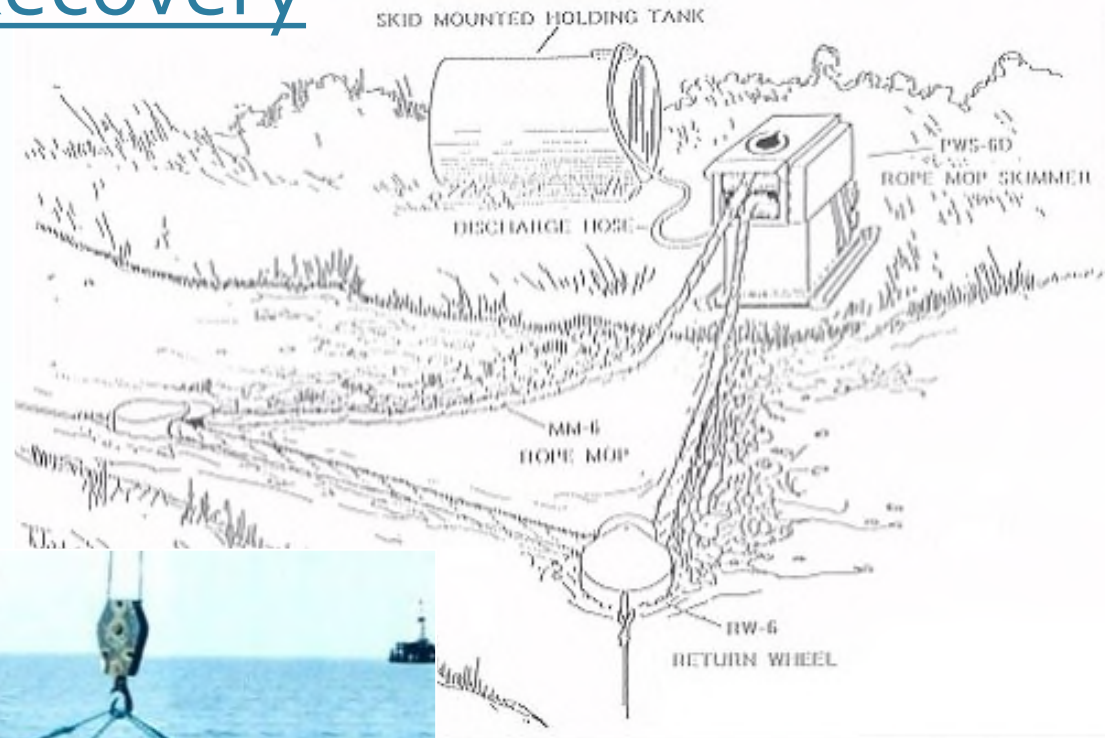
# Containment and Recovery

## Disc Skimmer



# Containment and Recovery

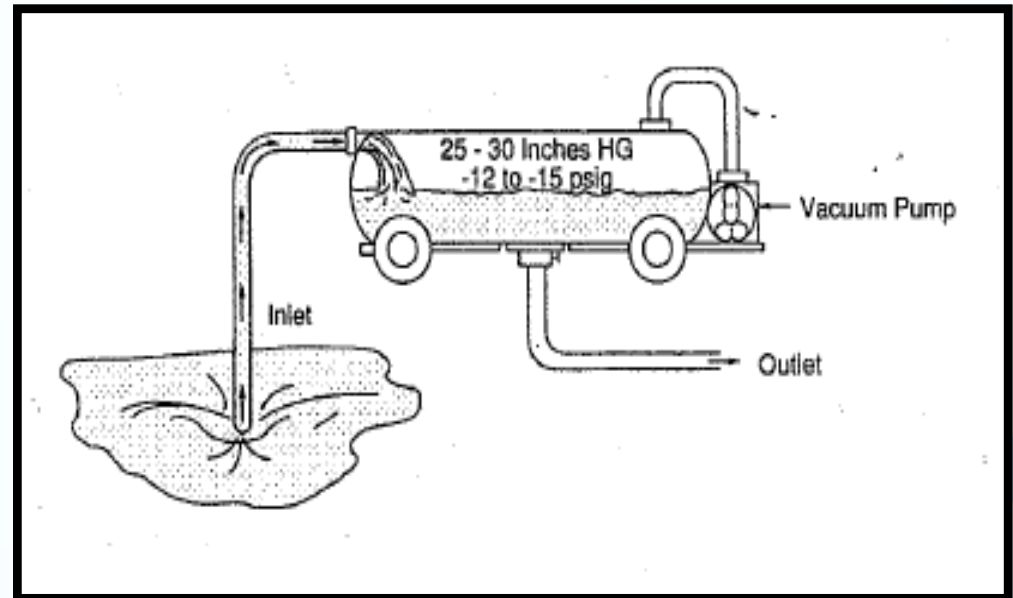
## Rope Mop Skimmers



# Containment and Recovery

## Vacuum Systems

- Vacuum Trucks are generally available in industrial Areas
- Will Recover fluids of any Viscosity
- Provides its own Storage
- Capable of Operating Many Different Skimmers

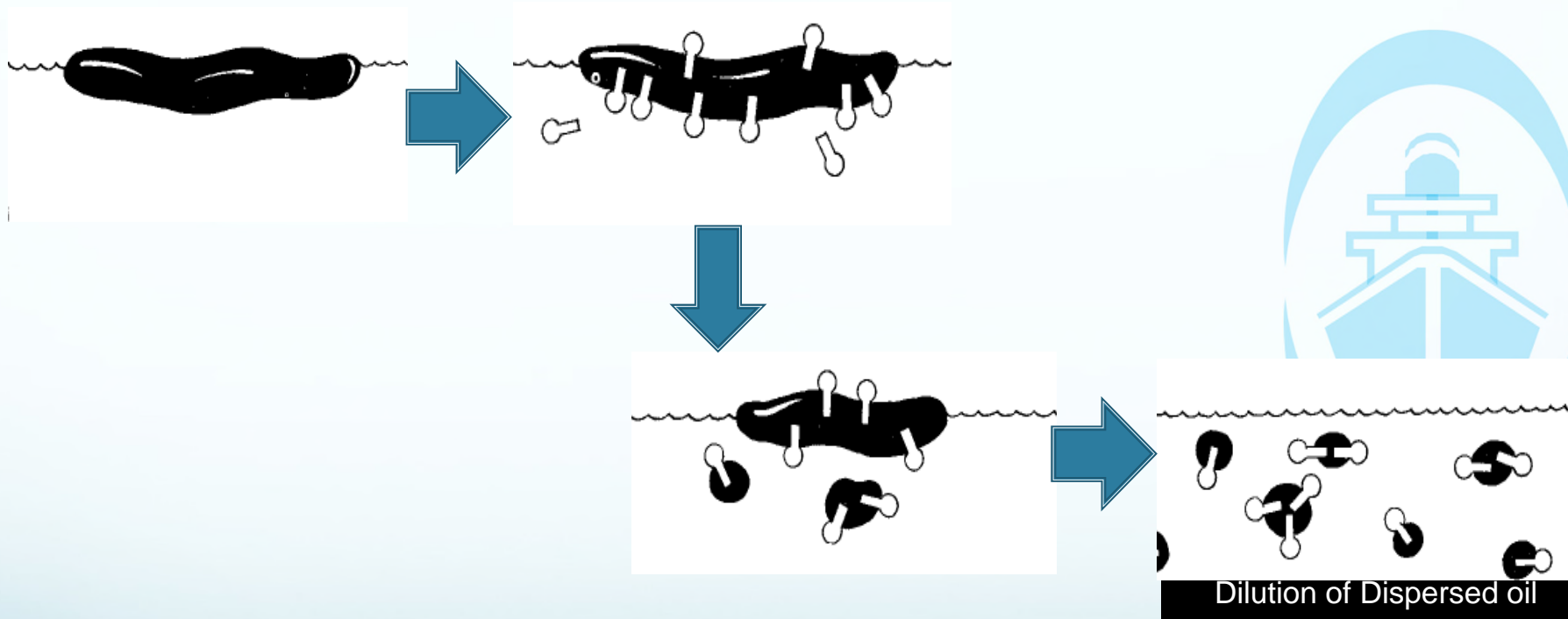


## Alternative Technologies

- Chemical Dispersion
- Insitu-Burning
- Bioremediation



# Mechanism of Chemical Dispersants



# Alternative Technologies

## In-situ Burning

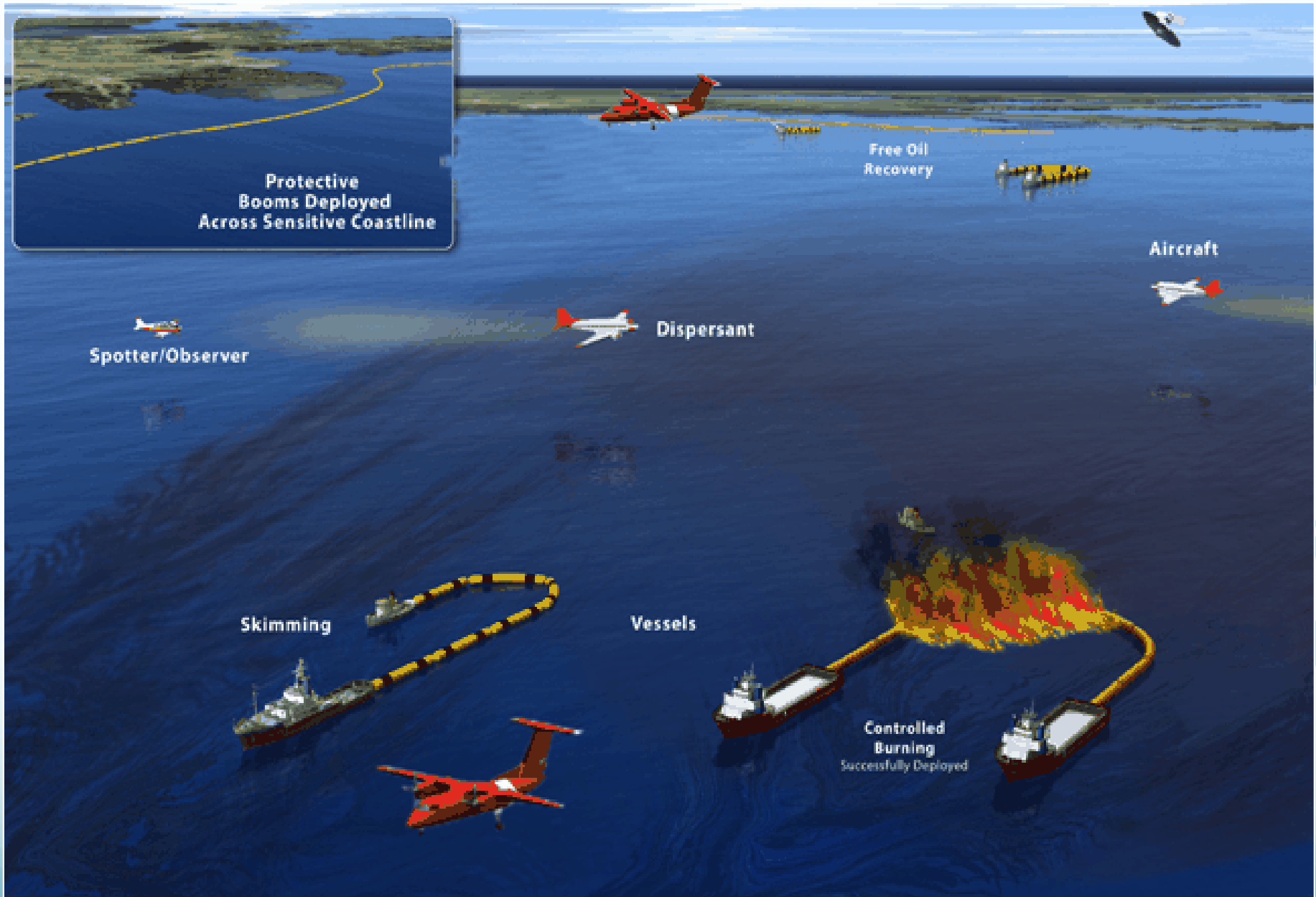


What is In-situ Burning?

Why Conduct In-situ Burning?

How is In-situ Burning done?

# Alternative Technologies





# Wildlife Capture and Cleaning

## Oiled Birds

- Destroys the insulating properties of the feathers
- Rapid heat loss and death
- Some Petroleum products are toxic



## Oiled Mammals

- Most Marine Mammals are not affected by oil
- Sea Otters are vulnerable, oil destroys insulation
- Capturing oiled mammals is hazardous
- For the well-trained professional



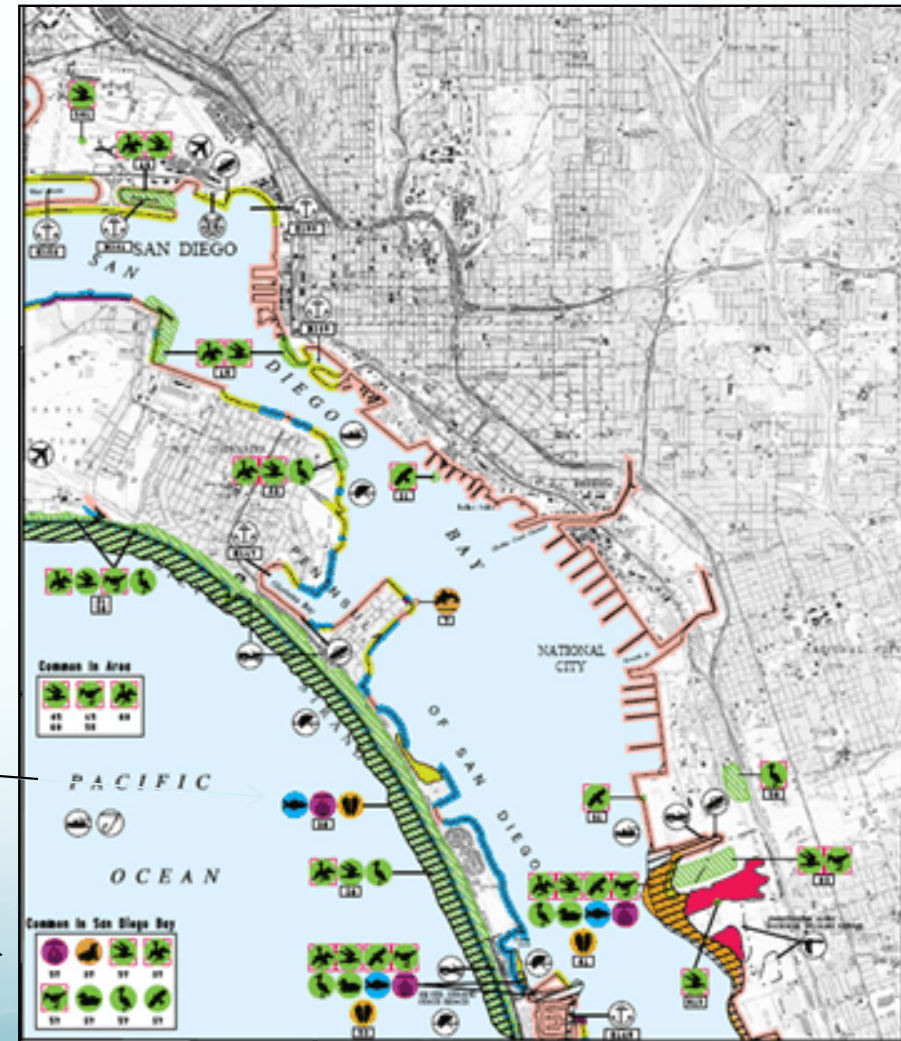
# Shoreline Protection & Cleanup

## Environmental Sensitivity Index

Resources at Risk including Wildlife, Socioeconomic and Archeological Resources  
Maps show Seasonal Fluctuations of Animal Populations

Resources at Risk

Legend



# Shoreline Protection & Cleanup

## Factors Affecting Cleanup Decisions

Type of Oil

Geology of the Shoreline

Sensitivity of the Biological Communities

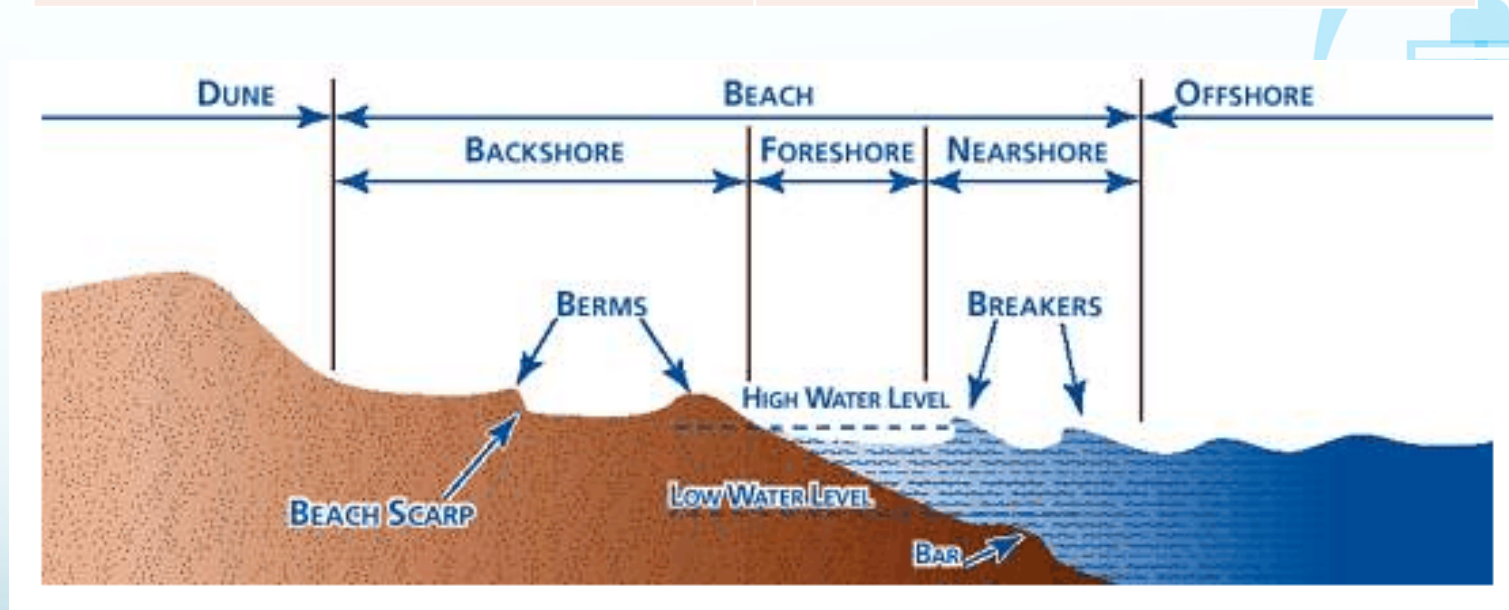
Cleanup Process and Methods



# Shoreline Protection & Cleanup

## Types of Beaches

Sand Beaches	Sheltered Rocky Coast
Course Grain Beaches	Exposed Rocky Coast
Gravel Beaches	Tidal Flats



Morphology of a Beach

# Shoreline Protection & Cleanup

## Shoreline Cleanup Techniques

Selection of the proper cleanup technique depends on many different factors including the following:

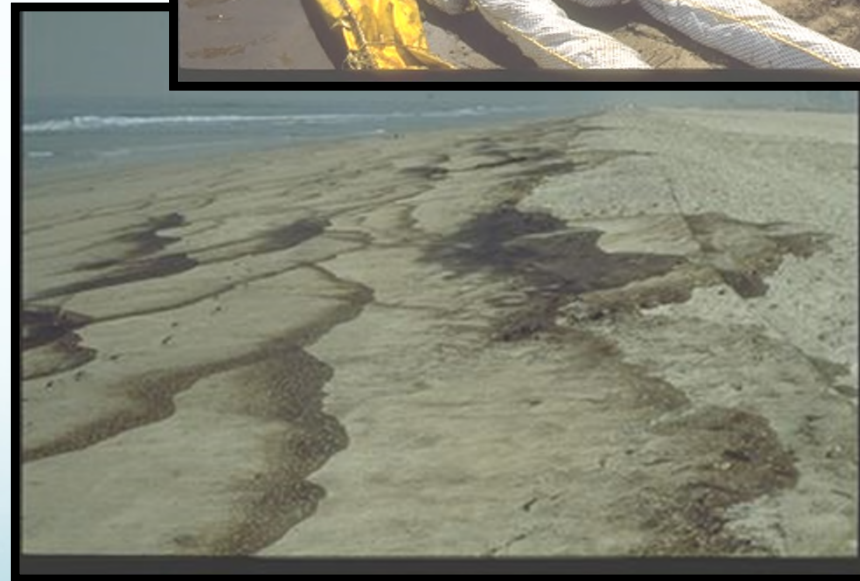
- Type of Substrate
- Amount of Oil on the Shoreline
- Depth of Oil in the Sediments
- Type of Oil ( Tar balls, Viscous-coating, etc.)
- Traffic ability of Equipment on the Oiled Shoreline
- Environmental or Cultural Sensitivity of the Oiled Shoreline



# Shoreline Protection & Cleanup

## Sand Beaches

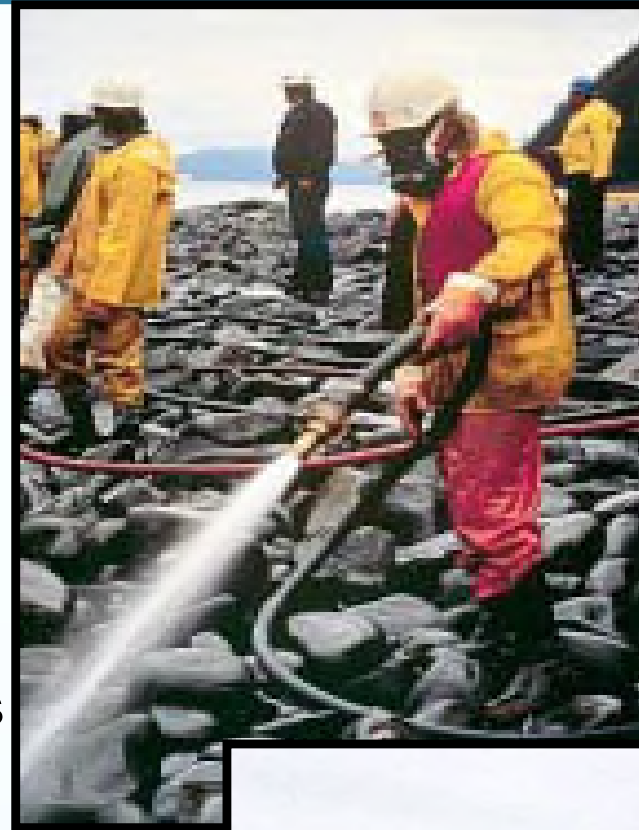
- Oil may be buried
- Oil usually does not penetrate fine grain sand
- Usually hard packed, supports heavy equipment
- Cleaning usually consists of removing contaminated sand and replacing it with clean sand.



# Shoreline Protection & Cleanup

## Gravel Beaches

- Made up of pebbles, cobbles or boulders.
- Different sediment transfer patterns
- Oil may penetrate as deep as 50 inches
- Oil may be persistent and last for years
- If fluid, oil can be pumped off, if not heave equipment will be required for removal.



## WHAT OFTEN HAPPENS...

- AVOID THE FIVE STAGES OF OIL SPILL GRIEF
  - DENIAL “HOW COULD THIS HAVE HAPPENED TO US?”, OFTEN ACCOMPANIED BY PANIC
  - ANGER “WHO CAN WE BLAME? GET THE LAWYERS!”
  - BARGAINING “IT ISN’T AS BAD AS THEY SAY”
  - DEPRESSION “WE ARE OUT OF CONTROL OF OUR OWN DESTINY”
  - ACCEPTANCE “HOW MUCH DO WE HAVE TO PAY”





## INSTEAD...

- UNDERTAKE TO MANAGE ACTIVITIES EFFECTIVELY
- ASSESS RISK TO CORPORATE INTERESTS
- DEVELOP RIGHT-MINDED STRATEGY TO ADDRESS AND MITIGATE
- TAKE APPROPRIATE AND TIMELY ACTIONS
- PLAN FOR THE NEXT PHASE



## Considerations for Declaring Spill Response Complete

- Long Term Environmental Damage Issues
- Remaining Oil Visibility
- Claims
- Achieving Agreement on “How Clean is Clean”
- Stakeholder Agreement v Spill Command
- Waste Disposal Issues



## Post Incident Evaluation

- Lessons Learned
- PRIORITIES
- STAKEHOLDER ISSUES
- PLANNING
- OPERATIONS
- LOGISTICS
- COMMUNICATIONS
- FINANCE

**WAS THE RESPONSE REASONABLE AND EFFECTIVE?**



## Documentation and Document Design

Having documentation plan designed in advance helps to streamline spill response activities and communications!



## Challenges

- Secondary Incident Management
- Media and Social Media
- Coordination Information of Commercial Stakeholders
- Security
- Conflicting Priorities

